AREVA	**Form 3.2-1** **Calculation Cover Sheet** **Revision 10**	**Calculation No.:** TN-BGC1-0601 **Revision No.:** 2 Page: 1 of 110

DCR NO (if applicable) : 502800-002	**PROJECT NAME: TN-BGC1**
PROJECT NO: 502800	**CLIENT:** AREVA Inc.

CALCULATION TITLE: Criticality Analysis for TN-BGC1 – Contents 11a, 11b, 11c , 11g under non-air transport case and air transport case

SUMMARY DESCRIPTION:

1) Calculation Summary

This calculation reports the criticality analysis performed for TN-BGC1 contents 11a, 11b, 11c and 11g for HAC, NCT and isolated cases. CSAS5 control module available in SCALE 6.0 package is used to carry out the analysis. The maximum allowable fissile content in each of these cases is determined. Also, air transport case is analyzed to determine the maximum amount of CH_2 that can be used to moderate 7 Kg of U-235.

Revision 1 removes the 4 last tables of Appendix C showing the Uranium masses in no-resin model.

Revision 2 is performed to provide criticality safety calculations when the fissile metallic uranium in content 11 of TN-BGC1 package is replaced with uranium oxides/uranium tetrafluorides/uranium alloys.

2) Storage Media Description

COLDSTOR location: /areva_tn/502800/TN-BGC1-0601-002

If original issue, is licensing review per TIP 3.5 required?

Yes ☐ **No** ☒ **(explain below)** **Licensing Review No.:** ______

This calculation is performed to support a transport license revalidation of French competent authority, certificate F/313/B(U) F-96, that will be reviewed and approved by NRC, certificate USA/0492/B(U) F-96. Therefore, a licensing review per TIP 3.5 is not applicable.

Software Utilized (subject to test requirements of TIP 3.3):	**Software Version:**	**Software Log Revision:**
SCALE6.0 Module: CSAS5	C750MNYCP01	32

Calculation is complete:

Originator Name and Signature: Nandan GC [signature] Date: 1/29/2016

Calculation has been checked for consistency, completeness and correctness:

Checker Name and Signature: Jun Li [signature] Date: 1/29/2016

Calculation is approved for use:

O. GANDOU
Project Engineer Name and Signature: [signature] Olivier Gandou 2016.01.29 14:24:56 -05'00' Date: 01/29/2016

REVISION SUMMARY

Rev.	Description	Affected Pages	Affected Disks
0	Initial issue	All	N/A
1	Remove the 4 last tables of Appendix C showing the Uranium masses in no-resin model.	1, 3, 6, 19, 66 and 97	N/A
2	Addition of Appendix D, the analysis is to provide criticality safety calculations when the fissile metallic uranium in content 11 of TN-BGC1 package is replaced with uranium oxides/uranium tetrafluorides/uranium alloys.	6, 15, 18, 66-71 and 103-110	N/A

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1.0 PURPOSE

The purpose of this evaluation is to perform criticality analysis for TN-BGC1 contents 11a, 11b, 11c and 11g using KENO V.a module of SCALE 6.0, Reference [1] for HAC, NCT and isolated cases. In addition air transport case is analyzed. The TN-BGC1 is a transport package owned by CEA. Contents 11a, 11b and 11c are described in section 4.11.1.1 of Reference [2]. Content 11g is described in section 4.11.1.2 of Reference [2]. The calculation model of the air transport case is presented in section 4.11.2 of Reference [2].

This criticality analysis is performed to address the NRC Request for Additional Information issued on 1/30/2014, Reference [3]. This criticality analysis is performed to revalidate the analysis already performed in Reference [4] and Reference [5] using KENO V.a module of SCALE 6.0. Reference [4] contains the criticality analysis of contents 11a, 11b and 11c and Reference [5] contains the criticality analysis of content 11g of TN-BGC1 transport package using KENO VI module of SCALE 4.4 software.

The transportation cases include both non-air transport and air transport. Different models are used to study these cases. Both assume homogeneous mixture of fissile content. In non-air transport case the maximum amount of fissile material that can be loaded into the package is determined. In case of air-transport, the maximum amount of CH_2 that can be used to moderate 7 Kg of U-235 is determined. A USL equal to 0.9370 is applied for this calculation (Section 8.2).

The purpose of the revision 1 is to remove the 4 last tables of Appendix C showing the Uranium masses in the no-resin model.

The purpose of revision 2 is to provide criticality safety calculations when the fissile metallic uranium in content 11 of TN-BGC1 package is replaced with UO_2/UF_4/UAl_2/U-7Mo/U_3Si/U-10Zr materials. This is to address the NRC Request for Additional Information issued on December 16, 2016, Reference [12].The analysis concludes that the uranium metal as fissile medium in TN-BGC1 package is most reactive and bounds the fissile medium with other contents such as uranium oxides/uranium tetrafluorides/uranium alloys.

The maximum uranium masses allowed for contents 11a, 11b, 11c and 11g are indicated in Table 10-22.

2.0 CONSERVATISM

- The arrays in HAC case are modelled such that the packages are touching each other to bring the packages as close as possible.

- The 11g case is modeled such that the fissile content is as close as possible to each other when it is stacked one above the other which means the fissile content in the lower stack is at the top position and it is at the bottom in the upper stack.

- For the HAC case, part of resin is replaced with air (Table presented in Appendix C shows that using air is more conservative than water).

3.0 ASSUMPTIONS

The following assumptions are considered for this calculation

- All fissile materials used in this calculation are unirradiated, hence no burnup credit is considered.

- The density of the fissile medium is assumed to be maximum at 18.92 g/cc.

- Water can penetrate into or escape from the package and between the packages in array case.

- Impact limiters and cage are not included because they have negligible effect on the k_{eff} of the system. Also SCALE 6.0 has a limitation that the diagonal rods of the cage cannot be modeled.

4.0 DESIGN INPUT/DATA

4.1 TN-BGC1 Package Description

TN-BGC1 package consists of a parallelepiped cage inside which a generally cylindrical body equipped with a closure system and a cover is fixed. The main sub-assemblies forming the package are described in Reference [4 & 5] as follows:

4.1.1 Cage

The cage is a structure of dimensions 600 x 600 x 1821 mm^3, made from tubes welded together. Aluminum rolled tubes of square section 30 x 30 mm^2 and thickness 2 mm are used. The cage consists mainly of uprights and horizontal bars forming three "floors". Tubes across the diagonals give the structure its transverse rigidity.

Spaces, reinforced by 40 x 40 x 4 mm^3 angle bars, also made from aluminum, are provided in the lower part and at about two thirds of the height to insert the forks of a fork lift truck in order to handle the packaging.

In the upper part, on one side, a 200 x 125 mm^2 opening is provided to extract the internal fittings while reducing the height under hook required if a travelling crane is used for handling.

Frames are provided inside the cage to connect the cage to the body:

- They are offset by 45° with respect to the cage and drilled to insert the body attachment screws;
- Inclined tubes are welded between the frames and the rest of the structure to guarantee good transmission of the mechanical forces from the body to the cage; the part of the end not welded to the frames is closed by a rectangular plastic plug.

This cage which is made of aluminum is not modelled in KENO V.a model since it acts as a neutron absorber.

4.1.2 Body

The body cavity is formed from a stainless steel shell (rolled then welded plate) of useful inner diameter 178 mm and minimum thickness 6 mm and a 8 mm thick bottom also made from stainless steel, connected by a circular weld. An extra water layer of radial thickness 3 mm is added in the KENO V.a model (which is shown in Figure 11-1, it is required so as to keep the dimensions of SS steel cylinders and thickness of resin same as in Drawing Reference [6]).

A second stainless steel shell of inner diameter 292 mm and thickness 1.5 mm cooperates with the first shell to delimit a space full of loaded resin that acts as a neutron absorber and active heat insulation.

In the event of fire (HAC cases) it is assumed that a part of resin of thickness 15 mm in the radial direction is burned and replaced with air in the KENO V.a model. The resin at the bottom is kept at nominal thickness since it suffered no damage during the fire test (Reference [2]).

A 25mm thick distribution plate made from special steel is attached to the bottom (by 4 studs welded to it) to strengthen it in the event of a fall on the packaging base.

A compartment made from a poplar disc in the central section and a balsa ring on the outside in the lower part of the body acts as shock absorber in case of a fall. However, the balsa ring and poplar discs are not modelled in KENO V.a input since they do not impact criticality analysis.

In the upper part, a stainless steel machined flange is welded to the two shells to receive the closure system described below and provide a suitable bearing surface at its seals.

4.1.3 Closure System

The closure of the body cavity consists of a system composed of 3 main parts: a plug, a clamping ring and a bayonet ring.

The plug is machined from a 92 mm thick stainless steel disc. This plug is held in place by a bronze clamping ring that is screwed into the stainless steel bayonet ring itself resting on the body flange.

4.1.4 Shock Absorber Cover

A shock-absorber cover is placed over the top of the body and the closure system. It is composed of two steel plate compartments; the one closest to the body is filled with resin and the other is filled with wood. Figure 11-1 shows schematic diagram of TN-BGC1 drawing.

4.2 Description of the contents

The details of the contents 11a, 11b, and 11c are given in Table 10-1. These are also described in section 4.11.1.1 of Reference [2].

For contents 11a and 11b, uranium metal of density equal to 18.92 g/cm^3 with any enrichment of U-235 is used. In the KENO V.a model, 100% U-235 enrichment is used. For content 11c, the enrichment should be less than 20 wt. % U-235 and the KENO V.a model uses 20% enrichment of U-235. All the three fissile contents can be moderated by any quantity of CH_2.

Contents 11g is described in section 4.11.1.2 of Reference [2]. Uranium metal of density equal to 18.92 g/cm^3, 20% enrichment of U-235 and water moderator is used in the KENO V.a model.

For the air transport case, 7 Kg of 100% U-235 enriched fissile material, packed in polyethylene bags of maximum mass equal to 400 g is considered as described in section 4.11.2 of Reference [2]. The fissile material is moderated by a mix of ($C+H_2O+CH_2$).

4.3 Material and Geometry Data of the KENO model

The dimensions of different components of TN-BGC1 transport package used in the KENO V.a input model are given in Table 10-2. Material property data is given in Table 10-3. The details of geometry units used in the KENO V.a model for all the cases are given in Table 10-4.

The geometry of the KENO model for non-air transport, HAC case includes:
In radial direction,

- A cylinder of 60 or 50 mm radius containing the fissile medium
- 2 mm thick stainless steel wall
- 184 mm diameter cylinder containing water (In the input, this is actually two concentric cylinders one of radius 89 mm the other of radius 92 mm, both filled with water)

- 6 mm thick stainless steel wall
- 33 mm resin
- 15 mm air gap
- 1.5 mm thick stainless steel wall

In the axial direction at top,
- 92 mm Stainless steel

In the axial direction at bottom,
- 33 mm stainless steel
- 24 mm resin
- 1.5 mm stainless steel

The geometry of the KENO model for non-air transport; NCT case includes:
In radial direction,
- A cylinder of 60 or 50 mm radius containing the fissile medium
- 2 mm thick stainless steel wall
- 184 mm diameter cylinder containing water (In the input, this is actually two concentric cylinders one of radius 89 mm the other of radius 92 mm, both filled with water)
- 6 mm thick stainless steel wall
- 48 mm resin
- 1.5 mm thick stainless steel wall

In the axial direction at top,
- 92 mm Stainless steel

In the axial direction at bottom,
- 33 mm stainless steel
- 24 mm resin
- 1.5 mm stainless steel

The geometry of the KENO model for air transport includes four concentric spheres:
- Inner most sphere contains homogenous mixture of fraction of fissile content and moderator mixture (CH_2+water+C), variable mass of CH_2, 2 Kg of water and 2.5 Kg of C.
- Second sphere contains the remaining unmoderated fissile content
- Third sphere is composed of 340 Kg stainless steel
- Outermost sphere is a 20 cm thick water reflector

For non-air transport, the fissile material is placed in an internal fitting contained inside the internal cavity of the package. The radius of the internal fittings varies for different contents (Table 10-1). The fissile content is modeled as homogeneous mixture of uranium and moderator for all four contents. Though content 11c has an enrichment of 20% U-235, heterogeneous case is not considered, however the homogenous demonstration will suffice since the max k_{eff} is very low (less than 0.9). The enrichment of U-235 and the moderator used in each case are given in Table 10-1. The position of fissile mixture inside the inner fittings is at the top because this position gives maximum k_{eff}.

From Reference [4], using water spacer is the most penalizing case as compared to air or aluminum spacer. Hence, all the analyses are performed for homogeneous case with water spacer.

4.4 Computer Codes

The CSAS5 control module of SCALE 6.0 Reference [1] is used to calculate the effective neutron multiplication factor (k_{KENO}) of the TN-BGC1 transport package. The 238-group ENDF/B-V cross section library is chosen. The CSAS5 control module allows simplified data input to the functional modules BONAMI, NITAWL and KENO V.a. These modules process the required cross sections and calculate the k_{KENO} of the system. BONAMI performs resonance self-shielding calculations for nuclides that have Bondarenko data associated with their cross sections. NITAWL applies a Nordheim resonance self-shielding correction to nuclides having resonance parameters. Finally, KENO V.a calculates the k_{KENO} of a three-dimensional system. A sufficiently large number of neutron histories (5000 generations in total with 2000 neutrons per generation) are run so that the standard deviation is around 0.0003 for all calculations.

4.5 Configurations Studied

For Contents 11a, 11b, and 11c, 2N HAC, 5N NCT, isolated HAC and isolated NCT are studied. The value of N=10. The HAC cases are modeled as 2N array with triangular pitch. The 2N HAC configuration is shown in Figure 11-2Figure 11-2 and Figure 11-3. The 5N NCT case is modeled as 7 x 8 x 1 array of square pitch. This configuration is shown in Figure 11-4 and Figure 11-5. Figure 11-6 shows horizontal cross sectional view of isolated HAC case. Longitudinal view of isolated case is shown in Figure 11-7.

For content 11g, 5N HAC, 5N NCT, isolated HAC, and isolated NCT configurations are studied. The value of N=50. The HAC cases are modeled as 5N hexagonal close array and the packages are stacked one above the other. The bottom layer of packages contains fissile mixture inside the internal fittings at the top position while the upper layer of array contains it in the bottom position so as to keep the fissile contents closer. This configuration can be seen in Figure 11-8 and Figure 11-9. NCT case is modelled in 12 x 12 x 2 array. This configuration can be seen in Figure 11-10 and Figure 11-11.

The air transport case is demonstrated in Figure 11-12. The radius of the inner most sphere containing U-235 and moderator mixture varies depending on the mass of moderated U-235 and the CH_2 used for moderation. The mass of moderated fissile content is varied from 50 g to 7 Kg and CH_2 mass is increased from 100 g to a maximum allowable mass so as to keep the k_{eff} below USL. The radius of the second sphere containing unmoderated fissile material varies depending on the mass of unmoderated fissile content. The radius of the third sphere is kept at a constant radius calculated based on the SS mass of 340 Kg. The fourth sphere is a 20 cm thick water surrounding the SS sphere.

5.0 METHODOLOGY

5.1 Non-Air Transport Case

5.1.1 Determination of Payload Limit

This analysis is performed to address the issue #3 in RAI (Reference [3]) with regard to determination of the payload limit. Content 11a, 11b, 11c and 11g cases are analyzed to determine the permissible amount of fissile materials such that the criteria, k_{eff} <USL is met, where $k_{eff} = k_{KENO} + 3\sigma$. The USL value is obtained from Reference [7]. The USL computation is described in Section 8.2 below.

KENO V.a model of the TN-BGC1 package developed for criticality analysis is used to evaluate maximum allowable fissile contents in each case. The methodology followed here is similar to that followed in Reference [4]. For contents, 11a, 11b, 11c, the 2N HAC case is simulated. The analysis is performed by varying the height of the internal fittings from 10 cm to 147 cm to vary the amount of moderator (the amount of fissile content is fixed) and determine the maximum k_{eff}. The amount of fissile content is then varied to repeat the above step. The procedure is repeated until a case result in maximum k_{eff} just below the USL value. The mass of fissile content corresponding to this case is the maximum allowable fissile content. Next, the 5N NCT is simulated with the maximum allowable fissile content in each case and the k_{eff} is determined. This is shown to be less than max k_{eff} obtained for 2N HAC case. Similarly, the penalizing nature of 2N HAC case is verified by comparing it with the results obtained for isolated package (in HAC and NCT configuration).

For content 11g, the above procedure is repeated with 5N HAC case modeled as in Reference [5] since it covers both 2N HAC and 5N NCT cases. It is verified to be greater than the k_{eff} obtained for isolated package case.

5.1.2 Effect of Fog between Packages

The effect of fog between the packages is studied by replacing air with water between the packages. The density of water is varied from 0 to 100% and the k_{eff} is determined. The resulting k_{eff} is verified to be less than the USL.

5.1.3 Payload Limit when H/X=0

Criticality simulations are performed for each of the content case to determine the maximum allowable fissile mass when no moderator is used. The height of inner fittings is modeled such that it contains only the fissile content without any moderator. The cavity contains water as filler and the space between the packages are filled with air (since fog density near 0-0.1% results in max k_{eff}, see Section 9.0). If the k_{eff} determined exceeds the USL value then the mass of fissile content is reduced until the k_{eff} falls below USL.

5.2 Air Transport Case

5.2.1 Determination of Maximum Mass of CH_2 used for Moderation

The fissile content in this model is metallic uranium with 100 wt% U-235. The fissile content is moderated by variable quantity of polyethylene, water and carbon. The criticality evaluation is carried out by varying the mass of moderated fissile material and the amount of CH_2, while keeping the total (moderated +unmoderated) masses of U-235 a constant (7 Kg). First, the mass of moderated U-235 is varied from 0.05 Kg to 7 kg in the innermost sphere for a given mass of CH_2 and the k_{eff} is determined. Next, the procedure is

repeated for an increased mass of CH_2. The mass of CH_2 used in this study vary from 0.1 Kg to 0.8 Kg. The maximum mass of CH_2 that can be used to moderate the fissile content is determined so as to satisfy the condition.

APPENDIX A gives all the results obtained from criticality analysis from which the optimum case in each content is chosen. APPENDIX B provides the sample inputs used for the simulation.

5.3 KENO Input Nomenclature

For HAC 2N case, with air in inter packaging space, input file is named as "*HAC2N_11a_1750g_050cm*". *HAC2N* stands for hypothetical accidental condition in 2N array configuration where N = 10. *11a* is the content of TN-BGC1 package, *1750g* shows mass of uranium metal in grams, and 050cm is the height of the internal fitting containing the fissile material. Height of this cylinder is varied from 10 cm to 147 cm to determine the optimum height. For HAC 2N case, with fog in inter packaging space, input file is named as *"HAC2N_11a_1750g_050cm_000"* where *000* stands for density of fog. Fog density is varied from 0% to 100%. For HAC 2N case, with H/X ratio equal to 0, input file is named as "*HAC2N_11a_1750g_HbyX_ZERO*" where *HbyX_ZERO* represents the case. Here, fissile mixture doesn't have moderator.

For NCT 5N case, with air in inter packaging space, input file is named as "NCT5N_11a_1750g_050cm". NCT5N stands for normal condition of transport in 5N array configuration where N = 10. Rest of the file nomenclature is same as for HAC 2N cases. Here 5N array is made as 7 x 8 x 1.

For isolated HAC case, input file is named as "*Isolated_HAC_11a_1750g_050cm*" and for isolated NCT case, input file is named as "*Isolated_NCT_11a_1750g_050cm*". Rest of the file nomenclature is same as for HAC 2N cases.

For air transport cases, the input file name is given as "*AT_0050_0100gCH2*" where AT stands for air transport, 0050 represents the mass of moderated U-235 in grams, 0100gCH2 represents the mass of CH2 used in the model as moderator.

6.0 REFERENCES

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7.0 NOMENCLATURE

atoms/(b-cm) – Atoms per barn-centimeter

CEA - Atomic Energy and Alternative Energies Commission

cm – centimeter

EALF – Energy of Average Lethargy of Fission

g – Grams

g/cm^3 – grams per cubic centimeter

HAC – Hypothetical Accidental Condition

H/X ratio – Hydrogen to fissile ratio

K – kelvin, S.I. unit of temperature

Kg – Kilogram

NCT – Normal Condition of Transport

US NRC – United States Nuclear Regulatory Commission

RAI – Request for Additional Information

SS – Stainless Steel

U – Uranium

wt. % - Weight Percent

8.0 COMPUTATIONS

8.1 Volume Fraction and k_{eff}

This section details the calculation of the volume fractions and k_{eff}.

In case of non-air transport, the volume fraction of fissile material is calculated in following manner

$$\text{Uranium volume fraction} = \frac{V_{\text{Uranium}}}{\pi * r^2 * h} \qquad \text{Equation 1}$$

Where h is the height (in cm) of cylinder containing fissile mixture and $V_{Uranium}$ is volume of uranium metal which is calculated as

$$V_{\text{Uranium}} = \frac{M}{\rho} \qquad \text{Equation 2}$$

Where M is the mass of the uranium metal and ρ is the density which is taken as 18.92 gm/cm^3 for this calculation. Volume fraction of moderator is calculated in following manner

$$\text{Moderator volume fraction} = 1 - \text{Uranium volume fraction} \qquad \text{Equation 3}$$

The case in which only fissile material is used (H/X = 0), the height of fissile cylinder is calculated in the following manner

$$h = \frac{V_{\text{Uranium}}}{\pi * r^2} \qquad \text{Equation 4}$$

In case of air transport the volume of the spheres are calculated using the mass and density of each material. Also, the radius of the spheres are calculated using,

$$r = \left(\frac{3V}{4\pi}\right)^{\frac{1}{3}} \qquad \text{Equation 5}$$

K_{eff} is calculated as following

$$k_{eff} = k_{keno} + 3\sigma \qquad \text{Equation 6}$$

8.2 USL Computation

The USL value applied in this calculation is obtained from Reference [7]. The parameters considered are moderator to fuel ratio, EALF, mean free path, average number of fission neutrons and enrichment. The limiting case in this calculation is the case with content 11a, 1.7 Kg U-235, and 50 cm height of the internal fittings (RUN ID: HAC2N_11a_1700g_050cm). The k_{eff} in this case is 0.9361. The value of EALF, mean free path and average number of neutrons are 1.31049E-01 eV, 8.15008E-01 cm, and 2.439 respectively. The enrichment value is 100 wt% of U-235. From Table 10-6 of Reference [7], except enrichment all other parameters are within the range of applicability. The USL for EALF, mean free path and average number of fission neutrons parameters is 0.9384, Table 10-6 of Reference [7]. The moderator to fuel ratio by volume is 61.9, therefore the applicable USL for this parameter is 0.9370, Table 10-6 of Reference [7]. Note that the moderator to fuel ratios reported in tables in Appendix A are H/X ratio, by atom-density.

To find the USL corresponding to enrichment, the USL function is extrapolated. This is done by using the following equations taken from Reference [8]:

$$USL = 1 - \Delta k_m - W(x) + \beta(x) \qquad \text{Equation 7}$$

Where $\Delta k_m = 0.05$, required administrative value,

$\beta(x) = k_c(x) - 1$, $k_c(x)$ is the linear regression equation (obtained from USLSTATS output), no credit taken for positive bias by assuming $k_c(x)=1$. So for all $k_c(x)>1$, $\beta(x) = 0$

And W(x) is calculated using the equation,

$$W(x) = t_{1-\gamma_1} s_p \left[1 + \frac{1}{n} + \frac{(x-\bar{x})^2}{\sum_{i=1,n}(x_i-\bar{x})^2}\right]^{\frac{1}{2}} \quad \text{Equation 8}$$

Where n= the number of critical calculations used in establishing $k_c(x)$,

$t_{1-\gamma_1}$ = the Student-t distribution statistic for $1-\gamma_1$ and n-2 degrees of freedom

$\bar{x}$ = the mean value of parameter x in the set of calculations,

s_p= the pooled standard deviation for the set of criticality calculations.

$$\text{So, } W(x) = 1.6504 * (6.9491E-3)\left[1 + \frac{1}{279} + \frac{(100-71.45)^2}{334755}\right]^{\frac{1}{2}} = 0.01150$$

All values are obtained from Reference [7]. The parameter 'x' corresponds to enrichment value.

Since k(x) corresponding to enrichment is [1.0022 + (-1.8914E-05)*X] which is >0 (Table 10-7 of Reference [7]), USL is calculated using,

$$USL = 1 - \Delta k_m - W(x) \quad \text{Equation 9}$$

The USL value obtained from the calculation is then 0.9385.

The USL applicable to the criticality analysis is then **0.9370** since this is the minimum USL value for the moderator to fuel ratio, EALF, mean free path, average number of fission neutrons and enrichment parameters.

The USL is determined using 279 critical experiments selected from DICE. The selected experiments are shown in Section 4.3 of Reference [7], the experiments data encompass uranium metal, uranium oxide, uranium tetrafluorides and uranium alloys mainly aluminum.

A similarity study consisting of comparing the neutronic characteristics such as EALF, mean free path and average number of fission neutrons, Table 13-14 and Table 13-15, indicates that the system loaded with these eligible contents is "neutronically" similar, therefore an unique USL of **0.9370** can be used. Further, the substantial margins in Δk shown in Table 13-12 and Table 13-13 ensure that uranium metal is the bounding uranium form and the uranium mass limits determined in Table 10-22 based on uranium metal are applicable to the uranium forms requested.

9.0 RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

The criticality analysis results of content 11a for various masses of fissile content are shown in Table 10-5. The case using 1.70 Kg U-235 resulted in maximum k_{eff} below USL. With mass of 1.65 Kg, the 5N NCT case and isolated cases are simulated and the results are tabulated in Table 10-6 and Table 10-7. The results show that the 2N HAC case is the most penalizing case.

The presence of fog between the packages is studied and the results are tabulated in Table 10-8. The k_{eff} values decrease with the increase in the fog density. This shows that the inter space package filled with air is the penalizing case.

Similar analysis is performed for content 11b. The results are tabulated in Table 10-9 through Table 10-12. The maximum k_{eff} is less than USL for the case with 16.0 Kg of U-235 (However it is shown that when H/X is made zero for this case the k_{eff} is above USL, see Table 10-21). The comparison of criticality results of NCT and isolated cases show that HAC case result in maximum k_{eff}. The fog density study shows that the interspace packaging filled with 0.1% fog density is the most penalizing case.

For content 11c, the results for HAC cases are tabulated in Table 10-13. The k_{eff} results for different amount of fissile material are well below the USL value. The k_{eff} value peaks around 35 Kg and 40 Kg. The NCT and isolated cases are simulated using 40 Kg fissile mass and the results are provided in Table 10-14 and Table 10-15 respectively. The fog density study is given in Table 10-16.

For 11g, the simulations are performed for 5N HAC. The analysis is performed for 40 Kg of uranium since it is a self-limit on TN-BGC1 package (Reference [5]). The results are tabulated in Table 10-17. The results are below the USL value. The maximum k_{eff} is obtained at a fissile height of 147 cm. The 5N NCT results given in Table 10-18 and isolated case results in Table 10-19 are compared with 5N HAC results. The HAC case is the penalizing case. The fog density variation study results are provided in Table 10-20.

The fog density study in each case shows that the maximum k_{eff} is obtained for 0.1 % or 0 % fog density. The k_{eff} decreases with increasing fog density cases.

A study is conducted for all four contents where H/X is made zero and with the mass of fissile content equal to the case that resulted in k_{eff} just below USL. The results are tabulated in Table 10-21. For 11a, 11c and 11g, the k_{eff} is below USL. For 11b, the k_{eff} result is above USL. Hence a case with H/X =0 is evaluated for 15 kg fissile material and is shown to give k_{eff} below USL.

Based on the above results, a summary of the maximum allowable limits on mass, enrichment and number of packages for contents 11a, 11b, 11c and 11g are tabulated in Table 10-22.

The air transport case results are tabulated from Table 10-23 through Table 10-30. The fraction of fissile content in the moderated mixture is varied keeping the amount of water, graphite and CH_2 in the moderator mixture constant. The k_{eff} results are compared to the USL value. Then the amount of CH_2 is changed and the above step is repeated. This is repeated to find the maximum amount of CH_2 content that can be used to moderate the fissile mixture so as to stay below the USL value. The results show that for 7 Kg of uranium, the maximum CH_2 cannot exceed 0.4 Kg.

10.0 TABLES

Table 10-1: TN-BGC1 contents

Content	Fuel enrichment	Inner fittings		Moderator	N	NCT (XxYxZ)	HAC (XxYxZ)
		Radius (cm)	Thickness (cm)				
11a	100 % U-235	6	0.2	CH_2	10	7x8x1	5x5x1
11b	100 % U-235	5	0.2	CH_2	10	7x8x1	5x5x1
11c	20 % U-235	6	0.2	CH_2	10	7x8x1	5x5x1
11g	20 % U-235	6	0.2	water	50	12x12x2	12x12x2
Air transport	100% U-235	-	-	CH_2, H_2O, C	-	-	-

Table 10-2: Dimensions used in KENO V.a model for TN-BGC1 transport package

Dimensions Used in the KENO V.a Model	
Part	**Dimension (cm)**
Inner radius of inner fittings	6
	5 for 11b
Thickness of inner fittings ss cylinder	0.2
Radial thickness of water spacer	3
Inner radius of inner steel cylinder	9.2
Thickness of inner steel cylinder	0.6
Thickness of resin (In NCT)	4.8
Thickness of resin (in HAC)	3.3
Thickness of burned resin replaced with air (in HAC)	1.5
Inner radius of outer steel cylinder	14.6
Thickness of outer steel cylinder	0.15
Thickness of lid	9.2
Thickness of water reflector	30

Table 10-3: Material property data used in KENO V.a model for TN-BGC1 transport package

Material property data			
Material		**Density**	**unit**
Uranium		18.92	g/cc
CH2 (Polyethylene)		0.92	g/cc
Water		1	g/cc
Air	C	1.00E-08	atoms/(b-cm)
	N	3.90E-05	atoms/(b-cm)
	O	1.10E-05	atoms/(b-cm)
Stainless Steel	Fe	0.061341	atoms/(b-cm)
	Ni	0.016467	atoms/(b-cm)
	Cr	0.008107	atoms/(b-cm)
Resin	H	0.040616	atoms/(b-cm)
	C	0.023803	atoms/(b-cm)
	O	0.02358	atoms/(b-cm)
	B	0.00094597	atoms/(b-cm)

Table 10-4: Geometry Units used in the KENO V.a model for TN-BGC1 transport package

Geometry Units in non-air transport cases		
Geometry Units	**Applicable contents**	**Description**
HAC		
1	11a, 11b, 11c, 11g	Fissile medium inside the ss-cavity
2	11a, 11b, 11c, 11g	Container
3	11a, 11b, 11c, 11g	Lid
4	11a, 11b, 11c, 11g	Container1, containing units 2 and 3
6	11a, 11b, 11c, 11g	Array
7	11a, 11b, 11c, 11g	Global unit, containing unit 6 and water reflector
101	11g	Fissile medium inside the ss-cavity
102	11g	Container
103	11g	Lid
104	11g	Container1, containing units 102 and 103
5N NCT		
1	11a, 11b, 11c, 11g	Fissile medium inside the ss-cavity
2	11a, 11b, 11c, 11g	Container
3	11a, 11b, 11c, 11g	Lid
4	11a, 11b, 11c, 11g	Container1, containing units 2 and 3
5	11a, 11b, 11c, 11g	Cage-vertical
6	11a, 11b, 11c, 11g	Cage horizontal2
7	11a, 11b, 11c, 11g	Cage horizontal1
8	11a, 11b, 11c, 11g	Cage
9	11a, 11b, 11c, 11g	Array
14	11a, 11b, 11c, 11g	Global unit, containing unit 6 and water reflector
Isolated HAC		
1	11a, 11b, 11c, 11g	Fissile medium inside the ss-cavity
2	11a, 11b, 11c, 11g	Container
3	11a, 11b, 11c, 11g	Lid
4	11a, 11b, 11c, 11g	Container1, containing units 2 and 3
14	11a, 11b, 11c, 11g	Global unit, containing unit 6 and water reflector
Geometry Units in air transport cases		
1	Air transport contents	Three concentric sphere- moderated U-235, unmoderated U-235 and SS.
2	Air transport contents	Global unit, fourth concentric sphere made of water

Table 10-5: KENO V.a results for content 11a, HAC 2N case, different masses

Content 11a, U Metal (100 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11a, 2N HAC case, U-235 mass = 1.50 kg, h = 40 cm	0.9250	0.0003	0.9259	HAC2N_11a_1500g_040cm
Content 11a, 2N HAC case, U-235 mass = 1.65 kg, h = 50 cm	0.9327	0.0003	0.9337	HAC2N_11a_1650g_050cm
Content 11a, 2N HAC case, U-235 mass = 1.70 kg, h = 50 cm	0.9351	0.0004	0.9361	HAC2N_11a_1700g_050cm
Content 11a, 2N HAC case, U-235 mass = 1.75 kg, h = 50 cm	0.9384	0.0003	0.9394	HAC2N_11a_1750g_050cm
Content 11a, 2N HAC case, U-235 mass = 2.00 kg, h = 50 cm	0.9472	0.0004	0.9483	HAC2N_11a_2000g_050cm
Content 11a, 2N HAC case, U-235 mass = 2.25 kg, h = 50 cm	0.9548	0.0004	0.9558	HAC2N_11a_2250g_050cm
Content 11a, 2N HAC case, U-235 mass = 2.50 kg, h = 60 cm	0.9617	0.0003	0.9627	HAC2N_11a_2500g_060cm

Table 10-6: KENO V.a results for content 11a, 5N NCT case with fissile mass 1.65 kg

Content 11a, U Metal (100 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11a, 5N NCT case, U-235 mass = 1.65 kg, h = 50 cm	0.8916	0.0003	0.8926	NCT5N_11a_1650g_050cm

Table 10-7: KENO V.a results for content 11a, isolated case

Content 11a, U Metal (100 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11a, Isolated package in HAC, U-235 mass = 1.65 kg, h = 50 cm	0.8802	0.0003	0.8812	Isolated_HAC_11a_1650g_050cm
Content 11a, Isolated package in NCT, U-235 mass = 1.65 kg, h = 50 cm	0.8814	0.0003	0.8824	Isolated_NCT_11a_1650g_050cm

Table 10-8: KENO V.a results for content 11a, 2N HAC case, fog density study.

Content 11a, U Metal (100 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11a, 2N HAC, Fog density = 0 %, U-235 mass = 1.65 kg, h = 50 cm	0.9327	0.0003	0.9337	HAC2N_11a_1650g_050cm_000
Content 11a, 2N HAC, Fog density = 0.1 %, U-235 mass = 1.65 kg, h = 50cm	0.9327	0.0003	0.9337	HAC2N_11a_1650g_050cm_0001
Content 11a, 2N HAC, Fog density = 1 %, U-235 mass = 1.65 kg, h = 50 cm	0.9319	0.0003	0.9328	HAC2N_11a_1650g_050cm_001
Content 11a, 2N HAC, Fog density =10 %, U-235 mass = 1.65 kg, h = 50 cm	0.9302	0.0003	0.9312	HAC2N_11a_1650g_050cm_010
Content 11a, 2N HAC, Fog density = 20 %, U-235 mass = 1.65 kg, h = 50 cm	0.9297	0.0003	0.9307	HAC2N_11a_1650g_050cm_020
Content 11a, 2N HAC, Fog density = 30 %, U-235 mass = 1.65 kg, h = 50 cm	0.9277	0.0003	0.9287	HAC2N_11a_1650g_050cm_030
Content 11a, 2N HAC, Fog density = 40 %, U-235 mass = 1.65 kg, h = 50 cm	0.9261	0.0003	0.9270	HAC2N_11a_1650g_050cm_040
Content 11a, 2N HAC, Fog density = 50 %, U-235 mass = 1.65 kg, h = 50 cm	0.9246	0.0003	0.9256	HAC2N_11a_1650g_050cm_050
Content 11a, 2N HAC, Fog density = 60 %, U-235 mass = 1.65 kg, h = 50 cm	0.9230	0.0003	0.9240	HAC2N_11a_1650g_050cm_060
Content 11a, 2N HAC, Fog density = 70 %, U-235 mass = 1.65 kg, h = 50 cm	0.9214	0.0003	0.9224	HAC2N_11a_1650g_050cm_070
Content 11a, 2N HAC, Fog density = 80 %, U-235 mass = 1.65 kg, h = 50 cm	0.9203	0.0003	0.9213	HAC2N_11a_1650g_050cm_080
Content 11a, 2N HAC, Fog density = 90 %, U-235 mass = 1.65 kg, h = 50 cm	0.9198	0.0003	0.9208	HAC2N_11a_1650g_050cm_090
Content 11a, 2N HAC, Fog density = 100 %, U-235 mass = 1.65 kg, h = 50 cm	0.9181	0.0003	0.9191	HAC2N_11a_1650g_050cm_100

Table 10-9: KENO V.a results for content 11b, different masses

Content 11b, U Metal (100 % U-235);Internal fittings: Ø = 100 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11b, 2N HAC case, U-235 mass = 15 kg, h = 50 cm	0.9255	0.0003	0.9263	HAC2N_11b_15000g_050cm
Content 11b, 2N HAC case, U-235 mass = 16 kg, h = 15 cm	0.9319	0.0003	0.9328	HAC2N_11b_16000g_015cm
Content 11b, 2N HAC case, U-235 mass = 16.5 kg, h = 15 cm	0.9387	0.0003	0.9396	HAC2N_11b_16500g_015cm
Content 11b, 2N HAC case, U-235 mass = 17.5 kg, h = 15 cm	0.9507	0.0003	0.9514	HAC2N_11b_17500g_015cm
Content 11b, 2N HAC case, U-235 mass = 18.5 kg, h = 15 cm	0.9630	0.0002	0.9637	HAC2N_11b_18500g_015cm
Content 11b, 2N HAC case, U-235 mass = 19.5 kg, h = 15 cm	0.9763	0.0003	0.9771	HAC2N_11b_19500g_015cm
Content 11b, 2N HAC case, U-235 mass = 20 kg, h = 15 cm	0.9820	0.0003	0.9828	HAC2N_11b_20000g_015cm

Table 10-10: KENO V.a results for content 11b, 5N NCT case

Content 11b, U Metal (100 % U-235);Internal fittings: Ø = 100 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11b, 5N NCT case, U-235 mass = 16 kg, h = 15 cm	0.9045	0.0003	0.9052	NCT5N_11b_16000g_015cm

Table 10-11: KENO V.a results for content 11b, isolated case

Content 11b, U Metal (100 % U-235);Internal fittings: Ø = 100 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Content 11b, Isolated package in HAC, U-235 mass = 16 kg, h = 15 cm	0.8987	0.0003	0.8994	Isolated_HAC_11b_16000g_015cm
Content 11b, Isolated package in NCT, U-235 mass = 16 kg, h = 15 cm	0.9002	0.0003	0.9009	Isolated_NCT_11b_16000g_015cm

Table 10-12: KENO V.a results for content 11b, 2N HAC case, fog density study

Content 11b, U Metal (100 % U-235);Internal fittings: Ø = 100 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	**Run ID**
Content 11b, 2N HAC, Fog density = 0 %, U-235 mass = 16 kg, h = 15 cm	0.9319	0.0003	0.9328	HAC2N_11b_16000g_015cm
Content 11b, 2N HAC, Fog density = 0.1 %, U-235 mass = 16 kg, h = 15 cm	0.9323	0.0003	0.9331	HAC2N_11b_16000g_015cm_0001
Content 11b, 2N HAC, Fog density = 1 %, U-235 mass = 16 kg, h = 15 cm	0.9321	0.0003	0.9329	HAC2N_11b_16000g_015cm_001
Content 11b, 2N HAC, Fog density =10 %, U-235 mass = 16 kg, h = 15 cm	0.9305	0.0003	0.9313	HAC2N_11b_16000g_015cm_010
Content 11b, 2N HAC, Fog density = 30 %, U-235 mass = 16 kg, h = 15 cm	0.9292	0.0003	0.9300	HAC2N_11b_16000g_015cm_030
Content 11b, 2N HAC, Fog density = 50 %, U-235 mass = 16 kg, h = 15 cm	0.9272	0.0003	0.9280	HAC2N_11b_16000g_015cm_050
Content 11b, 2N HAC, Fog density = 80 %, U-235 mass = 16 kg, h = 15 cm	0.9244	0.0003	0.9252	HAC2N_11b_16000g_015cm_080
Content 11b, 2N HAC, Fog density = 100 %, U-235 mass = 16 kg, h = 15 cm	0.9227	0.0003	0.9235	HAC2N_11b_16000g_015cm_100

Table 10-13: KENO V.a results for content 11c, different masses

Content 11c, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11c, 2N HAC case, U mass = 15 kg, h = 90 cm	0.8618	0.0003	0.8628	HAC2N_11c_15000g_090cm
Content 11c, 2N HAC case, U mass = 20 kg, h = 110 cm	0.8689	0.0003	0.8698	HAC2N_11c_20000g_110cm
Content 11c, 2N HAC case, U mass = 25 kg, h = 120 cm	0.8737	0.0003	0.8746	HAC2N_11c_25000g_120cm
Content 11c, 2N HAC case, U mass = 30 kg, h = 147 cm	0.8757	0.0003	0.8766	HAC2N_11c_30000g_147cm
Content 11c, 2N HAC case, U mass = 35 kg, h = 147 cm	0.8768	0.0003	0.8778	HAC2N_11c_35000g_147cm
Content 11c, 2N HAC case, U mass = 40 kg, h = 147 cm	0.8764	0.0003	0.8773	HAC2N_11c_40000g_147cm
Content 11c, 2N HAC case, U mass = 60 kg, h = 147 cm	0.8673	0.0003	0.8681	HAC2N_11c_60000g_147cm
Content 11c, 2N HAC case, U mass = 80 kg, h = 147 cm	0.8564	0.0003	0.8572	HAC2N_11c_80000g_147cm
Content 11c, 2N HAC case, U mass = 100 kg, h = 147 cm	0.8456	0.0003	0.8465	HAC2N_11c_100000g_147cm
Content 11c, 2N HAC case, U mass = 150 kg, h = 147 cm	0.8259	0.0003	0.8267	HAC2N_11c_150000g_147cm
Content 11c, 2N HAC case, U mass = 200 kg, h = 147 cm	0.8124	0.0003	0.8131	HAC2N_11c_200000g_147cm
Content 11c, 2N HAC case, U mass = 250 kg, h = 147 cm	0.7999	0.0002	0.8006	HAC2N_11c_250000g_147cm
Content 11c, 2N HAC case, U mass = 300 kg, h = 147 cm	0.7863	0.0002	0.7869	HAC2N_11c_300000g_147cm

Table 10-14: KENO V.a results for content 11c, 5N NCT case

Content 11c, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11c, 5N NCT case, U mass = 40 kg, h = 147 cm	0.8388	0.0003	0.8397	NCT5N_11c_40000g_147cm

Table 10-15: KENO V.a results for content 11c, isolated case

Content 11c, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11c, Isolated package in HAC, U mass = 40 kg, h = 147 cm	0.8134	0.0003	0.8142	Isolated_HAC_11c_40000g_147cm
Content 11c, Isolated package in NCT, U mass = 40 kg, h = 147 cm	0.8153	0.0003	0.8162	Isolated_NCT_11c_40000g_147cm

Table 10-16: KENO V.a results for content 11c, 2N HAC case, fog density variation study

Content 11c, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 10				
Case Description	k_{KENO}	σ	$k_{KENO} + 3\sigma$	**Run ID**
Content 11c, 2N HAC, Fog density = 0 %, U mass = 40 kg, h = 50 cm	0.8764	0.0003	0.8773	HAC2N_11c_40000g_147cm_000
Content 11c, 2N HAC, Fog density = 0.1 %, U mass = 40 kg, h = 50 cm	0.8761	0.0003	0.8770	HAC2N_11c_40000g_147cm_0001
Content 11c, 2N HAC, Fog density = 1 %, U mass = 40 kg, h = 50 cm	0.8762	0.0003	0.8772	HAC2N_11c_40000g_147cm_001
Content 11c, 2N HAC, Fog density =10 %, U mass = 40 kg, h = 50 cm	0.8741	0.0003	0.8750	HAC2N_11c_40000g_147cm_010
Content 11c, 2N HAC, Fog density = 20 %, U mass = 40 kg, h = 50 cm	0.8712	0.0003	0.8721	HAC2N_11c_40000g_147cm_020
Content 11c, 2N HAC, Fog density = 30 %, U mass = 40 kg, h = 50 cm	0.8693	0.0003	0.8702	HAC2N_11c_40000g_147cm_030
Content 11c, 2N HAC, Fog density = 40 %, U mass = 40 kg, h = 50 cm	0.8673	0.0003	0.8682	HAC2N_11c_40000g_147cm_040
Content 11c, 2N HAC, Fog density = 50 %, U mass = 40 kg, h = 50 cm	0.8657	0.0003	0.8666	HAC2N_11c_40000g_147cm_050
Content 11c, 2N HAC, Fog density = 60 %, U mass = 40 kg, h = 50 cm	0.8637	0.0003	0.8645	HAC2N_11c_40000g_147cm_060
Content 11c, 2N HAC, Fog density = 70 %, U mass = 40 kg, h = 50 cm	0.8627	0.0003	0.8636	HAC2N_11c_40000g_147cm_070
Content 11c, 2N HAC, Fog density = 80 %, U mass = 40 kg, h = 50 cm	0.8603	0.0003	0.8612	HAC2N_11c_40000g_147cm_080
Content 11c, 2N HAC, Fog density = 90 %, U mass = 40 kg, h = 50 cm	0.8595	0.0003	0.8603	HAC2N_11c_40000g_147cm_090
Content 11c, 2N HAC, Fog density = 100 %, U mass = 40 kg, h = 50 cm	0.8577	0.0003	0.8586	HAC2N_11c_40000g_147cm_100

Table 10-17: KENO V.a results for content 11g, 5N HAC case with fissile mass 40 kg

Content 11g, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 50				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11g, 5N HAC case, U mass = 40 kg, h = 20 cm	0.6811	0.0002	0.6817	HAC5N_11g_40000g_020cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 30 cm	0.7317	0.0002	0.7324	HAC5N_11g_40000g_030cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 40 cm	0.7579	0.0003	0.7587	HAC5N_11g_40000g_040cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 50 cm	0.7756	0.0003	0.7764	HAC5N_11g_40000g_050cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 60 cm	0.7882	0.0003	0.7889	HAC5N_11g_40000g_060cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 70 cm	0.7977	0.0003	0.7985	HAC5N_11g_40000g_070cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 80 cm	0.8048	0.0003	0.8057	HAC5N_11g_40000g_080cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 90 cm	0.8108	0.0003	0.8116	HAC5N_11g_40000g_090cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 100 cm	0.8156	0.0003	0.8165	HAC5N_11g_40000g_100cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 110 cm	0.8178	0.0003	0.8186	HAC5N_11g_40000g_110cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 120 cm	0.8208	0.0003	0.8216	HAC5N_11g_40000g_120cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 130 cm	0.8217	0.0003	0.8226	HAC5N_11g_40000g_130cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 140 cm	0.8239	0.0003	0.8248	HAC5N_11g_40000g_140cm
Content 11g, 5N HAC case, U mass = 40 kg, h = 147 cm	0.8242	0.0003	0.8250	HAC5N_11g_40000g_147cm

Table 10-18: KENO V.a results for content 11g, NCT 5N case

Content 11g, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 50				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11g, 5N NCT case, U mass = 40 kg, h = 147 cm	0.7839	0.0003	0.7848	NCT5N_11g_40000g_147cm

Table 10-19: KENO V.a results for content 11g, isolated case

Content 11g, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 50				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11g, Isolated package in HAC, U mass = 40 kg, h = 147 cm	0.7384	0.0003	0.7391	Isolated_HAC_11g_40000g_147cm
Content 11g, Isolated package in NCT, U mass = 40 kg, h = 147 cm	0.7407	0.0003	0.7416	Isolated_NCT_11g_40000g_147cm

Table 10-20: KENO V.a results for content 11g, HAC 5N case, fog density variation study

Content 11g, U Metal (20 % U-235);Internal fittings: Ø = 120 mm, Water spacer, N = 50				
Case Description	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
Content 11g, 5N HAC, Fog density = 0 %, U mass = 40 kg, h = 147 cm	0.8242	0.0003	0.8250	HAC5N_11g_40000g_147cm
Content 11g, 5N HAC, Fog density = 0.1 %, U mass = 40 kg, h = 147 cm	0.8244	0.0003	0.8252	HAC5N_11g_40000g_147cm_0001
Content 11g, 5N HAC, Fog density = 1 %, U mass = 40 kg, h = 147 cm	0.8235	0.0003	0.8244	HAC5N_11g_40000g_147cm_001
Content 11g, 5N HAC, Fog density =10 %, U mass = 40 kg, h = 147 cm	0.8203	0.0003	0.8211	HAC5N_11g_40000g_147cm_010
Content 11g, 5N HAC, Fog density = 30 %, U mass = 40 kg, h = 147 cm	0.8135	0.0003	0.8143	HAC5N_11g_40000g_147cm_030
Content 11g, 5N HAC, Fog density = 50 %, U mass = 40 kg, h = 147 cm	0.8071	0.0003	0.8079	HAC5N_11g_40000g_147cm_050
Content 11g, 5N HAC, Fog density = 80 %, U mass = 40 kg, h = 147 cm	0.8001	0.0003	0.8010	HAC5N_11g_40000g_147cm_080
Content 11g, 5N HAC, Fog density = 100 %, U mass = 40 kg, h = 147 cm	0.7964	0.0003	0.7973	HAC5N_11g_40000g_147cm_100

Table 10-21: k_{eff} results obtained for different contents for H/X=0

Case Description	k_{KENO}	σ	kKENO + 3σ	Run ID
Content 11a, 2N HAC, U-235 mass=1.65 Kg, H/X=0	0.3858	0.0002	0.3863	HAC2N_11a_1650g_HbyX_ZERO
Content 11b, 2N HAC, U-235 mass = 16.0 kg, H/X = 0	0.9397	0.0002	0.9404	HAC2N_11b_16000g_HbyX_ZERO
Content 11b, 2N HAC, U-235 mass = 15 kg, H/X = 0	0.9250	0.0003	0.9257	HAC2N_11b_15000g_HbyX_ZERO
Content 11c, 2N HAC, U mass = 40 kg, H/X = 0	0.6515	0.0002	0.6521	HAC2N_11c_40000g_HbyX_ZERO
Content 11g, 5N HAC, U mass = 40 kg, H/X = 0	0.6727	0.0002	0.6731	HAC5N_11g_40000g_HbyX_ZERO

Table 10-22: Summary of the maximum allowable limits for different contents.

Content No.	Guaranteed containment radius (cm)	U-235/U	Maximum mass of U (Kg)	Number of Packages
11a	6	Any	1.70	10
11b	5	Any	15	10
11c	6	≤ 20 %	Any	10
11g	6	≤ 20 %	40	50

Table 10-23: Air transport case with 100 gm CH_2, variable moderated fissile material

Air transport case, 100 gm CH2				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Air transport, CH2 = 100 gm, Mod U-235 = 50 g	0.7643	0.0003	0.7651	AT_0050_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 100 g	0.8056	0.0003	0.8064	AT_0100_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 200 g	0.8410	0.0003	0.8419	AT_0200_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 500 g	0.8718	0.0003	0.8728	AT_0500_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 1 kg	0.8798	0.0003	0.8807	AT_1000_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 2 kg	0.8784	0.0003	0.8793	AT_2000_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 3 kg	0.8750	0.0003	0.8759	AT_3000_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 4 kg	0.8743	0.0003	0.8752	AT_4000_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 5 kg	0.8736	0.0003	0.8745	AT_5000_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 6 kg	0.8741	0.0003	0.8749	AT_6000_0100gCH2
Air transport, CH2 = 100 gm, Mod U-235 = 7 kg	0.8737	0.0003	0.8745	AT_7000_0100gCH2

Table 10-24: Air transport case with 200 gm CH_2, variable moderated fissile material

Air transport case, 200 gm CH2				
Case Description	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
Air transport, CH2 = 200 gm, Mod U-235 = 50 g	0.7694	0.0003	0.7701	AT_0050_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 100 g	0.8128	0.0003	0.8137	AT_0100_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 200 g	0.8529	0.0003	0.8538	AT_0200_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 500 g	0.8873	0.0003	0.8882	AT_0500_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 1 kg	0.8955	0.0003	0.8964	AT_1000_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 2 kg	0.8946	0.0003	0.8956	AT_2000_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 3 kg	0.8914	0.0003	0.8922	AT_3000_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 4 kg	0.8898	0.0003	0.8906	AT_4000_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 5 kg	0.8889	0.0003	0.8897	AT_5000_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 6 kg	0.8883	0.0003	0.8892	AT_6000_0200gCH2
Air transport, CH2 = 200 gm, Mod U-235 = 7 kg	0.8881	0.0003	0.8890	AT_7000_0200gCH2

Table 10-25: Air transport case with 300 gm CH_2, variable moderated fissile material

Air transport case, 300 gm CH2				
Case Description	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
Air transport, CH2 = 300 gm, Mod U-235 = 50 g	0.7734	0.0003	0.7741	AT_0050_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 100 g	0.8202	0.0003	0.8210	AT_0100_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 200 g	0.8634	0.0003	0.8643	AT_0200_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 500 g	0.9008	0.0003	0.9017	AT_0500_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 1 kg	0.9117	0.0003	0.9127	AT_1000_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 2 kg	0.9102	0.0003	0.9111	AT_2000_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 3 kg	0.9070	0.0003	0.9078	AT_3000_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 4 kg	0.9042	0.0003	0.9050	AT_4000_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 5 kg	0.9030	0.0003	0.9039	AT_5000_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 6 kg	0.9024	0.0003	0.9033	AT_6000_0300gCH2
Air transport, CH2 = 300 gm, Mod U-235 = 7 kg	0.9013	0.0003	0.9021	AT_7000_0300gCH2

Table 10-26: Air transport case with 400 gm CH_2, variable moderated fissile material

Air transport case, 400 gm CH2				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Air transport, CH2 = 400 gm, Mod U-235 = 50 g	0.7770	0.0003	0.7778	AT_0050_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 100 g	0.8276	0.0003	0.8284	AT_0100_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 200 g	0.8741	0.0003	0.8749	AT_0200_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 500 g	0.9145	0.0003	0.9154	AT_0500_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 1 kg	0.9263	0.0003	0.9272	AT_1000_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 2 kg	0.9255	0.0003	0.9264	AT_2000_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 3 kg	0.9217	0.0003	0.9226	AT_3000_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 4 kg	0.9191	0.0003	0.9200	AT_4000_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 5 kg	0.9176	0.0003	0.9185	AT_5000_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 6 kg	0.9164	0.0003	0.9172	AT_6000_0400gCH2
Air transport, CH2 = 400 gm, Mod U-235 = 7 kg	0.9137	0.0003	0.9146	AT_7000_0400gCH2

Table 10-27: Air transport case with 500 gm CH_2, variable moderated fissile material

Air transport case,500 gm CH2				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Air transport, CH2 = 500 gm, Mod U-235 = 50 gm	0.7802	0.0003	0.7810	AT_0050_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 100 gm	0.8332	0.0003	0.8340	AT_0100_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 200 gm	0.8830	0.0003	0.8839	AT_0200_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 500 gm	0.9269	0.0003	0.9278	AT_0500_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 1 kg	0.9403	0.0003	0.9412	AT_1000_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 2 kg	0.9403	0.0003	0.9412	AT_2000_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 3 kg	0.9361	0.0003	0.9370	AT_3000_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 4 kg	0.9334	0.0003	0.9343	AT_4000_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 5 kg	0.9301	0.0003	0.9310	AT_5000_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 6 kg	0.9291	0.0003	0.9300	AT_6000_0500gCH2
Air transport, CH2 = 500 gm, Mod U-235 = 7 kg	0.9266	0.0003	0.9275	AT_7000_0500gCH2

Table 10-28: Air transport case with 600 gm CH_2, variable moderated fissile material

Air transport case,600 gm CH2				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Air transport, CH2 = 600 gm, Mod U-235 = 50 gm	0.7829	0.0003	0.7837	AT_0050_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 100 gm	0.8382	0.0003	0.8391	AT_0100_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 200 gm	0.8914	0.0003	0.8922	AT_0200_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 600 gm	0.9383	0.0003	0.9392	AT_0500_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 1 kg	0.9536	0.0003	0.9545	AT_1000_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 2 kg	0.9535	0.0003	0.9545	AT_2000_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 3 kg	0.9496	0.0003	0.9506	AT_3000_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 4 kg	0.9459	0.0003	0.9468	AT_4000_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 5 kg	0.9434	0.0003	0.9443	AT_5000_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 6 kg	0.9418	0.0003	0.9427	AT_6000_0600gCH2
Air transport, CH2 = 600 gm, Mod U-235 = 7 kg	0.9385	0.0003	0.9394	AT_7000_0600gCH2

Table 10-29: Air transport case with 700 gm CH_2, variable moderated fissile material

Air transport case,700 gm CH2				
Case Description	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
Air transport, CH2 = 700 gm, Mod U-235 = 50 gm	0.7847	0.0003	0.7854	AT_0050_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 100 gm	0.8425	0.0003	0.8433	AT_0100_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 200 gm	0.8990	0.0003	0.8999	AT_0200_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 500 gm	0.9501	0.0003	0.9510	AT_0500_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 1 kg	0.9652	0.0003	0.9661	AT_1000_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 2 kg	0.9668	0.0003	0.9677	AT_2000_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 3 kg	0.9627	0.0003	0.9637	AT_3000_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 4 kg	0.9582	0.0003	0.9591	AT_4000_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 5 kg	0.9556	0.0003	0.9565	AT_5000_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 6 kg	0.9527	0.0003	0.9536	AT_6000_0700gCH2
Air transport, CH2 = 700 gm, Mod U-235 = 7 kg	0.9503	0.0003	0.9511	AT_7000_0700gCH2

Table 10-30: Air transport case with 800 gm CH_2, variable moderated fissile material

Air transport case,700 gm CH2				
Case Description	k_{KENO}	σ	$k_{KENO} + 3\sigma$	**Run ID**
Air transport, CH2 = 800 gm, Mod U-235 = 50 g	0.7860	0.0003	0.7867	AT_0050_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 100 g	0.8468	0.0003	0.8477	AT_0100_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 200 g	0.9063	0.0003	0.9072	AT_0200_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 500 g	0.9600	0.0003	0.9609	AT_0500_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 1 kg	0.9776	0.0003	0.9786	AT_1000_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 2 kg	0.9785	0.0003	0.9794	AT_2000_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 3 kg	0.9742	0.0003	0.9751	AT_3000_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 4 kg	0.9710	0.0003	0.9719	AT_4000_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 5 kg	0.9674	0.0003	0.9683	AT_5000_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 6 kg	0.9640	0.0003	0.9649	AT_6000_0800gCH2
Air transport, CH2 = 800 gm, Mod U-235 = 7 kg	0.9610	0.0003	0.9619	AT_7000_0800gCH2

11.0 FIGURES

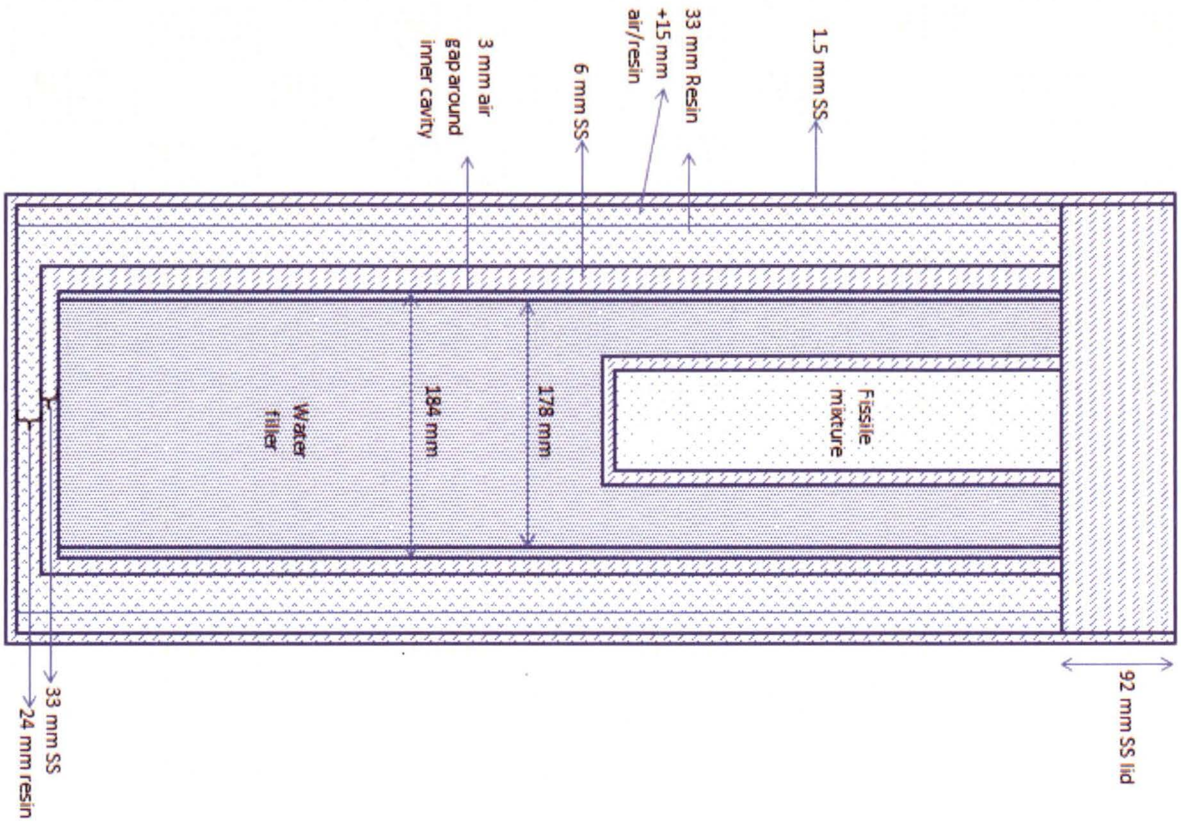


Figure 11-1: TN-BGC1 drawing

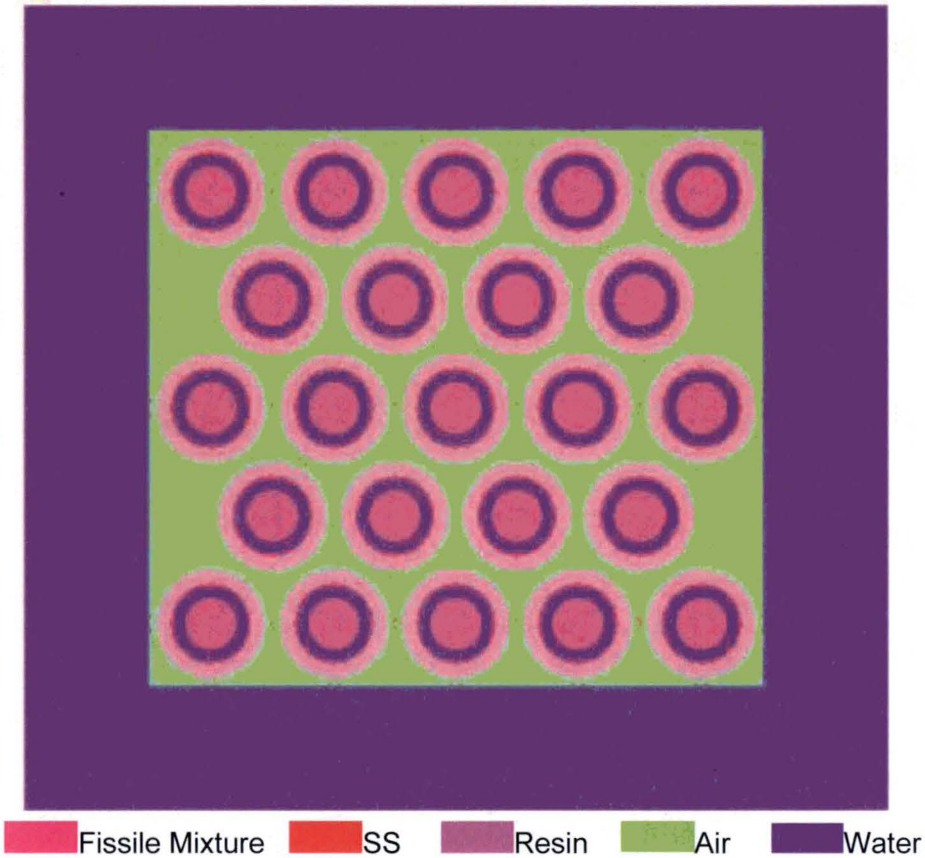


Figure 11-2: Cross sectional view of 11a 2N HAC case

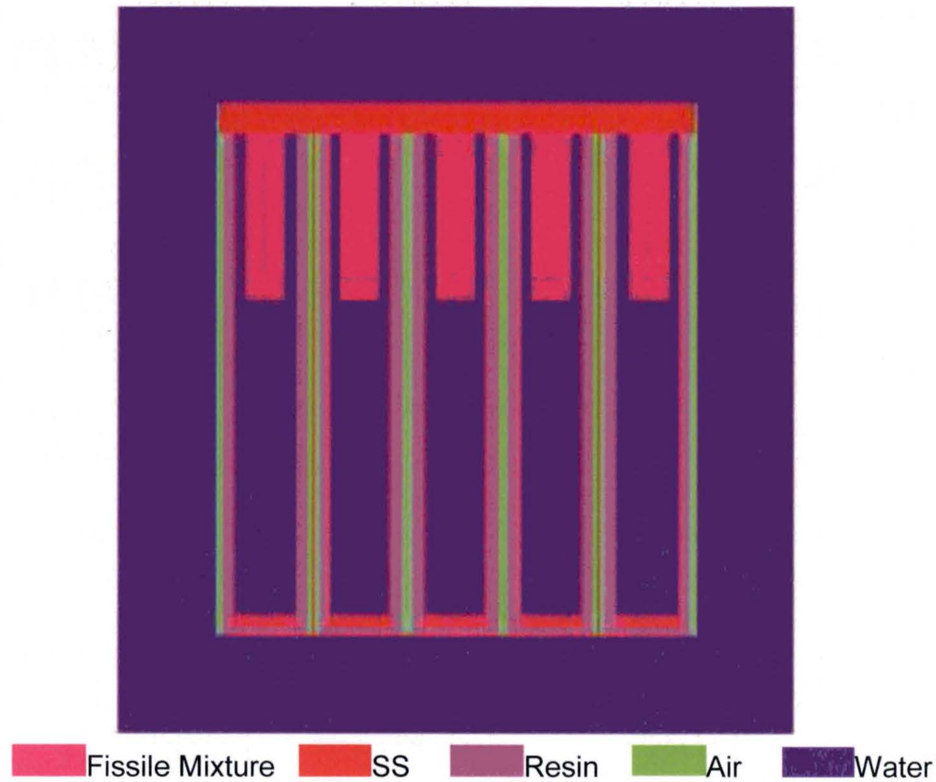


Figure 11-3: Longitudinal view of 11a 2N HAC case

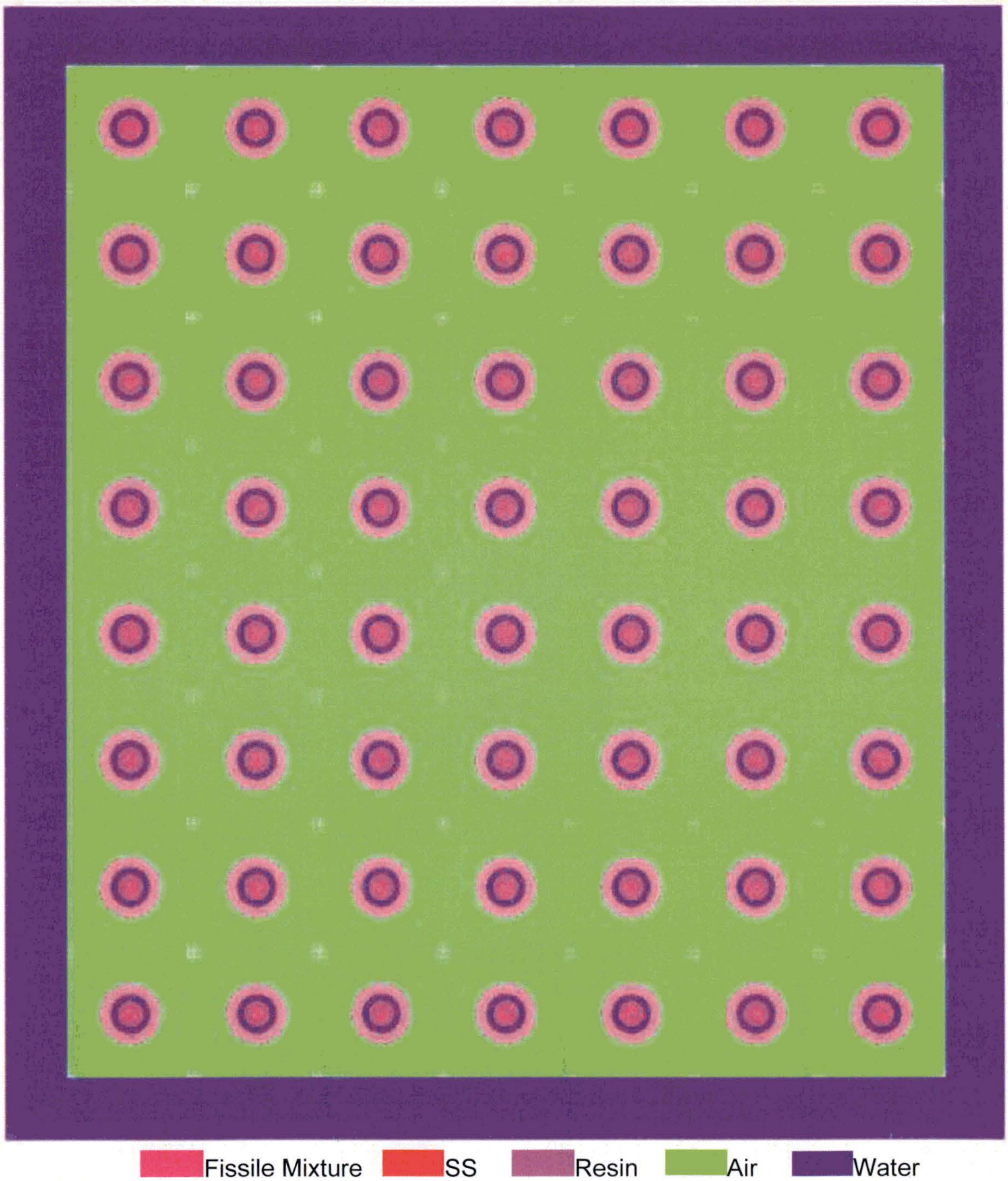


Figure 11-4: Cross sectional view of 11a 5N NCT case

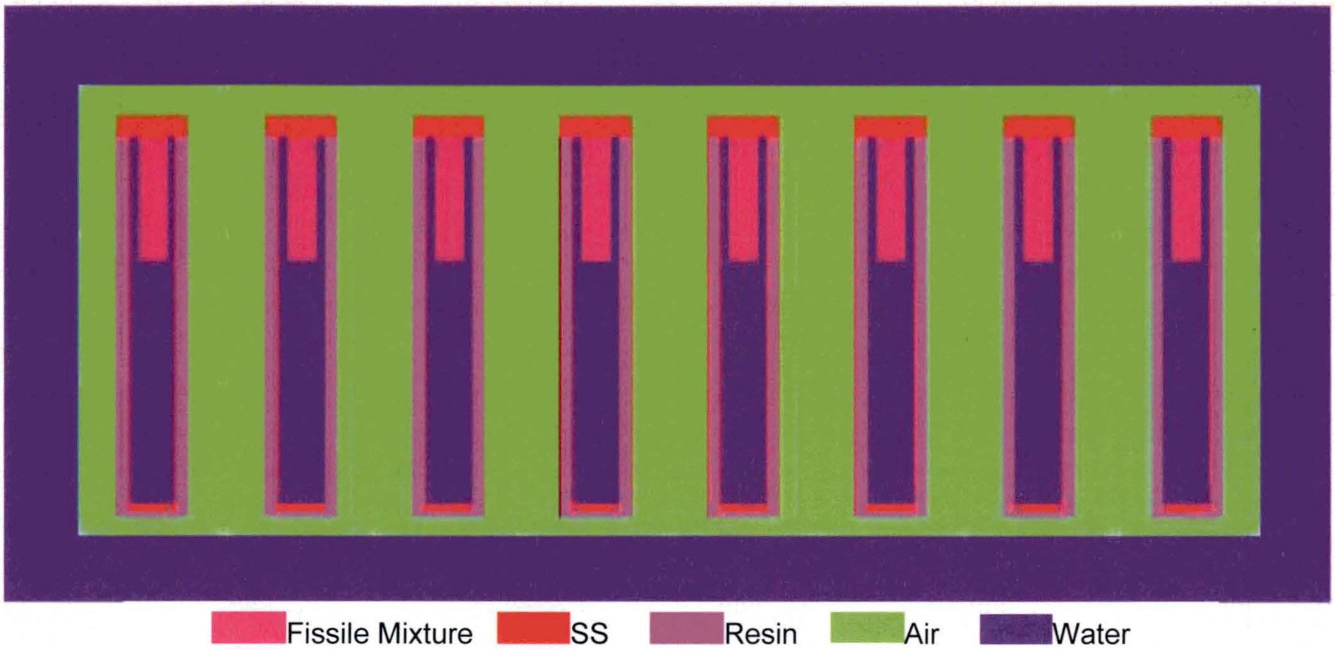


Figure 11-5: Longitudinal view of 11a 5N NCT case

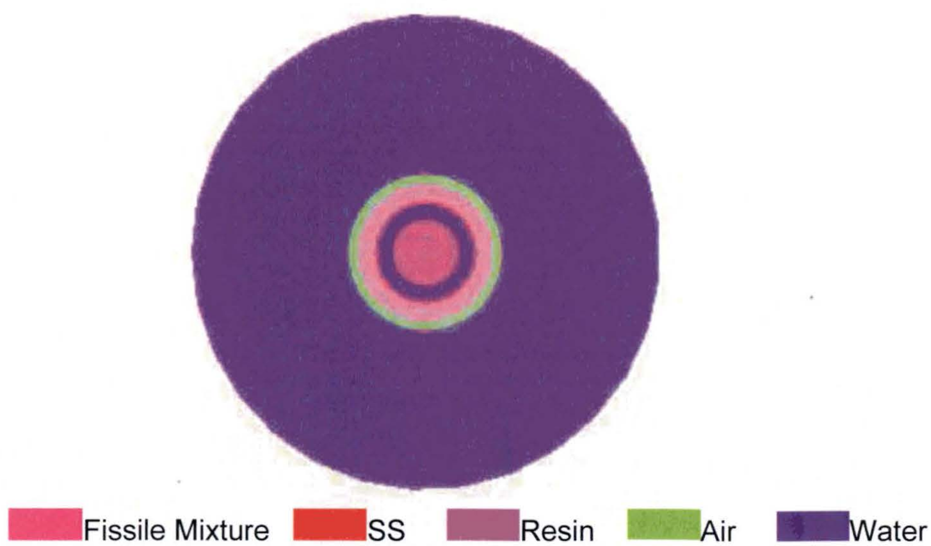
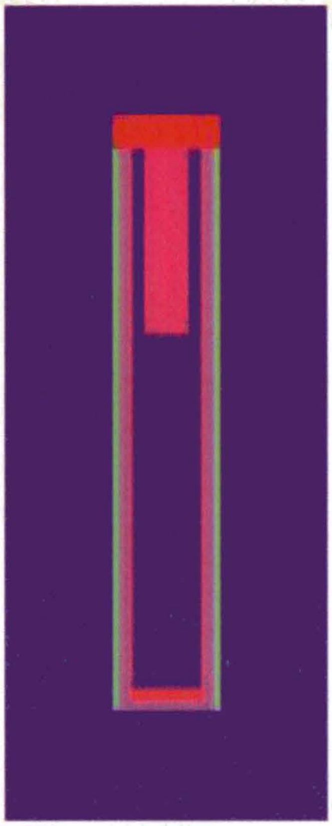


Figure 11-6: Cross sectional view of 11a isolated HAC case



Fissile Mixture SS Resin Air Water

Figure 11-7: Longitudinal view of 11a isolated HAC case

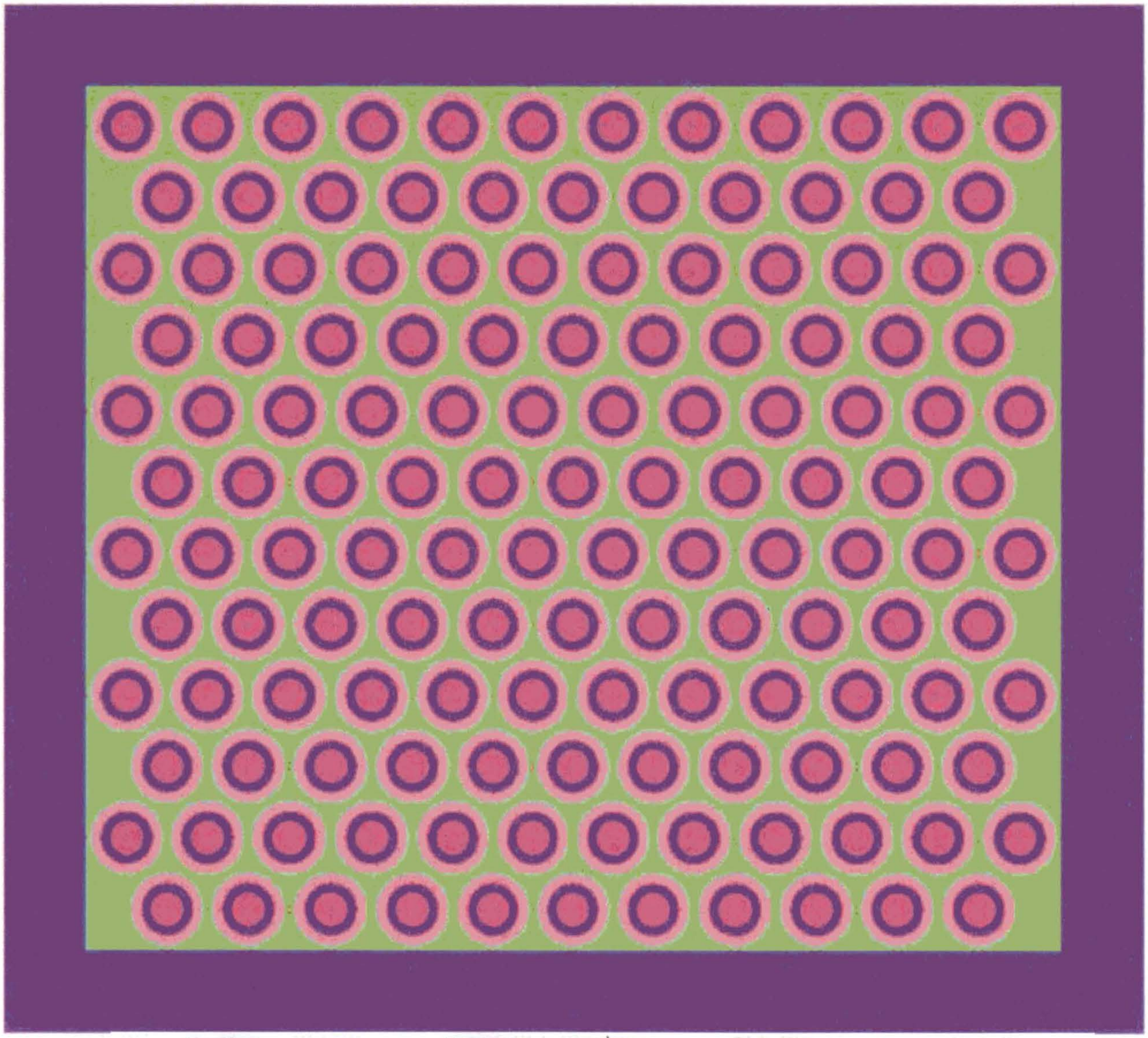


Figure 11-8: Cross sectional view of 11g 5N HAC case

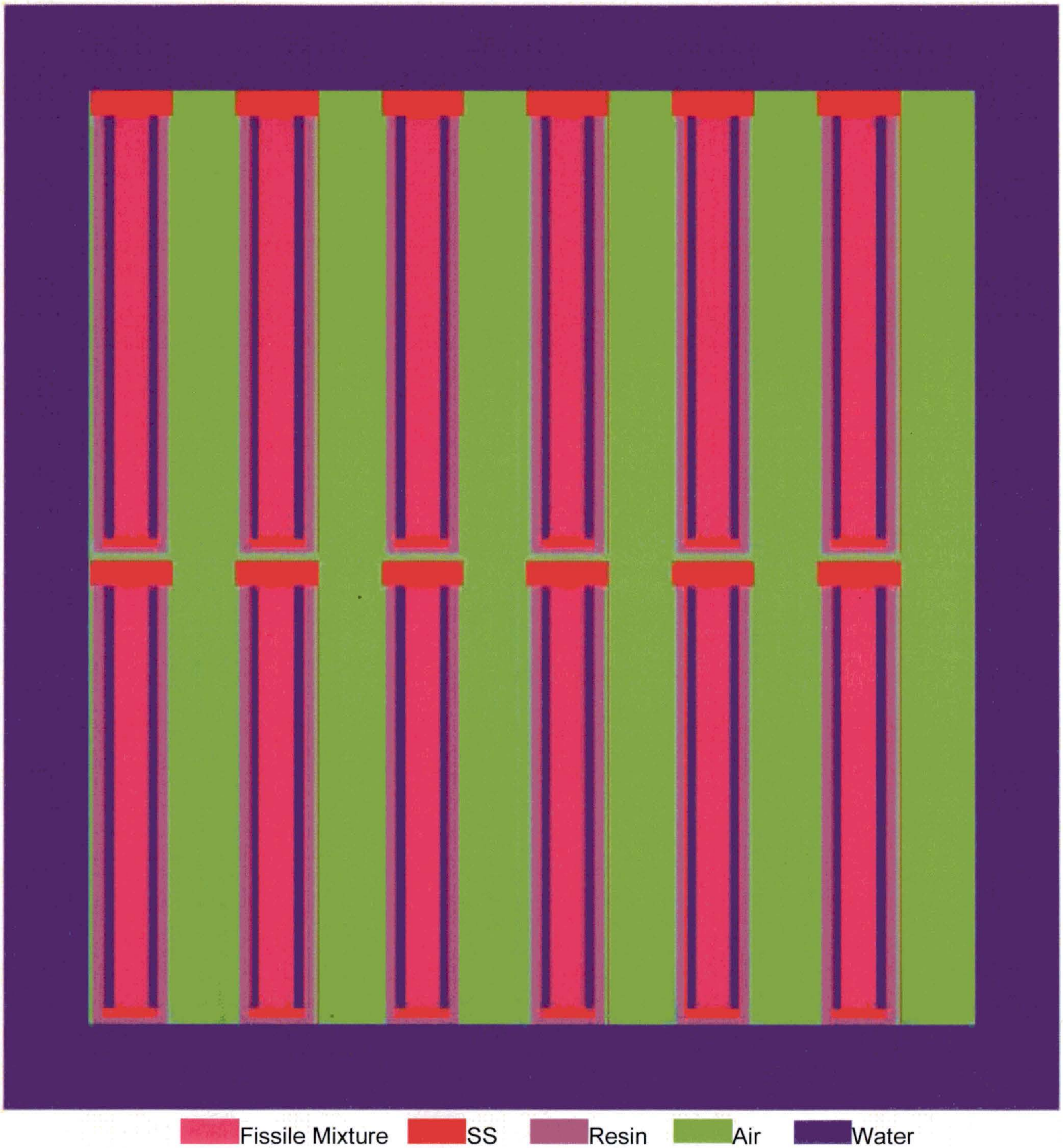


Figure 11-9: Longitudinal view of 11g 5N HAC case

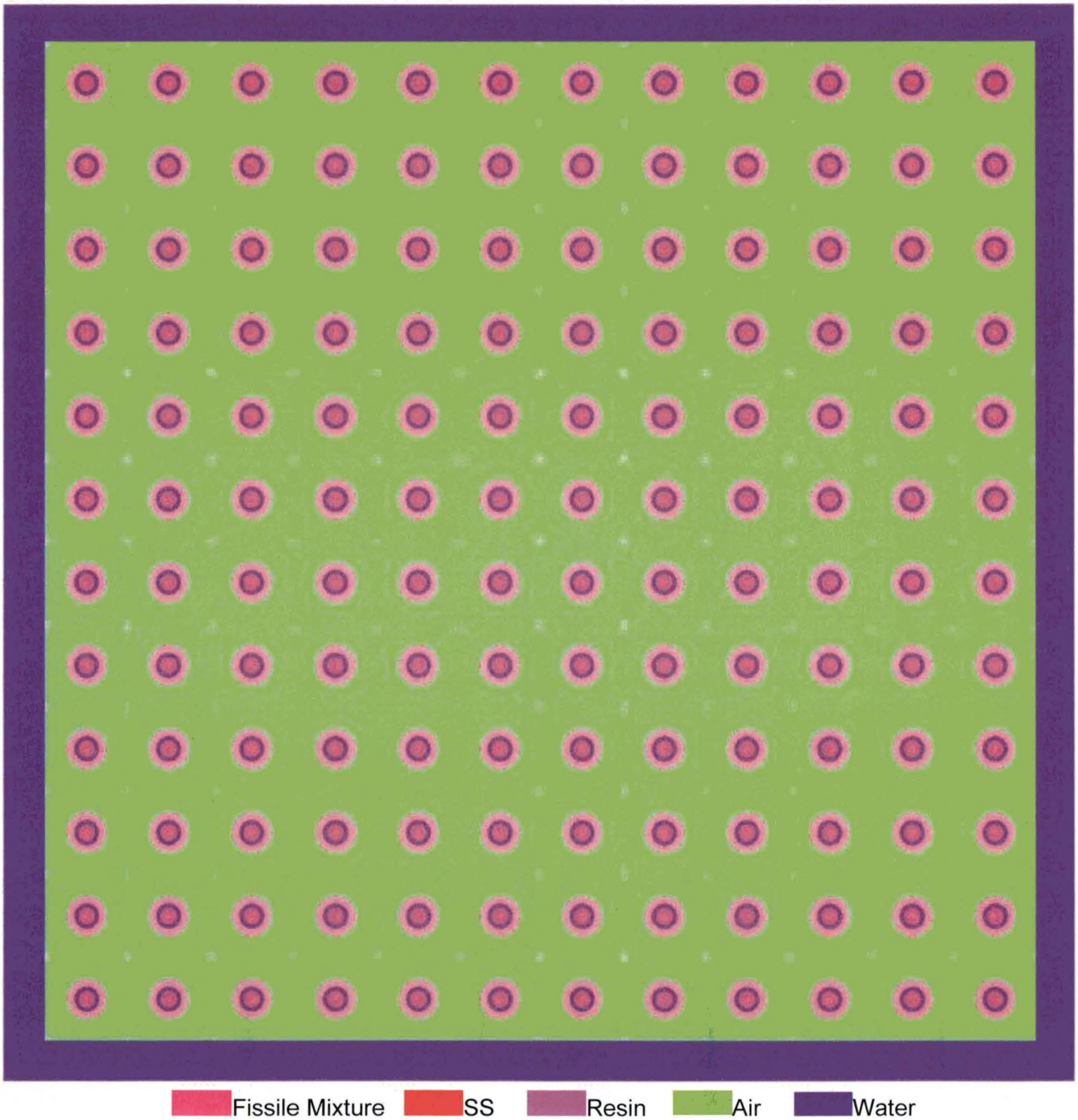


Figure 11-10: Cross sectional view of 11g 5N NCT case

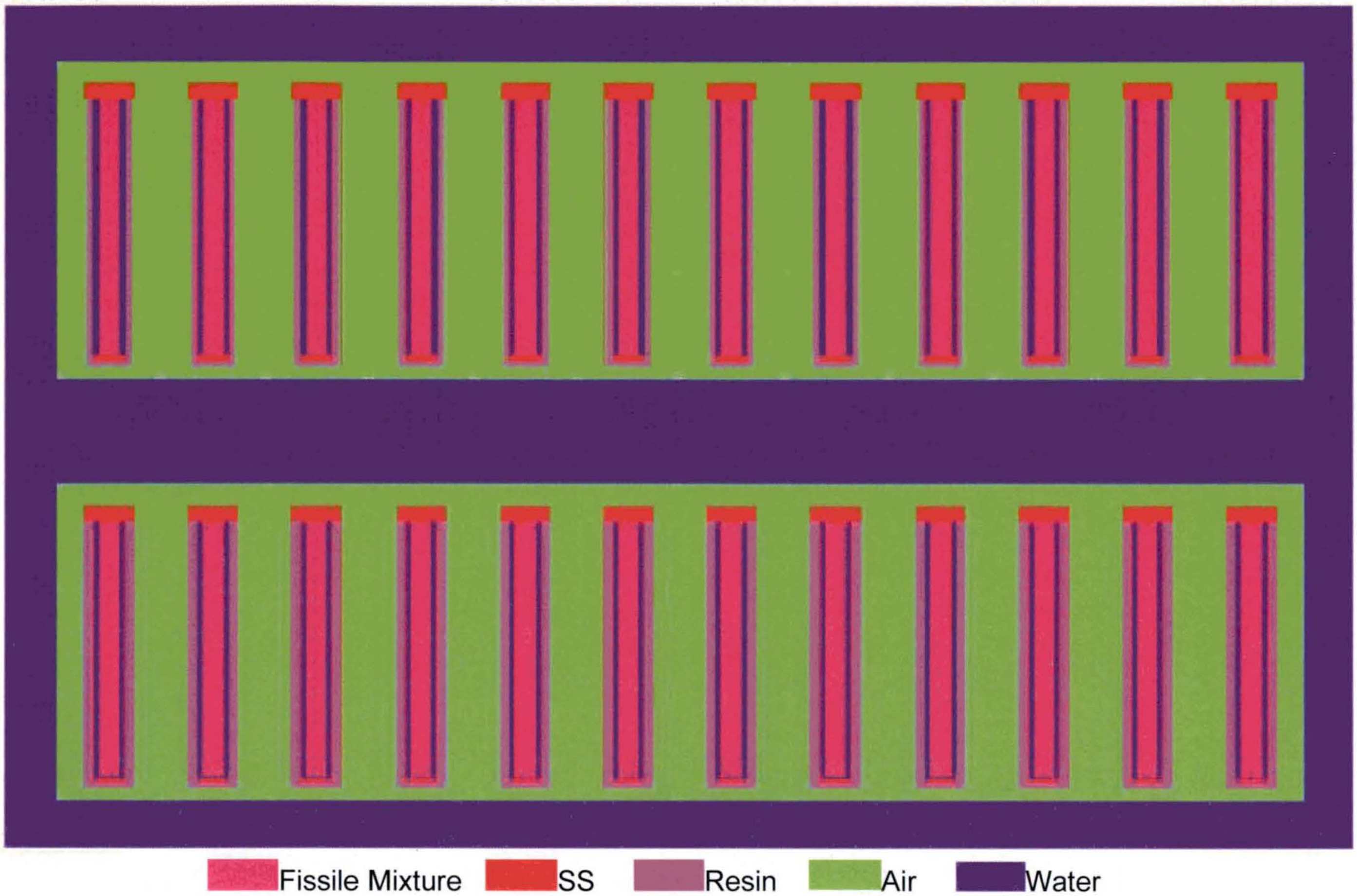


Figure 11-11: Longitudinal view of 11g 5N NCT case

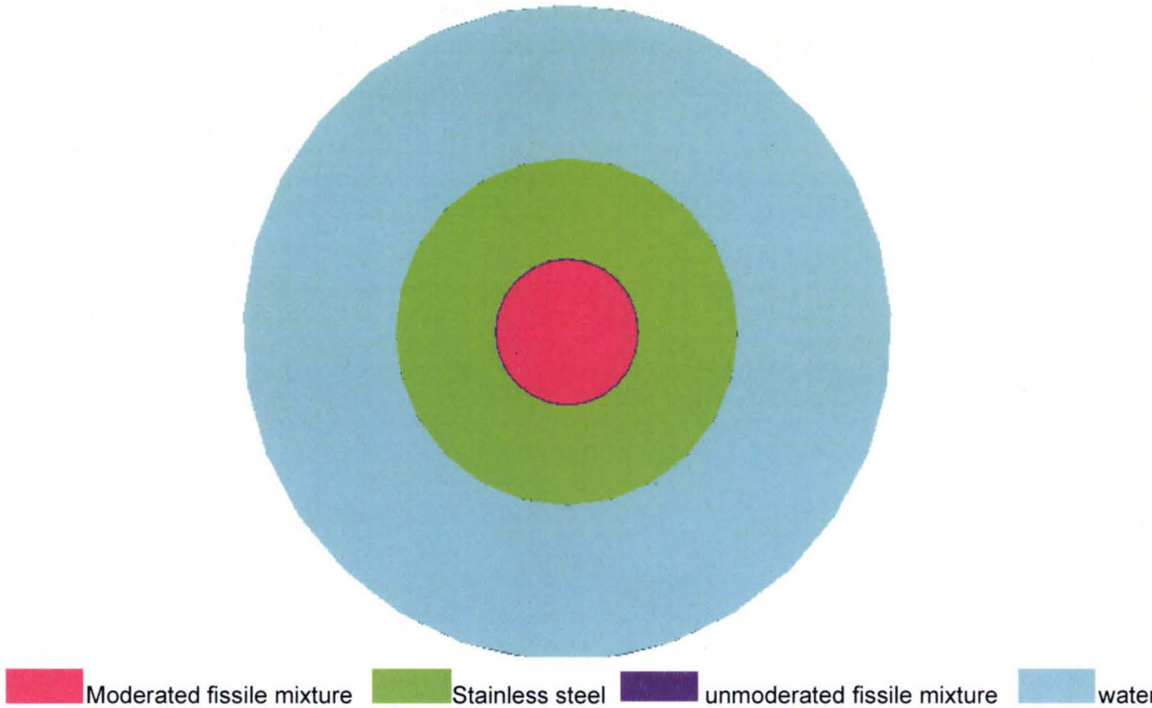


Figure 11-12: Air transport model of TN-BGC1

12.0 LISTING OF COMPUTER FILES

Code: SCALE 6.0
Module: CSAS5
Version: C00750MNYCP01
Computer System: TN Linux Cluster
Files: Secure network initially, then redundant tape backup

Content 11a, 2N HAC case with 1.5 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1500g_010cm	3/31/2015	5:25 PM	3,148	04/22/2015	7:29 PM	19,12,736
HAC2N_11a_1500g_020cm	3/31/2015	5:25 PM	3,150	04/22/2015	7:28 PM	19,11,510
HAC2N_11a_1500g_030cm	3/31/2015	5:25 PM	3,150	04/22/2015	7:28 PM	19,10,540
HAC2N_11a_1500g_040cm	5/05/2015	11:02 AM	3,166	05/05/2015	11:02 AM	19,09,414
HAC2N_11a_1500g_050cm	3/31/2015	5:26 PM	3,149	04/22/2015	7:28 PM	19,10,820
HAC2N_11a_1500g_060cm	3/31/2015	5:26 PM	3,150	04/22/2015	7:29 PM	19,11,638
HAC2N_11a_1500g_080cm	5/05/2015	11:03 AM	3,166	05/05/2015	11:03 AM	19,09,905
HAC2N_11a_1500g_100cm	3/31/2015	5:27 PM	3,149	04/22/2015	7:29 PM	19,10,549
HAC2N_11a_1500g_120cm	3/31/2015	5:27 PM	3,149	04/22/2015	7:29 PM	19,10,817
HAC2N_11a_1500g_140cm	3/31/2015	5:27 PM	3,151	04/22/2015	7:29 PM	19,10,640

Content 11a, 2N HAC case with 1.65 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1650g_010cm	04/08/2015	1:22 PM	3,149	04/22/2015	7:25 PM	19,10,528
HAC2N_11a_1650g_020cm	04/08/2015	1:25 PM	3,151	04/22/2015	7:24 PM	19,10,478
HAC2N_11a_1650g_030cm	04/08/2015	1:25 PM	3,151	04/22/2015	7:24 PM	19,07,740
HAC2N_11a_1650g_040cm	04/08/2015	1:25 PM	3,149	04/22/2015	7:24 PM	19,10,454
HAC2N_11a_1650g_050cm	04/08/2015	1:26 PM	3,150	04/22/2015	7:24 PM	19,09,059
HAC2N_11a_1650g_060cm	05/05/2015	11:02 AM	3,169	05/05/2015	11:02 AM	19,09,162
HAC2N_11a_1650g_080cm	04/08/2015	1:26 PM	3,149	04/22/2015	7:25 PM	19,09,467
HAC2N_11a_1650g_100cm	04/08/2015	1:27 PM	3,150	04/22/2015	7:25 PM	19,09,851
HAC2N_11a_1650g_120cm	04/08/2015	1:27 PM	3,150	04/22/2015	7:25 PM	19,09,228
HAC2N_11a_1650g_140cm	04/08/2015	1:27 PM	3,152	04/22/2015	7:25 PM	19,09,633

Content 11a, 2N HAC case with 1.7 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1700g_010cm	04/08/2015	1:12 PM	3,148	04/22/2015	7:35 PM	19,09,337
HAC2N_11a_1700g_020cm	04/08/2015	1:14 PM	3,150	04/22/2015	7:34 PM	19,09,179
HAC2N_11a_1700g_030cm	04/08/2015	1:14 PM	3,150	04/22/2015	7:34 PM	19,08,547
HAC2N_11a_1700g_040cm	04/08/2015	1:15 PM	3,148	04/22/2015	7:34 PM	19,10,336
HAC2N_11a_1700g_050cm	04/08/2015	1:15 PM	3,149	04/22/2015	7:34 PM	19,11,795
HAC2N_11a_1700g_060cm	04/08/2015	1:15 PM	3,150	04/22/2015	7:35 PM	19,09,751
HAC2N_11a_1700g_080cm	04/08/2015	1:16 PM	3,148	04/22/2015	7:35 PM	19,11,480
HAC2N_11a_1700g_100cm	04/08/2015	1:16 PM	3,149	04/22/2015	7:35 PM	19,07,273
HAC2N_11a_1700g_120cm	04/08/2015	1:17 PM	3,149	04/22/2015	7:35 PM	19,07,731
HAC2N_11a_1700g_140cm	04/08/2015	1:17 PM	3,151	04/22/2015	7:35 PM	19,10,512

Content 11a, 2N HAC case with 1.75 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1750g_010cm	3/31/2015	5:16 PM	3,149	04/22/2015	7:27 PM	19,09,672
HAC2N_11a_1750g_020cm	3/31/2015	5:17 PM	3,153	04/22/2015	7:26 PM	19,10,063
HAC2N_11a_1750g_030cm	3/31/2015	5:19 PM	3,151	04/22/2015	7:26 PM	19,09,261
HAC2N_11a_1750g_040cm	3/31/2015	5:19 PM	3,151	04/22/2015	7:26 PM	19,07,636
HAC2N_11a_1750g_050cm	3/31/2015	5:20 PM	3,151	04/22/2015	7:26 PM	19,10,028
HAC2N_11a_1750g_060cm	4/01/2015	12:06 PM	3,151	04/22/2015	7:27 PM	19,10,040
HAC2N_11a_1750g_080cm	3/31/2015	5:20 PM	3,149	04/22/2015	7:27 PM	19,09,018
HAC2N_11a_1750g_100cm	3/31/2015	5:20 PM	3,152	04/22/2015	7:27 PM	19,11,317
HAC2N_11a_1750g_120cm	3/31/2015	5:20 PM	3,152	04/22/2015	7:27 PM	19,10,473
HAC2N_11a_1750g_140cm	3/31/2015	5:20 PM	3,152	04/22/2015	7:27 PM	19,08,953

Content 11a, 2N HAC case with 2 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_2000g_010cm	3/31/2015	5:27 PM	3,146	04/22/2015	7:33 PM	19,11,146
HAC2N_11a_2000g_020cm	3/31/2015	5:29 PM	3,150	04/22/2015	7:32 PM	19,07,251
HAC2N_11a_2000g_030cm	3/31/2015	5:29 PM	3,150	04/22/2015	7:32 PM	19,08,887
HAC2N_11a_2000g_040cm	3/31/2015	5:29 PM	3,150	04/22/2015	7:32 PM	19,08,662
HAC2N_11a_2000g_050cm	5/05/2015	11:02 AM	3,166	05/05/2015	11:02 AM	19,10,619
HAC2N_11a_2000g_060cm	3/31/2015	5:30 PM	3,150	04/22/2015	7:33 PM	19,07,950
HAC2N_11a_2000g_080cm	3/31/2015	5:30 PM	3,146	04/22/2015	7:33 PM	19,07,123
HAC2N_11a_2000g_100cm	3/31/2015	5:30 PM	3,149	04/22/2015	7:33 PM	19,10,607
HAC2N_11a_2000g_120cm	3/31/2015	5:30 PM	3,151	04/22/2015	7:33 PM	19,11,105
HAC2N_11a_2000g_140cm	3/31/2015	5:30 PM	3,151	04/22/2015	7:33 PM	19,08,135

Content 11a, 2N HAC case with 2.25 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_2250g_010cm	3/31/2015	5:31 PM	3,149	04/22/2015	7:37 PM	19,09,575
HAC2N_11a_2250g_020cm	3/31/2015	5:31 PM	3,149	04/22/2015	7:36 PM	19,09,059
HAC2N_11a_2250g_030cm	3/31/2015	5:31 PM	3,149	04/22/2015	7:36 PM	19,10,697
HAC2N_11a_2250g_040cm	3/31/2015	5:31 PM	3,151	04/22/2015	7:36 PM	19,10,549
HAC2N_11a_2250g_050cm	3/31/2015	5:31 PM	3,151	04/22/2015	7:36 PM	19,07,312
HAC2N_11a_2250g_060cm	3/31/2015	5:31 PM	3,149	04/22/2015	7:37 PM	19,08,875
HAC2N_11a_2250g_080cm	3/31/2015	5:32 PM	3,147	04/22/2015	7:37 PM	19,11,402
HAC2N_11a_2250g_100cm	3/31/2015	5:32 PM	3,150	04/22/2015	7:37 PM	19,07,809
HAC2N_11a_2250g_120cm	3/31/2015	5:32 PM	3,150	04/22/2015	7:37 PM	19,10,751
HAC2N_11a_2250g_140cm	3/31/2015	5:32 PM	3,152	04/22/2015	7:37 PM	19,07,658

Content 11a, 2N HAC case with 2.5 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_2500g_010cm	3/31/2015	6:15 PM	3,146	04/22/2015	7:31 PM	19,07,265
HAC2N_11a_2500g_020cm	3/31/2015	6:15 PM	3,148	04/22/2015	7:30 PM	19,07,631
HAC2N_11a_2500g_030cm	3/31/2015	6:15 PM	3,150	04/22/2015	7:30 PM	19,09,458
HAC2N_11a_2500g_040cm	3/31/2015	6:16 PM	3,148	04/22/2015	7:30 PM	19,10,546
HAC2N_11a_2500g_050cm	3/31/2015	6:16 PM	3,150	04/22/2015	7:30 PM	19,09,650
HAC2N_11a_2500g_060cm	3/31/2015	6:16 PM	3,148	04/22/2015	7:31 PM	19,07,768
HAC2N_11a_2500g_080cm	3/31/2015	6:16 PM	3,146	04/22/2015	7:31 PM	19,07,201
HAC2N_11a_2500g_100cm	3/31/2015	6:16 PM	3,149	04/22/2015	7:31 PM	19,08,972
HAC2N_11a_2500g_120cm	3/31/2015	6:16 PM	3,149	04/22/2015	7:31 PM	19,09,586
HAC2N_11a_2500g_140cm	3/31/2015	6:16 PM	3,151	04/22/2015	7:31 PM	19,10,693

Content 11a, 5N NCT case with 1.65 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
NCT5N_11a_1650g_050cm	4/14/2015	12:13 PM	3,835	04/22/2015	7:03 PM	18,77,966

Content 11a, Isolated cases with 1.65 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
Isolated_HAC_11a_1650g_050cm	04/08/2015	5:38 PM	2,191	04/22/2015	6:43 PM	19,08,074
Isolated_NCT_11a_1650g_050cm	04/08/2015	5:38 PM	2,191	04/22/2015	6:42 PM	19,08,338

Content 11a, 2N HAC case with 1.65 Kg U-235, Fog density study						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1650g_050cm_0001	04/08/2015	6:27 PM	3,232	04/22/2015	7:21 PM	19,13,928
HAC2N_11a_1650g_050cm_000	04/08/2015	6:27 PM	3,238	04/22/2015	7:21 PM	19,11,915
HAC2N_11a_1650g_050cm_001	04/08/2015	6:27 PM	3,235	04/22/2015	7:21 PM	19,13,448
HAC2N_11a_1650g_050cm_010	04/08/2015	6:27 PM	3,235	04/22/2015	7:21 PM	19,12,069
HAC2N_11a_1650g_050cm_020	04/08/2015	6:27 PM	3,235	04/22/2015	7:22 PM	19,13,665
HAC2N_11a_1650g_050cm_030	04/08/2015	6:28 PM	3,235	04/22/2015	7:22 PM	19,12,670
HAC2N_11a_1650g_050cm_040	04/08/2015	6:28 PM	3,235	04/22/2015	7:22 PM	19,13,537
HAC2N_11a_1650g_050cm_050	04/08/2015	6:28 PM	3,235	04/22/2015	7:22 PM	19,11,752
HAC2N_11a_1650g_050cm_060	04/08/2015	6:28 PM	3,235	04/22/2015	7:23 PM	19,12,614
HAC2N_11a_1650g_050cm_070	04/08/2015	6:28 PM	3,235	04/22/2015	7:24 PM	19,13,216
HAC2N_11a_1650g_050cm_080	05/05/2015	11:03 AM	3,253	05/05/2015	11:03 AM	19,11,950
HAC2N_11a_1650g_050cm_090	04/08/2015	6:28 PM	3,235	04/22/2015	7:24 PM	19,11,157
HAC2N_11a_1650g_050cm_100	04/08/2015	6:28 PM	3,234	04/22/2015	7:24 PM	19,13,500

Content 11b, 2N HAC case with 15 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_15000g_015cm	02/04/2015	12:22 PM	3156	05/05/2015	11:10 AM	19,03,672
HAC2N_11b_15000g_020cm	02/04/2015	12:22 PM	3156	05/05/2015	11:09 AM	19,02,892
HAC2N_11b_15000g_030cm	02/04/2015	12:22 PM	3156	05/05/2015	11:09 AM	19,06,182
HAC2N_11b_15000g_040cm	02/04/2015	12:23 PM	3156	05/05/2015	11:09 AM	19,04,078
HAC2N_11b_15000g_050cm	02/04/2015	12:23 PM	3156	05/05/2015	11:09 AM	19,06,350
HAC2N_11b_15000g_060cm	02/04/2015	12:23 PM	3156	05/05/2015	11:10 AM	19,06,431
HAC2N_11b_15000g_070cm	02/04/2015	12:23 PM	3154	05/05/2015	11:10 AM	19,06,598
HAC2N_11b_15000g_080cm	02/04/2015	12:24 PM	3156	05/05/2015	11:10 AM	19,08,405
HAC2N_11b_15000g_090cm	02/04/2015	12:24 PM	3158	05/05/2015	11:10 AM	19,07,154
HAC2N_11b_15000g_100cm	02/04/2015	12:25 PM	3159	05/05/2015	11:10 AM	19,06,831
HAC2N_11b_15000g_110cm	02/04/2015	12:25 PM	3159	05/05/2015	11:10 AM	19,09,139
HAC2N_11b_15000g_120cm	02/04/2015	12:25 PM	3159	05/05/2015	11:10 AM	19,05,871
HAC2N_11b_15000g_130cm	02/04/2015	12:25 PM	3159	05/05/2015	11:10 AM	19,07,238
HAC2N_11b_15000g_140cm	02/04/2015	12:26 PM	3159	05/05/2015	11:11 AM	19,09,032
HAC2N_11b_15000g_147cm	02/04/2015	12:26 PM	3159	05/05/2015	11:11 AM	19,08,739

Content 11b, 2N HAC case with 16 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_16000g_015cm	02/04/2015	12:26 PM	3156	05/05/2015	11:13 AM	19,04,712
HAC2N_11b_16000g_020cm	02/04/2015	12:26 PM	3156	05/05/2015	11:13 AM	19,03,482
HAC2N_11b_16000g_030cm	02/04/2015	12:27 PM	3156	05/05/2015	11:12 AM	19,06,020
HAC2N_11b_16000g_040cm	02/04/2015	12:27 PM	3156	05/05/2015	11:12 AM	19,05,378
HAC2N_11b_16000g_050cm	02/04/2015	12:27 PM	3156	05/05/2015	11:12 AM	19,06,049
HAC2N_11b_16000g_060cm	02/04/2015	12:27 PM	3156	05/05/2015	11:13 AM	19,06,971
HAC2N_11b_16000g_070cm	02/04/2015	12:27 PM	3154	05/05/2015	11:12 AM	19,07,045
HAC2N_11b_16000g_080cm	02/04/2015	12:27 PM	3156	05/05/2015	11:13 AM	19,07,081
HAC2N_11b_16000g_090cm	02/04/2015	12:28 PM	3158	05/05/2015	11:12 AM	19,07,795
HAC2N_11b_16000g_100cm	02/04/2015	12:28 PM	3159	05/05/2015	11:13 AM	19,06,727
HAC2N_11b_16000g_110cm	02/04/2015	12:28 PM	3159	05/05/2015	11:13 AM	19,07,557
HAC2N_11b_16000g_120cm	02/04/2015	12:28 PM	3159	05/05/2015	11:13 AM	19,06,654
HAC2N_11b_16000g_130cm	02/04/2015	12:28 PM	3159	05/05/2015	11:14 AM	19,07,532
HAC2N_11b_16000g_140cm	02/04/2015	12:28 PM	3159	05/05/2015	11:14 AM	19,07,232
HAC2N_11b_16000g_147cm	02/04/2015	12:29 PM	3159	05/05/2015	11:14 AM	19,08,845

Content 11b, 2N HAC case with 16.5 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_16500g_015cm	03/31/2015	4:54 PM	3158	05/05/2015	11:16 AM	19,04,385
HAC2N_11b_16500g_020cm	03/31/2015	4:54 PM	3158	05/05/2015	11:15 AM	19,02,420
HAC2N_11b_16500g_030cm	03/31/2015	4:55 PM	3158	05/05/2015	11:15 AM	19,04,490
HAC2N_11b_16500g_040cm	03/31/2015	4:55 PM	3158	05/05/2015	11:15 AM	19,05,190
HAC2N_11b_16500g_050cm	03/31/2015	4:55 PM	3158	05/05/2015	11:15 AM	19,05,647
HAC2N_11b_16500g_060cm	03/31/2015	4:55 PM	3158	05/05/2015	11:16 AM	19,06,004
HAC2N_11b_16500g_070cm	03/31/2015	4:55 PM	3156	05/05/2015	11:16 AM	19,06,581
HAC2N_11b_16500g_080cm	03/31/2015	4:55 PM	3158	05/05/2015	11:16 AM	19,07,553
HAC2N_11b_16500g_090cm	03/31/2015	4:56 PM	3160	05/05/2015	11:16 AM	19,05,703
HAC2N_11b_16500g_100cm	03/31/2015	4:56 PM	3161	05/05/2015	11:15 AM	19,06,240
HAC2N_11b_16500g_110cm	03/31/2015	4:56 PM	3161	05/05/2015	11:16 AM	19,06,122
HAC2N_11b_16500g_120cm	03/31/2015	4:56 PM	3161	05/05/2015	11:16 AM	19,06,621
HAC2N_11b_16500g_130cm	03/31/2015	4:56 PM	3161	05/05/2015	11:17 AM	19,06,550
HAC2N_11b_16500g_140cm	03/31/2015	4:57 PM	3161	05/05/2015	11:17 AM	19,05,712
HAC2N_11b_16500g_147cm	03/31/2015	4:57 PM	3161	05/05/2015	11:17 AM	19,08,363

Content 11b, 2N HAC case with 17.5 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_17500g_015cm	02/04/2015	12:31 PM	3158	05/05/2015	11:19 AM	19,03,830
HAC2N_11b_17500g_020cm	02/04/2015	12:31 PM	3158	05/05/2015	11:19 AM	19,04,874
HAC2N_11b_17500g_030cm	02/04/2015	12:32 PM	3158	05/05/2015	11:18 AM	19,04,429
HAC2N_11b_17500g_040cm	02/04/2015	12:32 PM	3158	05/05/2015	11:18 AM	19,04,954
HAC2N_11b_17500g_050cm	02/04/2015	12:32 PM	3158	05/05/2015	11:18 AM	19,04,950
HAC2N_11b_17500g_060cm	02/04/2015	12:32 PM	3158	05/05/2015	11:18 AM	19,06,060
HAC2N_11b_17500g_070cm	02/04/2015	12:32 PM	3156	05/05/2015	11:18 AM	19,07,206
HAC2N_11b_17500g_080cm	02/04/2015	12:33 PM	3158	05/05/2015	11:19 AM	19,06,908
HAC2N_11b_17500g_090cm	02/04/2015	12:33 PM	3160	05/05/2015	11:19 AM	19,06,121
HAC2N_11b_17500g_100cm	02/04/2015	12:33 PM	3161	05/05/2015	11:19 AM	19,06,864
HAC2N_11b_17500g_110cm	02/04/2015	12:33 PM	3161	05/05/2015	11:19 AM	19,03,775
HAC2N_11b_17500g_120cm	02/04/2015	12:33 PM	3161	05/05/2015	11:19 AM	19,07,549
HAC2N_11b_17500g_130cm	02/04/2015	12:33 PM	3161	05/05/2015	11:20 AM	19,07,302
HAC2N_11b_17500g_140cm	02/04/2015	12:33 PM	3161	05/05/2015	11:20 AM	19,08,211
HAC2N_11b_17500g_147cm	02/04/2015	12:34 PM	3161	05/05/2015	11:20 AM	19,07,822

Content 11b, 2N HAC case with 18.5 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_18500g_015cm	02/04/2015	1:10 PM	3160	05/05/2015	11:22 AM	19,04,196
HAC2N_11b_18500g_020cm	02/04/2015	1:10 PM	3160	05/05/2015	11:22 AM	19,02,715
HAC2N_11b_18500g_030cm	02/04/2015	1:10 PM	3160	05/05/2015	11:21 AM	19,03,657
HAC2N_11b_18500g_040cm	02/04/2015	1:11 PM	3160	05/05/2015	11:21 AM	19,06,636
HAC2N_11b_18500g_050cm	02/04/2015	1:11 PM	3160	05/05/2015	11:21 AM	19,05,908
HAC2N_11b_18500g_060cm	02/04/2015	1:11 PM	3160	05/05/2015	11:22 AM	19,06,859
HAC2N_11b_18500g_070cm	02/04/2015	1:11 PM	3158	05/05/2015	11:22 AM	19,05,828
HAC2N_11b_18500g_080cm	02/04/2015	1:11 PM	3160	05/05/2015	11:22 AM	19,06,501
HAC2N_11b_18500g_090cm	02/04/2015	1:11 PM	3162	05/05/2015	11:22 AM	19,05,875
HAC2N_11b_18500g_100cm	02/04/2015	1:12 PM	3163	05/05/2015	11:22 AM	19,07,232
HAC2N_11b_18500g_110cm	02/04/2015	1:12 PM	3163	05/05/2015	11:22 AM	19,08,182
HAC2N_11b_18500g_120cm	02/04/2015	1:12 PM	3163	05/05/2015	11:22 AM	19,07,735
HAC2N_11b_18500g_130cm	02/04/2015	1:12 PM	3163	05/05/2015	11:22 AM	19,05,051
HAC2N_11b_18500g_140cm	02/04/2015	1:12 PM	3163	05/05/2015	11:23 AM	19,07,424
HAC2N_11b_18500g_147cm	02/04/2015	1:12 PM	3163	05/05/2015	11:23 AM	19,06,371

Content 11b, 2N HAC case with 19.5 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_19500g_015cm	03/31/2015	5:22 PM	3158	05/05/2015	11:25 AM	19,03,227
HAC2N_11b_19500g_020cm	02/04/2015	1:25 PM	3160	05/05/2015	11:25 AM	19,04,622
HAC2N_11b_19500g_030cm	02/04/2015	1:26 PM	3160	05/05/2015	11:24 AM	19,05,671
HAC2N_11b_19500g_040cm	02/04/2015	1:26 PM	3160	05/05/2015	11:24 AM	19,06,146
HAC2N_11b_19500g_050cm	02/04/2015	1:26 PM	3160	05/05/2015	11:24 AM	19,04,757
HAC2N_11b_19500g_060cm	02/04/2015	1:26 PM	3160	05/05/2015	11:24 AM	19,06,404
HAC2N_11b_19500g_070cm	02/04/2015	1:26 PM	3158	05/05/2015	11:24 AM	19,05,913
HAC2N_11b_19500g_080cm	02/04/2015	1:26 PM	3160	05/05/2015	11:25 AM	19,07,411
HAC2N_11b_19500g_090cm	02/04/2015	1:26 PM	3162	05/05/2015	11:24 AM	19,07,165
HAC2N_11b_19500g_100cm	02/04/2015	1:27 PM	3163	05/05/2015	11:24 AM	19,05,270
HAC2N_11b_19500g_110cm	02/04/2015	1:27 PM	3163	05/05/2015	11:25 AM	19,03,032
HAC2N_11b_19500g_120cm	02/04/2015	1:27 PM	3163	05/05/2015	11:25 AM	19,05,502
HAC2N_11b_19500g_130cm	02/04/2015	1:27 PM	3163	05/05/2015	11:26 AM	19,05,743
HAC2N_11b_19500g_140cm	02/04/2015	1:27 PM	3163	05/05/2015	11:26 AM	19,06,763
HAC2N_11b_19500g_147cm	02/04/2015	1:27 PM	3163	05/05/2015	11:26 AM	19,05,800

Content 11b, 2N HAC case with 20 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_20000g_015cm	02/04/2015	1:28 PM	3158	05/05/2015	11:28 AM	19,03,105
HAC2N_11b_20000g_020cm	02/04/2015	1:28 PM	3158	05/05/2015	11:28 AM	19,03,055
HAC2N_11b_20000g_030cm	02/04/2015	1:28 PM	3158	05/05/2015	11:27 AM	19,04,516
HAC2N_11b_20000g_040cm	02/04/2015	1:28 PM	3158	05/05/2015	11:27 AM	19,03,840
HAC2N_11b_20000g_050cm	02/04/2015	1:28 PM	3158	05/05/2015	11:27 AM	19,06,444
HAC2N_11b_20000g_060cm	02/04/2015	1:29 PM	3158	05/05/2015	11:28 AM	19,05,125
HAC2N_11b_20000g_070cm	02/04/2015	1:29 PM	3156	05/05/2015	11:28 AM	19,05,457
HAC2N_11b_20000g_080cm	02/04/2015	1:29 PM	3158	05/05/2015	11:27 AM	19,03,957
HAC2N_11b_20000g_090cm	02/04/2015	1:29 PM	3162	05/05/2015	11:28 AM	19,06,939
HAC2N_11b_20000g_100cm	02/04/2015	1:29 PM	3161	05/05/2015	11:28 AM	19,05,029
HAC2N_11b_20000g_110cm	02/04/2015	1:29 PM	3161	05/05/2015	11:28 AM	19,06,399
HAC2N_11b_20000g_120cm	02/04/2015	1:30 PM	3161	05/05/2015	11:28 AM	19,07,627
HAC2N_11b_20000g_130cm	02/04/2015	1:30 PM	3161	05/05/2015	11:29 AM	19,07,500
HAC2N_11b_20000g_140cm	02/04/2015	1:30 PM	3161	05/05/2015	11:28 AM	19,05,796
HAC2N_11b_20000g_147cm	02/04/2015	1:31 PM	3161	05/05/2015	11:29 AM	19,07,402

Content 11b, 5N NCT case with 16 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
NCT5N_11b_16000g_015cm	04-14-2015	12:09 PM	3833	04/22/2015	6:43 PM	19,13,135

Content 11b, Isolated cases with 16 Kg U-235						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
Isolated_HAC_11b_16000g_015cm	09/04/2015	1:48 PM	2038	04/22/2015	6:27 PM	19,02,021
Isolated_NCT_11b_16000g_015cm	09/04/2015	1:49 PM	2038	04/22/2015	6:26 PM	19,00,423

Content 11b, 2N HAC case with 16 Kg U-235, Fog density study						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11b_16000g_015cm_0001	09/04/2015	3:01 PM	3,253	04/22/2015	6:32 PM	19,06,719
HAC2N_11b_16000g_015cm_001	09/04/2015	2:53 PM	3,250	04/22/2015	6:32 PM	19,07,292
HAC2N_11b_16000g_015cm_010	09/04/2015	2:48 PM	3,250	04/22/2015	6:32 PM	19,07,999
HAC2N_11b_16000g_015cm_030	09/04/2015	2:39 PM	3,250	04/22/2015	6:33 PM	19,05,962
HAC2N_11b_16000g_015cm_050	09/04/2015	2:34 PM	3,250	04/22/2015	6:34 PM	19,06,022
HAC2N_11b_16000g_015cm_080	09/04/2015	2:33 PM	3,250	04/22/2015	6:34 PM	19,07,570
HAC2N_11b_16000g_015cm_100	09/04/2015	2:24 PM	3,251	04/22/2015	6:35 PM	19,07,061

Content 11c, 2N HAC case with 15 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_15000g_010cm	3/31/2015	7:00 PM	3,189	04/22/2015	6:57 PM	19,17,778
HAC2N_11c_15000g_020cm	3/31/2015	7:00 PM	3,191	04/22/2015	6:55 PM	19,17,756
HAC2N_11c_15000g_030cm	3/31/2015	7:00 PM	3,191	04/22/2015	6:55 PM	19,17,399
HAC2N_11c_15000g_040cm	3/31/2015	7:00 PM	3,193	04/22/2015	6:55 PM	19,15,010
HAC2N_11c_15000g_050cm	3/31/2015	7:01 PM	3,191	04/22/2015	6:55 PM	19,18,153
HAC2N_11c_15000g_060cm	3/31/2015	7:01 PM	3,193	04/22/2015	6:56 PM	19,18,823
HAC2N_11c_15000g_070cm	3/31/2015	7:01 PM	3,191	04/22/2015	6:56 PM	19,18,301
HAC2N_11c_15000g_080cm	3/31/2015	7:01 PM	3,193	04/22/2015	6:56 PM	19,17,529
HAC2N_11c_15000g_090cm	3/31/2015	7:01 PM	3,195	04/22/2015	6:56 PM	19,18,968
HAC2N_11c_15000g_100cm	3/31/2015	7:01 PM	3,196	04/22/2015	6:56 PM	19,17,798
HAC2N_11c_15000g_110cm	3/31/2015	7:02 PM	3,194	04/22/2015	6:57 PM	19,19,088
HAC2N_11c_15000g_120cm	3/31/2015	7:02 PM	3,194	04/22/2015	6:57 PM	19,16,971
HAC2N_11c_15000g_130cm	3/31/2015	7:02 PM	3,194	04/22/2015	6:57 PM	19,18,492
HAC2N_11c_15000g_140cm	3/31/2015	7:02 PM	3,194	04/22/2015	6:57 PM	19,18,782

Content 11c, 2N HAC case with 20 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_20000g_010cm	3/31/2015	7:03 PM	3,189	04/22/2015	6:47 PM	19,16,673
HAC2N_11c_20000g_020cm	3/31/2015	7:03 PM	3,191	04/22/2015	6:46 PM	19,17,040
HAC2N_11c_20000g_030cm	3/31/2015	7:03 PM	3,191	04/22/2015	6:45 PM	19,18,091
HAC2N_11c_20000g_040cm	3/31/2015	7:03 PM	3,191	04/22/2015	6:45 PM	19,15,010
HAC2N_11c_20000g_050cm	3/31/2015	7:04 PM	3,191	04/22/2015	6:45 PM	19,16,857
HAC2N_11c_20000g_060cm	3/31/2015	7:04 PM	3,193	04/22/2015	6:45 PM	19,17,959
HAC2N_11c_20000g_070cm	3/31/2015	7:04 PM	3,189	04/22/2015	6:45 PM	19,18,493
HAC2N_11c_20000g_080cm	3/31/2015	7:04 PM	3,191	04/22/2015	6:45 PM	19,16,878
HAC2N_11c_20000g_090cm	3/31/2015	7:04 PM	3,193	04/22/2015	6:45 PM	19,18,424
HAC2N_11c_20000g_100cm	3/31/2015	7:04 PM	3,194	04/22/2015	6:45 PM	19,16,505
HAC2N_11c_20000g_110cm	3/31/2015	7:05 PM	3,196	04/22/2015	6:47 PM	19,19,058
HAC2N_11c_20000g_120cm	3/31/2015	7:05 PM	3,194	04/22/2015	6:46 PM	19,17,420
HAC2N_11c_20000g_130cm	3/31/2015	7:05 PM	3,194	04/22/2015	6:47 PM	19,18,241
HAC2N_11c_20000g_140cm	3/31/2015	7:05 PM	3,194	04/22/2015	6:47 PM	19,17,627

Content 11c, 2N HAC case with 25 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_25000g_020cm	3/31/2015	7:08 PM	3,191	04/22/2015	6:58 PM	19,16,604
HAC2N_11c_25000g_030cm	3/31/2015	7:08 PM	3,191	04/22/2015	6:58 PM	19,15,679
HAC2N_11c_25000g_040cm	3/31/2015	7:16 PM	3,191	04/22/2015	6:58 PM	19,17,656
HAC2N_11c_25000g_050cm	3/31/2015	7:16 PM	3,189	04/22/2015	6:58 PM	19,16,952
HAC2N_11c_25000g_060cm	3/31/2015	7:16 PM	3,191	04/22/2015	6:57 PM	19,16,314
HAC2N_11c_25000g_070cm	3/31/2015	7:16 PM	3,191	04/22/2015	6:57 PM	19,16,238
HAC2N_11c_25000g_080cm	3/31/2015	7:16 PM	3,191	04/22/2015	6:58 PM	19,20,182
HAC2N_11c_25000g_090cm	3/31/2015	7:17 PM	3,195	04/22/2015	6:58 PM	19,15,778
HAC2N_11c_25000g_100cm	3/31/2015	7:17 PM	3,194	04/22/2015	6:58 PM	19,18,089
HAC2N_11c_25000g_110cm	3/31/2015	7:17 PM	3,196	04/22/2015	6:58 PM	19,18,278
HAC2N_11c_25000g_120cm	3/31/2015	7:17 PM	3,194	04/22/2015	6:58 PM	19,18,117
HAC2N_11c_25000g_130cm	3/31/2015	7:17 PM	3,196	04/22/2015	6:59 PM	19,18,784
HAC2N_11c_25000g_140cm	3/31/2015	7:17 PM	3,194	04/22/2015	6:59 PM	19,16,750
HAC2N_11c_25000g_147cm	3/31/2015	7:17 PM	3,196	04/22/2015	6:59 PM	19,16,223

Content 11c, 2N HAC case with 30 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_30000g_020cm	3/31/2015	7:18 PM	3,191	04/22/2015	6:53 PM	19,15,911
HAC2N_11c_30000g_030cm	3/31/2015	7:18 PM	3,191	04/22/2015	6:52 PM	19,14,576
HAC2N_11c_30000g_040cm	3/31/2015	7:18 PM	3,193	04/22/2015	6:52 PM	19,16,711
HAC2N_11c_30000g_050cm	3/31/2015	7:19 PM	3,189	04/22/2015	6:52 PM	19,17,157
HAC2N_11c_30000g_060cm	3/31/2015	7:19 PM	3,193	04/22/2015	6:52 PM	19,16,979
HAC2N_11c_30000g_070cm	3/31/2015	7:19 PM	3,191	04/22/2015	6:52 PM	19,16,382
HAC2N_11c_30000g_080cm	3/31/2015	7:19 PM	3,193	04/22/2015	6:52 PM	19,17,930
HAC2N_11c_30000g_090cm	3/31/2015	7:19 PM	3,195	04/22/2015	6:52 PM	19,17,509
HAC2N_11c_30000g_100cm	3/31/2015	7:19 PM	3,196	04/22/2015	6:52 PM	19,18,240
HAC2N_11c_30000g_110cm	3/31/2015	7:19 PM	3,196	04/22/2015	6:53 PM	19,17,753
HAC2N_11c_30000g_120cm	3/31/2015	7:19 PM	3,196	04/22/2015	6:53 PM	19,17,566
HAC2N_11c_30000g_130cm	3/31/2015	7:20 PM	3,196	04/22/2015	6:53 PM	19,18,446
HAC2N_11c_30000g_140cm	3/31/2015	7:20 PM	3,194	04/22/2015	6:53 PM	19,17,192
HAC2N_11c_30000g_147cm	3/31/2015	7:20 PM	3,196	04/22/2015	6:53 PM	19,17,393

Content 11c, 2N HAC case with 35 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_35000g_020cm	3/31/2015	7:21 PM	3,191	04/22/2015	6:43 PM	19,15,883
HAC2N_11c_35000g_030cm	3/31/2015	7:21 PM	3,189	04/22/2015	6:42 PM	19,13,474
HAC2N_11c_35000g_040cm	3/31/2015	7:21 PM	3,193	04/22/2015	6:42 PM	19,16,741
HAC2N_11c_35000g_050cm	3/31/2015	7:21 PM	3,189	04/22/2015	6:42 PM	19,16,267
HAC2N_11c_35000g_060cm	3/31/2015	7:21 PM	3,191	04/22/2015	6:42 PM	19,15,918
HAC2N_11c_35000g_070cm	3/31/2015	7:21 PM	3,191	04/22/2015	6:42 PM	19,16,740
HAC2N_11c_35000g_080cm	3/31/2015	7:22 PM	3,191	04/22/2015	6:43 PM	19,17,150
HAC2N_11c_35000g_090cm	3/31/2015	7:22 PM	3,195	04/22/2015	6:42 PM	19,15,193
HAC2N_11c_35000g_100cm	3/31/2015	7:22 PM	3,196	04/22/2015	6:42 PM	19,17,218
HAC2N_11c_35000g_110cm	3/31/2015	7:22 PM	3,194	04/22/2015	6:43 PM	19,15,933
HAC2N_11c_35000g_120cm	3/31/2015	7:22 PM	3,194	04/22/2015	6:43 PM	19,17,350
HAC2N_11c_35000g_130cm	3/31/2015	7:22 PM	3,194	04/22/2015	6:43 PM	19,15,733
HAC2N_11c_35000g_140cm	3/31/2015	7:22 PM	3,194	04/22/2015	6:43 PM	19,16,272
HAC2N_11c_35000g_147cm	5/05/2015	11:03 AM	3,210	05/05/2015	11:03 AM	19,16,232

Content 11c, 2N HAC case with 40 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_40000g_020cm	04/09/2015	12:11 PM	3,191	04/22/2015	6:48 PM	19,12,507
HAC2N_11c_40000g_030cm	04/09/2015	12:11 PM	3,189	04/22/2015	6:48 PM	19,15,151
HAC2N_11c_40000g_040cm	04/09/2015	12:12 PM	3,193	04/22/2015	6:48 PM	19,13,407
HAC2N_11c_40000g_050cm	04/09/2015	12:12 PM	3,189	04/22/2015	6:48 PM	19,15,724
HAC2N_11c_40000g_060cm	04/09/2015	12:12 PM	3,191	04/22/2015	6:47 PM	19,14,023
HAC2N_11c_40000g_070cm	04/09/2015	12:12 PM	3,191	04/22/2015	6:47 PM	19,16,184
HAC2N_11c_40000g_080cm	04/09/2015	12:13 PM	3,191	04/22/2015	6:48 PM	19,16,771
HAC2N_11c_40000g_090cm	04/09/2015	12:13 PM	3,195	04/22/2015	6:48 PM	19,15,492
HAC2N_11c_40000g_100cm	04/09/2015	12:14 PM	3,196	04/22/2015	6:48 PM	19,17,953
HAC2N_11c_40000g_110cm	04/09/2015	12:14 PM	3,194	04/22/2015	6:48 PM	19,18,785
HAC2N_11c_40000g_120cm	04/09/2015	12:14 PM	3,194	04/22/2015	6:48 PM	19,15,358
HAC2N_11c_40000g_130cm	04/09/2015	12:14 PM	3,194	04/22/2015	6:49 PM	19,15,049
HAC2N_11c_40000g_140cm	04/09/2015	12:15 PM	3,194	04/22/2015	6:49 PM	19,16,335
HAC2N_11c_40000g_147cm	04/09/2015	12:15 PM	3,192	04/22/2015	6:50 PM	19,15,554

Content 11c, 2N HAC case with 40+ Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_60000g_147cm	3/31/2015	7:23 PM	3,192	04/22/2015	6:50 PM	19,15,653
HAC2N_11c_80000g_147cm	3/31/2015	7:23 PM	3,192	04/22/2015	6:51 PM	19,16,951
HAC2N_11c_100000g_147cm	3/31/2015	7:23 PM	3,193	04/22/2015	6:49 PM	19,15,026
HAC2N_11c_150000g_147cm	3/31/2015	7:23 PM	3,193	04/22/2015	6:49 PM	19,13,396
HAC2N_11c_200000g_147cm	3/31/2015	7:24 PM	3,193	04/22/2015	6:50 PM	19,13,505
HAC2N_11c_250000g_147cm	3/31/2015	7:24 PM	3,195	04/22/2015	6:50 PM	19,12,639
HAC2N_11c_300000g_147cm	3/31/2015	7:24 PM	3,193	04/22/2015	6:51 PM	19,13,169

Content 11c, 5N NCT case with 40 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
NCT5N_11c_40000g_147cm	4/14/2015	12:15 PM	3,878	05/04/2015	11:05 AM	18,78,980

Content 11c, Isolated cases with 40 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
Isolated_HAC_11c_40000g_147cm	04/09/2015	11:14 AM	2,219	05/04/2015	11:07 AM	19,15,678
Isolated_NCT_11c_40000g_147cm	04/09/2015	11:15 AM	2,219	05/04/2015	11:06 AM	19,16,768

Content 11c, 2N HAC case with 40 Kg U, Fog density study						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11c_40000g_147cm_000	04/01/2015	2:19 PM	3,273	04/22/2015	7:14 PM	19,20,142
HAC2N_11c_40000g_147cm_0001	04/09/2015	2:18 PM	3,279	04/22/2015	7:14 PM	19,18,410
HAC2N_11c_40000g_147cm_001	04/01/2015	2:19 PM	3,276	04/22/2015	7:14 PM	19,19,181
HAC2N_11c_40000g_147cm_010	04/01/2015	2:19 PM	3,276	04/22/2015	7:15 PM	19,20,612
HAC2N_11c_40000g_147cm_020	04/01/2015	2:20 PM	3,276	04/22/2015	7:16 PM	19,19,354
HAC2N_11c_40000g_147cm_030	04/01/2015	2:20 PM	3,276	04/22/2015	7:16 PM	19,18,955
HAC2N_11c_40000g_147cm_040	04/01/2015	2:20 PM	3,276	04/22/2015	7:16 PM	19,21,450
HAC2N_11c_40000g_147cm_050	04/01/2015	2:20 PM	3,276	04/22/2015	7:16 PM	19,20,922
HAC2N_11c_40000g_147cm_060	04/01/2015	2:21 PM	3,276	04/22/2015	7:17 PM	19,21,546
HAC2N_11c_40000g_147cm_070	04/01/2015	2:21 PM	3,276	04/22/2015	7:17 PM	19,18,804
HAC2N_11c_40000g_147cm_080	04/01/2015	2:21 PM	3,276	04/22/2015	7:17 PM	19,20,648
HAC2N_11c_40000g_147cm_090	04/01/2015	2:21 PM	3,276	04/22/2015	7:18 PM	19,19,845
HAC2N_11c_40000g_147cm_100	04/01/2015	2:13 PM	3,275	04/22/2015	7:18 PM	19,21,893

Content 11g, 5N HAC case with 40 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_40000g_020cm	07/04/2015	2:48 PM	12,622	04/22/2015	6:41 PM	19,55,800
HAC5N_11g_40000g_030cm	07/04/2015	2:47 PM	12,624	04/22/2015	6:40 PM	19,56,480
HAC5N_11g_40000g_040cm	07/04/2015	2:47 PM	12,622	04/22/2015	6:39 PM	19,57,354
HAC5N_11g_40000g_050cm	07/04/2015	2:47 PM	12,622	04/22/2015	6:39 PM	19,55,958
HAC5N_11g_40000g_060cm	05/05/2015	11:04 AM	12,640	05/05/2015	11:04 AM	19,57,971
HAC5N_11g_40000g_070cm	07/04/2015	2:47 PM	12,618	04/22/2015	6:40 PM	19,58,558
HAC5N_11g_40000g_080cm	07/04/2015	2:46 PM	12,618	04/22/2015	6:40 PM	19,59,000
HAC5N_11g_40000g_090cm	07/04/2015	2:48 PM	12,622	04/22/2015	6:40 PM	19,59,247
HAC5N_11g_40000g_100cm	07/04/2015	2:49 PM	12,625	04/22/2015	6:40 PM	19,57,876
HAC5N_11g_40000g_110cm	07/04/2015	2:50 PM	12,625	04/22/2015	6:41 PM	19,59,364
HAC5N_11g_40000g_120cm	07/04/2015	2:50 PM	12,625	04/22/2015	6:41 PM	19,58,636
HAC5N_11g_40000g_130cm	07/04/2015	2:50 PM	12,625	04/22/2015	6:41 PM	19,59,085
HAC5N_11g_40000g_140cm	07/04/2015	2:50 PM	12,625	04/22/2015	6:41 PM	19,59,878
HAC5N_11g_40000g_147cm	07/04/2015	2:51 PM	12,625	04/22/2015	6:41 PM	19,60,856

Content 11g, 5N NCT case with 40 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
NCT5N_11g_40000g_147cm	04/14/2015	12:11 PM	6,845	04/22/2015	6:37 PM	19,39,857

Content 11g, Isolated cases with 40 Kg U						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
Isolated_HAC_11g_40000g_147cm	05/05/2015	11:05 AM	2,071	05/05/2015	11:05 AM	19,17,435
Isolated_NCT_11g_40000g_147cm	05/05/2015	11:04 AM	2,071	05/05/2015	11:04 AM	19,15,688

Content 11g, 2N HAC case with 40 Kg U, Fog density study						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_40000g_147cm_0001	09/04/2015	4:02 PM	12,722	04/22/2015	6:37 PM	19,64,359
HAC5N_11g_40000g_147cm_001	09/04/2015	4:03 PM	12,719	04/22/2015	6:38 PM	19,61,811
HAC5N_11g_40000g_147cm_010	09/04/2015	3:22 PM	12,719	04/22/2015	6:38 PM	19,64,525
HAC5N_11g_40000g_147cm_030	09/04/2015	3:20 PM	12,719	04/22/2015	6:40 PM	19,62,594
HAC5N_11g_40000g_147cm_050	09/04/2015	3:19 PM	12,719	04/22/2015	6:42 PM	19,63,093
HAC5N_11g_40000g_147cm_080	09/04/2015	3:18 PM	12,719	04/22/2015	6:45 PM	19,65,000
HAC5N_11g_40000g_147cm_100	09/04/2015	3:17 PM	12,720	04/22/2015	6:49 PM	19,63,768

H/X=0 cases						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1650g_HbyX_ZERO	04-08-2015	5:51 PM	3,119	04/22/2015	7:23 PM	19,11,162
HAC2N_11b_15000g_HbyX_ZERO	04/13/2015	3:01 PM	3,113	04/22/2015	7:20 PM	19,01,844
HAC2N_11b_16000g_HbyX_ZERO	05/29/2015	2:31 PM	3,106	06/01/2015	7:20 PM	18,99,499
HAC2N_11c_40000g_HbyX_ZERO	04/09/2015	11:10 AM	3,163	04/22/2015	7:20 PM	19,10,745
HAC5N_11g_40000g_HbyX_ZERO	06/10/2015	7:36 PM	12,204	06/10/2015	7:36 PM	1,953,319

Air transport case with 100g CH2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0100gCH2	04/10/2015	11:20 AM	932	04/22/2015	7:25 PM	18,68,042
AT_0100_0100gCH2	04/10/2015	1:21 PM	930	04/22/2015	7:25 PM	18,68,779
AT_0200_0100gCH2	04/10/2015	1:59 PM	906	04/22/2015	7:24 PM	18,72,795
AT_0500_0100gCH2	04/10/2015	1:59 PM	908	04/22/2015	7:24 PM	18,71,947
AT_1000_0100gCH2	04/10/2015	1:59 PM	906	04/22/2015	7:24 PM	18,70,774
AT_2000_0100gCH2	04/10/2015	2:00 PM	906	04/22/2015	7:24 PM	18,69,698
AT_3000_0100gCH2	04/10/2015	2:00 PM	906	04/22/2015	7:24 PM	18,71,505
AT_4000_0100gCH2	04/10/2015	2:00 PM	906	04/22/2015	7:24 PM	18,70,522
AT_5000_0100gCH2	04/10/2015	2:00 PM	906	04/22/2015	7:24 PM	18,70,670
AT_6000_0100gCH2	04/10/2015	2:00 PM	906	04/22/2015	7:24 PM	18,71,970
AT_7000_0100gCH2	04/10/2015	2:00 PM	884	04/22/2015	7:25 PM	18,70,630

Air Transport Case with 200g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0200gCH2	04/10/2015	2:34 PM	909	04/22/2015	7:09 PM	18,69,820
AT_0100_0200gCH2	04/10/2015	2:03 PM	909	04/22/2015	7:08 PM	18,70,597
AT_0200_0200gCH2	04/10/2015	2:06 PM	915	04/22/2015	7:08 PM	18,71,893
AT_0500_0200gCH2	05/05/2015	11:06 AM	934	05/05/2015	11:06 AM	18,72,812
AT_1000_0200gCH2	04/10/2015	2:12 PM	912	04/22/2015	7:07 PM	18,72,129
AT_2000_0200gCH2	04/10/2015	2:13 PM	912	04/22/2015	7:08 PM	18,70,759
AT_3000_0200gCH2	04/10/2015	2:14 PM	912	04/22/2015	7:08 PM	18,72,417
AT_4000_0200gCH2	04/10/2015	2:15 PM	912	04/22/2015	7:08 PM	18,70,224
AT_5000_0200gCH2	04/10/2015	2:17 PM	913	04/22/2015	7:08 PM	18,71,815
AT_6000_0200gCH2	04/10/2015	2:18 PM	912	04/22/2015	7:08 PM	18,70,740
AT_7000_0200gCH2	04/10/2015	2:20 PM	892	04/22/2015	7:09 PM	18,71,563

Air Transport Case with 300g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0300gCH2	04/10/2015	2:34 PM	916	04/22/2015	7:06 PM	18,67,902
AT_0100_0300gCH2	04/10/2015	2:36 PM	914	04/22/2015	7:05 PM	18,69,584
AT_0200_0300gCH2	04/10/2015	2:38 PM	914	04/22/2015	7:06 PM	18,70,204
AT_0500_0300gCH2	04/10/2015	2:40 PM	913	04/22/2015	7:05 PM	18,69,657
AT_1000_0300gCH2	04/10/2015	2:43 PM	913	04/22/2015	7:05 PM	18,67,993
AT_2000_0300gCH2	04/10/2015	2:43 PM	913	04/22/2015	7:05 PM	18,71,888
AT_3000_0300gCH2	04/10/2015	2:44 PM	912	04/22/2015	7:05 PM	18,71,819
AT_4000_0300gCH2	04/10/2015	2:45 PM	913	04/22/2015	7:06 PM	18,71,156
AT_5000_0300gCH2	04/10/2015	2:46 PM	912	04/22/2015	7:06 PM	18,72,890
AT_6000_0300gCH2	04/10/2015	2:47 PM	911	04/22/2015	7:06 PM	18,72,689
AT_7000_0300gCH2	04/10/2015	2:48 PM	892	04/22/2015	7:06 PM	18,67,824

Air Transport Case with 400g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0400gCH2	04/10/2015	2:50 PM	916	04/22/2015	6:40 PM	18,68,191
AT_0100_0400gCH2	04/10/2015	2:54 PM	914	04/22/2015	6:39 PM	18,68,989
AT_0200_0400gCH2	04/10/2015	2:55 PM	915	04/22/2015	6:39 PM	18,69,613
AT_0500_0400gCH2	05/05/2015	11:06 AM	934	05/05/2015	11:06 AM	18,70,195
AT_1000_0400gCH2	04/10/2015	2:58 PM	912	04/22/2015	6:39 PM	18,71,264
AT_2000_0400gCH2	04/10/2015	2:59 PM	913	04/22/2015	6:39 PM	18,69,616
AT_3000_0400gCH2	04/10/2015	3:00 PM	912	04/22/2015	6:39 PM	18,72,720
AT_4000_0400gCH2	04/10/2015	3:01 PM	913	04/22/2015	6:39 PM	18,72,421
AT_5000_0400gCH2	04/10/2015	3:02 PM	912	04/22/2015	6:40 PM	18,69,579
AT_6000_0400gCH2	04/10/2015	3:03 PM	911	04/22/2015	6:40 PM	18,68,518
AT_7000_0400gCH2	04/10/2015	3:04 PM	891	04/22/2015	6:40 PM	18,69,200

Air Transport Case with 500g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0500gCH2	04/10/2015	2:41 PM	935	04/22/2015	6:30 PM	18,68,740
AT_0100_0500gCH2	04/10/2015	2:49 PM	934	04/22/2015	6:29 PM	18,70,273
AT_0200_0500gCH2	04/10/2015	3:09 PM	934	04/22/2015	6:30 PM	18,69,141
AT_0500_0500gCH2	04/11/2015	11:56 AM	934	04/22/2015	6:29 PM	18,68,801
AT_1000_0500gCH2	04/10/2015	3:12 PM	932	04/22/2015	6:29 PM	18,69,691
AT_2000_0500gCH2	04/10/2015	3:13 PM	932	04/22/2015	6:29 PM	18,70,465
AT_3000_0500gCH2	04/10/2015	3:14 PM	932	04/22/2015	6:29 PM	18,69,441
AT_4000_0500gCH2	04/10/2015	3:16 PM	932	04/22/2015	6:30 PM	18,70,049
AT_5000_0500gCH2	04/10/2015	3:17 PM	932	04/22/2015	6:30 PM	18,72,969
AT_6000_0500gCH2	04/10/2015	3:18 PM	932	04/22/2015	6:30 PM	18,69,531
AT_7000_0500gCH2	4/15/2015	10:06 AM	910	04/22/2015	6:30 PM	18,70,008

Air Transport Case with 600g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0600gCH2	04/10/2015	3:23 PM	935	04/22/2015	6:32 PM	18,70,471
AT_0100_0600gCH2	04/10/2015	3:31 PM	934	04/22/2015	6:32 PM	18,68,822
AT_0200_0600gCH2	04/10/2015	3:33 PM	934	04/22/2015	6:32 PM	18,70,516
AT_0500_0600gCH2	04/10/2015	3:34 PM	934	04/22/2015	6:31 PM	18,69,463
AT_1000_0600gCH2	04/10/2015	3:35 PM	932	04/22/2015	6:31 PM	18,69,141
AT_2000_0600gCH2	04/10/2015	3:37 PM	932	04/22/2015	6:31 PM	18,71,743
AT_3000_0600gCH2	04/10/2015	3:38 PM	932	04/22/2015	6:32 PM	18,70,144
AT_4000_0600gCH2	04/10/2015	3:39 PM	932	04/22/2015	6:32 PM	18,70,479
AT_5000_0600gCH2	04/10/2015	3:39 PM	932	04/22/2015	6:32 PM	18,69,404
AT_6000_0600gCH2	04/10/2015	3:40 PM	932	04/22/2015	6:32 PM	18,70,238
AT_7000_0600gCH2	4/15/2015	10:08 AM	910	04/22/2015	6:32 PM	18,70,923

Air Transport Case with 700g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0700gCH2	04/10/2015	3:47 PM	936	04/22/2015	7:11 PM	18,69,496
AT_0100_0700gCH2	04/11/2015	11:14 AM	935	04/22/2015	7:10 PM	18,69,127
AT_0200_0700gCH2	04/11/2015	11:13 AM	933	04/22/2015	7:10 PM	18,68,609
AT_0500_0700gCH2	04/11/2015	11:12 AM	933	04/22/2015	7:09 PM	18,69,405
AT_1000_0700gCH2	04/11/2015	11:11 AM	931	04/22/2015	7:10 PM	18,69,997
AT_2000_0700gCH2	04/11/2015	11:11 AM	931	04/22/2015	7:10 PM	18,70,362
AT_3000_0700gCH2	05/05/2015	11:05 AM	952	05/05/2015	11:05 AM	18,70,261
AT_4000_0700gCH2	04/11/2015	11:09 AM	931	04/22/2015	7:10 PM	18,69,477
AT_5000_0700gCH2	04/11/2015	11:09 AM	931	04/22/2015	7:10 PM	18,70,339
AT_6000_0700gCH2	05/05/2015	11:05 AM	950	05/05/2015	11:05 AM	18,70,360
AT_7000_0700gCH2	4/15/2015	10:09 AM	909	04/22/2015	7:10 PM	18,70,340

Air Transport Case with 800g CH_2						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
AT_0050_0800gCH2	04/10/2015	3:23 PM	916	04/22/2015	6:35 PM	18,68,738
AT_0100_0800gCH2	04/10/2015	3:24 PM	916	04/22/2015	6:34 PM	18,68,116
AT_0200_0800gCH2	05/05/2015	11:06 AM	935	05/05/2015	11:06 AM	18,68,821
AT_0500_0800gCH2	04/10/2015	3:26 PM	916	04/22/2015	6:33 PM	18,69,666
AT_1000_0800gCH2	04/10/2015	3:27 PM	913	04/22/2015	6:33 PM	18,67,981
AT_2000_0800gCH2	04/10/2015	3:29 PM	911	04/22/2015	6:34 PM	18,69,039
AT_3000_0800gCH2	04/10/2015	3:30 PM	914	04/22/2015	6:34 PM	18,70,891
AT_4000_0800gCH2	04/10/2015	3:31 PM	914	04/22/2015	6:34 PM	18,70,503
AT_5000_0800gCH2	04/10/2015	3:32 PM	915	04/22/2015	6:33 PM	18,70,345
AT_6000_0800gCH2	04/10/2015	3:33 PM	914	04/22/2015	6:34 PM	18,68,692
AT_7000_0800gCH2	04/10/2015	3:34 PM	893	04/22/2015	6:34 PM	18,70,698

Filename	Date	Time	Size (Bytes)
U VF_TN-BGC1_05-08-2015.xlsx	05/08/2015	4:12 PM	1,73,454

Appendix C						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_800g_050cm_noresin_air	05/18/2015	6:44 PM	3,157	05/18/2015	10:58 PM	1,906,506
HAC2N_11a_800g_050cm_noresin_water	05/18/2015	6:44 PM	3,157	05/18/2015	10:58 PM	1,910,701
HAC2N_11b_14000g_015cm_noresin_air	05/18/2015	6:44 PM	3,141	05/18/2015	11:04 PM	1,903,953
HAC2N_11b_14000g_015cm_noresin_water	05/18/2015	6:44 PM	3,141	05/18/2015	11:00 PM	1,904,764
HAC2N_11c_12000g_147cm_noresin_air	05/18/2015	6:44 PM	3,193	05/18/2015	11:00 PM	1,915,964
HAC2N_11c_12000g_147cm_noresin_water	05/18/2015	6:44 PM	3,193	05/18/2015	10:57 PM	1,919,207
HAC5N_11g_10000g_147cm_noresin_air	05/18/2015	6:44 PM	12,630	05/18/2015	11:05 PM	1,958,225
HAC5N_11g_10000g_147cm_noresin_water	05/18/2015	6:44 PM	12,630	05/18/2015	11:06 PM	1,957,292

Appendix D- HAC2N Cases for Content 11a With Uranium Metal as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_1700g_010cm	12-24-2015	11:22 AM	3,205	1-11-2016	12:51 PM	1,909,333
HAC2N_11a_1700g_020cm	12-24-2015	11:22 AM	3,207	1-11-2016	12:46 PM	1,909,175
HAC2N_11a_1700g_030cm	12-24-2015	11:22 AM	3,207	1-11-2016	12:47 PM	1,908,543
HAC2N_11a_1700g_040cm	12-24-2015	11:23 AM	3,205	1-11-2016	12:46 PM	1,910,332
HAC2N_11a_1700g_050cm	12-24-2015	11:23 AM	3,206	1-11-2016	12:50 PM	1,911,791
HAC2N_11a_1700g_060cm	12-24-2015	11:23 AM	3,207	1-11-2016	12:49 PM	1,909,747
HAC2N_11a_1700g_070cm	12-24-2015	11:23 AM	3,209	1-11-2016	12:45 PM	1,909,854
HAC2N_11a_1700g_080cm	12-24-2015	11:23 AM	3,205	1-11-2016	12:48 PM	1,911,476
HAC2N_11a_1700g_090cm	12-24-2015	11:23 AM	3,211	1-11-2016	12:48 PM	1,908,091
HAC2N_11a_1700g_100cm	12-24-2015	11:23 AM	3,206	1-11-2016	12:52 PM	1,907,269
HAC2N_11a_1700g_110cm	12-24-2015	11:23 AM	3,210	1-11-2016	12:48 PM	1,911,336
HAC2N_11a_1700g_120cm	12-24-2015	11:24 AM	3,206	1-11-2016	12:51 PM	1,907,727
HAC2N_11a_1700g_130cm	12-24-2015	11:24 AM	3,210	1-11-2016	12:46 PM	1,908,885
HAC2N_11a_1700g_140cm	12-24-2015	11:24 AM	3,208	1-11-2016	12:45 PM	1,910,508
HAC2N_11a_1700g_147cm	12-24-2015	11:24 AM	3,212	1-11-2016	12:49 PM	1,908,310

Appendix D- HAC2N Cases for Content 11a With Uranium Dioxide as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_UO2_1700gU_010cm	1-14-2016	3:01 PM	3,217	1-20-2016	7:52 AM	1,913,832
HAC2N_11a_UO2_1700gU_020cm	1-14-2016	3:01 PM	3,219	1-20-2016	7:49 AM	1,910,269
HAC2N_11a_UO2_1700gU_030cm	1-14-2016	3:01 PM	3,219	1-20-2016	7:47 AM	1,911,889
HAC2N_11a_UO2_1700gU_040cm	1-14-2016	3:02 PM	3,217	1-20-2016	8:09 AM	1,911,184
HAC2N_11a_UO2_1700gU_050cm	1-14-2016	3:02 PM	3,218	1-20-2016	7:59 AM	1,912,467
HAC2N_11a_UO2_1700gU_060cm	1-14-2016	3:02 PM	3,219	1-20-2016	8:08 AM	1,912,190
HAC2N_11a_UO2_1700gU_070cm	1-14-2016	3:03 PM	3,221	1-20-2016	7:51 AM	1,911,373
HAC2N_11a_UO2_1700gU_080cm	1-14-2016	3:03 PM	3,217	1-20-2016	7:51 AM	1,911,846
HAC2N_11a_UO2_1700gU_090cm	1-14-2016	3:03 PM	3,223	1-20-2016	8:10 AM	1,909,820
HAC2N_11a_UO2_1700gU_100cm	1-14-2016	3:04 PM	3,218	1-20-2016	8:15 AM	1,910,444
HAC2N_11a_UO2_1700gU_110cm	1-14-2016	3:04 PM	3,222	1-20-2016	7:43 AM	1,912,852
HAC2N_11a_UO2_1700gU_120cm	1-14-2016	3:04 PM	3,218	1-20-2016	8:05 AM	1,910,601
HAC2N_11a_UO2_1700gU_130cm	1-14-2016	3:05 PM	3,222	1-20-2016	8:11 AM	1,909,138
HAC2N_11a_UO2_1700gU_140cm	1-14-2016	3:05 PM	3,220	1-20-2016	8:04 AM	1,911,955
HAC2N_11a_UO2_1700gU_147cm	1-14-2016	3:05 PM	3,224	1-20-2016	7:53 AM	1,911,294

Appendix D- HAC2N Cases for Content 11a With Uranium Tetrafluoride as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC2N_11a_UF4_1700gU_010cm	1-14-2016	2:50 PM	3,216	1-20-2016	8:09 AM	1,914,236
HAC2N_11a_UF4_1700gU_020cm	1-14-2016	2:51 PM	3,218	1-20-2016	8:08 AM	1,912,051
HAC2N_11a_UF4_1700gU_030cm	1-14-2016	2:51 PM	3,218	1-20-2016	7:57 AM	1,911,049
HAC2N_11a_UF4_1700gU_040cm	1-14-2016	2:52 PM	3,216	1-20-2016	8:02 AM	1,911,649
HAC2N_11a_UF4_1700gU_050cm	1-14-2016	2:52 PM	3,217	1-20-2016	7:57 AM	1,908,946
HAC2N_11a_UF4_1700gU_060cm	1-14-2016	2:52 PM	3,218	1-20-2016	8:05 AM	1,910,615
HAC2N_11a_UF4_1700gU_070cm	1-14-2016	2:53 PM	3,220	1-20-2016	7:53 AM	1,911,931
HAC2N_11a_UF4_1700gU_080cm	1-14-2016	2:53 PM	3,216	1-20-2016	8:19 AM	1,911,876
HAC2N_11a_UF4_1700gU_090cm	1-14-2016	2:54 PM	3,222	1-20-2016	8:12 AM	1,911,660
HAC2N_11a_UF4_1700gU_100cm	1-14-2016	2:54 PM	3,217	1-20-2016	8:09 AM	1,914,578
HAC2N_11a_UF4_1700gU_110cm	1-14-2016	2:54 PM	3,221	1-20-2016	7:59 AM	1,909,591
HAC2N_11a_UF4_1700gU_120cm	1-14-2016	2:55 PM	3,217	1-20-2016	8:07 AM	1,909,711
HAC2N_11a_UF4_1700gU_130cm	1-14-2016	2:55 PM	3,221	1-20-2016	7:47 AM	1,909,711
HAC2N_11a_UF4_1700gU_140cm	1-14-2016	2:55 PM	3,219	1-20-2016	7:57 AM	1,913,385
HAC2N_11a_UF4_1700gU_147cm	1-14-2016	2:56 PM	3,223	1-20-2016	8:00 AM	1,912,316

Appendix D- HAC5N Cases for Content 11g With Uranium Metal as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_40000g_020cm	12-24-2015	12:11 PM	12,680	1-21-2016	8:14 AM	1,955,797
HAC5N_11g_40000g_030cm	12-24-2015	12:12 PM	12,682	1-21-2016	8:12 AM	1,956,225
HAC5N_11g_40000g_040cm	12-24-2015	12:13 PM	12,682	1-21-2016	8:13 AM	1,959,099
HAC5N_11g_40000g_050cm	12-24-2015	12:13 PM	12,682	1-21-2016	8:12 AM	1,957,464
HAC5N_11g_40000g_060cm	12-24-2015	12:14 PM	12,682	1-21-2016	8:13 AM	1,957,796
HAC5N_11g_40000g_070cm	12-24-2015	12:15 PM	12,684	1-21-2016	8:11 AM	1,959,502
HAC5N_11g_40000g_080cm	12-24-2015	12:16 PM	12,680	1-21-2016	8:10 AM	1,957,474
HAC5N_11g_40000g_090cm	12-24-2015	12:17 PM	12,686	1-21-2016	8:12 AM	1,959,666
HAC5N_11g_40000g_100cm	12-24-2015	12:17 PM	12,683	1-21-2016	8:10 AM	1,959,262
HAC5N_11g_40000g_110cm	12-24-2015	12:18 PM	12,687	1-21-2016	8:13 AM	1,958,061
HAC5N_11g_40000g_120cm	12-24-2015	12:19 PM	12,683	1-21-2016	8:11 AM	1,959,207
HAC5N_11g_40000g_130cm	12-24-2015	12:20 PM	12,687	1-21-2016	8:14 AM	1,961,071
HAC5N_11g_40000g_140cm	12-24-2015	12:20 PM	12,683	1-21-2016	8:14 AM	1,959,269
HAC5N_11g_40000g_147cm	12-24-2015	12:21 PM	12,687	1-21-2016	8:14 AM	1,960,373

Appendix D- HAC5N Cases for Content 11g With Uranium Aluminum Alloy as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_UAl2_40000gU_060cm	1-22-2016	12:23 PM	12,831	1-24-2016	9:14 PM	1,963,220
HAC5N_11g_UAl2_40000gU_070cm	1-22-2016	12:23 PM	12,833	1-24-2016	9:16 PM	1,961,007
HAC5N_11g_UAl2_40000gU_080cm	1-22-2016	12:23 PM	12,829	1-24-2016	9:17 PM	1,960,698
HAC5N_11g_UAl2_40000gU_090cm	1-22-2016	12:23 PM	12,835	1-24-2016	9:16 PM	1,962,888
HAC5N_11g_UAl2_40000gU_100cm	1-22-2016	12:23 PM	12,832	1-24-2016	9:15 PM	1,962,259
HAC5N_11g_UAl2_40000gU_110cm	1-22-2016	12:24 PM	12,836	1-24-2016	9:13 PM	1,962,043
HAC5N_11g_UAl2_40000gU_120cm	1-22-2016	12:24 PM	12,832	1-24-2016	9:16 PM	1,963,222
HAC5N_11g_UAl2_40000gU_130cm	1-22-2016	12:24 PM	12,836	1-24-2016	9:14 PM	1,964,458
HAC5N_11g_UAl2_40000gU_140cm	1-22-2016	12:24 PM	12,832	1-24-2016	9:17 PM	1,963,355
HAC5N_11g_UAl2_40000gU_147cm	1-22-2016	12:24 PM	12,836	1-24-2016	9:14 PM	1,959,790

Appendix D- HAC5N Cases for Content 11g With Uranium Molybdenum Alloy as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_U7Mo_40000gU_030cm	1-14-2016	4:03 PM	12,831	1-20-2016	7:50 AM	1,962,721
HAC5N_11g_U7Mo_40000gU_040cm	1-14-2016	4:04 PM	12,831	1-20-2016	8:17 AM	1,964,708
HAC5N_11g_U7Mo_40000gU_050cm	1-14-2016	4:04 PM	12,831	1-20-2016	7:46 AM	1,965,553
HAC5N_11g_U7Mo_40000gU_060cm	1-14-2016	4:05 PM	12,831	1-20-2016	8:18 AM	1,964,403
HAC5N_11g_U7Mo_40000gU_070cm	1-14-2016	4:05 PM	12,833	1-20-2016	8:04 AM	1,966,847
HAC5N_11g_U7Mo_40000gU_080cm	1-14-2016	4:05 PM	12,829	1-20-2016	8:17 AM	1,964,807
HAC5N_11g_U7Mo_40000gU_090cm	1-14-2016	4:06 PM	12,835	1-20-2016	8:00 AM	1,965,549
HAC5N_11g_U7Mo_40000gU_100cm	1-14-2016	4:06 PM	12,832	1-20-2016	8:12 AM	1,965,443
HAC5N_11g_U7Mo_40000gU_110cm	1-14-2016	4:06 PM	12,836	1-20-2016	8:02 AM	1,965,571
HAC5N_11g_U7Mo_40000gU_120cm	1-14-2016	4:07 PM	12,832	1-20-2016	8:10 AM	1,966,169
HAC5N_11g_U7Mo_40000gU_130cm	1-14-2016	4:07 PM	12,836	1-20-2016	8:13 AM	1,967,164
HAC5N_11g_U7Mo_40000gU_140cm	1-14-2016	4:08 PM	12,832	1-20-2016	8:03 AM	1,967,021
HAC5N_11g_U7Mo_40000gU_147cm	1-14-2016	4:08 PM	12,836	1-20-2016	8:18 AM	1,964,450

Appendix D- HAC5N Cases for Content 11g With Uranium Silicon Alloy as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_U3Si_40000gU_030cm	1-22-2016	12:20 PM	12,833	1-24-2016	9:14 PM	1,958,485
HAC5N_11g_U3Si_40000gU_040cm	1-22-2016	12:20 PM	12,833	1-24-2016	9:17 PM	1,959,876
HAC5N_11g_U3Si_40000gU_050cm	1-22-2016	12:20 PM	12,833	1-24-2016	9:13 PM	1,958,896
HAC5N_11g_U3Si_40000gU_060cm	1-22-2016	12:20 PM	12,833	1-24-2016	9:18 PM	1,961,932
HAC5N_11g_U3Si_40000gU_070cm	1-22-2016	12:20 PM	12,835	1-24-2016	9:17 PM	1,961,606
HAC5N_11g_U3Si_40000gU_080cm	1-22-2016	12:20 PM	12,831	1-24-2016	9:14 PM	1,961,011
HAC5N_11g_U3Si_40000gU_090cm	1-22-2016	12:21 PM	12,837	1-24-2016	9:12 PM	1,961,708
HAC5N_11g_U3Si_40000gU_100cm	1-22-2016	12:21 PM	12,834	1-24-2016	9:15 PM	1,959,082
HAC5N_11g_U3Si_40000gU_110cm	1-22-2016	12:21 PM	12,838	1-24-2016	9:17 PM	1,961,331
HAC5N_11g_U3Si_40000gU_120cm	1-22-2016	12:21 PM	12,834	1-24-2016	9:16 PM	1,959,660
HAC5N_11g_U3Si_40000gU_130cm	1-22-2016	12:21 PM	12,838	1-24-2016	9:12 PM	1,960,113
HAC5N_11g_U3Si_40000gU_140cm	1-22-2016	12:21 PM	12,834	1-24-2016	9:15 PM	1,960,903
HAC5N_11g_U3Si_40000gU_147cm	1-22-2016	12:21 PM	12,838	1-24-2016	9:14 PM	1,961,965

Appendix D- HAC5N Cases for Content 11g With Uranium Zirconium Alloy as Fissile Medium						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
HAC5N_11g_U10Zr_40000gU_030cm	1-14-2016	3:56 PM	12,835	1-20-2016	8:04 AM	1,963,647
HAC5N_11g_U10Zr_40000gU_040cm	1-14-2016	3:56 PM	12,835	1-20-2016	7:57 AM	1,960,998
HAC5N_11g_U10Zr_40000gU_050cm	1-14-2016	3:57 PM	12,835	1-20-2016	8:21 AM	1,964,413
HAC5N_11g_U10Zr_40000gU_060cm	1-14-2016	3:57 PM	12,835	1-20-2016	7:45 AM	1,962,609
HAC5N_11g_U10Zr_40000gU_070cm	1-14-2016	3:58 PM	12,837	1-20-2016	7:50 AM	1,964,295
HAC5N_11g_U10Zr_40000gU_080cm	1-14-2016	3:58 PM	12,833	1-20-2016	7:46 AM	1,965,334
HAC5N_11g_U10Zr_40000gU_090cm	1-14-2016	3:59 PM	12,839	1-20-2016	8:09 AM	1,962,683
HAC5N_11g_U10Zr_40000gU_100cm	1-14-2016	3:59 PM	12,836	1-20-2016	8:01 AM	1,964,099
HAC5N_11g_U10Zr_40000gU_110cm	1-14-2016	3:59 PM	12,840	1-20-2016	7:44 AM	1,965,197
HAC5N_11g_U10Zr_40000gU_120cm	1-14-2016	4:00 PM	12,836	1-20-2016	7:58 AM	1,963,190
HAC5N_11g_U10Zr_40000gU_130cm	1-14-2016	4:00 PM	12,840	1-20-2016	7:47 AM	1,964,778
HAC5N_11g_U10Zr_40000gU_140cm	1-14-2016	4:01 PM	12,836	1-20-2016	8:16 AM	1,965,679
HAC5N_11g_U10Zr_40000gU_147cm	1-14-2016	4:01 PM	12,840	1-20-2016	8:11 AM	1,966,207

Appendix D- NCT5N Cases						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
NCT5N_11a_UF4_1700gU_050cm	1-19-2016	1:41 PM	4,008	1-20-2016	7:50 AM	1,921,835
NCT5N_11a_UO2_1700gU_050cm	1-19-2016	1:42 PM	4,009	1-20-2016	8:17 AM	1,919,992
NCT5N_11g_U10Zr_40000gU_147cm	1-19-2016	1:43 PM	7,056	1-20-2016	8:19 AM	1,945,835
NCT5N_11g_U3Si_40000gU_147cm	1-25-2016	11:02 AM	7,054	1-25-2016	7:58 AM	1,942,831
NCT5N_11g_U7Mo_40000gU_147cm	1-19-2016	1:43 PM	7,052	1-20-2016	8:01 AM	1,946,861
NCT5N_11g_UAl2_40000gU_147cm	1-25-2016	11:03 AM	7,052	1-25-2016	8:01 AM	1,942,998

Appendix D- Isolated NCT and HAC Cases						
Run ID	Input File			Output file		
	Date	Time	Size (Bytes)	Date	Time	Size (Bytes)
Isolated_HAC_11a_UF4_1700gU_050cm	1-19-2016	1:34 PM	2,236	1-20-2016	8:00 AM	1,909,234
Isolated_HAC_11a_UO2_1700gU_050cm	1-19-2016	1:35 PM	2,237	1-20-2016	7:50 AM	1,912,183
Isolated_HAC_11g_U10Zr_40000gU_147cm	1-19-2016	1:38 PM	2,418	1-20-2016	7:53 AM	1,923,037
Isolated_HAC_11g_U3Si_40000gU_147cm	1-25-2016	11:00 AM	2,415	1-25-2016	8:03 AM	1,920,482
Isolated_HAC_11g_U7Mo_40000gU_147cm	1-19-2016	1:39 PM	2,414	1-20-2016	8:22 AM	1,924,379
Isolated_HAC_11g_UAl2_40000gU_147cm	1-25-2016	10:58 AM	2,417	1-25-2016	8:04 AM	1,921,437
Isolated_NCT_11a_UF4_1700gU_050cm	1-19-2016	1:34 PM	2,236	1-20-2016	8:05 AM	1,908,144
Isolated_NCT_11a_UO2_1700gU_050cm	1-19-2016	1:35 PM	2,234	1-20-2016	7:54 AM	1,909,494
Isolated_NCT_11g_U10Zr_40000gU_147cm	1-19-2016	1:38 PM	2,415	1-20-2016	8:06 AM	1,920,852
Isolated_NCT_11g_U3Si_40000gU_147cm	1-25-2016	11:00 AM	2,412	1-25-2016	8:00 AM	1,918,788
Isolated_NCT_11g_U7Mo_40000gU_147cm	1-19-2016	1:39 PM	2411	1-20-2016	7:44 AM	1,926,744
Isolated_NCT_11g_UAl2_40000gU_147cm	1-25-2016	11:00 AM	2414	1-25-2016	7:59 AM	1,921,769

Appendix D- Excel File with Volume Fraction Calculation and Extracted Results			
File Name	Date	Time	Size (Bytes)
TN-BGC1-0601-R2.xlsx	28-01-2016	3:47 PM	78,573

13.0 APPENDICES

13.1 APPENDIX A - Results

Results of criticality analysis:

TN-BGC1 Content 11a, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 1.5 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
21.5	10	0.7494	0.0003	0.7503	HAC2N_11a_1500g_010cm
44.6	20	0.8726	0.0003	0.8736	HAC2N_11a_1500g_020cm
67.5	30	0.9132	0.0003	0.9142	HAC2N_11a_1500g_030cm
90.9	40	0.9250	0.0003	0.9259	HAC2N_11a_1500g_040cm
114.0	50	0.9240	0.0003	0.9250	HAC2N_11a_1500g_050cm
136.7	60	0.9186	0.0003	0.9195	HAC2N_11a_1500g_060cm
182.3	80	0.8987	0.0003	0.8996	HAC2N_11a_1500g_080cm
229.6	100	0.8740	0.0003	0.8749	HAC2N_11a_1500g_100cm
277.4	120	0.8488	0.0003	0.8498	HAC2N_11a_1500g_120cm
322.1	140	0.8259	0.0003	0.8268	HAC2N_11a_1500g_140cm

TN-BGC1 Content 11a, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 1.65 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
19.4	10	0.7527	0.0003	0.7536	HAC2N_11a_1650g_010cm
40.3	20	0.8765	0.0003	0.8774	HAC2N_11a_1650g_020cm
61.4	30	0.9195	0.0003	0.9204	HAC2N_11a_1650g_030cm
82.2	40	0.9316	0.0003	0.9325	HAC2N_11a_1650g_040cm
103.5	50	0.9327	0.0003	0.9337	HAC2N_11a_1650g_050cm
123.8	60	0.9278	0.0004	0.9289	HAC2N_11a_1650g_060cm
167.0	80	0.9092	0.0003	0.9101	HAC2N_11a_1650g_080cm
208.6	100	0.8875	0.0003	0.8885	HAC2N_11a_1650g_100cm
251.3	120	0.8644	0.0003	0.8653	HAC2N_11a_1650g_120cm
292.7	140	0.8423	0.0003	0.8432	HAC2N_11a_1650g_140cm

TN-BGC1
Content 11a, U Metal (100 % U-235) – Homogeneous modelling
Internal fittings: Ø = 120 mm, Water spacer, N = 10

Fissile Mass = 1.7 kg

H/X	Height (cm)	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
18.8	10	0.7538	0.0003	0.7547	HAC2N_11a_1700g_010cm
39.2	20	0.8784	0.0003	0.8793	HAC2N_11a_1700g_020cm
59.5	30	0.9201	0.0003	0.9211	HAC2N_11a_1700g_030cm
79.7	40	0.9341	0.0003	0.9351	HAC2N_11a_1700g_040cm
100.2	50	0.9351	0.0004	0.9361	HAC2N_11a_1700g_050cm
121.0	60	0.9301	0.0003	0.9311	HAC2N_11a_1700g_060cm
161.9	80	0.9119	0.0003	0.9129	HAC2N_11a_1700g_080cm
203.3	100	0.8916	0.0003	0.8925	HAC2N_11a_1700g_100cm
243.6	120	0.8692	0.0003	0.8701	HAC2N_11a_1700g_120cm
282.3	140	0.8477	0.0003	0.8485	HAC2N_11a_1700g_140cm

TN-BGC1
Content 11a, U Metal (100 % U-235) – Homogeneous modelling
Internal fittings: Ø = 120 mm, Water spacer, N = 10

Fissile Mass = 1.75 kg

H/X	Height (cm)	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
18.2	10	0.7552	0.0003	0.7561	HAC2N_11a_1750g_010cm
38.0	20	0.8789	0.0003	0.8798	HAC2N_11a_1750g_020cm
57.7	30	0.9220	0.0003	0.9229	HAC2N_11a_1750g_030cm
77.7	40	0.9355	0.0003	0.9366	HAC2N_11a_1750g_040cm
97.1	50	0.9384	0.0003	0.9394	HAC2N_11a_1750g_050cm
117.4	60	0.9330	0.0003	0.9339	HAC2N_11a_1750g_060cm
157.1	80	0.9161	0.0003	0.9170	HAC2N_11a_1750g_080cm
195.8	100	0.8963	0.0003	0.8972	HAC2N_11a_1750g_100cm
236.4	120	0.8739	0.0003	0.8748	HAC2N_11a_1750g_120cm
277.4	140	0.8507	0.0003	0.8516	HAC2N_11a_1750g_140cm

TN-BGC1 Content 11a, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 2 kg					
H/X	**Height (cm)**	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
15.7	10	0.7605	0.0003	0.7614	HAC2N_11a_2000g_010cm
33.0	20	0.8835	0.0003	0.8844	HAC2N_11a_2000g_020cm
50.3	30	0.9274	0.0003	0.9284	HAC2N_11a_2000g_030cm
67.5	40	0.9443	0.0003	0.9453	HAC2N_11a_2000g_040cm
84.9	50	0.9472	0.0004	0.9483	HAC2N_11a_2000g_050cm
102.1	60	0.9451	0.0004	0.9461	HAC2N_11a_2000g_060cm
136.7	80	0.9315	0.0003	0.9324	HAC2N_11a_2000g_080cm
172.4	100	0.9120	0.0003	0.9129	HAC2N_11a_2000g_100cm
205.9	120	0.8939	0.0003	0.8948	HAC2N_11a_2000g_120cm
240.0	140	0.8741	0.0003	0.8751	HAC2N_11a_2000g_140cm

TN-BGC1 Content 11a, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 2.25kg					
H/X	**Height (cm)**	**k_{KENO}**	**σ**	**k_{KENO} + 3σ**	**Run ID**
13.8	10	0.7646	0.0003	0.7655	HAC2N_11a_2250g_010cm
29.2	20	0.8871	0.0003	0.8880	HAC2N_11a_2250g_020cm
44.6	30	0.9325	0.0004	0.9336	HAC2N_11a_2250g_030cm
59.9	40	0.9500	0.0004	0.9511	HAC2N_11a_2250g_040cm
75.5	50	0.9548	0.0004	0.9558	HAC2N_11a_2250g_050cm
90.9	60	0.9544	0.0003	0.9553	HAC2N_11a_2250g_060cm
121.9	80	0.9424	0.0003	0.9434	HAC2N_11a_2250g_080cm
152.5	100	0.9269	0.0003	0.9279	HAC2N_11a_2250g_100cm
182.3	120	0.9093	0.0003	0.9103	HAC2N_11a_2250g_120cm
214.2	140	0.8910	0.0003	0.8919	HAC2N_11a_2250g_140cm

TN-BGC1 Content 11a, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 2.5 kg					
H/X	height (cm)	k_{KENO}	σ	$k_{KENO} + 3σ$	Run ID
12.2	10	0.7683	0.0003	0.7692	HAC2N_11a_2500g_010cm
26.1	20	0.8909	0.0003	0.8919	HAC2N_11a_2500g_020cm
40.0	30	0.9365	0.0003	0.9375	HAC2N_11a_2500g_030cm
53.8	40	0.9555	0.0003	0.9565	HAC2N_11a_2500g_040cm
67.5	50	0.9614	0.0003	0.9623	HAC2N_11a_2500g_050cm
81.4	60	0.9617	0.0003	0.9627	HAC2N_11a_2500g_060cm
109.2	80	0.9518	0.0003	0.9528	HAC2N_11a_2500g_080cm
136.7	100	0.9385	0.0003	0.9394	HAC2N_11a_2500g_100cm
165.2	120	0.9215	0.0003	0.9224	HAC2N_11a_2500g_120cm
193.4	140	0.9046	0.0003	0.9056	HAC2N_11a_2500g_140cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 15 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3σ$	Run ID
0.8	15	0.9197	0.0003	0.9205	HAC2N_11b_15000g_015cm
1.6	20	0.9214	0.0003	0.9223	HAC2N_11b_15000g_020cm
3.2	30	0.9239	0.0003	0.9248	HAC2N_11b_15000g_030cm
4.8	40	0.9249	0.0003	0.9258	HAC2N_11b_15000g_040cm
6.4	50	0.9255	0.0003	0.9263	HAC2N_11b_15000g_050cm
8.0	60	0.9252	0.0003	0.9260	HAC2N_11b_15000g_060cm
9.6	70	0.9254	0.0003	0.9263	HAC2N_11b_15000g_070cm
11.2	80	0.9247	0.0003	0.9257	HAC2N_11b_15000g_080cm
12.8	90	0.9238	0.0003	0.9247	HAC2N_11b_15000g_090cm
14.4	100	0.9233	0.0003	0.9243	HAC2N_11b_15000g_100cm
16.0	110	0.9221	0.0003	0.9230	HAC2N_11b_15000g_110cm
17.6	120	0.9215	0.0003	0.9225	HAC2N_11b_15000g_120cm
19.2	130	0.9201	0.0003	0.9210	HAC2N_11b_15000g_130cm
20.8	140	0.9193	0.0003	0.9202	HAC2N_11b_15000g_140cm
21.9	147	0.9184	0.0003	0.9193	HAC2N_11b_15000g_147cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 16 kg					
H/X	**Height (cm)**	**k_{KENO}**	**σ**	**$k_{KENO} + 3\sigma$**	**Run ID**
0.6	15	0.9319	0.0003	0.9328	HAC2N_11b_16000g_015cm
1.4	20	0.9311	0.0003	0.9319	HAC2N_11b_16000g_020cm
2.9	30	0.9306	0.0003	0.9314	HAC2N_11b_16000g_030cm
4.4	40	0.9302	0.0003	0.9311	HAC2N_11b_16000g_040cm
5.9	50	0.9295	0.0003	0.9304	HAC2N_11b_16000g_050cm
7.4	60	0.9284	0.0003	0.9294	HAC2N_11b_16000g_060cm
8.9	70	0.9279	0.0004	0.9290	HAC2N_11b_16000g_070cm
10.4	80	0.9270	0.0003	0.9279	HAC2N_11b_16000g_080cm
11.9	90	0.9259	0.0003	0.9269	HAC2N_11b_16000g_090cm
13.4	100	0.9247	0.0003	0.9256	HAC2N_11b_16000g_100cm
14.9	110	0.9238	0.0003	0.9247	HAC2N_11b_16000g_110cm
16.4	120	0.9235	0.0003	0.9243	HAC2N_11b_16000g_120cm
17.9	130	0.9222	0.0003	0.9232	HAC2N_11b_16000g_130cm
19.4	140	0.9210	0.0003	0.9219	HAC2N_11b_16000g_140cm
20.5	147	0.9200	0.0003	0.9209	HAC2N_11b_16000g_147cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 16.5 kg					
H/X	**Height (cm)**	k_{KENO}	**σ**	$k_{KENO} + 3\sigma$	**Run ID**
0.6	15	0.9387	0.0003	0.9396	HAC2N_11b_16500g_015cm
1.3	20	0.9362	0.0003	0.9370	HAC2N_11b_16500g_020cm
2.8	30	0.9337	0.0003	0.9346	HAC2N_11b_16500g_030cm
4.2	40	0.9328	0.0003	0.9336	HAC2N_11b_16500g_040cm
5.7	50	0.9310	0.0003	0.9319	HAC2N_11b_16500g_050cm
7.1	60	0.9302	0.0003	0.9311	HAC2N_11b_16500g_060cm
8.6	70	0.9291	0.0003	0.9300	HAC2N_11b_16500g_070cm
10.0	80	0.9282	0.0003	0.9292	HAC2N_11b_16500g_080cm
11.5	90	0.9274	0.0003	0.9283	HAC2N_11b_16500g_090cm
13.0	100	0.9261	0.0003	0.9270	HAC2N_11b_16500g_100cm
14.4	110	0.9253	0.0003	0.9262	HAC2N_11b_16500g_110cm
15.9	120	0.9244	0.0003	0.9254	HAC2N_11b_16500g_120cm
17.3	130	0.9230	0.0003	0.9239	HAC2N_11b_16500g_130cm
18.8	140	0.9217	0.0003	0.9226	HAC2N_11b_16500g_140cm
19.8	147	0.9212	0.0003	0.9222	HAC2N_11b_16500g_147cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 17.5 kg					
H/X	**Height (cm)**	**k_{KENO}**	**σ**	**$k_{KENO} + 3\sigma$**	**Run ID**
0.4	15	0.9507	0.0003	0.9514	HAC2N_11b_17500g_015cm
1.1	20	0.9444	0.0003	0.9452	HAC2N_11b_17500g_020cm
2.5	30	0.9404	0.0003	0.9413	HAC2N_11b_17500g_030cm
3.9	40	0.9377	0.0003	0.9387	HAC2N_11b_17500g_040cm
5.3	50	0.9353	0.0003	0.9362	HAC2N_11b_17500g_050cm
6.6	60	0.9338	0.0003	0.9347	HAC2N_11b_17500g_060cm
8.0	70	0.9325	0.0003	0.9334	HAC2N_11b_17500g_070cm
9.4	80	0.9307	0.0003	0.9317	HAC2N_11b_17500g_080cm
10.7	90	0.9291	0.0003	0.9300	HAC2N_11b_17500g_090cm
12.1	100	0.9280	0.0003	0.9290	HAC2N_11b_17500g_100cm
13.5	110	0.9268	0.0003	0.9277	HAC2N_11b_17500g_110cm
14.9	120	0.9262	0.0003	0.9271	HAC2N_11b_17500g_120cm
16.2	130	0.9239	0.0003	0.9247	HAC2N_11b_17500g_130cm
17.6	140	0.9233	0.0003	0.9242	HAC2N_11b_17500g_140cm
18.6	147	0.9226	0.0003	0.9235	HAC2N_11b_17500g_147cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 18.5 kg					
H/X	Height (cm)	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
0.3	15	0.9630	0.0002	0.9637	HAC2N_11b_18500g_015cm
1.0	20	0.9546	0.0003	0.9553	HAC2N_11b_18500g_020cm
2.3	30	0.9472	0.0003	0.9481	HAC2N_11b_18500g_030cm
3.6	40	0.9419	0.0003	0.9428	HAC2N_11b_18500g_040cm
4.9	50	0.9390	0.0003	0.9398	HAC2N_11b_18500g_050cm
6.2	60	0.9368	0.0003	0.9377	HAC2N_11b_18500g_060cm
7.5	70	0.9346	0.0003	0.9355	HAC2N_11b_18500g_070cm
8.8	80	0.9328	0.0003	0.9336	HAC2N_11b_18500g_080cm
10.1	90	0.9312	0.0003	0.9320	HAC2N_11b_18500g_090cm
11.4	100	0.9298	0.0003	0.9307	HAC2N_11b_18500g_100cm
12.7	110	0.9296	0.0003	0.9305	HAC2N_11b_18500g_110cm
14.0	120	0.9277	0.0003	0.9287	HAC2N_11b_18500g_120cm
15.3	130	0.9263	0.0003	0.9271	HAC2N_11b_18500g_130cm
16.6	140	0.9254	0.0003	0.9263	HAC2N_11b_18500g_140cm
17.5	147	0.9245	0.0003	0.9255	HAC2N_11b_18500g_147cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 19.5 kg					
H/X	**Height (cm)**	**k_{KENO}**	**σ**	**$k_{KENO} + 3\sigma$**	**Run ID**
0.2	15	0.9763	0.0003	0.9771	HAC2N_11b_19500g_015cm
0.8	20	0.9635	0.0003	0.9643	HAC2N_11b_19500g_020cm
2.1	30	0.9535	0.0003	0.9543	HAC2N_11b_19500g_030cm
3.3	40	0.9472	0.0003	0.9480	HAC2N_11b_19500g_040cm
4.5	50	0.9429	0.0003	0.9438	HAC2N_11b_19500g_050cm
5.8	60	0.9402	0.0003	0.9411	HAC2N_11b_19500g_060cm
7.0	70	0.9370	0.0003	0.9379	HAC2N_11b_19500g_070cm
8.3	80	0.9352	0.0003	0.9361	HAC2N_11b_19500g_080cm
9.5	90	0.9338	0.0003	0.9347	HAC2N_11b_19500g_090cm
10.7	100	0.9322	0.0003	0.9331	HAC2N_11b_19500g_100cm
11.9	110	0.9309	0.0003	0.9318	HAC2N_11b_19500g_110cm
13.2	120	0.9297	0.0003	0.9306	HAC2N_11b_19500g_120cm
14.4	130	0.9276	0.0003	0.9285	HAC2N_11b_19500g_130cm
15.7	140	0.9272	0.0003	0.9281	HAC2N_11b_19500g_140cm
16.5	147	0.9261	0.0003	0.9270	HAC2N_11b_19500g_147cm

TN-BGC1 Content 11b, U Metal (100 % U-235) – Homogeneous modelling Internal fittings: Ø = 100 mm, Water spacer, N = 10					
Fissile Mass = 20 kg					
H/X	Height (cm)	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
0.2	15	0.9820	0.0003	0.9828	HAC2N_11b_20000g_015cm
0.8	20	0.9682	0.0003	0.9690	HAC2N_11b_20000g_020cm
2.0	30	0.9568	0.0003	0.9576	HAC2N_11b_20000g_030cm
3.2	40	0.9493	0.0003	0.9501	HAC2N_11b_20000g_040cm
4.4	50	0.9450	0.0003	0.9459	HAC2N_11b_20000g_050cm
5.6	60	0.9410	0.0003	0.9419	HAC2N_11b_20000g_060cm
6.8	70	0.9392	0.0003	0.9401	HAC2N_11b_20000g_070cm
8.0	80	0.9370	0.0003	0.9379	HAC2N_11b_20000g_080cm
9.2	90	0.9346	0.0003	0.9355	HAC2N_11b_20000g_090cm
10.4	100	0.9334	0.0003	0.9343	HAC2N_11b_20000g_100cm
11.6	110	0.9318	0.0003	0.9327	HAC2N_11b_20000g_110cm
12.8	120	0.9301	0.0003	0.9309	HAC2N_11b_20000g_120cm
14.0	130	0.9291	0.0003	0.9300	HAC2N_11b_20000g_130cm
15.2	140	0.9274	0.0003	0.9283	HAC2N_11b_20000g_140cm
16.1	147	0.9267	0.0003	0.9275	HAC2N_11b_20000g_147cm

TN-BGC1 Content 11c, U Metal (20 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 15 kg					
H/X	Height (cm)	k_{KENO}	σ	k_{KENO} + 3σ	Run ID
3.5	10	0.5716	0.0002	0.5722	HAC2N_11c_15000g_010cm
15.0	20	0.7164	0.0003	0.7172	HAC2N_11c_15000g_020cm
26.5	30	0.7835	0.0003	0.7843	HAC2N_11c_15000g_030cm
26.5	40	0.8093	0.0003	0.8102	HAC2N_11c_15000g_040cm
49.6	50	0.8396	0.0003	0.8405	HAC2N_11c_15000g_050cm
61.2	60	0.8514	0.0003	0.8523	HAC2N_11c_15000g_060cm
72.8	70	0.8579	0.0003	0.8588	HAC2N_11c_15000g_070cm
84.3	80	0.8610	0.0003	0.8620	HAC2N_11c_15000g_080cm
95.8	90	0.8618	0.0003	0.8628	HAC2N_11c_15000g_090cm
107.4	100	0.8605	0.0003	0.8614	HAC2N_11c_15000g_100cm
118.9	110	0.8586	0.0003	0.8596	HAC2N_11c_15000g_110cm
130.5	120	0.8557	0.0003	0.8566	HAC2N_11c_15000g_120cm
142.0	130	0.8524	0.0003	0.8533	HAC2N_11c_15000g_130cm
153.4	140	0.8483	0.0003	0.8492	HAC2N_11c_15000g_140cm

TN-BGC1 Content 11c, U Metal (20 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 20 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
0.6	10	0.5576	0.0002	0.5582	HAC2N_11c_20000g_010cm
9.2	20	0.7033	0.0002	0.7040	HAC2N_11c_20000g_020cm
17.9	30	0.7709	0.0003	0.7716	HAC2N_11c_20000g_030cm
26.5	40	0.8093	0.0003	0.8102	HAC2N_11c_20000g_040cm
35.2	50	0.8329	0.0003	0.8338	HAC2N_11c_20000g_050cm
43.8	60	0.8475	0.0003	0.8484	HAC2N_11c_20000g_060cm
52.5	70	0.8570	0.0003	0.8579	HAC2N_11c_20000g_070cm
61.2	80	0.8631	0.0003	0.8640	HAC2N_11c_20000g_080cm
69.8	90	0.8669	0.0003	0.8679	HAC2N_11c_20000g_090cm
78.5	100	0.8684	0.0003	0.8693	HAC2N_11c_20000g_100cm
87.1	110	0.8689	0.0003	0.8698	HAC2N_11c_20000g_110cm
95.8	120	0.8680	0.0003	0.8689	HAC2N_11c_20000g_120cm
104.5	130	0.8668	0.0003	0.8677	HAC2N_11c_20000g_130cm
113.1	140	0.8647	0.0003	0.8656	HAC2N_11c_20000g_140cm

TN-BGC1 Content 11c, U Metal (20 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 25 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
5.8	20	0.6925	0.0002	0.6932	HAC2N_11c_25000g_020cm
12.7	30	0.7610	0.0003	0.7618	HAC2N_11c_25000g_030cm
19.6	40	0.8000	0.0003	0.8009	HAC2N_11c_25000g_040cm
26.5	50	0.8241	0.0003	0.8250	HAC2N_11c_25000g_050cm
33.5	60	0.8414	0.0003	0.8423	HAC2N_11c_25000g_060cm
40.4	70	0.8535	0.0003	0.8543	HAC2N_11c_25000g_070cm
47.3	80	0.8607	0.0003	0.8616	HAC2N_11c_25000g_080cm
54.3	90	0.8659	0.0003	0.8668	HAC2N_11c_25000g_090cm
61.2	100	0.8689	0.0003	0.8698	HAC2N_11c_25000g_100cm
68.1	110	0.8718	0.0003	0.8728	HAC2N_11c_25000g_110cm
75.0	120	0.8737	0.0003	0.8746	HAC2N_11c_25000g_120cm
81.9	130	0.8725	0.0003	0.8734	HAC2N_11c_25000g_130cm
88.8	140	0.8722	0.0003	0.8731	HAC2N_11c_25000g_140cm
93.7	147	0.8718	0.0003	0.8726	HAC2N_11c_25000g_147cm

TN-BGC1
Content 11c, U Metal (20 % U-235) – Homogeneous modelling
Internal fittings: Ø = 120 mm, Water spacer, N = 10

Fissile Mass = 30 kg

H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
3.5	20	0.6836	0.0002	0.6843	HAC2N_11c_30000g_020cm
9.2	30	0.7516	0.0003	0.7523	HAC2N_11c_30000g_030cm
15.0	40	0.7914	0.0003	0.7922	HAC2N_11c_30000g_040cm
20.8	50	0.8169	0.0003	0.8177	HAC2N_11c_30000g_050cm
26.5	60	0.8352	0.0003	0.8360	HAC2N_11c_30000g_060cm
32.3	70	0.8476	0.0003	0.8485	HAC2N_11c_30000g_070cm
38.1	80	0.8563	0.0003	0.8572	HAC2N_11c_30000g_080cm
43.8	90	0.8638	0.0003	0.8648	HAC2N_11c_30000g_090cm
49.6	100	0.8681	0.0003	0.8689	HAC2N_11c_30000g_100cm
55.4	110	0.8712	0.0003	0.8721	HAC2N_11c_30000g_110cm
61.2	120	0.8736	0.0003	0.8745	HAC2N_11c_30000g_120cm
67.0	130	0.8756	0.0003	0.8765	HAC2N_11c_30000g_130cm
72.8	140	0.8752	0.0003	0.8761	HAC2N_11c_30000g_140cm
76.7	147	0.8757	0.0003	0.8766	HAC2N_11c_30000g_147cm

TN-BGC1
Content 11c, U Metal (20 % U-235) – Homogeneous modelling
Internal fittings: Ø = 120 mm, Water spacer, N = 10

Fissile Mass = 35 kg

H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
1.8	20	0.6737	0.0002	0.6745	HAC2N_11c_35000g_020cm
6.8	30	0.7441	0.0003	0.7449	HAC2N_11c_35000g_030cm
11.7	40	0.7832	0.0003	0.7839	HAC2N_11c_35000g_040cm
16.6	50	0.8091	0.0003	0.8099	HAC2N_11c_35000g_050cm
21.6	60	0.8279	0.0003	0.8287	HAC2N_11c_35000g_060cm
26.5	70	0.8416	0.0003	0.8426	HAC2N_11c_35000g_070cm
31.5	80	0.8512	0.0003	0.8520	HAC2N_11c_35000g_080cm
36.4	90	0.8593	0.0003	0.8602	HAC2N_11c_35000g_090cm
41.4	100	0.8646	0.0003	0.8655	HAC2N_11c_35000g_100cm
46.3	110	0.8693	0.0003	0.8702	HAC2N_11c_35000g_110cm
51.3	120	0.8723	0.0003	0.8732	HAC2N_11c_35000g_120cm
56.2	130	0.8748	0.0003	0.8757	HAC2N_11c_35000g_130cm
61.2	140	0.8760	0.0003	0.8769	HAC2N_11c_35000g_140cm
64.6	147	0.8768	0.0003	0.8778	HAC2N_11c_35000g_147cm

TN-BGC1 Content 11c, U Metal (20 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Fissile Mass = 40 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
0.6	20	0.6636	0.0002	0.6642	HAC2N_11c_40000g_020cm
4.9	30	0.7374	0.0002	0.7381	HAC2N_11c_40000g_030cm
9.2	40	0.7768	0.0003	0.7777	HAC2N_11c_40000g_040cm
13.6	50	0.8031	0.0003	0.8039	HAC2N_11c_40000g_050cm
17.9	60	0.8213	0.0003	0.8222	HAC2N_11c_40000g_060cm
22.2	70	0.8363	0.0003	0.8372	HAC2N_11c_40000g_070cm
26.5	80	0.8470	0.0003	0.8478	HAC2N_11c_40000g_080cm
30.9	90	0.8545	0.0003	0.8554	HAC2N_11c_40000g_090cm
35.2	100	0.8613	0.0003	0.8622	HAC2N_11c_40000g_100cm
39.5	110	0.8662	0.0003	0.8671	HAC2N_11c_40000g_110cm
43.8	120	0.8690	0.0003	0.8699	HAC2N_11c_40000g_120cm
48.2	130	0.8729	0.0003	0.8738	HAC2N_11c_40000g_130cm
52.5	140	0.8752	0.0003	0.8761	HAC2N_11c_40000g_140cm
55.5	147	0.8764	0.0003	0.8773	HAC2N_11c_40000g_147cm

TN-BGC1 Content 11c, U Metal (20 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 10					
Height = 147 cm					
H/X	Uranium mass (kg)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
55.5	40	0.8764	0.0003	0.8773	HAC2N_11c_40000g_147cm
34.3	60	0.8673	0.0003	0.8681	HAC2N_11c_60000g_147cm
23.7	80	0.8564	0.0003	0.8572	HAC2N_11c_80000g_147cm
17.4	100	0.8456	0.0003	0.8465	HAC2N_11c_100000g_147cm
8.9	150	0.8259	0.0003	0.8267	HAC2N_11c_150000g_147cm
4.6	200	0.8124	0.0003	0.8131	HAC2N_11c_200000g_147cm
2.1	250	0.7999	0.0002	0.8006	HAC2N_11c_250000g_147cm
0.4	300	0.7863	0.0002	0.7869	HAC2N_11c_300000g_147cm

TN-BGC1 Content 11g, U Metal (20 % U-235) – Homogeneous modelling Internal fittings: Ø = 120 mm, Water spacer, N = 50					
Fissile Mass = 40 kg					
H/X	Height (cm)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
0.5	20	0.6811	0.0002	0.6817	HAC2N_11g_40000g_020cm
4.1	30	0.7317	0.0002	0.7324	HAC2N_11g_40000g_030cm
7.8	40	0.7579	0.0003	0.7587	HAC2N_11g_40000g_040cm
11.5	50	0.7756	0.0003	0.7764	HAC2N_11g_40000g_050cm
15.1	60	0.7882	0.0003	0.7889	HAC2N_11g_40000g_060cm
18.8	70	0.7977	0.0003	0.7985	HAC2N_11g_40000g_070cm
22.4	80	0.8048	0.0003	0.8057	HAC2N_11g_40000g_080cm
26.1	90	0.8108	0.0003	0.8116	HAC2N_11g_40000g_090cm
29.7	100	0.8156	0.0003	0.8165	HAC2N_11g_40000g_100cm
33.4	110	0.8178	0.0003	0.8186	HAC2N_11g_40000g_110cm
37.1	120	0.8208	0.0003	0.8216	HAC2N_11g_40000g_120cm
40.7	130	0.8217	0.0003	0.8226	HAC2N_11g_40000g_130cm
44.4	140	0.8239	0.0003	0.8248	HAC2N_11g_40000g_140cm
46.9	147	0.8242	0.0003	0.8250	HAC2N_11g_40000g_147cm

H/X = 0					
Content	Uranium mass (kg)	k_{KENO}	σ	$k_{KENO} + 3\sigma$	Run ID
11a	1.65	0.3858	0.0002	0.3863	HAC2N_11a_1650g_HbyX_ZERO
11b	15	0.9250	0.0003	0.9257	HAC2N_11b_15000g_HbyX_ZERO
11b	16	0.9397	0.0002	0.9404	HAC2N_11b_16000g_HbyX_ZERO
11c	40	0.6515	0.0002	0.6521	HAC2N_11c_40000g_HbyX_ZERO
11g	40	0.6727	0.0002	0.6731	HAC5N_11g_40000g_HbyX_ZERO

13.2 APPENDIX B - Sample Inputs

Sample Inputs:

Non-air transport for content 11a, 2N HAC: (Contents 11b and 11c are modelled in same manner in 2N HAC case with required modifications)

```
=csas5 parm=(nitawl)
tn-bgc1 criticality analysis: HAC Content 11a (1.65 kg U, h = 50 cm)
238groupndf5
read composition
'fissile material
 u            1 0.0154 300
                                 92235 100   end
 polyethylene 1 0.9846 300   end
'water
 h2o          2 1 300   end
'balsa not used
 h            3 0 0.040616 300   end
 c            3 0 0.023803 300   end
 o            3 0 0.02358 300   end
'air
 c            4 0 1e-08 300   end
 n            4 0 3.9e-05 300   end
 o            4 0 1.1e-05 300   end
'Aluminum not used
 wtptaug4        5  2.67  7
                                 14000 0.5
                                 26000 0.7
                                 29000 4.25
                                 25055 0.7
                                 12000 0.7
                                 24000 0.1
                                 13027 93.05
                       1 300   end
'Stainless Steel
 fe           6 0 0.061341 300   end
 ni           6 0 0.016467 300   end
 cr           6 0 0.008107 300   end
'resin
 h            7 0 0.040616 300   end
 c            7 0 0.023803 300   end
 o            7 0 0.02358 300   end
 b            7 0 0.00094597 300   end
end composition
read parameter
 gen=5000 npg=2000 htm=yes
end parameter
read geometry
unit 1
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6   73.55   23.55
 zcylinder 6 1     6.2   73.75   23.35
unit 2
com='container'
 zcylinder 2 1     8.9    73.75   -73.75
  hole 1       0        0        0
 zcylinder 2 1     9.2    73.75   -73.75
 zcylinder 6 1     9.8    73.75   -77.05
 zcylinder 7 1    13.1    73.75   -79.45
 zcylinder 4 1    14.6    73.75   -79.45
 zcylinder 6 1   14.75    73.75    -79.6
unit 3
com='lid'
 zcylinder 6 1   14.75    82.95    73.75
unit 4
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
```

```
  hole 3      0        0        0
  hole 2      0        0        0
unit 6
com='array'
cuboid 4 1     74.0    -74.0     66.2     -66.2  82.9501  -79.6001
  hole 4      0         0        0
  hole 4     29.6       0        0
  hole 4    -29.6       0        0
  hole 4     59.2       0        0
  hole 4    -59.2       0        0
  hole 4    -44.4    -25.7       0
  hole 4    -14.8    -25.7       0
  hole 4     14.8    -25.7       0
  hole 4     44.4    -25.7       0
  hole 4    -59.2    -51.4       0
  hole 4    -29.6    -51.4       0
  hole 4      0      -51.4       0
  hole 4     29.6    -51.4       0
  hole 4     59.2    -51.4       0
  hole 4    -44.4     25.7       0
  hole 4    -14.8     25.7       0
  hole 4     14.8     25.7       0
  hole 4     44.4     25.7       0
  hole 4    -59.2     51.4       0
  hole 4    -29.6     51.4       0
  hole 4      0       51.4       0
  hole 4     29.6     51.4       0
  hole 4     59.2     51.4       0
global unit 7
com='water reflector'
cuboid 2 1    104.0   -104.0     96.2    -96.2    112.95    -109.6
  hole 6      0        0        0
end geometry
read bnds
+xb=mirror
-xb=mirror
+yb=mirror
-yb=mirror
+zb=mirror
-zb=mirror
  end bnds
end data
end
```

Non-air transport for content 11a, 5N NCT: (Contents 11b and 11c are modelled in same manner in 5N NCT case with required modifications)

```
=csas5 parm=(nitawl)
tn-bgc1 criticality analysis: NCT content 11a(1.65 Kg U-235, h=50 cm)
44groupndf5
read composition
 u           1 0.0154 300
                                 92235 100   end
 polyethylene 1 0.9846 300   end
 h2o         2 1 300   end
 h           3 0 0.040616 300   end
 c           3 0 0.023803 300   end
 o           3 0 0.02358 300   end
 c           4 0 1e-08 300   end
 n           4 0 3.9e-05 300   end
 o           4 0 1.1e-05 300   end
 wtptaug4        5  2.67  7
                                 14000 0.5
                                 26000 0.7
                                 29000 4.25
                                 25055 0.7
                                 12000 0.7
                                 24000 0.1
                                 13027 93.05
                       1 300   end
 fe          6 0 0.061341 300   end
 ni          6 0 0.016467 300   end
 cr          6 0 0.008107 300   end
 h           7 0 0.040616 300   end
 c           7 0 0.023803 300   end
 o           7 0 0.02358 300   end
 b           7 0 0.00094597 300   end
 aluminum    8 1 300   end
end composition
read celldata
  latticecell triangpitch fuelr=6 1 hpitch=30 4 end
end celldata
read parameter
 gen=5000
 npg=2000
 htm=yes
end parameter
read geometry
unit 1
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6   73.55   23.55
 zcylinder 6 1     6.2   73.75   23.35
unit 2
com='container'
 zcylinder 2 1     8.9    73.75   -73.75
  hole 1       0        0        0
 zcylinder 2 1     9.2    73.75   -73.75
 zcylinder 6 1     9.8    73.75   -77.05
 zcylinder 7 1    13.1    73.75   -79.45
 zcylinder 7 1    14.6    73.75   -79.45
 zcylinder 6 1   14.75    73.75    -79.6
unit 3
com='lid'
 zcylinder 6 1   14.75    82.95    73.75
unit 4
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
  hole 3       0        0        0
  hole 2       0        0        0
unit 5
com='cage-vertical'
 cuboid 4 1      1.3     -1.3      1.3     -1.3    95.35   -86.75
 cuboid 4 1      1.5     -1.5      1.5     -1.5    95.35   -86.75
```

```
unit 6
com='cage horizontal2'
 cuboid 4 1      1.3     -1.3       27      -27      1.3     -1.3
 cuboid 4 1      1.5     -1.5       27      -27      1.5     -1.5
unit 7
com='cage horizontal1'
 cuboid 4 1       27      -27      1.3     -1.3      1.3     -1.3
 cuboid 4 1       27      -27      1.5     -1.5      1.5     -1.5
unit 8
com='cage'
 cuboid 4 1     30.1    -30.1     30.1    -30.1    95.35   -86.75
  hole 5    28.5     28.5        0
  hole 5    28.5    -28.5        0
  hole 5   -28.5    -28.5        0
  hole 5   -28.5     28.5        0
  hole 7       0    -28.5   -85.25
  hole 7       0    -28.5   -25.55
  hole 7       0    -28.5    34.15
  hole 7       0    -28.5    93.85
  hole 7       0     28.5   -85.25
  hole 7       0     28.5   -25.55
  hole 7       0     28.5    34.15
  hole 7       0     28.5    93.85
  hole 6   -28.5        0   -85.25
  hole 6   -28.5        0   -25.55
  hole 6   -28.5        0    34.15
  hole 6   -28.5        0    93.85
  hole 6    28.5        0   -85.25
  hole 6    28.5        0   -25.55
  hole 6    28.5        0    34.15
  hole 6    28.5        0    93.85
  hole 4       0        0        0
unit 9
com='array'
 array 1       -210    -240    -89.3
global unit 14
com='water reflector'
 cuboid 2 1      240      -240      270      -270      125.35      -116.75
  hole 9       0        0        0
end geometry
read array
ara=1 nux=7 nuy=8 nuz=1
 fill
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8
   8   8   8   8   8   8   8  end fill
end array
end data
end
```

Non-air transport for content 11a, isolated case: (Contents 11b, 11c and 11g are modelled in same manner in isolated case with required modifications)

```
=csas5 parm=(nitawl)
tn-bgc1 criticality analysis:Isolated_HAC_content_11a(1.65Kg_U-235,h=50cm)
238groupndf5
read composition
'fissile material
 u            1 0.0154 300
                                  92235 100   end
 polyethylene 1 0.9846 300   end
'water
 h2o          2 1 300   end
'balsa not used
 h            3 0 0.040616 300   end
 c            3 0 0.023803 300   end
 o            3 0 0.02358 300   end
'air
 c            4 0 1e-08 300   end
 n            4 0 3.9e-05 300   end
 o            4 0 1.1e-05 300   end
'Aluminum not used
 wtptaug4         5  2.67  7
                                  14000 0.5
                                  26000 0.7
                                  29000 4.25
                                  25055 0.7
                                  12000 0.7
                                  24000 0.1
                                  13027 93.05
                        1 300   end
'Stainless Steel
 fe           6 0 0.061341 300   end
 ni           6 0 0.016467 300   end
 cr           6 0 0.008107 300   end
'resin
 h            7 0 0.040616 300   end
 c            7 0 0.023803 300   end
 o            7 0 0.02358 300   end
 b            7 0 0.00094597 300   end
end composition
read celldata
  latticecell triangpitch fuelr=6 1 hpitch=30 4 end
end celldata
read parameter
 gen=5000
 npg=2000
 htm=yes
end parameter
read geometry
unit 1
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6   73.55   23.55
 zcylinder 6 1     6.2   73.75   23.35
unit 2
com='container'
 zcylinder 2 1     8.9    73.75   -73.75
  hole 1       0         0         0
 zcylinder 2 1     9.2    73.75   -73.75
 zcylinder 6 1     9.8    73.75   -77.05
 zcylinder 7 1    13.1    73.75   -79.45
 zcylinder 4 1    14.6    73.75   -79.45
 zcylinder 6 1   14.75    73.75    -79.6
unit 3
com='lid'
 zcylinder 6 1   14.75    82.95    73.75
unit 4
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
```

```
  hole 3       0        0        0
  hole 2       0        0        0
global unit 14
com='water reflector'
 zcylinder 2 1 44.7501  112.9501  -109.6001
  hole 4       0        0        0
end geometry
end data
end
```

Non-air transport for content 11g, 5N HAC:

```
=csas5 parm=(nitawl)
tn-bgc1 criticality analysis: HAC content 11g(40 Kg U, h=147 cm)
238groupndf5
read composition
'fissile material
 u           1 0.1272  300
                                 92235 20
                                 92238 80   end
 h2o             1 0.8728 300   end
'water
 h2o         2 1 300   end
'balsa not used
 h           3 0 0.040616 300   end
 c           3 0 0.023803 300   end
 o           3 0 0.02358 300   end
'air
 c           4 0 1e-08 300   end
 n           4 0 3.9e-05 300   end
 o           4 0 1.1e-05 300   end
'Aluminum not used
 wtptaug4        5  2.67  7
                                 14000 0.5
                                 26000 0.7
                                 29000 4.25
                                 25055 0.7
                                 12000 0.7
                                 24000 0.1
                                 13027 93.05
                          1 300   end
'Stainless Steel
 fe          6 0 0.061341 300   end
 ni          6 0 0.016467 300   end
 cr          6 0 0.008107 300   end
'resin
 h           7 0 0.040616 300   end
 c           7 0 0.023803 300   end
 o           7 0 0.02358 300   end
 b           7 0 0.00094597 300   end
end composition
read parameter
 gen=5000 npg=2000 htm=yes
end parameter
read geometry
unit 1
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6   73.55   -73.45
 zcylinder 6 1     6.2   73.75   -73.65
unit 2
com='container'
 zcylinder 2 1     8.9     73.75   -73.75
  hole 1       0         0         0
 zcylinder 2 1     9.2     73.75   -73.75
 zcylinder 6 1     9.8     73.75   -77.05
 zcylinder 7 1    13.1     73.75   -79.45
 zcylinder 4 1    14.6     73.75   -79.45
 zcylinder 6 1   14.75     73.75    -79.6
unit 3
com='lid'
 zcylinder 6 1   14.75     82.95    73.75
unit 4
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
  hole 3       0         0         0
  hole 2       0         0         0
unit 101
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6   73.45   -73.55
 zcylinder 6 1     6.2   73.65   -73.75
```

```
unit 102
com='container'
 zcylinder 2 1     8.9    73.75   -73.75
  hole 101       0        0        0
 zcylinder 2 1     9.2    73.75   -73.75
 zcylinder 6 1     9.8    73.75   -77.05
 zcylinder 7 1    13.1    73.75   -79.45
 zcylinder 4 1    14.6    73.75   -79.45
 zcylinder 6 1   14.75    73.75    -79.6
unit 103
com='lid'
 zcylinder 6 1   14.75    82.95    73.75
unit 104
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
  hole 103       0        0        0
  hole 102       0        0        0
unit 6
com='array'
 cuboid 4 1     177.6    -177.6     169.0    -143.3  82.9501  -244.1501
hole    104     -162.8  0              0
hole    104     -133.2  0              0
hole    104     -103.6  0              0
hole    104     -74            0              0
hole    104     -44.4          0              0
hole    104     -14.8          0              0
hole    104     14.8           0              0
hole    104     44.4           0              0
hole    104     74             0              0
hole    104     103.6          0              0
hole    104     133.2          0              0
hole    104     162.8          0              0
hole    104     -148           -25.7          0
hole    104     -118.4  -25.7          0
hole    104     -88.8          -25.7          0
hole    104     -59.2          -25.7          0
hole    104     -29.6          -25.7          0
hole    104     0              -25.7          0
hole    104     29.6           -25.7          0
hole    104     59.2           -25.7          0
hole    104     88.8           -25.7          0
hole    104     118.4          -25.7          0
hole    104     148            -25.7          0
hole    104     -148           25.7           0
hole    104     -118.4  25.7           0
hole    104     -88.8          25.7           0
hole    104     -59.2          25.7           0
hole    104     -29.6          25.7           0
hole    104     0              25.7           0
hole    104     29.6           25.7           0
hole    104     59.2           25.7           0
hole    104     88.8           25.7           0
hole    104     118.4          25.7           0
hole    104     148            25.7           0
hole    104     -162.8  51.4           0
hole    104     -133.2  51.4           0
hole    104     -103.6  51.4           0
hole    104     -74            51.4           0
hole    104     -44.4          51.4           0
hole    104     -14.8          51.4           0
hole    104     14.8           51.4           0
hole    104     44.4           51.4           0
hole    104     74             51.4           0
hole    104     103.6          51.4           0
hole    104     133.2          51.4           0
hole    104     162.8          51.4           0
hole    104     -162.8  -51.4          0
hole    104     -133.2  -51.4          0
hole    104     -103.6  -51.4          0
hole    104     -74            -51.4          0
```

```
hole    104     -44.4           -51.4           0
hole    104     -14.8           -51.4           0
hole    104     14.8            -51.4           0
hole    104     44.4            -51.4           0
hole    104     74              -51.4           0
hole    104     103.6           -51.4           0
hole    104     133.2           -51.4           0
hole    104     162.8           -51.4           0
hole    104     -148            77.1            0
hole    104     -118.4  77.1            0
hole    104     -88.8           77.1            0
hole    104     -59.2           77.1            0
hole    104     -29.6           77.1            0
hole    104     0               77.1            0
hole    104     29.6            77.1            0
hole    104     59.2            77.1            0
hole    104     88.8            77.1            0
hole    104     118.4           77.1            0
hole    104     148             77.1            0
hole    104     -148            -77.1           0
hole    104     -118.4  -77.1           0
hole    104     -88.8           -77.1           0
hole    104     -59.2           -77.1           0
hole    104     -29.6           -77.1           0
hole    104     0               -77.1           0
hole    104     29.6            -77.1           0
hole    104     59.2            -77.1           0
hole    104     88.8            -77.1           0
hole    104     118.4           -77.1           0
hole    104     148             -77.1           0
hole    104     -162.8  102.8           0
hole    104     -133.2  102.8           0
hole    104     -103.6  102.8           0
hole    104     -74             102.8           0
hole    104     -44.4           102.8           0
hole    104     -14.8           102.8           0
hole    104     14.8            102.8           0
hole    104     44.4            102.8           0
hole    104     74              102.8           0
hole    104     103.6           102.8           0
hole    104     133.2           102.8           0
hole    104     162.8           102.8           0
hole    104     -162.8  -102.8  0
hole    104     -133.2  -102.8  0
hole    104     -103.6  -102.8  0
hole    104     -74             -102.8  0
hole    104     -44.4           -102.8  0
hole    104     -14.8           -102.8  0
hole    104     14.8            -102.8  0
hole    104     44.4            -102.8  0
hole    104     74              -102.8  0
hole    104     103.6           -102.8  0
hole    104     133.2           -102.8  0
hole    104     162.8           -102.8  0
hole    104     -148            128.5           0
hole    104     -118.4  128.5           0
hole    104     -88.8           128.5           0
hole    104     -59.2           128.5           0
hole    104     -29.6           128.5           0
hole    104     0               128.5           0
hole    104     29.6            128.5           0
hole    104     59.2            128.5           0
hole    104     88.8            128.5           0
hole    104     118.4           128.5           0
hole    104     148             128.5           0
hole    104     -148            -128.5  0
hole    104     -118.4  -128.5  0
hole    104     -88.8           -128.5  0
hole    104     -59.2           -128.5  0
hole    104     -29.6           -128.5  0
```

hole	104	0		-128.5	0	
hole	104	29.6		-128.5	0	
hole	104	59.2		-128.5	0	
hole	104	88.8		-128.5	0	
hole	104	118.4		-128.5	0	
hole	104	148		-128.5	0	
hole	104	14.8		154.2		0
hole	104	44.4		154.2		0
hole	104	74		154.2		0
hole	104	103.6		154.2		0
hole	104	133.2		154.2		0
hole	104	162.8		154.2		0
hole	104	-14.8		154.2		0
hole	104	-44.4		154.2		0
hole	104	-74		154.2		0
hole	104	-103.6	154.2		0	
hole	104	-133.2	154.2		0	
hole	104	-162.8	154.2		0	
hole	4	-162.8	0		-164.55	
hole	4	-133.2	0		-164.55	
hole	4	-103.6	0		-164.55	
hole	4	-74		0		-164.55
hole	4	-44.4		0		-164.55
hole	4	-14.8		0		-164.55
hole	4	14.8		0		-164.55
hole	4	44.4		0		-164.55
hole	4	74		0		-164.55
hole	4	103.6		0		-164.55
hole	4	133.2		0		-164.55
hole	4	162.8		0		-164.55
hole	4	-148		-25.7		-164.55
hole	4	-118.4	-25.7		-164.55	
hole	4	-88.8		-25.7		-164.55
hole	4	-59.2		-25.7		-164.55
hole	4	-29.6		-25.7		-164.55
hole	4	0		-25.7		-164.55
hole	4	29.6		-25.7		-164.55
hole	4	59.2		-25.7		-164.55
hole	4	88.8		-25.7		-164.55
hole	4	118.4		-25.7		-164.55
hole	4	148		-25.7		-164.55
hole	4	-148		25.7		-164.55
hole	4	-118.4	25.7		-164.55	
hole	4	-88.8		25.7		-164.55
hole	4	-59.2		25.7		-164.55
hole	4	-29.6		25.7		-164.55
hole	4	0		25.7		-164.55
hole	4	29.6		25.7		-164.55
hole	4	59.2		25.7		-164.55
hole	4	88.8		25.7		-164.55
hole	4	118.4		25.7		-164.55
hole	4	148		25.7		-164.55
hole	4	-162.8	51.4		-164.55	
hole	4	-133.2	51.4		-164.55	
hole	4	-103.6	51.4		-164.55	
hole	4	-74		51.4		-164.55
hole	4	-44.4		51.4		-164.55
hole	4	-14.8		51.4		-164.55
hole	4	14.8		51.4		-164.55
hole	4	44.4		51.4		-164.55
hole	4	74		51.4		-164.55
hole	4	103.6		51.4		-164.55
hole	4	133.2		51.4		-164.55
hole	4	162.8		51.4		-164.55
hole	4	-162.8	-51.4		-164.55	
hole	4	-133.2	-51.4		-164.55	
hole	4	-103.6	-51.4		-164.55	
hole	4	-74		-51.4		-164.55
hole	4	-44.4		-51.4		-164.55
hole	4	-14.8		-51.4		-164.55

hole	4	14.8		-51.4		-164.55
hole	4	44.4		-51.4		-164.55
hole	4	74		-51.4		-164.55
hole	4	103.6		-51.4		-164.55
hole	4	133.2		-51.4		-164.55
hole	4	162.8		-51.4		-164.55
hole	4	-148		77.1		-164.55
hole	4	-118.4	77.1		-164.55	
hole	4	-88.8		77.1		-164.55
hole	4	-59.2		77.1		-164.55
hole	4	-29.6		77.1		-164.55
hole	4	0		77.1		-164.55
hole	4	29.6		77.1		-164.55
hole	4	59.2		77.1		-164.55
hole	4	88.8		77.1		-164.55
hole	4	118.4		77.1		-164.55
hole	4	148		77.1		-164.55
hole	4	-148		-77.1		-164.55
hole	4	-118.4	-77.1		-164.55	
hole	4	-88.8		-77.1		-164.55
hole	4	-59.2		-77.1		-164.55
hole	4	-29.6		-77.1		-164.55
hole	4	0		-77.1		-164.55
hole	4	29.6		-77.1		-164.55
hole	4	59.2		-77.1		-164.55
hole	4	88.8		-77.1		-164.55
hole	4	118.4		-77.1		-164.55
hole	4	148		-77.1		-164.55
hole	4	-162.8	102.8		-164.55	
hole	4	-133.2	102.8		-164.55	
hole	4	-103.6	102.8		-164.55	
hole	4	-74		102.8		-164.55
hole	4	-44.4		102.8		-164.55
hole	4	-14.8		102.8		-164.55
hole	4	14.8		102.8		-164.55
hole	4	44.4		102.8		-164.55
hole	4	74		102.8		-164.55
hole	4	103.6		102.8		-164.55
hole	4	133.2		102.8		-164.55
hole	4	162.8		102.8		-164.55
hole	4	-162.8	-102.8	-164.55		
hole	4	-133.2	-102.8	-164.55		
hole	4	-103.6	-102.8	-164.55		
hole	4	-74		-102.8	-164.55	
hole	4	-44.4		-102.8	-164.55	
hole	4	-14.8		-102.8	-164.55	
hole	4	14.8		-102.8	-164.55	
hole	4	44.4		-102.8	-164.55	
hole	4	74		-102.8	-164.55	
hole	4	103.6		-102.8	-164.55	
hole	4	133.2		-102.8	-164.55	
hole	4	162.8		-102.8	-164.55	
hole	4	-148		128.5		-164.55
hole	4	-118.4	128.5		-164.55	
hole	4	-88.8		128.5		-164.55
hole	4	-59.2		128.5		-164.55
hole	4	-29.6		128.5		-164.55
hole	4	0		128.5		-164.55
hole	4	29.6		128.5		-164.55
hole	4	59.2		128.5		-164.55
hole	4	88.8		128.5		-164.55
hole	4	118.4		128.5		-164.55
hole	4	148		128.5		-164.55
hole	4	-148		-128.5	-164.55	
hole	4	-118.4	-128.5	-164.55		
hole	4	-88.8		-128.5	-164.55	
hole	4	-59.2		-128.5	-164.55	
hole	4	-29.6		-128.5	-164.55	
hole	4	0		-128.5	-164.55	
hole	4	29.6		-128.5	-164.55	

```
hole    4       59.2            -128.5  -164.55
hole    4       88.8            -128.5  -164.55
hole    4       118.4           -128.5  -164.55
hole    4       148             -128.5  -164.55
hole    4       14.8            154.2          -164.55
hole    4       44.4            154.2          -164.55
hole    4       74              154.2          -164.55
hole    4       103.6           154.2          -164.55
hole    4       133.2           154.2          -164.55
hole    4       162.8           154.2          -164.55
hole    4       -14.8           154.2          -164.55
hole    4       -44.4           154.2          -164.55
hole    4       -74             154.2          -164.55
hole    4       -103.6  154.2          -164.55
hole    4       -133.2  154.2          -164.55
hole    4       -162.8  154.2          -164.55
global unit 7
com='water reflector'
 cuboid 2 1     207.6    -207.6    199.0    -173.3    112.95    -274.15
  hole 6        0         0         0
end geometry
read bnds
 +xb=mirror
 -xb=mirror
 +yb=mirror
 -yb=mirror
 +zb=mirror
 -zb=mirror
  end bnds
end data
end
```

Sample input for content 11g, 5N NCT:

```
=csas5 parm=(nitawl)
tn-bgc1 criticality analysis: NCT content 11g(40 Kg U, h=147 cm)
238groupndf5
read composition
'fissile material
 u           1 0.1272  300
                                 92235 20
                                 92238 80   end
 h2o             1 0.8728 300   end
'water
 h2o         2 1 300   end
'balsa not used
 h           3 0 0.040616 300   end
 c           3 0 0.023803 300   end
 o           3 0 0.02358 300   end
'air
 c           4 0 1e-08 300   end
 n           4 0 3.9e-05 300   end
 o           4 0 1.1e-05 300   end
'Aluminum not used
 wtptaug4        5  2.67  7
                                 14000 0.5
                                 26000 0.7
                                 29000 4.25
                                 25055 0.7
                                 12000 0.7
                                 24000 0.1
                                 13027 93.05
                      1 300   end
'Stainless Steel
 fe          6 0 0.061341 300   end
 ni          6 0 0.016467 300   end
 cr          6 0 0.008107 300   end
'resin
 h           7 0 0.040616 300   end
 c           7 0 0.023803 300   end
 o           7 0 0.02358 300   end
 b           7 0 0.00094597 300   end
 aluminum    8 1 300   end
end composition
read celldata
  latticecell triangpitch fuelr=6 1 hpitch=30 4 end
end celldata
read parameter
 gen=5000
 npg=2000
 htm=yes
end parameter
read geometry
unit 1
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6    73.55   -73.45
 zcylinder 6 1     6.2    73.75   -73.65
unit 2
com='container'
 zcylinder 2 1     8.9    73.75   -73.75
  hole 1       0        0        0
 zcylinder 6 1     9.5    73.75   -77.05
 zcylinder 7 1    12.8    73.75   -79.45
 zcylinder 7 1    14.6    73.75   -79.45
 zcylinder 6 1   14.75    73.75    -79.6
unit 3
com='lid'
 zcylinder 6 1   14.75    82.95    73.75
unit 4
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
  hole 3       0        0        0
```

```
 hole 2       0        0        0
unit 101
com='fissile medium inside the ss-cavity'
 zcylinder 1 1       6    73.45   -73.55
 zcylinder 6 1     6.2    73.65   -73.75
unit 102
com='container'
 zcylinder 2 1     8.9    73.75   -73.75
  hole 101      0        0        0
 zcylinder 2 1     9.2    73.75   -73.75
 zcylinder 6 1     9.8    73.75   -77.05
 zcylinder 7 1    13.1    73.75   -79.45
 zcylinder 4 1    14.6    73.75   -79.45
 zcylinder 6 1   14.75    73.75    -79.6
unit 103
com='lid'
 zcylinder 6 1   14.75    82.95    73.75
unit 104
com='container1'
 zcylinder 0 1 14.7501  82.9501  -79.6001
  hole 103      0        0        0
  hole 102      0        0        0
unit 5
com='cage-vertical'
 cuboid 4 1      1.3     -1.3      1.3     -1.3     95.35    -86.75
 cuboid 4 1      1.5     -1.5      1.5     -1.5     95.35    -86.75
unit 6
com='cage horizontal2'
 cuboid 4 1      1.3     -1.3       27      -27       1.3      -1.3
 cuboid 4 1      1.5     -1.5       27      -27       1.5      -1.5
unit 7
com='cage horizontal1'
 cuboid 4 1       27      -27      1.3     -1.3       1.3      -1.3
 cuboid 4 1       27      -27      1.5     -1.5       1.5      -1.5
unit 8
com='cage'
 cuboid 4 1     30.1    -30.1     30.1    -30.1     95.35    -86.75
  hole 5    28.5     28.5        0
  hole 5    28.5    -28.5        0
  hole 5   -28.5    -28.5        0
  hole 5   -28.5     28.5        0
  hole 7       0    -28.5   -85.25
  hole 7       0    -28.5   -25.55
  hole 7       0    -28.5    34.15
  hole 7       0    -28.5    93.85
  hole 7       0     28.5   -85.25
  hole 7       0     28.5   -25.55
  hole 7       0     28.5    34.15
  hole 7       0     28.5    93.85
  hole 6   -28.5        0   -85.25
  hole 6   -28.5        0   -25.55
  hole 6   -28.5        0    34.15
  hole 6   -28.5        0    93.85
  hole 6    28.5        0   -85.25
  hole 6    28.5        0   -25.55
  hole 6    28.5        0    34.15
  hole 6    28.5        0    93.85
  hole 4       0        0        0
unit 9
com='array'
  array 1    -360     -360    -89.3
unit 108
com='cage'
 cuboid 4 1     30.1    -30.1     30.1    -30.1     95.35    -86.75
  hole 5    28.5     28.5        0
  hole 5    28.5    -28.5        0
  hole 5   -28.5    -28.5        0
  hole 5   -28.5     28.5        0
  hole 7       0    -28.5   -85.25
  hole 7       0    -28.5   -25.55
```

```
  hole 7       0     -28.5    34.15
  hole 7       0     -28.5    93.85
  hole 7       0      28.5   -85.25
  hole 7       0      28.5   -25.55
  hole 7       0      28.5    34.15
  hole 7       0      28.5    93.85
  hole 6   -28.5         0   -85.25
  hole 6   -28.5         0   -25.55
  hole 6   -28.5         0    34.15
  hole 6   -28.5         0    93.85
  hole 6    28.5         0   -85.25
  hole 6    28.5         0   -25.55
  hole 6    28.5         0    34.15
  hole 6    28.5         0    93.85
  hole 104       0         0         0
unit 109
com='array'
  array 2    -360     -360    -89.3
global unit 14
com='water reflector'
 cuboid 2 1      390      -390      390      -390    367.45  -116.75
  hole 9       0         0         0
  hole 109     0         0         242.1
end geometry
read array
ara=1 nux=12 nuy=12 nuz=1
 com=''
 fill
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8
    8    8    8    8    8    8    8    8    8    8    8    8  end fill
ara=2 nux=12 nuy=12 nuz=1
 fill
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108
  108  108  108  108  108  108  108  108  108  108  108  108  end fill
end array
end data
end
```

Sample input for air transport case:

Case with total 7 Kg U-235, 0.1 Kg of CH_2 moderator and 0.05 Kg of moderated U-235.

```
=csas5 parm=(nitawl)
tn-bgc1 criticality analysis: Air transport(0.05kg u-235 moderated, 0.1kg CH2)
238groupndf5
read composition
'moderated fissile mixture
 uranium     1 0.000821 300
                                 92235 100   end
 polyethylene 1 0.033782 300   end
 c-graphite  1 0.343802 300   end
 h2o         1 0.621594 300   end
'unmoderated fissile material
 uranium     2 1 300
                                 92235 100   end
'water
 h2o         3 1 300   end
'Stainless steel
 fe          4 0 0.061341 300   end
 ni          4 0 0.016467 300   end
 cr          4 0 0.008107 300   end
end composition
read parameter
 gen=5000
 npg=2000
 htm=yes
end parameter
read geometry
unit 1
com='4 concentric spheres'
 sphere 1 1   9.158
 sphere 2 1   9.494
 sphere 4 1  22.371
global unit 2
com='Global Unit 2'
 sphere 3 1  42.371
  hole 1       0        0        0
end geometry
end data
end
```

13.3 APPENDIX C - Resin Replaced With Air Vs Water

All of the criticality analysis is performed by replacing the layer of resin that was lost during HAC with air in the HAC model. This is a conservative approach compared to using water in place of the layer of resin that was lost during HAC because water has more neutron absorbing hydrogen as compared to air. This is demonstrated in the Table below, where the resin is replaced with air at first and then water. It is shown that replacing resin with air resulted in higher k_{eff} compared to replacing resin with water.

Case	Resin replaced with air			Resin replaced with water		
	k_{KENO}	σ	$k_{KENO} + 3\sigma$	k_{KENO}	σ	$k_{KENO} + 3\sigma$
11a,2N HAC, Noresin, U-235 mass=800 g, h=50 cm	0.9300	0.0003	0.9309	0.8377	0.0003	0.8386
11b,2N HAC, Noresin, U-235 mass=14 Kg, h=15 cm	0.9286	0.0003	0.9294	0.8933	0.0003	0.8941
11c,2N HAC, Noresin, U mass=12 Kg, h=147 cm	0.9324	0.0003	0.9333	0.8045	0.0003	0.8054
11g,5N HAC, Noresin, U mass=10 Kg, h=147 cm	0.9268	0.0003	0.9277	0.9205	0.0003	0.9213

13.4 APPENDIX D – Criticality Safety Calculations for the Uranium Oxides, Uranium Tetrafluoride and Uranium Alloys

The criticality analysis of TN-BGC1 package containing content 11a, 11b, 11c and 11g, where the fissile material is uranium metal, are demonstrated to meet the regulatory requirements. The purpose of this analysis is to provide criticality safety calculations when the fissile metallic uranium is replaced with UO_2/UF_4/UAl_2/U-7Mo/U_3Si/U-10Zr materials. The criticality analysis is performed using uranium dioxide, uranium tetrafluoride, uranium-aluminum alloy, uranium-zirconium alloy, uranium-silicon alloy and uranium-molybdenum alloy as a fissile medium (content) in TN-BGC1 package. The most reactive cases, content 11a and content 11g from Table 10-22 are considered as content of interest for the analysis. Content 11a, with 100 wt. % U-235 enrichment and payload limit of 1.70 kg is the most reactive case with higher enrichment. Content 11g, with 20 wt. % U-235 enrichment and payload limit of 40 kg is a content of interest because of reasonably higher payload limit with mid-range enrichment.

Uranium oxide and uranium tetrafluoride analysis is performed using content 11a as reference. The payload limits are calculated such that the maximum uranium mass in UO_2 and UF_4 is 1.70 kg. For the analysis of uranium-alloys, content 11g is used as reference as the availability of 100 wt. % U-235 enriched uranium-alloys is impractical. The payload limits of uranium-alloys in the package are calculated such that the maximum uranium mass in uranium alloys is 40 kg.

Description of content 11a and content 11g are provided in Section 4.2. Uranium metal of density 18.92 g/cm^3, 100 wt. % U-235 enrichment and CH_2 as moderator is used in the KENO V.a model for the analysis of TN-BGC1 package with content 11a. KENO V.a model for the analysis of TN-BGC1 package with content 11g uses uranium metal of density 18.92 g/cm^3, 20 wt. % U-235 enrichment and water as moderator. For the HAC case, it is assumed that 1.5 cm resin material in the cask is lost in the event of fire and is modeled as air. The analysis is performed for different UO_2/UF_4/U-Alloy and moderator homogenous mixture (fissile mixture) height in the container (internal fitting). The increase in the height increases the concentration of moderator in the fissile mixture keeping UO_2/UF_4/U-Alloy concentration constant.

Content 11a specifications are used for the analysis of UO_2 and UF_4 fissile materials. The analysis is performed with same KENO V.a model used for HAC2N content 11a except by changing the fissile content to UO_2/UF_4 in the internal fitting. Table 13-1 tabulates the results of content 11a base case, which is U-metal fissile medium with enrichment of 100 wt. % U-235 and moderated by CH_2. The k_{eff} is computed as k_{KENO}+3σ. Content 11a base case results are used as reference for UO_2 and UF_4 criticality analysis.

Table 13-1: HAC2N Criticality Results for TN-BGC1 Package with Content 11a (Uranium Metal)

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}
HAC2N_11a_1700g_010cm	10	0.7538	0.0003	0.7547
HAC2N_11a_1700g_020cm	20	0.8784	0.0003	0.8793
HAC2N_11a_1700g_030cm	30	0.9201	0.0003	0.9211
HAC2N_11a_1700g_040cm	40	0.9341	0.0003	0.9351
HAC2N_11a_1700g_050cm	***50***	***0.9351***	***0.0004***	***0.9361***
HAC2N_11a_1700g_060cm	60	0.9301	0.0003	0.9311
HAC2N_11a_1700g_070cm	70	0.9221	0.0003	0.9231
HAC2N_11a_1700g_080cm	80	0.9119	0.0003	0.9129
HAC2N_11a_1700g_090cm	90	0.9032	0.0003	0.9042
HAC2N_11a_1700g_100cm	100	0.8916	0.0003	0.8925
HAC2N_11a_1700g_110cm	110	0.8803	0.0003	0.8813
HAC2N_11a_1700g_120cm	120	0.8692	0.0003	0.8701
HAC2N_11a_1700g_130cm	130	0.8578	0.0003	0.8587
HAC2N_11a_1700g_140cm	140	0.8477	0.0003	0.8485
HAC2N_11a_1700g_147cm	147	0.8391	0.0003	0.8400

The analysis for UO_2 content is performed by replacing U-metal by UO_2 as the fissile medium in content 11a. In the KENO V.a model, 1.9315 kg $\left(= 1.70\ \mathrm{kgU} \times \left(\frac{235\frac{g}{mol}U^{235} + 2\times16\frac{g}{mol}O}{235\frac{g}{mol}U^{235}}\right)\right)$ UO_2 of density 10.96 g/cm^3(Ref. [9]), 100 wt. % U-235 enrichment and CH_2 as moderator is used. The results obtained are tabulated in Table 13-2. The k_{eff} is computed as k_{KENO}+3σ. The value Δk is the difference in the k_{eff} value between base case (content 11a, U-metal) and UO_2 case.

Table 13-2: HAC2N Criticality Results for TN-BGC1 Package with Content UO_2

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}	Δk
HAC2N_11a_UO2_1700gU_010cm	10	0.7236	0.0003	0.7245	0.0302
HAC2N_11a_UO2_1700gU_020cm	20	0.8614	0.0003	0.8624	0.0169
HAC2N_11a_UO2_1700gU_030cm	30	0.9093	0.0003	0.9103	0.0108
HAC2N_11a_UO2_1700gU_040cm	40	0.9246	0.0004	0.9256	0.0094
HAC2N_11a_UO2_1700gU_050cm	***50***	***0.9286***	***0.0004***	***0.9297***	0.0064
HAC2N_11a_UO2_1700gU_060cm	60	0.9245	0.0003	0.9254	0.0057
HAC2N_11a_UO2_1700gU_070cm	70	0.9178	0.0003	0.9188	0.0043
HAC2N_11a_UO2_1700gU_080cm	80	0.9093	0.0003	0.9102	0.0027
HAC2N_11a_UO2_1700gU_090cm	90	0.8987	0.0003	0.8997	0.0045
HAC2N_11a_UO2_1700gU_100cm	100	0.8885	0.0003	0.8894	0.0031
HAC2N_11a_UO2_1700gU_110cm	110	0.8774	0.0003	0.8784	0.0029
HAC2N_11a_UO2_1700gU_120cm	120	0.8662	0.0003	0.8672	0.0029
HAC2N_11a_UO2_1700gU_130cm	130	0.8557	0.0003	0.8567	0.0021
HAC2N_11a_UO2_1700gU_140cm	140	0.8432	0.0003	0.8441	0.0044
HAC2N_11a_UO2_1700gU_147cm	147	0.8368	0.0003	0.8377	0.0023

Uranium metal in content 11a is replaced by UF_4 as the fissile medium for the analysis of TN-BGC1 package with UF_4 content. In the KENO V.a model, 2.2498 kg UF_4 of density 6.7 g/cm^3 (Ref. [10]), 100 wt. % U-235 enrichment and CH_2 as moderator is used. The results obtained are tabulated in Table 13-3. The k_{eff} is computed as k_{KENO}+3σ. The value Δk is the difference in the k_{eff} value between content 11a base case and UF_6 case.

Table 13-3: HAC2N Criticality Results for TN-BGC1 Package with Content UF_4

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}	Δk
HAC2N_11a_UF4_1700gU_010cm	10	0.6651	0.0003	0.6660	0.0887
HAC2N_11a_UF4_1700gU_020cm	20	0.8305	0.0003	0.8314	0.0479
HAC2N_11a_UF4_1700gU_030cm	30	0.8888	0.0003	0.8897	0.0314
HAC2N_11a_UF4_1700gU_040cm	40	0.9114	0.0003	0.9123	0.0228
HAC2N_11a_UF4_1700gU_050cm	***50***	***0.9165***	***0.0003***	***0.9176***	0.0186
HAC2N_11a_UF4_1700gU_060cm	60	0.9155	0.0003	0.9164	0.0147
HAC2N_11a_UF4_1700gU_070cm	70	0.9106	0.0003	0.9116	0.0115
HAC2N_11a_UF4_1700gU_080cm	80	0.9019	0.0003	0.9029	0.0100
HAC2N_11a_UF4_1700gU_090cm	90	0.8936	0.0003	0.8945	0.0097
HAC2N_11a_UF4_1700gU_100cm	100	0.8835	0.0003	0.8844	0.0081
HAC2N_11a_UF4_1700gU_110cm	110	0.8732	0.0003	0.8741	0.0071
HAC2N_11a_UF4_1700gU_120cm	120	0.8613	0.0003	0.8622	0.0078
HAC2N_11a_UF4_1700gU_130cm	130	0.8514	0.0003	0.8523	0.0064
HAC2N_11a_UF4_1700gU_140cm	140	0.8415	0.0003	0.8425	0.0060
HAC2N_11a_UF4_1700gU_147cm	147	0.8338	0.0003	0.8347	0.0053

Content 11g specifications are used for the criticality analysis of uranium alloy fissile materials. The analysis is performed with same KENO V.a model used for HAC5N content 11g except by changing the fissile content to uranium alloys in the internal fitting. Table 13-4 tabulates the results of content 11g base case, which is U-metal fissile medium with enrichment of 20 wt. % U-235 and moderated by water. The k_{eff} is computed as k_{KENO}+3σ. Content 11g base case results are used as reference for uranium alloys criticality analysis.

Table 13-4: HAC5N Criticality Results for TN-BGC1 Package with Content 11g (Uranium Metal)

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}
HAC5N_11g_40000g_020cm	20	0.6811	0.0002	0.6817
HAC5N_11g_40000g_030cm	30	0.7270	0.0003	0.7277
HAC5N_11g_40000g_040cm	40	0.7542	0.0003	0.7549
HAC5N_11g_40000g_050cm	**50**	0.7728	0.0003	0.7736
HAC5N_11g_40000g_060cm	60	0.7860	0.0003	0.7868
HAC5N_11g_40000g_070cm	70	0.7955	0.0003	0.7963
HAC5N_11g_40000g_080cm	80	0.8033	0.0003	0.8041
HAC5N_11g_40000g_090cm	90	0.8092	0.0003	0.8101
HAC5N_11g_40000g_100cm	100	0.8145	0.0003	0.8154
HAC5N_11g_40000g_110cm	110	0.8168	0.0003	0.8177
HAC5N_11g_40000g_120cm	120	0.8201	0.0003	0.8209
HAC5N_11g_40000g_130cm	130	0.8220	0.0003	0.8229
HAC5N_11g_40000g_140cm	140	0.8231	0.0003	0.8240
HAC5N_11g_40000g_147cm	***147***	***0.8236***	***0.0003***	***0.8244***

The analysis for uranium-aluminum alloy content is performed by replacing U-metal by uranium-aluminum (UAl_2) alloy as fissile medium in content 11g. 49.0986 kg UAl_2 alloy of density 8.10 g/cm^3(Ref. [9]), 20 wt. % U-235 enrichment and water as moderator is used in the KENO V.a model. The uranium-aluminum alloy contains 18.5 wt. % of aluminum and 81.5 wt. % of uranium. The results obtained are tabulated in Table 13-5. The k_{eff} is computed as $k_{KENO}+3\sigma$. The value Δk is the difference in the k_{eff} value between base case (content 11g, 20 wt. % U-235 U-metal) and UAl_2 alloy case.

Table 13-5: HAC5N Criticality Results for TN-BGC1 Package with Content Uranium-Aluminum (UAl_2) Alloy

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}	Δk
HAC5N_11g_UAl2_40000gU_060cm	60	0.5673	0.0002	0.5680	0.2189
HAC5N_11g_UAl2_40000gU_070cm	70	0.6014	0.0002	0.6020	0.1942
HAC5N_11g_UAl2_40000gU_080cm	80	0.6296	0.0002	0.6303	0.1738
HAC5N_11g_UAl2_40000gU_090cm	90	0.6514	0.0003	0.6522	0.1579
HAC5N_11g_UAl2_40000gU_100cm	100	0.6703	0.0003	0.6711	0.1443
HAC5N_11g_UAl2_40000gU_110cm	110	0.6858	0.0003	0.6866	0.1310
HAC5N_11g_UAl2_40000gU_120cm	120	0.6983	0.0003	0.6992	0.1218
HAC5N_11g_UAl2_40000gU_130cm	130	0.7082	0.0003	0.7090	0.1139
HAC5N_11g_UAl2_40000gU_140cm	140	0.7181	0.0003	0.7190	0.1050
HAC5N_11g_UAl2_40000gU_147cm	***147***	***0.7233***	***0.0003***	***0.7242***	0.1002

The analysis for uranium-molybdenum alloy content is performed by replacing U-metal by uranium-molybdenum (U-7Mo) alloy as fissile medium in content 11g. 43.0108 kg U-7Mo alloy of density 18.32 g/cm^3[=(18.92 g/cc-U*0.93) + (10.28 g/cc-Mo*0.07), (Ref. [11])], 20 wt. % U-235 enrichment and water as moderator is used in the KENO V.a model. The U-7Mo alloy contains 7 wt. % of molybdenum and 93 wt. % of uranium. The results obtained are tabulated in Table 13-6. The k_{eff} is computed as $k_{KENO}+3\sigma$. The value Δk is the difference in the k_{eff} value between content 11g base case and U-7Mo alloy case.

Table 13-6: HAC5N Criticality Results for TN-BGC1 Package with Content Uranium-Molybdenum (U-7Mo) Alloy

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}	Δk
HAC5N_11g_U7Mo_40000gU_030cm	30	0.6936	0.0002	0.6943	0.0334
HAC5N_11g_U7Mo_40000gU_040cm	40	0.7239	0.0002	0.7247	0.0303
HAC5N_11g_U7Mo_40000gU_050cm	50	0.7446	0.0003	0.7454	0.0282
HAC5N_11g_U7Mo_40000gU_060cm	60	0.7608	0.0003	0.7616	0.0252
HAC5N_11g_U7Mo_40000gU_070cm	70	0.7728	0.0003	0.7735	0.0227
HAC5N_11g_U7Mo_40000gU_080cm	80	0.7817	0.0003	0.7825	0.0216
HAC5N_11g_U7Mo_40000gU_090cm	90	0.7890	0.0003	0.7897	0.0204
HAC5N_11g_U7Mo_40000gU_100cm	100	0.7935	0.0003	0.7943	0.0211
HAC5N_11g_U7Mo_40000gU_110cm	110	0.7985	0.0003	0.7994	0.0183
HAC5N_11g_U7Mo_40000gU_120cm	120	0.8023	0.0003	0.8032	0.0178
HAC5N_11g_U7Mo_40000gU_130cm	130	0.8050	0.0003	0.8058	0.0170
HAC5N_11g_U7Mo_40000gU_140cm	140	0.8065	0.0003	0.8074	0.0166
HAC5N_11g_U7Mo_40000gU_147cm	***147***	***0.8076***	***0.0003***	***0.8085***	0.0159

The analysis for uranium-silicon alloy content is performed by replacing U-metal by uranium-silicon (U_3Si) alloy as fissile medium in content 11g of TN-BGC1 package. In the KENO V.a model, 41.5726 kg U_3Si alloy of density 15.40 g/cm^3(Ref. [9]), 20 wt. % U-235 enrichment and water as moderator is used. The U_3Si alloy contains 3.8 wt. % of silicon and 96.2 wt. % of uranium. The results obtained are tabulated in Table 13-7. The k_{eff} is computed as k_{KENO}+3σ. The value Δk is the difference in the k_{eff} value between content 11g base case and U_3Si alloy case.

Table 13-7: HAC5N Criticality Results for TN-BGC1 Package with Content Uranium-Silicon (U_3Si) Alloy

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}	Δk
HAC5N_11g_U3Si_40000gU_030cm	30	0.6687	0.0002	0.6694	0.0583
HAC5N_11g_U3Si_40000gU_040cm	40	0.7084	0.0002	0.7091	0.0459
HAC5N_11g_U3Si_40000gU_050cm	50	0.7349	0.0003	0.7357	0.0379
HAC5N_11g_U3Si_40000gU_060cm	60	0.7534	0.0003	0.7541	0.0327
HAC5N_11g_U3Si_40000gU_070cm	70	0.7673	0.0003	0.7680	0.0282
HAC5N_11g_U3Si_40000gU_080cm	80	0.7788	0.0003	0.7796	0.0245
HAC5N_11g_U3Si_40000gU_090cm	90	0.7867	0.0003	0.7875	0.0226
HAC5N_11g_U3Si_40000gU_100cm	100	0.7934	0.0003	0.7942	0.0212
HAC5N_11g_U3Si_40000gU_110cm	110	0.7982	0.0003	0.7991	0.0186
HAC5N_11g_U3Si_40000gU_120cm	120	0.8019	0.0003	0.8027	0.0182
HAC5N_11g_U3Si_40000gU_130cm	130	0.8060	0.0003	0.8069	0.0160
HAC5N_11g_U3Si_40000gU_140cm	140	0.8075	0.0003	0.8083	0.0157
HAC5N_11g_U3Si_40000gU_147cm	***147***	***0.8090***	***0.0003***	***0.8099***	0.0145

The analysis for uranium-zirconium alloy content is performed by replacing U-metal by uranium-zirconium (U-10Zr) alloy as fissile medium in content 11g. 44.4444 kg U-10Zr alloy of density 16.00 g/cm^3 (Ref. [9]), 20

wt. % U-235 enrichment and water as moderator is used in the KENO V.a model. The U-10Zr alloy contains 10 wt. % of zirconium and 90 wt. % of uranium. The results obtained are tabulated in Table 13-8. The k_{eff} is computed as k_{KENO}+3σ. The value Δk is the difference in the k_{eff} value between content 11g base case and U-10Zr alloy case.

Table 13-8: HAC5N Criticality Results for TN-BGC1 Package with Content Uranium-Zirconium (U-10Zr) Alloy

Case ID	Height (cm)	k_{KENO}	σ	k_{eff}	Δk
HAC5N_11g_U10Zr_40000gU_030cm	30	0.6608	0.0002	0.6615	0.0662
HAC5N_11g_U10Zr_40000gU_040cm	40	0.7037	0.0003	0.7045	0.0505
HAC5N_11g_U10Zr_40000gU_050cm	50	0.7301	0.0003	0.7309	0.0427
HAC5N_11g_U10Zr_40000gU_060cm	60	0.7497	0.0003	0.7505	0.0363
HAC5N_11g_U10Zr_40000gU_070cm	70	0.7647	0.0003	0.7654	0.0308
HAC5N_11g_U10Zr_40000gU_080cm	80	0.7760	0.0003	0.7768	0.0273
HAC5N_11g_U10Zr_40000gU_090cm	90	0.7841	0.0003	0.7849	0.0252
HAC5N_11g_U10Zr_40000gU_100cm	100	0.7911	0.0003	0.7919	0.0235
HAC5N_11g_U10Zr_40000gU_110cm	110	0.7967	0.0003	0.7975	0.0202
HAC5N_11g_U10Zr_40000gU_120cm	120	0.8009	0.0003	0.8017	0.0193
HAC5N_11g_U10Zr_40000gU_130cm	130	0.8040	0.0003	0.8048	0.0180
HAC5N_11g_U10Zr_40000gU_140cm	140	0.8066	0.0003	0.8074	0.0166
HAC5N_11g_U10Zr_40000gU_147cm	***147***	***0.8078***	***0.0003***	***0.8087***	0.0157

Considering HAC conditions as bounding, the analyses for NCT conditions are performed considering the height of fissile mixture resulting highest k_{eff} value. The obtained results for NCT5N case analysis for different fissile mixture content are tabulated in Table 13-9.

Table 13-9: NCT5N Criticality Results for TN-BGC1 Package with Content UO_2, UF_4 and U-Alloys

Case ID	Fissile Material	Height (cm)	k_{KENO}	σ	k_{eff}
NCT5N_11a_UF4_1700gU_050cm	UF_4	50	0.8763	0.0004	0.8774
NCT5N_11a_UO2_1700gU_050cm	UO_2	50	0.8891	0.0003	0.8901
NCT5N_11g_U10Zr_40000gU_147cm	U-10Zr	147	0.7684	0.0003	0.7692
NCT5N_11g_U3Si_40000gU_147cm	U_3Si	147	0.7690	0.0003	0.7699
NCT5N_11g_U7Mo_40000gU_147cm	U-7Mo	147	0.6797	0.0003	0.6805
NCT5N_11g_UAl2_40000gU_147cm	UAl_2	147	0.6800	0.0003	0.6807

The isolated cases analyses (analysis with single package) are performed for both HAC and NCT conditions. The analysis is performed with uranium mass of 1.70 kg and for the fissile mixture height resulting maximum k_{eff} for UO_2 and UF_4 content. The analysis is performed with uranium mass of 40 kg and for the fissile mixture height resulting maximum k_{eff} for uranium alloy content. The isolated cases results for HAC and NCT conditions are tabulated in Table 13-10 and Table 13-11, respectively.

Table 13-10: Criticality Results for HAC Isolated Cases

Case ID	Fissile Material	Height (cm)	k_{KENO}	σ	k_{eff}
Isolated_HAC_11a_UF4_1700gU_050cm	UF_4	50	0.8537	0.0003	0.8547
Isolated_HAC_11a_UO2_1700gU_050cm	UO_2	50	0.8658	0.0003	0.8668
Isolated_HAC_11g_U10Zr_40000gU_147cm	U-10Zr	147	0.7169	0.0003	0.7177
Isolated_HAC_11g_U3Si_40000gU_147cm	U_3Si	147	0.7173	0.0003	0.7182
Isolated_HAC_11g_UAl2_40000gU_147cm	UAl_2	147	0.6249	0.0003	0.6257
Isolated_HAC_11g_U7Mo_40000gU_147cm	U-7Mo	147	0.7188	0.0003	0.7196

Table 13-11: Criticality Results for NCT Isolated Cases

Case ID	Fissile Material	Height (cm)	k_{KENO}	σ	k_{eff}
Isolated_NCT_11a_UF4_1700gU_050cm	UF_4	50	0.8648	0.0003	0.8658
Isolated_NCT_11a_UO2_1700gU_050cm	UO_2	50	0.8771	0.0003	0.8780
Isolated_NCT_11g_U10Zr_40000gU_147cm	U-10Zr	147	0.7239	0.0003	0.7248
Isolated_NCT_11g_U3Si_40000gU_147cm	U_3Si	147	0.7255	0.0003	0.7263
Isolated_NCT_11g_UAl2_40000gU_147cm	UAl_2	147	0.6329	0.0003	0.6337
Isolated_NCT_11g_U7Mo_40000gU_147cm	U-7Mo	147	0.7262	0.0003	0.7271

The summary of the most reactive HAC2N cases for TN-BGC1 package with content 11a base case, UO_2 and UF_4 are tabulated in Table 13-12. It can be observed form Table 13-2, Table 13-3 and Table 13-12 that the content 11a base case with 100 wt. % U-235 enriched U-metal fissile medium has higher k_{eff} values compared to the cases with UO_2 and UF_4 as fissile medium.

Table 13-12: Summary of Most Reactive Cases with Content 11a Specifications

Case ID	Fissile Material	Height (cm)	k_{KENO}	σ	k_{eff}
HAC2N_11a_1700g_050cm	***U-Metal***	***50***	***0.9351***	***0.0004***	***0.9361***
HAC2N_11a_UO2_1700gU_050cm	UO_2	50	0.9286	0.0004	0.9297
HAC2N_11a_UF4_1700gU_050cm	UF_4	50	0.9165	0.0003	0.9176

The summary of the most reactive HAC5N cases for TN-BGC1 package with content 11g base case, U-Al alloy, U-Mo alloy, U-Si alloy and U-Zr alloy are tabulated in Table 13-13. It can be observed form Table 13-13 and tables through Table 13-5 to Table 13-8 that the content 11g base case with 20 wt. % U-235 enriched U-metal fissile medium has higher k_{eff} values compared to the cases with uranium alloys as fissile medium.

Table 13-13: Summary of Most Reactive Cases with Content 11g Specifications

Case ID	Fissile Material	Height (cm)	k_{KENO}	σ	k_{eff}
HAC5N_11g_40000g_147cm	***U-Metal***	***147***	***0.8236***	***0.0003***	***0.8244***
HAC5N_11g_UAl2_40000gU_147cm	UAl_2	147	0.7233	0.0003	0.7242
HAC5N_11g_U7Mo_40000gU_147cm	U-7Mo	147	0.8076	0.0003	0.8085
HAC5N_11g_U3Si_40000gU_147cm	U_3Si	147	0.8090	0.0003	0.8099
HAC5N_11g_U10Zr_40000gU_147cm	U-10Zr	147	0.8078	0.0003	0.8087

By observing Δk values for UO_2 and UF_4 respectively in Table 13-2 and Table 13-3; and Δk values for uranium alloys in tables through Table 13-5 to Table 13-8, it can be concluded that the fissile medium with uranium metal represented in content 11 as most reactive and bounds the cases with fissile medium with uranium oxides/uranium fluorides/uranium alloys.

Table 13-14: Summary of Content 11a – Neutronic Characteristics

	U metal	**UO_2**	**UF_4**
Energy of average lethargy of Fission (eV)	1.31E-01	1.32E-01	1.36E-01
system mean free path (cm)	8.15E-01	8.18E-01	8.26E-01
average number of fission neutrons	2.44	2.44	2.44
Case ID	HAC2N_11a_1700g_050 cm	HAC2N_11a_UO2_1700gU_050 cm	HAC2N_11a_UF4_1700gU_050 cm

Table 13-15: Summary of Content 11g – Neutronic Characteristics

	U metal	**U-Al_2**	**U-7Mo**	**U_3Si**	**U-10Zr**
Energy of average lethargy of Fission (eV)	4.89E-01	7.44E-01	5.00E-01	5.11E-01	5.15E-01
system mean free path (cm)	1.05E+00	1.13E+00	1.05E+00	1.06E+00	1.06E+00
average number of fission neutrons	2.45E+00	2.45E+00	2.45E+00	2.45E+00	2.45E+00
Case ID	HAC5N_11g_40000 g_147cm	HAC5N_11g_UAl2_4000 0gU_147cm	HAC5N_11g_U7Mo_4000 0gU_147cm	HAC5N_11g_U3Si_4000 0gU_147cm	HAC5N_11g_U10Zr_4000 0gU_147cm