



**GEOLOGICAL SURVEY OF CANADA
OPEN FILE 7252**

**Radiation Environment Analysis for Canadian Polar
Communication and Weather Mission**

L. Trichtchenko

2012



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1. Introduction

Polar Communication and Weather mission is planned for provision of continuous 24/7 communication and meteorological service of the Canadian Arctic area. The requirements for the coverage and time resolution lead to the requirements for the orbit to be elliptical with long dwelling time over the northern high latitude areas. Three orbits were chosen as candidates, 12-hours Molniya orbit (A.Trishchenko and L.Garand, 2011), 16-hours Three Apogee orbit (Trishchenko, A.P., L.Garand and L.D.Trichtchenko , 2011) and 24 hours Tundra orbit (Michel Capderou, *Satellites: Orbits and Missions, Vol. 1, Chapter 5*, 2005).

Radiation environment has been analysed for all three possible candidate orbits: for mission duration of 8 years by running SPENVIS on-line tool.

2. Orbital Parameters

This paragraph describes orbital parameters of candidate orbits. Mission overview is presented in Table 2.1. Tables 2.2 a)-c) and Figs. 2.1a)-c) represent candidate orbits which have been chosen based on the requirements for polar area coverage.

Table 2.1. Mission overview

Mission overview	
Orbit around:	Earth
Number of mission segments:	1
Mission start:	01/03/2017 00:00:00
Mission end:	27/02/2025 00:00:00
Mission duration:	2920.00 days (8.00 years)

Table 2.2 a) Sample of 12-hrs Molniya orbit used in space environment analysis

Orbit type	Molniya
Apogee:	39380.00 km
Perigee:	972.00 km
Inclination:	63.40°
R. A. Ascending Node:	45.00°
Argument of Perigee:	270.00°
True Anomaly:	0.00°

Period:	11.96 hrs
Number of orbits:	2.00
Duration:	1.00 days
Orbit start:	01/03/2017 00:00: 0.0
Orbit end:	01/03/2017 23:54:52.0
Segment end:	27/02/2025 00:00: 0.0
Segment length:	2920.00 days
Semi latus rectum:	12654.90 km
Semi major axis:	26547.00 km
Eccentricity:	0.72
Mean motion:	12.61 rad/day

Table 2.2b) Sample of 16-hrs. TAP orbit used in space environment analysis

Orbit type:	16 hrs TAP
Apogee:	43500.14 km
Perigee:	8107.72 km
Inclination:	63.44°
R. A. Ascending Node:	212.79°
Argument of Perigee:	270.00°
True Anomaly:	0.00°
Period:	15.95 hrs
Number of orbits:	3.00
Duration:	1.99 days
Orbit start:	01/03/2017 00:00: 0.0
Orbit end:	02/03/2017 23:51:48.7
Segment end:	27/02/2025 00:00: 0.0
Segment length:	2920.00 days
Semi latus rectum:	22442.01 km
Semi major axis:	32174.93 km
Eccentricity:	0.55
Mean motion:	9.45 rad/day
Integration step:	0.50°

Table 2.2c) Sample of 24-hrs Tundra orbit used in space environment analysis

Orbit type:	Tundra
Apogee:	48441.43 km
Perigee:	23143.38 km
Inclination:	90.00°
R. A. Ascending Node:	224.20°
Argument of Perigee:	270.00°
True Anomaly:	0.00°
Period:	23.93 hrs
Number of orbits:	1.00
Duration:	1.00 days
Orbit start:	01/03/2017 00:00: 0.0
Orbit end:	01/03/2017 23:56: 1.4
Segment end:	27/02/2025 00:00: 0.0
Segment length:	2920.00 days
Semi latus rectum:	38368.70 km
Semi major axis:	42163.40 km
Eccentricity:	0.30
Mean motion:	6.30 rad/day
Integration step:	0.50°

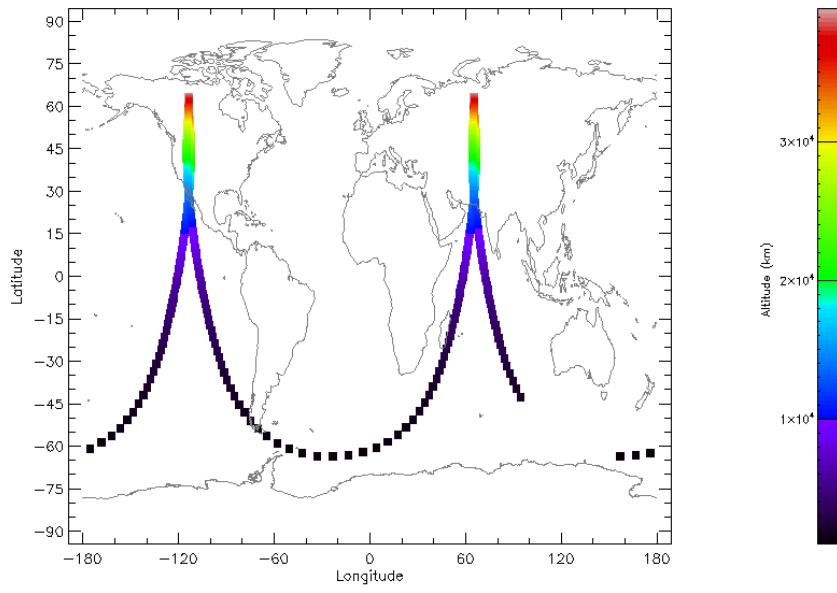


Fig. 2.1a), World map of Molniya orbit used in space environment analysis

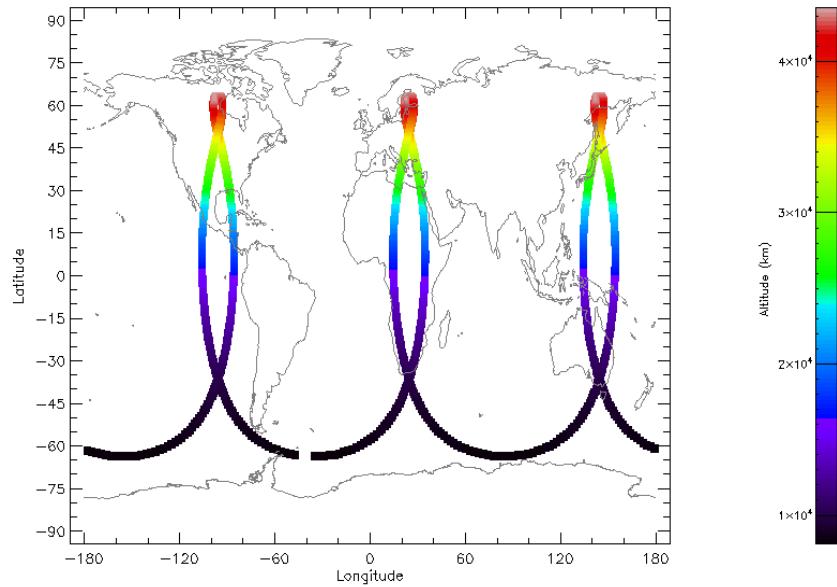


Fig. 2.1b), World map of 16-hrs TAP orbit used in space environment analysis

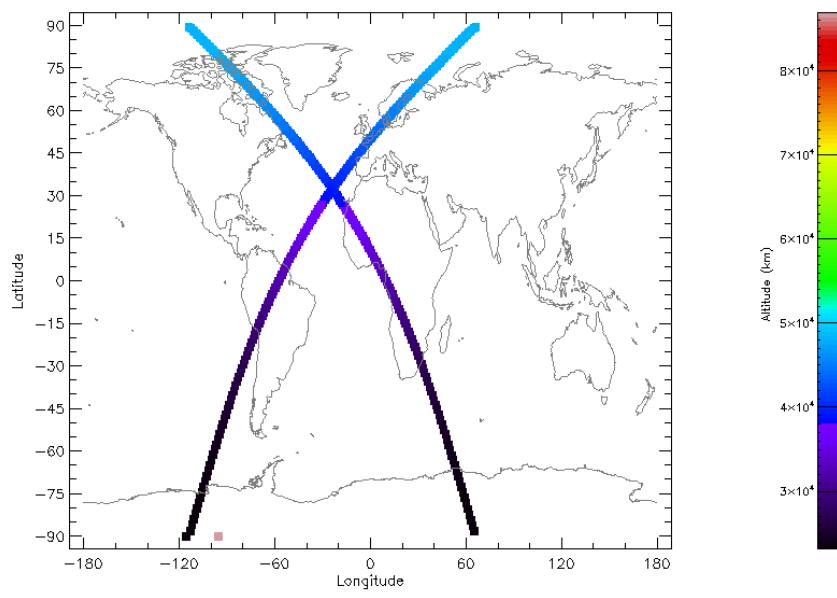


Fig. 2.1 c), World map of 24-hrs Tundra orbit used in space environment analysis

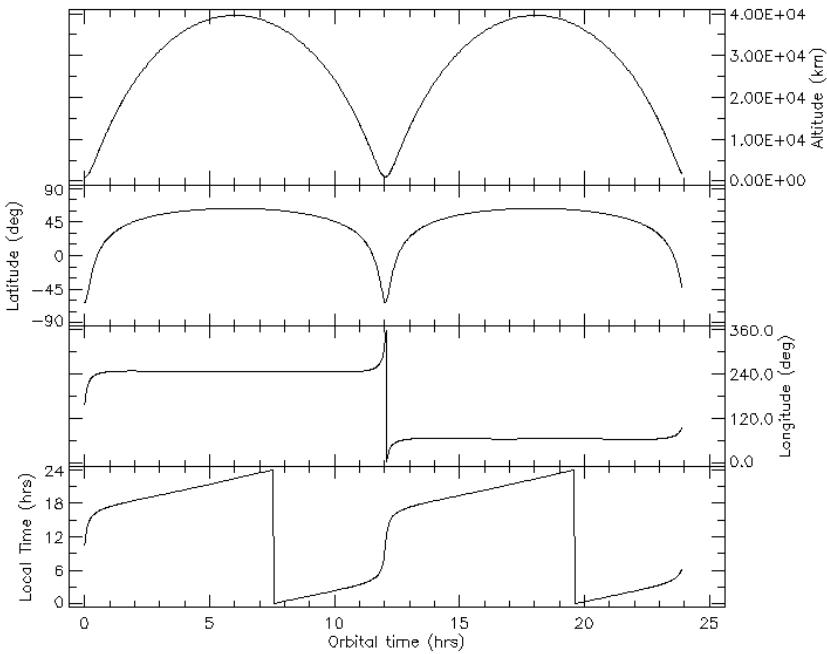


Fig. 2.2a) Time variations of Molniya orbital parameters

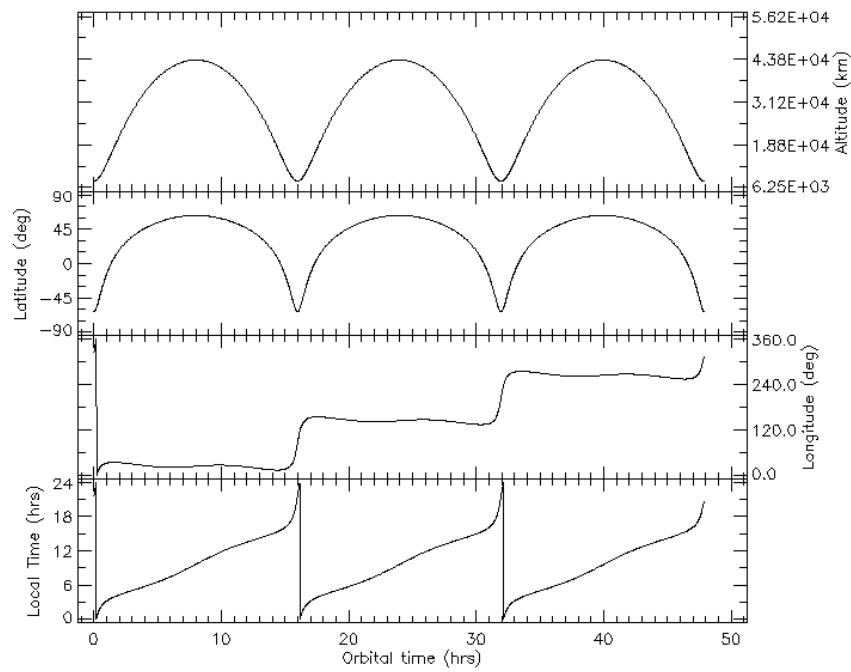


Fig. 2.2 b). Time variations of TAP orbital parameters

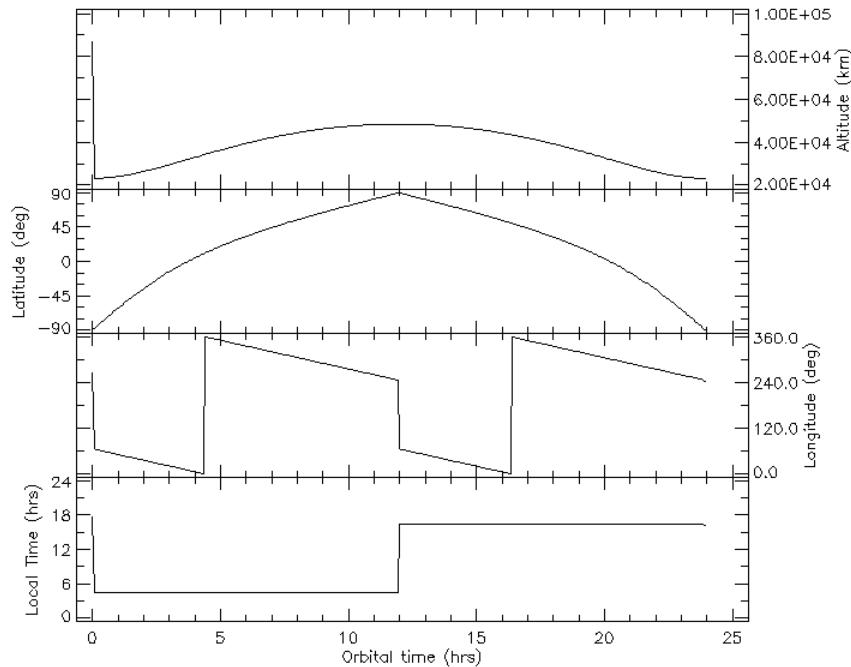


Fig.2.2 c) Time variations of Tundra orbital parameters

3. Trapped Radiation

Trapped particle fluxes were calculated using AP-8 solar minimum and AE-8 solar maximum models with internal magnetic field model of Jensen & Cain 1960, no external magnetic field; for AE-8 local time variation is not taken into account and probability that fluxes will not be exceeded (AE-4): 50.0%. This set of parameters is standard for space environment calculations. Results for protons are presented in Figs. 3.1(a-c) and for electrons in Figs. 3.2 (a-c).

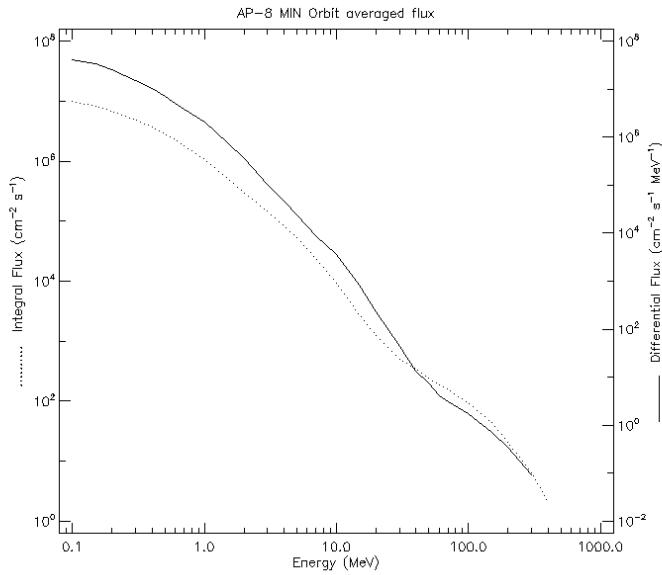


Fig. 3.1 a) Proton flux (differential and integral) on Molniya orbit

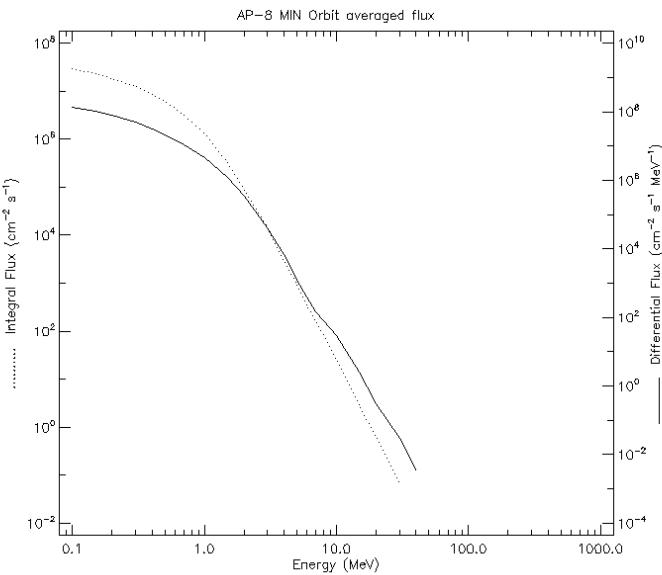


Fig. 3.1b) Proton flux (differential and integral) on TAP orbit

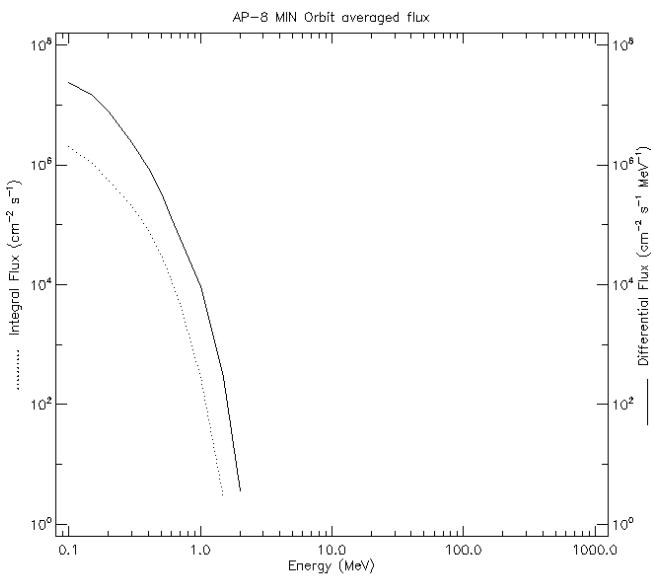


Fig. 3.1c). Proton flux (differential and integral) on Tundra orbit

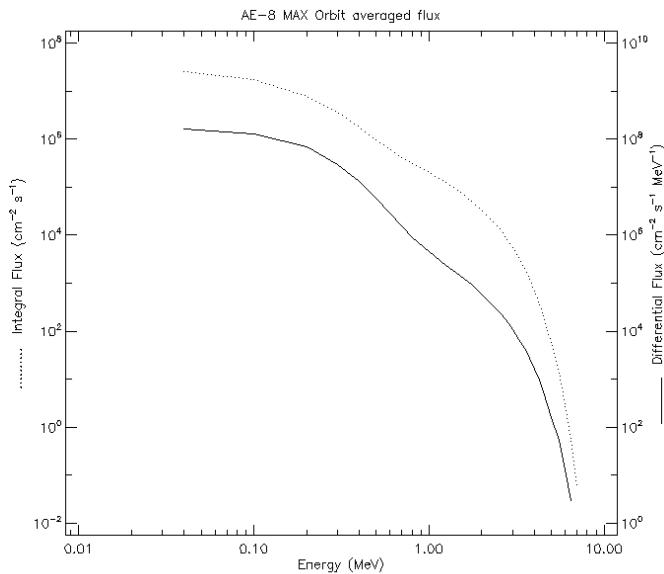


Fig.3.2 a). Electron flux (differential and integral) on Molniya orbit

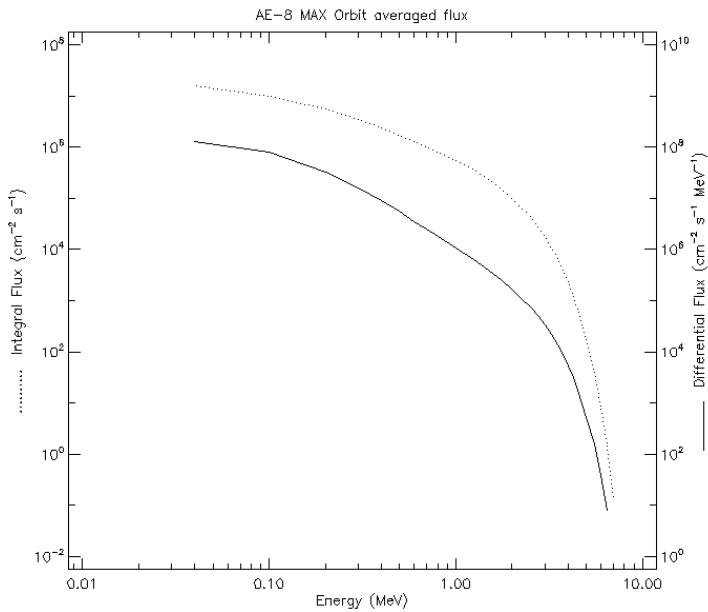


Fig.3.2 b).Electron flux (differential and integral) on TAP orbit

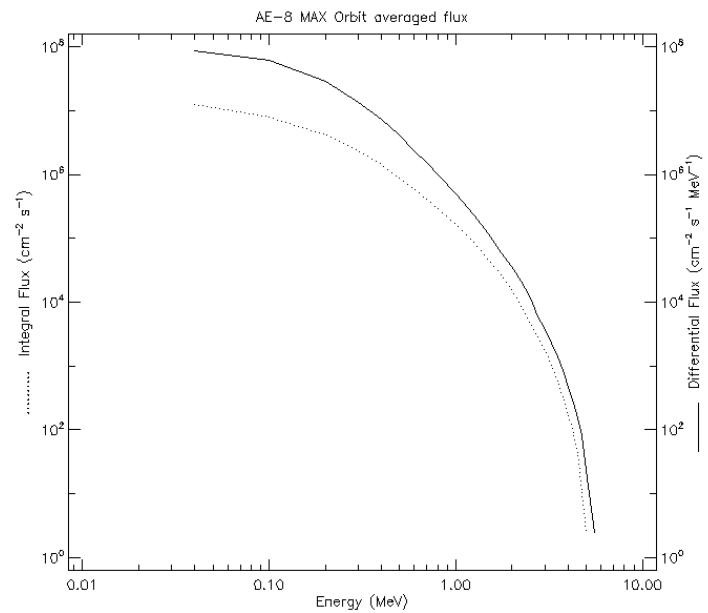


Fig.3.2 c). Electron flux (differential and integral) on Tundra orbit.

4. Variations of the trapped radiation along the orbit (time dependence)

Samples of the orbital time variations of the trapped radiation for mission segment 1 (Figs. 4.1-4.7) were calculated for three different proton energy levels (above 1, 10 MeV and 50 MeV) and two different electron energy levels (above 1 and 4 MeV).

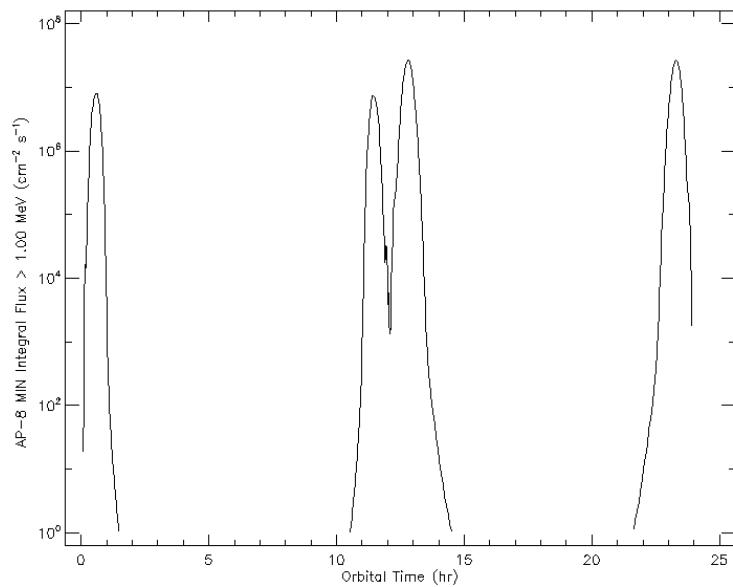


Fig. 4.1 a). Proton flux variations along Molniya orbit (energy >1MeV)

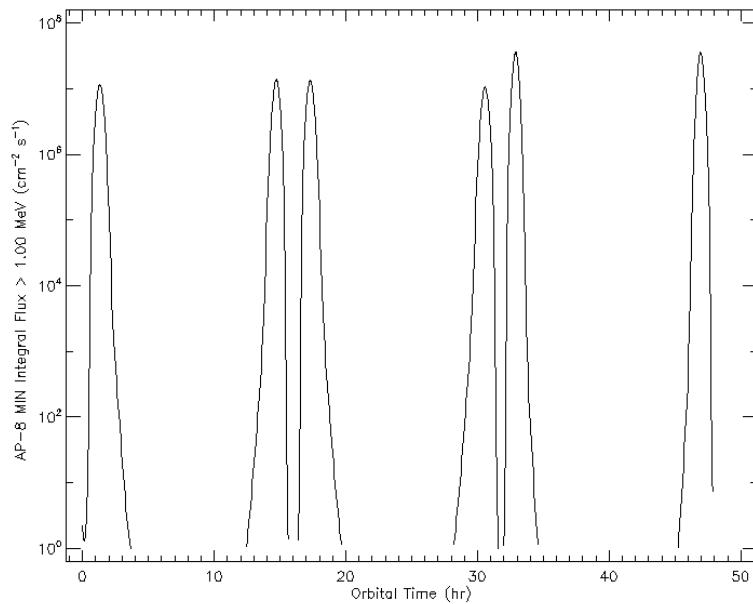


Fig. 4.1 b) Proton flux variations along TAP orbit (energy >1MeV)

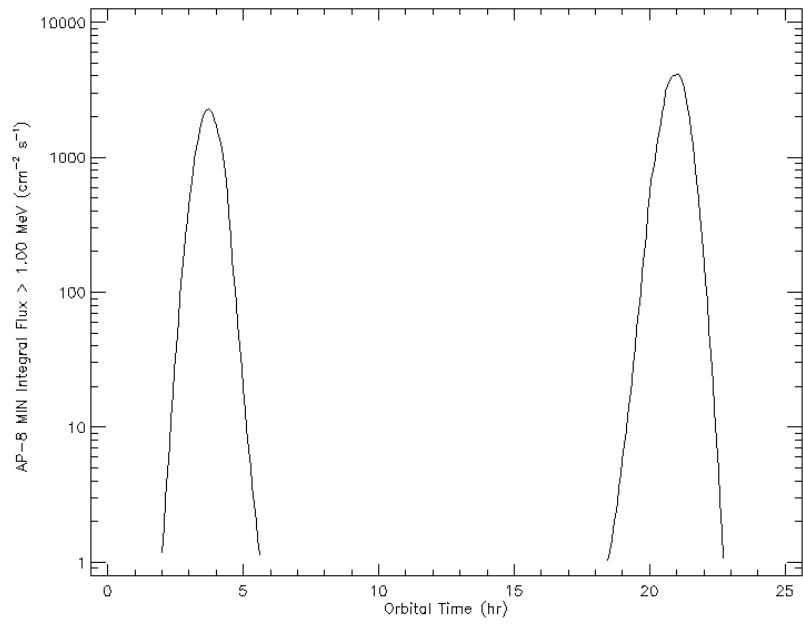


Fig.4.1 c). Proton flux variations along Tundra orbit (energy >1MeV)

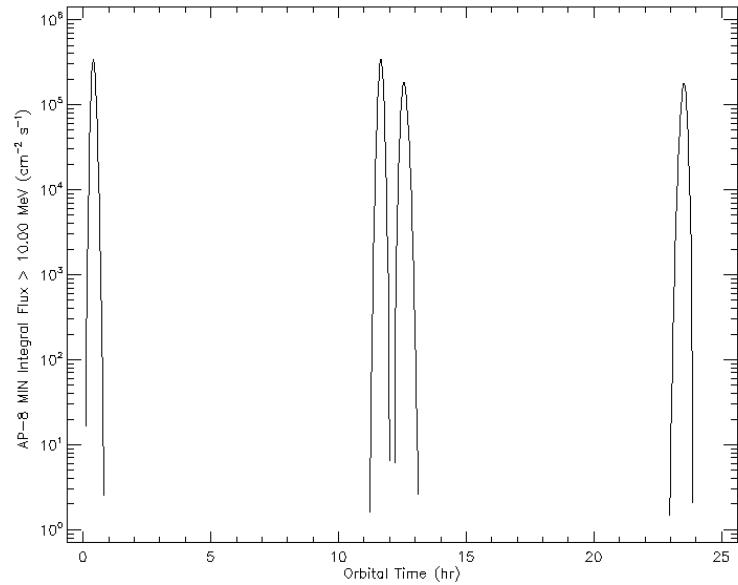


Fig. 4.2 a).Proton flux variations along Molniya orbit (energy >10MeV)

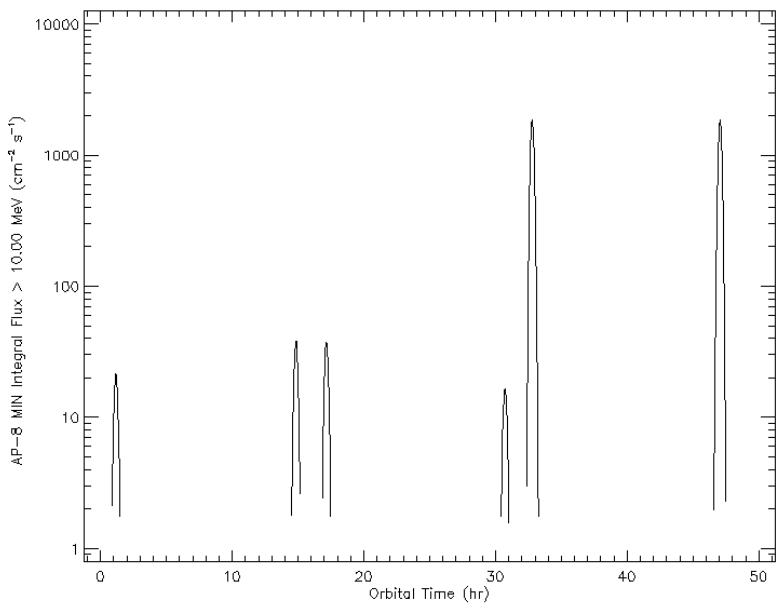


Fig. 4.2 b). Proton flux variations along TAP orbit (energy >10MeV)

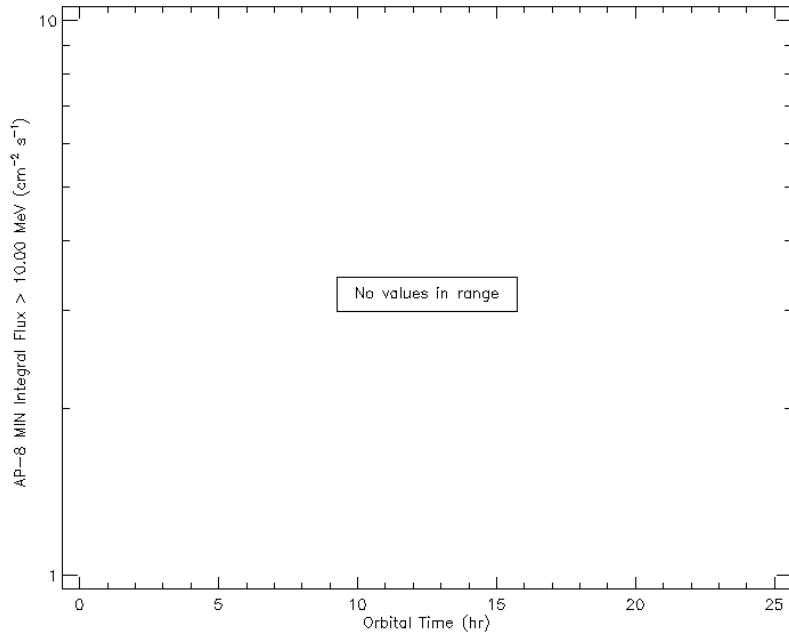


Fig. 4.2 c). Proton flux variations along Tundra orbit (energy >10MeV)

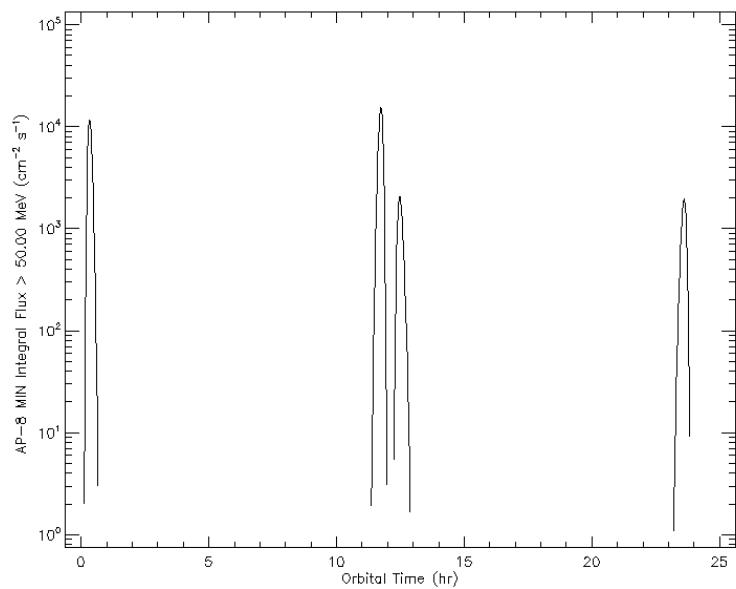


Fig. 4.3 a) Proton flux variations along Molniya orbit (energy >50 MeV)

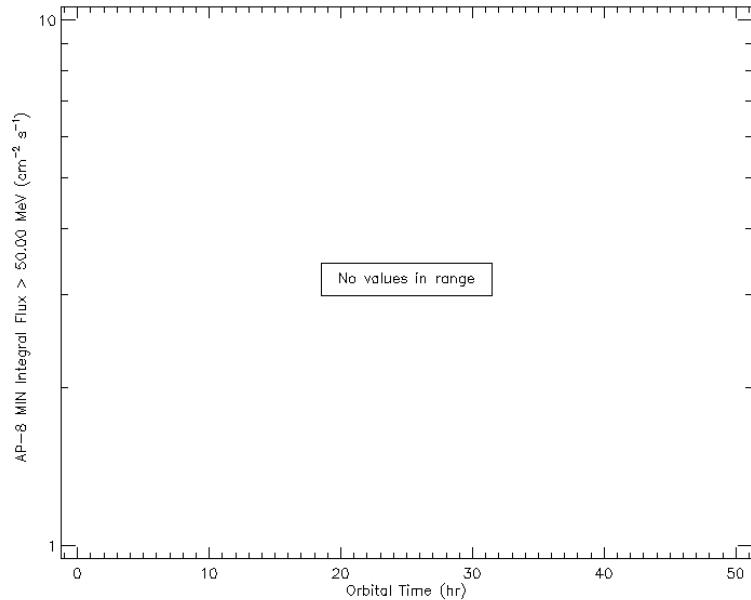


Fig.4.3 b). Proton flux variations on TAP orbit (energy >50 MeV)

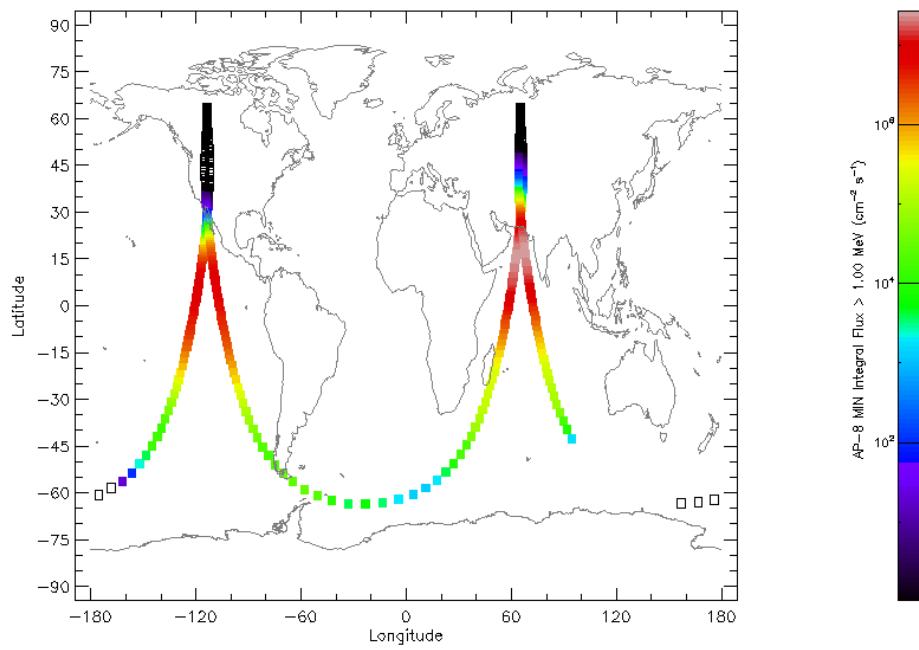


Fig. 4.4 a). World map of integral flux of protons >1 MeV on Molniya orbit

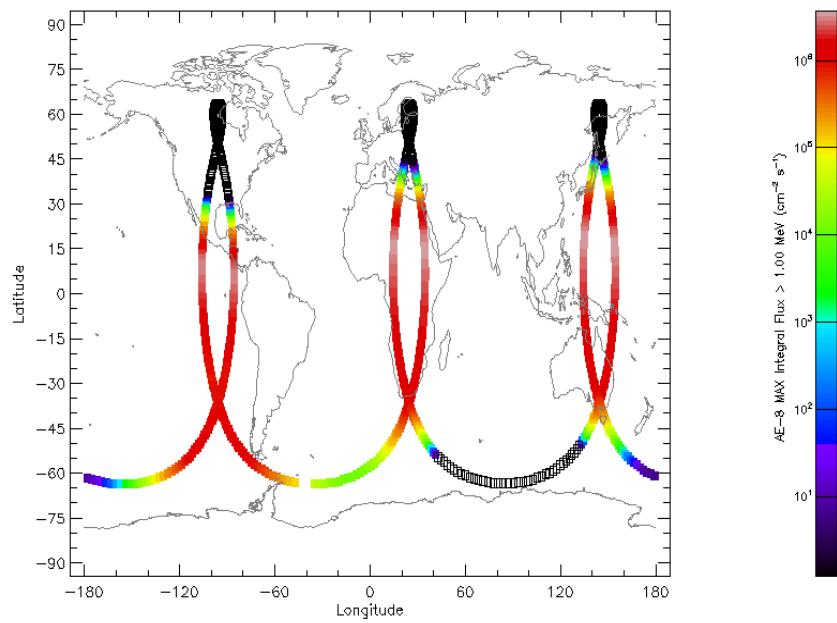


Fig. 4.4 b). World map of integral flux of protons >1 MeV on TAP orbit

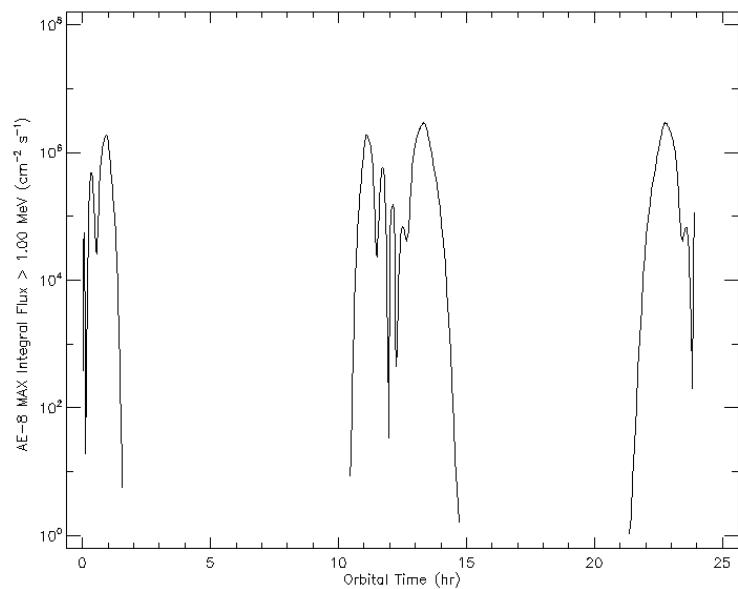


Fig. 4.5 a). Electron flux variations along Molniya orbit (energy >1MeV)

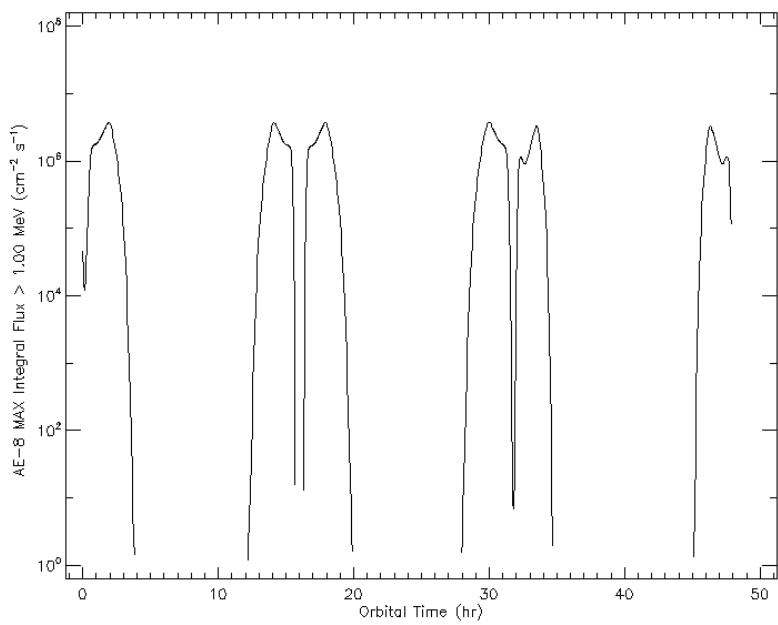


Fig. 4.5 b). Electron flux variations along TAP orbit (energy >4MeV)

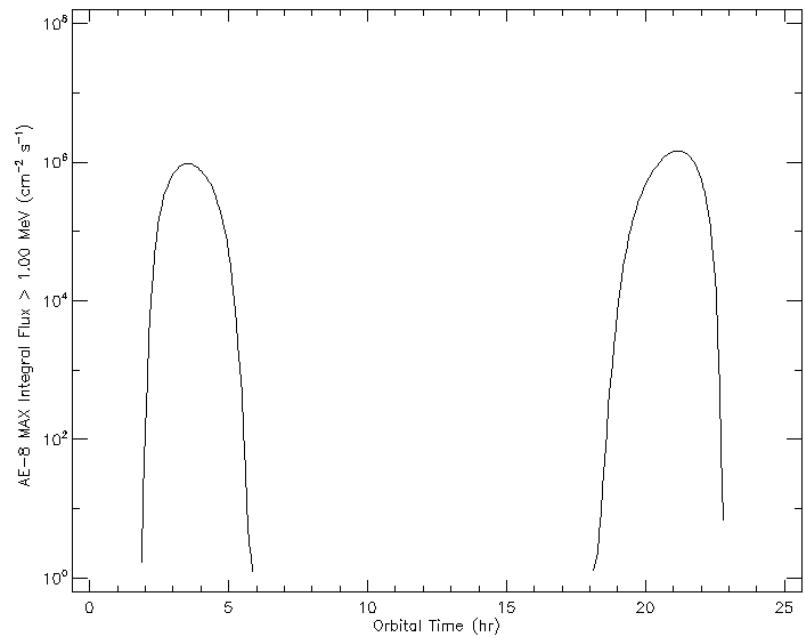


Fig. 4.3c). Electron flux variations along Tundra orbit (energy >1MeV)

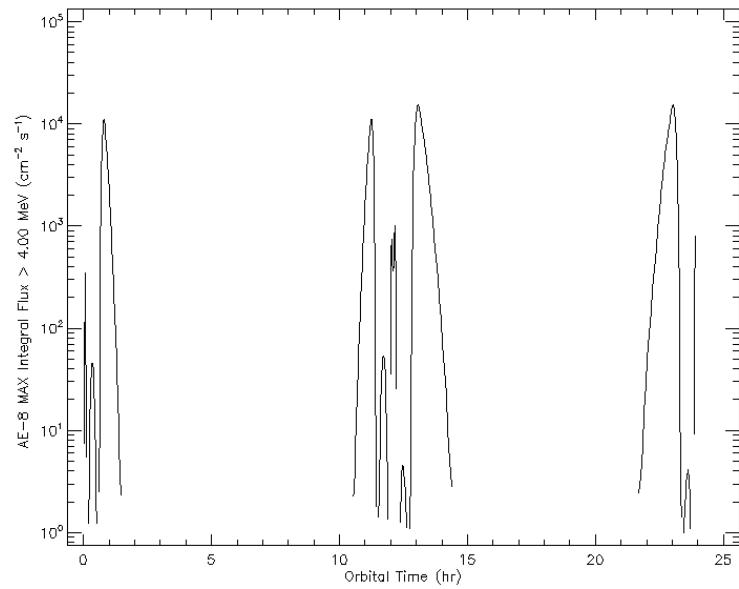


Fig. 4.6 a). Electron flux variations along Molniya orbit (energy >4MeV)

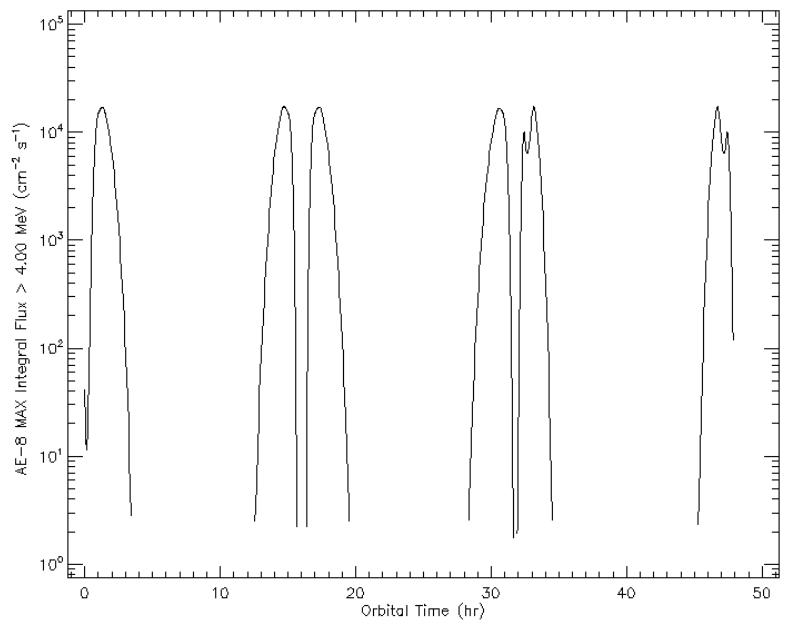


Fig. 4.6 b). Electron flux variations along TAP orbit (energy $>4\text{MeV}$)

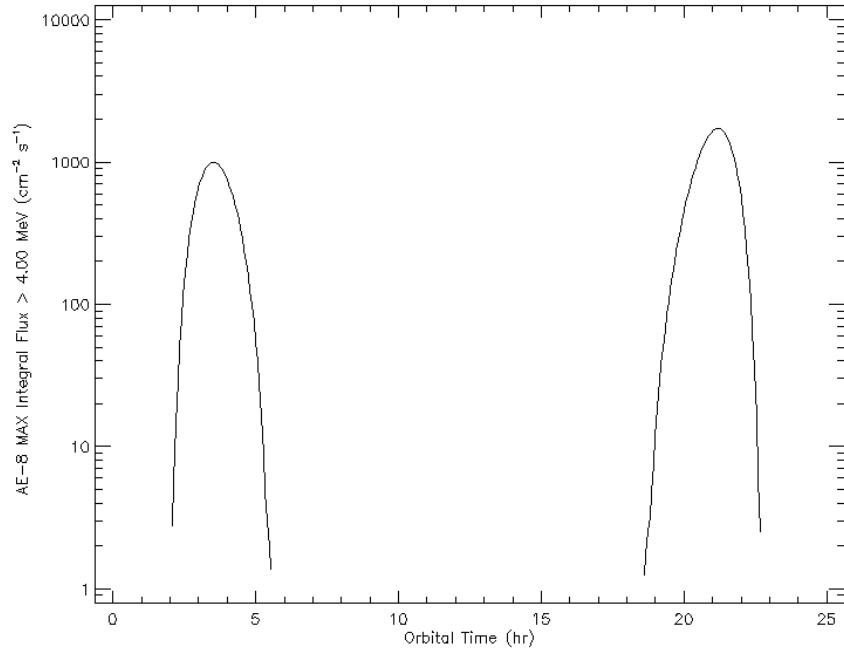


Fig. 4.6 c). Electron flux variations along Tundra orbit (energy $>4\text{MeV}$)

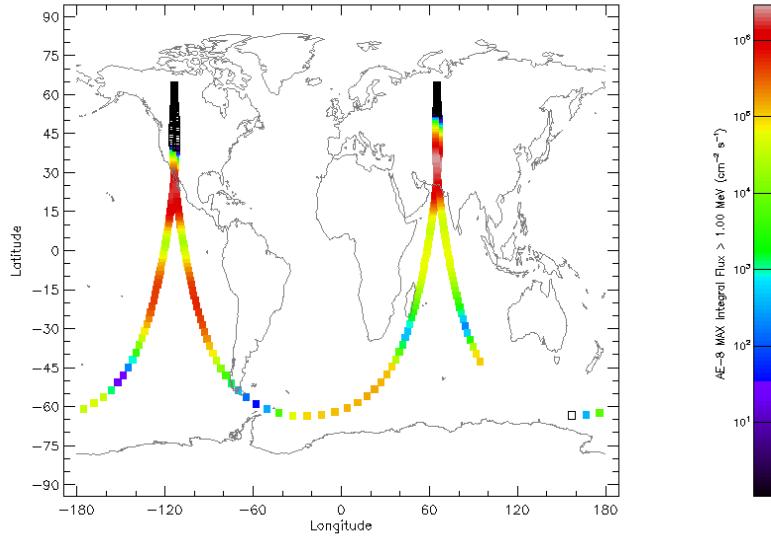


Fig. 4.7 a). World map of integral flux of electrons >1 MeV on Molniya orbit

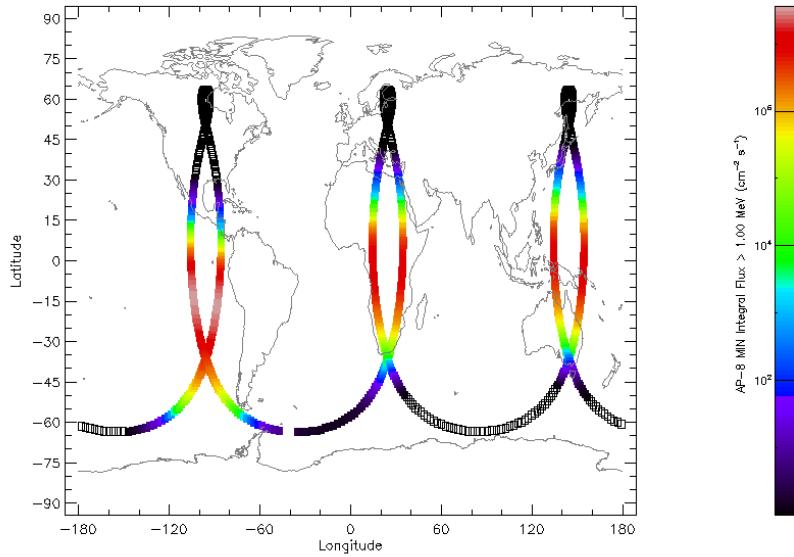


Fig. 4.7 b). World map of integral flux of electrons >1 MeV on TAP orbit

As can be inferred from modeling results, there are no protons with energies > 50 MeV on TAP and Tundra orbit and no protons with energies > 10 MeV on Tundra orbit.

Tables in Appendix A contain integral and differential proton and electron spectrum (total and for mission segment 1), exposure for electron flux exceeding $1.00/\text{cm}^2/\text{s}$ (total and for mission segment 1) and integral peak proton and electron fluxes for segment 1 produced for each of candidate orbit

5. Long-term Solar Protons and Heavy Ions Environment

Total fluences were calculated using solar particle model of ESP-PSYCHIC with following input parameters: a)Magnetic shielding: eccentric dipole/quiet magnetosphere/unchanged magnetic moment/all arrival directions; b) Prediction period: 8.00 yr (4.00 yr in solar max., 4.00 yr in solar min, over 2 solar cycles) with 90.00% probability of fluences not being exceeded; c)Ion range: H – U (1-92).

Results for different orbits are presented in Figs 5.1-5.3 and in Appendix B.

The exposure factors (See Tables in Appendix B) for all energies from 0.1 MeV to 500 MeV are above 0.79 on Molniya orbit, >0.78 on TAP orbit and >0.99 on Tundra orbit, i.e. natural geomagnetic shielding is low on all orbits and especially on Tundra orbit.

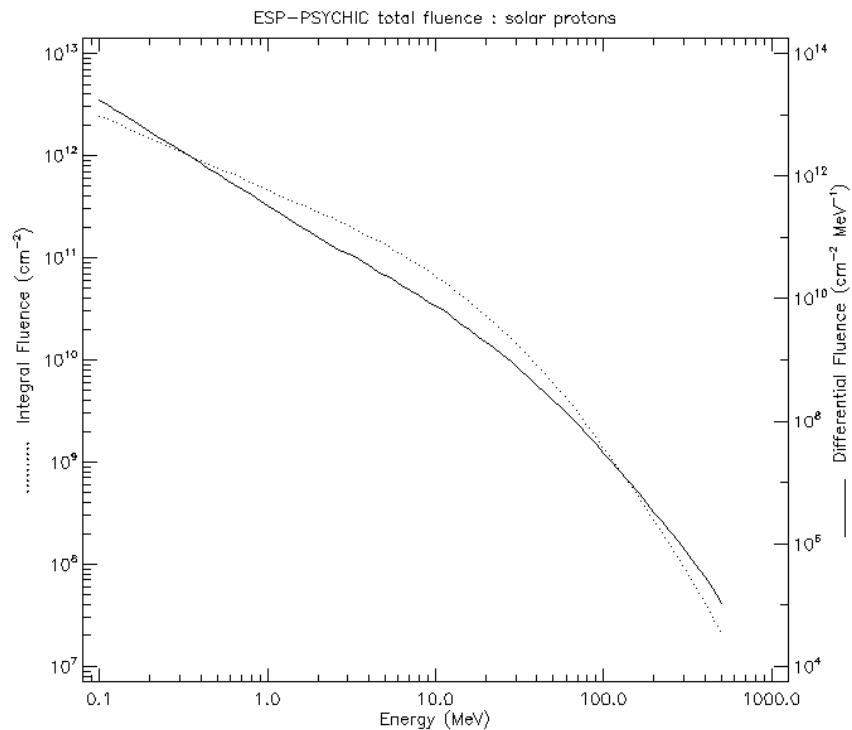


Fig. 5.1a). Solar Proton Fluence on Molniya orbit

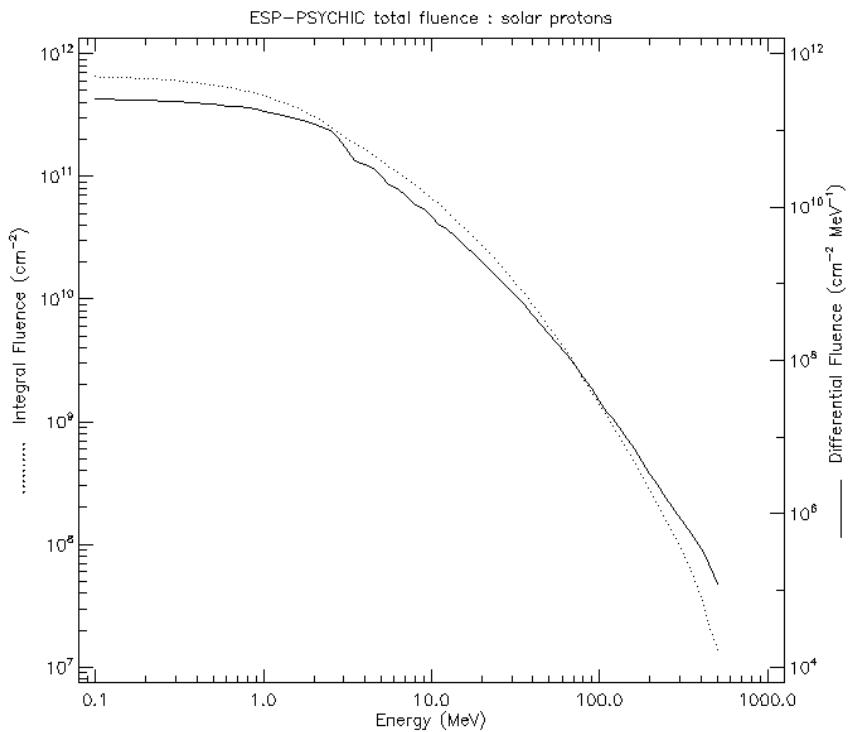


Fig. 5.1 b). Solar Proton Fluence on TAP Orbit

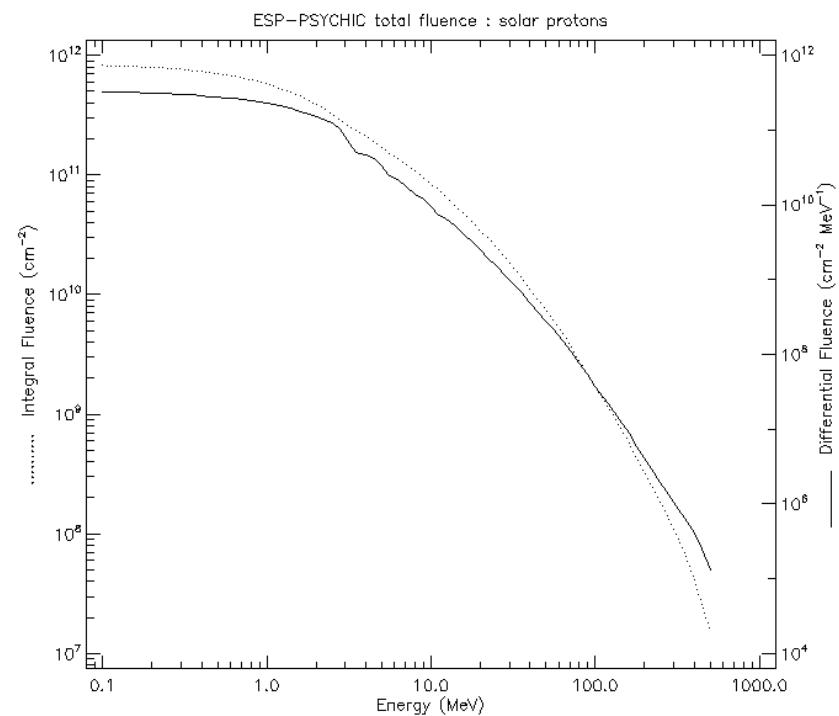


Fig.5.1 c). Solar Proton Fluence on Tundra Orbit

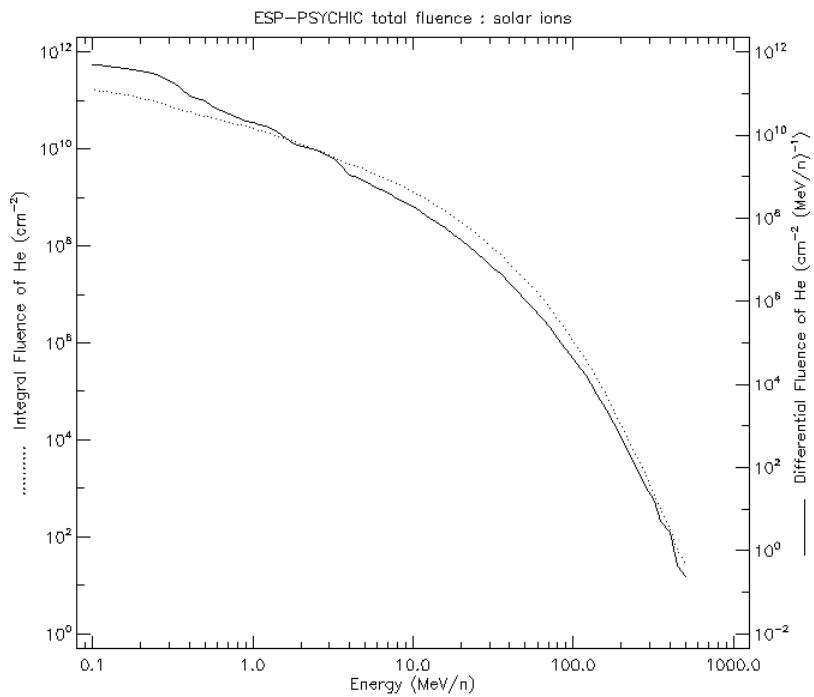


Fig.5.2 a). Solar Ions Fluence on Molniya Orbit

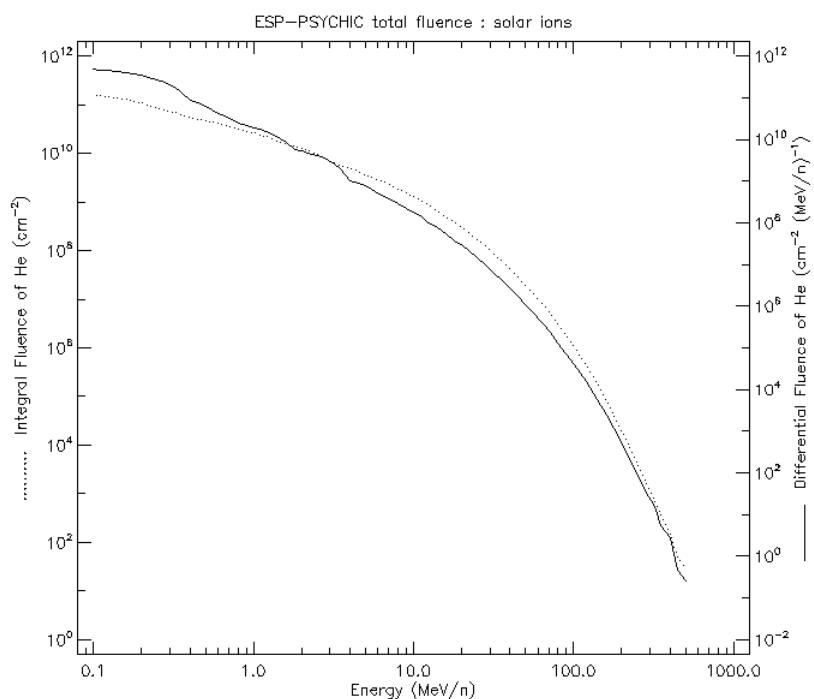


Fig.5.2b). Solar Ions Fluence on TAP orbit

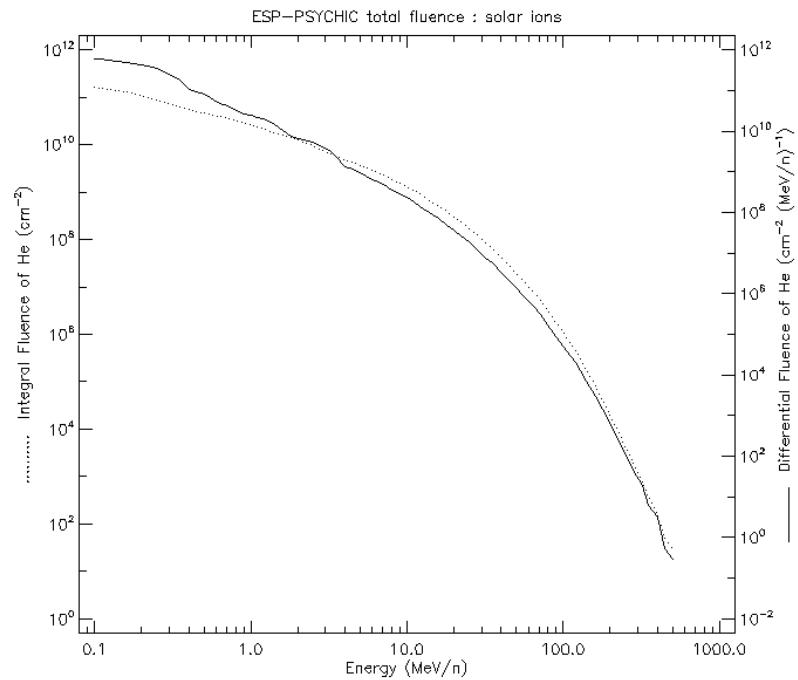


Fig.5.2 c). Solar Ions Fluence on Tundra Orbit

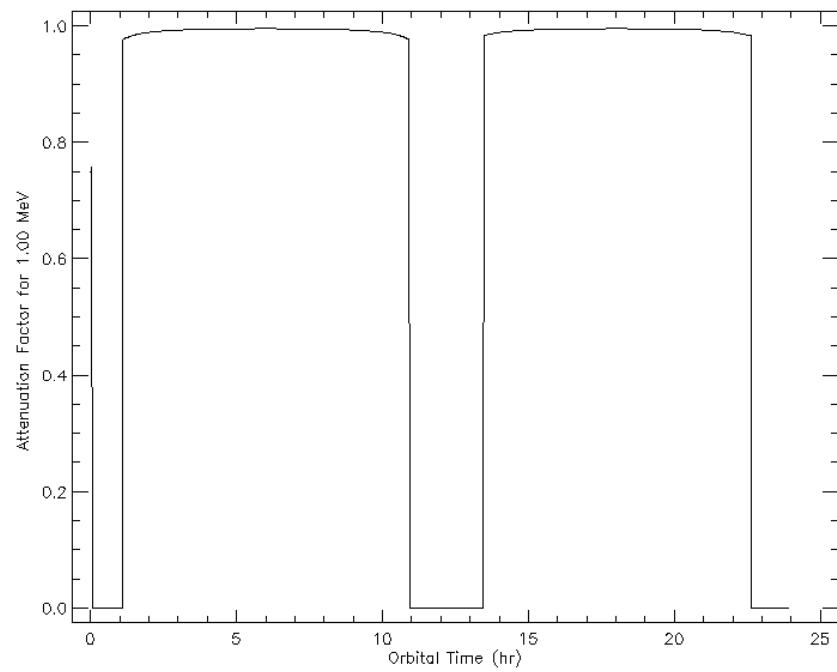


Fig.5.3 a). Attenuation factor for 1MeV on Molniya orbit

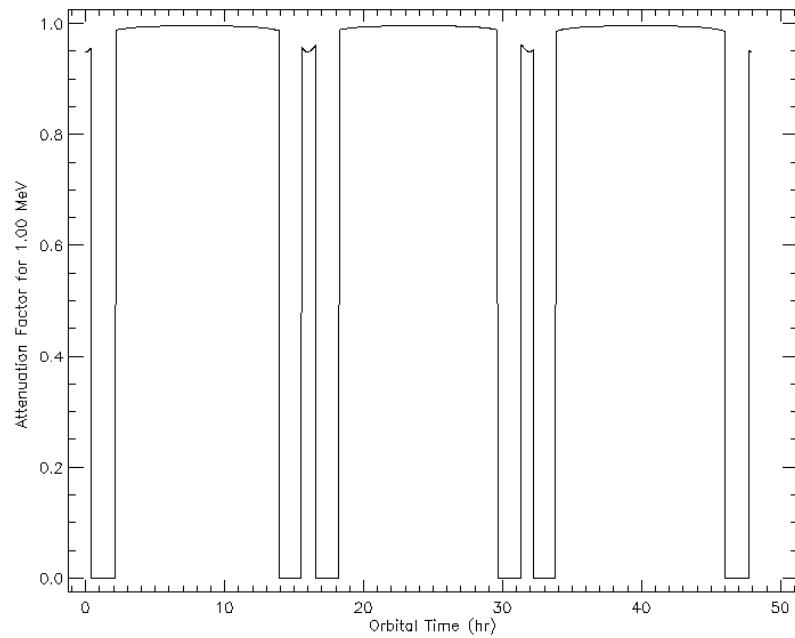


Fig. 5.3b). Attenuation factor for 1MeV on TAP Orbit

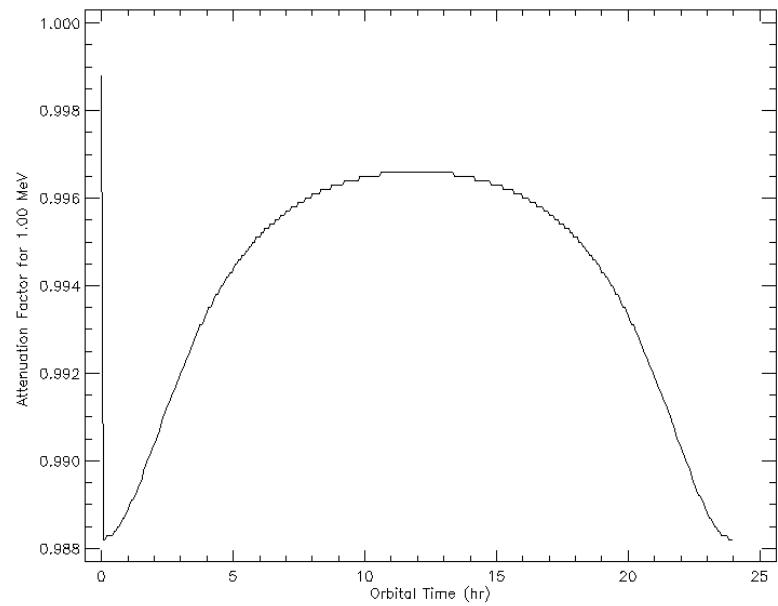


Fig. 5.3 c). Attenuation factor for 1MeV on Tundra Orbit

6. Galactic Cosmic Rays spectra (CREME-86 model)

The CREME86 GCR models implemented in SPENVIS are from the CREME86 software package and are marked by the interplanetary weather indices $M = 1, 2, 3$ and 4 . The weather index $M=1$ gives the best approximation to the galactic cosmic ray flux at the given date and is also included in $M=2$ and $M=4$ models. Index M=3 gives the worst-case galactic cosmic ray fluxes that allow uncertainties in flux data and solar activity. These fluxes are so severe that they have only a 10% chance of being exceeded by actual fluxes at any moment.

Overview input: Ion range: H – U; Interplanetary weather index: $M = 3$; Magnetic shielding: eccentric dipole/quiet magnetosphere/unchanged magnetic moment/all arrival directions.

Modelling results are presented in Figs. 6.1 a)-c) and in Appendix C.

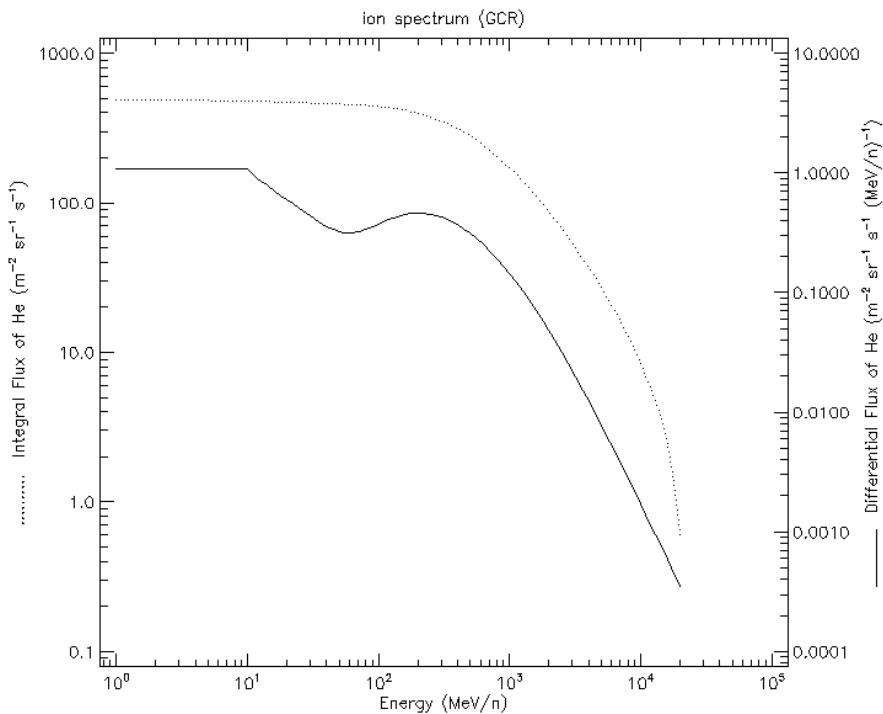


Fig. 6.1 a). GCR flux on Molniya orbit

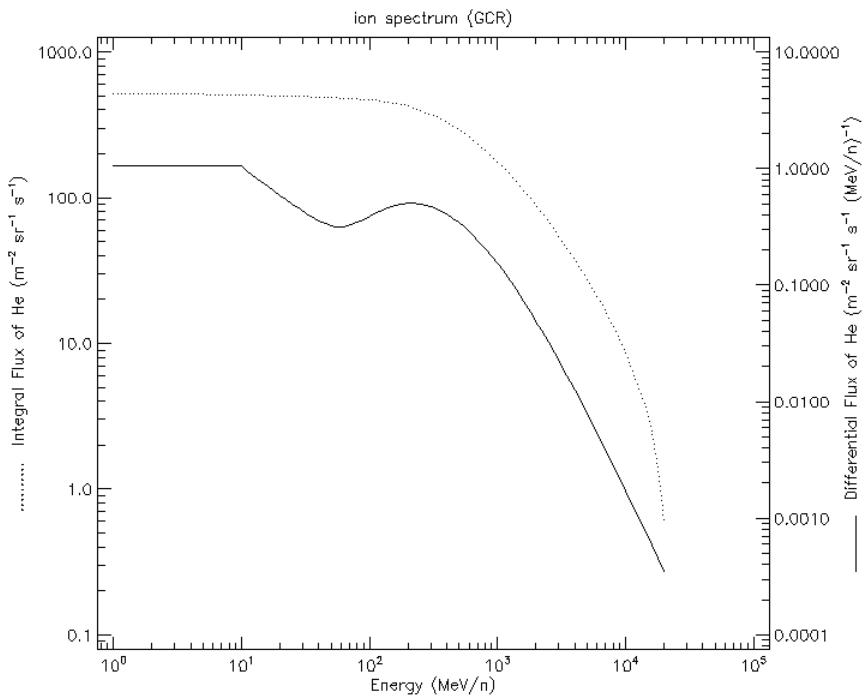


Fig. 6.1 b). GCR flux on TAP orbit

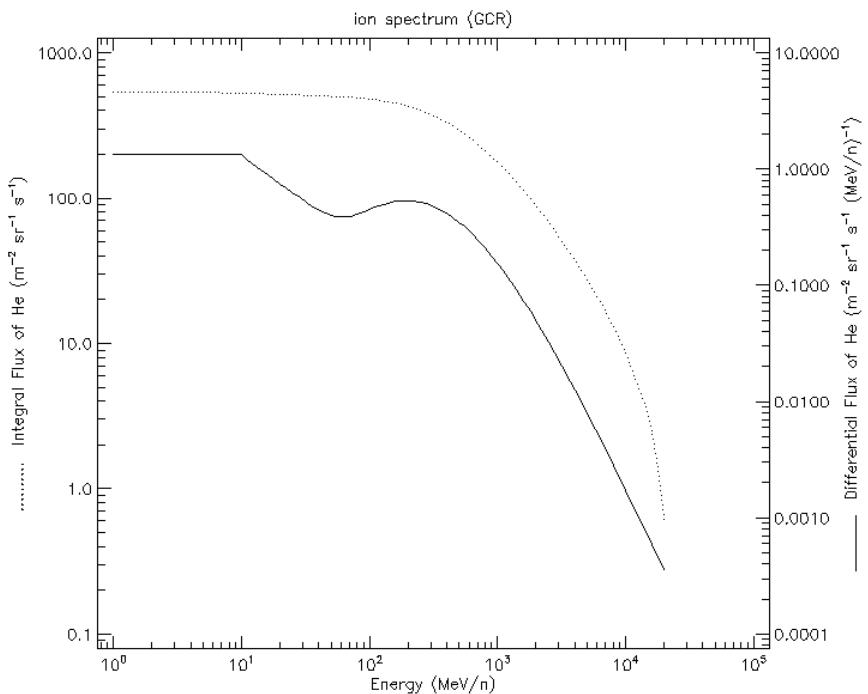


Fig. 6.1 c). GCR flux on Tundra orbit

7. Solar Particle flux models

Solar particle flux models are needed for evaluating single-event upset rates and the CRÈME -86 models with M=5-1 and M=7-1 flare fluxes were used with magnetic shielding as eccentric dipole/quiet magnetosphere/unchanged mag. mom./all arrival directions for ion range: H – U. Results are presented in Figs. 7.1-7.4 and Appendix D.

Peak ordinary flare flux and mean composition: M= 5-1

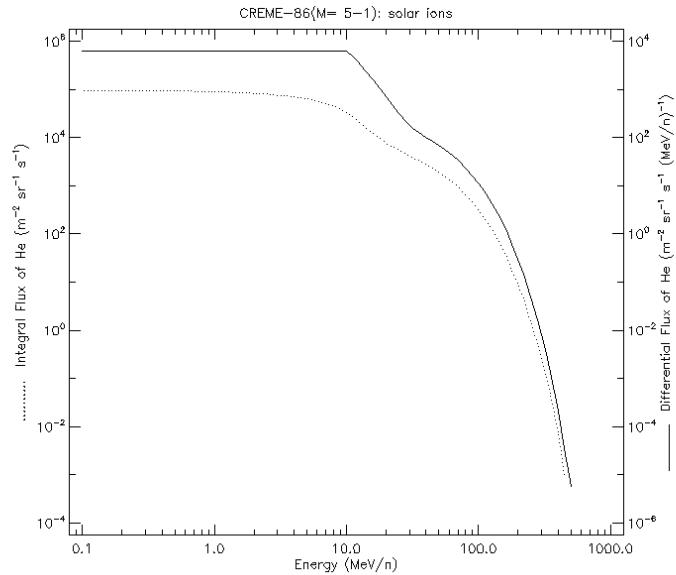


Fig. 7.1 a). Solar ion fluxes on Molniya orbit

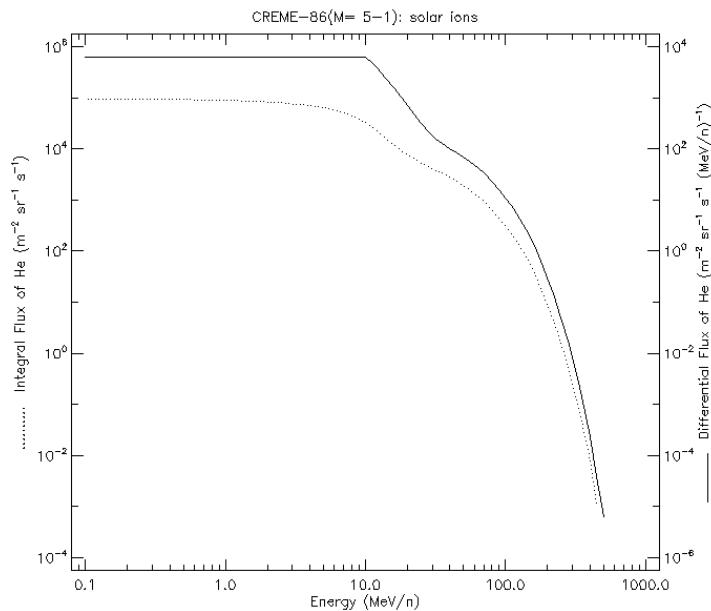


Fig.7.1b). Solar ion fluxes on TAP orbit

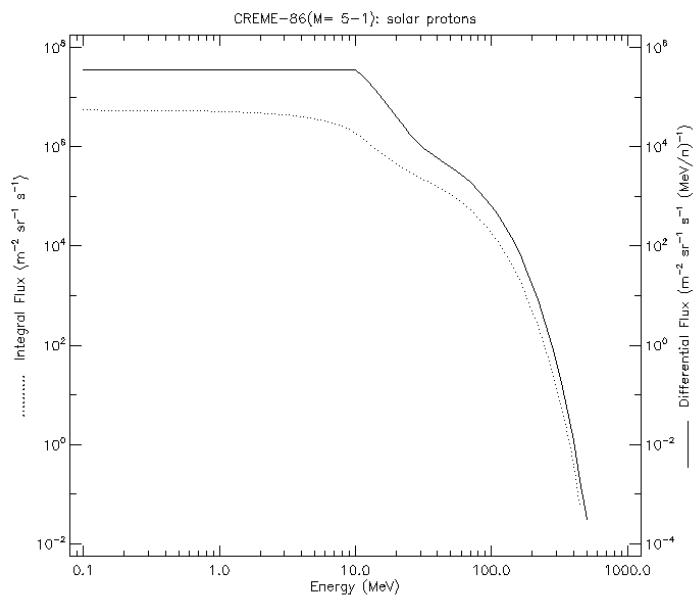


Fig.7.1 c). Solar proton fluxes on Tundra orbit

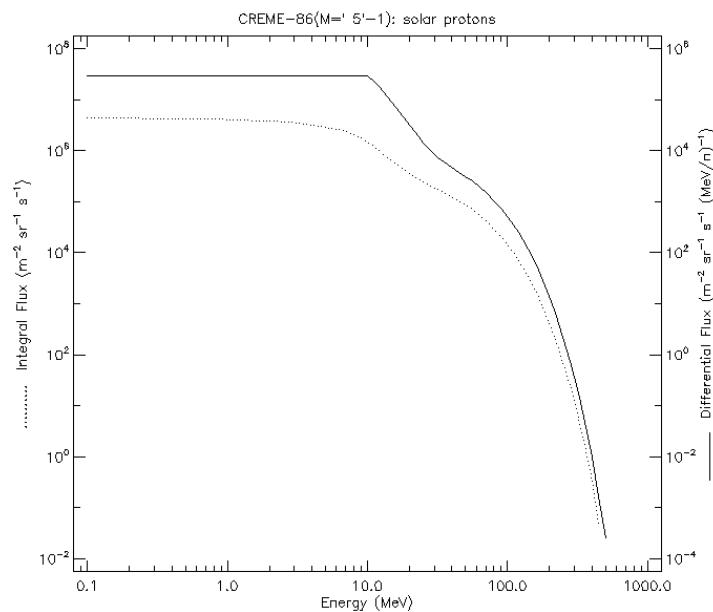


Fig. 7.2 a). Solar proton fluxes on Molniya orbit

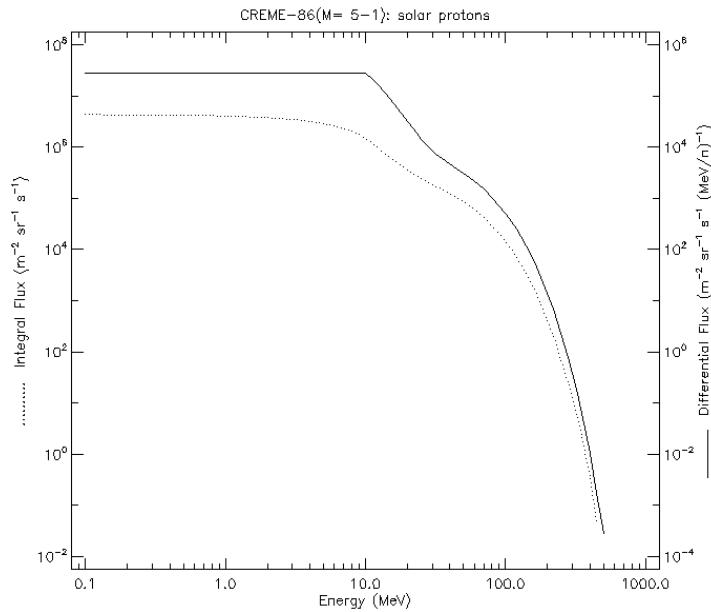


Fig.7.2b). Solar proton fluxes on TAP orbit

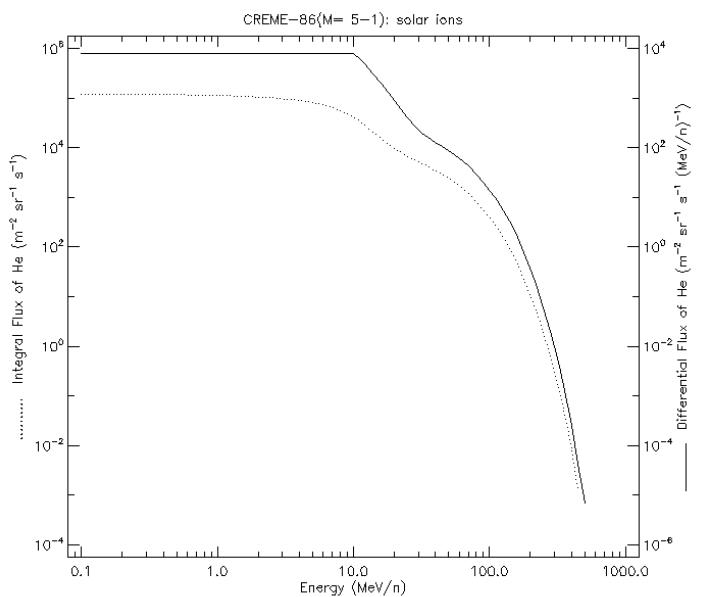


Fig.7.2 c). Solar ion fluxes on Tundra orbit.

Peak 10% worst-case flare flux and mean composition (M=7-1)

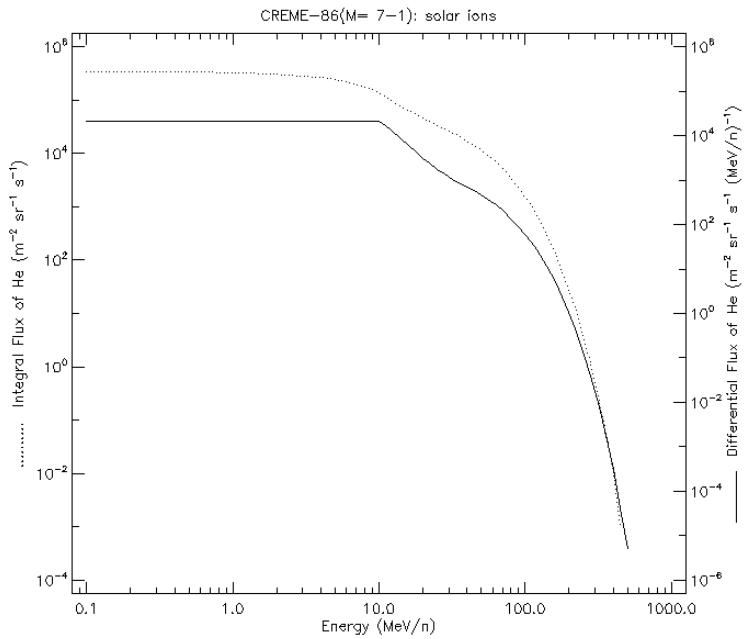


Fig. 7.3a). Solar ion fluxes on Molniya orbit

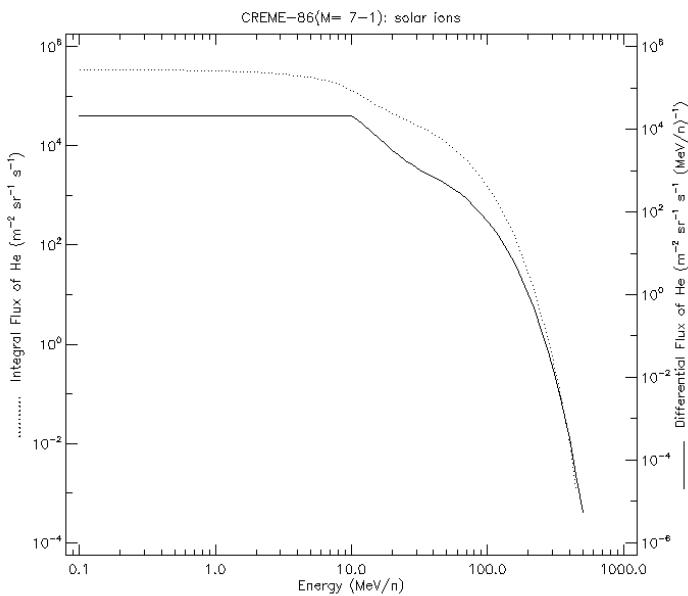


Fig. 7.3 b). Solar ion fluxes on TAP orbit

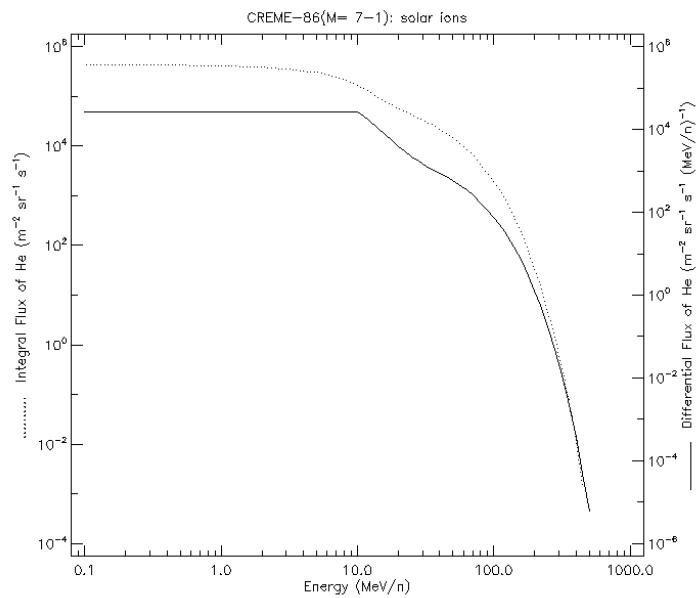


Fig.7.3 c). Solar ion fluxes on Tundra orbit

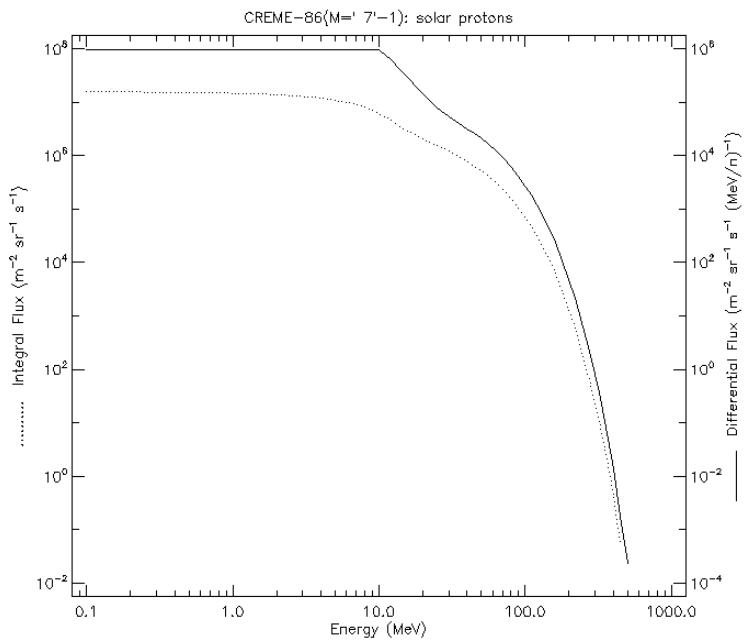


Fig. 7.4 a). Solar proton fluxes on Molniya orbit

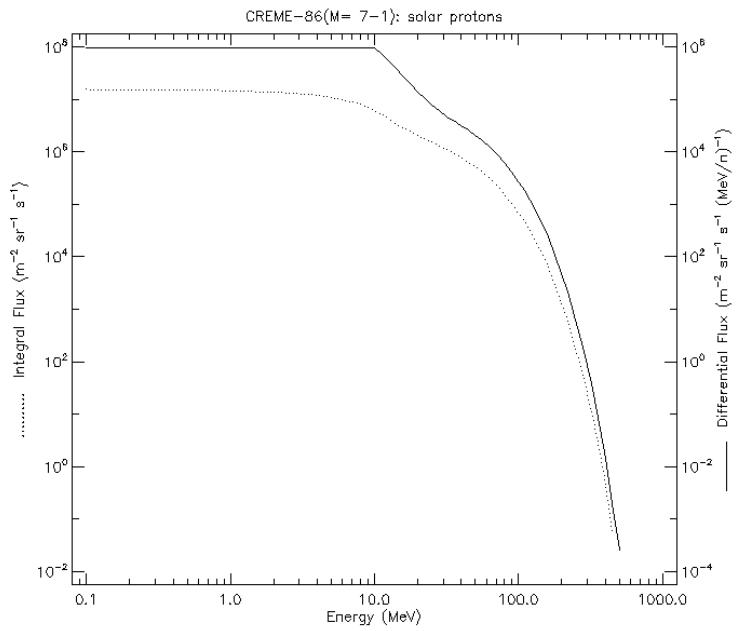


Fig. 7.4 b). Solar proton fluxes on TAP orbit

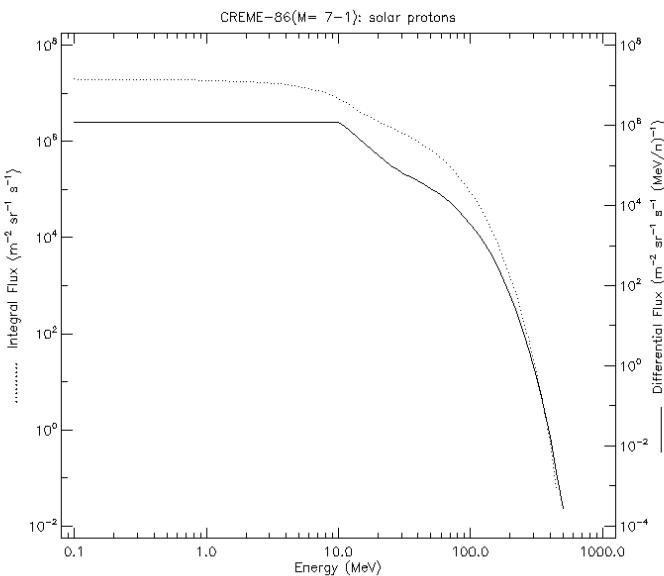


Fig. 7.4 c). Solar proton fluxes on Tundra orbit

8. Single Event Upset Rates

Overview input		
Particle spectra : trapped protons + solar particles (H - U) + GCR particles (H - U)		
Spacecraft shielding thickness (Al equivalent) : 0.51 cm		
Device name	Heavy ion method	Proton method
#01: DEFAULT (user defined) Mat.: Si RPP: 38.70 x 38.70 x 2.00 (μm^3)	Qcrit= 1.13E-02 pC SEU algorithm: CREME	A = 4.88 MeV B = 7.09 MeV

SEU rates for M=5-1 flare model

Table 8.1.

a) Molniya orbit

Segment averaged and total SEU rates							
		Mission total			Mission segment 1		
Device	Effect	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)
DEFAULT	Direct ionization	2.7391E+03	1.0857E-05	9.3804E-01	2.7391E+03	1.0857E-05	9.3804E-01
	Proton induced ionization	1.3392E+01	5.3083E-08	4.5863E-03	1.3392E+01	5.3083E-08	4.5863E-03
	Total	2.7525E+03	1.0910E-05	9.4262E-01	2.7525E+03	1.0910E-05	9.4262E-01

b) TAP orbit

Segment averaged and total SEU rates							
		Mission total			Mission segment 1		
Device	Effect	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)
DEFAULT	Direct ionization	7.8291E+02	3.1032E-06	2.6812E-01	7.8291E+02	3.1032E-06	2.6812E-01
	Proton induced ionization	3.6056E+00	1.4291E-08	1.2348E-03	3.6056E+00	1.4291E-08	1.2348E-03
	Total	7.8652E+02	3.1175E-06	2.6936E-01	7.8652E+02	3.1175E-06	2.6936E-01

c) Tundra orbit

Segment averaged and total SEU rates							
		Mission total			Mission segment 1		
Device	Effect	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)
DEFAULT	Direct ionization	9.8602E+02	3.9083E-06	3.3768E-01	9.8602E+02	3.9083E-06	3.3768E-01
	Proton induced ionization	4.5023E+00	1.7846E-08	1.5419E-03	4.5023E+00	1.7846E-08	1.5419E-03
	Total	9.9052E+02	3.9262E-06	3.3922E-01	9.9052E+02	3.9262E-06	3.3922E-01

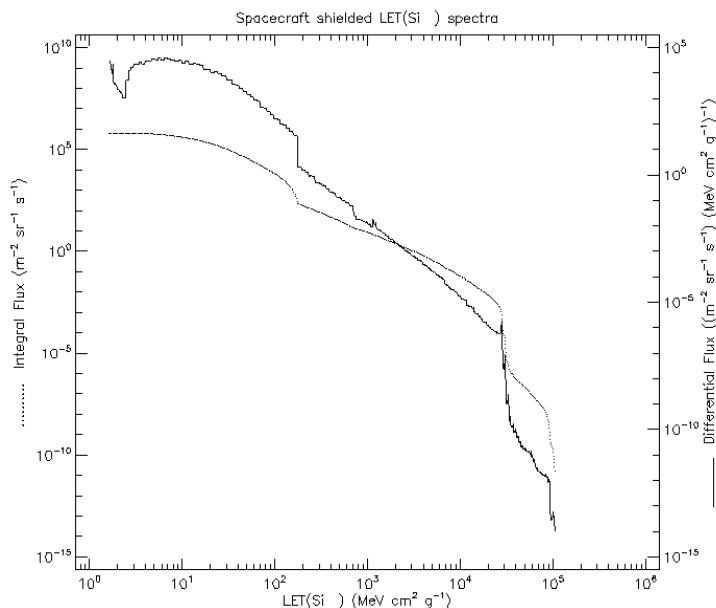


Fig. 8.1a). LET Spectra, Molniya orbit

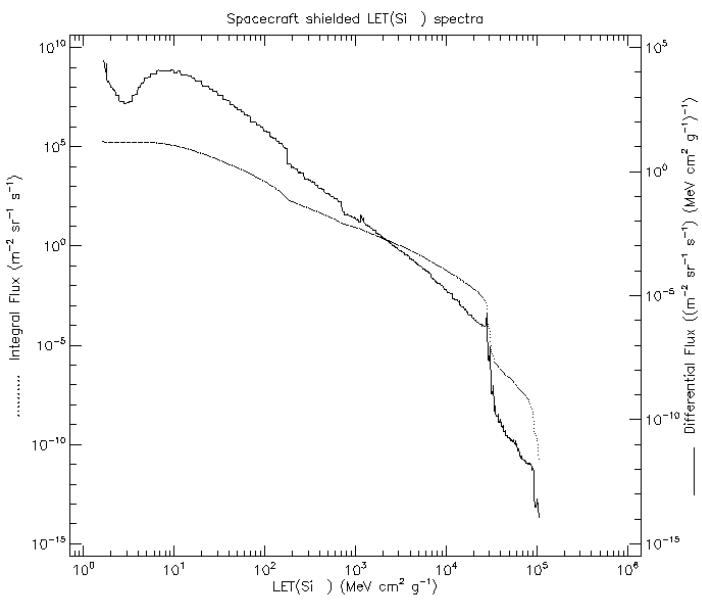


Fig. 8.1 b). LET Spectra TAP orbit

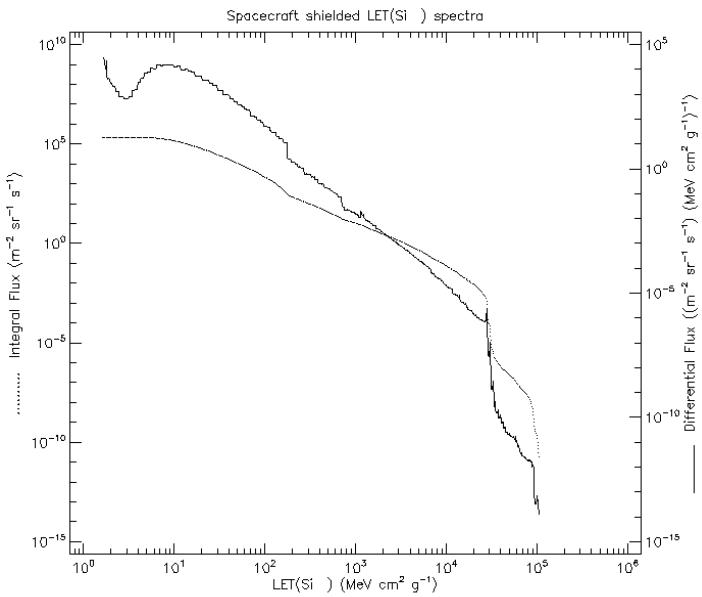


Fig.8.1 c). LET Spectra Tundra orbit.

SEU rates for M=7-1 flare model

Table 8.2

a) Molniya orbit.

Segment averaged and total SEU rates							
		Mission total			Mission segment 1		
Device	Effect	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)
DEFAULT	Direct ionization	7.0545E+03	2.7962E-05	2.4159E+00	7.0545E+03	2.7962E-05	2.4159E+00
	Proton induced ionization	3.0223E+01	1.1980E-07	1.0350E-02	3.0223E+01	1.1980E-07	1.0350E-02
	Total	7.0848E+03	2.8082E-05	2.4263E+00	7.0848E+03	2.8082E-05	2.4263E+00

b) TAP orbit

Segment averaged and total SEU rates							
		Mission total			Mission segment 1		
Device	Effect	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)
DEFAULT	Direct ionization	5.0629E+03	2.0068E-05	1.7339E+00	5.0629E+03	2.0068E-05	1.7339E+00
	Proton induced ionization	2.0308E+01	8.0495E-08	6.9548E-03	2.0308E+01	8.0495E-08	6.9548E-03
	Total	5.0832E+03	2.0148E-05	1.7408E+00	5.0832E+03	2.0148E-05	1.7408E+00

c) Tundra orbit

Segment averaged and total SEU rates							
		Mission total			Mission segment 1		
Device	Effect	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)	(bit ⁻¹)	(bit ⁻¹ s ⁻¹)	(bit ⁻¹ day ⁻¹)
DEFAULT	Direct ionization	6.4110E+03	2.5411E-05	2.1956E+00	6.4110E+03	2.5411E-05	2.1956E+00
	Proton induced ionization	2.5654E+01	1.0169E-07	8.7856E-03	2.5654E+01	1.0169E-07	8.7856E-03
	Total	6.4367E+03	2.5513E-05	2.2043E+00	6.4367E+03	2.5513E-05	2.2043E+00

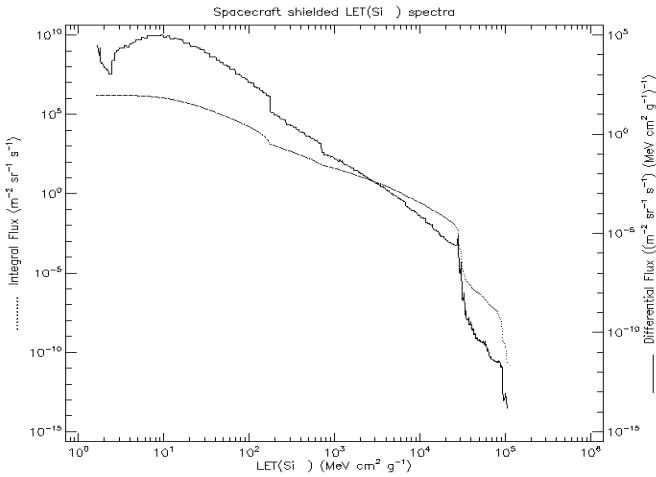


Fig. 8.2 a). LET Spectra, Molniya orbit.

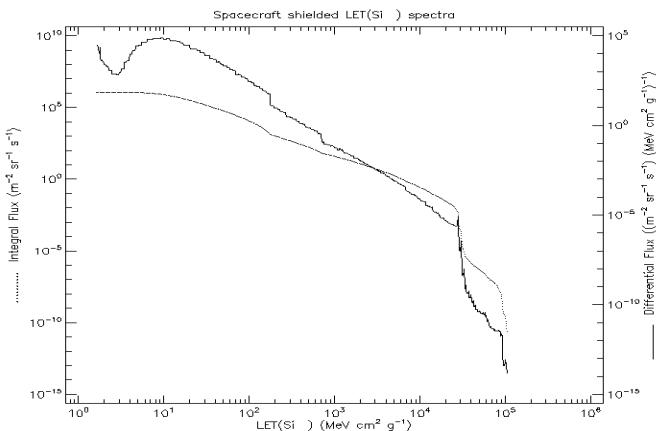


Fig. 8.2 b). LET Spectra, TAP orbit.

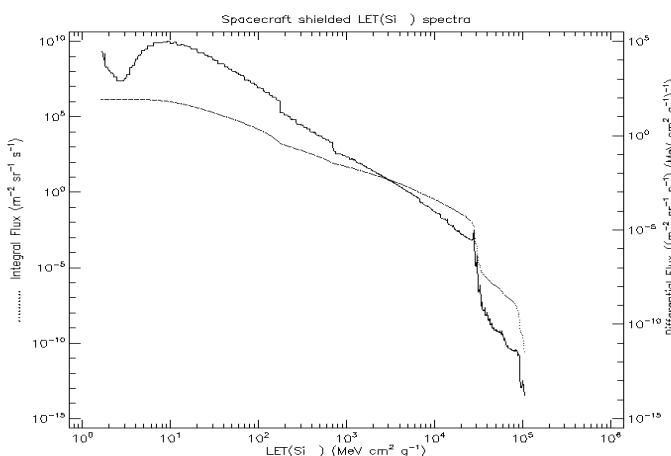


Fig. 8.2 c). LET Spectra, Tundra orbit

9. Total Ionizing Doze

Total mission dose was evaluated by application of SHIELDOSE software (SPENVIS) for target material: Si; Shield configuration: Centre of Al spheres.
Results for different candidate orbits are presented in Figs. 9.1 a)-c) and in Appendix E.

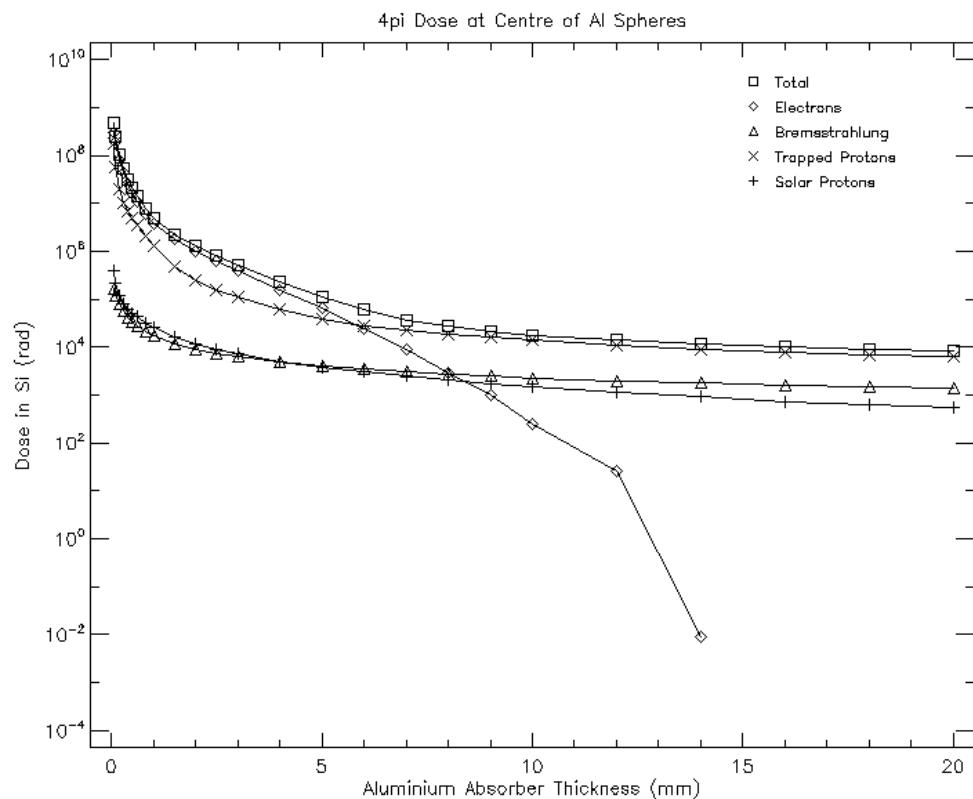


Fig. 9.1 a). Ionizing dose for different Al shielding thicknesses, Molniya orbit

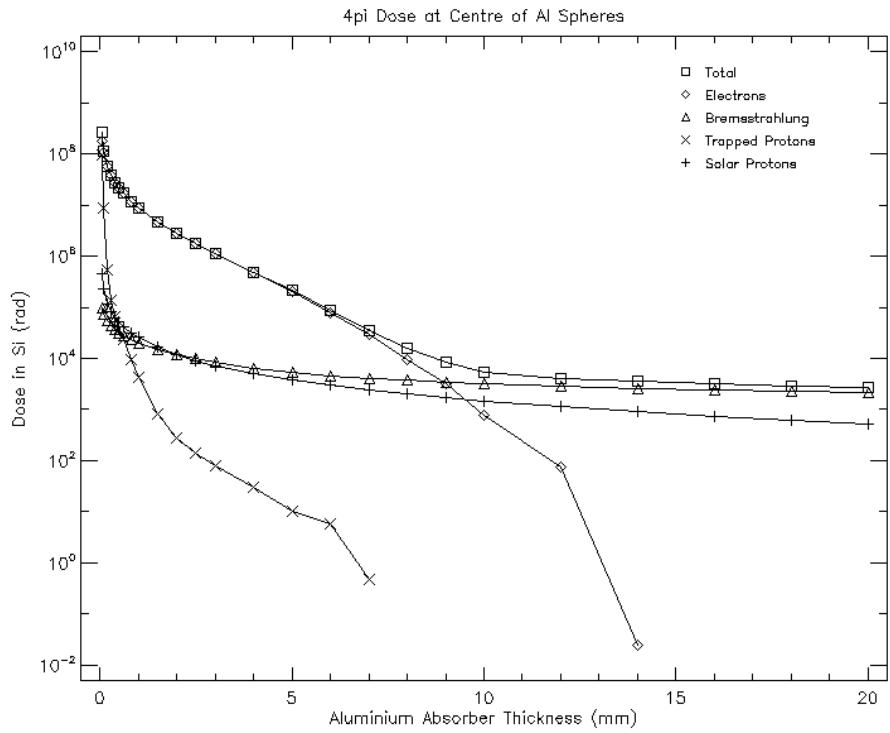


Fig. 9.1 b). Ionizing dose for different Al shielding thicknesses, TAP orbit

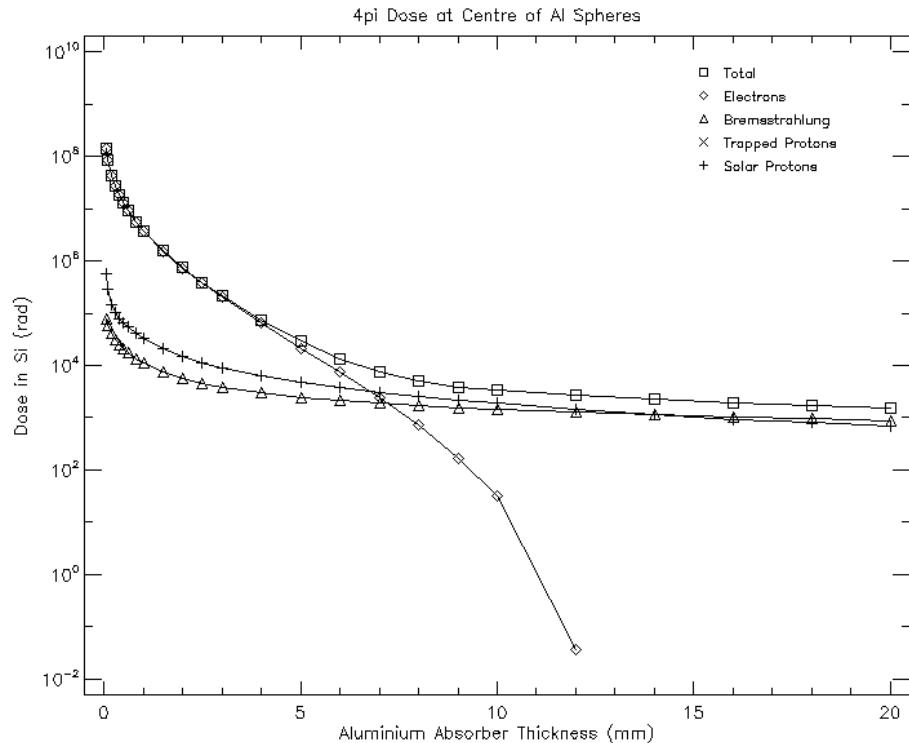


Fig. 9.1 c). Ionizing dose for different Al shielding thicknesses, Tundra orbit

10. Solar Cell Damage Equivalent Fluences

The basic solar cell equations can be used to describe the changes which occur during irradiation. This method would require data regarding the changes in the light generated current, series resistance, shunt resistance, and the basic diode parameters of saturation current and diode quality factor. Although such a method would be a logical analysis, most investigations have not reported enough data to determine the variations in the above parameters. The usual practice in the study of solar cell damage has been to reduce the experimental data in terms of changes in the cell short circuit current (I_{sc}), open circuit voltage (V_{oc}), and maximum power (P_{max}).

The methods for estimating solar cell degradation in space can be summarised as: the omnidirectional space radiation is converted to a damage equivalent unidirectional fluence at a normalised energy and in terms of a specific radiation particle. This equivalent fluence will produce the same damage as that produced by omnidirectional space radiation considered if the relative damage coefficient (RDC) is properly defined to allow the conversion. When the equivalent fluence is determined for a given space environment, the parameter degradation can be evaluated in the laboratory by irradiating the solar cell with the calculated fluence level of unidirectional normally incident flux. The equivalent fluence is normally expressed in terms of 1 MeV electrons or 10 MeV protons. In the presence of a cover shield, angular dependence of both effective shield thickness and damage effectiveness (or stopping power for dose calculations) is integrated over 2π for a given energy, assuming semi-infinite planar geometry. As a result, the RDC for a given shield thickness is computed only once. Subsequent equivalent fluence calculations simply involve an integration of the omnidirectional fluence times the appropriate damage coefficients as discussed below.

The three basic input elements necessary to perform degradation calculations are:

1. degradation data for solar cells under normal incidence 1 MeV electron irradiation;
2. effective relative damage coefficients for omnidirectional space electrons and protons of various energies for solar cells with various coverglass thicknesses;
3. space radiation environment data for the orbit of interest.

The effective relative damage coefficients allow the conversion of various energy spectra of space electrons and protons into equivalent fluences. The equivalent fluences are based on normal-incidence monoenergetic irradiations for which the degradations of the solar cells of interest are characterized.

Results are presented in Figs 10.1-10.3 and in Appendix F.

Input table:

Cell: Si	
Electron/proton damage ratios:	
P_{\max}	= 3000.0
V_{oc}	= 3000.0
I_{sc}	= 3000.0
Coverglass	
material: fused silica	
density: 2.20 (g/cm ³)	

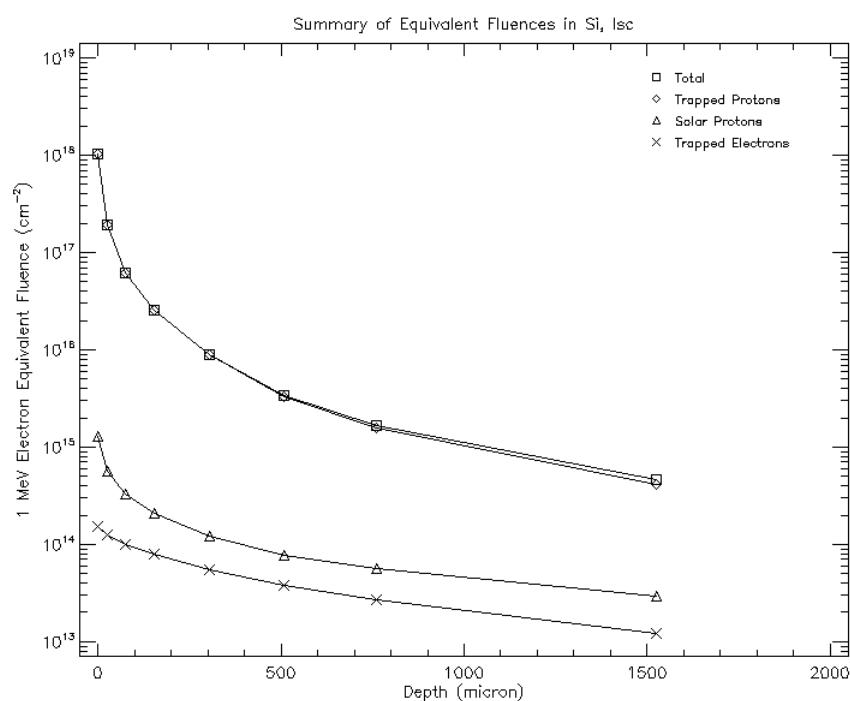


Fig. 10.1 a). Fluences for different depths. Short circuit current, Molniya orbit.

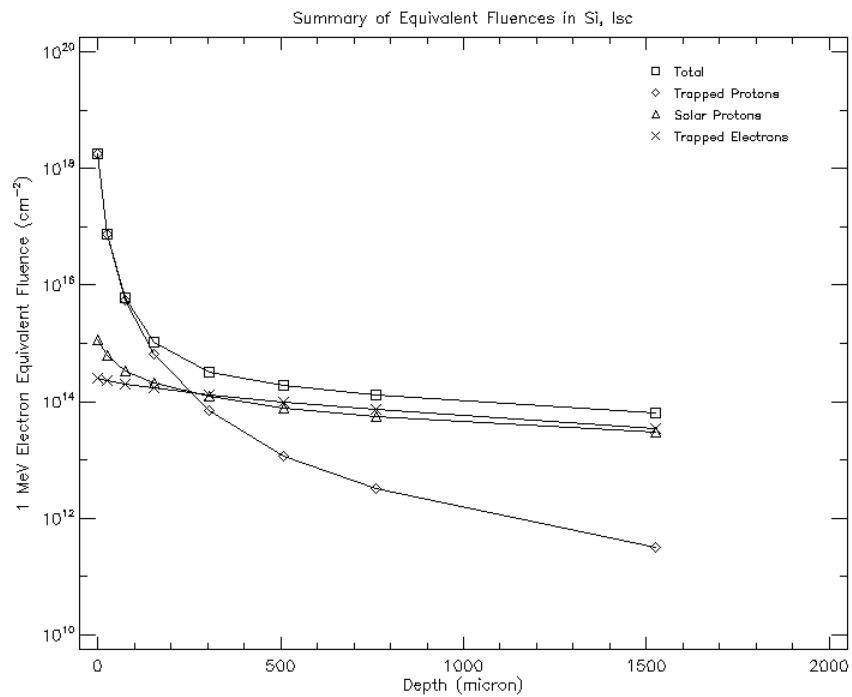


Fig. 10.1 b). Fluences for different depths. Short circuit current, TAP orbit.

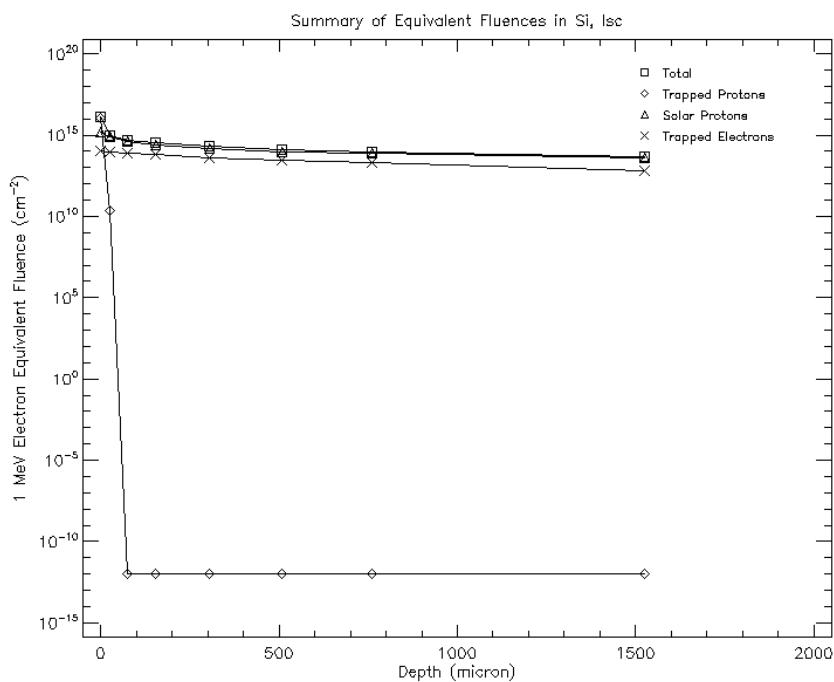


Fig. 10.1 c). Fluences for different depths. Short circuit current, Tundra orbit.

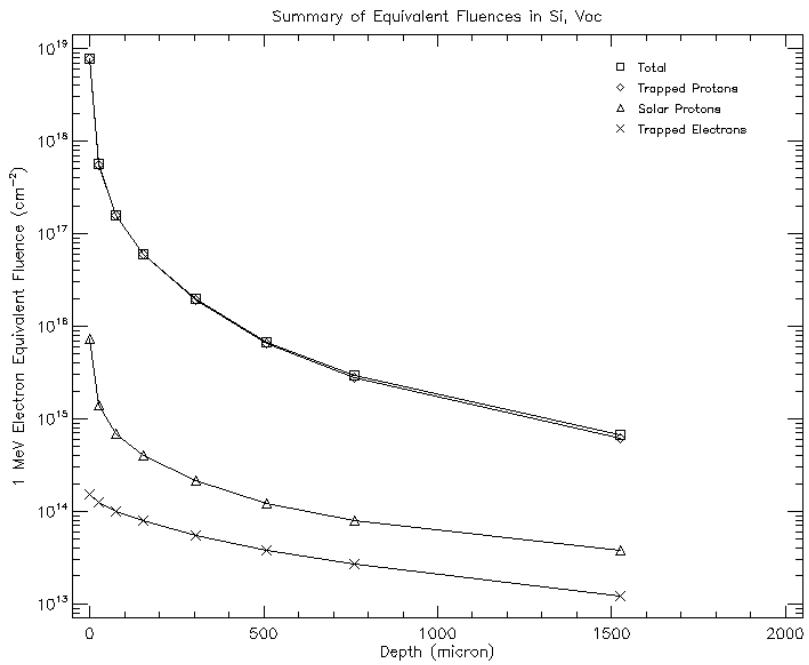


Fig. 10.2a). Fluences for different depths. Open circuit voltage, Molniya orbit

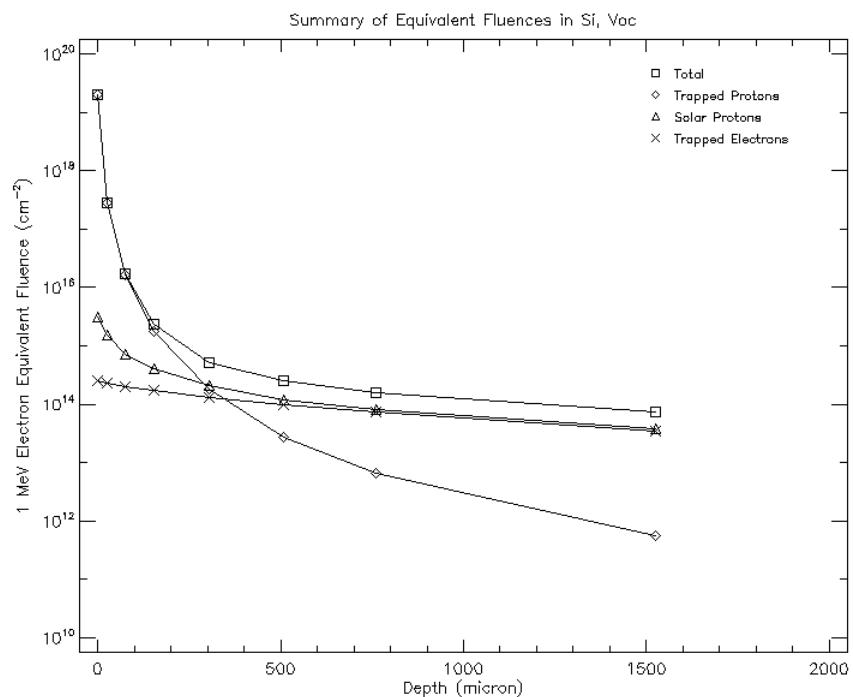


Fig. 10.2b). Fluences for different depths. Open circuit voltage, TAP orbit

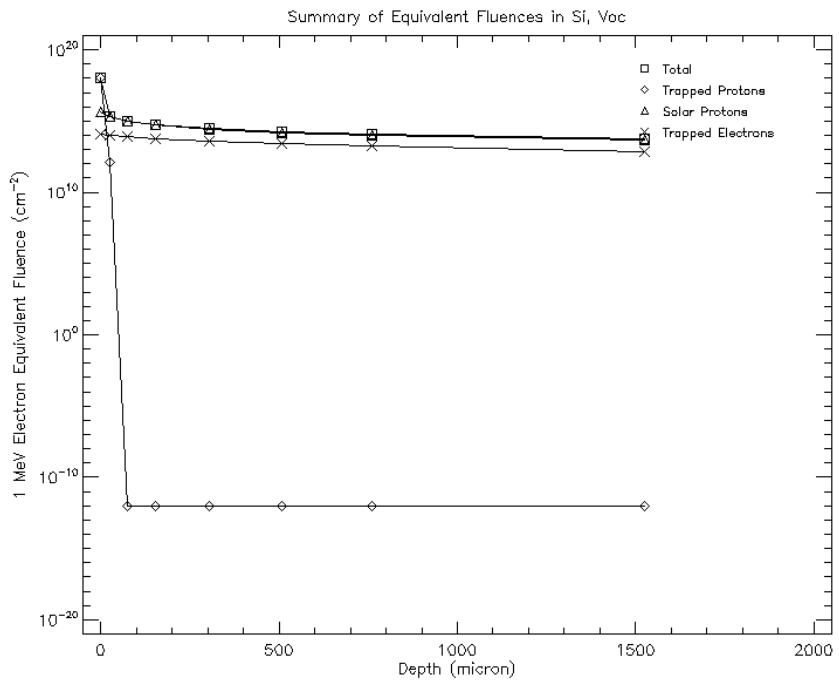


Fig. 10.2c). Fluences for different depths. Open circuit voltage, Tundra orbit

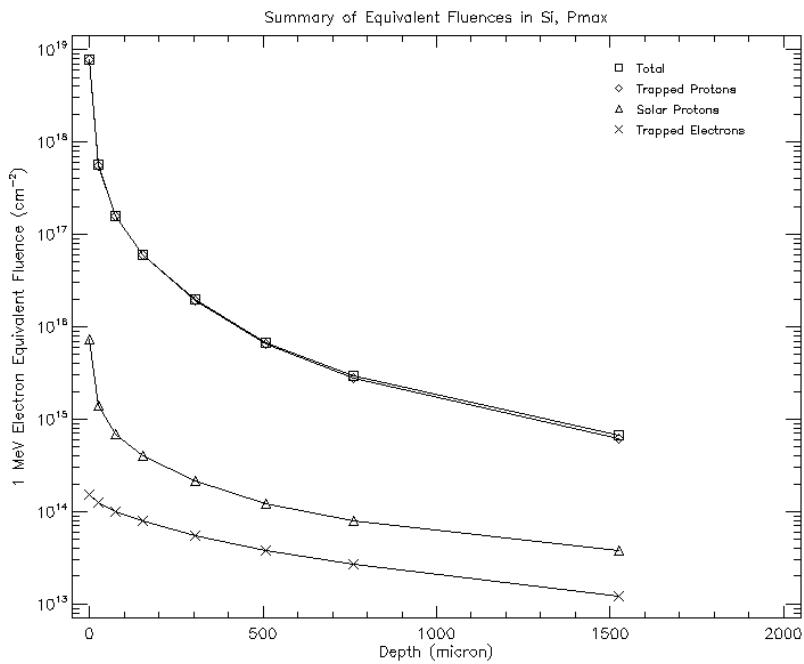


Fig. 10.3a). Equivalent fluences for different depths. Max. power, Molniya orbit

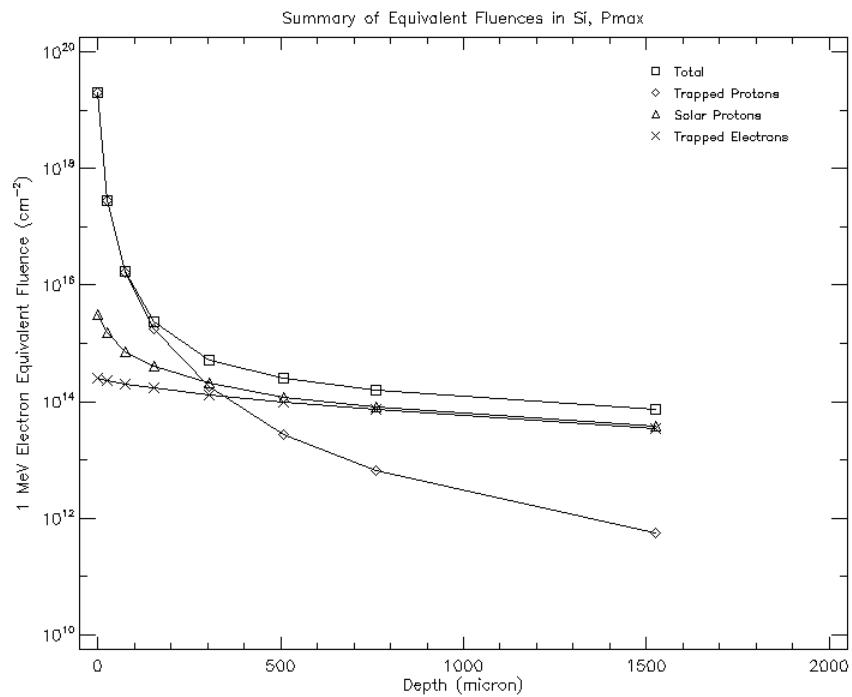


Fig. 10.3b). Equivalent fluences for different depths. Max. power, TAP orbit

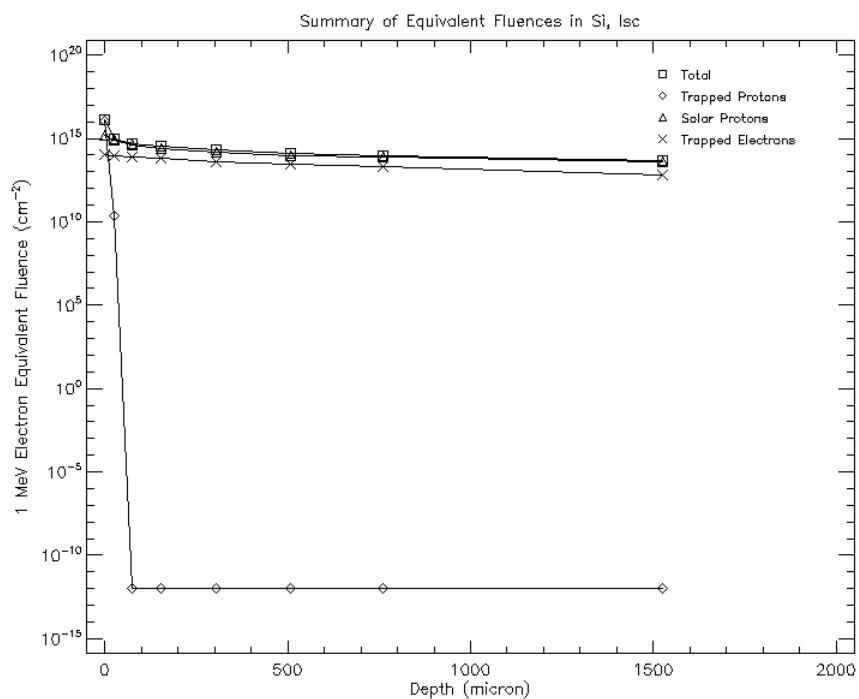


Fig. 10.3c). Equivalent fluences for different depths. Max. power, Tundra orbit

11. References:

A.Trishchenko and L.Garand, Spatial and Temporal Sampling of Polar Regions from Two-Satellite System on Molniya Orbit, *Journ. Of Atmospheric and Oceanic Technology*, V28, pp. 977-992, 2011.

Trishchenko, A.P., L.Garand and L.D.Trichchenko, Three apogee 16-h highly elliptical orbit as optimal choice for continuous meteorological imaging of polar regions, *Journal of Atmospheric and Oceanic Technology*. Vol. 28, No. 11. pp.1407-1422, 2011.

Michel Capderou, *Satellites: Orbits and Missions*, Vol. 1, ISBN 2-287-21317-1, Springer-Verlag France 2005, Chapter 5.

Appendix A.

Tables of the results for trapped radiation on 12-hrs (Molniya) orbit

Integral proton spectra				
Energy (MeV)	Total mission average flux (/cm ² /s)	Total mission fluence (/cm ²)	Mission segment 1	
			Average flux (/cm ² /s)	Segment fluence (/cm ²)
0.10	2.8942E+07	7.3017E+15	2.8942E+07	7.3017E+15
0.15	2.3017E+07	5.8070E+15	2.3017E+07	5.8070E+15
0.20	1.8420E+07	4.6472E+15	1.8420E+07	4.6472E+15
0.30	1.2593E+07	3.1772E+15	1.2593E+07	3.1772E+15
0.40	8.6938E+06	2.1934E+15	8.6938E+06	2.1934E+15
0.50	6.1594E+06	1.5540E+15	6.1594E+06	1.5540E+15
0.60	4.3933E+06	1.1084E+15	4.3933E+06	1.1084E+15
0.70	3.1955E+06	8.0619E+14	3.1955E+06	8.0619E+14
1.00	1.2832E+06	3.2373E+14	1.2832E+06	3.2373E+14
1.50	3.2298E+05	8.1484E+13	3.2298E+05	8.1484E+13
2.00	8.6565E+04	2.1839E+13	8.6565E+04	2.1839E+13
3.00	1.5123E+04	3.8153E+12	1.5123E+04	3.8153E+12
4.00	2.7926E+03	7.0453E+11	2.7926E+03	7.0453E+11
5.00	9.7162E+02	2.4513E+11	9.7162E+02	2.4513E+11
6.00	3.4319E+02	8.6582E+10	3.4319E+02	8.6582E+10
7.00	1.6367E+02	4.1291E+10	1.6367E+02	4.1291E+10
10.00	2.5634E+01	6.4671E+09	2.5634E+01	6.4671E+09
15.00	2.8336E+00	7.1489E+08	2.8336E+00	7.1489E+08
20.00	6.0927E-01	1.5371E+08	6.0927E-01	1.5371E+08
30.00	6.9717E-02	1.7589E+07	6.9717E-02	1.7589E+07
40.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
50.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
60.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
70.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
100.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
150.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
200.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

400.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Differential proton spectra				
	Total mission average flux (/cm²/MeV/s)	Total mission fluence (/cm²/MeV)	Mission segment 1	
Energy (MeV)			Average flux (/cm²/MeV/s)	Segment fluence (/cm²/MeV)
0.10	1.3176E+08	3.3242E+16	1.3176E+08	3.3242E+16
0.15	1.0521E+08	2.6544E+16	1.0521E+08	2.6544E+16
0.20	8.0717E+07	2.0364E+16	8.0717E+07	2.0364E+16
0.30	4.8633E+07	1.2269E+16	4.8633E+07	1.2269E+16
0.40	3.2170E+07	8.1161E+15	3.2170E+07	8.1161E+15
0.50	2.1503E+07	5.4249E+15	2.1503E+07	5.4249E+15
0.60	1.4820E+07	3.7388E+15	1.4820E+07	3.7388E+15
0.70	1.0577E+07	2.6684E+15	1.0577E+07	2.6684E+15
1.00	4.7042E+06	1.1868E+15	4.7042E+06	1.1868E+15
1.50	1.1966E+06	3.0189E+14	1.1966E+06	3.0189E+14
2.00	3.3903E+05	8.5534E+13	3.3903E+05	8.5534E+13
3.00	4.1886E+04	1.0567E+13	4.1886E+04	1.0567E+13
4.00	7.0757E+03	1.7851E+12	7.0757E+03	1.7851E+12
5.00	1.2247E+03	3.0897E+11	1.2247E+03	3.0897E+11
6.00	4.0397E+02	1.0192E+11	4.0397E+02	1.0192E+11
7.00	1.4615E+02	3.6871E+10	1.4615E+02	3.6871E+10
10.00	3.0467E+01	7.6864E+09	3.0467E+01	7.6864E+09
15.00	2.5025E+00	6.3134E+08	2.5025E+00	6.3134E+08
20.00	3.1457E-01	7.9362E+07	3.1457E-01	7.9362E+07
30.00	3.0463E-02	7.6855E+06	3.0463E-02	7.6855E+06
40.00	3.4859E-03	8.7944E+05	3.4859E-03	8.7944E+05
50.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
60.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
70.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
100.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
150.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
200.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
400.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Integral electron spectra				
Energy (MeV)	Total mission average flux (/cm ² /s)	Total mission fluence (/cm ²)	Mission segment 1	
			Average flux (/cm ² /s)	Segment fluence (/cm ²)
4.0E-02	1.6147E+07	4.0737E+15	1.6147E+07	4.0737E+15
0.10	9.9266E+06	2.5044E+15	9.9266E+06	2.5044E+15
0.20	5.5440E+06	1.3987E+15	5.5440E+06	1.3987E+15
0.30	3.4690E+06	8.7518E+14	3.4690E+06	8.7518E+14
0.40	2.4231E+06	6.1131E+14	2.4231E+06	6.1131E+14
0.50	1.7002E+06	4.2893E+14	1.7002E+06	4.2893E+14
0.60	1.3032E+06	3.2878E+14	1.3032E+06	3.2878E+14
0.70	1.0021E+06	2.5282E+14	1.0021E+06	2.5282E+14
0.80	7.9796E+05	2.0132E+14	7.9796E+05	2.0132E+14
1.00	5.4184E+05	1.3670E+14	5.4184E+05	1.3670E+14
1.25	3.5106E+05	8.8569E+13	3.5106E+05	8.8569E+13
1.50	2.2971E+05	5.7953E+13	2.2971E+05	5.7953E+13
1.75	1.4982E+05	3.7798E+13	1.4982E+05	3.7798E+13
2.00	9.8097E+04	2.4749E+13	9.8097E+04	2.4749E+13
2.25	6.5306E+04	1.6476E+13	6.5306E+04	1.6476E+13
2.50	4.3686E+04	1.1021E+13	4.3686E+04	1.1021E+13
2.75	2.7593E+04	6.9613E+12	2.7593E+04	6.9613E+12
3.00	1.7474E+04	4.4086E+12	1.7474E+04	4.4086E+12
3.25	1.0845E+04	2.7360E+12	1.0845E+04	2.7360E+12
3.50	6.7436E+03	1.7013E+12	6.7436E+03	1.7013E+12
3.75	3.8710E+03	9.7661E+11	3.8710E+03	9.7661E+11
4.00	2.2318E+03	5.6306E+11	2.2318E+03	5.6306E+11
4.25	1.1991E+03	3.0251E+11	1.1991E+03	3.0251E+11
4.50	6.4814E+02	1.6352E+11	6.4814E+02	1.6352E+11
4.75	3.2684E+02	8.2457E+10	3.2684E+02	8.2457E+10
5.00	1.6956E+02	4.2779E+10	1.6956E+02	4.2779E+10
5.50	3.8937E+01	9.8234E+09	3.8937E+01	9.8234E+09
6.00	8.0204E+00	2.0234E+09	8.0204E+00	2.0234E+09
6.50	1.4574E+00	3.6769E+08	1.4574E+00	3.6769E+08
7.00	1.3867E-01	3.4986E+07	1.3867E-01	3.4986E+07

Differential electron spectra				
Energy (MeV)	Total mission average flux (/cm ² /MeV/s)	Total mission fluence (/cm ² /MeV)	Mission segment 1	
	Average flux (/cm ² /MeV/s)	Segment fluence (/cm ² /MeV)		
4.0E-02	1.2612E+08	3.1818E+16	1.2612E+08	3.1818E+16
0.10	8.1231E+07	2.0494E+16	8.1231E+07	2.0494E+16
0.20	3.2288E+07	8.1459E+15	3.2288E+07	8.1459E+15
0.30	1.5605E+07	3.9368E+15	1.5605E+07	3.9368E+15
0.40	8.8440E+06	2.2312E+15	8.8440E+06	2.2312E+15
0.50	5.5994E+06	1.4127E+15	5.5994E+06	1.4127E+15
0.60	3.4903E+06	8.8056E+14	3.4903E+06	8.8056E+14
0.70	2.5262E+06	6.3732E+14	2.5262E+06	6.3732E+14
0.80	1.7879E+06	4.5106E+14	1.7879E+06	4.5106E+14
1.00	1.0506E+06	2.6506E+14	1.0506E+06	2.6506E+14
1.25	6.2426E+05	1.5749E+14	6.2426E+05	1.5749E+14
1.50	4.0248E+05	1.0154E+14	4.0248E+05	1.0154E+14
1.75	2.6323E+05	6.6409E+13	2.6323E+05	6.6409E+13
2.00	1.6903E+05	4.2644E+13	1.6903E+05	4.2644E+13
2.25	1.0882E+05	2.7455E+13	1.0882E+05	2.7455E+13
2.50	7.5426E+04	1.9029E+13	7.5426E+04	1.9029E+13
2.75	5.2424E+04	1.3226E+13	5.2424E+04	1.3226E+13
3.00	3.3496E+04	8.4506E+12	3.3496E+04	8.4506E+12
3.25	2.1462E+04	5.4145E+12	2.1462E+04	5.4145E+12
3.50	1.3948E+04	3.5188E+12	1.3948E+04	3.5188E+12
3.75	9.0236E+03	2.2765E+12	9.0236E+03	2.2765E+12
4.00	5.3439E+03	1.3482E+12	5.3439E+03	1.3482E+12
4.25	3.1673E+03	7.9908E+11	3.1673E+03	7.9908E+11
4.50	1.7444E+03	4.4010E+11	1.7444E+03	4.4010E+11
4.75	9.5716E+02	2.4148E+11	9.5716E+02	2.4148E+11
5.00	5.0648E+02	1.2778E+11	5.0648E+02	1.2778E+11
5.50	1.6154E+02	4.0756E+10	1.6154E+02	4.0756E+10
6.00	3.7480E+01	9.4557E+09	3.7480E+01	9.4557E+09
6.50	7.8817E+00	1.9885E+09	7.8817E+00	1.9885E+09
7.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Exposure for proton flux exceeding threshold 1.00 /cm ² /s			
Energy (MeV)	Total exposure (hr)	Mission segment 1	
		Exposure time (hr)	Orbit fraction
0.10	28559.25	28559.25	0.4075
0.15	28559.25	28559.25	0.4075
0.20	28559.25	28559.25	0.4075
0.30	28559.25	28559.25	0.4075
0.40	28559.25	28559.25	0.4075
0.50	28510.43	28510.43	0.4068
0.60	28510.43	28510.43	0.4068
0.70	28412.79	28412.79	0.4054
1.00	27729.32	27729.32	0.3957
1.50	17648.15	17648.15	0.2518
2.00	14865.45	14865.45	0.2121
3.00	12253.63	12253.63	0.1749
4.00	11716.61	11716.61	0.1672
5.00	10007.94	10007.94	0.1428
6.00	9556.36	9556.36	0.1364
7.00	8421.32	8421.32	0.1202
10.00	6297.68	6297.68	0.0899
15.00	3051.20	3051.20	0.0435
20.00	1879.54	1879.54	0.0268
30.00	1342.53	1342.53	0.0192
40.00	0.00	0.00	0.0000
50.00	0.00	0.00	0.0000
60.00	0.00	0.00	0.0000
70.00	0.00	0.00	0.0000
100.00	0.00	0.00	0.0000
150.00	0.00	0.00	0.0000
200.00	0.00	0.00	0.0000
300.00	0.00	0.00	0.0000
400.00	0.00	0.00	0.0000

Exposure for electron flux exceeding threshold 1.00 /cm ² /s			
Energy (MeV)	Total exposure (hr)	Mission segment 1	
		Exposure time (hr)	Orbit fraction
0.04	33099.44	33099.44	0.4723
0.10	33099.44	33099.44	0.4723
0.20	33099.44	33099.44	0.4723
0.30	32757.70	32757.70	0.4674
0.40	31171.08	31171.08	0.4448
0.50	31171.08	31171.08	0.4448
0.60	31049.03	31049.03	0.4431
0.70	31049.03	31049.03	0.4431
0.80	31049.03	31049.03	0.4431
1.00	30316.74	30316.74	0.4326
1.25	29340.36	29340.36	0.4187
1.50	29242.72	29242.72	0.4173
1.75	28998.62	28998.62	0.4138
2.00	28949.80	28949.80	0.4131
2.25	28656.89	28656.89	0.4089
2.50	28510.43	28510.43	0.4068
2.75	28412.79	28412.79	0.4054
3.00	28315.15	28315.15	0.4040
3.25	28315.15	28315.15	0.4040
3.50	27802.55	27802.55	0.3967
3.75	27704.91	27704.91	0.3953
4.00	26948.21	26948.21	0.3845
4.25	26948.21	26948.21	0.3845
4.50	26240.33	26240.33	0.3744
4.75	25605.68	25605.68	0.3654
5.00	20882.42	20882.42	0.2980
5.50	15915.07	15915.07	0.2271
6.00	11716.61	11716.61	0.1672
6.50	8567.77	8567.77	0.1223
7.00	3710.26	3710.26	0.0529

Integral peak proton fluxes for mission segment 1								
Energy (MeV)	Peak flux (/cm ² /s)	Longitude (deg)	Latitude (deg)	Altitude (km)	Orbit time (hr)	B (Gauss)	L (R _E)	
0.10	1.9774E+08	66.0	24.7	12753.2	23.1	0.01329	3.190	
0.15	1.6874E+08	64.4	23.7	12382.3	13.0	0.01395	3.102	
0.20	1.4506E+08	66.3	23.5	12318.8	23.1	0.01408	3.081	
0.30	1.0806E+08	66.7	21.6	11657.2	23.2	0.01543	2.922	
0.40	8.2599E+07	66.9	20.2	11209.6	23.2	0.01647	2.819	
0.50	6.6372E+07	66.9	20.2	11209.6	23.2	0.01647	2.819	
0.60	5.4342E+07	67.3	18.8	10756.9	23.3	0.01764	2.719	
0.70	4.5366E+07	67.3	18.8	10756.9	23.3	0.01764	2.719	
1.00	2.6660E+07	67.6	17.3	10299.0	23.3	0.01896	2.622	
1.50	1.2990E+07	68.6	13.1	9133.1	23.4	0.02321	2.394	
2.00	7.2632E+06	69.1	11.2	8658.9	23.4	0.02542	2.310	
3.00	3.6388E+06	60.5	7.4	7769.1	12.6	0.03027	2.177	
4.00	2.0509E+06	59.8	5.2	7284.9	12.6	0.03379	2.108	
5.00	1.4382E+06	236.8	-7.6	5072.8	0.4	0.05351	1.802	
6.00	1.0922E+06	236.8	-7.6	5072.8	0.4	0.05351	1.802	
7.00	8.1197E+05	236.8	-7.6	5072.8	0.4	0.05351	1.802	
10.00	3.4244E+05	258.0	-13.1	4334.0	11.7	0.06259	1.708	
15.00	1.0667E+05	258.8	-15.0	4099.5	11.7	0.06669	1.675	
20.00	5.1849E+04	259.6	-17.0	3867.9	11.7	0.07128	1.647	
30.00	2.6755E+04	261.6	-21.3	3414.9	11.7	0.08222	1.603	
40.00	2.0305E+04	261.6	-21.3	3414.9	11.7	0.08222	1.603	
50.00	1.5409E+04	261.6	-21.3	3414.9	11.7	0.08222	1.603	
60.00	1.2696E+04	261.6	-21.3	3414.9	11.7	0.08222	1.603	
70.00	1.0786E+04	261.6	-21.3	3414.9	11.7	0.08222	1.603	
100.00	6.9288E+03	262.7	-23.6	3194.9	11.7	0.08870	1.589	
150.00	3.5383E+03	262.7	-23.6	3194.9	11.7	0.08870	1.589	
200.00	1.8069E+03	262.7	-23.6	3194.9	11.7	0.08870	1.589	
300.00	6.1950E+02	262.7	-23.6	3194.9	11.7	0.08870	1.589	
400.00	2.1240E+02	262.7	-23.6	3194.9	11.7	0.08870	1.589	

Integral peak electron fluxes for mission segment 1								
Energy (MeV)	Peak flux (/cm ² /s)	Longitude (deg)	Latitude (deg)	Altitude (km)	Orbit time (hr)	B (Gauss)	L (R _E)	
0.04	4.2762E+08	236.8	-7.6	5072.8	0.4	0.05351	1.802	
0.10	3.0691E+08	236.8	-7.6	5072.8	0.4	0.05351	1.802	
0.20	1.4985E+08	236.8	-7.6	5072.8	0.4	0.05351	1.802	
0.30	6.6111E+07	236.8	-7.6	5072.8	0.4	0.05351	1.802	
0.40	2.6355E+07	236.8	-7.6	5072.8	0.4	0.05351	1.802	
0.50	1.0506E+07	236.8	-7.6	5072.8	0.4	0.05351	1.802	
0.60	6.5345E+06	64.5	34.9	17188.6	22.7	0.00794	4.506	
0.70	5.1714E+06	64.5	34.9	17188.6	22.7	0.00794	4.506	
0.80	4.1719E+06	64.5	34.9	17188.6	22.7	0.00794	4.506	
1.00	2.9186E+06	66.1	34.2	16866.0	13.3	0.00821	4.389	
1.25	1.8950E+06	65.9	33.0	16290.8	13.3	0.00873	4.202	
1.50	1.2890E+06	64.9	31.7	15646.9	22.9	0.00938	4.005	
1.75	8.4438E+05	64.9	31.7	15646.9	22.9	0.00938	4.005	
2.00	5.5312E+05	64.9	31.7	15646.9	22.9	0.00938	4.005	
2.25	3.8249E+05	65.1	30.3	15048.1	22.9	0.01003	3.823	
2.50	2.7217E+05	65.5	30.0	14905.1	13.2	0.01020	3.779	
2.75	1.6857E+05	65.5	30.0	14905.1	13.2	0.01020	3.779	
3.00	1.0690E+05	65.3	28.6	14292.1	13.1	0.01096	3.604	
3.25	6.7531E+04	65.4	28.4	14231.9	23.0	0.01104	3.587	
3.50	4.2978E+04	65.1	27.6	13876.9	13.1	0.01153	3.489	
3.75	2.5569E+04	65.1	27.6	13876.9	13.1	0.01153	3.489	
4.00	1.5299E+04	65.6	26.9	13606.1	23.0	0.01192	3.414	
4.25	8.7296E+03	65.6	26.9	13606.1	23.0	0.01192	3.414	
4.50	5.0531E+03	64.9	26.5	13456.5	13.1	0.01214	3.376	
4.75	3.1735E+03	64.6	24.9	12816.0	13.0	0.01318	3.210	
5.00	2.0724E+03	64.6	24.9	12816.0	13.0	0.01318	3.210	
5.50	5.6784E+02	66.0	24.7	12753.2	23.1	0.01329	3.190	
6.00	1.7233E+02	66.4	22.9	12099.6	23.1	0.01451	3.027	
6.50	3.4234E+01	66.4	22.9	12099.6	23.1	0.01451	3.027	
7.00	4.3974E+00	66.0	24.7	12753.2	23.1	0.01329	3.190	

Tables of the results for trapped radiation on 16-hrs (TAP) orbit

Integral proton spectra				
Energy (MeV)	Total mission average flux (/cm ² /s)	Total mission fluence (/cm ²)	Mission segment 1	
			Average flux (/cm ² /s)	Segment fluence (/cm ²)
0.10	2.8942E+07	7.3017E+15	2.8942E+07	7.3017E+15
0.15	2.3017E+07	5.8070E+15	2.3017E+07	5.8070E+15
0.20	1.8420E+07	4.6472E+15	1.8420E+07	4.6472E+15
0.30	1.2593E+07	3.1772E+15	1.2593E+07	3.1772E+15
0.40	8.6938E+06	2.1934E+15	8.6938E+06	2.1934E+15
0.50	6.1594E+06	1.5540E+15	6.1594E+06	1.5540E+15
0.60	4.3933E+06	1.1084E+15	4.3933E+06	1.1084E+15
0.70	3.1955E+06	8.0619E+14	3.1955E+06	8.0619E+14
1.00	1.2832E+06	3.2373E+14	1.2832E+06	3.2373E+14
1.50	3.2298E+05	8.1484E+13	3.2298E+05	8.1484E+13
2.00	8.6565E+04	2.1839E+13	8.6565E+04	2.1839E+13
3.00	1.5123E+04	3.8153E+12	1.5123E+04	3.8153E+12
4.00	2.7926E+03	7.0453E+11	2.7926E+03	7.0453E+11
5.00	9.7162E+02	2.4513E+11	9.7162E+02	2.4513E+11
6.00	3.4319E+02	8.6582E+10	3.4319E+02	8.6582E+10
7.00	1.6367E+02	4.1291E+10	1.6367E+02	4.1291E+10
10.00	2.5634E+01	6.4671E+09	2.5634E+01	6.4671E+09
15.00	2.8336E+00	7.1489E+08	2.8336E+00	7.1489E+08
20.00	6.0927E-01	1.5371E+08	6.0927E-01	1.5371E+08
30.00	6.9717E-02	1.7589E+07	6.9717E-02	1.7589E+07
40.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
50.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
60.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
70.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
100.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
150.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
200.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
400.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Differential proton spectra				
Energy (MeV)	Total mission average flux (/cm ² /MeV/s)	Total mission fluence (/cm ² /MeV)	Mission segment 1	
	Average flux (/cm ² /MeV/s)	Segment fluence (/cm ² /MeV)		
0.10	1.3176E+08	3.3242E+16	1.3176E+08	3.3242E+16
0.15	1.0521E+08	2.6544E+16	1.0521E+08	2.6544E+16
0.20	8.0717E+07	2.0364E+16	8.0717E+07	2.0364E+16
0.30	4.8633E+07	1.2269E+16	4.8633E+07	1.2269E+16
0.40	3.2170E+07	8.1161E+15	3.2170E+07	8.1161E+15
0.50	2.1503E+07	5.4249E+15	2.1503E+07	5.4249E+15
0.60	1.4820E+07	3.7388E+15	1.4820E+07	3.7388E+15
0.70	1.0577E+07	2.6684E+15	1.0577E+07	2.6684E+15
1.00	4.7042E+06	1.1868E+15	4.7042E+06	1.1868E+15
1.50	1.1966E+06	3.0189E+14	1.1966E+06	3.0189E+14
2.00	3.3903E+05	8.5534E+13	3.3903E+05	8.5534E+13
3.00	4.1886E+04	1.0567E+13	4.1886E+04	1.0567E+13
4.00	7.0757E+03	1.7851E+12	7.0757E+03	1.7851E+12
5.00	1.2247E+03	3.0897E+11	1.2247E+03	3.0897E+11
6.00	4.0397E+02	1.0192E+11	4.0397E+02	1.0192E+11
7.00	1.4615E+02	3.6871E+10	1.4615E+02	3.6871E+10
10.00	3.0467E+01	7.6864E+09	3.0467E+01	7.6864E+09
15.00	2.5025E+00	6.3134E+08	2.5025E+00	6.3134E+08
20.00	3.1457E-01	7.9362E+07	3.1457E-01	7.9362E+07
30.00	3.0463E-02	7.6855E+06	3.0463E-02	7.6855E+06
40.00	3.4859E-03	8.7944E+05	3.4859E-03	8.7944E+05
50.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
60.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
70.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
100.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
150.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
200.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
400.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Integral electron spectra				
Energy (MeV)	Total mission average flux (/cm ² /s)	Total mission fluence (/cm ²)	Mission segment 1	
	Average flux (/cm ² /s)	Segment fluence (/cm ²)		
4.0E-02	1.6147E+07	4.0737E+15	1.6147E+07	4.0737E+15
0.10	9.9266E+06	2.5044E+15	9.9266E+06	2.5044E+15
0.20	5.5440E+06	1.3987E+15	5.5440E+06	1.3987E+15
0.30	3.4690E+06	8.7518E+14	3.4690E+06	8.7518E+14
0.40	2.4231E+06	6.1131E+14	2.4231E+06	6.1131E+14
0.50	1.7002E+06	4.2893E+14	1.7002E+06	4.2893E+14
0.60	1.3032E+06	3.2878E+14	1.3032E+06	3.2878E+14
0.70	1.0021E+06	2.5282E+14	1.0021E+06	2.5282E+14
0.80	7.9796E+05	2.0132E+14	7.9796E+05	2.0132E+14
1.00	5.4184E+05	1.3670E+14	5.4184E+05	1.3670E+14
1.25	3.5106E+05	8.8569E+13	3.5106E+05	8.8569E+13
1.50	2.2971E+05	5.7953E+13	2.2971E+05	5.7953E+13
1.75	1.4982E+05	3.7798E+13	1.4982E+05	3.7798E+13
2.00	9.8097E+04	2.4749E+13	9.8097E+04	2.4749E+13
2.25	6.5306E+04	1.6476E+13	6.5306E+04	1.6476E+13
2.50	4.3686E+04	1.1021E+13	4.3686E+04	1.1021E+13
2.75	2.7593E+04	6.9613E+12	2.7593E+04	6.9613E+12
3.00	1.7474E+04	4.4086E+12	1.7474E+04	4.4086E+12
3.25	1.0845E+04	2.7360E+12	1.0845E+04	2.7360E+12
3.50	6.7436E+03	1.7013E+12	6.7436E+03	1.7013E+12
3.75	3.8710E+03	9.7661E+11	3.8710E+03	9.7661E+11
4.00	2.2318E+03	5.6306E+11	2.2318E+03	5.6306E+11
4.25	1.1991E+03	3.0251E+11	1.1991E+03	3.0251E+11
4.50	6.4814E+02	1.6352E+11	6.4814E+02	1.6352E+11
4.75	3.2684E+02	8.2457E+10	3.2684E+02	8.2457E+10
5.00	1.6956E+02	4.2779E+10	1.6956E+02	4.2779E+10
5.50	3.8937E+01	9.8234E+09	3.8937E+01	9.8234E+09
6.00	8.0204E+00	2.0234E+09	8.0204E+00	2.0234E+09
6.50	1.4574E+00	3.6769E+08	1.4574E+00	3.6769E+08
7.00	1.3867E-01	3.4986E+07	1.3867E-01	3.4986E+07

Differential electron spectra				
Energy (MeV)	Total mission average flux (/cm ² /MeV/s)	Total mission fluence (/cm ² /MeV)	Mission segment 1	
			Average flux (/cm ² /MeV/s)	Segment fluence (/cm ² /MeV)
4.0E-02	1.2612E+08	3.1818E+16	1.2612E+08	3.1818E+16
0.10	8.1231E+07	2.0494E+16	8.1231E+07	2.0494E+16
0.20	3.2288E+07	8.1459E+15	3.2288E+07	8.1459E+15
0.30	1.5605E+07	3.9368E+15	1.5605E+07	3.9368E+15
0.40	8.8440E+06	2.2312E+15	8.8440E+06	2.2312E+15
0.50	5.5994E+06	1.4127E+15	5.5994E+06	1.4127E+15
0.60	3.4903E+06	8.8056E+14	3.4903E+06	8.8056E+14
0.70	2.5262E+06	6.3732E+14	2.5262E+06	6.3732E+14
0.80	1.7879E+06	4.5106E+14	1.7879E+06	4.5106E+14
1.00	1.0506E+06	2.6506E+14	1.0506E+06	2.6506E+14
1.25	6.2426E+05	1.5749E+14	6.2426E+05	1.5749E+14
1.50	4.0248E+05	1.0154E+14	4.0248E+05	1.0154E+14
1.75	2.6323E+05	6.6409E+13	2.6323E+05	6.6409E+13
2.00	1.6903E+05	4.2644E+13	1.6903E+05	4.2644E+13
2.25	1.0882E+05	2.7455E+13	1.0882E+05	2.7455E+13
2.50	7.5426E+04	1.9029E+13	7.5426E+04	1.9029E+13
2.75	5.2424E+04	1.3226E+13	5.2424E+04	1.3226E+13
3.00	3.3496E+04	8.4506E+12	3.3496E+04	8.4506E+12
3.25	2.1462E+04	5.4145E+12	2.1462E+04	5.4145E+12
3.50	1.3948E+04	3.5188E+12	1.3948E+04	3.5188E+12
3.75	9.0236E+03	2.2765E+12	9.0236E+03	2.2765E+12
4.00	5.3439E+03	1.3482E+12	5.3439E+03	1.3482E+12
4.25	3.1673E+03	7.9908E+11	3.1673E+03	7.9908E+11
4.50	1.7444E+03	4.4010E+11	1.7444E+03	4.4010E+11
4.75	9.5716E+02	2.4148E+11	9.5716E+02	2.4148E+11
5.00	5.0648E+02	1.2778E+11	5.0648E+02	1.2778E+11
5.50	1.6154E+02	4.0756E+10	1.6154E+02	4.0756E+10
6.00	3.7480E+01	9.4557E+09	3.7480E+01	9.4557E+09
6.50	7.8817E+00	1.9885E+09	7.8817E+00	1.9885E+09
7.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Exposure for proton flux exceeding threshold 1.00 /cm2/s			
Energy (MeV)	Total exposure (hr)	Mission segment 1	
		Exposure time (hr)	Orbit fraction
0.10	28559.25	28559.25	0.4075
0.15	28559.25	28559.25	0.4075
0.20	28559.25	28559.25	0.4075
0.30	28559.25	28559.25	0.4075
0.40	28559.25	28559.25	0.4075
0.50	28510.43	28510.43	0.4068
0.60	28510.43	28510.43	0.4068
0.70	28412.79	28412.79	0.4054
1.00	27729.32	27729.32	0.3957
1.50	17648.15	17648.15	0.2518
2.00	14865.45	14865.45	0.2121
3.00	12253.63	12253.63	0.1749
4.00	11716.61	11716.61	0.1672
5.00	10007.94	10007.94	0.1428
6.00	9556.36	9556.36	0.1364
7.00	8421.32	8421.32	0.1202
10.00	6297.68	6297.68	0.0899
15.00	3051.20	3051.20	0.0435
20.00	1879.54	1879.54	0.0268
30.00	1342.53	1342.53	0.0192
40.00	0.00	0.00	0.0000
50.00	0.00	0.00	0.0000
60.00	0.00	0.00	0.0000
70.00	0.00	0.00	0.0000
100.00	0.00	0.00	0.0000
150.00	0.00	0.00	0.0000
200.00	0.00	0.00	0.0000
300.00	0.00	0.00	0.0000
400.00	0.00	0.00	0.0000

Exposure for electron flux exceeding threshold 1.00 /cm ² /s			
Energy (MeV)	Total exposure (hr)	<u>Mission segment 1</u>	
		Exposure time (hr)	Orbit fraction
0.04	33099.44	33099.44	0.4723
0.10	33099.44	33099.44	0.4723
0.20	33099.44	33099.44	0.4723
0.30	32757.70	32757.70	0.4674
0.40	31171.08	31171.08	0.4448
0.50	31171.08	31171.08	0.4448
0.60	31049.03	31049.03	0.4431
0.70	31049.03	31049.03	0.4431
0.80	31049.03	31049.03	0.4431
1.00	30316.74	30316.74	0.4326
1.25	29340.36	29340.36	0.4187
1.50	29242.72	29242.72	0.4173
1.75	28998.62	28998.62	0.4138
2.00	28949.80	28949.80	0.4131
2.25	28656.89	28656.89	0.4089
2.50	28510.43	28510.43	0.4068
2.75	28412.79	28412.79	0.4054
3.00	28315.15	28315.15	0.4040
3.25	28315.15	28315.15	0.4040
3.50	27802.55	27802.55	0.3967
3.75	27704.91	27704.91	0.3953
4.00	26948.21	26948.21	0.3845
4.25	26948.21	26948.21	0.3845
4.50	26240.33	26240.33	0.3744
4.75	25605.68	25605.68	0.3654
5.00	20882.42	20882.42	0.2980
5.50	15915.07	15915.07	0.2271
6.00	11716.61	11716.61	0.1672
6.50	8567.77	8567.77	0.1223
7.00	3710.26	3710.26	0.0529

Integral peak proton fluxes for <u>mission segment 1</u>								
Energy (MeV)	Peak flux (/cm ² /s)	Longitude (deg)	Latitude (deg)	Altitude (km)	Orbit time (hr)	B (Gauss)	L (R _E)	
0.10	3.8350E+08	255.4	-10.3	13843.8	46.8	0.00948	3.207	
0.15	3.3116E+08	255.5	-11.0	13707.8	46.8	0.00967	3.184	
0.20	2.8703E+08	255.5	-11.0	13707.8	46.8	0.00967	3.184	
0.30	2.1146E+08	272.3	-13.2	13322.5	33.0	0.01006	3.141	
0.40	1.5807E+08	272.2	-13.9	13188.3	32.9	0.01027	3.121	
0.50	1.2013E+08	272.0	-14.7	13054.7	32.9	0.01049	3.102	
0.60	9.1338E+07	272.0	-14.7	13054.7	32.9	0.01049	3.102	
0.70	7.1167E+07	272.0	-14.7	13054.7	32.9	0.01049	3.102	
1.00	3.5933E+07	272.0	-14.7	13054.7	32.9	0.01049	3.102	
1.50	1.1472E+07	271.7	-16.2	12789.3	32.9	0.01096	3.068	
2.00	3.7779E+06	271.3	-17.8	12526.6	32.9	0.01148	3.038	
3.00	7.6621E+05	271.1	-18.6	12396.4	32.8	0.01176	3.025	
4.00	1.5660E+05	270.9	-19.4	12267.0	32.8	0.01206	3.014	
5.00	5.8135E+04	270.9	-19.4	12267.0	32.8	0.01206	3.014	
6.00	2.1714E+04	270.6	-20.3	12138.4	32.8	0.01237	3.004	
7.00	1.0852E+04	270.6	-20.3	12138.4	32.8	0.01237	3.004	
10.00	1.8545E+03	270.4	-21.1	12010.8	32.8	0.01269	2.995	
15.00	2.2373E+02	270.2	-22.0	11884.0	32.8	0.01303	2.987	
20.00	4.9520E+01	270.2	-22.0	11884.0	32.8	0.01303	2.987	
30.00	5.7842E+00	269.9	-22.8	11758.3	32.7	0.01339	2.982	
40.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
50.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
60.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
70.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
100.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
150.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
200.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
300.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	
400.00	0.0000E+00	324.7	-63.5	8117.7	0.0	0.04116	6.667	

Integral peak electron fluxes for <u>mission segment 1</u>								
Energy (MeV)	Peak flux (/cm ² /s)	Longitude (deg)	Latitude (deg)	Altitude (km)	Orbit time (hr)	B (Gauss)	L (R _E)	
0.04	7.8932E+07	135.0	19.8	21984.0	29.9	0.00387	4.566	
0.10	5.0487E+07	135.2	21.2	22496.3	29.8	0.00372	4.698	
0.20	3.1630E+07	135.2	21.2	22496.3	29.8	0.00372	4.698	
0.30	2.1028E+07	135.0	19.8	21984.0	29.9	0.00387	4.566	
0.40	1.5002E+07	135.0	19.8	21984.0	29.9	0.00387	4.566	
0.50	1.0703E+07	135.0	19.8	21984.0	29.9	0.00387	4.566	
0.60	8.4166E+06	134.8	18.4	21465.7	29.9	0.00405	4.438	
0.70	6.6587E+06	34.1	17.5	21160.7	2.0	0.00407	4.487	
0.80	5.3762E+06	34.1	17.5	21160.7	2.0	0.00407	4.487	
1.00	3.7080E+06	134.8	18.4	21465.7	29.9	0.00405	4.438	
1.25	2.3961E+06	134.5	15.3	20412.3	30.1	0.00446	4.201	
1.50	1.5925E+06	134.3	12.4	19473.6	30.2	0.00490	4.014	
1.75	1.0407E+06	134.3	12.4	19473.6	30.2	0.00490	4.014	
2.00	6.8416E+05	134.3	11.9	19338.3	30.2	0.00498	3.989	
2.25	4.6392E+05	134.3	11.9	19338.3	30.2	0.00498	3.989	
2.50	3.2878E+05	134.2	8.3	18246.9	30.3	0.00566	3.806	
2.75	2.0253E+05	34.7	6.6	17787.4	1.5	0.00571	3.794	
3.00	1.2493E+05	14.5	3.6	16980.2	14.5	0.00618	3.695	
3.25	7.8725E+04	14.6	0.9	16285.3	14.6	0.00677	3.596	
3.50	4.9796E+04	14.6	0.9	16285.3	14.6	0.00677	3.596	
3.75	2.9135E+04	14.8	-1.4	15728.8	14.7	0.00734	3.530	
4.00	1.7224E+04	14.9	-2.6	15450.8	14.7	0.00766	3.501	
4.25	9.8922E+03	273.4	-6.2	14687.6	33.1	0.00842	3.397	
4.50	5.7004E+03	273.4	-6.2	14687.6	33.1	0.00842	3.397	
4.75	3.5344E+03	255.4	-10.3	13843.8	46.8	0.00948	3.207	
5.00	2.3146E+03	255.4	-10.3	13843.8	46.8	0.00948	3.207	
5.50	6.2897E+02	255.6	-11.8	13572.3	46.9	0.00986	3.162	
6.00	1.9327E+02	270.6	-20.3	12138.4	32.8	0.01237	3.004	
6.50	3.8587E+01	270.6	-20.3	12138.4	32.8	0.01237	3.004	
7.00	4.8626E+00	255.4	-10.3	13843.8	46.8	0.00948	3.207	

Tables of the results for trapped radiation parameters on Tundra orbit.

Integral proton spectra				
Energy (MeV)	Total mission average flux (/cm ² /s)	Total mission fluence (/cm ²)	Mission segment 1	
	Average flux (/cm ² /s)	Segment fluence (/cm ²)		
0.10	2.0165E+06	5.0875E+14	2.0165E+06	5.0875E+14
0.15	1.0558E+06	2.6635E+14	1.0558E+06	2.6635E+14
0.20	5.5478E+05	1.3996E+14	5.5478E+05	1.3996E+14
0.30	2.0937E+05	5.2822E+13	2.0937E+05	5.2822E+13
0.40	7.9209E+04	1.9984E+13	7.9209E+04	1.9984E+13
0.50	3.0851E+04	7.7833E+12	3.0851E+04	7.7833E+12
0.60	1.2046E+04	3.0392E+12	1.2046E+04	3.0392E+12
0.70	4.6987E+03	1.1854E+12	4.6987E+03	1.1854E+12
1.00	2.8518E+02	7.1948E+10	2.8518E+02	7.1948E+10
1.50	2.7532E+00	6.9460E+08	2.7532E+00	6.9460E+08
2.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
6.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
20.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
30.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
40.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
50.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
60.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
70.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
100.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
150.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
200.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
400.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
Differential proton spectra				

Energy (MeV)	Total mission average flux (/cm ² /MeV/s)	Total mission fluence (/cm ² /MeV)	Mission segment 1	
			Average flux (/cm ² /MeV/s)	Segment fluence (/cm ² /MeV)
0.10	2.3814E+07	6.0079E+15	2.3814E+07	6.0079E+15
0.15	1.4618E+07	3.6878E+15	1.4618E+07	3.6878E+15
0.20	7.8311E+06	1.9757E+15	7.8311E+06	1.9757E+15
0.30	2.3778E+06	5.9990E+14	2.3778E+06	5.9990E+14
0.40	8.9260E+05	2.2519E+14	8.9260E+05	2.2519E+14
0.50	3.3581E+05	8.4722E+13	3.3581E+05	8.4722E+13
0.60	1.3076E+05	3.2990E+13	1.3076E+05	3.2990E+13
0.70	5.8786E+04	1.4831E+13	5.8786E+04	1.4831E+13
1.00	9.4066E+03	2.3732E+12	9.4066E+03	2.3732E+12
1.50	2.8518E+02	7.1948E+10	2.8518E+02	7.1948E+10
2.00	3.6709E+00	9.2613E+08	3.6709E+00	9.2613E+08
3.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
4.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
5.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
6.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
10.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
15.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
20.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
30.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
40.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
50.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
60.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
70.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
100.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
150.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
200.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
300.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
400.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Integral electron spectra				
Energy (MeV)	Total mission average flux (/cm ² /s)	Total mission fluence (/cm ²)	Mission segment 1	
			Average flux (/cm ² /s)	Segment fluence (/cm ²)
4.0E-02	1.2449E+07	3.1406E+15	1.2449E+07	3.1406E+15
0.10	8.0126E+06	2.0215E+15	8.0126E+06	2.0215E+15
0.20	4.1302E+06	1.0420E+15	4.1302E+06	1.0420E+15
0.30	2.3304E+06	5.8793E+14	2.3304E+06	5.8793E+14
0.40	1.4342E+06	3.6183E+14	1.4342E+06	3.6183E+14
0.50	8.8641E+05	2.2363E+14	8.8641E+05	2.2363E+14
0.60	6.0235E+05	1.5197E+14	6.0235E+05	1.5197E+14
0.70	4.0972E+05	1.0337E+14	4.0972E+05	1.0337E+14
0.80	2.9240E+05	7.3768E+13	2.9240E+05	7.3768E+13
1.00	1.6408E+05	4.1394E+13	1.6408E+05	4.1394E+13
1.25	8.6580E+04	2.1843E+13	8.6580E+04	2.1843E+13
1.50	4.5773E+04	1.1548E+13	4.5773E+04	1.1548E+13
1.75	2.6682E+04	6.7315E+12	2.6682E+04	6.7315E+12
2.00	1.5564E+04	3.9265E+12	1.5564E+04	3.9265E+12
2.25	8.5648E+03	2.1608E+12	8.5648E+03	2.1608E+12
2.50	4.7213E+03	1.1911E+12	4.7213E+03	1.1911E+12
2.75	2.8548E+03	7.2023E+11	2.8548E+03	7.2023E+11
3.00	1.7264E+03	4.3556E+11	1.7264E+03	4.3556E+11
3.25	1.0094E+03	2.5466E+11	1.0094E+03	2.5466E+11
3.50	5.9116E+02	1.4914E+11	5.9116E+02	1.4914E+11
3.75	3.2043E+02	8.0840E+10	3.2043E+02	8.0840E+10
4.00	1.7391E+02	4.3876E+10	1.7391E+02	4.3876E+10
4.25	8.6238E+01	2.1757E+10	8.6238E+01	2.1757E+10
4.50	4.2769E+01	1.0790E+10	4.2769E+01	1.0790E+10
4.75	1.0386E+01	2.6201E+09	1.0386E+01	2.6201E+09
5.00	2.4818E+00	6.2612E+08	2.4818E+00	6.2612E+08
5.50	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
6.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
6.50	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Differential electron spectra				
Energy (MeV)	Total mission average flux (/cm ² /MeV/s)	Total mission fluence (/cm ² /MeV)	Mission segment 1	
	Average flux (/cm ² /MeV/s)	Segment fluence (/cm ² /MeV)		
4.0E-02	8.7100E+07	2.1974E+16	8.7100E+07	2.1974E+16
0.10	6.0767E+07	1.5331E+16	6.0767E+07	1.5331E+16
0.20	2.8411E+07	7.1677E+15	2.8411E+07	7.1677E+15
0.30	1.3480E+07	3.4008E+15	1.3480E+07	3.4008E+15
0.40	7.2199E+06	1.8215E+15	7.2199E+06	1.8215E+15
0.50	4.1592E+06	1.0493E+15	4.1592E+06	1.0493E+15
0.60	2.3835E+06	6.0132E+14	2.3835E+06	6.0132E+14
0.70	1.5498E+06	3.9099E+14	1.5498E+06	3.9099E+14
0.80	9.9599E+05	2.5128E+14	9.9599E+05	2.5128E+14
1.00	4.9422E+05	1.2469E+14	4.9422E+05	1.2469E+14
1.25	2.3661E+05	5.9693E+13	2.3661E+05	5.9693E+13
1.50	1.1980E+05	3.0223E+13	1.1980E+05	3.0223E+13
1.75	6.0418E+04	1.5243E+13	6.0418E+04	1.5243E+13
2.00	3.6234E+04	9.1415E+12	3.6234E+04	9.1415E+12
2.25	2.1685E+04	5.4708E+12	2.1685E+04	5.4708E+12
2.50	1.1420E+04	2.8811E+12	1.1420E+04	2.8811E+12
2.75	5.9896E+03	1.5111E+12	5.9896E+03	1.5111E+12
3.00	3.6908E+03	9.3116E+11	3.6908E+03	9.3116E+11
3.25	2.2705E+03	5.7283E+11	2.2705E+03	5.7283E+11
3.50	1.3779E+03	3.4763E+11	1.3779E+03	3.4763E+11
3.75	8.3450E+02	2.1053E+11	8.3450E+02	2.1053E+11
4.00	4.6838E+02	1.1817E+11	4.6838E+02	1.1817E+11
4.25	2.6229E+02	6.6171E+10	2.6229E+02	6.6171E+10
4.50	1.5170E+02	3.8273E+10	1.5170E+02	3.8273E+10
4.75	8.0574E+01	2.0328E+10	8.0574E+01	2.0328E+10
5.00	2.2731E+01	5.7348E+09	2.2731E+01	5.7348E+09
5.50	2.4818E+00	6.2612E+08	2.4818E+00	6.2612E+08
6.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
6.50	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
7.00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00

Exposure for proton flux exceeding threshold 1.00 /cm ² /s			
Energy (MeV)	Total exposure (hr)	Mission segment 1	
		Exposure time (hr)	Orbit fraction
0.10	24010.70	24010.70	0.3426
0.15	24010.70	24010.70	0.3426
0.20	24010.70	24010.70	0.3426
0.30	24010.70	24010.70	0.3426
0.40	24010.70	24010.70	0.3426
0.50	24010.70	24010.70	0.3426
0.60	24010.70	24010.70	0.3426
0.70	24010.70	24010.70	0.3426
1.00	23425.07	23425.07	0.3343
1.50	14250.25	14250.25	0.2033
2.00	0.00	0.00	0.0000
3.00	0.00	0.00	0.0000
4.00	0.00	0.00	0.0000
5.00	0.00	0.00	0.0000
6.00	0.00	0.00	0.0000
7.00	0.00	0.00	0.0000
10.00	0.00	0.00	0.0000
15.00	0.00	0.00	0.0000
20.00	0.00	0.00	0.0000
30.00	0.00	0.00	0.0000
40.00	0.00	0.00	0.0000
50.00	0.00	0.00	0.0000
60.00	0.00	0.00	0.0000
70.00	0.00	0.00	0.0000
100.00	0.00	0.00	0.0000
150.00	0.00	0.00	0.0000
200.00	0.00	0.00	0.0000
300.00	0.00	0.00	0.0000
400.00	0.00	0.00	0.0000

Exposure for electron flux exceeding threshold 1.00 /cm ² /s			
Energy (MeV)	Total exposure (hr)	Mission segment 1	
		Exposure time (hr)	Orbit fraction
0.04	28500.50	28500.50	0.4067
0.10	28500.50	28500.50	0.4067
0.20	28500.50	28500.50	0.4067
0.30	28110.08	28110.08	0.4011
0.40	26548.41	26548.41	0.3788
0.50	26548.41	26548.41	0.3788
0.60	26548.41	26548.41	0.3788
0.70	26548.41	26548.41	0.3788
0.80	26548.41	26548.41	0.3788
1.00	25767.58	25767.58	0.3677
1.25	24401.11	24401.11	0.3482
1.50	24205.91	24205.91	0.3454
1.75	24205.91	24205.91	0.3454
2.00	24205.91	24205.91	0.3454
2.25	24010.70	24010.70	0.3426
2.50	24010.70	24010.70	0.3426
2.75	24010.70	24010.70	0.3426
3.00	23620.28	23620.28	0.3370
3.25	23425.07	23425.07	0.3343
3.50	23034.65	23034.65	0.3287
3.75	22839.44	22839.44	0.3259
4.00	22449.03	22449.03	0.3203
4.25	22449.03	22449.03	0.3203
4.50	21277.77	21277.77	0.3036
4.75	20301.73	20301.73	0.2897
5.00	13469.42	13469.42	0.1922
5.50	0.00	0.00	0.0000
6.00	0.00	0.00	0.0000
6.50	0.00	0.00	0.0000
7.00	0.00	0.00	0.0000

Integral peak proton flux (/cm²/s);

Energy (MeV)	Segment 1
0.10	2.1364E+07
0.15	1.2067E+07
0.20	6.8157E+06
0.30	2.7048E+06
0.40	1.0734E+06
0.50	4.1686E+05
0.60	1.6231E+05
0.70	6.6000E+04
1.00	4.1410E+03
1.50	4.1067E+01
2.00	0.0000E+00
3.00	0.0000E+00
4.00	0.0000E+00
5.00	0.0000E+00
6.00	0.0000E+00
7.00	0.0000E+00
10.00	0.0000E+00
15.00	0.0000E+00
20.00	0.0000E+00
30.00	0.0000E+00
40.00	0.0000E+00
50.00	0.0000E+00
60.00	0.0000E+00
70.00	0.0000E+00
100.00	0.0000E+00
150.00	0.0000E+00
200.00	0.0000E+00
300.00	0.0000E+00
400.00	0.0000E+00

Integral peak electron flux (/cm ² /s);	
Energy (MeV)	Segment 1
0.04	6.6613E+07
0.10	4.5906E+07
0.20	2.6104E+07
0.30	1.5955E+07
0.40	1.0459E+07
0.50	6.8567E+06
0.60	4.7757E+06
0.70	3.3263E+06
0.80	2.4412E+06
1.00	1.4606E+06
1.25	8.0220E+05
1.50	4.4059E+05
1.75	2.5850E+05
2.00	1.5166E+05
2.25	8.7535E+04
2.50	5.0524E+04
2.75	3.0419E+04
3.00	1.8314E+04
3.25	1.0452E+04
3.50	5.9656E+03
3.75	3.2013E+03
4.00	1.7179E+03
4.25	8.3392E+02
4.50	4.0481E+02
4.75	1.1250E+02
5.00	3.1258E+01
5.50	0.0000E+00
6.00	0.0000E+00
6.50	0.0000E+00
7.00	0.0000E+00

APPENDIX B. Solar particule fluences.

Molniya orbit

Solar proton fluences for the spacecraft trajectory and outside the magnetosphere				
	Fluence at spacecraft		Model fluence at 1.0AU	
	Total mission fluence		Total prediction period	
Energy (MeV)	Integral (cm ⁻²)	Differential (cm ⁻² MeV ⁻¹)	Integral (cm ⁻²)	Differential (cm ⁻² MeV ⁻¹)
0.10	2.436E+12	1.710E+13	3.033E+12	2.163E+13
0.11	2.277E+12	1.479E+13	2.832E+12	1.870E+13
0.12	2.139E+12	1.277E+13	2.659E+12	1.616E+13
0.14	1.912E+12	9.855E+12	2.379E+12	1.246E+13
0.16	1.736E+12	7.802E+12	2.161E+12	9.867E+12
0.18	1.594E+12	6.353E+12	1.985E+12	8.035E+12
0.20	1.478E+12	5.289E+12	1.839E+12	6.690E+12
0.22	1.380E+12	4.496E+12	1.717E+12	5.686E+12
0.25	1.258E+12	3.615E+12	1.566E+12	4.571E+12
0.28	1.160E+12	2.975E+12	1.443E+12	3.762E+12
0.32	1.053E+12	2.359E+12	1.310E+12	2.983E+12
0.35	9.872E+11	2.021E+12	1.228E+12	2.556E+12
0.40	8.964E+11	1.611E+12	1.115E+12	2.037E+12
0.45	8.233E+11	1.312E+12	1.024E+12	1.659E+12
0.50	7.632E+11	1.092E+12	9.494E+11	1.381E+12
0.55	7.127E+11	9.287E+11	8.863E+11	1.175E+12
0.63	6.461E+11	7.371E+11	8.036E+11	9.323E+11
0.71	5.926E+11	5.991E+11	7.371E+11	7.576E+11
0.80	5.437E+11	4.877E+11	6.763E+11	6.168E+11
0.90	4.995E+11	3.977E+11	6.212E+11	5.030E+11
1.00	4.630E+11	3.311E+11	5.757E+11	4.188E+11
1.10	4.324E+11	2.806E+11	5.374E+11	3.549E+11
1.20	4.063E+11	2.425E+11	5.047E+11	3.066E+11
1.40	3.633E+11	1.871E+11	4.516E+11	2.366E+11
1.60	3.298E+11	1.481E+11	4.101E+11	1.873E+11
1.80	3.030E+11	1.206E+11	3.767E+11	1.525E+11
2.00	2.809E+11	1.004E+11	3.491E+11	1.270E+11

2.20	2.623E+11	8.532E+10	3.259E+11	1.079E+11
2.50	2.392E+11	6.860E+10	2.972E+11	8.676E+10
2.80	2.202E+11	5.835E+10	2.738E+11	7.380E+10
3.20	1.983E+11	5.078E+10	2.464E+11	6.422E+10
3.50	1.840E+11	4.486E+10	2.281E+11	5.673E+10
4.00	1.640E+11	3.511E+10	2.033E+11	4.441E+10
4.50	1.482E+11	2.812E+10	1.837E+11	3.556E+10
5.00	1.351E+11	2.439E+10	1.678E+11	3.085E+10
5.50	1.235E+11	2.172E+10	1.529E+11	2.747E+10
6.30	1.081E+11	1.676E+10	1.339E+11	2.120E+10
7.10	9.592E+10	1.379E+10	1.190E+11	1.745E+10
8.00	8.458E+10	1.139E+10	1.045E+11	1.440E+10
9.00	7.444E+10	8.892E+09	9.194E+10	1.125E+10
10.00	6.624E+10	7.519E+09	8.200E+10	9.510E+09
11.00	5.922E+10	6.516E+09	7.293E+10	8.241E+09
12.00	5.326E+10	5.396E+09	6.552E+10	6.825E+09
14.00	4.392E+10	3.949E+09	5.420E+10	4.994E+09
16.00	3.691E+10	3.061E+09	4.554E+10	3.871E+09
18.00	3.146E+10	2.386E+09	3.871E+10	3.017E+09
20.00	2.716E+10	1.913E+09	3.347E+10	2.420E+09
22.00	2.366E+10	1.586E+09	2.903E+10	2.006E+09
25.00	1.950E+10	1.189E+09	2.398E+10	1.503E+09
28.00	1.632E+10	9.320E+08	2.001E+10	1.179E+09
32.00	1.311E+10	6.731E+08	1.607E+10	8.513E+08
35.00	1.129E+10	5.425E+08	1.382E+10	6.862E+08
40.00	8.941E+09	3.961E+08	1.093E+10	5.010E+08
45.00	7.217E+09	2.935E+08	8.809E+09	3.712E+08
50.00	5.927E+09	2.226E+08	7.220E+09	2.815E+08
55.00	4.935E+09	1.742E+08	5.994E+09	2.204E+08
63.00	3.754E+09	1.210E+08	4.549E+09	1.531E+08
71.00	2.926E+09	8.595E+07	3.545E+09	1.087E+08
80.00	2.264E+09	6.122E+07	2.736E+09	7.743E+07
90.00	1.742E+09	4.317E+07	2.100E+09	5.460E+07
100.00	1.373E+09	3.063E+07	1.644E+09	3.874E+07
110.00	1.109E+09	2.202E+07	1.325E+09	2.783E+07

120.00	9.149E+08	1.689E+07	1.088E+09	2.133E+07
140.00	6.387E+08	1.072E+07	7.563E+08	1.351E+07
160.00	4.624E+08	6.910E+06	5.472E+08	8.680E+06
180.00	3.467E+08	4.657E+06	4.091E+08	5.829E+06
200.00	2.674E+08	3.276E+06	3.141E+08	4.085E+06
220.00	2.106E+08	2.400E+06	2.457E+08	2.982E+06
250.00	1.510E+08	1.577E+06	1.759E+08	1.949E+06
280.00	1.112E+08	1.078E+06	1.288E+08	1.325E+06
320.00	7.653E+07	6.534E+05	8.900E+07	7.980E+05
350.00	5.973E+07	4.669E+05	6.947E+07	5.678E+05
400.00	4.085E+07	2.881E+05	4.802E+07	3.480E+05
450.00	2.904E+07	1.842E+05	3.467E+07	2.211E+05
500.00	2.172E+07	1.085E+05	2.591E+07	1.294E+05

Exposure factors		
Energy (MeV)	Mission average	Mission segment 1
0.10	0.7907	0.7907
0.11	0.7907	0.7907
0.12	0.7907	0.7907
0.14	0.7907	0.7907
0.16	0.7907	0.7907
0.18	0.7907	0.7907
0.20	0.7907	0.7907
0.22	0.7907	0.7907
0.25	0.7907	0.7907
0.28	0.7907	0.7907
0.32	0.7907	0.7907
0.35	0.7907	0.7907
0.40	0.7907	0.7907
0.45	0.7907	0.7907
0.50	0.7907	0.7907
0.55	0.7907	0.7907
0.63	0.7907	0.7907

0.71	0.7907	0.7907
0.80	0.7907	0.7907
0.90	0.7907	0.7907
1.00	0.7907	0.7907
1.10	0.7907	0.7907
1.20	0.7907	0.7907
1.40	0.7907	0.7907
1.60	0.7907	0.7907
1.80	0.7907	0.7907
2.00	0.7907	0.7907
2.20	0.7907	0.7907
2.50	0.7907	0.7907
2.80	0.7907	0.7907
3.20	0.7907	0.7907
3.50	0.7907	0.7907
4.00	0.7907	0.7907
4.50	0.7907	0.7907
5.00	0.7907	0.7907
5.50	0.7907	0.7907
6.30	0.7907	0.7907
7.10	0.7907	0.7907
8.00	0.7907	0.7907
9.00	0.7907	0.7907
10.00	0.7907	0.7907
11.00	0.7907	0.7907
12.00	0.7907	0.7907
14.00	0.7907	0.7907
16.00	0.7907	0.7907
18.00	0.7907	0.7907
20.00	0.7907	0.7907
22.00	0.7907	0.7907
25.00	0.7907	0.7907
28.00	0.7907	0.7907
32.00	0.7907	0.7907
35.00	0.7907	0.7907

40.00	0.7907	0.7907
45.00	0.7907	0.7907
50.00	0.7907	0.7907
55.00	0.7907	0.7907
63.00	0.7907	0.7907
71.00	0.7907	0.7907
80.00	0.7907	0.7907
90.00	0.7907	0.7907
100.00	0.7907	0.7907
110.00	0.7910	0.7910
120.00	0.7917	0.7917
140.00	0.7937	0.7937
160.00	0.7962	0.7962
180.00	0.7990	0.7990
200.00	0.8019	0.8019
220.00	0.8049	0.8049
250.00	0.8095	0.8095
280.00	0.8136	0.8136
320.00	0.8187	0.8187
350.00	0.8223	0.8223
400.00	0.8280	0.8280
450.00	0.8333	0.8333
500.00	0.8384	0.8384

Exposure times (hr)			
Energy (MeV)	Mission total	<u>Mission segment 1</u>	
		Orbit exposure	Segment exposure
0.10	55883.18	19.06	55883.18
0.11	55883.18	19.06	55883.18
0.12	55883.18	19.06	55883.18
0.14	55883.18	19.06	55883.18
0.16	55883.18	19.06	55883.18
0.18	55883.18	19.06	55883.18

0.20	55883.18	19.06	55883.18
0.22	55883.18	19.06	55883.18
0.25	55883.18	19.06	55883.18
0.28	55883.18	19.06	55883.18
0.32	55883.18	19.06	55883.18
0.35	55883.18	19.06	55883.18
0.40	55883.18	19.06	55883.18
0.45	55883.18	19.06	55883.18
0.50	55883.18	19.06	55883.18
0.55	55883.18	19.06	55883.18
0.63	55883.18	19.06	55883.18
0.71	55883.18	19.06	55883.18
0.80	55883.18	19.06	55883.18
0.90	55883.18	19.06	55883.18
1.00	55883.18	19.06	55883.18
1.10	55883.18	19.06	55883.18
1.20	55883.18	19.06	55883.18
1.40	55883.18	19.06	55883.18
1.60	55883.18	19.06	55883.18
1.80	55883.18	19.06	55883.18
2.00	55883.18	19.06	55883.18
2.20	55883.18	19.06	55883.18
2.50	55883.18	19.06	55883.18
2.80	55883.18	19.06	55883.18
3.20	55883.18	19.06	55883.18
3.50	55883.18	19.06	55883.18
4.00	55883.18	19.06	55883.18
4.50	55883.18	19.06	55883.18
5.00	55883.18	19.06	55883.18
5.50	55883.18	19.06	55883.18
6.30	55883.18	19.06	55883.18
7.10	55883.18	19.06	55883.18
8.00	55883.18	19.06	55883.18
9.00	55883.18	19.06	55883.18
10.00	55883.18	19.06	55883.18

11.00	55883.18	19.06	55883.18
12.00	55883.18	19.06	55883.18
14.00	55883.18	19.06	55883.18
16.00	55883.18	19.06	55883.18
18.00	55883.18	19.06	55883.18
20.00	55883.18	19.06	55883.18
22.00	55883.18	19.06	55883.18
25.00	55883.18	19.06	55883.18
28.00	55883.18	19.06	55883.18
32.00	55883.18	19.06	55883.18
35.00	55883.18	19.06	55883.18
40.00	55883.18	19.06	55883.18
45.00	55883.18	19.06	55883.18
50.00	55883.18	19.06	55883.18
55.00	55883.18	19.06	55883.18
63.00	55883.18	19.06	55883.18
71.00	55883.18	19.06	55883.18
80.00	55883.18	19.06	55883.18
90.00	55883.18	19.06	55883.18
100.00	55980.92	19.09	55980.92
110.00	56225.27	19.18	56225.27
120.00	56567.36	19.29	56567.36
140.00	57056.07	19.46	57056.07
160.00	57349.29	19.56	57349.29
180.00	57789.12	19.71	57789.12
200.00	58131.21	19.83	58131.21
220.00	58424.44	19.93	58424.44
250.00	58815.40	20.06	58815.40
280.00	59255.23	20.21	59255.23
320.00	59548.45	20.31	59548.45
350.00	59890.54	20.42	59890.54
400.00	60305.94	20.57	60305.94
450.00	60843.51	20.75	60843.51
500.00	61185.61	20.87	61185.61

TAP orbit

Solar proton fluences for the [spacecraft trajectory](#) and outside the magnetosphere

	Fluence at spacecraft		Model fluence at 1.0AU	
	Total mission fluence		Total prediction period	
Energy (MeV)	Integral (cm ⁻²)	Differential (cm ⁻² MeV ⁻¹)	Integral (cm ⁻²)	Differential (cm ⁻² MeV ⁻¹)
0.10	6.484E+11	2.557E+11	8.225E+11	3.261E+11
0.11	6.458E+11	2.547E+11	8.193E+11	3.248E+11
0.12	6.433E+11	2.537E+11	8.160E+11	3.235E+11
0.14	6.382E+11	2.517E+11	8.096E+11	3.210E+11
0.16	6.332E+11	2.497E+11	8.032E+11	3.184E+11
0.18	6.282E+11	2.477E+11	7.969E+11	3.159E+11
0.20	6.233E+11	2.458E+11	7.906E+11	3.134E+11
0.22	6.184E+11	2.438E+11	7.843E+11	3.109E+11
0.25	6.111E+11	2.409E+11	7.750E+11	3.073E+11
0.28	6.039E+11	2.381E+11	7.659E+11	3.036E+11
0.32	5.945E+11	2.343E+11	7.538E+11	2.989E+11
0.35	5.875E+11	2.316E+11	7.449E+11	2.953E+11
0.40	5.760E+11	2.270E+11	7.303E+11	2.895E+11
0.45	5.648E+11	2.226E+11	7.160E+11	2.839E+11
0.50	5.538E+11	2.182E+11	7.019E+11	2.783E+11
0.55	5.430E+11	2.139E+11	6.881E+11	2.728E+11
0.63	5.261E+11	2.073E+11	6.667E+11	2.643E+11
0.71	5.098E+11	2.008E+11	6.458E+11	2.561E+11
0.80	4.920E+11	1.938E+11	6.232E+11	2.471E+11
0.90	4.730E+11	1.863E+11	5.990E+11	2.375E+11
1.00	4.548E+11	1.790E+11	5.757E+11	2.283E+11
1.10	4.372E+11	1.721E+11	5.533E+11	2.194E+11
1.20	4.203E+11	1.654E+11	5.318E+11	2.109E+11
1.40	3.885E+11	1.529E+11	4.913E+11	1.950E+11
1.60	3.591E+11	1.412E+11	4.538E+11	1.801E+11
1.80	3.319E+11	1.305E+11	4.192E+11	1.664E+11
2.00	3.068E+11	1.205E+11	3.873E+11	1.537E+11
2.20	2.837E+11	1.114E+11	3.578E+11	1.421E+11
2.50	2.521E+11	9.898E+10	3.176E+11	1.262E+11

2.80	2.251E+11	8.068E+10	2.820E+11	1.029E+11
3.20	1.988E+11	5.127E+10	2.493E+11	6.538E+10
3.50	1.850E+11	4.031E+10	2.334E+11	5.141E+10
4.00	1.659E+11	3.614E+10	2.091E+11	4.609E+10
4.50	1.488E+11	3.238E+10	1.873E+11	4.129E+10
5.00	1.343E+11	2.567E+10	1.678E+11	3.274E+10
5.50	1.229E+11	1.994E+10	1.546E+11	2.543E+10
6.30	1.080E+11	1.730E+10	1.355E+11	2.206E+10
7.10	9.552E+10	1.381E+10	1.193E+11	1.761E+10
8.00	8.446E+10	1.078E+10	1.062E+11	1.375E+10
9.00	7.433E+10	9.475E+09	9.331E+10	1.208E+10
10.00	6.585E+10	7.486E+09	8.200E+10	9.547E+09
11.00	5.920E+10	5.818E+09	7.421E+10	7.419E+09
12.00	5.365E+10	5.274E+09	6.716E+10	6.725E+09
14.00	4.423E+10	4.152E+09	5.501E+10	5.295E+09
16.00	3.698E+10	3.093E+09	4.598E+10	3.944E+09
18.00	3.144E+10	2.453E+09	3.923E+10	3.128E+09
20.00	2.703E+10	1.948E+09	3.347E+10	2.485E+09
22.00	2.355E+10	1.538E+09	2.930E+10	1.962E+09
25.00	1.945E+10	1.197E+09	2.398E+10	1.526E+09
28.00	1.629E+10	9.095E+08	2.014E+10	1.160E+09
32.00	1.310E+10	6.833E+08	1.615E+10	8.713E+08
35.00	1.125E+10	5.508E+08	1.382E+10	7.025E+08
40.00	8.890E+09	3.929E+08	1.093E+10	5.010E+08
45.00	7.180E+09	2.911E+08	8.809E+09	3.712E+08
50.00	5.901E+09	2.208E+08	7.220E+09	2.815E+08
55.00	4.919E+09	1.719E+08	5.994E+09	2.192E+08
63.00	3.752E+09	1.197E+08	4.573E+09	1.527E+08
71.00	2.928E+09	8.642E+07	3.551E+09	1.102E+08
80.00	2.265E+09	6.101E+07	2.736E+09	7.780E+07
90.00	1.745E+09	4.281E+07	2.100E+09	5.460E+07
100.00	1.383E+09	2.969E+07	1.644E+09	3.782E+07
110.00	1.127E+09	2.151E+07	1.343E+09	2.736E+07
120.00	9.329E+08	1.730E+07	1.097E+09	2.196E+07
140.00	6.518E+08	1.081E+07	7.634E+08	1.365E+07

160.00	4.734E+08	7.030E+06	5.511E+08	8.821E+06
180.00	3.556E+08	4.758E+06	4.106E+08	5.926E+06
200.00	2.748E+08	3.322E+06	3.141E+08	4.106E+06
220.00	2.173E+08	2.421E+06	2.464E+08	2.970E+06
250.00	1.568E+08	1.614E+06	1.759E+08	1.957E+06
280.00	1.159E+08	1.115E+06	1.290E+08	1.336E+06
320.00	7.900E+07	7.292E+05	8.776E+07	8.608E+05
350.00	5.975E+07	5.545E+05	6.575E+07	6.469E+05
400.00	3.701E+07	3.551E+05	4.064E+07	4.064E+05
450.00	2.255E+07	2.231E+05	2.511E+07	2.512E+05
500.00	1.399E+07	1.195E+05	1.552E+07	1.326E+05

Exposure factors		
Energy (MeV)	Mission average	<u>Mission segment 1</u>
0.10	0.7841	0.7841
0.11	0.7841	0.7841
0.12	0.7841	0.7841
0.14	0.7841	0.7841
0.16	0.7841	0.7841
0.18	0.7841	0.7841
0.20	0.7841	0.7841
0.22	0.7841	0.7841
0.25	0.7841	0.7841
0.28	0.7841	0.7841
0.32	0.7841	0.7841
0.35	0.7841	0.7841
0.40	0.7841	0.7841
0.45	0.7841	0.7841
0.50	0.7841	0.7841
0.55	0.7841	0.7841
0.63	0.7841	0.7841
0.71	0.7841	0.7841
0.80	0.7841	0.7841

0.90	0.7841	0.7841
1.00	0.7841	0.7841
1.10	0.7841	0.7841
1.20	0.7841	0.7841
1.40	0.7841	0.7841
1.60	0.7841	0.7841
1.80	0.7841	0.7841
2.00	0.7841	0.7841
2.20	0.7841	0.7841
2.50	0.7841	0.7841
2.80	0.7841	0.7841
3.20	0.7841	0.7841
3.50	0.7841	0.7841
4.00	0.7841	0.7841
4.50	0.7841	0.7841
5.00	0.7841	0.7841
5.50	0.7841	0.7841
6.30	0.7841	0.7841
7.10	0.7841	0.7841
8.00	0.7841	0.7841
9.00	0.7841	0.7841
10.00	0.7841	0.7841
11.00	0.7841	0.7841
12.00	0.7841	0.7841
14.00	0.7841	0.7841
16.00	0.7841	0.7841
18.00	0.7841	0.7841
20.00	0.7841	0.7841
22.00	0.7841	0.7841
25.00	0.7841	0.7841
28.00	0.7841	0.7841
32.00	0.7841	0.7841
35.00	0.7841	0.7841
40.00	0.7841	0.7841
45.00	0.7841	0.7841

50.00	0.7841	0.7841
55.00	0.7841	0.7841
63.00	0.7841	0.7841
71.00	0.7841	0.7841
80.00	0.7841	0.7841
90.00	0.7842	0.7842
100.00	0.7849	0.7849
110.00	0.7861	0.7861
120.00	0.7876	0.7876
140.00	0.7917	0.7917
160.00	0.7970	0.7970
180.00	0.8029	0.8029
200.00	0.8090	0.8090
220.00	0.8153	0.8153
250.00	0.8248	0.8248
280.00	0.8343	0.8343
320.00	0.8471	0.8471
350.00	0.8572	0.8572
400.00	0.8738	0.8738
450.00	0.8882	0.8882
500.00	0.9012	0.9012

Exposure times (hr)			
Energy (MeV)	Mission total	<u>Mission segment 1</u>	
		Orbit exposure	Segment exposure
0.10	55434.23	37.85	55434.23
0.11	55434.23	37.85	55434.23
0.12	55434.23	37.85	55434.23
0.14	55434.23	37.85	55434.23
0.16	55434.23	37.85	55434.23
0.18	55434.23	37.85	55434.23
0.20	55434.23	37.85	55434.23
0.22	55434.23	37.85	55434.23

0.25	55434.23	37.85	55434.23
0.28	55434.23	37.85	55434.23
0.32	55434.23	37.85	55434.23
0.35	55434.23	37.85	55434.23
0.40	55434.23	37.85	55434.23
0.45	55434.23	37.85	55434.23
0.50	55434.23	37.85	55434.23
0.55	55434.23	37.85	55434.23
0.63	55434.23	37.85	55434.23
0.71	55434.23	37.85	55434.23
0.80	55434.23	37.85	55434.23
0.90	55434.23	37.85	55434.23
1.00	55434.23	37.85	55434.23
1.10	55434.23	37.85	55434.23
1.20	55434.23	37.85	55434.23
1.40	55434.23	37.85	55434.23
1.60	55434.23	37.85	55434.23
1.80	55434.23	37.85	55434.23
2.00	55434.23	37.85	55434.23
2.20	55434.23	37.85	55434.23
2.50	55434.23	37.85	55434.23
2.80	55434.23	37.85	55434.23
3.20	55434.23	37.85	55434.23
3.50	55434.23	37.85	55434.23
4.00	55434.23	37.85	55434.23
4.50	55434.23	37.85	55434.23
5.00	55434.23	37.85	55434.23
5.50	55434.23	37.85	55434.23
6.30	55434.23	37.85	55434.23
7.10	55434.23	37.85	55434.23
8.00	55434.23	37.85	55434.23
9.00	55434.23	37.85	55434.23
10.00	55434.23	37.85	55434.23
11.00	55434.23	37.85	55434.23
12.00	55434.23	37.85	55434.23

14.00	55434.23	37.85	55434.23
16.00	55434.23	37.85	55434.23
18.00	55434.23	37.85	55434.23
20.00	55434.23	37.85	55434.23
22.00	55434.23	37.85	55434.23
25.00	55434.23	37.85	55434.23
28.00	55434.23	37.85	55434.23
32.00	55434.23	37.85	55434.23
35.00	55434.23	37.85	55434.23
40.00	55434.23	37.85	55434.23
45.00	55434.23	37.85	55434.23
50.00	55434.23	37.85	55434.23
55.00	55434.23	37.85	55434.23
63.00	55434.23	37.85	55434.23
71.00	55434.23	37.85	55434.23
80.00	55434.23	37.85	55434.23
90.00	55629.51	37.98	55629.51
100.00	56203.13	38.37	56203.13
110.00	56752.35	38.75	56752.35
120.00	57045.27	38.95	57045.27
140.00	58155.90	39.71	58155.90
160.00	59095.67	40.35	59095.67
180.00	59925.60	40.92	59925.60
200.00	60755.53	41.48	60755.53
220.00	61487.82	41.98	61487.82
250.00	62683.89	42.80	62683.89
280.00	63855.55	43.60	63855.55
320.00	65710.68	44.87	65710.68
350.00	67272.89	45.93	67272.89
400.00	68591.01	46.83	68591.01
450.00	69250.07	47.28	69250.07
500.00	70080.00	47.85	70080.00

Tundra Orbit

	Total mission fluence	
Energy (MeV)	Integral (cm⁻²)	Differential (cm⁻² MeV⁻¹)
0.10	8.218E+11	3.241E+11
0.11	8.186E+11	3.228E+11
0.12	8.154E+11	3.216E+11
0.14	8.090E+11	3.190E+11
0.16	8.026E+11	3.165E+11
0.18	7.963E+11	3.140E+11
0.20	7.901E+11	3.115E+11
0.22	7.839E+11	3.091E+11
0.25	7.746E+11	3.054E+11
0.28	7.655E+11	3.018E+11
0.32	7.535E+11	2.971E+11
0.35	7.447E+11	2.936E+11
0.40	7.302E+11	2.878E+11
0.45	7.159E+11	2.822E+11
0.50	7.019E+11	2.766E+11
0.55	6.882E+11	2.712E+11
0.63	6.669E+11	2.627E+11
0.71	6.462E+11	2.545E+11
0.80	6.237E+11	2.456E+11
0.90	5.996E+11	2.361E+11
1.00	5.764E+11	2.269E+11
1.10	5.542E+11	2.181E+11
1.20	5.328E+11	2.097E+11
1.40	4.925E+11	1.938E+11
1.60	4.552E+11	1.790E+11
1.80	4.207E+11	1.654E+11
2.00	3.889E+11	1.528E+11
2.20	3.595E+11	1.412E+11

2.50	3.195E+11	1.255E+11
2.80	2.854E+11	1.023E+11
3.20	2.519E+11	6.499E+10
3.50	2.345E+11	5.110E+10
4.00	2.103E+11	4.582E+10
4.50	1.886E+11	4.104E+10
5.00	1.702E+11	3.254E+10
5.50	1.557E+11	2.528E+10
6.30	1.368E+11	2.193E+10
7.10	1.210E+11	1.750E+10
8.00	1.070E+11	1.366E+10
9.00	9.419E+10	1.201E+10
10.00	8.344E+10	9.490E+09
11.00	7.500E+10	7.375E+09
12.00	6.797E+10	6.685E+09
14.00	5.603E+10	5.263E+09
16.00	4.684E+10	3.920E+09
18.00	3.981E+10	3.109E+09
20.00	3.424E+10	2.470E+09
22.00	2.982E+10	1.950E+09
25.00	2.462E+10	1.517E+09
28.00	2.061E+10	1.153E+09
32.00	1.657E+10	8.661E+08
35.00	1.423E+10	6.983E+08
40.00	1.124E+10	4.980E+08
45.00	9.068E+09	3.690E+08
50.00	7.446E+09	2.798E+08
55.00	6.201E+09	2.179E+08
63.00	4.723E+09	1.517E+08
71.00	3.678E+09	1.096E+08
80.00	2.837E+09	7.733E+07
90.00	2.179E+09	5.427E+07
100.00	1.719E+09	3.759E+07
110.00	1.395E+09	2.720E+07
120.00	1.150E+09	2.183E+07

140.00	7.962E+08	1.357E+07
160.00	5.728E+08	8.768E+06
180.00	4.262E+08	5.890E+06
200.00	3.265E+08	4.081E+06
220.00	2.562E+08	2.952E+06
250.00	1.827E+08	1.945E+06
280.00	1.336E+08	1.328E+06
320.00	8.996E+07	8.556E+05
350.00	6.748E+07	6.430E+05
400.00	4.130E+07	4.039E+05
450.00	2.496E+07	2.496E+05
500.00	1.543E+07	1.318E+05

Appendix C. Galactic Cosmic Rays Spectra for M=3

Overview input
Ion range: H - U
GCR model: CREME-86
Interplanetary weather index: M = 3
Magnetic shielding: eccentric dipole/quiet magnetosphere/unchanged magnetic moment/all arrival directions

Molniya Orbit

Average proton spectra. Units for integral and differential flux are ($\text{m}^{-2} \text{ sr}^{-1} \text{ s}^{-1}$) and ($\text{m}^{-2} \text{ sr}^{-1} \text{ s}^{-1} (\text{MeV/n})^{-1}$).

Energy (MeV/n)	Total mission integral flux	Total mission differential flux	<u>Mission segment 1</u>	
			Integral flux	Differential flux
1.000E+00	1.067E+04	4.426E+02	1.067E+04	4.426E+02
1.100E+00	1.063E+04	4.426E+02	1.063E+04	4.426E+02
1.200E+00	1.058E+04	4.426E+02	1.058E+04	4.426E+02
1.400E+00	1.049E+04	4.426E+02	1.049E+04	4.426E+02
1.600E+00	1.041E+04	4.426E+02	1.041E+04	4.426E+02
1.800E+00	1.032E+04	4.426E+02	1.032E+04	4.426E+02
2.000E+00	1.023E+04	4.426E+02	1.023E+04	4.426E+02
2.200E+00	1.014E+04	4.426E+02	1.014E+04	4.426E+02
2.500E+00	1.001E+04	4.426E+02	1.001E+04	4.426E+02
2.800E+00	9.875E+03	4.426E+02	9.875E+03	4.426E+02
3.200E+00	9.698E+03	4.426E+02	9.698E+03	4.426E+02
3.500E+00	9.565E+03	4.426E+02	9.565E+03	4.426E+02
4.000E+00	9.344E+03	4.426E+02	9.344E+03	4.426E+02
4.500E+00	9.122E+03	4.426E+02	9.122E+03	4.426E+02
5.000E+00	8.901E+03	4.426E+02	8.901E+03	4.426E+02
5.500E+00	8.680E+03	4.426E+02	8.680E+03	4.426E+02
6.300E+00	8.326E+03	4.426E+02	8.326E+03	4.426E+02
7.100E+00	7.972E+03	4.426E+02	7.972E+03	4.426E+02
8.000E+00	7.573E+03	4.426E+02	7.573E+03	4.426E+02
9.000E+00	7.131E+03	4.426E+02	7.131E+03	4.426E+02

1.000E+01	6.688E+03	4.426E+02	6.688E+03	4.426E+02
1.100E+01	6.307E+03	3.200E+02	6.307E+03	3.200E+02
1.200E+01	6.027E+03	2.401E+02	6.027E+03	2.401E+02
1.400E+01	5.639E+03	1.474E+02	5.639E+03	1.474E+02
1.600E+01	5.393E+03	9.852E+01	5.393E+03	9.852E+01
1.800E+01	5.225E+03	6.990E+01	5.225E+03	6.990E+01
2.000E+01	5.103E+03	5.179E+01	5.103E+03	5.179E+01
2.200E+01	5.012E+03	3.963E+01	5.012E+03	3.963E+01
2.500E+01	4.911E+03	2.769E+01	4.911E+03	2.769E+01
2.800E+01	4.839E+03	2.007E+01	4.839E+03	2.007E+01
3.200E+01	4.772E+03	1.358E+01	4.772E+03	1.358E+01
3.500E+01	4.736E+03	1.033E+01	4.736E+03	1.033E+01
4.000E+01	4.693E+03	6.730E+00	4.693E+03	6.730E+00
4.500E+01	4.665E+03	4.505E+00	4.665E+03	4.505E+00
5.000E+01	4.646E+03	3.098E+00	4.646E+03	3.098E+00
5.500E+01	4.633E+03	2.202E+00	4.633E+03	2.202E+00
6.300E+01	4.618E+03	1.400E+00	4.618E+03	1.400E+00
7.100E+01	4.609E+03	1.034E+00	4.609E+03	1.034E+00
8.000E+01	4.600E+03	8.826E-01	4.600E+03	8.826E-01
9.000E+01	4.591E+03	8.685E-01	4.591E+03	8.685E-01
1.000E+02	4.582E+03	9.264E-01	4.582E+03	9.264E-01
1.100E+02	4.573E+03	1.001E+00	4.573E+03	1.001E+00
1.200E+02	4.562E+03	1.109E+00	4.562E+03	1.109E+00
1.400E+02	4.538E+03	1.321E+00	4.538E+03	1.321E+00
1.600E+02	4.509E+03	1.520E+00	4.509E+03	1.520E+00
1.800E+02	4.477E+03	1.703E+00	4.477E+03	1.703E+00
2.000E+02	4.441E+03	1.867E+00	4.441E+03	1.867E+00
2.200E+02	4.403E+03	2.013E+00	4.403E+03	2.013E+00
2.500E+02	4.340E+03	2.194E+00	4.340E+03	2.194E+00
2.800E+02	4.272E+03	2.335E+00	4.272E+03	2.335E+00
3.200E+02	4.176E+03	2.466E+00	4.176E+03	2.466E+00
3.500E+02	4.101E+03	2.529E+00	4.101E+03	2.529E+00
4.000E+02	3.973E+03	2.580E+00	3.973E+03	2.580E+00
4.500E+02	3.844E+03	2.580E+00	3.844E+03	2.580E+00
5.000E+02	3.716E+03	2.545E+00	3.716E+03	2.545E+00

5.500E+02	3.590E+03	2.486E+00	3.590E+03	2.486E+00
6.300E+02	3.396E+03	2.361E+00	3.396E+03	2.361E+00
7.100E+02	3.213E+03	2.216E+00	3.213E+03	2.216E+00
8.000E+02	3.021E+03	2.047E+00	3.021E+03	2.047E+00
9.000E+02	2.826E+03	1.866E+00	2.826E+03	1.866E+00
1.000E+03	2.648E+03	1.696E+00	2.648E+03	1.696E+00
1.100E+03	2.486E+03	1.542E+00	2.486E+03	1.542E+00
1.200E+03	2.338E+03	1.403E+00	2.338E+03	1.403E+00
1.400E+03	2.081E+03	1.168E+00	2.081E+03	1.168E+00
1.600E+03	1.866E+03	9.816E-01	1.866E+03	9.816E-01
1.800E+03	1.685E+03	8.327E-01	1.685E+03	8.327E-01
2.000E+03	1.530E+03	7.135E-01	1.530E+03	7.135E-01
2.200E+03	1.397E+03	6.171E-01	1.397E+03	6.171E-01
2.500E+03	1.229E+03	5.035E-01	1.229E+03	5.035E-01
2.800E+03	1.091E+03	4.172E-01	1.091E+03	4.172E-01
3.200E+03	9.411E+02	3.316E-01	9.411E+02	3.316E-01
3.500E+03	8.490E+02	2.826E-01	8.490E+02	2.826E-01
4.000E+03	7.231E+02	2.211E-01	7.231E+02	2.211E-01
4.500E+03	6.235E+02	1.769E-01	6.235E+02	1.769E-01
5.000E+03	5.432E+02	1.443E-01	5.432E+02	1.443E-01
5.500E+03	4.773E+02	1.196E-01	4.773E+02	1.196E-01
6.300E+03	3.930E+02	9.105E-02	3.930E+02	9.105E-02
7.100E+03	3.281E+02	7.133E-02	3.281E+02	7.133E-02
8.000E+03	2.709E+02	5.572E-02	2.709E+02	5.572E-02
9.000E+03	2.212E+02	4.355E-02	2.212E+02	4.355E-02
1.000E+04	1.820E+02	3.487E-02	1.820E+02	3.487E-02
1.100E+04	1.504E+02	2.848E-02	1.504E+02	2.848E-02
1.200E+04	1.243E+02	2.365E-02	1.243E+02	2.365E-02
1.400E+04	8.367E+01	1.698E-02	8.367E+01	1.698E-02
1.600E+04	5.395E+01	1.273E-02	5.395E+01	1.273E-02
1.800E+04	3.137E+01	9.860E-03	3.137E+01	9.860E-03
2.000E+04	1.366E+01	7.842E-03	1.366E+01	7.842E-03

TAP orbit:

Average proton spectra. Units for integral and differential flux are ($\text{m}^{-2} \text{ sr}^{-1} \text{ s}^{-1}$) and ($\text{m}^{-2} \text{ sr}^{-1} \text{ s}^{-1} (\text{MeV/n})^{-1}$).

Energy (MeV/n)	Total mission integral flux	Total mission differential flux	<u>Mission segment 1</u>	
			Integral flux	Differential flux
1.000E+00	1.091E+04	4.390E+02	1.091E+04	4.390E+02
1.100E+00	1.087E+04	4.390E+02	1.087E+04	4.390E+02
1.200E+00	1.083E+04	4.390E+02	1.083E+04	4.390E+02
1.400E+00	1.074E+04	4.390E+02	1.074E+04	4.390E+02
1.600E+00	1.065E+04	4.390E+02	1.065E+04	4.390E+02
1.800E+00	1.056E+04	4.390E+02	1.056E+04	4.390E+02
2.000E+00	1.048E+04	4.390E+02	1.048E+04	4.390E+02
2.200E+00	1.039E+04	4.390E+02	1.039E+04	4.390E+02
2.500E+00	1.026E+04	4.390E+02	1.026E+04	4.390E+02
2.800E+00	1.012E+04	4.390E+02	1.012E+04	4.390E+02
3.200E+00	9.949E+03	4.390E+02	9.949E+03	4.390E+02
3.500E+00	9.817E+03	4.390E+02	9.817E+03	4.390E+02
4.000E+00	9.598E+03	4.390E+02	9.598E+03	4.390E+02
4.500E+00	9.378E+03	4.390E+02	9.378E+03	4.390E+02
5.000E+00	9.159E+03	4.390E+02	9.159E+03	4.390E+02
5.500E+00	8.939E+03	4.390E+02	8.939E+03	4.390E+02
6.300E+00	8.588E+03	4.390E+02	8.588E+03	4.390E+02
7.100E+00	8.237E+03	4.390E+02	8.237E+03	4.390E+02
8.000E+00	7.842E+03	4.390E+02	7.842E+03	4.390E+02
9.000E+00	7.403E+03	4.390E+02	7.403E+03	4.390E+02
1.000E+01	6.964E+03	4.390E+02	6.964E+03	4.390E+02
1.100E+01	6.586E+03	3.173E+02	6.586E+03	3.173E+02
1.200E+01	6.308E+03	2.381E+02	6.308E+03	2.381E+02
1.400E+01	5.924E+03	1.462E+02	5.924E+03	1.462E+02
1.600E+01	5.680E+03	9.770E+01	5.680E+03	9.770E+01
1.800E+01	5.513E+03	6.932E+01	5.513E+03	6.932E+01
2.000E+01	5.392E+03	5.137E+01	5.392E+03	5.137E+01
2.200E+01	5.301E+03	3.930E+01	5.301E+03	3.930E+01
2.500E+01	5.201E+03	2.746E+01	5.201E+03	2.746E+01
2.800E+01	5.130E+03	1.991E+01	5.130E+03	1.991E+01

3.200E+01	5.064E+03	1.347E+01	5.064E+03	1.347E+01
3.500E+01	5.028E+03	1.025E+01	5.028E+03	1.025E+01
4.000E+01	4.986E+03	6.675E+00	4.986E+03	6.675E+00
4.500E+01	4.958E+03	4.468E+00	4.958E+03	4.468E+00
5.000E+01	4.939E+03	3.073E+00	4.939E+03	3.073E+00
5.500E+01	4.926E+03	2.184E+00	4.926E+03	2.184E+00
6.300E+01	4.912E+03	1.389E+00	4.912E+03	1.389E+00
7.100E+01	4.902E+03	1.026E+00	4.902E+03	1.026E+00
8.000E+01	4.893E+03	8.753E-01	4.893E+03	8.753E-01
9.000E+01	4.885E+03	8.614E-01	4.885E+03	8.614E-01
1.000E+02	4.876E+03	9.196E-01	4.876E+03	9.196E-01
1.100E+02	4.866E+03	9.951E-01	4.866E+03	9.951E-01
1.200E+02	4.856E+03	1.104E+00	4.856E+03	1.104E+00
1.400E+02	4.831E+03	1.317E+00	4.831E+03	1.317E+00
1.600E+02	4.803E+03	1.521E+00	4.803E+03	1.521E+00
1.800E+02	4.771E+03	1.711E+00	4.771E+03	1.711E+00
2.000E+02	4.735E+03	1.884E+00	4.735E+03	1.884E+00
2.200E+02	4.696E+03	2.038E+00	4.696E+03	2.038E+00
2.500E+02	4.631E+03	2.236E+00	4.631E+03	2.236E+00
2.800E+02	4.562E+03	2.394E+00	4.562E+03	2.394E+00
3.200E+02	4.463E+03	2.551E+00	4.463E+03	2.551E+00
3.500E+02	4.385E+03	2.636E+00	4.385E+03	2.636E+00
4.000E+02	4.251E+03	2.723E+00	4.251E+03	2.723E+00
4.500E+02	4.114E+03	2.750E+00	4.114E+03	2.750E+00
5.000E+02	3.977E+03	2.736E+00	3.977E+03	2.736E+00
5.500E+02	3.842E+03	2.690E+00	3.842E+03	2.690E+00
6.300E+02	3.631E+03	2.573E+00	3.631E+03	2.573E+00
7.100E+02	3.431E+03	2.426E+00	3.431E+03	2.426E+00
8.000E+02	3.221E+03	2.249E+00	3.221E+03	2.249E+00
9.000E+02	3.006E+03	2.054E+00	3.006E+03	2.054E+00
1.000E+03	2.810E+03	1.869E+00	2.810E+03	1.869E+00
1.100E+03	2.631E+03	1.698E+00	2.631E+03	1.698E+00
1.200E+03	2.469E+03	1.544E+00	2.469E+03	1.544E+00
1.400E+03	2.187E+03	1.281E+00	2.187E+03	1.281E+00
1.600E+03	1.952E+03	1.071E+00	1.952E+03	1.071E+00

1.800E+03	1.754E+03	9.037E-01	1.754E+03	9.037E-01
2.000E+03	1.587E+03	7.696E-01	1.587E+03	7.696E-01
2.200E+03	1.444E+03	6.612E-01	1.444E+03	6.612E-01
2.500E+03	1.264E+03	5.347E-01	1.264E+03	5.347E-01
2.800E+03	1.118E+03	4.395E-01	1.118E+03	4.395E-01
3.200E+03	9.611E+02	3.459E-01	9.611E+02	3.459E-01
3.500E+03	8.652E+02	2.932E-01	8.652E+02	2.932E-01
4.000E+03	7.350E+02	2.278E-01	7.350E+02	2.278E-01
4.500E+03	6.327E+02	1.814E-01	6.327E+02	1.814E-01
5.000E+03	5.505E+02	1.473E-01	5.505E+02	1.473E-01
5.500E+03	4.832E+02	1.218E-01	4.832E+02	1.218E-01
6.300E+03	3.976E+02	9.244E-02	3.976E+02	9.244E-02
7.100E+03	3.317E+02	7.229E-02	3.317E+02	7.229E-02
8.000E+03	2.738E+02	5.640E-02	2.738E+02	5.640E-02
9.000E+03	2.235E+02	4.404E-02	2.235E+02	4.404E-02
1.000E+04	1.839E+02	3.524E-02	1.839E+02	3.524E-02
1.100E+04	1.519E+02	2.878E-02	1.519E+02	2.878E-02
1.200E+04	1.256E+02	2.389E-02	1.256E+02	2.389E-02
1.400E+04	8.451E+01	1.715E-02	8.451E+01	1.715E-02
1.600E+04	5.450E+01	1.286E-02	5.450E+01	1.286E-02
1.800E+04	3.168E+01	9.959E-03	3.168E+01	9.959E-03
2.000E+04	1.380E+01	7.920E-03	1.380E+01	7.920E-03

Tundra Orbit:

Average proton spectra. Units for integral and differential flux are ($\text{m}^{-2} \text{ sr}^{-1} \text{ s}^{-1}$) and ($\text{m}^{-2} \text{ sr}^{-1} \text{ s}^{-1} (\text{MeV/n})^{-1}$).

Energy (MeV/n)	Total mission integral flux	Total mission differential flux	Mission segment 1	
			Integral flux	Differential flux
1.000E+00	1.279E+04	5.565E+02	1.279E+04	5.565E+02

1.100E+00	1.274E+04	5.565E+02	1.274E+04	5.565E+02
1.200E+00	1.268E+04	5.565E+02	1.268E+04	5.565E+02
1.400E+00	1.257E+04	5.565E+02	1.257E+04	5.565E+02
1.600E+00	1.246E+04	5.565E+02	1.246E+04	5.565E+02
1.800E+00	1.235E+04	5.565E+02	1.235E+04	5.565E+02
2.000E+00	1.224E+04	5.565E+02	1.224E+04	5.565E+02
2.200E+00	1.212E+04	5.565E+02	1.212E+04	5.565E+02
2.500E+00	1.196E+04	5.565E+02	1.196E+04	5.565E+02
2.800E+00	1.179E+04	5.565E+02	1.179E+04	5.565E+02
3.200E+00	1.157E+04	5.565E+02	1.157E+04	5.565E+02
3.500E+00	1.140E+04	5.565E+02	1.140E+04	5.565E+02
4.000E+00	1.112E+04	5.565E+02	1.112E+04	5.565E+02
4.500E+00	1.084E+04	5.565E+02	1.084E+04	5.565E+02
5.000E+00	1.057E+04	5.565E+02	1.057E+04	5.565E+02
5.500E+00	1.029E+04	5.565E+02	1.029E+04	5.565E+02
6.300E+00	9.843E+03	5.565E+02	9.843E+03	5.565E+02
7.100E+00	9.398E+03	5.565E+02	9.398E+03	5.565E+02
8.000E+00	8.897E+03	5.565E+02	8.897E+03	5.565E+02
9.000E+00	8.340E+03	5.565E+02	8.340E+03	5.565E+02
1.000E+01	7.784E+03	5.565E+02	7.784E+03	5.565E+02
1.100E+01	7.304E+03	4.022E+02	7.304E+03	4.022E+02
1.200E+01	6.952E+03	3.019E+02	6.952E+03	3.019E+02
1.400E+01	6.465E+03	1.853E+02	6.465E+03	1.853E+02
1.600E+01	6.156E+03	1.239E+02	6.156E+03	1.239E+02
1.800E+01	5.944E+03	8.788E+01	5.944E+03	8.788E+01
2.000E+01	5.791E+03	6.511E+01	5.791E+03	6.511E+01
2.200E+01	5.676E+03	4.981E+01	5.676E+03	4.981E+01
2.500E+01	5.549E+03	3.481E+01	5.549E+03	3.481E+01
2.800E+01	5.459E+03	2.523E+01	5.459E+03	2.523E+01
3.200E+01	5.375E+03	1.707E+01	5.375E+03	1.707E+01
3.500E+01	5.330E+03	1.299E+01	5.330E+03	1.299E+01
4.000E+01	5.276E+03	8.461E+00	5.276E+03	8.461E+00
4.500E+01	5.241E+03	5.663E+00	5.241E+03	5.663E+00
5.000E+01	5.217E+03	3.895E+00	5.217E+03	3.895E+00
5.500E+01	5.200E+03	2.768E+00	5.200E+03	2.768E+00

6.300E+01	5.182E+03	1.761E+00	5.182E+03	1.761E+00
7.100E+01	5.170E+03	1.300E+00	5.170E+03	1.300E+00
8.000E+01	5.159E+03	1.110E+00	5.159E+03	1.110E+00
9.000E+01	5.148E+03	1.092E+00	5.148E+03	1.092E+00
1.000E+02	5.137E+03	1.165E+00	5.137E+03	1.165E+00
1.100E+02	5.125E+03	1.258E+00	5.125E+03	1.258E+00
1.200E+02	5.111E+03	1.393E+00	5.111E+03	1.393E+00
1.400E+02	5.081E+03	1.654E+00	5.081E+03	1.654E+00
1.600E+02	5.045E+03	1.897E+00	5.045E+03	1.897E+00
1.800E+02	5.005E+03	2.119E+00	5.005E+03	2.119E+00
2.000E+02	4.961E+03	2.315E+00	4.961E+03	2.315E+00
2.200E+02	4.913E+03	2.485E+00	4.913E+03	2.485E+00
2.500E+02	4.835E+03	2.695E+00	4.835E+03	2.695E+00
2.800E+02	4.752E+03	2.852E+00	4.752E+03	2.852E+00
3.200E+02	4.635E+03	2.994E+00	4.635E+03	2.994E+00
3.500E+02	4.544E+03	3.056E+00	4.544E+03	3.056E+00
4.000E+02	4.390E+03	3.097E+00	4.390E+03	3.097E+00
4.500E+02	4.236E+03	3.078E+00	4.236E+03	3.078E+00
5.000E+02	4.084E+03	3.018E+00	4.084E+03	3.018E+00
5.500E+02	3.935E+03	2.931E+00	3.935E+03	2.931E+00
6.300E+02	3.707E+03	2.760E+00	3.707E+03	2.760E+00
7.100E+02	3.494E+03	2.572E+00	3.494E+03	2.572E+00
8.000E+02	3.272E+03	2.360E+00	3.272E+03	2.360E+00
9.000E+02	3.047E+03	2.136E+00	3.047E+03	2.136E+00
1.000E+03	2.844E+03	1.931E+00	2.844E+03	1.931E+00
1.100E+03	2.660E+03	1.745E+00	2.660E+03	1.745E+00
1.200E+03	2.494E+03	1.580E+00	2.494E+03	1.580E+00
1.400E+03	2.206E+03	1.303E+00	2.206E+03	1.303E+00
1.600E+03	1.967E+03	1.086E+00	1.967E+03	1.086E+00
1.800E+03	1.767E+03	9.141E-01	1.767E+03	9.141E-01
2.000E+03	1.598E+03	7.772E-01	1.598E+03	7.772E-01
2.200E+03	1.453E+03	6.670E-01	1.453E+03	6.670E-01
2.500E+03	1.272E+03	5.387E-01	1.272E+03	5.387E-01
2.800E+03	1.125E+03	4.425E-01	1.125E+03	4.425E-01
3.200E+03	9.669E+02	3.481E-01	9.669E+02	3.481E-01

3.500E+03	8.705E+02	2.950E-01	8.705E+02	2.950E-01
4.000E+03	7.394E+02	2.292E-01	7.394E+02	2.292E-01
4.500E+03	6.365E+02	1.825E-01	6.365E+02	1.825E-01
5.000E+03	5.538E+02	1.482E-01	5.538E+02	1.482E-01
5.500E+03	4.862E+02	1.225E-01	4.862E+02	1.225E-01
6.300E+03	4.000E+02	9.300E-02	4.000E+02	9.300E-02
7.100E+03	3.337E+02	7.273E-02	3.337E+02	7.273E-02
8.000E+03	2.754E+02	5.674E-02	2.754E+02	5.674E-02
9.000E+03	2.249E+02	4.431E-02	2.249E+02	4.431E-02
1.000E+04	1.850E+02	3.546E-02	1.850E+02	3.546E-02
1.100E+04	1.528E+02	2.895E-02	1.528E+02	2.895E-02
1.200E+04	1.263E+02	2.404E-02	1.263E+02	2.404E-02
1.400E+04	8.502E+01	1.726E-02	8.502E+01	1.726E-02
1.600E+04	5.482E+01	1.293E-02	5.482E+01	1.293E-02
1.800E+04	3.187E+01	1.002E-02	3.187E+01	1.002E-02
2.000E+04	1.388E+01	7.968E-03	1.388E+01	7.968E-03

APPENDIX D. Solar Proton Fluxes for Spacecraft Trajectory

Solar flare model: CREME-86 (M= 5-1)

Magnetic shielding: eccentric dipole/quiet magnetosphere/unchanged magn. mom./all arrival directions

Ion range: H - U

Molniya Orbit

Solar proton fluxes for the [spacecraft trajectory](#) and outside the magnetosphere

	Flux at spacecraft		Model flux at 1.0AU	
	Total mission flux		Total mission flux	
Energy (MeV)	Integral ($\text{m}^{-2} \text{sr}^{-1} \text{s}^{-1}$)	Differential ($\text{m}^{-2} \text{sr}^{-1} \text{s}^{-1} (\text{MeV/n})^{-1}$)	Integral ($\text{m}^{-2} \text{sr}^{-1} \text{s}^{-1}$)	Differential ($\text{m}^{-2} \text{sr}^{-1} \text{s}^{-1} (\text{MeV/n})^{-1}$)
0.10	4.347E+06	2.886E+05	5.470E+06	3.649E+05
0.11	4.344E+06	2.886E+05	5.466E+06	3.649E+05
0.12	4.341E+06	2.886E+05	5.462E+06	3.649E+05
0.14	4.335E+06	2.886E+05	5.455E+06	3.649E+05
0.16	4.329E+06	2.886E+05	5.448E+06	3.649E+05
0.18	4.324E+06	2.886E+05	5.441E+06	3.649E+05
0.20	4.318E+06	2.886E+05	5.433E+06	3.649E+05
0.22	4.312E+06	2.886E+05	5.426E+06	3.649E+05
0.25	4.303E+06	2.886E+05	5.415E+06	3.649E+05
0.28	4.295E+06	2.886E+05	5.404E+06	3.649E+05
0.32	4.283E+06	2.886E+05	5.390E+06	3.649E+05
0.35	4.275E+06	2.886E+05	5.379E+06	3.649E+05
0.40	4.260E+06	2.886E+05	5.360E+06	3.649E+05
0.45	4.246E+06	2.886E+05	5.342E+06	3.649E+05
0.50	4.231E+06	2.886E+05	5.324E+06	3.649E+05
0.55	4.217E+06	2.886E+05	5.306E+06	3.649E+05
0.63	4.194E+06	2.886E+05	5.276E+06	3.649E+05
0.71	4.171E+06	2.886E+05	5.247E+06	3.649E+05
0.80	4.145E+06	2.886E+05	5.214E+06	3.649E+05
0.90	4.116E+06	2.886E+05	5.178E+06	3.649E+05
1.00	4.087E+06	2.886E+05	5.141E+06	3.649E+05
1.10	4.058E+06	2.886E+05	5.105E+06	3.649E+05

1.20	4.029E+06	2.886E+05	5.068E+06	3.649E+05
1.40	3.972E+06	2.886E+05	4.995E+06	3.649E+05
1.60	3.914E+06	2.886E+05	4.922E+06	3.649E+05
1.80	3.856E+06	2.886E+05	4.849E+06	3.649E+05
2.00	3.798E+06	2.886E+05	4.776E+06	3.649E+05
2.20	3.741E+06	2.886E+05	4.703E+06	3.649E+05
2.50	3.654E+06	2.886E+05	4.594E+06	3.649E+05
2.80	3.568E+06	2.886E+05	4.484E+06	3.649E+05
3.20	3.452E+06	2.886E+05	4.338E+06	3.649E+05
3.50	3.366E+06	2.886E+05	4.229E+06	3.649E+05
4.00	3.221E+06	2.886E+05	4.046E+06	3.649E+05
4.50	3.077E+06	2.886E+05	3.864E+06	3.649E+05
5.00	2.933E+06	2.886E+05	3.682E+06	3.649E+05
5.50	2.788E+06	2.886E+05	3.499E+06	3.649E+05
6.30	2.558E+06	2.886E+05	3.207E+06	3.649E+05
7.10	2.327E+06	2.886E+05	2.915E+06	3.649E+05
8.00	2.067E+06	2.886E+05	2.587E+06	3.649E+05
9.00	1.778E+06	2.886E+05	2.222E+06	3.649E+05
10.00	1.490E+06	2.886E+05	1.857E+06	3.649E+05
11.00	1.232E+06	2.272E+05	1.533E+06	2.874E+05
12.00	1.029E+06	1.794E+05	1.277E+06	2.269E+05
14.00	7.365E+05	1.128E+05	9.164E+05	1.427E+05
16.00	5.515E+05	7.221E+04	6.873E+05	9.132E+04
18.00	4.320E+05	4.730E+04	5.390E+05	5.982E+04
20.00	3.527E+05	3.194E+04	4.403E+05	4.040E+04
22.00	2.984E+05	2.240E+04	3.725E+05	2.833E+04
25.00	2.434E+05	1.427E+04	3.044E+05	1.805E+04
28.00	2.069E+05	1.005E+04	2.589E+05	1.272E+04
32.00	1.724E+05	7.175E+03	2.159E+05	9.074E+03
35.00	1.527E+05	5.956E+03	1.911E+05	7.533E+03
40.00	1.261E+05	4.676E+03	1.577E+05	5.913E+03
45.00	1.049E+05	3.815E+03	1.310E+05	4.825E+03
50.00	8.749E+04	3.157E+03	1.091E+05	3.993E+03
55.00	7.303E+04	2.625E+03	9.087E+04	3.320E+03
63.00	5.469E+04	1.960E+03	6.791E+04	2.479E+03

71.00	4.098E+04	1.465E+03	5.075E+04	1.853E+03
80.00	2.964E+04	1.056E+03	3.657E+04	1.336E+03
90.00	2.068E+04	7.342E+02	2.541E+04	9.286E+02
100.00	1.446E+04	5.104E+02	1.765E+04	6.455E+02
110.00	1.013E+04	3.550E+02	1.226E+04	4.487E+02
120.00	7.125E+03	2.469E+02	8.506E+03	3.119E+02
140.00	3.459E+03	1.196E+02	4.114E+03	1.507E+02
160.00	1.683E+03	5.799E+01	1.989E+03	7.284E+01
180.00	8.220E+02	2.812E+01	9.608E+02	3.520E+01
200.00	4.044E+02	1.364E+01	4.638E+02	1.701E+01
220.00	2.019E+02	6.616E+00	2.234E+02	8.219E+00
250.00	6.910E+01	2.235E+00	7.504E+01	2.761E+00
280.00	2.426E+01	7.545E-01	2.513E+01	9.274E-01
320.00	5.627E+00	1.773E-01	5.887E+00	2.165E-01
350.00	2.071E+00	5.982E-02	1.964E+00	7.274E-02
400.00	3.308E-01	9.777E-03	3.205E-01	1.181E-02
450.00	4.645E-02	1.597E-03	5.305E-02	1.917E-03
500.00	0.000E+00	2.608E-04	9.568E-03	3.111E-04

Exposure factors		
Energy (MeV)	Mission average	Mission segment 1
0.10	0.7907	0.7907
0.11	0.7907	0.7907
0.12	0.7907	0.7907
0.14	0.7907	0.7907
0.16	0.7907	0.7907
0.18	0.7907	0.7907
0.20	0.7907	0.7907
0.22	0.7907	0.7907
0.25	0.7907	0.7907
0.28	0.7907	0.7907
0.32	0.7907	0.7907
0.35	0.7907	0.7907

0.40	0.7907	0.7907
0.45	0.7907	0.7907
0.50	0.7907	0.7907
0.55	0.7907	0.7907
0.63	0.7907	0.7907
0.71	0.7907	0.7907
0.80	0.7907	0.7907
0.90	0.7907	0.7907
1.00	0.7907	0.7907
1.10	0.7907	0.7907
1.20	0.7907	0.7907
1.40	0.7907	0.7907
1.60	0.7907	0.7907
1.80	0.7907	0.7907
2.00	0.7907	0.7907
2.20	0.7907	0.7907
2.50	0.7907	0.7907
2.80	0.7907	0.7907
3.20	0.7907	0.7907
3.50	0.7907	0.7907
4.00	0.7907	0.7907
4.50	0.7907	0.7907
5.00	0.7907	0.7907
5.50	0.7907	0.7907
6.30	0.7907	0.7907
7.10	0.7907	0.7907
8.00	0.7907	0.7907
9.00	0.7907	0.7907
10.00	0.7907	0.7907
11.00	0.7907	0.7907
12.00	0.7907	0.7907
14.00	0.7907	0.7907
16.00	0.7907	0.7907
18.00	0.7907	0.7907
20.00	0.7907	0.7907

22.00	0.7907	0.7907
25.00	0.7907	0.7907
28.00	0.7907	0.7907
32.00	0.7907	0.7907
35.00	0.7907	0.7907
40.00	0.7907	0.7907
45.00	0.7907	0.7907
50.00	0.7907	0.7907
55.00	0.7907	0.7907
63.00	0.7907	0.7907
71.00	0.7907	0.7907
80.00	0.7907	0.7907
90.00	0.7907	0.7907
100.00	0.7907	0.7907
110.00	0.7910	0.7910
120.00	0.7917	0.7917
140.00	0.7937	0.7937
160.00	0.7962	0.7962
180.00	0.7990	0.7990
200.00	0.8019	0.8019
220.00	0.8049	0.8049
250.00	0.8095	0.8095
280.00	0.8136	0.8136
320.00	0.8187	0.8187
350.00	0.8223	0.8223
400.00	0.8280	0.8280
450.00	0.8333	0.8333
500.00	0.8384	0.8384

Exposure times (hr)			
Energy (MeV)	Mission total	Mission segment 1	
		Orbit exposure	Segment exposure
0.10	55883.18	19.06	55883.18

0.11	55883.18	19.06	55883.18
0.12	55883.18	19.06	55883.18
0.14	55883.18	19.06	55883.18
0.16	55883.18	19.06	55883.18
0.18	55883.18	19.06	55883.18
0.20	55883.18	19.06	55883.18
0.22	55883.18	19.06	55883.18
0.25	55883.18	19.06	55883.18
0.28	55883.18	19.06	55883.18
0.32	55883.18	19.06	55883.18
0.35	55883.18	19.06	55883.18
0.40	55883.18	19.06	55883.18
0.45	55883.18	19.06	55883.18
0.50	55883.18	19.06	55883.18
0.55	55883.18	19.06	55883.18
0.63	55883.18	19.06	55883.18
0.71	55883.18	19.06	55883.18
0.80	55883.18	19.06	55883.18
0.90	55883.18	19.06	55883.18
1.00	55883.18	19.06	55883.18
1.10	55883.18	19.06	55883.18
1.20	55883.18	19.06	55883.18
1.40	55883.18	19.06	55883.18
1.60	55883.18	19.06	55883.18
1.80	55883.18	19.06	55883.18
2.00	55883.18	19.06	55883.18
2.20	55883.18	19.06	55883.18
2.50	55883.18	19.06	55883.18
2.80	55883.18	19.06	55883.18
3.20	55883.18	19.06	55883.18
3.50	55883.18	19.06	55883.18
4.00	55883.18	19.06	55883.18
4.50	55883.18	19.06	55883.18
5.00	55883.18	19.06	55883.18
5.50	55883.18	19.06	55883.18

6.30	55883.18	19.06	55883.18
7.10	55883.18	19.06	55883.18
8.00	55883.18	19.06	55883.18
9.00	55883.18	19.06	55883.18
10.00	55883.18	19.06	55883.18
11.00	55883.18	19.06	55883.18
12.00	55883.18	19.06	55883.18
14.00	55883.18	19.06	55883.18
16.00	55883.18	19.06	55883.18
18.00	55883.18	19.06	55883.18
20.00	55883.18	19.06	55883.18
22.00	55883.18	19.06	55883.18
25.00	55883.18	19.06	55883.18
28.00	55883.18	19.06	55883.18
32.00	55883.18	19.06	55883.18
35.00	55883.18	19.06	55883.18
40.00	55883.18	19.06	55883.18
45.00	55883.18	19.06	55883.18
50.00	55883.18	19.06	55883.18
55.00	55883.18	19.06	55883.18
63.00	55883.18	19.06	55883.18
71.00	55883.18	19.06	55883.18
80.00	55883.18	19.06	55883.18
90.00	55883.18	19.06	55883.18
100.00	55980.92	19.09	55980.92
110.00	56225.27	19.18	56225.27
120.00	56567.36	19.29	56567.36
140.00	57056.07	19.46	57056.07
160.00	57349.29	19.56	57349.29
180.00	57789.12	19.71	57789.12
200.00	58131.21	19.83	58131.21
220.00	58424.44	19.93	58424.44
250.00	58815.40	20.06	58815.40
280.00	59255.23	20.21	59255.23
320.00	59548.45	20.31	59548.45

350.00	59890.54	20.42	59890.54
400.00	60305.94	20.57	60305.94
450.00	60843.51	20.75	60843.51
500.00	61185.61	20.87	61185.61

TAP Orbit:

Solar proton fluxes for the spacecraft trajectory and outside the magnetosphere				
	Flux at spacecraft		Model flux at 1.0AU	
	Total mission flux		Total mission flux	
Energy (MeV)	Integral (m⁻²sr⁻¹s⁻¹)	Differential (m⁻² sr⁻¹s⁻¹ (MeV/n)⁻¹)	Integral (m⁻²sr⁻¹s⁻¹)	Differential (m⁻² sr⁻¹s⁻¹ (MeV/n)⁻¹)
0.10	4.311E+06	2.862E+05	5.470E+06	3.649E+05
0.11	4.308E+06	2.862E+05	5.466E+06	3.649E+05
0.12	4.305E+06	2.862E+05	5.462E+06	3.649E+05
0.14	4.299E+06	2.862E+05	5.455E+06	3.649E+05
0.16	4.294E+06	2.862E+05	5.448E+06	3.649E+05
0.18	4.288E+06	2.862E+05	5.441E+06	3.649E+05
0.20	4.282E+06	2.862E+05	5.433E+06	3.649E+05
0.22	4.276E+06	2.862E+05	5.426E+06	3.649E+05
0.25	4.268E+06	2.862E+05	5.415E+06	3.649E+05
0.28	4.259E+06	2.862E+05	5.404E+06	3.649E+05
0.32	4.248E+06	2.862E+05	5.390E+06	3.649E+05
0.35	4.239E+06	2.862E+05	5.379E+06	3.649E+05
0.40	4.225E+06	2.862E+05	5.360E+06	3.649E+05
0.45	4.211E+06	2.862E+05	5.342E+06	3.649E+05
0.50	4.196E+06	2.862E+05	5.324E+06	3.649E+05
0.55	4.182E+06	2.862E+05	5.306E+06	3.649E+05
0.63	4.159E+06	2.862E+05	5.276E+06	3.649E+05
0.71	4.136E+06	2.862E+05	5.247E+06	3.649E+05
0.80	4.110E+06	2.862E+05	5.214E+06	3.649E+05

0.90	4.082E+06	2.862E+05	5.178E+06	3.649E+05
1.00	4.053E+06	2.862E+05	5.141E+06	3.649E+05
1.10	4.025E+06	2.862E+05	5.105E+06	3.649E+05
1.20	3.996E+06	2.862E+05	5.068E+06	3.649E+05
1.40	3.939E+06	2.862E+05	4.995E+06	3.649E+05
1.60	3.882E+06	2.862E+05	4.922E+06	3.649E+05
1.80	3.824E+06	2.862E+05	4.849E+06	3.649E+05
2.00	3.767E+06	2.862E+05	4.776E+06	3.649E+05
2.20	3.710E+06	2.862E+05	4.703E+06	3.649E+05
2.50	3.624E+06	2.862E+05	4.594E+06	3.649E+05
2.80	3.538E+06	2.862E+05	4.484E+06	3.649E+05
3.20	3.424E+06	2.862E+05	4.338E+06	3.649E+05
3.50	3.338E+06	2.862E+05	4.229E+06	3.649E+05
4.00	3.195E+06	2.862E+05	4.046E+06	3.649E+05
4.50	3.052E+06	2.862E+05	3.864E+06	3.649E+05
5.00	2.909E+06	2.862E+05	3.682E+06	3.649E+05
5.50	2.765E+06	2.862E+05	3.499E+06	3.649E+05
6.30	2.537E+06	2.862E+05	3.207E+06	3.649E+05
7.10	2.308E+06	2.862E+05	2.915E+06	3.649E+05
8.00	2.050E+06	2.862E+05	2.587E+06	3.649E+05
9.00	1.764E+06	2.862E+05	2.222E+06	3.649E+05
10.00	1.478E+06	2.862E+05	1.857E+06	3.649E+05
11.00	1.222E+06	2.253E+05	1.533E+06	2.874E+05
12.00	1.020E+06	1.779E+05	1.277E+06	2.269E+05
14.00	7.305E+05	1.119E+05	9.164E+05	1.427E+05
16.00	5.470E+05	7.161E+04	6.873E+05	9.132E+04
18.00	4.285E+05	4.691E+04	5.390E+05	5.982E+04
20.00	3.499E+05	3.168E+04	4.403E+05	4.040E+04
22.00	2.960E+05	2.221E+04	3.725E+05	2.833E+04
25.00	2.414E+05	1.416E+04	3.044E+05	1.805E+04
28.00	2.052E+05	9.971E+03	2.589E+05	1.272E+04
32.00	1.711E+05	7.116E+03	2.159E+05	9.074E+03
35.00	1.515E+05	5.907E+03	1.911E+05	7.533E+03
40.00	1.252E+05	4.637E+03	1.577E+05	5.913E+03
45.00	1.041E+05	3.783E+03	1.310E+05	4.825E+03

50.00	8.683E+04	3.131E+03	1.091E+05	3.993E+03
55.00	7.249E+04	2.604E+03	9.087E+04	3.320E+03
63.00	5.430E+04	1.944E+03	6.791E+04	2.479E+03
71.00	4.071E+04	1.453E+03	5.075E+04	1.853E+03
80.00	2.946E+04	1.048E+03	3.657E+04	1.336E+03
90.00	2.058E+04	7.282E+02	2.541E+04	9.286E+02
100.00	1.441E+04	5.067E+02	1.765E+04	6.455E+02
110.00	1.011E+04	3.527E+02	1.226E+04	4.487E+02
120.00	7.118E+03	2.457E+02	8.506E+03	3.119E+02
140.00	3.467E+03	1.193E+02	4.114E+03	1.507E+02
160.00	1.693E+03	5.805E+01	1.989E+03	7.284E+01
180.00	8.302E+02	2.826E+01	9.608E+02	3.520E+01
200.00	4.100E+02	1.376E+01	4.638E+02	1.701E+01
220.00	2.054E+02	6.700E+00	2.234E+02	8.219E+00
250.00	7.076E+01	2.277E+00	7.504E+01	2.761E+00
280.00	2.500E+01	7.738E-01	2.513E+01	9.274E-01
320.00	5.854E+00	1.834E-01	5.887E+00	2.165E-01
350.00	2.167E+00	6.236E-02	1.964E+00	7.274E-02
400.00	3.501E-01	1.032E-02	3.205E-01	1.181E-02
450.00	4.957E-02	1.702E-03	5.305E-02	1.917E-03
500.00	0.000E+00	2.804E-04	9.568E-03	3.111E-04

Exposure factors		
Energy (MeV)	Mission average	<u>Mission segment 1</u>
0.10	0.7841	0.7841
0.11	0.7841	0.7841
0.12	0.7841	0.7841
0.14	0.7841	0.7841
0.16	0.7841	0.7841
0.18	0.7841	0.7841
0.20	0.7841	0.7841
0.22	0.7841	0.7841
0.25	0.7841	0.7841

0.28	0.7841	0.7841
0.32	0.7841	0.7841
0.35	0.7841	0.7841
0.40	0.7841	0.7841
0.45	0.7841	0.7841
0.50	0.7841	0.7841
0.55	0.7841	0.7841
0.63	0.7841	0.7841
0.71	0.7841	0.7841
0.80	0.7841	0.7841
0.90	0.7841	0.7841
1.00	0.7841	0.7841
1.10	0.7841	0.7841
1.20	0.7841	0.7841
1.40	0.7841	0.7841
1.60	0.7841	0.7841
1.80	0.7841	0.7841
2.00	0.7841	0.7841
2.20	0.7841	0.7841
2.50	0.7841	0.7841
2.80	0.7841	0.7841
3.20	0.7841	0.7841
3.50	0.7841	0.7841
4.00	0.7841	0.7841
4.50	0.7841	0.7841
5.00	0.7841	0.7841
5.50	0.7841	0.7841
6.30	0.7841	0.7841
7.10	0.7841	0.7841
8.00	0.7841	0.7841
9.00	0.7841	0.7841
10.00	0.7841	0.7841
11.00	0.7841	0.7841
12.00	0.7841	0.7841
14.00	0.7841	0.7841

16.00	0.7841	0.7841
18.00	0.7841	0.7841
20.00	0.7841	0.7841
22.00	0.7841	0.7841
25.00	0.7841	0.7841
28.00	0.7841	0.7841
32.00	0.7841	0.7841
35.00	0.7841	0.7841
40.00	0.7841	0.7841
45.00	0.7841	0.7841
50.00	0.7841	0.7841
55.00	0.7841	0.7841
63.00	0.7841	0.7841
71.00	0.7841	0.7841
80.00	0.7841	0.7841
90.00	0.7842	0.7842
100.00	0.7849	0.7849
110.00	0.7861	0.7861
120.00	0.7876	0.7876
140.00	0.7917	0.7917
160.00	0.7970	0.7970
180.00	0.8029	0.8029
200.00	0.8090	0.8090
220.00	0.8153	0.8153
250.00	0.8248	0.8248
280.00	0.8343	0.8343
320.00	0.8471	0.8471
350.00	0.8572	0.8572
400.00	0.8738	0.8738
450.00	0.8882	0.8882
500.00	0.9012	0.9012

Exposure times (hr)			
Energy (MeV)	Mission total	<u>Mission segment 1</u>	
		Orbit exposure	Segment exposure
0.10	55434.23	37.85	55434.23
0.11	55434.23	37.85	55434.23
0.12	55434.23	37.85	55434.23
0.14	55434.23	37.85	55434.23
0.16	55434.23	37.85	55434.23
0.18	55434.23	37.85	55434.23
0.20	55434.23	37.85	55434.23
0.22	55434.23	37.85	55434.23
0.25	55434.23	37.85	55434.23
0.28	55434.23	37.85	55434.23
0.32	55434.23	37.85	55434.23
0.35	55434.23	37.85	55434.23
0.40	55434.23	37.85	55434.23
0.45	55434.23	37.85	55434.23
0.50	55434.23	37.85	55434.23
0.55	55434.23	37.85	55434.23
0.63	55434.23	37.85	55434.23
0.71	55434.23	37.85	55434.23
0.80	55434.23	37.85	55434.23
0.90	55434.23	37.85	55434.23
1.00	55434.23	37.85	55434.23
1.10	55434.23	37.85	55434.23
1.20	55434.23	37.85	55434.23
1.40	55434.23	37.85	55434.23
1.60	55434.23	37.85	55434.23
1.80	55434.23	37.85	55434.23
2.00	55434.23	37.85	55434.23
2.20	55434.23	37.85	55434.23
2.50	55434.23	37.85	55434.23
2.80	55434.23	37.85	55434.23

3.20	55434.23	37.85	55434.23
3.50	55434.23	37.85	55434.23
4.00	55434.23	37.85	55434.23
4.50	55434.23	37.85	55434.23
5.00	55434.23	37.85	55434.23
5.50	55434.23	37.85	55434.23
6.30	55434.23	37.85	55434.23
7.10	55434.23	37.85	55434.23
8.00	55434.23	37.85	55434.23
9.00	55434.23	37.85	55434.23
10.00	55434.23	37.85	55434.23
11.00	55434.23	37.85	55434.23
12.00	55434.23	37.85	55434.23
14.00	55434.23	37.85	55434.23
16.00	55434.23	37.85	55434.23
18.00	55434.23	37.85	55434.23
20.00	55434.23	37.85	55434.23
22.00	55434.23	37.85	55434.23
25.00	55434.23	37.85	55434.23
28.00	55434.23	37.85	55434.23
32.00	55434.23	37.85	55434.23
35.00	55434.23	37.85	55434.23
40.00	55434.23	37.85	55434.23
45.00	55434.23	37.85	55434.23
50.00	55434.23	37.85	55434.23
55.00	55434.23	37.85	55434.23
63.00	55434.23	37.85	55434.23
71.00	55434.23	37.85	55434.23
80.00	55434.23	37.85	55434.23
90.00	55629.51	37.98	55629.51
100.00	56203.13	38.37	56203.13
110.00	56752.35	38.75	56752.35
120.00	57045.27	38.95	57045.27
140.00	58155.90	39.71	58155.90
160.00	59095.67	40.35	59095.67

180.00	59925.60	40.92	59925.60
200.00	60755.53	41.48	60755.53
220.00	61487.82	41.98	61487.82
250.00	62683.89	42.80	62683.89
280.00	63855.55	43.60	63855.55
320.00	65710.68	44.87	65710.68
350.00	67272.89	45.93	67272.89
400.00	68591.01	46.83	68591.01
450.00	69250.07	47.28	69250.07
500.00	70080.00	47.85	70080.00

Tundra orbit:

Energy (MeV)	Total mission flux	
	Integral (m ⁻² sr ⁻¹ s ⁻¹)	Differential (m ⁻² sr ⁻¹ s ⁻¹ (MeV/n) ⁻¹)
0.10	5.464E+06	3.628E+05
0.11	5.461E+06	3.628E+05
0.12	5.457E+06	3.628E+05
0.14	5.450E+06	3.628E+05
0.16	5.442E+06	3.628E+05
0.18	5.435E+06	3.628E+05
0.20	5.428E+06	3.628E+05
0.22	5.421E+06	3.628E+05
0.25	5.410E+06	3.628E+05
0.28	5.399E+06	3.628E+05
0.32	5.384E+06	3.628E+05
0.35	5.374E+06	3.628E+05
0.40	5.355E+06	3.628E+05
0.45	5.337E+06	3.628E+05
0.50	5.319E+06	3.628E+05

0.55	5.301E+06	3.628E+05
0.63	5.272E+06	3.628E+05
0.71	5.243E+06	3.628E+05
0.80	5.210E+06	3.628E+05
0.90	5.174E+06	3.628E+05
1.00	5.138E+06	3.628E+05
1.10	5.102E+06	3.628E+05
1.20	5.065E+06	3.628E+05
1.40	4.993E+06	3.628E+05
1.60	4.920E+06	3.628E+05
1.80	4.848E+06	3.628E+05
2.00	4.775E+06	3.628E+05
2.20	4.702E+06	3.628E+05
2.50	4.594E+06	3.628E+05
2.80	4.485E+06	3.628E+05
3.20	4.340E+06	3.628E+05
3.50	4.231E+06	3.628E+05
4.00	4.050E+06	3.628E+05
4.50	3.868E+06	3.628E+05
5.00	3.687E+06	3.628E+05
5.50	3.505E+06	3.628E+05
6.30	3.215E+06	3.628E+05
7.10	2.925E+06	3.628E+05
8.00	2.598E+06	3.628E+05
9.00	2.236E+06	3.628E+05
10.00	1.873E+06	3.628E+05
11.00	1.549E+06	2.857E+05
12.00	1.293E+06	2.255E+05
14.00	9.259E+05	1.419E+05
16.00	6.932E+05	9.077E+04
18.00	5.430E+05	5.946E+04
20.00	4.434E+05	4.016E+04
22.00	3.751E+05	2.816E+04
25.00	3.059E+05	1.794E+04
28.00	2.600E+05	1.264E+04

32.00	2.167E+05	9.020E+03
35.00	1.919E+05	7.488E+03
40.00	1.585E+05	5.878E+03
45.00	1.318E+05	4.796E+03
50.00	1.099E+05	3.969E+03
55.00	9.176E+04	3.300E+03
63.00	6.870E+04	2.464E+03
71.00	5.147E+04	1.842E+03
80.00	3.721E+04	1.328E+03
90.00	2.596E+04	9.230E+02
100.00	1.813E+04	6.416E+02
110.00	1.269E+04	4.460E+02
120.00	8.913E+03	3.101E+02
140.00	4.314E+03	1.498E+02
160.00	2.092E+03	7.240E+01
180.00	1.018E+03	3.499E+01
200.00	4.990E+02	1.691E+01
220.00	2.482E+02	8.169E+00
250.00	8.454E+01	2.744E+00
280.00	2.955E+01	9.218E-01
320.00	6.811E+00	2.152E-01
350.00	2.497E+00	7.230E-02
400.00	3.964E-01	1.174E-02
450.00	5.536E-02	1.905E-03
500.00	0.000E+00	3.092E-04

Solar flare model: CREME-86 (M= 7-1)

Magnetic shielding: eccentric dipole/quiet magnetosphere/unchanged magn. mom./all arrival directions

Ion range: H - U

Molniya Orbit:

Solar proton fluxes for the [spacecraft trajectory](#) and outside the magnetosphere

	Flux at spacecraft		Model flux at 1.0AU	
	Total mission flux		Total mission flux	
Energy (MeV)	Integral ($m^{-2} sr^{-1} s^{-1}$)	Differential ($m^{-2} sr^{-1} s^{-1} (MeV/n)^{-1}$)	Integral ($m^{-2} sr^{-1} s^{-1}$)	Differential ($m^{-2} sr^{-1} s^{-1} (MeV/n)^{-1}$)
0.10	1.561E+07	9.586E+05	1.965E+07	1.212E+06
0.11	1.560E+07	9.586E+05	1.964E+07	1.212E+06
0.12	1.559E+07	9.586E+05	1.963E+07	1.212E+06
0.14	1.557E+07	9.586E+05	1.960E+07	1.212E+06
0.16	1.555E+07	9.586E+05	1.958E+07	1.212E+06
0.18	1.553E+07	9.586E+05	1.956E+07	1.212E+06
0.20	1.551E+07	9.586E+05	1.953E+07	1.212E+06
0.22	1.549E+07	9.586E+05	1.951E+07	1.212E+06
0.25	1.547E+07	9.586E+05	1.947E+07	1.212E+06
0.28	1.544E+07	9.586E+05	1.944E+07	1.212E+06
0.32	1.540E+07	9.586E+05	1.939E+07	1.212E+06
0.35	1.537E+07	9.586E+05	1.935E+07	1.212E+06
0.40	1.532E+07	9.586E+05	1.929E+07	1.212E+06
0.45	1.527E+07	9.586E+05	1.923E+07	1.212E+06
0.50	1.523E+07	9.586E+05	1.917E+07	1.212E+06
0.55	1.518E+07	9.586E+05	1.911E+07	1.212E+06
0.63	1.510E+07	9.586E+05	1.901E+07	1.212E+06
0.71	1.503E+07	9.586E+05	1.891E+07	1.212E+06
0.80	1.494E+07	9.586E+05	1.880E+07	1.212E+06
0.90	1.484E+07	9.586E+05	1.868E+07	1.212E+06
1.00	1.475E+07	9.586E+05	1.856E+07	1.212E+06
1.10	1.465E+07	9.586E+05	1.844E+07	1.212E+06
1.20	1.456E+07	9.586E+05	1.832E+07	1.212E+06

1.40	1.436E+07	9.586E+05	1.808E+07	1.212E+06
1.60	1.417E+07	9.586E+05	1.783E+07	1.212E+06
1.80	1.398E+07	9.586E+05	1.759E+07	1.212E+06
2.00	1.379E+07	9.586E+05	1.735E+07	1.212E+06
2.20	1.360E+07	9.586E+05	1.711E+07	1.212E+06
2.50	1.331E+07	9.586E+05	1.674E+07	1.212E+06
2.80	1.302E+07	9.586E+05	1.638E+07	1.212E+06
3.20	1.264E+07	9.586E+05	1.589E+07	1.212E+06
3.50	1.235E+07	9.586E+05	1.553E+07	1.212E+06
4.00	1.187E+07	9.586E+05	1.492E+07	1.212E+06
4.50	1.139E+07	9.586E+05	1.432E+07	1.212E+06
5.00	1.091E+07	9.586E+05	1.371E+07	1.212E+06
5.50	1.043E+07	9.586E+05	1.311E+07	1.212E+06
6.30	9.666E+06	9.586E+05	1.214E+07	1.212E+06
7.10	8.900E+06	9.586E+05	1.117E+07	1.212E+06
8.00	8.037E+06	9.586E+05	1.008E+07	1.212E+06
9.00	7.078E+06	9.586E+05	8.863E+06	1.212E+06
10.00	6.120E+06	9.586E+05	7.651E+06	1.212E+06
11.00	5.257E+06	7.662E+05	6.566E+06	9.690E+05
12.00	4.566E+06	6.156E+05	5.697E+06	7.785E+05
14.00	3.546E+06	4.048E+05	4.432E+06	5.120E+05
16.00	2.867E+06	2.745E+05	3.587E+06	3.472E+05
18.00	2.399E+06	1.932E+05	3.004E+06	2.444E+05
20.00	2.064E+06	1.418E+05	2.585E+06	1.793E+05
22.00	1.813E+06	1.087E+05	2.270E+06	1.375E+05
25.00	1.532E+06	7.871E+04	1.919E+06	9.954E+04
28.00	1.322E+06	6.139E+04	1.655E+06	7.764E+04
32.00	1.104E+06	4.759E+04	1.382E+06	6.019E+04
35.00	9.717E+05	4.068E+04	1.215E+06	5.144E+04
40.00	7.893E+05	3.230E+04	9.858E+05	4.085E+04
45.00	6.433E+05	2.609E+04	8.023E+05	3.299E+04
50.00	5.251E+05	2.120E+04	6.536E+05	2.681E+04
55.00	4.289E+05	1.727E+04	5.326E+05	2.184E+04
63.00	3.100E+05	1.245E+04	3.842E+05	1.575E+04
71.00	2.243E+05	8.981E+03	2.770E+05	1.136E+04

80.00	1.559E+05	6.220E+03	1.918E+05	7.866E+03
90.00	1.041E+05	4.135E+03	1.275E+05	5.230E+03
100.00	6.971E+04	2.750E+03	8.469E+04	3.477E+03
110.00	4.682E+04	1.829E+03	5.623E+04	2.312E+03
120.00	3.159E+04	1.217E+03	3.730E+04	1.537E+03
140.00	1.403E+04	5.393E+02	1.651E+04	6.795E+02
160.00	6.243E+03	2.391E+02	7.301E+03	3.004E+02
180.00	2.791E+03	1.061E+02	3.227E+03	1.328E+02
200.00	1.259E+03	4.707E+01	1.425E+03	5.870E+01
220.00	5.799E+02	2.089E+01	6.276E+02	2.595E+01
250.00	1.740E+02	6.173E+00	1.845E+02	7.626E+00
280.00	5.404E+01	1.823E+00	5.401E+01	2.241E+00
320.00	1.040E+01	3.586E-01	1.060E+01	4.380E-01
350.00	3.435E+00	1.059E-01	3.089E+00	1.287E-01
400.00	4.426E-01	1.385E-02	4.031E-01	1.672E-02
450.00	5.118E-02	1.811E-03	5.323E-02	2.173E-03
500.00	0.000E+00	2.367E-04	7.684E-03	2.823E-04

Exposure factors		
Energy (MeV)	Mission average	Mission segment 1
0.10	0.7907	0.7907
0.11	0.7907	0.7907
0.12	0.7907	0.7907
0.14	0.7907	0.7907
0.16	0.7907	0.7907
0.18	0.7907	0.7907
0.20	0.7907	0.7907
0.22	0.7907	0.7907
0.25	0.7907	0.7907
0.28	0.7907	0.7907
0.32	0.7907	0.7907
0.35	0.7907	0.7907
0.40	0.7907	0.7907

0.45	0.7907	0.7907
0.50	0.7907	0.7907
0.55	0.7907	0.7907
0.63	0.7907	0.7907
0.71	0.7907	0.7907
0.80	0.7907	0.7907
0.90	0.7907	0.7907
1.00	0.7907	0.7907
1.10	0.7907	0.7907
1.20	0.7907	0.7907
1.40	0.7907	0.7907
1.60	0.7907	0.7907
1.80	0.7907	0.7907
2.00	0.7907	0.7907
2.20	0.7907	0.7907
2.50	0.7907	0.7907
2.80	0.7907	0.7907
3.20	0.7907	0.7907
3.50	0.7907	0.7907
4.00	0.7907	0.7907
4.50	0.7907	0.7907
5.00	0.7907	0.7907
5.50	0.7907	0.7907
6.30	0.7907	0.7907
7.10	0.7907	0.7907
8.00	0.7907	0.7907
9.00	0.7907	0.7907
10.00	0.7907	0.7907
11.00	0.7907	0.7907
12.00	0.7907	0.7907
14.00	0.7907	0.7907
16.00	0.7907	0.7907
18.00	0.7907	0.7907
20.00	0.7907	0.7907
22.00	0.7907	0.7907

25.00	0.7907	0.7907
28.00	0.7907	0.7907
32.00	0.7907	0.7907
35.00	0.7907	0.7907
40.00	0.7907	0.7907
45.00	0.7907	0.7907
50.00	0.7907	0.7907
55.00	0.7907	0.7907
63.00	0.7907	0.7907
71.00	0.7907	0.7907
80.00	0.7907	0.7907
90.00	0.7907	0.7907
100.00	0.7907	0.7907
110.00	0.7910	0.7910
120.00	0.7917	0.7917
140.00	0.7937	0.7937
160.00	0.7962	0.7962
180.00	0.7990	0.7990
200.00	0.8019	0.8019
220.00	0.8049	0.8049
250.00	0.8095	0.8095
280.00	0.8136	0.8136
320.00	0.8187	0.8187
350.00	0.8223	0.8223
400.00	0.8280	0.8280
450.00	0.8333	0.8333
500.00	0.8384	0.8384

Exposure times (hr)			
Energy (MeV)	Mission total	<u>Mission segment 1</u>	
		Orbit	Segment exposure
0.10	55883.18	19.06	55883.18
0.11	55883.18	19.06	55883.18
0.12	55883.18	19.06	55883.18

0.14	55883.18	19.06	55883.18
0.16	55883.18	19.06	55883.18
0.18	55883.18	19.06	55883.18
0.20	55883.18	19.06	55883.18
0.22	55883.18	19.06	55883.18
0.25	55883.18	19.06	55883.18
0.28	55883.18	19.06	55883.18
0.32	55883.18	19.06	55883.18
0.35	55883.18	19.06	55883.18
0.40	55883.18	19.06	55883.18
0.45	55883.18	19.06	55883.18
0.50	55883.18	19.06	55883.18
0.55	55883.18	19.06	55883.18
0.63	55883.18	19.06	55883.18
0.71	55883.18	19.06	55883.18
0.80	55883.18	19.06	55883.18
0.90	55883.18	19.06	55883.18
1.00	55883.18	19.06	55883.18
1.10	55883.18	19.06	55883.18
1.20	55883.18	19.06	55883.18
1.40	55883.18	19.06	55883.18
1.60	55883.18	19.06	55883.18
1.80	55883.18	19.06	55883.18
2.00	55883.18	19.06	55883.18
2.20	55883.18	19.06	55883.18
2.50	55883.18	19.06	55883.18
2.80	55883.18	19.06	55883.18
3.20	55883.18	19.06	55883.18
3.50	55883.18	19.06	55883.18
4.00	55883.18	19.06	55883.18
4.50	55883.18	19.06	55883.18
5.00	55883.18	19.06	55883.18
5.50	55883.18	19.06	55883.18
6.30	55883.18	19.06	55883.18
7.10	55883.18	19.06	55883.18

8.00	55883.18	19.06	55883.18
9.00	55883.18	19.06	55883.18
10.00	55883.18	19.06	55883.18
11.00	55883.18	19.06	55883.18
12.00	55883.18	19.06	55883.18
14.00	55883.18	19.06	55883.18
16.00	55883.18	19.06	55883.18
18.00	55883.18	19.06	55883.18
20.00	55883.18	19.06	55883.18
22.00	55883.18	19.06	55883.18
25.00	55883.18	19.06	55883.18
28.00	55883.18	19.06	55883.18
32.00	55883.18	19.06	55883.18
35.00	55883.18	19.06	55883.18
40.00	55883.18	19.06	55883.18
45.00	55883.18	19.06	55883.18
50.00	55883.18	19.06	55883.18
55.00	55883.18	19.06	55883.18
63.00	55883.18	19.06	55883.18
71.00	55883.18	19.06	55883.18
80.00	55883.18	19.06	55883.18
90.00	55883.18	19.06	55883.18
100.00	55980.92	19.09	55980.92
110.00	56225.27	19.18	56225.27
120.00	56567.36	19.29	56567.36
140.00	57056.07	19.46	57056.07
160.00	57349.29	19.56	57349.29
180.00	57789.12	19.71	57789.12
200.00	58131.21	19.83	58131.21
220.00	58424.44	19.93	58424.44
250.00	58815.40	20.06	58815.40
280.00	59255.23	20.21	59255.23
320.00	59548.45	20.31	59548.45
350.00	59890.54	20.42	59890.54
400.00	60305.94	20.57	60305.94

450.00	60843.51	20.75	60843.51
500.00	61185.61	20.87	61185.61

TAP Orbit:

Solar proton fluxes for the spacecraft trajectory and outside the magnetosphere				
	Flux at spacecraft		Model flux at 1.0AU	
	Total mission flux		Total mission flux	
Energy (MeV)	Integral (m ⁻² sr ⁻¹ s ⁻¹)	Differential (m ⁻² sr ⁻¹ s ⁻¹ (MeV/n) ⁻¹)	Integral (m ⁻² sr ⁻¹ s ⁻¹)	Differential (m ⁻² sr ⁻¹ s ⁻¹ (MeV/n) ⁻¹)
0.10	1.548E+07	9.507E+05	1.965E+07	1.212E+06
0.11	1.547E+07	9.507E+05	1.964E+07	1.212E+06
0.12	1.546E+07	9.507E+05	1.963E+07	1.212E+06
0.14	1.544E+07	9.507E+05	1.960E+07	1.212E+06
0.16	1.542E+07	9.507E+05	1.958E+07	1.212E+06
0.18	1.541E+07	9.507E+05	1.956E+07	1.212E+06
0.20	1.539E+07	9.507E+05	1.953E+07	1.212E+06
0.22	1.537E+07	9.507E+05	1.951E+07	1.212E+06
0.25	1.534E+07	9.507E+05	1.947E+07	1.212E+06
0.28	1.531E+07	9.507E+05	1.944E+07	1.212E+06
0.32	1.527E+07	9.507E+05	1.939E+07	1.212E+06
0.35	1.524E+07	9.507E+05	1.935E+07	1.212E+06
0.40	1.520E+07	9.507E+05	1.929E+07	1.212E+06
0.45	1.515E+07	9.507E+05	1.923E+07	1.212E+06
0.50	1.510E+07	9.507E+05	1.917E+07	1.212E+06
0.55	1.505E+07	9.507E+05	1.911E+07	1.212E+06
0.63	1.498E+07	9.507E+05	1.901E+07	1.212E+06
0.71	1.490E+07	9.507E+05	1.891E+07	1.212E+06
0.80	1.482E+07	9.507E+05	1.880E+07	1.212E+06
0.90	1.472E+07	9.507E+05	1.868E+07	1.212E+06
1.00	1.463E+07	9.507E+05	1.856E+07	1.212E+06
1.10	1.453E+07	9.507E+05	1.844E+07	1.212E+06

1.20	1.444E+07	9.507E+05	1.832E+07	1.212E+06
1.40	1.425E+07	9.507E+05	1.808E+07	1.212E+06
1.60	1.406E+07	9.507E+05	1.783E+07	1.212E+06
1.80	1.386E+07	9.507E+05	1.759E+07	1.212E+06
2.00	1.367E+07	9.507E+05	1.735E+07	1.212E+06
2.20	1.348E+07	9.507E+05	1.711E+07	1.212E+06
2.50	1.320E+07	9.507E+05	1.674E+07	1.212E+06
2.80	1.291E+07	9.507E+05	1.638E+07	1.212E+06
3.20	1.253E+07	9.507E+05	1.589E+07	1.212E+06
3.50	1.225E+07	9.507E+05	1.553E+07	1.212E+06
4.00	1.177E+07	9.507E+05	1.492E+07	1.212E+06
4.50	1.130E+07	9.507E+05	1.432E+07	1.212E+06
5.00	1.082E+07	9.507E+05	1.371E+07	1.212E+06
5.50	1.035E+07	9.507E+05	1.311E+07	1.212E+06
6.30	9.587E+06	9.507E+05	1.214E+07	1.212E+06
7.10	8.826E+06	9.507E+05	1.117E+07	1.212E+06
8.00	7.971E+06	9.507E+05	1.008E+07	1.212E+06
9.00	7.020E+06	9.507E+05	8.863E+06	1.212E+06
10.00	6.069E+06	9.507E+05	7.651E+06	1.212E+06
11.00	5.214E+06	7.599E+05	6.566E+06	9.690E+05
12.00	4.529E+06	6.105E+05	5.697E+06	7.785E+05
14.00	3.517E+06	4.015E+05	4.432E+06	5.120E+05
16.00	2.843E+06	2.722E+05	3.587E+06	3.472E+05
18.00	2.379E+06	1.916E+05	3.004E+06	2.444E+05
20.00	2.047E+06	1.406E+05	2.585E+06	1.793E+05
22.00	1.799E+06	1.078E+05	2.270E+06	1.375E+05
25.00	1.520E+06	7.806E+04	1.919E+06	9.954E+04
28.00	1.311E+06	6.088E+04	1.655E+06	7.764E+04
32.00	1.095E+06	4.720E+04	1.382E+06	6.019E+04
35.00	9.639E+05	4.034E+04	1.215E+06	5.144E+04
40.00	7.830E+05	3.203E+04	9.858E+05	4.085E+04
45.00	6.383E+05	2.587E+04	8.023E+05	3.299E+04
50.00	5.210E+05	2.103E+04	6.536E+05	2.681E+04
55.00	4.256E+05	1.712E+04	5.326E+05	2.184E+04
63.00	3.078E+05	1.235E+04	3.842E+05	1.575E+04

71.00	2.227E+05	8.906E+03	2.770E+05	1.136E+04
80.00	1.549E+05	6.168E+03	1.918E+05	7.866E+03
90.00	1.036E+05	4.101E+03	1.275E+05	5.230E+03
100.00	6.941E+04	2.729E+03	8.469E+04	3.477E+03
110.00	4.668E+04	1.817E+03	5.623E+04	2.312E+03
120.00	3.154E+04	1.211E+03	3.730E+04	1.537E+03
140.00	1.405E+04	5.380E+02	1.651E+04	6.795E+02
160.00	6.277E+03	2.394E+02	7.301E+03	3.004E+02
180.00	2.817E+03	1.066E+02	3.227E+03	1.328E+02
200.00	1.276E+03	4.748E+01	1.425E+03	5.870E+01
220.00	5.897E+02	2.115E+01	6.276E+02	2.595E+01
250.00	1.780E+02	6.290E+00	1.845E+02	7.626E+00
280.00	5.563E+01	1.870E+00	5.401E+01	2.241E+00
320.00	1.081E+01	3.710E-01	1.060E+01	4.380E-01
350.00	3.592E+00	1.103E-01	3.089E+00	1.287E-01
400.00	4.682E-01	1.461E-02	4.031E-01	1.672E-02
450.00	5.461E-02	1.930E-03	5.323E-02	2.173E-03
500.00	0.000E+00	2.544E-04	7.684E-03	2.823E-04

Exposure factors		
Energy (MeV)	Mission average	<u>Mission</u> <u>segment 1</u>
0.10	0.7841	0.7841
0.11	0.7841	0.7841
0.12	0.7841	0.7841
0.14	0.7841	0.7841
0.16	0.7841	0.7841
0.18	0.7841	0.7841
0.20	0.7841	0.7841
0.22	0.7841	0.7841
0.25	0.7841	0.7841
0.28	0.7841	0.7841
0.32	0.7841	0.7841
0.35	0.7841	0.7841

0.40	0.7841	0.7841
0.45	0.7841	0.7841
0.50	0.7841	0.7841
0.55	0.7841	0.7841
0.63	0.7841	0.7841
0.71	0.7841	0.7841
0.80	0.7841	0.7841
0.90	0.7841	0.7841
1.00	0.7841	0.7841
1.10	0.7841	0.7841
1.20	0.7841	0.7841
1.40	0.7841	0.7841
1.60	0.7841	0.7841
1.80	0.7841	0.7841
2.00	0.7841	0.7841
2.20	0.7841	0.7841
2.50	0.7841	0.7841
2.80	0.7841	0.7841
3.20	0.7841	0.7841
3.50	0.7841	0.7841
4.00	0.7841	0.7841
4.50	0.7841	0.7841
5.00	0.7841	0.7841
5.50	0.7841	0.7841
6.30	0.7841	0.7841
7.10	0.7841	0.7841
8.00	0.7841	0.7841
9.00	0.7841	0.7841
10.00	0.7841	0.7841
11.00	0.7841	0.7841
12.00	0.7841	0.7841
14.00	0.7841	0.7841
16.00	0.7841	0.7841
18.00	0.7841	0.7841
20.00	0.7841	0.7841

22.00	0.7841	0.7841
25.00	0.7841	0.7841
28.00	0.7841	0.7841
32.00	0.7841	0.7841
35.00	0.7841	0.7841
40.00	0.7841	0.7841
45.00	0.7841	0.7841
50.00	0.7841	0.7841
55.00	0.7841	0.7841
63.00	0.7841	0.7841
71.00	0.7841	0.7841
80.00	0.7841	0.7841
90.00	0.7842	0.7842
100.00	0.7849	0.7849
110.00	0.7861	0.7861
120.00	0.7876	0.7876
140.00	0.7917	0.7917
160.00	0.7970	0.7970
180.00	0.8029	0.8029
200.00	0.8090	0.8090
220.00	0.8153	0.8153
250.00	0.8248	0.8248
280.00	0.8343	0.8343
320.00	0.8471	0.8471
350.00	0.8572	0.8572
400.00	0.8738	0.8738
450.00	0.8882	0.8882
500.00	0.9012	0.9012

Exposure times (hr)			
Energy (MeV)	Mission total	<u>Mission segment 1</u>	
		Orbit exposure	Segment exposure
0.10	55434.23	37.85	55434.23

0.11	55434.23	37.85	55434.23
0.12	55434.23	37.85	55434.23
0.14	55434.23	37.85	55434.23
0.16	55434.23	37.85	55434.23
0.18	55434.23	37.85	55434.23
0.20	55434.23	37.85	55434.23
0.22	55434.23	37.85	55434.23
0.25	55434.23	37.85	55434.23
0.28	55434.23	37.85	55434.23
0.32	55434.23	37.85	55434.23
0.35	55434.23	37.85	55434.23
0.40	55434.23	37.85	55434.23
0.45	55434.23	37.85	55434.23
0.50	55434.23	37.85	55434.23
0.55	55434.23	37.85	55434.23
0.63	55434.23	37.85	55434.23
0.71	55434.23	37.85	55434.23
0.80	55434.23	37.85	55434.23
0.90	55434.23	37.85	55434.23
1.00	55434.23	37.85	55434.23
1.10	55434.23	37.85	55434.23
1.20	55434.23	37.85	55434.23
1.40	55434.23	37.85	55434.23
1.60	55434.23	37.85	55434.23
1.80	55434.23	37.85	55434.23
2.00	55434.23	37.85	55434.23
2.20	55434.23	37.85	55434.23
2.50	55434.23	37.85	55434.23
2.80	55434.23	37.85	55434.23
3.20	55434.23	37.85	55434.23
3.50	55434.23	37.85	55434.23
4.00	55434.23	37.85	55434.23
4.50	55434.23	37.85	55434.23
5.00	55434.23	37.85	55434.23
5.50	55434.23	37.85	55434.23

6.30	55434.23	37.85	55434.23
7.10	55434.23	37.85	55434.23
8.00	55434.23	37.85	55434.23
9.00	55434.23	37.85	55434.23
10.00	55434.23	37.85	55434.23
11.00	55434.23	37.85	55434.23
12.00	55434.23	37.85	55434.23
14.00	55434.23	37.85	55434.23
16.00	55434.23	37.85	55434.23
18.00	55434.23	37.85	55434.23
20.00	55434.23	37.85	55434.23
22.00	55434.23	37.85	55434.23
25.00	55434.23	37.85	55434.23
28.00	55434.23	37.85	55434.23
32.00	55434.23	37.85	55434.23
35.00	55434.23	37.85	55434.23
40.00	55434.23	37.85	55434.23
45.00	55434.23	37.85	55434.23
50.00	55434.23	37.85	55434.23
55.00	55434.23	37.85	55434.23
63.00	55434.23	37.85	55434.23
71.00	55434.23	37.85	55434.23
80.00	55434.23	37.85	55434.23
90.00	55629.51	37.98	55629.51
100.00	56203.13	38.37	56203.13
110.00	56752.35	38.75	56752.35
120.00	57045.27	38.95	57045.27
140.00	58155.90	39.71	58155.90
160.00	59095.67	40.35	59095.67
180.00	59925.60	40.92	59925.60
200.00	60755.53	41.48	60755.53
220.00	61487.82	41.98	61487.82
250.00	62683.89	42.80	62683.89
280.00	63855.55	43.60	63855.55
320.00	65710.68	44.87	65710.68

350.00	67272.89	45.93	67272.89
400.00	68591.01	46.83	68591.01
450.00	69250.07	47.28	69250.07
500.00	70080.00	47.85	70080.00

Tundra Orbit:

Energy (MeV)	Total mission flux	
	Integral (m ⁻² sr ⁻¹ s ⁻¹)	Differential (m ⁻² sr ⁻¹ s ⁻¹ (MeV/n) ⁻¹)
0.10	1.962E+07	1.205E+06
0.11	1.961E+07	1.205E+06
0.12	1.960E+07	1.205E+06
0.14	1.958E+07	1.205E+06
0.16	1.955E+07	1.205E+06
0.18	1.953E+07	1.205E+06
0.20	1.950E+07	1.205E+06
0.22	1.948E+07	1.205E+06
0.25	1.944E+07	1.205E+06
0.28	1.941E+07	1.205E+06
0.32	1.936E+07	1.205E+06
0.35	1.932E+07	1.205E+06
0.40	1.926E+07	1.205E+06
0.45	1.920E+07	1.205E+06
0.50	1.914E+07	1.205E+06
0.55	1.908E+07	1.205E+06
0.63	1.898E+07	1.205E+06
0.71	1.889E+07	1.205E+06
0.80	1.878E+07	1.205E+06
0.90	1.866E+07	1.205E+06
1.00	1.854E+07	1.205E+06

1.10	1.842E+07	1.205E+06
1.20	1.830E+07	1.205E+06
1.40	1.806E+07	1.205E+06
1.60	1.782E+07	1.205E+06
1.80	1.757E+07	1.205E+06
2.00	1.733E+07	1.205E+06
2.20	1.709E+07	1.205E+06
2.50	1.673E+07	1.205E+06
2.80	1.637E+07	1.205E+06
3.20	1.589E+07	1.205E+06
3.50	1.553E+07	1.205E+06
4.00	1.492E+07	1.205E+06
4.50	1.432E+07	1.205E+06
5.00	1.372E+07	1.205E+06
5.50	1.312E+07	1.205E+06
6.30	1.215E+07	1.205E+06
7.10	1.119E+07	1.205E+06
8.00	1.010E+07	1.205E+06
9.00	8.898E+06	1.205E+06
10.00	7.693E+06	1.205E+06
11.00	6.609E+06	9.632E+05
12.00	5.740E+06	7.738E+05
14.00	4.457E+06	5.089E+05
16.00	3.603E+06	3.451E+05
18.00	3.015E+06	2.429E+05
20.00	2.594E+06	1.783E+05
22.00	2.279E+06	1.366E+05
25.00	1.926E+06	9.895E+04
28.00	1.662E+06	7.718E+04
32.00	1.388E+06	5.983E+04
35.00	1.221E+06	5.114E+04
40.00	9.920E+05	4.060E+04
45.00	8.085E+05	3.280E+04
50.00	6.599E+05	2.665E+04
55.00	5.390E+05	2.171E+04

63.00	3.896E+05	1.565E+04
71.00	2.818E+05	1.129E+04
80.00	1.958E+05	7.819E+03
90.00	1.307E+05	5.199E+03
100.00	8.744E+04	3.456E+03
110.00	5.867E+04	2.298E+03
120.00	3.954E+04	1.528E+03
140.00	1.750E+04	6.754E+02
160.00	7.764E+03	2.986E+02
180.00	3.458E+03	1.320E+02
200.00	1.555E+03	5.834E+01
220.00	7.135E+02	2.579E+01
250.00	2.130E+02	7.580E+00
280.00	6.586E+01	2.228E+00
320.00	1.259E+01	4.353E-01
350.00	4.145E+00	1.280E-01
400.00	5.306E-01	1.662E-02
450.00	6.101E-02	2.160E-03
500.00	0.000E+00	2.806E-04

Appendix E. Total Ionizing Dose

Input Data

SHIELDOSE	
Target material: Si	
Shield configuration: Centre of Al spheres	

Molniya Orbit:

Total mission dose (rad)									
Al absorber thickness			Total	Trapped electrons	Bremsstrahlung	Trapped protons	Solar protons	Tr. electrns + Bremsstrahlung	Tr. el.+Brems. +Tr. protons
(mm)	(mils)	(g c m ⁻²)							
0.050	1.968	0.014	4.781E+08	2.993E+08	1.608E+05	1.782E+08	3.799E+05	2.995E+08	4.777E+08
0.100	3.937	0.027	2.431E+08	1.845E+08	1.205E+05	5.819E+07	2.149E+05	1.847E+08	2.428E+08
0.200	7.874	0.054	1.012E+08	8.193E+07	7.868E+04	1.913E+07	1.174E+05	8.201E+07	1.011E+08
0.300	11.811	0.081	5.374E+07	4.328E+07	5.586E+04	1.032E+07	8.188E+04	4.334E+07	5.365E+07
0.400	15.748	0.108	3.226E+07	2.538E+07	4.175E+04	6.779E+06	6.290E+04	2.542E+07	3.220E+07
0.500	19.685	0.135	2.095E+07	1.603E+07	3.293E+04	4.831E+06	5.085E+04	1.607E+07	2.090E+07
0.600	23.622	0.162	1.441E+07	1.079E+07	2.724E+04	3.549E+06	4.284E+04	1.082E+07	1.436E+07
0.800	31.496	0.216	7.879E+06	5.799E+06	2.062E+04	2.028E+06	3.188E+04	5.819E+06	7.847E+06
1.000	39.370	0.270	5.008E+06	3.700E+06	1.687E+04	1.266E+06	2.511E+04	3.717E+06	4.983E+06
1.500	59.055	0.405	2.277E+06	1.763E+06	1.177E+04	4.869E+05	1.611E+04	1.774E+06	2.261E+06
2.000	78.740	0.540	1.295E+06	1.023E+06	9.079E+03	2.514E+05	1.185E+04	1.032E+06	1.283E+06
2.500	98.425	0.675	8.012E+05	6.272E+05	7.429E+03	1.576E+05	9.012E+03	6.346E+05	7.922E+05
3.000	118.110	0.810	5.134E+05	3.907E+05	6.319E+03	1.092E+05	7.234E+03	3.970E+05	5.062E+05

4.000	157.480	1.080	2.292E+05	1.590E+05	4.910E+03	6.017E+04	5.063E+03	1.639E+05	2.241E+05
5.000	196.850	1.350	1.105E+05	6.425E+04	4.044E+03	3.841E+04	3.814E+03	6.830E+04	1.067E+05
6.000	236.220	1.620	5.929E+04	2.468E+04	3.458E+03	2.814E+04	3.016E+03	2.813E+04	5.628E+04
7.000	275.590	1.890	3.659E+04	9.010E+03	3.037E+03	2.209E+04	2.453E+03	1.205E+04	3.413E+04
8.000	314.960	2.160	2.690E+04	2.982E+03	2.722E+03	1.913E+04	2.063E+03	5.704E+03	2.484E+04
9.000	354.330	2.430	2.145E+04	1.013E+03	2.479E+03	1.623E+04	1.727E+03	3.492E+03	1.972E+04
10.000	393.700	2.700	1.791E+04	2.540E+02	2.287E+03	1.388E+04	1.486E+03	2.541E+03	1.642E+04
12.000	472.440	3.240	1.400E+04	2.531E+01	2.000E+03	1.081E+04	1.159E+03	2.026E+03	1.284E+04
14.000	551.180	3.780	1.178E+04	9.002E-03	1.792E+03	9.069E+03	9.153E+02	1.792E+03	1.086E+04
16.000	629.920	4.320	1.023E+04	0.000E+00	1.631E+03	7.862E+03	7.396E+02	1.631E+03	9.492E+03
18.000	708.660	4.860	9.111E+03	0.000E+00	1.499E+03	6.983E+03	6.290E+02	1.499E+03	8.482E+03
20.000	787.400	5.400	8.367E+03	0.000E+00	1.388E+03	6.447E+03	5.327E+02	1.388E+03	7.835E+03

TAP Orbit:

Total mission dose (rad)									
Al absorber thickness			Total	<u>Trapped electrons</u>	Bremsstrahlung	<u>Trapped protons</u>	<u>Solar protons</u>	Tr. electrons+Bremsstrahlung	Tr. el.+Bremss. +Tr. protons
(mm)	(mils)	(g c m ⁻²)							
0.050	1.968	0.014	2.687E+08	1.736E+08	9.718E+04	9.459E+07	4.449E+05	1.737E+08	2.683E+08
0.100	3.937	0.027	1.133E+08	1.044E+08	7.436E+04	8.640E+06	2.244E+05	1.045E+08	1.131E+08
0.200	7.874	0.054	5.714E+07	5.641E+07	5.464E+04	5.512E+05	1.167E+05	5.647E+07	5.702E+07
0.300	11.811	0.081	3.778E+07	3.751E+07	4.408E+04	1.381E+05	8.109E+04	3.756E+07	3.770E+07
0.400	15.748	0.108	2.758E+07	2.741E+07	3.695E+04	6.440E+04	6.268E+04	2.745E+07	2.752E+07
0.500	19.685	0.135	2.121E+07	2.109E+07	3.192E+04	3.791E+04	5.123E+04	2.112E+07	2.116E+07

0.600	23.622	0.162	1.689E+07	1.679E+07	2.827E+04	2.349E+04	4.234E+04	1.682E+07	1.684E+07
0.800	31.496	0.216	1.162E+07	1.156E+07	2.337E+04	9.356E+03	3.188E+04	1.158E+07	1.159E+07
1.000	39.370	0.270	8.563E+06	8.513E+06	2.018E+04	4.180E+03	2.566E+04	8.533E+06	8.537E+06
1.500	59.055	0.405	4.696E+06	4.664E+06	1.515E+04	8.240E+02	1.630E+04	4.679E+06	4.680E+06
2.000	78.740	0.540	2.858E+06	2.834E+06	1.200E+04	2.836E+02	1.181E+04	2.846E+06	2.846E+06
2.500	98.425	0.675	1.801E+06	1.782E+06	9.871E+03	1.388E+02	8.944E+03	1.792E+06	1.792E+06
3.000	118.110	0.810	1.148E+06	1.132E+06	8.381E+03	7.767E+01	7.191E+03	1.140E+06	1.140E+06
4.000	157.480	1.080	4.903E+05	4.787E+05	6.502E+03	3.084E+01	5.058E+03	4.852E+05	4.852E+05
5.000	196.850	1.350	2.099E+05	2.006E+05	5.381E+03	1.015E+01	3.826E+03	2.060E+05	2.060E+05
6.000	236.220	1.620	8.666E+04	7.901E+04	4.639E+03	5.850E+00	3.008E+03	8.365E+04	8.365E+04
7.000	275.590	1.890	3.563E+04	2.908E+04	4.115E+03	4.876E+01	2.434E+03	3.320E+04	3.320E+04
8.000	314.960	2.160	1.534E+04	9.566E+03	3.728E+03	0.000E+00	2.046E+03	1.329E+04	1.329E+04
9.000	354.330	2.430	8.335E+03	3.189E+03	3.433E+03	0.000E+00	1.713E+03	6.622E+03	6.622E+03
10.00	393.700	2.700	5.457E+03	7.820E+02	3.202E+03	0.000E+00	1.474E+03	3.984E+03	3.984E+03
12.00	472.440	3.240	4.085E+03	7.315E+01	2.863E+03	0.000E+00	1.149E+03	2.936E+03	2.936E+03
14.00	551.180	3.780	3.527E+03	2.518E-02	2.619E+03	0.000E+00	9.083E+02	2.619E+03	2.619E+03
16.00	629.920	4.320	3.164E+03	0.000E+00	2.427E+03	0.000E+00	7.366E+02	2.427E+03	2.427E+03
18.00	708.660	4.860	2.896E+03	0.000E+00	2.267E+03	0.000E+00	6.284E+02	2.267E+03	2.267E+03
20.00	787.400	5.400	2.661E+03	0.000E+00	2.129E+03	0.000E+00	5.320E+02	2.129E+03	2.129E+03

Tundra Orbit:

Al absorber thickness			Total	Trapped electrons	Brems-strahlung	Trapped protons	Solar protons	Tr. electrons+Brems	Tr. el.+Brems. +Tr. protons
(mm)	(mils)	(g cm ⁻²)							
0.050	1.968	0.014	1.393	1.387E+08	7.574E+04	0.000E+00	5.640E+05	1.388E+08	1.388E+08

			E+08						
0.100	3.937	0.027	8.565 E+07	8.531E+07	5.793E+04	0.000E+00	2.844E+05	8.537E+07	8.537E+07
0.200	7.874	0.054	4.353 E+07	4.334E+07	4.087E+04	0.000E+00	1.480E+05	4.338E+07	4.338E+07
0.300	11.811	0.081	2.675 E+07	2.661E+07	3.138E+04	0.000E+00	1.028E+05	2.664E+07	2.664E+07
0.400	15.748	0.108	1.802 E+07	1.792E+07	2.503E+04	0.000E+00	7.945E+04	1.794E+07	1.794E+07
0.500	19.685	0.135	1.280 E+07	1.271E+07	2.066E+04	0.000E+00	6.494E+04	1.273E+07	1.273E+07
0.600	23.622	0.162	9.432 E+06	9.361E+06	1.757E+04	0.000E+00	5.367E+04	9.379E+06	9.379E+06
0.800	31.496	0.216	5.634 E+06	5.580E+06	1.361E+04	0.000E+00	4.041E+04	5.594E+06	5.594E+06
1.000	39.370	0.270	3.660 E+06	3.617E+06	1.115E+04	0.000E+00	3.253E+04	3.628E+06	3.628E+06
1.500	59.055	0.405	1.540 E+06	1.512E+06	7.603E+03	0.000E+00	2.066E+04	1.520E+06	1.520E+06
2.000	78.740	0.540	7.482 E+05	7.275E+05	5.692E+03	0.000E+00	1.497E+04	7.332E+05	7.332E+05
2.500	98.425	0.675	3.906 E+05	3.747E+05	4.551E+03	0.000E+00	1.134E+04	3.793E+05	3.793E+05
3.000	118.110	0.810	2.187 E+05	2.057E+05	3.824E+03	0.000E+00	9.115E+03	2.095E+05	2.095E+05
4.000	157.480	1.080	7.400 E+04	6.462E+04	2.966E+03	0.000E+00	6.411E+03	6.759E+04	6.759E+04
5.000	196.850	1.350	2.873 E+04	2.142E+04	2.465E+03	0.000E+00	4.850E+03	2.388E+04	2.388E+04
6.000	236.220	1.620	1.344 E+04	7.498E+03	2.127E+03	0.000E+00	3.812E+03	9.625E+03	9.625E+03
7.000	275.590	1.890	7.416 E+03	2.450E+03	1.882E+03	0.000E+00	3.084E+03	4.332E+03	4.332E+03
8.000	314.960	2.160	5.017 E+03	7.282E+02	1.697E+03	0.000E+00	2.592E+03	2.425E+03	2.425E+03
9.000	354.330	2.430	3.890 E+03	1.663E+02	1.553E+03	0.000E+00	2.171E+03	1.719E+03	1.719E+03
10.000	393.700	2.700	3.338 E+03	3.258E+01	1.438E+03	0.000E+00	1.867E+03	1.470E+03	1.470E+03
12.000	472.440	3.240	2.721 E+03	3.638E-02	1.265E+03	0.000E+00	1.456E+03	1.265E+03	1.265E+03
14.000	551.180	3.780	2.290 E+03	0.000E+00	1.139E+03	0.000E+00	1.150E+03	1.139E+03	1.139E+03
16.000	629.920	4.320	1.973 E+03	0.000E+00	1.040E+03	0.000E+00	9.327E+02	1.040E+03	1.040E+03
18.000	708.660	4.860	1.755 E+03	0.000E+00	9.594E+02	0.000E+00	7.956E+02	9.594E+02	9.594E+02
20.000	787.400	5.400	1.564 E+03	0.000E+00	8.907E+02	0.000E+00	6.734E+02	8.907E+02	8.907E+02

APPENDIX F. Solar Cell Damage Equivalent Fluences

Molniya Orbit:

Summary of 1 MeV equivalent electron fluences (cm^{-2})													
Coverglass thickness			Total			Trapped d electron s	Trapped protons			Solar protons			
							P_{\max}	V_{oc}	I_{sc}	P_{\max}	V_{oc}	I_{sc}	
g c m^{-2}	mi ls	micr on	P_{\max}	V_{oc}	I_{sc}	P_{\max}, V_o e, I_{sc}	P_{\max}	V_{oc}	I_{sc}	P_{\max}	V_{oc}	I_{sc}	
0.00 00	0.0	0.00	7.762E +18	7.762E +18	1.033E +18	1.509E +14	7.754E +18	7.754E +18	1.032E +18	7.417E +15	7.417E +15	1.301E +15	
0.00 56	1.0	25.40	5.603E +17	5.603E +17	1.907E +17	1.260E +14	5.588E +17	5.588E +17	1.900E +17	1.385E +15	1.385E +15	5.711E +14	
0.01 68	3.0	76.20	1.570E +17	1.570E +17	6.206E +16	1.007E +14	1.562E +17	1.562E +17	6.163E +16	6.970E +14	6.970E +14	3.252E +14	
0.03 35	6.0	152.4 0	6.050E +16	6.050E +16	2.561E +16	7.875E +13	6.002E +16	6.002E +16	2.533E +16	4.038E +14	4.038E +14	2.069E +14	
0.06 71	12. 0	304.8 0	1.964E +16	1.964E +16	9.052E +15	5.480E +13	1.937E +16	1.937E +16	8.874E +15	2.143E +14	2.143E +14	1.230E +14	
0.11 18	20. 0	508.0 0	6.678E +15	6.678E +15	3.386E +15	3.837E +13	6.518E +15	6.518E +15	3.270E +15	1.217E +14	1.217E +14	7.764E +13	
0.16 76	30. 0	762.0 0	2.912E +15	2.912E +15	1.670E +15	2.707E +13	2.805E +15	2.805E +15	1.587E +15	8.039E +13	8.039E +13	5.578E +13	
0.33 53	60. 0	1524. 00	6.621E +14	6.621E +14	4.572E +14	1.209E +13	6.119E +14	6.119E +14	4.158E +14	3.807E +13	3.807E +13	2.936E +13	
User defined coverglass thickness													
0.00 56	1.0	25.40	5.603E +17	5.603E +17	1.907E +17	1.260E +14	5.588E +17	5.588E +17	1.900E +17	1.385E +15	1.385E +15	5.711E +14	

TAP Orbit:

Summary of 1 MeV equivalent electron fluences (cm^{-2})													
Coverglass thickness			Total			Trapped d electron s	Trapped protons			Solar protons			
							P_{\max}	V_{oc}	I_{sc}	P_{\max}	V_{oc}	I_{sc}	
g c m^{-2}	mi ls	micr on	P_{\max}	V_{oc}	I_{sc}	P_{\max}, V_o e, I_{sc}	P_{\max}	V_{oc}	I_{sc}	P_{\max}	V_{oc}	I_{sc}	
0.00 00	0.0	0.00	2.027E +19	2.027E +19	1.762E +18	2.570E+ 14	2.026E +19	2.026E +19	1.761E +18	3.185E +15	3.185E +15	1.136E +15	

0.00 56	1.0	25.40	2.781E +17	2.781E +17	7.420E +16	2.314E+ 14	2.764E +17	2.764E +17	7.334E +16	1.540E +15	1.540E +15	6.321E +14
0.01 68	3.0	76.20	1.709E +16	1.709E +16	6.156E +15	2.013E+ 14	1.618E +16	1.618E +16	5.625E +15	7.126E +14	7.126E +14	3.295E +14
0.03 35	6.0	152.4 0	2.332E +15	2.332E +15	1.034E +15	1.712E+ 14	1.755E +15	1.755E +15	6.551E +14	4.060E +14	4.060E +14	2.076E +14
0.06 71	12. 0	304.8 0	5.257E +14	5.257E +14	3.268E +14	1.323E+ 14	1.799E +14	1.799E +14	7.186E +13	2.134E +14	2.134E +14	1.227E +14
0.11 18	20. 0	508.0 0	2.483E +14	2.483E +14	1.888E +14	9.994E+ 13	2.713E +13	2.713E +13	1.136E +13	1.212E +14	1.212E +14	7.746E +13
0.16 76	30. 0	762.0 0	1.609E +14	1.609E +14	1.332E +14	7.406E+ 13	6.614E +12	6.614E +12	3.265E +12	8.025E +13	8.025E +13	5.584E +13
0.33 53	60. 0	1524. 00	7.359E +13	7.359E +13	6.455E +13	3.487E+ 13	5.536E +11	5.536E +11	3.153E +11	3.816E +13	3.816E +13	2.936E +13
User defined coverglass thickness												
0.00 56	1.0	25.40	2.781E +17	2.781E +17	7.420E +16	2.314E+ 14	2.764E +17	2.764E +17	7.334E +16	1.540E +15	1.540E +15	6.321E +14

Tundra Orbit:

Summary of 1 MeV equivalent electron fluences (cm^{-2})												
Coverglass thickness			Total			Trapped electron s	Trapped protons			Solar protons		
g c m^{-2}	mi ls	micr on	P_{\max}	V_{oc}	I_{sc}		P_{\max}	V_{oc}	I_{sc}	P_{\max}	V_{oc}	I_{sc}
0.00 00	0.0	0.00	1.041E +18	1.041E +18	1.235E +16	1.109E+1 4	1.037E +18	1.037E +18	1.080E +16	4.037E +15	4.037E +15	1.440E +15
0.01 56	1.0	25.40	2.048E +15	2.048E +15	8.962E +14	9.498E+1 3	1.185E +12	1.185E +12	2.239E +10	1.952E +15	1.952E +15	8.012E +14
0.03 35	3.0	76.20	9.809E +14	9.809E +14	4.952E +14	7.758E+1 3	1.000E -12	1.000E -12	1.000E -12	9.033E +14	9.033E +14	4.176E +14
0.06 71	12. 0	304.8 0	3.130E +14	3.130E +14	1.979E +14	4.243E+1 3	1.000E -12	1.000E -12	1.000E -12	2.706E +14	2.706E +14	1.555E +14
0.11 18	20. 0	508.0 0	1.822E +14	1.822E +14	1.267E +14	2.853E+1 3	1.000E -12	1.000E -12	1.000E -12	1.536E +14	1.536E +14	9.818E +13
0.16 76	30. 0	762.0 0	1.205E +14	1.205E +14	8.960E +13	1.882E+1 3	1.000E -12	1.000E -12	1.000E -12	1.017E +14	1.017E +14	7.078E +13
0.33 53	60. 0	1524. 00	5.524E +13	5.524E +13	4.408E +13	6.867E+1 2	1.000E -12	1.000E -12	1.000E -12	4.837E +13	4.837E +13	3.721E +13