CREME-MC Website

Brian Sierawski[1], Marcus Mendenhall[1], Robert Weller[1],
Robert Reed[1]
Jim Adams[2]

1. Vanderbilt University
2. NASA, Marshall Space Flight Center

Motivation

- Current state-of-the-art tool CREME96 assumes
  - The ionization trail is much narrower than the minimum feature size in the microelectronic circuits
    - Since CREME96 was developed the minimum feature size has shrunk by more than a factor of 100
  - The SEE sensitivity of individual microcircuits can be idealized as being due to a single sensitive junction

- The solution is to replace models with a physics-based model that accounts for
  - The distribution of energy deposition about the track
  - The possible existence of multiple sensitive junctions in each microcircuit.
  - Nuclear processes

Logistics

- Alpha testing open to Vanderbilt and NASA civil servants

- Web address: https://creme-mc.isde.vanderbilt.edu
- Email: creme@vanderbilt.edu

navigation

- Help
- Members
- News
- Events

contents view

state: public draft

Welcome to CREME-MC

by admin — last modified Nov 01, 2007 09:33 AM

It has been almost a decade since the introduction of CREME96, the current state-of-the art tool for SEE rate prediction. CREME96 uses phenomenological models to predict SEE rates. These models were based on two assumptions. First it was assumed that the ionization trail left by the particle was much narrower than the minimum feature size in the microelectronic circuits. Second, it was assumed that the SEE sensitivity of individual microcircuits could be idealized as being due to a single sensitive junction. The cross section of this junction versus the linear energy transfer (LET) rate of the ionizing particle could then be measured and used to estimate the SEE rate. Since CREME96 was developed the minimum feature size has shrunk by more than a factor of 100. As a result, the interaction between track microstructure and device characteristics can no longer be ignored. This assumption in CREME96 has been shown to have significant shortcomings when applied to new and emerging technologies like advanced CMOS, SiGe HBTs, photodiodes, and IR FPAs. The solution is to replace current models in CREME96 with a physics-based model that correctly accounts for the distribution of energy deposition about the track and the possible existence of multiple sensitive junctions in each microcircuit.

The need for a comprehensive and extensible complement to CREME96 that is widely accessible is now apparent. The approach chosen for this new SEE model is modular, uses standardized or widely-adopted computer languages, and is based on a core of open-source material, the Geant4 libraries, for the basic radiation-computation engine. This core Monte Carlo engine can be supplemented in an extensible way with specific models relevant to new technologies, as these models are developed.

If you are new to the site, please read Getting Started

Send this — Print this —

navigation

- Help
  - Getting Started
  - Glossary
- Members
- News
- Events

view

actions ▼ state: public draft ▼

Getting Started

by admin — last modified Nov 12, 2007 01:11 PM

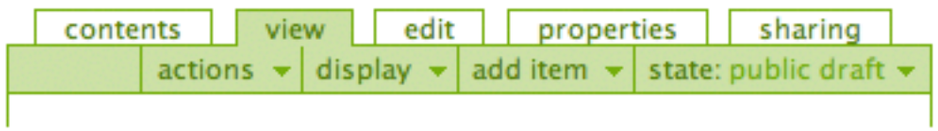
Obtaining an Account

When first visiting the site, you will need to register to obtain access to the site tools. You can do this by clicking on the 'New User?' link in the login portal of the Welcome page. Fill out your fullname, requested username, and email address. If you are experiencing difficulties with the site, please send an email to creme@vanderbilt.edu

Navigating the Site

Once you have logged into the site, you have a number of ways to navigate through the site. Underneath the header, you will find the Log In and Location Information. Underneath the Location Information, the site is split into two columns, where the left provides a tools portal and an additional navigation portal, and the right column displays the main content. To access your file space, click on the My Folder link to the right of your name in the top strip. If you do not see your name, or the My Folder link, you have not been properly authenticated.

You are now viewing your home folder. Because you have rights to this folder, you will see a green header strip for your member area. The header contains both tabs on the left and menus on the right.



The tabs:

- contents - shows a list of items in a folder
- view - shows the view an anonymous visitor would see
- edit - shows a form for changing an item's view
- properties - shows a panel for changing an item's data
- sharing - shows a form for changing the rights of others to view or change an item's content

The menus:

navigation

- Help
  - Getting Started
  - Glossary
  - Tutorial
- Members
- News
- Events

view

actions ▼ state: public draft ▼

Tutorial

by admin — last modified Oct 10, 2007 03:17 PM

Overview

In this tutorial, we will demonstrate how to use the site to reproduce simulation results contained in a published IEEE Transactions on Nuclear Science article [WARREN2005]. It will walk you through creating a multi-layered stack structure, representative of the back-end-of-line (BEOL) material found in a microelectronics device. The technology evaluated in the paper is a SEU hardened, 4 Mbit, 10 transistor 3.3 V SRAM. Further, you will irradiate the model with a custom particle beam capturing direct ionization induced by the primary ions, indirect ionization via atomic displacements caused by Coulomb scattering between target atoms and the incident ion, and indirect ionization from nuclear reaction products involving the incident ion and the target nucleus. Last, you will obtain an integral cross-section curve, and investigate the results.

Create the Stacks

After logging into the site, navigate to your home directory my clicking on the "my folder" link. From the "add item" menu, choose folder. Provide a title for the folder, such as "Warren2005". You may additionally choose to provide a description of the folder contents. Select "save". Ensure that the "view" tab is active. You are now viewing the "Warren2005" directory. Notice the "state" menu in the upper left corner indicating the state of the currently viewed item. You may change the state between public and private, either granting or revoking read permission for other users.

Stack A contains passivation ad interconnect layers that are consistent in thickness and composition with the technology under study. While still in your "Warren2005" folder, select "Create Stack" from the left portlet. You should see a single material layer. Ensure that the X and Y dimensions are both 5um. Click the "add" button 9 times such that you see a table consisting of 10 layers. Now enter the following materials and thicknesses associated with Stack A. The layers are ordered from the top of the BEOL down to the last layer representing the silicon substrate.

	material	x (um)	y (um)	thickness (um)
☐	Si3N4	5	5	0.400
☐	SiO2	5	5	1.000
☐	aluminum	5	5	0.840
☐	SiO2	5	5	0.600

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

actions ▼ display ▼ add new… ▼ state: private ▼

Brian Sierawski

MRED8 — by Brian Sierawski — last modified Feb 06, 2007 02:05 PM

0.25um CMOS — by Brian Sierawski — last modified Oct 08, 2007 03:30 PM

TODO — by Brian Sierawski — last modified Oct 10, 2007 03:45 PM

Warren2005 — by Brian Sierawski — last modified Oct 15, 2007 11:42 AM

"The Contribution of Nuclear Reactions to Heavy Ion Single Event Upset Cross-Section Measurements in a High-Density SEU Hardened SRAM"

Reed2006 — by Brian Sierawski — last modified Oct 15, 2007 11:43 AM

"Implications of Nuclear Reactions for Single Event Effects Test Methods and Analysis"

NSREC 2007 CREME-MC Side Meeting (Honolulu, HI, from Jul 25, 2007 12:15 PM to Jul 25, 2007 01:00 PM) — by Brian Sierawski

Send this — Print this —

History

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

actions ▼ display ▼ add new… ▼ state: private ▼

collection
event
file
folder
image
link
news item
page
restrictions…

Brian Sierawski

MRED8 — by Brian Sierawski — last modified Feb 06, 2007 02:05 PM

0.25um CMOS — by Brian Sierawski — last modified Oct 08, 2007 03:30 PM

TODO — by Brian Sierawski — last modified Oct 10, 2007 03:45 PM

Warren2005 — by Brian Sierawski — last modified Oct 15, 2007 11:42 AM

"The Contribution of Nuclear Reactions to Heavy Ion Single Event Upset Cross-Section Measurements in a High-Density SEU Hardened SRAM"

Reed2006 — by Brian Sierawski — last modified Oct 15, 2007 11:43 AM

"Implications of Nuclear Reactions for Single Event Effects Test Methods and Analysis"

NSREC 2007 CREME-MC Side Meeting (Honolulu, HI, from Jul 25, 2007 12:15 PM to Jul 25, 2007 01:00 PM) — by Brian Sierawski

Send this — Print this —

History

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

actions ▼ display ▼ add new... ▼ state: private ▼

Info Changes saved.

Example

There are currently no items in this folder.

Send this — Print this —

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

CREME/FLUX

External Space Ionizing-Radiation Environment: User-Supplied Parameters

1. **Atomic number of lightest element included:** 1
2. **Atomic number of heaviest element included:** 28
3. **Environment model:**

   Solar-quiet (no "flare") conditions:

   - (•) Solar Minimum (Cosmic-Ray Maximum)
   - ( ) Solar Maximum (Cosmic-Ray Minimum)
   - ( ) Enter year (eg. 1996.80)

   Solar-energetic particle ("flare") conditions:

   - ( ) Worst Week
   - ( ) Worst Day
   - ( ) Peak 5-minute-averaged fluxes

4. **Spacecraft location:**
   - (•) Near-Earth Interplanetary/Geosynchronous Orbit
   - ( ) Inside Earth's Magnetosphere

   a. **Name of GTRN File:** None

   b. **Trapped proton file:** None (Optional)

5. **Rootname for FLUX Output file:** (*.flx* extension added automatically)

submit reset help

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

actions ▼ display ▼ add new... ▼ state: private ▼

Example

geo_solarmin.flx — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (PNG) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (PDF) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (GRACE) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

Send this — Print this —

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

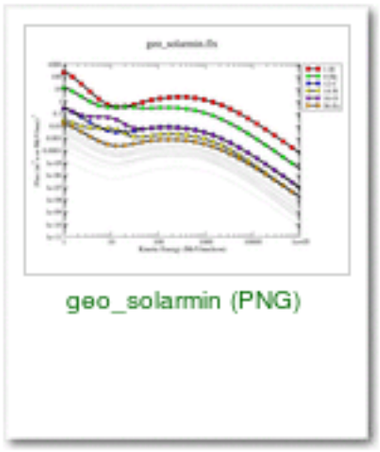
contents view edit sharing

actions ▼ display ▼ add new… ▼ state: private ▼

Info View changed.

Example

by Brian Sierawski — last modified Nov 12, 2007 01:31 PM



geo_solarmin (PNG)

geo_solarmin.flx — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (PDF) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (GRACE) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

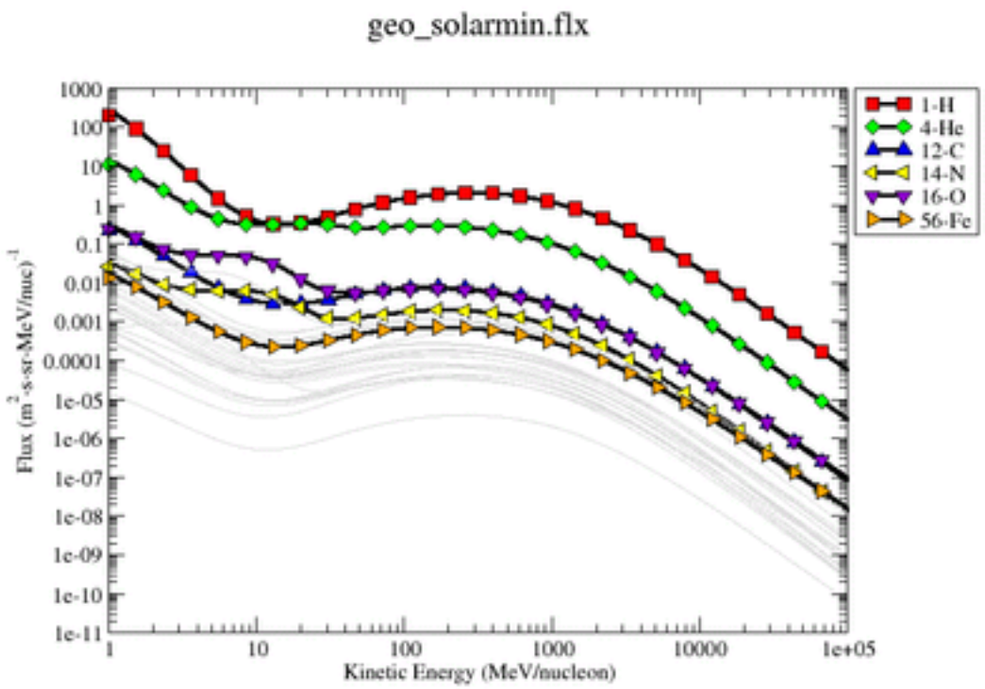
navigation

Help
Members
News
Events

geo_solarmin (PNG)

by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)



Click to view full-size image... — Size: 20.7 kB

Send this — Print this —

creme96 environments
- TRP
- GTRN
- FLUX
- TRANS

creme-mc rpp models
- Create Stack
- Run Beam
- Soft Error Rate

navigation
- Help
- Members
- News
- Events

geo_solarmin.flx

by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

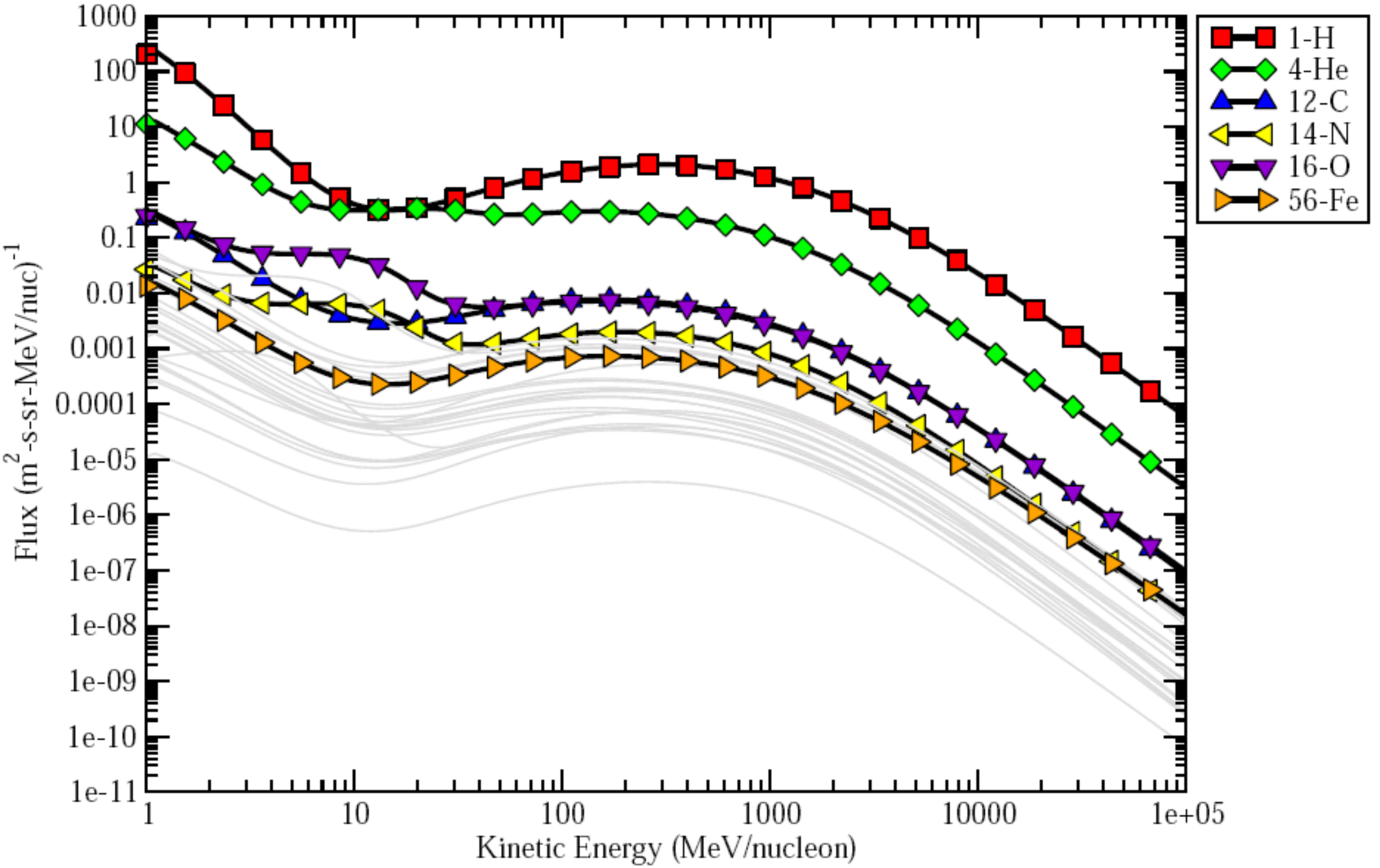
— Plain Text, 329Kb

File contents

```
 4 4RYlzC.FLX                                                              200 3
%Created by CREME96:FLUX_DRIVER Version  200 on 20071112  at 133216.3
%ZMIN =  1 ZMAX = 28
%IMODE  =   0 SOLAR-QUIET MODE: YEAR =  1977.0000
%ITRANS =   0 GEOSYNCH/NEAR-EARTH INTERPLANETARY FLUXES
1.0000E-01  1.0000E+05   1002      1     28  UNSHIELDED    1977.000  0 0   200 3

0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00  0.0000E+00
```

geo_solarmin.flx



navigation
- Help
  - Getting Started
  - Glossary
  - FLUX: Space Ionizing Radiation Environment Model
- Members
- News
- Events

view

FLUX: Space Ionizing Radiation Environment Model

by admin — last modified Aug 28, 2007 02:08 PM

Overview

The CREME FLUX module provides a numerical model of the space ionizing-radiation environment at the surface of the spacecraft, before transport through shielding. After running FLUX for the environment and orbit in which you are interested, you must run the TRANS program to transport the particle fluxes through shielding.

- If you are interested in geosynchronous or near-Earth interplanetary orbits, FLUX is your starting point for CREME calculations.
- If you are interested in orbits inside Earth's magnetosphere, you must run one or both of the following programs before running FLUX:
  - GTRN: This program accounts for the shielding provided by Earth's magnetic field.
  - TRP: This module evaluates fluxes of particles trapped in Earth's magnetic fields. (You can either run TRP and process trapped proton spectra through shielding, SEE-rate routines, etc. separately OR you can add the trapped protons spectra to the other non-trapped components described by FLUX. See TRP Option for further details.)

Inputs

In running FLUX, you must:

- Specify the range of atomic numbers to be included.
- Select an environment model.
- Specify the type of orbit.

Output

FLUX writes the particle fluxes to an output file ("something.flx"), whose rootname "something" you specify; the extension ".flx" is added automatically by FLUX.

This file is produced by the FLUX routine and contains the differential fluxes of various species (in nuclei/m^2-s-sr-MeV/nuc) vs. kinetic energy (in

navigation

- Help
  - Getting Started
  - Glossary
- Members
- News
- Events

view | actions ▼ | state: public draft ▼

Glossary

by Brian Sierawski — last modified Oct 11, 2007 08:28 AM

Apogee

Apogee is the maximum altitude above the Earth's surface attained during the spacecraft's orbit. Its value is input to the CREME software in either km or nautical miles.

Perigee

Perigee is the minimum altitude above the Earth's surface attained during the spacecraft's orbit. Its value is input to the CREME software in either km or nautical miles.

Nautical Mile

1 international nautical mile = 1.852 km = 1.1508 miles = 6076.1155 feet

The international nautical mile is also known as the international air mile.

The geographical nautical mile is 6080 feet (0.064% larger).

Orbital Inclination Angle

The orbital inclination is the angle between the orbital plane and Earth's geographic equatorial plane, measured in degrees. Retrograde orbits have inclinations greater than 90 and less than or equal to 180 degrees.

Initial Longitude of the Ascending Node

The ascending node is the point on a spacecraft's orbit at which it crosses the equator from south to north. The initial longitude of the ascending node is the east longitude for the position in space at which the orbit will first pass over the equator from south to north. The initial longitude is defined in an inertial coordinate system, not the geographical coordinate system which rotates with the Earth. That is, the initial longitude is defined using the initial time t0, and is not the longitude at time t=t0+dt, corresponding to the actual first crossing of the equator from south to north.

This parameter specifies an initial condition. In general, its value is not important for design studies, which typically average over many orbits. However, this parameter may be important if you are trying to evaluate a very specific orbital segment.

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

Submit a Beam Job

Beam Environment: User-Supplied Parameters

1. **Beam Species:** gamma
2. **Beam Energy (MeV):** 10
3. **Number of particles to run:** 5000
4. **RPP Stack name:** 0.25CMOS
5. **Sensitive Volume Placement:**
   The RPP coordinates are defined with (0,0,0) being the top center of the bottom layer, and positive Z values are along the forward direction of the beam (towards the bottom of the stack)

RPP Left-Back-Top	-1	-1	0
RPP Right-Front-Bottom	1	1	1

6. **Rootname for Job:** Untitled

submit reset help

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

Status of job: 63MeV Protons

- Submitted: Nov 12, 2007 01:41 PM
- Received: Nov 12, 2007 01:41 PM
- Started.Task.000: Nov 12, 2007 01:41 PM
- Done.Task.000: Nov 12, 2007 01:42 PM
- Queued: Nov 12, 2007 01:42 PM
- Done: Nov 12, 2007 01:42 PM
- Report Available

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

63MeV Protons (RST)

by Brian Sierawski — last modified Nov 12, 2007 01:42 PM

Report

- Simulation: 63MeV Protons
- Date: Nov 12, 2007 01:42 PM
- User: Brian Sierawski
- Email: brian.sierawski@vanderbilt.edu
- Script: rpp_beam.py v1.5
- MRED Version: mred-824

Status Report

- Submitted: Nov 12, 2007 01:41 PM
- Received: Nov 12, 2007 01:41 PM
- Started.Task.000: Nov 12, 2007 01:41 PM
- Done.Task.000: Nov 12, 2007 01:42 PM
- Queued: Nov 12, 2007 01:42 PM
- Done: Nov 12, 2007 01:42 PM

Physical Processes and Parameters

The following physical processes where included in this simulation:

- AlIonInelastic
- HadronElastic

Beam Spectrum

- 63.0MeV proton
- Simulated 100000 particles
- Fluence 2.70602e+11 particles/cm^2

Structure

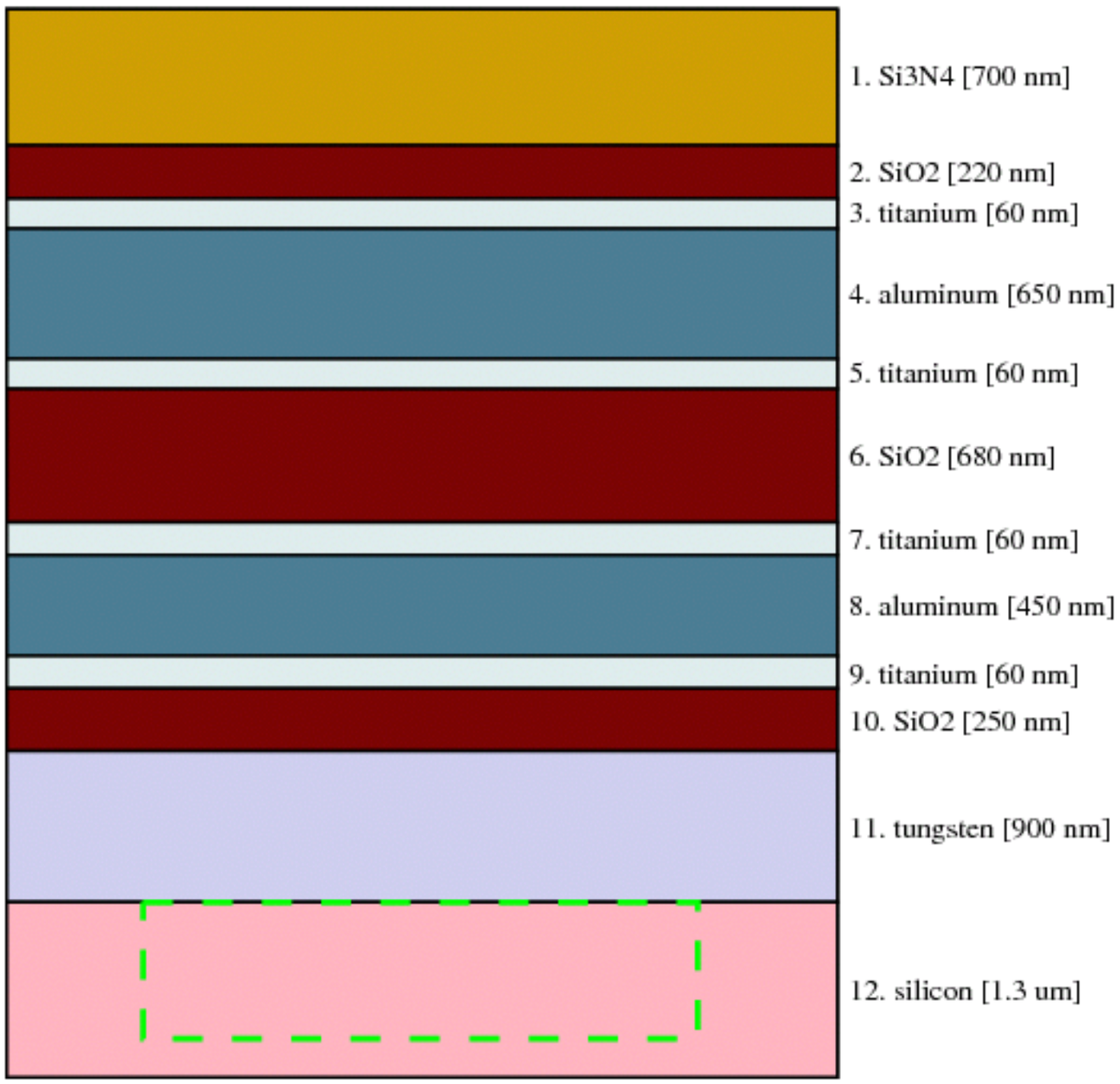


Figure: The 63MeV Protons stack

Sensitive Volume

- (-1 -1 0)(1 1 1)

Calorimetry

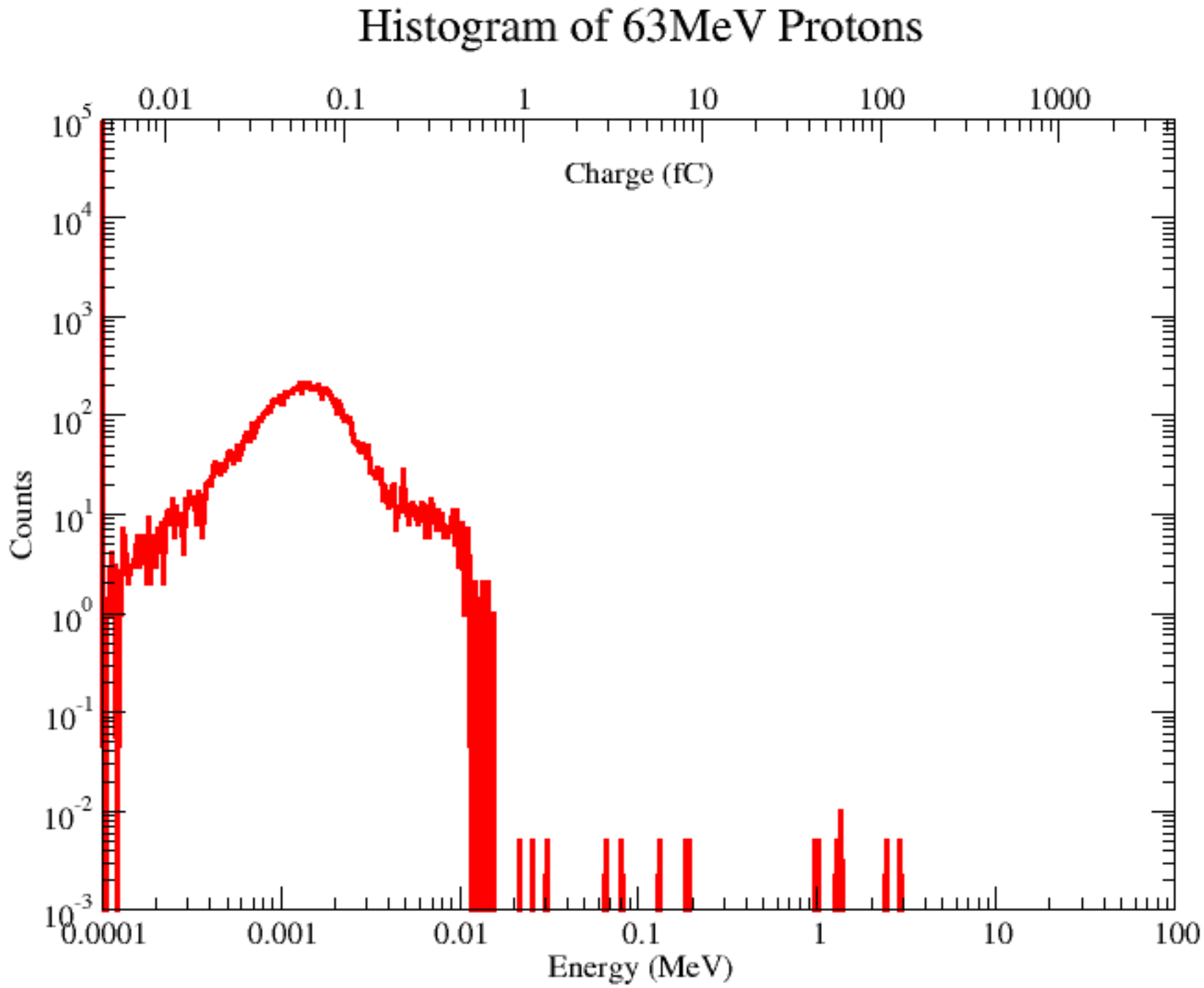


Figure: Counts as function of energy deposited

Cross-section

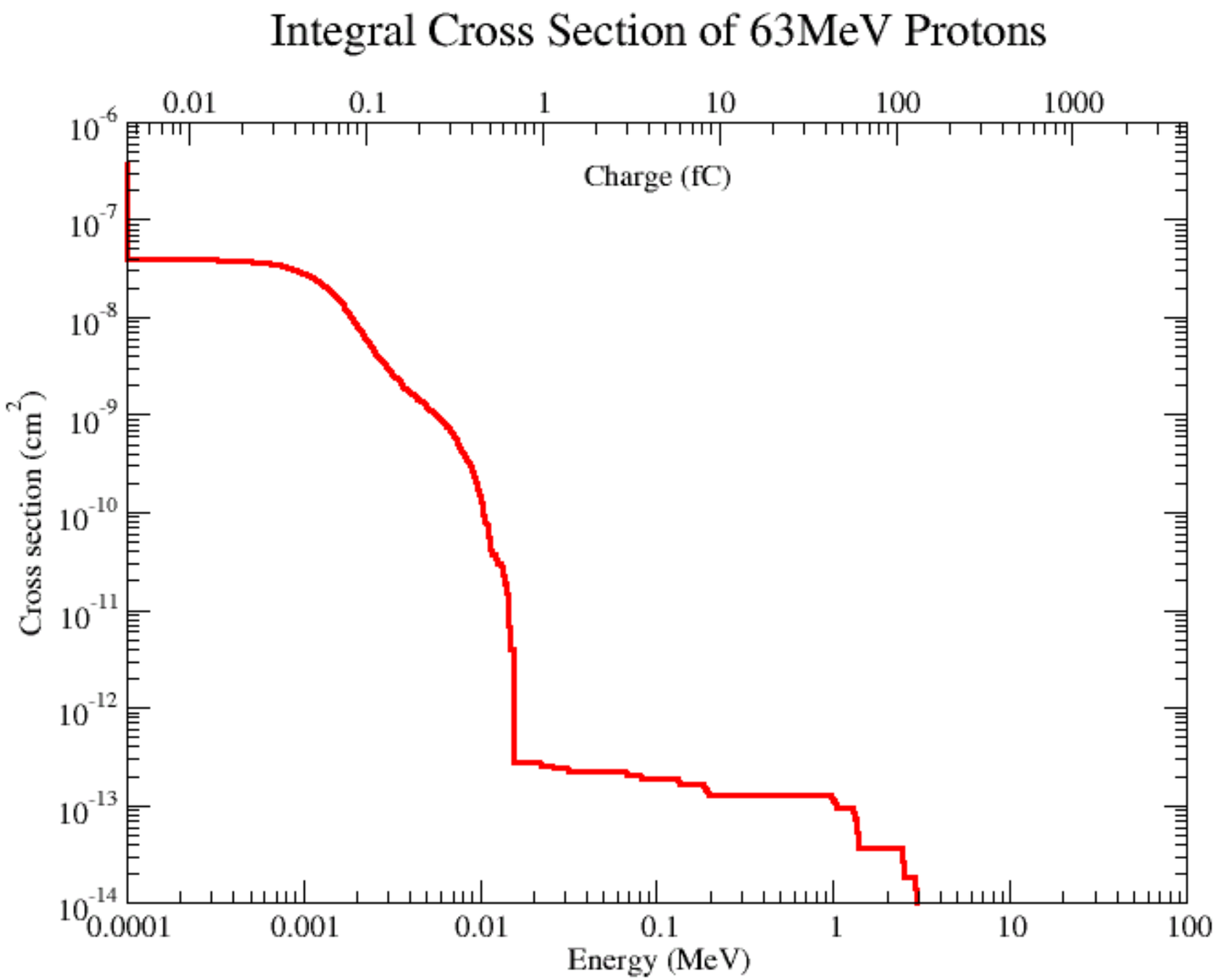


Figure: Reverse Integral Cross section

Grace: job.851716.x.agr

File Edit Data Plot View Window Help

G0: X, Y = [1350.54, 7.15247e-06]

Draw

AutoT

AutoO

ZX ZY

AX AY

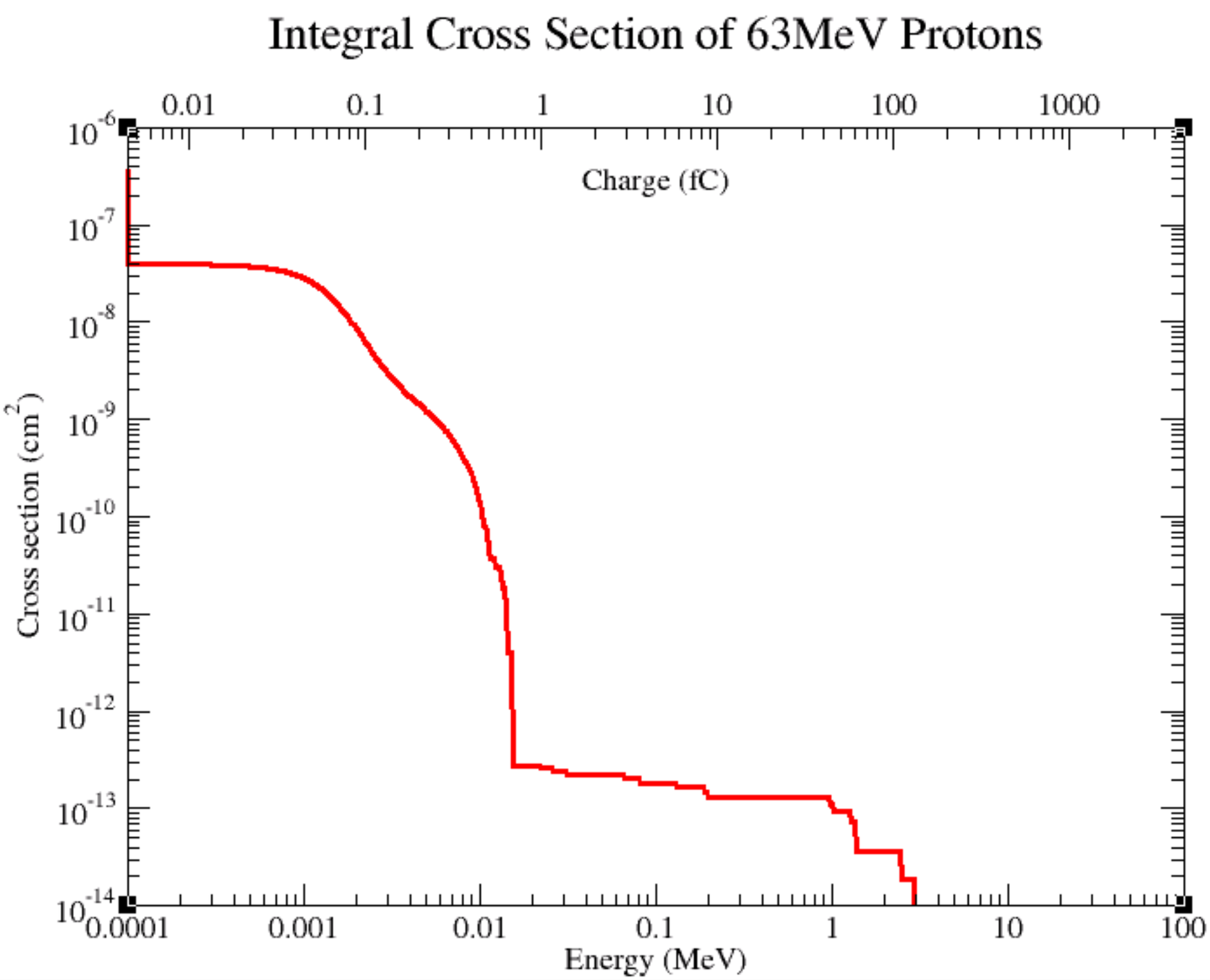
PZ Pu

Po Cy

SD:1

CW:0

Exit



goblue.isde.vanderbilt.edu, unix:1000.0, job.851716.x.agr

Grace: job.851716.x.agr (modified)

File Edit Data Plot View Window Help

G0: X, Y = [1151.36, 4.21425e-05]

Draw

AutoT

AutoO

ZX ZY

AX AY

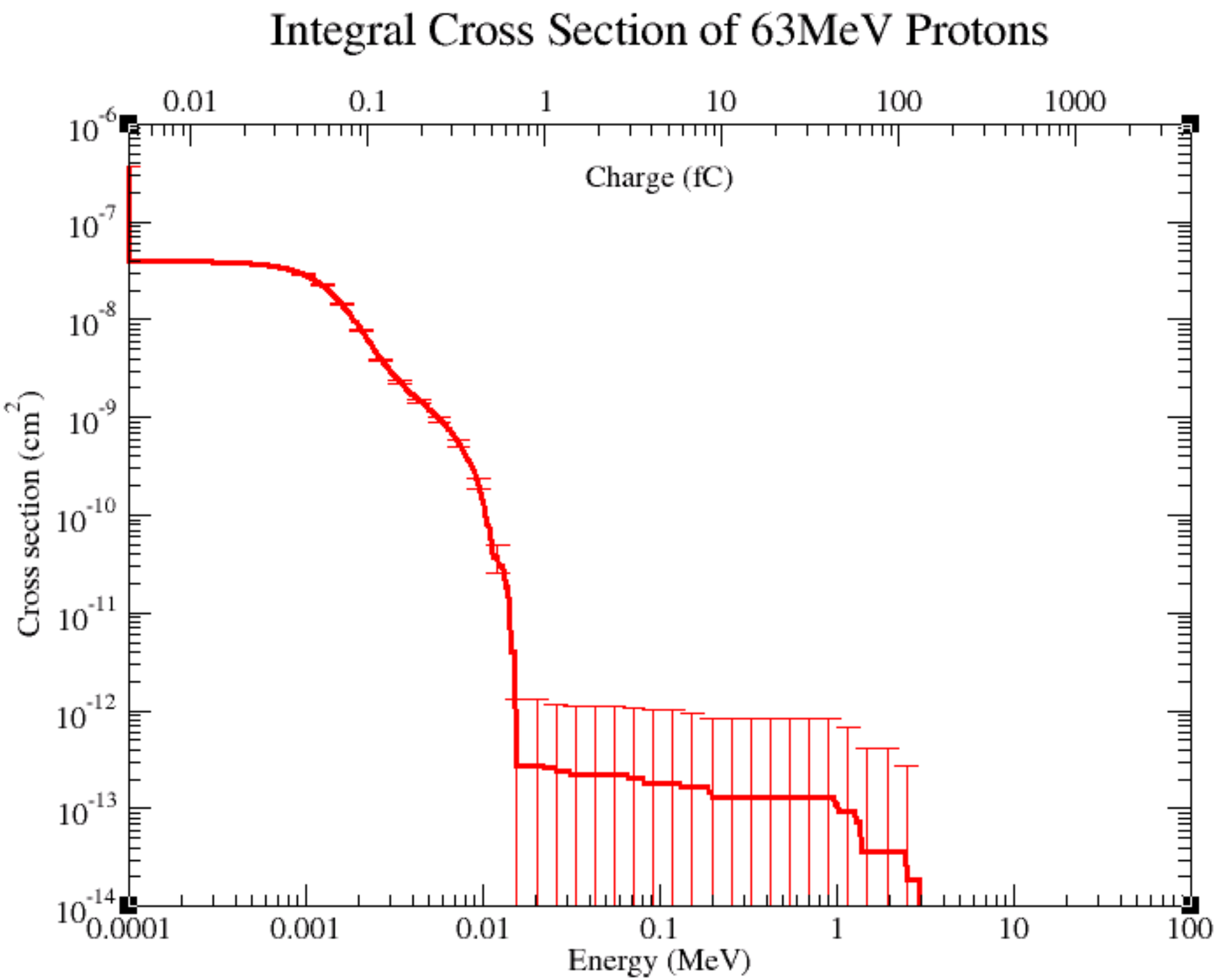
PZ Pu

Po Cy

SD:1

CW:0

Exit



goblue.isde.vanderbilt.edu, unix:1000.0, job.851716.x.agr

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

Help
Members
News
Events

contents view edit sharing

Soft Error Rate

Rpp Environment: User-Supplied Parameters

1. **Environment:** geo_solarmin.flx
2. **Rpp stack name:** 0.25CMOS.rppstack
3. **Number of particles to run:** 5000
4. **Rpp coordinates**

   The RPP coordinates are defined with XYZ=(0,0,0) being the top center of the stack, and positive Z values are into the stack (along the forward direction of the beam)

Min	-1	-1	0
Max	1	1	1

5. **Rootname for Job:** geo_solarmin

submit reset help

Calorimetry

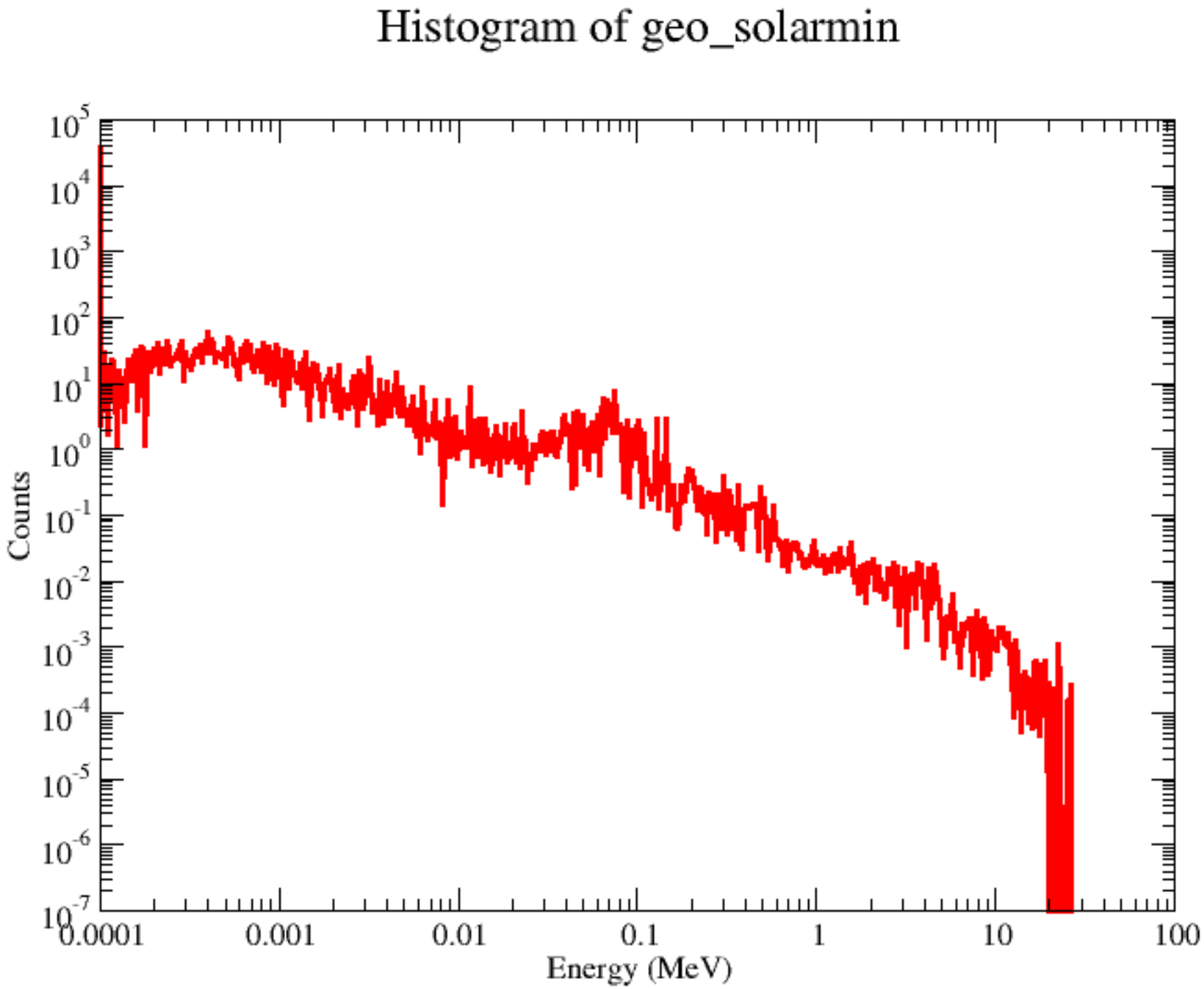


Figure: Counts as function of energy deposited

Single Event Upset Rate

Single Event Upset Rate

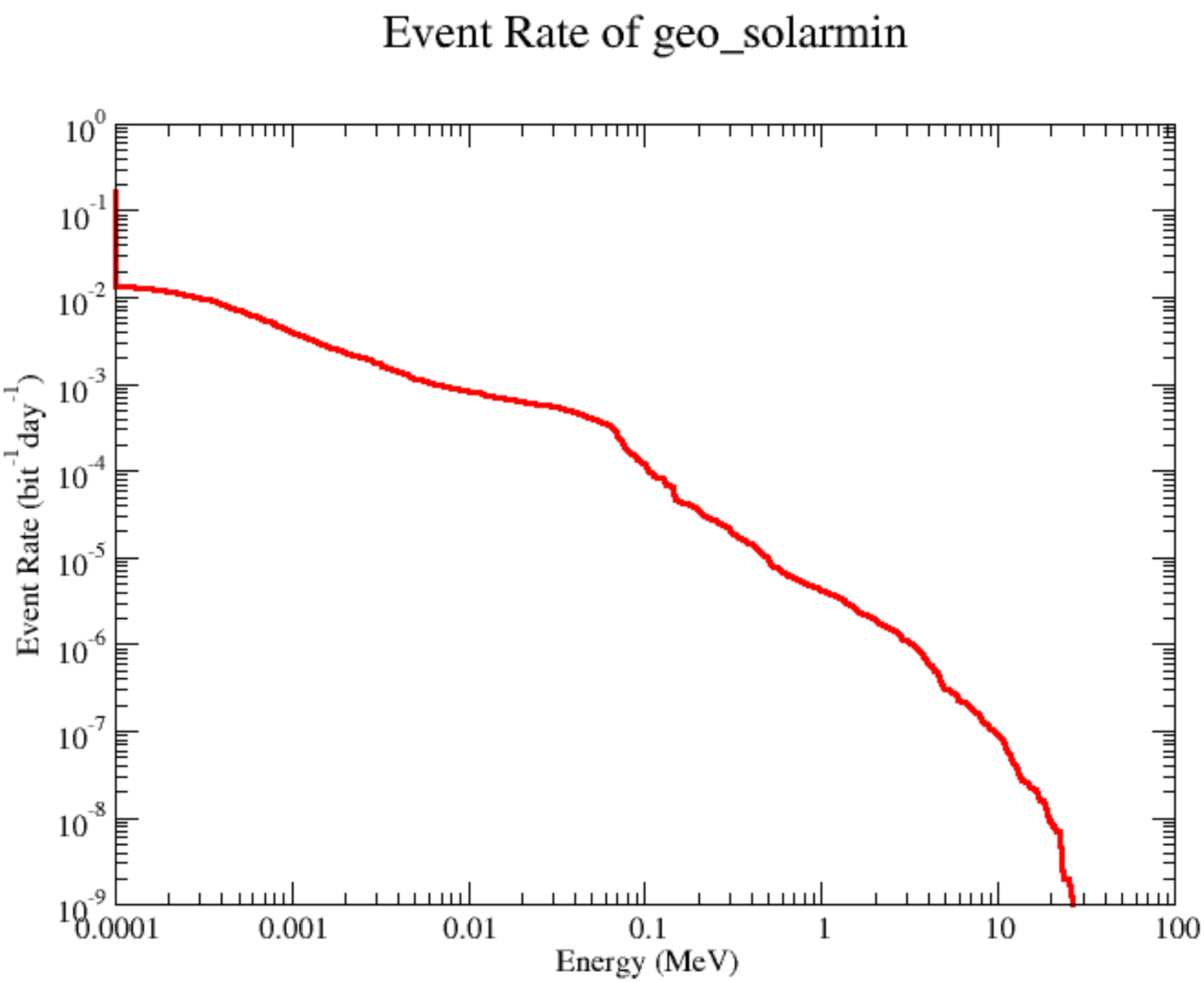


Figure: Error Rate as function of energy deposited

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

Create Stack
Run Beam
Soft Error Rate

navigation

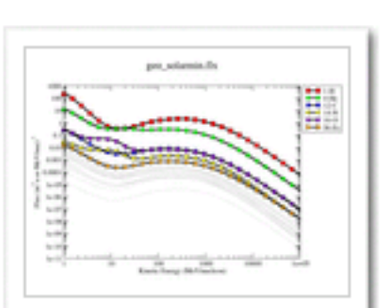
Help
Members
News
Events

contents view edit sharing

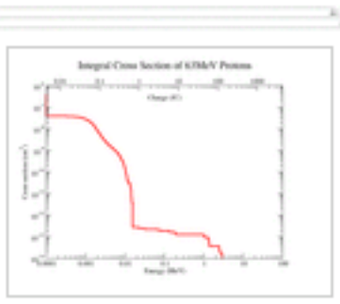
actions ▼ display ▼ add new… ▼ state: private ▼

Example

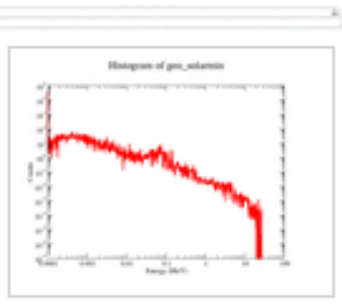
by Brian Sierawski — last modified Nov 12, 2007 01:31 PM



geo_solarmin (PNG)



63MeV Protons (3)



geo_solarmin (3)

geo_solarmin.flx — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (PDF) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (GRACE) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM

Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

0.25CMOS.rppstack — by Brian Sierawski — last modified Oct 05, 2007 10:13 AM

RPP overlayer stack

creme96 environments

TRP
GTRN
FLUX
TRANS

creme-mc rpp models

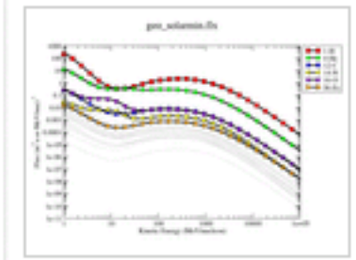
Create Stack
Run Beam
Soft Error Rate

navigation

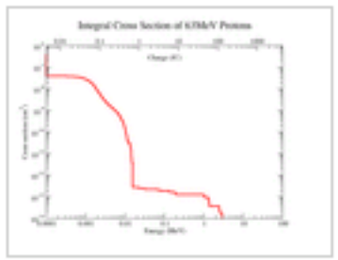
Help
Members
News
Events

Example

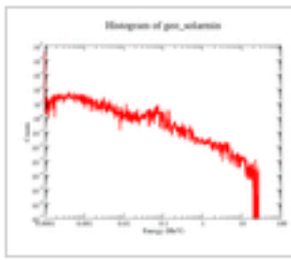
by Brian Sierawski — last modified Nov 12, 2007 01:31 PM



geo_solarmin (PNG)



63MeV Protons (3)



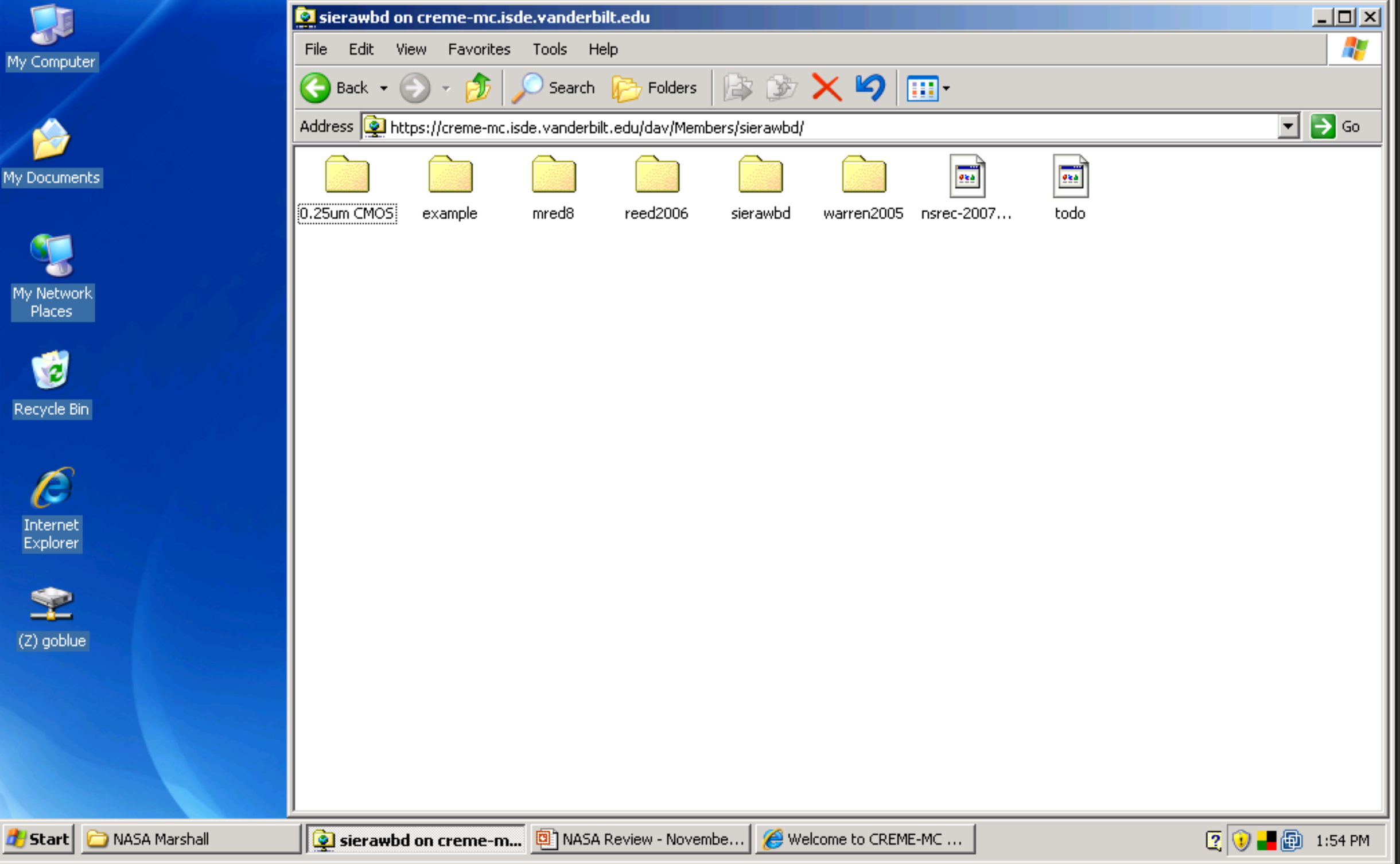
geo_solarmin (3)

geo_solarmin.flx — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (PDF) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

geo_solarmin (GRACE) — by Brian Sierawski — last modified Nov 12, 2007 01:32 PM
Interplanetary/Geosynchronous orbit, particle flux Z 1 to 28, Solar Minimum (Cosmic-Ray Maximum)

0.25CMOS.rppstack — by Brian Sierawski — last modified Oct 05, 2007 10:13 AM
RPP overlayer stack


My Computer
My Documents
My Network Places
Recycle Bin
Internet Explorer
(Z) goblue
sierawbd on creme-mc.isde.vanderbilt.edu
File Edit View Favorites Tools Help
Back Search Folders
Address https://creme-mc.isde.vanderbilt.edu/dav/Members/sierawbd/
Go
0.25um CMOS
example
mred8
reed2006
sierawbd
warren2005
nsrec-2007...
todo
Start
NASA Marshall
sierawbd on creme-m...
NASA Review - Novembe...
Welcome to CREME-MC ...
1:54 PM

Statistics for:
creme-mc.isde.vanderbilt.edu

Summary
When:
Monthly history
Days of month
Days of week
Hours
Who:
Countries
Full list
Hosts
Full list
Last visit
Unresolved IP Address
Robots/Spiders visitors
Full list
Last visit
Navigation:
Visits duration
File type
Viewed
Full list
Entry
Exit
Operating Systems
Versions
Unknown
Browsers
Versions
Unknown
Referrers:
Origin
Referring search engines
Referring sites
Search
Search Keyphrases
Search Keywords
Others:

Last Update: 09 Nov 2007 - 13:43

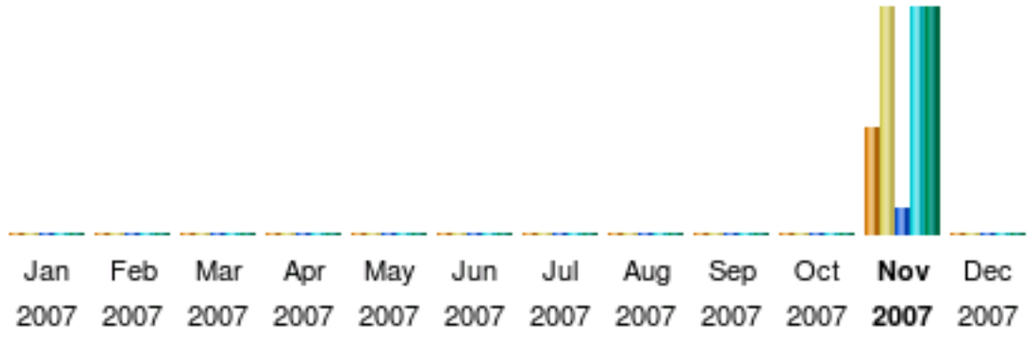
Reported period: Nov 2007 OK

Summary

Reported period	Month Nov 2007				
First visit	06 Nov 2007 - 13:20				
Last visit	09 Nov 2007 - 13:42				
	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Viewed traffic *	**7**	**15** (2.14 visits/visitor)	**1103** (73.53 Pages/Visit)	**9521** (634.73 Hits/Visit)	**33.77 MB** (2305.08 KB/Visit)
Not viewed traffic *			**390**	**1049**	**2.87 MB**

* Not viewed traffic includes traffic generated by robots, worms, or replies with special HTTP status codes.

Monthly history



Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2007	0	0	0	0	0
Feb 2007	0	0	0	0	0
Mar 2007	0	0	0	0	0
Apr 2007	0	0	0	0	0
May 2007	0	0	0	0	0
Jun 2007	0	0	0	0	0
Jul 2007	0	0	0	0	0
Aug 2007	0	0	0	0	0