SPENVIS

ESA'S SPACE ENVIRONMENT INFORMATION SYSTEM

PART 2: Update and future developments

B. Quaghebeur, J. Wera, (D. Heynderickx), H. De Witte
BIRA, Ringlaan 3, B-1180 Brussel, Belgium

H.D.R. Evans, E.J. Daly
ESA/ESTEC, Keplerlaan 1, NL-2200 AG Noordwijk, The Netherlands

Pasadena, GEANT4-SPENVIS workshop, 6-10 Nov 2006
Part 1: Existing SPENVIS (08 Nov 2006)

Description of SPENVIS
- Models and tools
- Radiation
  - (Overview of space environment and effects)
  - Radiation sources
  - Radiation effects
- Spacecraft charging
- Atmosphere and Ionosphere
- Magnetic field
- Meteoroids and debris
- Other models and tools
  - databases
  - Miscellaneous
  - ECSS

Practical info
Part 2: Ongoing updates and new developments (09 Nov 2006)

Enhancements of existing models
- Orbit generator
- Source particles
- Charging: new Dictat version
- Effects: Niel curves

New models

Geant4 applications: SSAT, GEMAT, GRAS, GDML

MarsREM

SEPEM

Architecture

Used web tools

Installation kits
Orbit generator (M)

- **New trajectory types:**
  - Hyperbolic
  - Parabolic
  - Manoeuvres

- **Other celestial bodies**
  - Moon orbit
  - Mars orbit (MarsREM Project)
  - Jovian orbit

- **--> Big influence on logical structure**
  - e.g. Don't use AP-8 on Mars

- **Wizards, e.g. ISS orbit**

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Environment models

- **Trapped particles (H)**
  - Mike Xapsos' TPM model
  - Onera models (MEO, POLE)
  - Sampex/PET

- **Solar particles (H)**
  - PSYCHIC model
  - Extension of energy range of the JPL model
  - Results of the SEPEM project
  - Nymmik's SEP model is no option

- **GCR's (H)**
  - ISO (Nymmik) model

- **Geomagnetic shielding (M)**

- **Planetary environments (L)**
  - Mars (MarsREM project)
  - Jupiter (JPL, Onera)

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Environment effects

- **Solar cell degradation (H)**
  - Direct Niel
  - Laboratory and RDC (Relative Damage Coefficients) data
  - GADGET-2 Data
  - Post-processing
  - ONERA data
  - Upload of data

- **Total Dose calculation (H)**
  - Biological effects: ICRP sphere

- **NIEL (H)**
  - Review of work by U. Köln and ONERA
  - Electron and Neutron NIEL
  - Updates in MULASSIS NIEL
  - Library of NIEL curves

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Environment effects

- **SEU (vH)**
  - Bug with heavy ions
  - Comparison between Nymmik and CREME96
  - Slowing and Stopping algorithm
  - Multiple LET curves (precalculated)
  - New devices

- **Sectoring tool (M)**
  - Bug in current code (H)
  - Additional shapes:
    - Cone
    - Paraboloid
  - Stand-alone geometry interface
  - GDML output (Scheme 1 is implemented, Scheme 2 under test)
  - Path-length calculation and histogramming

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• Collaboration with GEANT4 developers

• **REAT**
  - MULASSIS: Implemented
  - SSAT: Implementation ready, testing phase
  - GEMAT: Implementation almost ready

• **MAGNETOCOSMICS**: Implementation ready, restrictions to be added (CPU time)

• **PLANETOCOSMICS**

• **GRAS**: To be started (Question to Giovanni and Pete: Who is going to deliver the documentation?)

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Charging
- Deep dielectric charging (H-M)
  - Upgrade from DICTAT v2 to DICTAT v3
  - Rescheduled in planning
- Upgrade surface charging (M)
  - Code is ready from SPIGH (Space Plasma Interaction Guidelines and Handbook) project

ESTEC Ionosphere package to be installed (L)

Databases (L)
- SAMPEX/PET and RERMM data are available at BIRA
- PROBA/SREM
- Use data query output as input to dose models (M)

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• **Debris and Meteoroids (H)**
  - Damage and risk management: Status to be checked
  - Hosting of EDID (European Detector Impact Database, data from GORID and DEBIE-1 impact detectors)

• **Contamination tool (M)**
  - Study of existing tools
  - Development from scratch?

• **ECSS (M) (active versions)**
  - ECSS = European Coordination for Space Standardization
  - New version of ECSS-E-10-04 (Environment)
  - Implementation of ECSS-E-10-12 (Effects)
  - Implementation of ECSS-E-20-06 (Charging)

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Management topics

- **Project management**
  - Regular update of upcoming events
  - Setting up a more formal system for bug reporting, questions, support
  - Consultancy (?)

- **Business model**
  - Analysis of existing user database
  - Development of the business model
  - Implementation of the business model

- **Other Projects**
  - REAT-MS (Talk Pete Truscott)
  - SEPEM (Talk Alexi Glover)
  - MarsREM (Talk Pete Truscott)

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What's next

- Spenvis Architecture
- Used web tools
- Installation kits

Presentation by Jan Wera