AE9/AP9/SPM Radiation Environment Model

Release Notes

Version 1.30.001

The AE9/AP9/SPM model was developed by the Air Force Research Laboratory in partnership with MIT Lincoln Laboratory, Aerospace Corporation, Atmospheric and Environmental Research, Incorporated, Los Alamos National Laboratory and Boston College Institute for Scientific Research.

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The AE9/AP9/SPM model and related information can be obtained from AFRL's Virtual Distributed Laboratory (VDL) website: https://www.vdl.afrl.af.mil/programs/ae9ap9

V1.00.002 release: 05 September 2012

V1.03.001 release: 26 September 2012

V1.04.001 release: 20 March 2013

V1.04.002 release: 20 June 2013

V1.05.001 release: 06 September 2013

V1.20.001 release: 31 July 2014

V1.20.002 release: 13 March 2015

V1.20.003 release: 15 April 2015

V1.20.004 release: 28 September 2015

V1.30.001 release: 25 January 2016

In a future release of AE9/AP9/SPM, the model will be renamed to be
"International Radiation Environment Near Earth" (IRENE).

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January 25, 2016

Highlights

Please refer to the 'Ae9Ap9_v1_20_00*x*_ReleaseNotes' documents for a full description of the revisions and enhancements of the model since v1.05.001.

Modifications have been made to the AE9 and AP9 runtime tables and software to correct issues with Monte Carlo calculations.

An extra progress dialog was added to the Ae9Ap9Gui program for displaying the execution status of the IntegralPlasma utility application.

Restrictions for performing dose calculations were added.

The magnetic field model calculations were revised to produce more consistent results.

Software Changes

Ae9Ap9Gui application

- The parameter input tests were changed to require at least three depth values for performing dose calculations, due to a requirement of the underlying ShieldDose2 model.
- During the execution of the IntegralPlasma utility application (when required), a pop-up dialog window is displayed, showing its completion status.

CmdLineAe9Ap9 application

- The parameter input tests were changed to require at least three depth values for performing dose calculations, due to a requirement of the underlying ShieldDose2 model.

Ae9Ap9 model library

- An equation was corrected in the time history calculations for the Monte Carlo processing.
- The new 'W' dataset in the AE9 and AP9 databases were incorporated into the Monte Carlo processing calculations.

Magnetic Field model

- The internal time-interval update process for the calculation the IGRF coefficients was revised to produce more consistent results.

Build Script

- The build script was revised to change the Boost 3rd-party library version from 1.50.0 to 1.58.0.

Documentation Changes

- The *User's Guide* document was updated to state that a minimum of three depth values are required for performing dose calculations; it was also clarified that the 'bremsstrahlung' effects are included in the electron dose results.
- The *Build Instructions* document was updated to change the required Boost 3rd-party library version from 1.50.0 to 1.58.0.

Database Changes

- The AE9 and AP9 runtime files were updated to correct a numerical instability in the Monte Carlo matrices that affected very long mission calculations (>3-4 years). A new set of parameters ('W') were added to these files to improve the time progression. For more information, see the accompanying *AE9AP9 V1.30 MC Issue Fix* document.

General

- Due to the refinement of the magnetic field model calculations, the results for 'mean', 'percentile' and 'perturbed mean' calculations will be only slightly changed from those results in the previous release.
- Multiple changes in the 'Monte Carlo' processing were implemented for this release; the results produced (for both the individual scenarios and their associated aggregation statistics) may be significantly different from those results in the previous release.

Contact Information

Please send any questions, comments and/or bug reports to: ae9ap9@vdl.afrl.af.mil

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