

- 3.10 This analysis considers the most limiting conditions possible across all fuel types during the final cycle of operation for both Dresden 2 and Dresden 3. Dresden 2 contains approximately two-thirds AREVA ATRIUM 10XM fuel and one-third Westinghouse Optima-2 fuel (Reference 6). Dresden 3 contains a full core of AREVA ATRIUM 10XM (Reference 7). The limiting parameters for enrichment, exposure, and operating time are modeled as a fuel type and reactor dependent assembly, with the limiting decay heat loads being evaluated for time to 900°C.
- 3.11 All pre-existing assemblies in the Dresden 2 and Dresden 3 spent fuel pools (i.e. those not currently operating in their final cycle) will have undergone some decay since operation. As such, these assemblies are not thermally limiting and are not considered in this analysis.

4.0 References

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2. NUREG-1738, "Technical Study of Spent Fuel Pool Accident Risk at Decommissioning Nuclear Power Plants", February 2001.
3. NISR/DPR-ISG-02, "Emergency Planning Exemption Requests for Decommissioning Nuclear Power Plants," May 11, 2015.
4. NUREG/CR-6150, "SCDAP/RELAP5/MOD 3.3 Code Manual: Volume 4: A Library of Materials Properties for Light-Water-Reactor Accident Analysis," January 2001.
5. Oak Ridge National Laboratory report ORNL/TM-2000/351, "Thermophysical Properties of MOX and UO₂ Fuels Including the Effects of Irradiation," November 2000.
6. CLP Dresden 2, "Dresden Unit 2 Cycle 27 Core Loading Plan Revision 2," Revision 7.
7. CLP Dresden 3, "Dresden Unit 3 Cycle 27 Core Loading Plan," Revision 6.
8. ANP-3305P, "Mechanical Design Report for Quad Cities and Dresden ATRIUM 10XM Fuel Assemblies," Revision 5.
9. FS1-0028512, "AREVA US & Taiwan BWR Fuel Assembly Weight Calculation for ATRIUM 10 Family of Fuel Designs," December 22, 2016.
10. Drawing FS1-0003912, "Square Tube," Revision 0.
11. WCAP-15942-P-A, "Fuel Assembly Mechanical Design Methodology for Boiling Water Reactors Supplement 1 to CENP-287," March 2006.
12. TODI NF206070, Revision 0, "Dresden Unit 2 Cycle 27 and Dresden Unit 3 Cycle 27 Zirc Fire Calculation Inputs," December 7, 2020.
13. NUREG/CR-6999, "Technical Basis for a Proposed Expansion of Regulatory Guide 3.54 – Decay Heat Generation in an Independent Spent Fuel Storage Installation," February 2010.
14. Dresden UFSAR Section 9.1.3, Revision 7, June 2007.
15. EX0009108, SCALE Version 6.0.
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5.0 Identification of Computer Programs

ORIGEN-ARP is included in the SCALE6.0 code package and is used to calculate the hottest assembly decay heat. ORIGEN-ARP is run on NFW-KSQ-01, a Windows 2008 server, and is verified and validated per Reference 15.

6.0 Methodology and Numeric Analysis

To determine the bounding heat load for a given assembly in the Dresden 2 and Dresden 3 Spent Fuel Pool, the inputs described in Section 2.4 were used to perform ORIGEN-ARP decay heat calculations. Those decay heat values are used as an input in determining the minimum time required to reach 900°C. The limiting decay heat load is \dot{q} , representing the bundle's heat generation rate following discharge from the reactor to the spent fuel pool.

The known heat load, physical geometries/characteristics of the assembly, thermal capacity of materials, and temperature range allows for the determination of heat-up rate. Equation 6-1 correlates these parameters (Reference 16):

Equation 6-1:

$$\dot{q} = m \times c_p \times \frac{\Delta T}{\Delta t}$$

$$m = \rho \times V$$

Where:

\dot{q} is the heat generation rate in BTU/hr

m is the mass of material in lb

ρ is the density of the material in lb/ft³

V is the volume of the material in ft³

c_p is the specific heat in BTU/lb-°F

ΔT is the temperature increase in °F

Δt is the heat-up time step in hr

For this analysis, there are two materials being heated: Uranium Dioxide fuel pellets and the applicable assembly components. The applicable components include the cladding, the water box/water cross, the spacer grids, and the portion of fuel channel along the heated length of the assembly. For purpose of this analysis, these components are all considered to be fabricated from Zircaloy-2 (Refer to Assumptions 3.5 & 3.6). The Zircaloy-2 and Uranium Dioxide are modeled as heating up at the same rate, so the $\frac{\Delta T}{\Delta t}$ is the same for both materials, resulting in the following relationship:

Equation 6-2:

$$\dot{q} = \frac{\Delta T}{\Delta t} \times (m_u \times c_{p,u} + m_z \times c_{p,z})$$

Where:

X_u signifies the property is for Uranium Dioxide

X_z signifies the property is for Zircaloy-2

This calculation seeks to determine the increase in temperature over sequential time steps of 0.025 hours (Δt), so Equation 6-2 is solved for ΔT to establish Equation 6-3:

Equation 6-3:

$$\Delta T = \frac{\dot{q} \times \Delta t}{m_u \times c_{p,u} + m_z \times c_{p,z}}$$

There are two fuel assembly types considered for this analysis: AREVA ATRIUM 10XM and Westinghouse Optima-2. Both fuel types have unique geometries, which require separate calculations to determine their respective volumes. For ATRIUM 10XM, the volume of Uranium Dioxide is defined as:

Equation 6-4:

$$V_u = \left(\left(\pi \times \frac{D_p^2}{4} \right) N_{FL} \times L_{FL} \right) + \left(\left(\pi \times \frac{D_p^2}{4} \right) N_{PL} \times L_{PL} \right)$$

Where:

V_u is the volume of Uranium Dioxide in ft³

D_p is the diameter of the Uranium Dioxide pellet in ft

N_{FL} is the number of full length rods

L_{FL} is the heated length of the full length rods in ft

N_{PL} is the number of part length rods

L_{PL} is the heated length of part length rods in ft

The volume of the Zircaloy-2 in the heated rods, the water box, and fuel channel along the heated length of the ATRIUM 10XM fuel is shown in Equation 6-5, Equation 6-6, and Equation 6-7, respectively. The length of the cladding and channel is conservatively modeled as being the same as the heated length of the Uranium Dioxide pellets (in a full-length rod). In actuality these components are longer than the stack height of the Uranium Dioxide pellets and would absorb more heat. The mass of Zircaloy-2 from the spacer grids must also be considered and is accounted for in Equation 6-9.

Equation 6-5:

$$V_{z,cl} = \left(\left(\pi \times \frac{D_{c,o}^2 - D_{c,i}^2}{4} \right) N_{FL} \times L_{FL} \right) + \left(\left(\pi \times \frac{D_{c,o}^2 - D_{c,i}^2}{4} \right) N_{PL} \times L_{PL} \right)$$

Where:

$V_{z,cl}$ is the volume of Zircaloy-2 in the cladding of heated tubes in ft³

$D_{c,o}$ is the outer diameter of the cladding in ft

$D_{c,i}$ is the inner diameter of the cladding in ft

Equation 6-6:

$$V_{z,wb} = (D_{w,o}^2 - D_{w,i}^2) \times L_{wb}$$

Where:

$V_{z,wb}$ is the volume of Zircaloy-2 in the water box in ft³

$D_{w,o}$ is the outer width of the water box in ft

$D_{w,i}$ is the inner width of the water box in ft

L_{wb} is the heated length of the water box in ft

Equation 6-7:

$$V_{z,ch} = (D_{ch,o}^2 - D_{ch,i}^2) \times L_{ch}$$

Where:

$V_{z,ch}$ is the volume of Zircaloy-2 in the channel in ft³

$D_{ch,o}$ is the outer width of the channel in ft

$D_{ch,i}$ is the inner width of the channel in ft

L_{ch} is the heated length of the channel in ft

The total volume of Zircaloy-2 (V_z) for the ATRIUM 10XM assembly's cladding, water box, and channel along the heated length is therefore defined as:

Equation 6-8:

$$V_z = V_{z,cl} + V_{z,wr} + V_{z,ch}$$

The mass of the Zircaloy-2 present in the ATRIUM 10XM bundle is defined as:

Equation 6-9:

$$m_z = V_z \times c_{p,z} + m_{z,s}$$

Where:

m_z is the total mass of Zircaloy-2

$m_{z,s}$ is the mass of the Zircaloy-2 spacer grid

For the Westinghouse Optima-2 fuel, the volume of the Uranium Dioxide is defined as:

Equation 6-10:

$$V_u = \left(\left(\pi \times \frac{D_p^2}{4} \right) N_{FL} \times L_{FL} \right) + \left(\left(\pi \times \frac{D_p^2}{4} \right) N_{2/3L} \times L_{2/3L} \right) + \left(\left(\pi \times \frac{D_p^2}{4} \right) N_{1/3L} \times L_{1/3L} \right)$$

Where:

V_u is the volume of Uranium Dioxide in ft³

D_p is the diameter of the Uranium Dioxide pellet in ft

N_{FL} is the number of full length rods

L_{FL} is the heated length of the full length rods in ft

$N_{2/3L}$ is the number of two-thirds part length rods

$L_{2/3L}$ is the heated length of two-thirds part length rods in ft

$N_{1/3L}$ is the number of one-thirds part length rods

$L_{1/3L}$ is the heated length of one-thirds part length rods in ft

The volume of the Zircaloy-2 in the heated rods, the water cross, and fuel channel along the heated length of the Optima-2 fuel is shown in Equation 6-11, Equation 6-12, and Equation 6-13, respectively. The length of the cladding, water cross, and channel that are heated is conservatively modeled as being the same as the heated full length of Uranium Dioxide. In actuality these components are longer than the stack height of the Uranium Dioxide pellets. The mass of Zircaloy-2 from the spacer grids must also be considered and is accounted for in Equation 6-15.

Equation 6-11:

$$V_{z,cl} = \left(\left(\pi \times \frac{D_{c,o}^2 - D_{c,i}^2}{4} \right) N_{FL} \times L_{FL} \right) + \left(\left(\pi \times \frac{D_{c,o}^2 - D_{c,i}^2}{4} \right) N_{2/3L} \times L_{2/3L} \right) + \left(\left(\pi \times \frac{D_{c,o}^2 - D_{c,i}^2}{4} \right) N_{1/3L} \times L_{1/3L} \right)$$

Where:

$V_{z,cl}$ is the volume of Zircaloy-2 in the cladding of the heated tubes in ft³

$D_{c,o}$ is the outer diameter of the cladding in ft

$D_{c,i}$ is the inner diameter of the cladding in ft

N_{FL} is the number of full length rods

L_{FL} is the heated length of the full length rods in ft

$N_{2/3L}$ is the number of two-thirds part length rods

$L_{2/3L}$ is the heated length of two-thirds part length rods in ft

$N_{1/3L}$ is the number of one-thirds part length rods

$L_{1/3L}$ is the heated length of one-thirds part length rods in ft

Equation 6-12:

$$V_{z,wc} = (D_{w,o}^2 - D_{w,i}^2) \times L_{wc}$$

Where:

$V_{z,wc}$ is the volume of Zircaloy-2 in the water cross in ft³

$D_{w,o}$ is the outer width of the water cross in ft

$D_{w,i}$ is the inner width of the water cross in ft

L_{wc} is the heated length of the water box in ft

Equation 6-13:

$$V_{z,ch} = (D_{ch,o}^2 - D_{ch,i}^2) \times L_{ch}$$

Where:

$V_{z,ch}$ is the volume of Zircaloy-2 in the channel in ft³

$D_{ch,o}$ is the outer width of the channel in ft

$D_{ch,i}$ is the inner width of the channel in ft

L_{ch} is the heated length of the channel in ft

The total volume of Zircaloy-2 (V_z) for the Optima-2 assembly's cladding, water cross, and channel along the heated length is therefore defined as:

Equation 6-14:

$$V_z = V_{z,cl} + V_{z,wc} + V_{z,ch}$$

The mass of the Zircaloy-2 present in the Optima-2 bundle is defined as:

Equation 6-15:

$$m_z = V_z \times c_{p,z} + m_{z,s}$$

Where:

m_z is the total mass of Zircaloy-2

$m_{z,s}$ is the mass of the Zircaloy-2 spacer grid

7.0 Results and Conclusions

A summary of results from ORIGEN-ARP showing decay heat loads up to 365 days following shutdown are presented in Table 6. The decay heat listed for the associated fuel type and time since shutdown is in Watts. Attachment A contains the full results for reference.

Table 6: ORIGEN-ARP Summary for Decay Heat in Watts through 365 Days

<u>Unit</u>	<u>Fuel Type</u>	<u>1d</u>	<u>8d</u>	<u>50d</u>	<u>100d</u>	<u>200d</u>	<u>300d</u>	<u>365d</u>
2	10XM	24,940	11,910	5,543	4,038	2,740	2,103	1,838
	Optima-2	24,910	11,880	5,519	4,018	2,726	2,093	1,829
3	10XM	24,490	11,690	5,396	3,898	2,611	1,987	1,729

Attachment E presents the decay heat loads – based on the fuel characteristics described in Section 2 and utilizing the equations from Section 6 – that result in a heat-up time to 900°C/1652°F of greater than 10 hours. Table 7 provides the days since shutdown when the hottest assembly decays below this heat load. For Dresden 2, the more limiting of the two assembly types must be considered, so 348 days of decay is required for Dresden 2 to satisfy the zirconium fire limit. For Dresden 3, 299 days of decay is required to satisfy the zirconium fire limit.

Table 7: Day Since Shutdown When Limiting Heat Load Reached

	<u>Dresden 2</u> <u>ATRIUM 10-XM</u>	<u>Dresden 2</u> <u>Optima-2</u>	<u>Dresden 3</u> <u>ATRIUM 10-XM</u>
Days Since Shutdown	325	348	299
Decay Heat (BTU/hr)	6,797 BTU/hr	6,452 BTU/hr	6,793 BTU/hr

Attachment A: ORIGEN-ARP Decay Heat Results Through 3,650 Days

Dresden 2						Dresden 3		
ATRIUM 10XM			Optima-2			ATRIUM 10XM		
Days Since Shutdown	Decay Heat (Watts)	Decay Heat (BTU/hr)	Days Since Shutdown	Decay Heat (Watts)	Decay Heat (BTU/hr)	Days Since Shutdown	Decay Heat (Watts)	Decay Heat (BTU/hr)
1	24940	85095	1	24910	84993	1	24490	83560
3	17670	60290	3	17640	60188	3	17330	59130
8	11910	40637	8	11880	40535	8	11690	39886
24	7588	25890	24	7563	25805	24	7428	25344
50	5543	18913	50	5519	18831	50	5396	18411
100	4038	13778	100	4018	13709	100	3898	13300
200	2740	9349	200	2726	9301	200	2611	8909
300	2103	7175	300	2093	7141	298	1996	6810
324	1996	6810	347	1895	6466	299	1991	6793
325	1992	6797	348	1891	6452	300	1987	6780
326	1988	6783	349	1887	6438	312	1933	6595
365	1838	6271	365	1829	6241	365	1729	5899
730	1071	3654	730	1066	3637	730	993	3387
1095	742	2530	1095	737	2515	1095	679	2317
1460	574	1958	1460	570	1945	1460	521	1779
1825	481	1641	1825	477	1629	1825	435	1484
2190	425	1450	2190	422	1439	2190	384	1309
2555	389	1327	2555	386	1316	2555	351	1197
2920	364	1241	2920	360	1230	2920	328	1119
3285	345	1177	3285	342	1166	3285	311	1062
3650	330	1127	3650	327	1116	3650	298	1017

Attachment B: ORIGEN-ARP Input for Dresden 2, ATRIUM-10XM Fuel

```
'This SCALE input file was generated by
'OrigenArp Version 5.1.01 March 22, 2007
=arp
atrium10-9
3.9450005
5
500
500
500
500
258.77
23.097305
23.097305
23.097305
23.097305
23.097305
1
1
1
1
1
0.429
ft33f001
end
#origens
0$$ a4 33 a11 71 e t
atrium10-9
3$$ 33 a3 1 0 a16 2 a33 0 e t
35$$ 0 t
56$$ 10 10 a6 3 a10 0 a13 12 a15 3 a18 1 e
57** 0 a3 1e-05 0.2213594 e t
Burn to 500 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 50 100 150 200 250 300 350 400 450 500
66$$ a1 2 a5 2 a9 2 e
73$$ 80000 240000 250000 260000 270000 280000 400000 500000 922340
922350 922360 922380
74** 23758.6 423.9 26.5 1165.9 4.2 423.9 91148.3 1536.8 62.02059
6968.606 32.05559 169581.3
75$$ 4 4 4 4 4 4 4 2 2 2 2
t
atrium10-9
3$$ 33 a3 2 0 a33 0 e t
35$$ 0 t
56$$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 500 a3 1e-05 0.2213594 e t
Burn to 1000 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 550 600 650 700 750 800 850 900 950 1000
66$$ a1 2 a5 2 a9 2 e t
atrium10-9
3$$ 33 a3 3 0 a33 0 e t
35$$ 0 t
```

56\$\$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 1000 a3 1e-05 0.2213594 e t
Burn to 1500 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500
66\$\$ a1 2 a5 2 a9 2 e t
atrium10-9
3\$\$ 33 a3 4 0 a33 0 e t
35\$\$ 0 t
56\$\$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 1500 a3 1e-05 0.2213594 e t
Burn to 2000 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000
66\$\$ a1 2 a5 2 a9 2 e t
atrium10-9
3\$\$ 33 a3 5 0 a33 0 e t
35\$\$ 0 t
56\$\$ 10 10 a10 10 a15 3 a18 1 e
57** 2000 a3 1e-05 0.1145624 e t
Burn to 2258.77 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 2025.877 2051.754 2077.631 2103.508 2129.385 2155.262 2181.139
2207.016 2232.893 2258.77
66\$\$ a1 2 a5 2 a9 2 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 10 a6 1 a10 10 a15 3 a17 4 e
57** 0 a3 1e-05 e
95\$\$ 0 t
Decay to 325 Days
0.176644 MTU
60** 1 3 8 24 50 100 200 300 324 325
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ 0 0 a10 2 e t
56\$\$ 0 0 a10 3 e t
56\$\$ 0 0 a10 4 e t
56\$\$ 0 0 a10 5 e t
56\$\$ 0 0 a10 6 e t
56\$\$ 0 0 a10 7 e t
56\$\$ 0 0 a10 8 e t
56\$\$ 0 0 a10 9 e t
56\$\$ 0 0 a10 10 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 10 a6 1 a10 10 a15 3 a17 4 e
57** 325 a3 1e-05 e
95\$\$ 0 t

Decay to 3285 Days
0.176644 MTU
60** 326 365 730 1095 1460 1825 2190 2555 2920 3285
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ 0 0 a10 2 e t
56\$\$ 0 0 a10 3 e t
56\$\$ 0 0 a10 4 e t
56\$\$ 0 0 a10 5 e t
56\$\$ 0 0 a10 6 e t
56\$\$ 0 0 a10 7 e t
56\$\$ 0 0 a10 8 e t
56\$\$ 0 0 a10 9 e t
56\$\$ 0 0 a10 10 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 1 a6 1 a10 10 a15 3 a17 4 e
57** 3285 a3 1e-05 e
95\$\$ 0 t
Decay to 3650 Days
0.176644 MTU
60** 3650
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ f0 t
end
=opus
LIBUNIT=33
TYPARAMS=NUCLIDES
UNITS=WATTS
LIBTYPE=ALL
TIME=DAYS
NPOSITION=1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 end
end
#shell
copy ft71f001 "D:\Markland\ Dresden Decom Zirc Fire\ D2A10.f71"
del ft71f001
end

Attachment C: ORIGEN-ARP Input for Dresden 2, Optima-2 Fuel

```
'This SCALE input file was generated by
'OrigenArp Version 5.1.01 March 22, 2007
=arp
svea100-0
3.9450005
5
500
500
500
500
258.77
23.097305
23.097305
23.097305
23.097305
23.097305
1
1
1
1
1
0.429
ft33f001
end
#origens
0$$ a4 33 a11 71 e t
svea100-0
3$$ 33 a3 1 0 a16 2 a33 0 e t
35$$ 0 t
56$$ 10 10 a6 3 a10 0 a13 12 a15 3 a18 1 e
57** 0 a3 1e-05 0.2213594 e t
Burn to 500 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 50 100 150 200 250 300 350 400 450 500
66$$ a1 2 a5 2 a9 2 e
73$$ 80000 240000 250000 260000 270000 280000 400000 500000 922340
922350 922360 922380
74** 23758.6 423.9 26.5 1165.9 4.2 423.9 91148.3 1536.8 62.02059
6968.606 32.05559 169581.3
75$$ 4 4 4 4 4 4 4 2 2 2 2
t
svea100-0
3$$ 33 a3 2 0 a33 0 e t
35$$ 0 t
56$$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 500 a3 1e-05 0.2213594 e t
Burn to 1000 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 550 600 650 700 750 800 850 900 950 1000
66$$ a1 2 a5 2 a9 2 e t
svea100-0
3$$ 33 a3 3 0 a33 0 e t
35$$ 0 t
```

56\$\$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 1000 a3 1e-05 0.2213594 e t
Burn to 1500 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500
66\$\$ a1 2 a5 2 a9 2 e t
svea100-0
3\$\$ 33 a3 4 0 a33 0 e t
35\$\$ 0 t
56\$\$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 1500 a3 1e-05 0.2213594 e t
Burn to 2000 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000
66\$\$ a1 2 a5 2 a9 2 e t
svea100-0
3\$\$ 33 a3 5 0 a33 0 e t
35\$\$ 0 t
56\$\$ 10 10 a10 10 a15 3 a18 1 e
57** 2000 a3 1e-05 0.1145624 e t
Burn to 2258.77 EFPD
0.176644 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 2025.877 2051.754 2077.631 2103.508 2129.385 2155.262 2181.139
2207.016 2232.893 2258.77
66\$\$ a1 2 a5 2 a9 2 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 10 a6 1 a10 10 a15 3 a17 4 e
57** 0 a3 1e-05 e
95\$\$ 0 t
Decay to 348 Days
0.176644 MTU
60** 1 3 8 24 50 100 200 300 347 348
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ 0 0 a10 2 e t
56\$\$ 0 0 a10 3 e t
56\$\$ 0 0 a10 4 e t
56\$\$ 0 0 a10 5 e t
56\$\$ 0 0 a10 6 e t
56\$\$ 0 0 a10 7 e t
56\$\$ 0 0 a10 8 e t
56\$\$ 0 0 a10 9 e t
56\$\$ 0 0 a10 10 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 10 a6 1 a10 10 a15 3 a17 4 e
57** 348 a3 1e-05 e
95\$\$ 0 t

Decay to 3285 Days
0.176644 MTU
60** 349 365 730 1095 1460 1825 2190 2555 2920 3285
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ 0 0 a10 2 e t
56\$\$ 0 0 a10 3 e t
56\$\$ 0 0 a10 4 e t
56\$\$ 0 0 a10 5 e t
56\$\$ 0 0 a10 6 e t
56\$\$ 0 0 a10 7 e t
56\$\$ 0 0 a10 8 e t
56\$\$ 0 0 a10 9 e t
56\$\$ 0 0 a10 10 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 1 a6 1 a10 10 a15 3 a17 4 e
57** 3285 a3 1e-05 e
95\$\$ 0 t
Decay to 3650 Days
0.176644 MTU
60** 3650
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ f0 t
end
=opus
LIBUNIT=33
TYPARAMS=NUCLIDES
UNITS=WATTS
LIBTYPE=ALL
TIME=DAYS
NPOSITION=1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 end
end
#shell
copy ft71f001 "D:\Markland\ Dresden Decom Zirc Fire\ D2O2.f71"
del ft71f001
end

Attachment D: ORIGEN-ARP Input for Dresden 3, ATRIUM-10XM Fuel

```
'This SCALE input file was generated by
'OrigenArp Version 5.1.01 March 22, 2007
=arp
atrium10-9
3.9400002
5
500
500
500
500
85.88
23.04421
23.04421
23.04421
23.04421
23.04421
1
1
1
1
1
0.429
ft33f001
end
#origens
0$$ a4 33 a11 71 e t
atrium10-9
3$$ 33 a3 1 0 a16 2 a33 0 e t
35$$ 0 t
56$$ 10 10 a6 3 a10 0 a13 12 a15 3 a18 1 e
57** 0 a3 1e-05 0.239707 e t
Burn to 500 EFPD
0.177051 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 50 100 150 200 250 300 350 400 450 500
66$$ a1 2 a5 2 a9 2 e
73$$ 80000 240000 250000 260000 270000 280000 400000 500000 922340
922350 922360 922380
74** 23813.4 424.9 26.6 1168.5 4.2 424.9 91358.3 1540.3 62.0847 6975.809
32.08872 169981
75$$ 4 4 4 4 4 4 4 2 2 2 2
t
atrium10-9
3$$ 33 a3 2 0 a33 0 e t
35$$ 0 t
56$$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 500 a3 1e-05 0.239707 e t
Burn to 1000 EFPD
0.177051 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 550 600 650 700 750 800 850 900 950 1000
66$$ a1 2 a5 2 a9 2 e t
atrium10-9
3$$ 33 a3 3 0 a33 0 e t
35$$ 0 t
```

56\$\$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 1000 a3 1e-05 0.239707 e t
Burn to 1500 EFPD
0.177051 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 1050 1100 1150 1200 1250 1300 1350 1400 1450 1500
66\$\$ a1 2 a5 2 a9 2 e t
atrium10-9
3\$\$ 33 a3 4 0 a33 0 e t
35\$\$ 0 t
56\$\$ 10 10 a6 3 a10 10 a15 3 a18 1 e
57** 1500 a3 1e-05 0.239707 e t
Burn to 2000 EFPD
0.177051 MTU
58** 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08 4.08
60** 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000
66\$\$ a1 2 a5 2 a9 2 e t
atrium10-9
3\$\$ 33 a3 5 0 a33 0 e t
35\$\$ 0 t
56\$\$ 4 4 a10 10 a15 3 a18 1 e
57** 2000 a3 1e-05 0.04117207 e t
Burn to 2085.88 EFPD
0.177051 MTU
58** 4.08 4.08 4.08 4.08
60** 2021.47 2042.94 2064.41 2085.88
66\$\$ a1 2 a5 2 a9 2 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 10 a6 1 a10 4 a15 3 a17 4 e
57** 0 a3 1e-05 e
95\$\$ 0 t
Decay to 300 Days
0.177051 MTU
60** 1 3 8 24 50 100 200 298 299 300
61** f0.05
65\$\$

'Gram-Atoms	Grams	Curies	Watts-All	Watts-Gamma
3z	1	0	3z	3z
3z	1	0	3z	3z
3z	1	0	3z	3z

t
56\$\$ 0 0 a10 1 e t
56\$\$ 0 0 a10 2 e t
56\$\$ 0 0 a10 3 e t
56\$\$ 0 0 a10 4 e t
56\$\$ 0 0 a10 5 e t
56\$\$ 0 0 a10 6 e t
56\$\$ 0 0 a10 7 e t
56\$\$ 0 0 a10 8 e t
56\$\$ 0 0 a10 9 e t
56\$\$ 0 0 a10 10 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 10 a6 1 a10 10 a15 3 a17 4 e
57** 300 a3 1e-05 e
95\$\$ 0 t
Decay to 3285 Days

0.177051 MTU
60** 312 365 730 1095 1460 1825 2190 2555 2920 3285
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ 0 0 a10 2 e t
56\$\$ 0 0 a10 3 e t
56\$\$ 0 0 a10 4 e t
56\$\$ 0 0 a10 5 e t
56\$\$ 0 0 a10 6 e t
56\$\$ 0 0 a10 7 e t
56\$\$ 0 0 a10 8 e t
56\$\$ 0 0 a10 9 e t
56\$\$ 0 0 a10 10 e t
54\$\$ a8 1 a11 0 e
56\$\$ a2 1 a6 1 a10 10 a15 3 a17 4 e
57** 3285 a3 1e-05 e
95\$\$ 0 t
Decay to 3650 Days
0.177051 MTU
60** 3650
61** f0.05
65\$\$
'Gram-Atoms Grams Curies Watts-All Watts-Gamma
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
3z 1 0 0 3z 3z 3z 6z
t
56\$\$ 0 0 a10 1 e t
56\$\$ f0 t
end
=opus
LIBUNIT=33
TYPARAMS=NUCLIDES
UNITS=WATTS
LIBTYPE=ALL
TIME=DAYS
NPOSITION=1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 end
end
#shell
copy ft71f001 "D:\Markland\ Dresden Decom Zirc Fire\ D3A10.f71"
del ft71f001
end

Attachment E: Microsoft Excel Calculations and Reference Data

<u>Material Densities</u>		
Zirc-2 rho (lb/ft ³)	409	Reference 4
UO ₂ rho (lb/ft ³)	666	Reference 5

<u>Zircaloy-2 Specific Heat Capacities (Reference 4)</u>	
Temperature (°F)	Specific Heat (Btu/lb-°F)
80.33	0.0671
260.33	0.0721
692.33	0.0791
1502.33	0.0896
1507.73	0.1199
1543.73	0.1409
1579.73	0.1469
1615.73	0.1717
1651.73	0.1949

<u>Uranium Dioxide Specific Heat Capacities (Reference 5)</u>	
Temperature (°F)	Specific Heat (Btu/lb-°F)
80.33	0.0565
260.33	0.0631
440.33	0.0672
620.33	0.0699
800.33	0.0718
980.33	0.073
1160.33	0.0738
1340.33	0.0744
1520.33	0.0748

<u>Temperatures</u>		
Initial SFP Temp (°F)	150	Reference 14
Zirconium Failure Begins (°F)	1049	Reference 1
Zirconium Runaway Oxidation (°F)	1652	Reference 2

<u>ATRIUM 10XM Fuel Assembly Geometry/Specifications</u>		
Number of Full-Length Rods	79	Reference 8
Htd Length of Full-Length Rod (in.)	145.24	Reference 8
Number of Part-Length Rods	12	Reference 8
Htd Length of Part-Length Rod (in.)	75.00	Reference 8
Outer Diameter of Cladding (in.)	0.4047	Reference 8
Inner Diameter of Cladding (in.)	0.3559	Reference 8
Uranium Pellet Diameter (in.)	0.3492	Reference 8
Water Box Outside Dimension (in.)	1.378	Reference 8
Water Box Wall Thickness (in.)	0.0315	Reference 8
Water Box Inside Dimension (in.)	1.315	Derived
Water Box Length (in.)	145.098	Reference 10
Channel Thickness (non-corn.) (in.)	0.075	Reference 8
Channel Inside Dimension (in.)	5.278	Reference 8
Channel Outside Dimension (in.)	5.428	Derived
Spacer Weight (sum of 9) (lb)	3.59	Reference 9

<u>ATRIUM 10XM Volumes</u>		
Uranium Dioxide: V_u (ft^3)	0.6858	Equation 6-4
Zirc-2 Clad: $V_{z,cl}$ (ft^3)	0.2088	Equation 6-5
Zirc-2 Waterbox: $V_{z,wb}$ (ft^3)	0.0142	Equation 6-6
Zirc-2 Channel: $V_{z,ch}$ (ft^3)	0.1350	Equation 6-7
Zirc-2 Total: V_z (ft^3)	0.3580	Equation 6-8

<u>ATRIUM 10XM Masses</u>		
m_u (lbm)	456.75	Calculated
m_z (lbm)	150.00	Equation 6-9

<u>Optima-2 Fuel Assembly Geometry/Specifications</u>		
Number of Full-Length Rods	84	Reference 11
Htd Length of Full-Length Rod (in.)	145.27	Reference 11
Number of 2/3-Length Rods	8	Reference 11
Htd Length of 2/3-Length Rod (in.)	99.61	Reference 11
Number of 1/3-Length Rods	4.00	Reference 11
Htd Length of 1/3-Length Rod (in.)	50.39	Reference 11
Outer Diameter of Cladding (in.)	0.3874	Reference 11
Inner Diameter of Cladding (in.)	0.3398	Reference 11
Uranium Pellet Diameter (in.)	0.3338	Reference 11
Water Cross Inside Dimension (in.)	1.078	Reference 11
Water Cross Wall Thickness (in.)	0.031	Reference 11
Water Cross Out. Dimension (in.)	1.140	Derived
Water Box Length (in.)	145.27	Reference 11
Channel Thickness (non-corn.) (in.)	0.055	Reference 11
Channel Outside Dimension (in.)	5.456	Reference 11
Channel Inside Dimension (in.)	5.346	Derived
Spacer Weight (sum of 32) (lb)	1.904	Reference 11

<u>Optima-2 Volumes</u>		
Uranium Dioxide: V_u (ft^3)	0.6685	Equation 6-10
Zirc-2 Clad: $V_{z,cl}$ (ft^3)	0.2077	Equation 6-11
Zirc-2 Water Cross: $V_{z,wb}$ (ft^3)	0.0116	Equation 6-12
Zirc-2 Channel: $V_{z,ch}$ (ft^3)	0.0999	Equation 6-13
Zirc-2 Total: V_z (ft^3)	0.3191	Equation 6-14

<u>Optima-2 Masses</u>		
m_u (lbm)	445.25	Calculated
m_z (lbm)	132.43	Equation 6-15

<u>atrium 10xm Calculation</u>										
<u>Elapsed Time</u>	<u>Time Step</u>	<u>Initial Temp</u>	<u>Decay Heat</u>	<u>Mass UO2</u>	<u>Cp UO2</u>	<u>Mass Zirc</u>	<u>Cp Zirc</u>	<u>ΔT</u>	<u>Ending Temp</u>	
<u>hr</u>	<u>hr</u>	<u>°F</u>	<u>BTU/hr</u>	<u>lbm</u>	<u>BTU/lbm-°F</u>	<u>lbm</u>	<u>BTU/lbm-°F</u>	<u>°F</u>	<u>°F</u>	<u>°C</u>
0	0.025	150	6797	456.75	0.0591	150.00	0.0690	4.55	154.55	68.08
0.025	0.025	154.552147	6797	456.75	0.0592	150.00	0.0692	4.54	159.09	70.61
0.05	0.025	159.092713	6797	456.75	0.0594	150.00	0.0693	4.53	163.62	73.12
0.075	0.025	163.621787	6797	456.75	0.0596	150.00	0.0694	4.52	168.14	75.63
0.1	0.025	168.139455	6797	456.75	0.0597	150.00	0.0695	4.51	172.65	78.14
0.125	0.025	172.645803	6797	456.75	0.0599	150.00	0.0697	4.50	177.14	80.63
0.15	0.025	177.140917	6797	456.75	0.0600	150.00	0.0698	4.48	181.62	83.12
0.175	0.025	181.624879	6797	456.75	0.0602	150.00	0.0699	4.47	186.10	85.61
0.2	0.025	186.097772	6797	456.75	0.0604	150.00	0.0700	4.46	190.56	88.09
0.225	0.025	190.559679	6797	456.75	0.0605	150.00	0.0702	4.45	195.01	90.56
0.25	0.025	195.010679	6797	456.75	0.0607	150.00	0.0703	4.44	199.45	93.03
0.275	0.025	199.450852	6797	456.75	0.0609	150.00	0.0704	4.43	203.88	95.49
0.3	0.025	203.880277	6797	456.75	0.0610	150.00	0.0705	4.42	208.30	97.94
0.325	0.025	208.299032	6797	456.75	0.0612	150.00	0.0707	4.41	212.71	100.39
0.35	0.025	212.707193	6797	456.75	0.0614	150.00	0.0708	4.40	217.10	102.84
0.375	0.025	217.104836	6797	456.75	0.0615	150.00	0.0709	4.39	221.49	105.27
0.4	0.025	221.492037	6797	456.75	0.0617	150.00	0.0710	4.38	225.87	107.70
0.425	0.025	225.86887	6797	456.75	0.0618	150.00	0.0711	4.37	230.24	110.13
0.45	0.025	230.235407	6797	456.75	0.0620	150.00	0.0713	4.36	234.59	112.55
0.475	0.025	234.591721	6797	456.75	0.0622	150.00	0.0714	4.35	238.94	114.97
0.5	0.025	238.937883	6797	456.75	0.0623	150.00	0.0715	4.34	243.27	117.37
0.525	0.025	243.273965	6797	456.75	0.0625	150.00	0.0716	4.33	247.60	119.78
0.55	0.025	247.600036	6797	456.75	0.0626	150.00	0.0717	4.32	251.92	122.18
0.575	0.025	251.916165	6797	456.75	0.0628	150.00	0.0719	4.31	256.22	124.57
0.6	0.025	256.222421	6797	456.75	0.0629	150.00	0.0720	4.30	260.52	126.95
0.625	0.025	260.518871	6797	456.75	0.0631	150.00	0.0721	4.29	264.81	129.34

0.65	0.025	264.805746	6797	456.75	0.0632	150.00	0.0722	4.28	269.09	131.71
0.675	0.025	269.086679	6797	456.75	0.0633	150.00	0.0722	4.28	273.36	134.09
0.7	0.025	273.361695	6797	456.75	0.0634	150.00	0.0723	4.27	277.63	136.46
0.725	0.025	277.630818	6797	456.75	0.0635	150.00	0.0724	4.26	281.89	138.83
0.75	0.025	281.894073	6797	456.75	0.0636	150.00	0.0724	4.26	286.15	141.20
0.775	0.025	286.151482	6797	456.75	0.0637	150.00	0.0725	4.25	290.40	143.56
0.8	0.025	290.403072	6797	456.75	0.0638	150.00	0.0726	4.25	294.65	145.92
0.825	0.025	294.648865	6797	456.75	0.0639	150.00	0.0727	4.24	298.89	148.27
0.85	0.025	298.888885	6797	456.75	0.0640	150.00	0.0727	4.23	303.12	150.62
0.875	0.025	303.123155	6797	456.75	0.0641	150.00	0.0728	4.23	307.35	152.97
0.9	0.025	307.351699	6797	456.75	0.0642	150.00	0.0729	4.22	311.57	155.32
0.925	0.025	311.574541	6797	456.75	0.0643	150.00	0.0729	4.22	315.79	157.66
0.95	0.025	315.791702	6797	456.75	0.0644	150.00	0.0730	4.21	320.00	160.00
0.975	0.025	320.003206	6797	456.75	0.0645	150.00	0.0731	4.21	324.21	162.34
1	0.025	324.209076	6797	456.75	0.0646	150.00	0.0731	4.20	328.41	164.67
1.025	0.025	328.409334	6797	456.75	0.0647	150.00	0.0732	4.19	332.60	167.00
1.05	0.025	332.604002	6797	456.75	0.0647	150.00	0.0733	4.19	336.79	169.33
1.075	0.025	336.793104	6797	456.75	0.0648	150.00	0.0733	4.18	340.98	171.65
1.1	0.025	340.97666	6797	456.75	0.0649	150.00	0.0734	4.18	345.15	173.97
1.125	0.025	345.154694	6797	456.75	0.0650	150.00	0.0735	4.17	349.33	176.29
1.15	0.025	349.327226	6797	456.75	0.0651	150.00	0.0735	4.17	353.49	178.61
1.175	0.025	353.494279	6797	456.75	0.0652	150.00	0.0736	4.16	357.66	180.92
1.2	0.025	357.655873	6797	456.75	0.0653	150.00	0.0737	4.16	361.81	183.23
1.225	0.025	361.812031	6797	456.75	0.0654	150.00	0.0737	4.15	365.96	185.53
1.25	0.025	365.962774	6797	456.75	0.0655	150.00	0.0738	4.15	370.11	187.84
1.275	0.025	370.108123	6797	456.75	0.0656	150.00	0.0739	4.14	374.25	190.14
1.3	0.025	374.248098	6797	456.75	0.0657	150.00	0.0739	4.13	378.38	192.43
1.325	0.025	378.382721	6797	456.75	0.0658	150.00	0.0740	4.13	382.51	194.73
1.35	0.025	382.512012	6797	456.75	0.0659	150.00	0.0741	4.12	386.64	197.02

1.375	0.025	386.635992	6797	456.75	0.0660	150.00	0.0741	4.12	390.75	199.31
1.4	0.025	390.754682	6797	456.75	0.0661	150.00	0.0742	4.11	394.87	201.59
1.425	0.025	394.868101	6797	456.75	0.0662	150.00	0.0743	4.11	398.98	203.88
1.45	0.025	398.97627	6797	456.75	0.0663	150.00	0.0743	4.10	403.08	206.16
1.475	0.025	403.079209	6797	456.75	0.0664	150.00	0.0744	4.10	407.18	208.43
1.5	0.025	407.176938	6797	456.75	0.0664	150.00	0.0745	4.09	411.27	210.71
1.525	0.025	411.269477	6797	456.75	0.0665	150.00	0.0745	4.09	415.36	212.98
1.55	0.025	415.356845	6797	456.75	0.0666	150.00	0.0746	4.08	419.44	215.24
1.575	0.025	419.439061	6797	456.75	0.0667	150.00	0.0747	4.08	423.52	217.51
1.6	0.025	423.516147	6797	456.75	0.0668	150.00	0.0747	4.07	427.59	219.77
1.625	0.025	427.588119	6797	456.75	0.0669	150.00	0.0748	4.07	431.65	222.03
1.65	0.025	431.654999	6797	456.75	0.0670	150.00	0.0749	4.06	435.72	224.29
1.675	0.025	435.716805	6797	456.75	0.0671	150.00	0.0749	4.06	439.77	226.54
1.7	0.025	439.773555	6797	456.75	0.0672	150.00	0.0750	4.05	443.83	228.79
1.725	0.025	443.825269	6797	456.75	0.0673	150.00	0.0751	4.05	447.87	231.04
1.75	0.025	447.873163	6797	456.75	0.0673	150.00	0.0751	4.04	451.92	233.29
1.775	0.025	451.917437	6797	456.75	0.0674	150.00	0.0752	4.04	455.96	235.53
1.8	0.025	455.958101	6797	456.75	0.0674	150.00	0.0753	4.04	460.00	237.78
1.825	0.025	459.995164	6797	456.75	0.0675	150.00	0.0753	4.03	464.03	240.02
1.85	0.025	464.028637	6797	456.75	0.0676	150.00	0.0754	4.03	468.06	242.25
1.875	0.025	468.058529	6797	456.75	0.0676	150.00	0.0755	4.03	472.08	244.49
1.9	0.025	472.084848	6797	456.75	0.0677	150.00	0.0755	4.02	476.11	246.73
1.925	0.025	476.107606	6797	456.75	0.0677	150.00	0.0756	4.02	480.13	248.96
1.95	0.025	480.126811	6797	456.75	0.0678	150.00	0.0757	4.02	484.14	251.19
1.975	0.025	484.142473	6797	456.75	0.0679	150.00	0.0757	4.01	488.15	253.42
2	0.025	488.1546	6797	456.75	0.0679	150.00	0.0758	4.01	492.16	255.65
2.025	0.025	492.163203	6797	456.75	0.0680	150.00	0.0759	4.01	496.17	257.87
2.05	0.025	496.168291	6797	456.75	0.0680	150.00	0.0759	4.00	500.17	260.09
2.075	0.025	500.169872	6797	456.75	0.0681	150.00	0.0760	4.00	504.17	262.32

2.1	0.025	504.167957	6797	456.75	0.0682	150.00	0.0761	3.99	508.16	264.53
2.125	0.025	508.162553	6797	456.75	0.0682	150.00	0.0761	3.99	512.15	266.75
2.15	0.025	512.153671	6797	456.75	0.0683	150.00	0.0762	3.99	516.14	268.97
2.175	0.025	516.14132	6797	456.75	0.0683	150.00	0.0762	3.98	520.13	271.18
2.2	0.025	520.125507	6797	456.75	0.0684	150.00	0.0763	3.98	524.11	273.39
2.225	0.025	524.106243	6797	456.75	0.0685	150.00	0.0764	3.98	528.08	275.60
2.25	0.025	528.083537	6797	456.75	0.0685	150.00	0.0764	3.97	532.06	277.81
2.275	0.025	532.057397	6797	456.75	0.0686	150.00	0.0765	3.97	536.03	280.02
2.3	0.025	536.027832	6797	456.75	0.0686	150.00	0.0766	3.97	539.99	282.22
2.325	0.025	539.994851	6797	456.75	0.0687	150.00	0.0766	3.96	543.96	284.42
2.35	0.025	543.958462	6797	456.75	0.0688	150.00	0.0767	3.96	547.92	286.62
2.375	0.025	547.918676	6797	456.75	0.0688	150.00	0.0768	3.96	551.88	288.82
2.4	0.025	551.875499	6797	456.75	0.0689	150.00	0.0768	3.95	555.83	291.02
2.425	0.025	555.828942	6797	456.75	0.0689	150.00	0.0769	3.95	559.78	293.21
2.45	0.025	559.779012	6797	456.75	0.0690	150.00	0.0770	3.95	563.73	295.40
2.475	0.025	563.725719	6797	456.75	0.0691	150.00	0.0770	3.94	567.67	297.59
2.5	0.025	567.669071	6797	456.75	0.0691	150.00	0.0771	3.94	571.61	299.78
2.525	0.025	571.609075	6797	456.75	0.0692	150.00	0.0771	3.94	575.55	301.97
2.55	0.025	575.545742	6797	456.75	0.0692	150.00	0.0772	3.93	579.48	304.16
2.575	0.025	579.479079	6797	456.75	0.0693	150.00	0.0773	3.93	583.41	306.34
2.6	0.025	583.409095	6797	456.75	0.0693	150.00	0.0773	3.93	587.34	308.52
2.625	0.025	587.335799	6797	456.75	0.0694	150.00	0.0774	3.92	591.26	310.70
2.65	0.025	591.259197	6797	456.75	0.0695	150.00	0.0775	3.92	595.18	312.88
2.675	0.025	595.1793	6797	456.75	0.0695	150.00	0.0775	3.92	599.10	315.05
2.7	0.025	599.096115	6797	456.75	0.0696	150.00	0.0776	3.91	603.01	317.23
2.725	0.025	603.00965	6797	456.75	0.0696	150.00	0.0777	3.91	606.92	319.40
2.75	0.025	606.919914	6797	456.75	0.0697	150.00	0.0777	3.91	610.83	321.57
2.775	0.025	610.826915	6797	456.75	0.0698	150.00	0.0778	3.90	614.73	323.74
2.8	0.025	614.730661	6797	456.75	0.0698	150.00	0.0778	3.90	618.63	325.91
2.825	0.025	618.631161	6797	456.75	0.0699	150.00	0.0779	3.90	622.53	328.07

2.85	0.025	622.528421	6797	456.75	0.0699	150.00	0.0780	3.89	626.42	330.23
2.875	0.025	626.422849	6797	456.75	0.0700	150.00	0.0780	3.89	630.31	332.40
2.9	0.025	630.314758	6797	456.75	0.0700	150.00	0.0781	3.89	634.20	334.56
2.925	0.025	634.204153	6797	456.75	0.0700	150.00	0.0782	3.89	638.09	336.72
2.95	0.025	638.091038	6797	456.75	0.0701	150.00	0.0782	3.88	641.98	338.88
2.975	0.025	641.975419	6797	456.75	0.0701	150.00	0.0783	3.88	645.86	341.03
3	0.025	645.857301	6797	456.75	0.0702	150.00	0.0783	3.88	649.74	343.19
3.025	0.025	649.736687	6797	456.75	0.0702	150.00	0.0784	3.88	653.61	345.34
3.05	0.025	653.613584	6797	456.75	0.0703	150.00	0.0785	3.87	657.49	347.49
3.075	0.025	657.487995	6797	456.75	0.0703	150.00	0.0785	3.87	661.36	349.64
3.1	0.025	661.359926	6797	456.75	0.0703	150.00	0.0786	3.87	665.23	351.79
3.125	0.025	665.229381	6797	456.75	0.0704	150.00	0.0787	3.87	669.10	353.94
3.15	0.025	669.096366	6797	456.75	0.0704	150.00	0.0787	3.86	672.96	356.09
3.175	0.025	672.960884	6797	456.75	0.0705	150.00	0.0788	3.86	676.82	358.23
3.2	0.025	676.82294	6797	456.75	0.0705	150.00	0.0788	3.86	680.68	360.38
3.225	0.025	680.68254	6797	456.75	0.0705	150.00	0.0789	3.86	684.54	362.52
3.25	0.025	684.539688	6797	456.75	0.0706	150.00	0.0790	3.85	688.39	364.66
3.275	0.025	688.394388	6797	456.75	0.0706	150.00	0.0790	3.85	692.25	366.80
3.3	0.025	692.246645	6797	456.75	0.0707	150.00	0.0791	3.85	696.10	368.94
3.325	0.025	696.096465	6797	456.75	0.0707	150.00	0.0791	3.85	699.94	371.08
3.35	0.025	699.94401	6797	456.75	0.0707	150.00	0.0792	3.85	703.79	373.22
3.375	0.025	703.789289	6797	456.75	0.0708	150.00	0.0792	3.84	707.63	375.35
3.4	0.025	707.632305	6797	456.75	0.0708	150.00	0.0793	3.84	711.47	377.49
3.425	0.025	711.473063	6797	456.75	0.0709	150.00	0.0793	3.84	715.31	379.62
3.45	0.025	715.311566	6797	456.75	0.0709	150.00	0.0794	3.84	719.15	381.75
3.475	0.025	719.147819	6797	456.75	0.0709	150.00	0.0794	3.83	722.98	383.88
3.5	0.025	722.981825	6797	456.75	0.0710	150.00	0.0795	3.83	726.81	386.01
3.525	0.025	726.813588	6797	456.75	0.0710	150.00	0.0795	3.83	730.64	388.14
3.55	0.025	730.643113	6797	456.75	0.0711	150.00	0.0796	3.83	734.47	390.26
3.575	0.025	734.470403	6797	456.75	0.0711	150.00	0.0796	3.83	738.30	392.39

3.6	0.025	738.295462	6797	456.75	0.0711	150.00	0.0797	3.82	742.12	394.51
3.625	0.025	742.118294	6797	456.75	0.0712	150.00	0.0797	3.82	745.94	396.63
3.65	0.025	745.938904	6797	456.75	0.0712	150.00	0.0798	3.82	749.76	398.75
3.675	0.025	749.757293	6797	456.75	0.0713	150.00	0.0798	3.82	753.57	400.87
3.7	0.025	753.573468	6797	456.75	0.0713	150.00	0.0799	3.81	757.39	402.99
3.725	0.025	757.387431	6797	456.75	0.0713	150.00	0.0799	3.81	761.20	405.11
3.75	0.025	761.199186	6797	456.75	0.0714	150.00	0.0800	3.81	765.01	407.23
3.775	0.025	765.008737	6797	456.75	0.0714	150.00	0.0800	3.81	768.82	409.34
3.8	0.025	768.816089	6797	456.75	0.0715	150.00	0.0801	3.81	772.62	411.46
3.825	0.025	772.621244	6797	456.75	0.0715	150.00	0.0801	3.80	776.42	413.57
3.85	0.025	776.424207	6797	456.75	0.0715	150.00	0.0802	3.80	780.22	415.68
3.875	0.025	780.224981	6797	456.75	0.0716	150.00	0.0802	3.80	784.02	417.79
3.9	0.025	784.02357	6797	456.75	0.0716	150.00	0.0803	3.80	787.82	419.90
3.925	0.025	787.819978	6797	456.75	0.0717	150.00	0.0803	3.79	791.61	422.01
3.95	0.025	791.614209	6797	456.75	0.0717	150.00	0.0804	3.79	795.41	424.11
3.975	0.025	795.406267	6797	456.75	0.0717	150.00	0.0804	3.79	799.20	426.22
4	0.025	799.196154	6797	456.75	0.0718	150.00	0.0805	3.79	802.98	428.32
4.025	0.025	802.983875	6797	456.75	0.0718	150.00	0.0805	3.79	806.77	430.43
4.05	0.025	806.769832	6797	456.75	0.0718	150.00	0.0806	3.78	810.55	432.53
4.075	0.025	810.554195	6797	456.75	0.0719	150.00	0.0806	3.78	814.34	434.63
4.1	0.025	814.336968	6797	456.75	0.0719	150.00	0.0807	3.78	818.12	436.73
4.125	0.025	818.118153	6797	456.75	0.0719	150.00	0.0807	3.78	821.90	438.83
4.15	0.025	821.89775	6797	456.75	0.0719	150.00	0.0808	3.78	825.68	440.93
4.175	0.025	825.675763	6797	456.75	0.0720	150.00	0.0808	3.78	829.45	443.03
4.2	0.025	829.452193	6797	456.75	0.0720	150.00	0.0809	3.77	833.23	445.13
4.225	0.025	833.227043	6797	456.75	0.0720	150.00	0.0809	3.77	837.00	447.22
4.25	0.025	837.000313	6797	456.75	0.0720	150.00	0.0810	3.77	840.77	449.32
4.275	0.025	840.772007	6797	456.75	0.0721	150.00	0.0810	3.77	844.54	451.41
4.3	0.025	844.542126	6797	456.75	0.0721	150.00	0.0811	3.77	848.31	453.51
4.325	0.025	848.310672	6797	456.75	0.0721	150.00	0.0811	3.77	852.08	455.60

4.35	0.025	852.077648	6797	456.75	0.0721	150.00	0.0812	3.77	855.84	457.69
4.375	0.025	855.843054	6797	456.75	0.0722	150.00	0.0812	3.76	859.61	459.78
4.4	0.025	859.606894	6797	456.75	0.0722	150.00	0.0813	3.76	863.37	461.87
4.425	0.025	863.369168	6797	456.75	0.0722	150.00	0.0813	3.76	867.13	463.96
4.45	0.025	867.12988	6797	456.75	0.0722	150.00	0.0814	3.76	870.89	466.05
4.475	0.025	870.88903	6797	456.75	0.0723	150.00	0.0814	3.76	874.65	468.14
4.5	0.025	874.646622	6797	456.75	0.0723	150.00	0.0815	3.76	878.40	470.22
4.525	0.025	878.402656	6797	456.75	0.0723	150.00	0.0815	3.75	882.16	472.31
4.55	0.025	882.157135	6797	456.75	0.0723	150.00	0.0816	3.75	885.91	474.39
4.575	0.025	885.91006	6797	456.75	0.0724	150.00	0.0816	3.75	889.66	476.48
4.6	0.025	889.661434	6797	456.75	0.0724	150.00	0.0817	3.75	893.41	478.56
4.625	0.025	893.411259	6797	456.75	0.0724	150.00	0.0817	3.75	897.16	480.64
4.65	0.025	897.159536	6797	456.75	0.0724	150.00	0.0818	3.75	900.91	482.73
4.675	0.025	900.906267	6797	456.75	0.0725	150.00	0.0818	3.75	904.65	484.81
4.7	0.025	904.651455	6797	456.75	0.0725	150.00	0.0819	3.74	908.40	486.89
4.725	0.025	908.395101	6797	456.75	0.0725	150.00	0.0819	3.74	912.14	488.97
4.75	0.025	912.137207	6797	456.75	0.0725	150.00	0.0819	3.74	915.88	491.04
4.775	0.025	915.877775	6797	456.75	0.0726	150.00	0.0820	3.74	919.62	493.12
4.8	0.025	919.616806	6797	456.75	0.0726	150.00	0.0820	3.74	923.35	495.20
4.825	0.025	923.354304	6797	456.75	0.0726	150.00	0.0821	3.74	927.09	497.27
4.85	0.025	927.090269	6797	456.75	0.0726	150.00	0.0821	3.73	930.82	499.35
4.875	0.025	930.824703	6797	456.75	0.0727	150.00	0.0822	3.73	934.56	501.42
4.9	0.025	934.557609	6797	456.75	0.0727	150.00	0.0822	3.73	938.29	503.49
4.925	0.025	938.288989	6797	456.75	0.0727	150.00	0.0823	3.73	942.02	505.57
4.95	0.025	942.018843	6797	456.75	0.0727	150.00	0.0823	3.73	945.75	507.64
4.975	0.025	945.747175	6797	456.75	0.0728	150.00	0.0824	3.73	949.47	509.71
5	0.025	949.473985	6797	456.75	0.0728	150.00	0.0824	3.73	953.20	511.78
5.025	0.025	953.199276	6797	456.75	0.0728	150.00	0.0825	3.72	956.92	513.85
5.05	0.025	956.92305	6797	456.75	0.0728	150.00	0.0825	3.72	960.65	515.91
5.075	0.025	960.645308	6797	456.75	0.0729	150.00	0.0826	3.72	964.37	517.98

5.1	0.025	964.366052	6797	456.75	0.0729	150.00	0.0826	3.72	968.09	520.05
5.125	0.025	968.085285	6797	456.75	0.0729	150.00	0.0827	3.72	971.80	522.11
5.15	0.025	971.803007	6797	456.75	0.0729	150.00	0.0827	3.72	975.52	524.18
5.175	0.025	975.519222	6797	456.75	0.0730	150.00	0.0828	3.71	979.23	526.24
5.2	0.025	979.23393	6797	456.75	0.0730	150.00	0.0828	3.71	982.95	528.30
5.225	0.025	982.947133	6797	456.75	0.0730	150.00	0.0829	3.71	986.66	530.37
5.25	0.025	986.65905	6797	456.75	0.0730	150.00	0.0829	3.71	990.37	532.43
5.275	0.025	990.36977	6797	456.75	0.0730	150.00	0.0830	3.71	994.08	534.49
5.3	0.025	994.079296	6797	456.75	0.0731	150.00	0.0830	3.71	997.79	536.55
5.325	0.025	997.787628	6797	456.75	0.0731	150.00	0.0831	3.71	1001.49	538.61
5.35	0.025	1001.49477	6797	456.75	0.0731	150.00	0.0831	3.71	1005.20	540.67
5.375	0.025	1005.20072	6797	456.75	0.0731	150.00	0.0832	3.70	1008.91	542.73
5.4	0.025	1008.90547	6797	456.75	0.0731	150.00	0.0832	3.70	1012.61	544.78
5.425	0.025	1012.60904	6797	456.75	0.0731	150.00	0.0833	3.70	1016.31	546.84
5.45	0.025	1016.31143	6797	456.75	0.0732	150.00	0.0833	3.70	1020.01	548.90
5.475	0.025	1020.01262	6797	456.75	0.0732	150.00	0.0833	3.70	1023.71	550.95
5.5	0.025	1023.71263	6797	456.75	0.0732	150.00	0.0834	3.70	1027.41	553.01
5.525	0.025	1027.41146	6797	456.75	0.0732	150.00	0.0834	3.70	1031.11	555.06
5.55	0.025	1031.1091	6797	456.75	0.0732	150.00	0.0835	3.70	1034.81	557.11
5.575	0.025	1034.80556	6797	456.75	0.0732	150.00	0.0835	3.70	1038.50	559.17
5.6	0.025	1038.50084	6797	456.75	0.0733	150.00	0.0836	3.69	1042.19	561.22
5.625	0.025	1042.19494	6797	456.75	0.0733	150.00	0.0836	3.69	1045.89	563.27
5.65	0.025	1045.88786	6797	456.75	0.0733	150.00	0.0837	3.69	1049.58	565.32
5.675	0.025	1049.5796	6797	456.75	0.0733	150.00	0.0837	3.69	1053.27	567.37
5.7	0.025	1053.27016	6797	456.75	0.0733	150.00	0.0838	3.69	1056.96	569.42
5.725	0.025	1056.95956	6797	456.75	0.0733	150.00	0.0838	3.69	1060.65	571.47
5.75	0.025	1060.64777	6797	456.75	0.0734	150.00	0.0839	3.69	1064.33	573.52
5.775	0.025	1064.33482	6797	456.75	0.0734	150.00	0.0839	3.69	1068.02	575.57
5.8	0.025	1068.02069	6797	456.75	0.0734	150.00	0.0840	3.68	1071.71	577.61
5.825	0.025	1071.70539	6797	456.75	0.0734	150.00	0.0840	3.68	1075.39	579.66

5.85	0.025	1075.38892	6797	456.75	0.0734	150.00	0.0841	3.68	1079.07	581.71
5.875	0.025	1079.07128	6797	456.75	0.0734	150.00	0.0841	3.68	1082.75	583.75
5.9	0.025	1082.75248	6797	456.75	0.0735	150.00	0.0842	3.68	1086.43	585.80
5.925	0.025	1086.4325	6797	456.75	0.0735	150.00	0.0842	3.68	1090.11	587.84
5.95	0.025	1090.11137	6797	456.75	0.0735	150.00	0.0843	3.68	1093.79	589.88
5.975	0.025	1093.78907	6797	456.75	0.0735	150.00	0.0843	3.68	1097.47	591.93
6	0.025	1097.4656	6797	456.75	0.0735	150.00	0.0844	3.68	1101.14	593.97
6.025	0.025	1101.14098	6797	456.75	0.0735	150.00	0.0844	3.67	1104.82	596.01
6.05	0.025	1104.81519	6797	456.75	0.0736	150.00	0.0844	3.67	1108.49	598.05
6.075	0.025	1108.48824	6797	456.75	0.0736	150.00	0.0845	3.67	1112.16	600.09
6.1	0.025	1112.16014	6797	456.75	0.0736	150.00	0.0845	3.67	1115.83	602.13
6.125	0.025	1115.83087	6797	456.75	0.0736	150.00	0.0846	3.67	1119.50	604.17
6.15	0.025	1119.50045	6797	456.75	0.0736	150.00	0.0846	3.67	1123.17	606.20
6.175	0.025	1123.16888	6797	456.75	0.0736	150.00	0.0847	3.67	1126.84	608.24
6.2	0.025	1126.83615	6797	456.75	0.0737	150.00	0.0847	3.67	1130.50	610.28
6.225	0.025	1130.50227	6797	456.75	0.0737	150.00	0.0848	3.66	1134.17	612.32
6.25	0.025	1134.16723	6797	456.75	0.0737	150.00	0.0848	3.66	1137.83	614.35
6.275	0.025	1137.83105	6797	456.75	0.0737	150.00	0.0849	3.66	1141.49	616.39
6.3	0.025	1141.49371	6797	456.75	0.0737	150.00	0.0849	3.66	1145.16	618.42
6.325	0.025	1145.15523	6797	456.75	0.0737	150.00	0.0850	3.66	1148.82	620.45
6.35	0.025	1148.81559	6797	456.75	0.0737	150.00	0.0850	3.66	1152.47	622.49
6.375	0.025	1152.47482	6797	456.75	0.0738	150.00	0.0851	3.66	1156.13	624.52
6.4	0.025	1156.13289	6797	456.75	0.0738	150.00	0.0851	3.66	1159.79	626.55
6.425	0.025	1159.78982	6797	456.75	0.0738	150.00	0.0852	3.66	1163.45	628.58
6.45	0.025	1163.44561	6797	456.75	0.0738	150.00	0.0852	3.65	1167.10	630.61
6.475	0.025	1167.10038	6797	456.75	0.0738	150.00	0.0853	3.65	1170.75	632.64
6.5	0.025	1170.75415	6797	456.75	0.0738	150.00	0.0853	3.65	1174.41	634.67
6.525	0.025	1174.40693	6797	456.75	0.0738	150.00	0.0853	3.65	1178.06	636.70
6.55	0.025	1178.05871	6797	456.75	0.0739	150.00	0.0854	3.65	1181.71	638.73
6.575	0.025	1181.7095	6797	456.75	0.0739	150.00	0.0854	3.65	1185.36	640.76

6.6	0.025	1185.3593	6797	456.75	0.0739	150.00	0.0855	3.65	1189.01	642.78
6.625	0.025	1189.00811	6797	456.75	0.0739	150.00	0.0855	3.65	1192.66	644.81
6.65	0.025	1192.65593	6797	456.75	0.0739	150.00	0.0856	3.65	1196.30	646.83
6.675	0.025	1196.30275	6797	456.75	0.0739	150.00	0.0856	3.65	1199.95	648.86
6.7	0.025	1199.94859	6797	456.75	0.0739	150.00	0.0857	3.64	1203.59	650.89
6.725	0.025	1203.59344	6797	456.75	0.0739	150.00	0.0857	3.64	1207.24	652.91
6.75	0.025	1207.2373	6797	456.75	0.0740	150.00	0.0858	3.64	1210.88	654.93
6.775	0.025	1210.88017	6797	456.75	0.0740	150.00	0.0858	3.64	1214.52	656.96
6.8	0.025	1214.52206	6797	456.75	0.0740	150.00	0.0859	3.64	1218.16	658.98
6.825	0.025	1218.16296	6797	456.75	0.0740	150.00	0.0859	3.64	1221.80	661.00
6.85	0.025	1221.80288	6797	456.75	0.0740	150.00	0.0860	3.64	1225.44	663.02
6.875	0.025	1225.44181	6797	456.75	0.0740	150.00	0.0860	3.64	1229.08	665.04
6.9	0.025	1229.07976	6797	456.75	0.0740	150.00	0.0861	3.64	1232.72	667.06
6.925	0.025	1232.71673	6797	456.75	0.0740	150.00	0.0861	3.64	1236.35	669.08
6.95	0.025	1236.35272	6797	456.75	0.0741	150.00	0.0862	3.64	1239.99	671.10
6.975	0.025	1239.98772	6797	456.75	0.0741	150.00	0.0862	3.63	1243.62	673.12
7	0.025	1243.62175	6797	456.75	0.0741	150.00	0.0862	3.63	1247.25	675.14
7.025	0.025	1247.2548	6797	456.75	0.0741	150.00	0.0863	3.63	1250.89	677.16
7.05	0.025	1250.88687	6797	456.75	0.0741	150.00	0.0863	3.63	1254.52	679.18
7.075	0.025	1254.51796	6797	456.75	0.0741	150.00	0.0864	3.63	1258.15	681.19
7.1	0.025	1258.14808	6797	456.75	0.0741	150.00	0.0864	3.63	1261.78	683.21
7.125	0.025	1261.77722	6797	456.75	0.0741	150.00	0.0865	3.63	1265.41	685.23
7.15	0.025	1265.40539	6797	456.75	0.0742	150.00	0.0865	3.63	1269.03	687.24
7.175	0.025	1269.03258	6797	456.75	0.0742	150.00	0.0866	3.63	1272.66	689.25
7.2	0.025	1272.6588	6797	456.75	0.0742	150.00	0.0866	3.63	1276.28	691.27
7.225	0.025	1276.28404	6797	456.75	0.0742	150.00	0.0867	3.62	1279.91	693.28
7.25	0.025	1279.90832	6797	456.75	0.0742	150.00	0.0867	3.62	1283.53	695.30
7.275	0.025	1283.53162	6797	456.75	0.0742	150.00	0.0868	3.62	1287.15	697.31
7.3	0.025	1287.15395	6797	456.75	0.0742	150.00	0.0868	3.62	1290.78	699.32
7.325	0.025	1290.77532	6797	456.75	0.0742	150.00	0.0869	3.62	1294.40	701.33

7.35	0.025	1294.39571	6797	456.75	0.0742	150.00	0.0869	3.62	1298.02	703.34
7.375	0.025	1298.01514	6797	456.75	0.0743	150.00	0.0870	3.62	1301.63	705.35
7.4	0.025	1301.6336	6797	456.75	0.0743	150.00	0.0870	3.62	1305.25	707.36
7.425	0.025	1305.25109	6797	456.75	0.0743	150.00	0.0870	3.62	1308.87	709.37
7.45	0.025	1308.86762	6797	456.75	0.0743	150.00	0.0871	3.62	1312.48	711.38
7.475	0.025	1312.48318	6797	456.75	0.0743	150.00	0.0871	3.61	1316.10	713.39
7.5	0.025	1316.09778	6797	456.75	0.0743	150.00	0.0872	3.61	1319.71	715.40
7.525	0.025	1319.71141	6797	456.75	0.0743	150.00	0.0872	3.61	1323.32	717.40
7.55	0.025	1323.32409	6797	456.75	0.0743	150.00	0.0873	3.61	1326.94	719.41
7.575	0.025	1326.9358	6797	456.75	0.0744	150.00	0.0873	3.61	1330.55	721.41
7.6	0.025	1330.54655	6797	456.75	0.0744	150.00	0.0874	3.61	1334.16	723.42
7.625	0.025	1334.15634	6797	456.75	0.0744	150.00	0.0874	3.61	1337.77	725.43
7.65	0.025	1337.76517	6797	456.75	0.0744	150.00	0.0875	3.61	1341.37	727.43
7.675	0.025	1341.37304	6797	456.75	0.0744	150.00	0.0875	3.61	1344.98	729.43
7.7	0.025	1344.97999	6797	456.75	0.0744	150.00	0.0876	3.61	1348.59	731.44
7.725	0.025	1348.58613	6797	456.75	0.0744	150.00	0.0876	3.61	1352.19	733.44
7.75	0.025	1352.19145	6797	456.75	0.0744	150.00	0.0877	3.60	1355.80	735.44
7.775	0.025	1355.79595	6797	456.75	0.0744	150.00	0.0877	3.60	1359.40	737.44
7.8	0.025	1359.39964	6797	456.75	0.0744	150.00	0.0877	3.60	1363.00	739.45
7.825	0.025	1363.00252	6797	456.75	0.0745	150.00	0.0878	3.60	1366.60	741.45
7.85	0.025	1366.60458	6797	456.75	0.0745	150.00	0.0878	3.60	1370.21	743.45
7.875	0.025	1370.20582	6797	456.75	0.0745	150.00	0.0879	3.60	1373.81	745.45
7.9	0.025	1373.80626	6797	456.75	0.0745	150.00	0.0879	3.60	1377.41	747.45
7.925	0.025	1377.40588	6797	456.75	0.0745	150.00	0.0880	3.60	1381.00	749.45
7.95	0.025	1381.00468	6797	456.75	0.0745	150.00	0.0880	3.60	1384.60	751.45
7.975	0.025	1384.60268	6797	456.75	0.0745	150.00	0.0881	3.60	1388.20	753.44
8	0.025	1388.19987	6797	456.75	0.0745	150.00	0.0881	3.60	1391.80	755.44
8.025	0.025	1391.79624	6797	456.75	0.0745	150.00	0.0882	3.60	1395.39	757.44
8.05	0.025	1395.39181	6797	456.75	0.0745	150.00	0.0882	3.59	1398.99	759.44
8.075	0.025	1398.98656	6797	456.75	0.0745	150.00	0.0883	3.59	1402.58	761.43

8.1	0.025	1402.58051	6797	456.75	0.0745	150.00	0.0883	3.59	1406.17	763.43
8.125	0.025	1406.17365	6797	456.75	0.0745	150.00	0.0884	3.59	1409.77	765.43
8.15	0.025	1409.76598	6797	456.75	0.0746	150.00	0.0884	3.59	1413.36	767.42
8.175	0.025	1413.3575	6797	456.75	0.0746	150.00	0.0884	3.59	1416.95	769.42
8.2	0.025	1416.94822	6797	456.75	0.0746	150.00	0.0885	3.59	1420.54	771.41
8.225	0.025	1420.53813	6797	456.75	0.0746	150.00	0.0885	3.59	1424.13	773.40
8.25	0.025	1424.12723	6797	456.75	0.0746	150.00	0.0886	3.59	1427.72	775.40
8.275	0.025	1427.71553	6797	456.75	0.0746	150.00	0.0886	3.59	1431.30	777.39
8.3	0.025	1431.30303	6797	456.75	0.0746	150.00	0.0887	3.59	1434.89	779.38
8.325	0.025	1434.88972	6797	456.75	0.0746	150.00	0.0887	3.59	1438.48	781.38
8.35	0.025	1438.47561	6797	456.75	0.0746	150.00	0.0888	3.59	1442.06	783.37
8.375	0.025	1442.06069	6797	456.75	0.0746	150.00	0.0888	3.58	1445.64	785.36
8.4	0.025	1445.64498	6797	456.75	0.0746	150.00	0.0889	3.58	1449.23	787.35
8.425	0.025	1449.22846	6797	456.75	0.0746	150.00	0.0889	3.58	1452.81	789.34
8.45	0.025	1452.81114	6797	456.75	0.0746	150.00	0.0890	3.58	1456.39	791.33
8.475	0.025	1456.39302	6797	456.75	0.0747	150.00	0.0890	3.58	1459.97	793.32
8.5	0.025	1459.9741	6797	456.75	0.0747	150.00	0.0891	3.58	1463.55	795.31
8.525	0.025	1463.55437	6797	456.75	0.0747	150.00	0.0891	3.58	1467.13	797.30
8.55	0.025	1467.13386	6797	456.75	0.0747	150.00	0.0891	3.58	1470.71	799.28
8.575	0.025	1470.71254	6797	456.75	0.0747	150.00	0.0892	3.58	1474.29	801.27
8.6	0.025	1474.29042	6797	456.75	0.0747	150.00	0.0892	3.58	1477.87	803.26
8.625	0.025	1477.86751	6797	456.75	0.0747	150.00	0.0893	3.58	1481.44	805.25
8.65	0.025	1481.4438	6797	456.75	0.0747	150.00	0.0893	3.58	1485.02	807.23
8.675	0.025	1485.01929	6797	456.75	0.0747	150.00	0.0894	3.57	1488.59	809.22
8.7	0.025	1488.59398	6797	456.75	0.0747	150.00	0.0894	3.57	1492.17	811.20
8.725	0.025	1492.16789	6797	456.75	0.0747	150.00	0.0895	3.57	1495.74	813.19
8.75	0.025	1495.74099	6797	456.75	0.0747	150.00	0.0895	3.57	1499.31	815.17
8.775	0.025	1499.3133	6797	456.75	0.0748	150.00	0.0896	3.57	1502.88	817.16
8.8	0.025	1502.88482	6797	456.75	0.0748	150.00	0.0927	3.54	1506.42	819.12
8.825	0.025	1506.42093	6797	456.75	0.0748	150.00	0.1126	3.33	1509.75	820.97

8.85	0.025	1509.75056	6797	456.75	0.0748	150.00	0.1211	3.25	1513.00	822.78
8.875	0.025	1512.99861	6797	456.75	0.0748	150.00	0.1230	3.23	1516.23	824.57
8.9	0.025	1516.2289	6797	456.75	0.0748	150.00	0.1249	3.21	1519.44	826.36
8.925	0.025	1519.44172	6797	456.75	0.0748	150.00	0.1267	3.20	1522.64	828.13
8.95	0.025	1522.63737	6797	456.75	0.0748	150.00	0.1286	3.18	1525.82	829.90
8.975	0.025	1525.81624	6797	456.75	0.0748	150.00	0.1305	3.16	1528.98	831.65
9	0.025	1528.97866	6797	456.75	0.0748	150.00	0.1323	3.15	1532.12	833.40
9.025	0.025	1532.12487	6797	456.75	0.0748	150.00	0.1341	3.13	1535.26	835.14
9.05	0.025	1535.25513	6797	456.75	0.0748	150.00	0.1360	3.11	1538.37	836.87
9.075	0.025	1538.36967	6797	456.75	0.0748	150.00	0.1378	3.10	1541.47	838.59
9.1	0.025	1541.46874	6797	456.75	0.0748	150.00	0.1396	3.08	1544.55	840.31
9.125	0.025	1544.55255	6797	456.75	0.0748	150.00	0.1410	3.07	1547.62	842.01
9.15	0.025	1547.62419	6797	456.75	0.0748	150.00	0.1415	3.07	1550.69	843.72
9.175	0.025	1550.69157	6797	456.75	0.0748	150.00	0.1421	3.06	1553.75	845.42
9.2	0.025	1553.75471	6797	456.75	0.0748	150.00	0.1426	3.06	1556.81	847.12
9.225	0.025	1556.81362	6797	456.75	0.0748	150.00	0.1431	3.05	1559.87	848.82
9.25	0.025	1559.86833	6797	456.75	0.0748	150.00	0.1436	3.05	1562.92	850.51
9.275	0.025	1562.91885	6797	456.75	0.0748	150.00	0.1441	3.05	1565.97	852.20
9.3	0.025	1565.96521	6797	456.75	0.0748	150.00	0.1446	3.04	1569.01	853.89
9.325	0.025	1569.0074	6797	456.75	0.0748	150.00	0.1451	3.04	1572.05	855.58
9.35	0.025	1572.04547	6797	456.75	0.0748	150.00	0.1456	3.03	1575.08	857.27
9.375	0.025	1575.07941	6797	456.75	0.0748	150.00	0.1461	3.03	1578.11	858.95
9.4	0.025	1578.10925	6797	456.75	0.0748	150.00	0.1466	3.03	1581.13	860.63
9.425	0.025	1581.135	6797	456.75	0.0748	150.00	0.1479	3.02	1584.15	862.31
9.45	0.025	1584.15078	6797	456.75	0.0748	150.00	0.1499	3.00	1587.15	863.97
9.475	0.025	1587.14997	6797	456.75	0.0748	150.00	0.1520	2.98	1590.13	865.63
9.5	0.025	1590.13284	6797	456.75	0.0748	150.00	0.1541	2.97	1593.10	867.28
9.525	0.025	1593.09966	6797	456.75	0.0748	150.00	0.1561	2.95	1596.05	868.92
9.55	0.025	1596.05069	6797	456.75	0.0748	150.00	0.1581	2.94	1598.99	870.55
9.575	0.025	1598.98617	6797	456.75	0.0748	150.00	0.1602	2.92	1601.91	872.17

9.6	0.025	1601.90635	6797	456.75	0.0748	150.00	0.1622	2.91	1604.81	873.78
9.625	0.025	1604.81146	6797	456.75	0.0748	150.00	0.1642	2.89	1607.70	875.39
9.65	0.025	1607.70174	6797	456.75	0.0748	150.00	0.1662	2.88	1610.58	876.99
9.675	0.025	1610.57741	6797	456.75	0.0748	150.00	0.1682	2.86	1613.44	878.58
9.7	0.025	1613.43869	6797	456.75	0.0748	150.00	0.1701	2.85	1616.29	880.16
9.725	0.025	1616.2858	6797	456.75	0.0748	150.00	0.1721	2.83	1619.12	881.73
9.75	0.025	1619.11911	6797	456.75	0.0748	150.00	0.1739	2.82	1621.94	883.30
9.775	0.025	1621.93955	6797	456.75	0.0748	150.00	0.1757	2.81	1624.75	884.86
9.8	0.025	1624.74728	6797	456.75	0.0748	150.00	0.1775	2.80	1627.54	886.41
9.825	0.025	1627.54247	6797	456.75	0.0748	150.00	0.1793	2.78	1630.33	887.96
9.85	0.025	1630.3253	6797	456.75	0.0748	150.00	0.1811	2.77	1633.10	889.50
9.875	0.025	1633.09592	6797	456.75	0.0748	150.00	0.1829	2.76	1635.85	891.03
9.9	0.025	1635.85449	6797	456.75	0.0748	150.00	0.1847	2.75	1638.60	892.56
9.925	0.025	1638.60117	6797	456.75	0.0748	150.00	0.1864	2.73	1641.34	894.08
9.95	0.025	1641.33611	6797	456.75	0.0748	150.00	0.1882	2.72	1644.06	895.59
9.975	0.025	1644.05947	6797	456.75	0.0748	150.00	0.1900	2.71	1646.77	897.10
10	0.025	1646.77138	6797	456.75	0.0748	150.00	0.1917	2.70	1649.47	898.60
10.025	0.025	1649.472	6797	456.75	0.0748	150.00	0.1934	2.69	1652.16	900.09
10.05	0.025	1652.16145	6797	456.75	0.0748	150.00	0.1949	2.68	1654.84	901.58
10.075	0.025	1654.84165	6797	456.75	0.0748	150.00	0.1949	2.68	1657.52	903.07
10.1	0.025	1657.52184	6797	456.75	0.0748	150.00	0.1949	2.68	1660.20	904.56

<u>Optima-2 Calculation</u>										
<u>Elapsed Time</u>	<u>Time Step</u>	<u>Initial Temp</u>	<u>Decay Heat</u>	<u>Mass UO2</u>	<u>Cp UO2</u>	<u>Mass Zirc</u>	<u>Cp Zirc</u>	<u>ΔT</u>	<u>Ending Temp</u>	
hr	hr	°F	BTU/hr	lbm	BTU/lbm-°F	lbm	BTU/lbm-°F	°F	°F	°C
0	0.025	150	6452	445.25	0.0591	132.43	0.0690	4.55	154.55	68.08
0.025	0.025	154.551787	6452	445.25	0.0592	132.43	0.0692	4.54	159.09	70.61
0.05	0.025	159.091908	6452	445.2499	0.0594	132.43	0.0693	4.53	163.62	73.12
0.075	0.025	163.620452	6452	445.2499	0.0596	132.43	0.0694	4.52	168.14	75.63
0.1	0.025	168.137507	6452	445.2499	0.0597	132.43	0.0695	4.51	172.64	78.14
0.125	0.025	172.643161	6452	445.2499	0.0599	132.43	0.0697	4.49	177.14	80.63
0.15	0.025	177.1375	6452	445.2499	0.0600	132.43	0.0698	4.48	181.62	83.12
0.175	0.025	181.620607	6452	445.2499	0.0602	132.43	0.0699	4.47	186.09	85.61
0.2	0.025	186.092568	6452	445.2499	0.0604	132.43	0.0700	4.46	190.55	88.09
0.225	0.025	190.553465	6452	445.2499	0.0605	132.43	0.0702	4.45	195.00	90.56
0.25	0.025	195.00338	6452	445.2499	0.0607	132.43	0.0703	4.44	199.44	93.02
0.275	0.025	199.442393	6452	445.2499	0.0609	132.43	0.0704	4.43	203.87	95.48
0.3	0.025	203.870585	6452	445.2499	0.0610	132.43	0.0705	4.42	208.29	97.94
0.325	0.025	208.288033	6452	445.2499	0.0612	132.43	0.0707	4.41	212.69	100.39
0.35	0.025	212.694817	6452	445.2499	0.0614	132.43	0.0708	4.40	217.09	102.83
0.375	0.025	217.091013	6452	445.2499	0.0615	132.43	0.0709	4.39	221.48	105.26
0.4	0.025	221.476697	6452	445.2499	0.0617	132.43	0.0710	4.38	225.85	107.70
0.425	0.025	225.851944	6452	445.2499	0.0618	132.43	0.0711	4.36	230.22	110.12
0.45	0.025	230.216828	6452	445.2499	0.0620	132.43	0.0713	4.35	234.57	112.54
0.475	0.025	234.571423	6452	445.2499	0.0622	132.43	0.0714	4.34	238.92	114.95
0.5	0.025	238.915801	6452	445.2499	0.0623	132.43	0.0715	4.33	243.25	117.36
0.525	0.025	243.250033	6452	445.2499	0.0625	132.43	0.0716	4.32	247.57	119.76
0.55	0.025	247.574192	6452	445.2499	0.0626	132.43	0.0717	4.31	251.89	122.16
0.575	0.025	251.888346	6452	445.2499	0.0628	132.43	0.0719	4.30	256.19	124.55
0.6	0.025	256.192564	6452	445.2499	0.0629	132.43	0.0720	4.29	260.49	126.94
0.625	0.025	260.486916	6452	445.2499	0.0631	132.43	0.0721	4.28	264.77	129.32

0.65	0.025	264.771606	6452	445.2499	0.0632	132.43	0.0722	4.28	269.05	131.69
0.675	0.025	269.050313	6452	445.2499	0.0633	132.43	0.0722	4.27	273.32	134.07
0.7	0.025	273.32306	6452	445.2499	0.0634	132.43	0.0723	4.27	277.59	136.44
0.725	0.025	277.589873	6452	445.2499	0.0635	132.43	0.0724	4.26	281.85	138.81
0.75	0.025	281.850777	6452	445.2499	0.0636	132.43	0.0724	4.26	286.11	141.17
0.775	0.025	286.105796	6452	445.2499	0.0637	132.43	0.0725	4.25	290.35	143.53
0.8	0.025	290.354954	6452	445.2499	0.0638	132.43	0.0726	4.24	294.60	145.89
0.825	0.025	294.598276	6452	445.2499	0.0639	132.43	0.0727	4.24	298.84	148.24
0.85	0.025	298.835785	6452	445.2499	0.0640	132.43	0.0727	4.23	303.07	150.59
0.875	0.025	303.067506	6452	445.2499	0.0641	132.43	0.0728	4.23	307.29	152.94
0.9	0.025	307.293462	6452	445.2499	0.0642	132.43	0.0729	4.22	311.51	155.29
0.925	0.025	311.513676	6452	445.2499	0.0643	132.43	0.0729	4.21	315.73	157.63
0.95	0.025	315.728173	6452	445.2499	0.0644	132.43	0.0730	4.21	319.94	159.96
0.975	0.025	319.936974	6452	445.2499	0.0645	132.43	0.0731	4.20	324.14	162.30
1	0.025	324.140103	6452	445.2499	0.0646	132.43	0.0731	4.20	328.34	164.63
1.025	0.025	328.337584	6452	445.2499	0.0646	132.43	0.0732	4.19	332.53	166.96
1.05	0.025	332.529438	6452	445.2499	0.0647	132.43	0.0733	4.19	336.72	169.29
1.075	0.025	336.715689	6452	445.2499	0.0648	132.43	0.0733	4.18	340.90	171.61
1.1	0.025	340.896358	6452	445.2499	0.0649	132.43	0.0734	4.18	345.07	173.93
1.125	0.025	345.071468	6452	445.2499	0.0650	132.43	0.0735	4.17	349.24	176.25
1.15	0.025	349.241042	6452	445.2499	0.0651	132.43	0.0735	4.16	353.41	178.56
1.175	0.025	353.4051	6452	445.2499	0.0652	132.43	0.0736	4.16	357.56	180.87
1.2	0.025	357.563666	6452	445.2499	0.0653	132.43	0.0737	4.15	361.72	183.18
1.225	0.025	361.71676	6452	445.2499	0.0654	132.43	0.0737	4.15	365.86	185.48
1.25	0.025	365.864404	6452	445.2499	0.0655	132.43	0.0738	4.14	370.01	187.78
1.275	0.025	370.00662	6452	445.2499	0.0656	132.43	0.0739	4.14	374.14	190.08
1.3	0.025	374.143428	6452	445.2499	0.0657	132.43	0.0739	4.13	378.27	192.37
1.325	0.025	378.274851	6452	445.2499	0.0658	132.43	0.0740	4.13	382.40	194.67
1.35	0.025	382.400909	6452	445.2499	0.0659	132.43	0.0741	4.12	386.52	196.96

1.375	0.025	386.521622	6452	445.2499	0.0660	132.43	0.0741	4.12	390.64	199.24
1.4	0.025	390.637012	6452	445.2499	0.0661	132.43	0.0742	4.11	394.75	201.53
1.425	0.025	394.7471	6452	445.2499	0.0662	132.43	0.0743	4.10	398.85	203.81
1.45	0.025	398.851904	6452	445.2499	0.0663	132.43	0.0743	4.10	402.95	206.08
1.475	0.025	402.951447	6452	445.2499	0.0663	132.43	0.0744	4.09	407.05	208.36
1.5	0.025	407.045748	6452	445.2499	0.0664	132.43	0.0745	4.09	411.13	210.63
1.525	0.025	411.134827	6452	445.2499	0.0665	132.43	0.0745	4.08	415.22	212.90
1.55	0.025	415.218704	6452	445.2499	0.0666	132.43	0.0746	4.08	419.30	215.17
1.575	0.025	419.297399	6452	445.2499	0.0667	132.43	0.0747	4.07	423.37	217.43
1.6	0.025	423.370932	6452	445.2499	0.0668	132.43	0.0747	4.07	427.44	219.69
1.625	0.025	427.439322	6452	445.2499	0.0669	132.43	0.0748	4.06	431.50	221.95
1.65	0.025	431.502588	6452	445.2499	0.0670	132.43	0.0749	4.06	435.56	224.20
1.675	0.025	435.56075	6452	445.2499	0.0671	132.43	0.0749	4.05	439.61	226.45
1.7	0.025	439.613828	6452	445.2499	0.0672	132.43	0.0750	4.05	443.66	228.70
1.725	0.025	443.66184	6452	445.2499	0.0672	132.43	0.0751	4.04	447.71	230.95
1.75	0.025	447.705974	6452	445.2499	0.0673	132.43	0.0751	4.04	451.75	233.19
1.775	0.025	451.746493	6452	445.2499	0.0674	132.43	0.0752	4.04	455.78	235.44
1.8	0.025	455.783407	6452	445.2499	0.0674	132.43	0.0753	4.03	459.82	237.68
1.825	0.025	459.816724	6452	445.2499	0.0675	132.43	0.0753	4.03	463.85	239.91
1.85	0.025	463.846455	6452	445.2499	0.0676	132.43	0.0754	4.03	467.87	242.15
1.875	0.025	467.872609	6452	445.2499	0.0676	132.43	0.0755	4.02	471.90	244.39
1.9	0.025	471.895195	6452	445.2499	0.0677	132.43	0.0755	4.02	475.91	246.62
1.925	0.025	475.914224	6452	445.2499	0.0677	132.43	0.0756	4.02	479.93	248.85
1.95	0.025	479.929704	6452	445.2499	0.0678	132.43	0.0757	4.01	483.94	251.08
1.975	0.025	483.941645	6452	445.2499	0.0679	132.43	0.0757	4.01	487.95	253.31
2	0.025	487.950057	6452	445.2499	0.0679	132.43	0.0758	4.00	491.95	255.53
2.025	0.025	491.954948	6452	445.2499	0.0680	132.43	0.0759	4.00	495.96	257.75
2.05	0.025	495.956327	6452	445.2499	0.0680	132.43	0.0759	4.00	499.95	259.97
2.075	0.025	499.954205	6452	445.2499	0.0681	132.43	0.0760	3.99	503.95	262.19

2.1	0.025	503.94859	6452	445.2499	0.0682	132.43	0.0760	3.99	507.94	264.41
2.125	0.025	507.939491	6452	445.2499	0.0682	132.43	0.0761	3.99	511.93	266.63
2.15	0.025	511.926918	6452	445.2499	0.0683	132.43	0.0762	3.98	515.91	268.84
2.175	0.025	515.910879	6452	445.2499	0.0683	132.43	0.0762	3.98	519.89	271.05
2.2	0.025	519.891384	6452	445.2499	0.0684	132.43	0.0763	3.98	523.87	273.26
2.225	0.025	523.868441	6452	445.2499	0.0685	132.43	0.0764	3.97	527.84	275.47
2.25	0.025	527.84206	6452	445.2499	0.0685	132.43	0.0764	3.97	531.81	277.67
2.275	0.025	531.812249	6452	445.2499	0.0686	132.43	0.0765	3.97	535.78	279.88
2.3	0.025	535.779018	6452	445.2499	0.0686	132.43	0.0766	3.96	539.74	282.08
2.325	0.025	539.742374	6452	445.2499	0.0687	132.43	0.0766	3.96	543.70	284.28
2.35	0.025	543.702327	6452	445.2499	0.0688	132.43	0.0767	3.96	547.66	286.48
2.375	0.025	547.658886	6452	445.2499	0.0688	132.43	0.0768	3.95	551.61	288.67
2.4	0.025	551.61206	6452	445.2499	0.0689	132.43	0.0768	3.95	555.56	290.87
2.425	0.025	555.561856	6452	445.2499	0.0689	132.43	0.0769	3.95	559.51	293.06
2.45	0.025	559.508284	6452	445.2499	0.0690	132.43	0.0769	3.94	563.45	295.25
2.475	0.025	563.451352	6452	445.2499	0.0690	132.43	0.0770	3.94	567.39	297.44
2.5	0.025	567.391069	6452	445.2499	0.0691	132.43	0.0771	3.94	571.33	299.63
2.525	0.025	571.327443	6452	445.2499	0.0692	132.43	0.0771	3.93	575.26	301.81
2.55	0.025	575.260483	6452	445.2499	0.0692	132.43	0.0772	3.93	579.19	303.99
2.575	0.025	579.190198	6452	445.2499	0.0693	132.43	0.0773	3.93	583.12	306.18
2.6	0.025	583.116595	6452	445.2499	0.0693	132.43	0.0773	3.92	587.04	308.36
2.625	0.025	587.039683	6452	445.2499	0.0694	132.43	0.0774	3.92	590.96	310.53
2.65	0.025	590.959471	6452	445.2499	0.0695	132.43	0.0775	3.92	594.88	312.71
2.675	0.025	594.875967	6452	445.2499	0.0695	132.43	0.0775	3.91	598.79	314.88
2.7	0.025	598.789178	6452	445.2499	0.0696	132.43	0.0776	3.91	602.70	317.06
2.725	0.025	602.699114	6452	445.2499	0.0696	132.43	0.0776	3.91	606.61	319.23
2.75	0.025	606.605783	6452	445.2499	0.0697	132.43	0.0777	3.90	610.51	321.39
2.775	0.025	610.509192	6452	445.2499	0.0698	132.43	0.0778	3.90	614.41	323.56
2.8	0.025	614.409351	6452	445.2499	0.0698	132.43	0.0778	3.90	618.31	325.73
2.825	0.025	618.306266	6452	445.2499	0.0699	132.43	0.0779	3.89	622.20	327.89

2.85	0.025	622.199946	6452	445.2499	0.0699	132.43	0.0780	3.89	626.09	330.05
2.875	0.025	626.090746	6452	445.2499	0.0700	132.43	0.0780	3.89	629.98	332.21
2.9	0.025	629.979049	6452	445.2499	0.0700	132.43	0.0781	3.89	633.86	334.37
2.925	0.025	633.864858	6452	445.2499	0.0700	132.43	0.0782	3.88	637.75	336.53
2.95	0.025	637.748178	6452	445.2499	0.0701	132.43	0.0782	3.88	641.63	338.68
2.975	0.025	641.629015	6452	445.2499	0.0701	132.43	0.0783	3.88	645.51	340.84
3	0.025	645.507372	6452	445.2499	0.0702	132.43	0.0783	3.88	649.38	342.99
3.025	0.025	649.383256	6452	445.2499	0.0702	132.43	0.0784	3.87	653.26	345.14
3.05	0.025	653.256669	6452	445.2499	0.0702	132.43	0.0785	3.87	657.13	347.29
3.075	0.025	657.127618	6452	445.2499	0.0703	132.43	0.0785	3.87	661.00	349.44
3.1	0.025	660.996107	6452	445.2499	0.0703	132.43	0.0786	3.87	664.86	351.59
3.125	0.025	664.86214	6452	445.2499	0.0704	132.43	0.0787	3.86	668.73	353.74
3.15	0.025	668.725722	6452	445.2499	0.0704	132.43	0.0787	3.86	672.59	355.88
3.175	0.025	672.586858	6452	445.2499	0.0705	132.43	0.0788	3.86	676.45	358.03
3.2	0.025	676.445553	6452	445.2499	0.0705	132.43	0.0788	3.86	680.30	360.17
3.225	0.025	680.301811	6452	445.2499	0.0705	132.43	0.0789	3.85	684.16	362.31
3.25	0.025	684.155636	6452	445.2499	0.0706	132.43	0.0790	3.85	688.01	364.45
3.275	0.025	688.007034	6452	445.2499	0.0706	132.43	0.0790	3.85	691.86	366.59
3.3	0.025	691.856009	6452	445.2499	0.0707	132.43	0.0791	3.85	695.70	368.72
3.325	0.025	695.702565	6452	445.2499	0.0707	132.43	0.0791	3.84	699.55	370.86
3.35	0.025	699.54684	6452	445.2499	0.0707	132.43	0.0792	3.84	703.39	372.99
3.375	0.025	703.388856	6452	445.2499	0.0708	132.43	0.0792	3.84	707.23	375.13
3.4	0.025	707.228617	6452	445.2499	0.0708	132.43	0.0793	3.84	711.07	377.26
3.425	0.025	711.066128	6452	445.2499	0.0709	132.43	0.0793	3.84	714.90	379.39
3.45	0.025	714.901392	6452	445.2499	0.0709	132.43	0.0794	3.83	718.73	381.52
3.475	0.025	718.734413	6452	445.2499	0.0709	132.43	0.0794	3.83	722.57	383.65
3.5	0.025	722.565195	6452	445.2499	0.0710	132.43	0.0795	3.83	726.39	385.77
3.525	0.025	726.393742	6452	445.2499	0.0710	132.43	0.0795	3.83	730.22	387.90
3.55	0.025	730.220058	6452	445.2499	0.0711	132.43	0.0796	3.82	734.04	390.02
3.575	0.025	734.044146	6452	445.2499	0.0711	132.43	0.0796	3.82	737.87	392.15

3.6	0.025	737.866012	6452	445.2499	0.0711	132.43	0.0797	3.82	741.69	394.27
3.625	0.025	741.685658	6452	445.2499	0.0712	132.43	0.0797	3.82	745.50	396.39
3.65	0.025	745.503088	6452	445.2499	0.0712	132.43	0.0798	3.82	749.32	398.51
3.675	0.025	749.318307	6452	445.2499	0.0713	132.43	0.0798	3.81	753.13	400.63
3.7	0.025	753.131318	6452	445.2499	0.0713	132.43	0.0799	3.81	756.94	402.75
3.725	0.025	756.942125	6452	445.2499	0.0713	132.43	0.0799	3.81	760.75	404.86
3.75	0.025	760.750731	6452	445.2499	0.0714	132.43	0.0800	3.81	764.56	406.98
3.775	0.025	764.557141	6452	445.2499	0.0714	132.43	0.0800	3.80	768.36	409.09
3.8	0.025	768.361359	6452	445.2499	0.0715	132.43	0.0801	3.80	772.16	411.20
3.825	0.025	772.163387	6452	445.2499	0.0715	132.43	0.0801	3.80	775.96	413.31
3.85	0.025	775.963231	6452	445.2499	0.0715	132.43	0.0802	3.80	779.76	415.42
3.875	0.025	779.760893	6452	445.2499	0.0716	132.43	0.0802	3.80	783.56	417.53
3.9	0.025	783.556378	6452	445.2499	0.0716	132.43	0.0803	3.79	787.35	419.64
3.925	0.025	787.349688	6452	445.2499	0.0717	132.43	0.0803	3.79	791.14	421.74
3.95	0.025	791.140829	6452	445.2499	0.0717	132.43	0.0804	3.79	794.93	423.85
3.975	0.025	794.929803	6452	445.2499	0.0717	132.43	0.0804	3.79	798.72	425.95
4	0.025	798.716615	6452	445.2499	0.0718	132.43	0.0805	3.78	802.50	428.06
4.025	0.025	802.501268	6452	445.2499	0.0718	132.43	0.0805	3.78	806.28	430.16
4.05	0.025	806.284099	6452	445.2499	0.0718	132.43	0.0806	3.78	810.07	432.26
4.075	0.025	810.065358	6452	445.2499	0.0719	132.43	0.0806	3.78	813.85	434.36
4.1	0.025	813.845048	6452	445.2499	0.0719	132.43	0.0807	3.78	817.62	436.46
4.125	0.025	817.62317	6452	445.2499	0.0719	132.43	0.0807	3.78	821.40	438.56
4.15	0.025	821.399726	6452	445.2499	0.0719	132.43	0.0808	3.77	825.17	440.65
4.175	0.025	825.174719	6452	445.2499	0.0720	132.43	0.0808	3.77	828.95	442.75
4.2	0.025	828.948149	6452	445.2499	0.0720	132.43	0.0809	3.77	832.72	444.84
4.225	0.025	832.72002	6452	445.2499	0.0720	132.43	0.0809	3.77	836.49	446.94
4.25	0.025	836.490332	6452	445.2499	0.0720	132.43	0.0810	3.77	840.26	449.03
4.275	0.025	840.259089	6452	445.2499	0.0721	132.43	0.0810	3.77	844.03	451.13
4.3	0.025	844.026291	6452	445.2499	0.0721	132.43	0.0811	3.77	847.79	453.22
4.325	0.025	847.791941	6452	445.2499	0.0721	132.43	0.0811	3.76	851.56	455.31

4.35	0.025	851.556041	6452	445.2499	0.0721	132.43	0.0812	3.76	855.32	457.40
4.375	0.025	855.318592	6452	445.2499	0.0722	132.43	0.0812	3.76	859.08	459.49
4.4	0.025	859.079597	6452	445.2499	0.0722	132.43	0.0813	3.76	862.84	461.58
4.425	0.025	862.839057	6452	445.2499	0.0722	132.43	0.0813	3.76	866.60	463.66
4.45	0.025	866.596974	6452	445.2499	0.0722	132.43	0.0814	3.76	870.35	465.75
4.475	0.025	870.353351	6452	445.2499	0.0723	132.43	0.0814	3.75	874.11	467.84
4.5	0.025	874.108189	6452	445.2499	0.0723	132.43	0.0815	3.75	877.86	469.92
4.525	0.025	877.86149	6452	445.2499	0.0723	132.43	0.0815	3.75	881.61	472.01
4.55	0.025	881.613255	6452	445.2499	0.0723	132.43	0.0816	3.75	885.36	474.09
4.575	0.025	885.363488	6452	445.2499	0.0724	132.43	0.0816	3.75	889.11	476.17
4.6	0.025	889.112189	6452	445.2499	0.0724	132.43	0.0817	3.75	892.86	478.26
4.625	0.025	892.85936	6452	445.2499	0.0724	132.43	0.0817	3.75	896.61	480.34
4.65	0.025	896.605004	6452	445.2499	0.0724	132.43	0.0817	3.74	900.35	482.42
4.675	0.025	900.349122	6452	445.2499	0.0725	132.43	0.0818	3.74	904.09	484.50
4.7	0.025	904.091717	6452	445.2499	0.0725	132.43	0.0818	3.74	907.83	486.57
4.725	0.025	907.832789	6452	445.2499	0.0725	132.43	0.0819	3.74	911.57	488.65
4.75	0.025	911.572341	6452	445.2499	0.0725	132.43	0.0819	3.74	915.31	490.73
4.775	0.025	915.310375	6452	445.2499	0.0726	132.43	0.0820	3.74	919.05	492.80
4.8	0.025	919.046892	6452	445.2499	0.0726	132.43	0.0820	3.74	922.78	494.88
4.825	0.025	922.781895	6452	445.2499	0.0726	132.43	0.0821	3.73	926.52	496.95
4.85	0.025	926.515385	6452	445.2499	0.0726	132.43	0.0821	3.73	930.25	499.03
4.875	0.025	930.247364	6452	445.2499	0.0727	132.43	0.0822	3.73	933.98	501.10
4.9	0.025	933.977834	6452	445.2499	0.0727	132.43	0.0822	3.73	937.71	503.17
4.925	0.025	937.706796	6452	445.2499	0.0727	132.43	0.0823	3.73	941.43	505.24
4.95	0.025	941.434253	6452	445.2499	0.0727	132.43	0.0823	3.73	945.16	507.31
4.975	0.025	945.160207	6452	445.2499	0.0728	132.43	0.0824	3.72	948.88	509.38
5	0.025	948.884658	6452	445.2499	0.0728	132.43	0.0824	3.72	952.61	511.45
5.025	0.025	952.60761	6452	445.2499	0.0728	132.43	0.0825	3.72	956.33	513.52
5.05	0.025	956.329063	6452	445.2499	0.0728	132.43	0.0825	3.72	960.05	515.58
5.075	0.025	960.04902	6452	445.2499	0.0729	132.43	0.0826	3.72	963.77	517.65

5.1	0.025	963.767483	6452	445.2499	0.0729	132.43	0.0826	3.72	967.48	519.71
5.125	0.025	967.484453	6452	445.2499	0.0729	132.43	0.0827	3.72	971.20	521.78
5.15	0.025	971.199931	6452	445.2499	0.0729	132.43	0.0827	3.71	974.91	523.84
5.175	0.025	974.913921	6452	445.2499	0.0730	132.43	0.0828	3.71	978.63	525.90
5.2	0.025	978.626423	6452	445.2499	0.0730	132.43	0.0828	3.71	982.34	527.97
5.225	0.025	982.337439	6452	445.2499	0.0730	132.43	0.0829	3.71	986.05	530.03
5.25	0.025	986.047141	6452	445.2499	0.0730	132.43	0.0829	3.71	989.76	532.09
5.275	0.025	989.755674	6452	445.2499	0.0730	132.43	0.0830	3.71	993.46	534.15
5.3	0.025	993.463039	6452	445.2499	0.0731	132.43	0.0830	3.71	997.17	536.21
5.325	0.025	997.169236	6452	445.2499	0.0731	132.43	0.0831	3.71	1000.87	538.26
5.35	0.025	1000.87427	6452	445.2499	0.0731	132.43	0.0831	3.70	1004.58	540.32
5.375	0.025	1004.57813	6452	445.2499	0.0731	132.43	0.0831	3.70	1008.28	542.38
5.4	0.025	1008.28084	6452	445.2499	0.0731	132.43	0.0832	3.70	1011.98	544.43
5.425	0.025	1011.98238	6452	445.2499	0.0731	132.43	0.0832	3.70	1015.68	546.49
5.45	0.025	1015.68275	6452	445.2499	0.0732	132.43	0.0833	3.70	1019.38	548.55
5.475	0.025	1019.38197	6452	445.2499	0.0732	132.43	0.0833	3.70	1023.08	550.60
5.5	0.025	1023.08003	6452	445.2499	0.0732	132.43	0.0834	3.70	1026.78	552.65
5.525	0.025	1026.77693	6452	445.2499	0.0732	132.43	0.0834	3.70	1030.47	554.71
5.55	0.025	1030.47267	6452	445.2499	0.0732	132.43	0.0835	3.69	1034.17	556.76
5.575	0.025	1034.16726	6452	445.2499	0.0732	132.43	0.0835	3.69	1037.86	558.81
5.6	0.025	1037.86069	6452	445.2499	0.0733	132.43	0.0836	3.69	1041.55	560.86
5.625	0.025	1041.55297	6452	445.2499	0.0733	132.43	0.0836	3.69	1045.24	562.91
5.65	0.025	1045.24409	6452	445.2499	0.0733	132.43	0.0837	3.69	1048.93	564.96
5.675	0.025	1048.93407	6452	445.2499	0.0733	132.43	0.0837	3.69	1052.62	567.01
5.7	0.025	1052.62289	6452	445.2499	0.0733	132.43	0.0838	3.69	1056.31	569.06
5.725	0.025	1056.31056	6452	445.2499	0.0733	132.43	0.0838	3.69	1060.00	571.11
5.75	0.025	1059.99709	6452	445.2499	0.0734	132.43	0.0839	3.69	1063.68	573.16
5.775	0.025	1063.68246	6452	445.2499	0.0734	132.43	0.0839	3.68	1067.37	575.20
5.8	0.025	1067.36669	6452	445.2499	0.0734	132.43	0.0840	3.68	1071.05	577.25
5.825	0.025	1071.04978	6452	445.2499	0.0734	132.43	0.0840	3.68	1074.73	579.30

5.85	0.025	1074.73172	6452	445.2499	0.0734	132.43	0.0841	3.68	1078.41	581.34
5.875	0.025	1078.41251	6452	445.2499	0.0734	132.43	0.0841	3.68	1082.09	583.38
5.9	0.025	1082.09217	6452	445.2499	0.0735	132.43	0.0842	3.68	1085.77	585.43
5.925	0.025	1085.77068	6452	445.2499	0.0735	132.43	0.0842	3.68	1089.45	587.47
5.95	0.025	1089.44805	6452	445.2499	0.0735	132.43	0.0842	3.68	1093.12	589.51
5.975	0.025	1093.12429	6452	445.2499	0.0735	132.43	0.0843	3.68	1096.80	591.56
6	0.025	1096.79938	6452	445.2499	0.0735	132.43	0.0843	3.67	1100.47	593.60
6.025	0.025	1100.47334	6452	445.2499	0.0735	132.43	0.0844	3.67	1104.15	595.64
6.05	0.025	1104.14617	6452	445.2499	0.0736	132.43	0.0844	3.67	1107.82	597.68
6.075	0.025	1107.81785	6452	445.2499	0.0736	132.43	0.0845	3.67	1111.49	599.72
6.1	0.025	1111.48841	6452	445.2499	0.0736	132.43	0.0845	3.67	1115.16	601.75
6.125	0.025	1115.15783	6452	445.2499	0.0736	132.43	0.0846	3.67	1118.83	603.79
6.15	0.025	1118.82612	6452	445.2499	0.0736	132.43	0.0846	3.67	1122.49	605.83
6.175	0.025	1122.49328	6452	445.2499	0.0736	132.43	0.0847	3.67	1126.16	607.87
6.2	0.025	1126.15931	6452	445.2499	0.0736	132.43	0.0847	3.66	1129.82	609.90
6.225	0.025	1129.82422	6452	445.2499	0.0737	132.43	0.0848	3.66	1133.49	611.94
6.25	0.025	1133.48799	6452	445.2499	0.0737	132.43	0.0848	3.66	1137.15	613.97
6.275	0.025	1137.15064	6452	445.2499	0.0737	132.43	0.0849	3.66	1140.81	616.01
6.3	0.025	1140.81216	6452	445.2499	0.0737	132.43	0.0849	3.66	1144.47	618.04
6.325	0.025	1144.47256	6452	445.2499	0.0737	132.43	0.0850	3.66	1148.13	620.07
6.35	0.025	1148.13183	6452	445.2499	0.0737	132.43	0.0850	3.66	1151.79	622.11
6.375	0.025	1151.78999	6452	445.2499	0.0738	132.43	0.0851	3.66	1155.45	624.14
6.4	0.025	1155.44702	6452	445.2499	0.0738	132.43	0.0851	3.66	1159.10	626.17
6.425	0.025	1159.10293	6452	445.2499	0.0738	132.43	0.0852	3.65	1162.76	628.20
6.45	0.025	1162.75772	6452	445.2499	0.0738	132.43	0.0852	3.65	1166.41	630.23
6.475	0.025	1166.41149	6452	445.2499	0.0738	132.43	0.0852	3.65	1170.06	632.26
6.5	0.025	1170.0643	6452	445.2499	0.0738	132.43	0.0853	3.65	1173.72	634.29
6.525	0.025	1173.71614	6452	445.2499	0.0738	132.43	0.0853	3.65	1177.37	636.32
6.55	0.025	1177.36701	6452	445.2499	0.0739	132.43	0.0854	3.65	1181.02	638.34
6.575	0.025	1181.01692	6452	445.2499	0.0739	132.43	0.0854	3.65	1184.67	640.37

6.6	0.025	1184.66586	6452	445.2499	0.0739	132.43	0.0855	3.65	1188.31	642.40
6.625	0.025	1188.31384	6452	445.2499	0.0739	132.43	0.0855	3.65	1191.96	644.42
6.65	0.025	1191.96085	6452	445.2499	0.0739	132.43	0.0856	3.65	1195.61	646.45
6.675	0.025	1195.60691	6452	445.2499	0.0739	132.43	0.0856	3.65	1199.25	648.47
6.7	0.025	1199.252	6452	445.2499	0.0739	132.43	0.0857	3.64	1202.90	650.50
6.725	0.025	1202.89613	6452	445.2499	0.0739	132.43	0.0857	3.64	1206.54	652.52
6.75	0.025	1206.5393	6452	445.2499	0.0740	132.43	0.0858	3.64	1210.18	654.55
6.775	0.025	1210.18151	6452	445.2499	0.0740	132.43	0.0858	3.64	1213.82	656.57
6.8	0.025	1213.82276	6452	445.2499	0.0740	132.43	0.0859	3.64	1217.46	658.59
6.825	0.025	1217.46306	6452	445.2499	0.0740	132.43	0.0859	3.64	1221.10	660.61
6.85	0.025	1221.10239	6452	445.2499	0.0740	132.43	0.0860	3.64	1224.74	662.63
6.875	0.025	1224.74078	6452	445.2499	0.0740	132.43	0.0860	3.64	1228.38	664.65
6.9	0.025	1228.3782	6452	445.2499	0.0740	132.43	0.0860	3.64	1232.01	666.67
6.925	0.025	1232.01467	6452	445.2499	0.0740	132.43	0.0861	3.64	1235.65	668.69
6.95	0.025	1235.65019	6452	445.2499	0.0741	132.43	0.0861	3.63	1239.28	670.71
6.975	0.025	1239.28475	6452	445.2499	0.0741	132.43	0.0862	3.63	1242.92	672.73
7	0.025	1242.91837	6452	445.2499	0.0741	132.43	0.0862	3.63	1246.55	674.75
7.025	0.025	1246.55102	6452	445.2499	0.0741	132.43	0.0863	3.63	1250.18	676.77
7.05	0.025	1250.18273	6452	445.2499	0.0741	132.43	0.0863	3.63	1253.81	678.79
7.075	0.025	1253.81349	6452	445.2499	0.0741	132.43	0.0864	3.63	1257.44	680.80
7.1	0.025	1257.4433	6452	445.2499	0.0741	132.43	0.0864	3.63	1261.07	682.82
7.125	0.025	1261.07216	6452	445.2499	0.0741	132.43	0.0865	3.63	1264.70	684.83
7.15	0.025	1264.70007	6452	445.2499	0.0741	132.43	0.0865	3.63	1268.33	686.85
7.175	0.025	1268.32704	6452	445.2499	0.0742	132.43	0.0866	3.63	1271.95	688.86
7.2	0.025	1271.95305	6452	445.2499	0.0742	132.43	0.0866	3.63	1275.58	690.88
7.225	0.025	1275.57813	6452	445.2499	0.0742	132.43	0.0867	3.62	1279.20	692.89
7.25	0.025	1279.20225	6452	445.2499	0.0742	132.43	0.0867	3.62	1282.83	694.90
7.275	0.025	1282.82544	6452	445.2499	0.0742	132.43	0.0868	3.62	1286.45	696.92
7.3	0.025	1286.44767	6452	445.2499	0.0742	132.43	0.0868	3.62	1290.07	698.93
7.325	0.025	1290.06897	6452	445.2499	0.0742	132.43	0.0868	3.62	1293.69	700.94

7.35	0.025	1293.68932	6452	445.2499	0.0742	132.43	0.0869	3.62	1297.31	702.95
7.375	0.025	1297.30874	6452	445.2499	0.0743	132.43	0.0869	3.62	1300.93	704.96
7.4	0.025	1300.92721	6452	445.2499	0.0743	132.43	0.0870	3.62	1304.54	706.97
7.425	0.025	1304.54474	6452	445.2499	0.0743	132.43	0.0870	3.62	1308.16	708.98
7.45	0.025	1308.16133	6452	445.2499	0.0743	132.43	0.0871	3.62	1311.78	710.99
7.475	0.025	1311.77699	6452	445.2499	0.0743	132.43	0.0871	3.61	1315.39	713.00
7.5	0.025	1315.3917	6452	445.2499	0.0743	132.43	0.0872	3.61	1319.01	715.00
7.525	0.025	1319.00548	6452	445.2499	0.0743	132.43	0.0872	3.61	1322.62	717.01
7.55	0.025	1322.61833	6452	445.2499	0.0743	132.43	0.0873	3.61	1326.23	719.02
7.575	0.025	1326.23023	6452	445.2499	0.0744	132.43	0.0873	3.61	1329.84	721.02
7.6	0.025	1329.84121	6452	445.2499	0.0744	132.43	0.0874	3.61	1333.45	723.03
7.625	0.025	1333.45125	6452	445.2499	0.0744	132.43	0.0874	3.61	1337.06	725.03
7.65	0.025	1337.06035	6452	445.2499	0.0744	132.43	0.0875	3.61	1340.67	727.04
7.675	0.025	1340.66852	6452	445.2499	0.0744	132.43	0.0875	3.61	1344.28	729.04
7.7	0.025	1344.27578	6452	445.2499	0.0744	132.43	0.0876	3.61	1347.88	731.05
7.725	0.025	1347.88224	6452	445.2499	0.0744	132.43	0.0876	3.61	1351.49	733.05
7.75	0.025	1351.48792	6452	445.2499	0.0744	132.43	0.0876	3.60	1355.09	735.05
7.775	0.025	1355.09282	6452	445.2499	0.0744	132.43	0.0877	3.60	1358.70	737.05
7.8	0.025	1358.69693	6452	445.2499	0.0744	132.43	0.0877	3.60	1362.30	739.06
7.825	0.025	1362.30025	6452	445.2499	0.0744	132.43	0.0878	3.60	1365.90	741.06
7.85	0.025	1365.90279	6452	445.2499	0.0745	132.43	0.0878	3.60	1369.50	743.06
7.875	0.025	1369.50454	6452	445.2499	0.0745	132.43	0.0879	3.60	1373.11	745.06
7.9	0.025	1373.10551	6452	445.2499	0.0745	132.43	0.0879	3.60	1376.71	747.06
7.925	0.025	1376.7057	6452	445.2499	0.0745	132.43	0.0880	3.60	1380.31	749.06
7.95	0.025	1380.3051	6452	445.2499	0.0745	132.43	0.0880	3.60	1383.90	751.06
7.975	0.025	1383.90372	6452	445.2499	0.0745	132.43	0.0881	3.60	1387.50	753.06
8	0.025	1387.50156	6452	445.2499	0.0745	132.43	0.0881	3.60	1391.10	755.05
8.025	0.025	1391.09862	6452	445.2499	0.0745	132.43	0.0882	3.60	1394.69	757.05
8.05	0.025	1394.6949	6452	445.2499	0.0745	132.43	0.0882	3.60	1398.29	759.05
8.075	0.025	1398.2904	6452	445.2499	0.0745	132.43	0.0883	3.59	1401.89	761.05

8.1	0.025	1401.88512	6452	445.2499	0.0745	132.43	0.0883	3.59	1405.48	763.04
8.125	0.025	1405.47906	6452	445.2499	0.0745	132.43	0.0883	3.59	1409.07	765.04
8.15	0.025	1409.07222	6452	445.2499	0.0746	132.43	0.0884	3.59	1412.66	767.04
8.175	0.025	1412.6646	6452	445.2499	0.0746	132.43	0.0884	3.59	1416.26	769.03
8.2	0.025	1416.2562	6452	445.2499	0.0746	132.43	0.0885	3.59	1419.85	771.03
8.225	0.025	1419.84703	6452	445.2499	0.0746	132.43	0.0885	3.59	1423.44	773.02
8.25	0.025	1423.43708	6452	445.2499	0.0746	132.43	0.0886	3.59	1427.03	775.01
8.275	0.025	1427.02636	6452	445.2499	0.0746	132.43	0.0886	3.59	1430.61	777.01
8.3	0.025	1430.61486	6452	445.2499	0.0746	132.43	0.0887	3.59	1434.20	779.00
8.325	0.025	1434.20258	6452	445.2499	0.0746	132.43	0.0887	3.59	1437.79	780.99
8.35	0.025	1437.78953	6452	445.2499	0.0746	132.43	0.0888	3.59	1441.38	782.99
8.375	0.025	1441.37571	6452	445.2499	0.0746	132.43	0.0888	3.59	1444.96	784.98
8.4	0.025	1444.96111	6452	445.2499	0.0746	132.43	0.0889	3.58	1448.55	786.97
8.425	0.025	1448.54574	6452	445.2499	0.0746	132.43	0.0889	3.58	1452.13	788.96
8.45	0.025	1452.12959	6452	445.2499	0.0746	132.43	0.0889	3.58	1455.71	790.95
8.475	0.025	1455.71268	6452	445.2499	0.0747	132.43	0.0890	3.58	1459.29	792.94
8.5	0.025	1459.29499	6452	445.2499	0.0747	132.43	0.0890	3.58	1462.88	794.93
8.525	0.025	1462.87653	6452	445.2499	0.0747	132.43	0.0891	3.58	1466.46	796.92
8.55	0.025	1466.4573	6452	445.2499	0.0747	132.43	0.0891	3.58	1470.04	798.91
8.575	0.025	1470.0373	6452	445.2499	0.0747	132.43	0.0892	3.58	1473.62	800.90
8.6	0.025	1473.61653	6452	445.2499	0.0747	132.43	0.0892	3.58	1477.19	802.89
8.625	0.025	1477.195	6452	445.2499	0.0747	132.43	0.0893	3.58	1480.77	804.87
8.65	0.025	1480.77269	6452	445.2499	0.0747	132.43	0.0893	3.58	1484.35	806.86
8.675	0.025	1484.34961	6452	445.2499	0.0747	132.43	0.0894	3.58	1487.93	808.85
8.7	0.025	1487.92577	6452	445.2499	0.0747	132.43	0.0894	3.58	1491.50	810.83
8.725	0.025	1491.50116	6452	445.2499	0.0747	132.43	0.0895	3.57	1495.08	812.82
8.75	0.025	1495.07579	6452	445.2499	0.0747	132.43	0.0895	3.57	1498.65	814.81
8.775	0.025	1498.64964	6452	445.2499	0.0748	132.43	0.0896	3.57	1502.22	816.79
8.8	0.025	1502.22273	6452	445.2499	0.0748	132.43	0.0896	3.57	1505.80	818.78
8.825	0.025	1505.79506	6452	445.2499	0.0748	132.43	0.1090	3.38	1509.17	820.65

8.85	0.025	1509.1744	6452	445.2499	0.0748	132.43	0.1207	3.27	1512.45	822.47
8.875	0.025	1512.44726	6452	445.2499	0.0748	132.43	0.1227	3.26	1515.70	824.28
8.9	0.025	1515.70321	6452	445.2499	0.0748	132.43	0.1246	3.24	1518.94	826.08
8.925	0.025	1518.9425	6452	445.2499	0.0748	132.43	0.1264	3.22	1522.17	827.87
8.95	0.025	1522.16539	6452	445.2499	0.0748	132.43	0.1283	3.21	1525.37	829.65
8.975	0.025	1525.37223	6452	445.2499	0.0748	132.43	0.1302	3.19	1528.56	831.42
9	0.025	1528.56336	6452	445.2499	0.0748	132.43	0.1321	3.18	1531.74	833.19
9.025	0.025	1531.739	6452	445.2499	0.0748	132.43	0.1339	3.16	1534.90	834.94
9.05	0.025	1534.89937	6452	445.2499	0.0748	132.43	0.1357	3.15	1538.04	836.69
9.075	0.025	1538.0447	6452	445.2499	0.0748	132.43	0.1376	3.13	1541.18	838.43
9.1	0.025	1541.1752	6452	445.2499	0.0748	132.43	0.1394	3.12	1544.29	840.16
9.125	0.025	1544.29107	6452	445.2499	0.0748	132.43	0.1410	3.10	1547.39	841.89
9.15	0.025	1547.39437	6452	445.2499	0.0748	132.43	0.1415	3.10	1550.49	843.61
9.175	0.025	1550.49358	6452	445.2499	0.0748	132.43	0.1420	3.10	1553.59	845.33
9.2	0.025	1553.58872	6452	445.2499	0.0748	132.43	0.1425	3.09	1556.68	847.04
9.225	0.025	1556.67982	6452	445.2499	0.0748	132.43	0.1431	3.09	1559.77	848.76
9.25	0.025	1559.76687	6452	445.2499	0.0748	132.43	0.1436	3.08	1562.85	850.47
9.275	0.025	1562.84991	6452	445.2499	0.0748	132.43	0.1441	3.08	1565.93	852.18
9.3	0.025	1565.92894	6452	445.2499	0.0748	132.43	0.1446	3.08	1569.00	853.89
9.325	0.025	1569.00398	6452	445.2499	0.0748	132.43	0.1451	3.07	1572.08	855.60
9.35	0.025	1572.07505	6452	445.2499	0.0748	132.43	0.1456	3.07	1575.14	857.30
9.375	0.025	1575.14216	6452	445.2499	0.0748	132.43	0.1461	3.06	1578.21	859.00
9.4	0.025	1578.20533	6452	445.2499	0.0748	132.43	0.1466	3.06	1581.26	860.70
9.425	0.025	1581.26456	6452	445.2499	0.0748	132.43	0.1480	3.05	1584.31	862.40
9.45	0.025	1584.31376	6452	445.2499	0.0748	132.43	0.1501	3.03	1587.35	864.08
9.475	0.025	1587.347	6452	445.2499	0.0748	132.43	0.1521	3.02	1590.36	865.76
9.5	0.025	1590.36455	6452	445.2499	0.0748	132.43	0.1542	3.00	1593.37	867.43
9.525	0.025	1593.36663	6452	445.2499	0.0748	132.43	0.1563	2.99	1596.35	869.09
9.55	0.025	1596.35348	6452	445.2499	0.0748	132.43	0.1584	2.97	1599.33	870.74
9.575	0.025	1599.32534	6452	445.2499	0.0748	132.43	0.1604	2.96	1602.28	872.38

9.6	0.025	1602.28243	6452	445.2499	0.0748	132.43	0.1624	2.94	1605.22	874.01
9.625	0.025	1605.22496	6452	445.2499	0.0748	132.43	0.1645	2.93	1608.15	875.64
9.65	0.025	1608.15316	6452	445.2499	0.0748	132.43	0.1665	2.91	1611.07	877.26
9.675	0.025	1611.06722	6452	445.2499	0.0748	132.43	0.1685	2.90	1613.97	878.87
9.7	0.025	1613.96735	6452	445.2499	0.0748	132.43	0.1705	2.89	1616.85	880.47
9.725	0.025	1616.85375	6452	445.2499	0.0748	132.43	0.1724	2.87	1619.73	882.07
9.75	0.025	1619.72695	6452	445.2499	0.0748	132.43	0.1743	2.86	1622.59	883.66
9.775	0.025	1622.58766	6452	445.2499	0.0748	132.43	0.1761	2.85	1625.44	885.24
9.8	0.025	1625.43603	6452	445.2499	0.0748	132.43	0.1780	2.84	1628.27	886.82
9.825	0.025	1628.27223	6452	445.2499	0.0748	132.43	0.1798	2.82	1631.10	888.39
9.85	0.025	1631.09641	6452	445.2499	0.0748	132.43	0.1816	2.81	1633.91	889.95
9.875	0.025	1633.90872	6452	445.2499	0.0748	132.43	0.1834	2.80	1636.71	891.51
9.9	0.025	1636.7093	6452	445.2499	0.0748	132.43	0.1852	2.79	1639.50	893.05
9.925	0.025	1639.49832	6452	445.2499	0.0748	132.43	0.1870	2.78	1642.28	894.60
9.95	0.025	1642.2759	6452	445.2499	0.0748	132.43	0.1888	2.77	1645.04	896.13
9.975	0.025	1645.04219	6452	445.2499	0.0748	132.43	0.1906	2.76	1647.80	897.67
10	0.025	1647.79733	6452	445.2499	0.0748	132.43	0.1924	2.74	1650.54	899.19
10.025	0.025	1650.54144	6452	445.2499	0.0748	132.43	0.1941	2.73	1653.27	900.71
10.05	0.025	1653.27466	6452	445.2499	0.0748	132.43	0.1949	2.73	1656.00	902.22
10.075	0.025	1656.0032	6452	445.2499	0.0748	132.43	0.1949	2.73	1658.73	903.74
10.1	0.025	1658.73173	6452	445.2499	0.0748	132.43	0.1949	2.73	1661.46	905.26