Monte Carlo Simulations of SIS Geometrical Factor

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From: Christina M. S. Cohen
To: SIS Data Analysis Team
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Current Status:

The existing Monte Carlo simulation of SIS utilizes the actual detector shapes and current positions and center thicknesses (as given in Brian Dougherty's memo 1997.10.23.BLD). Currently the matrix detectors are being treated as single side detectors with no strips and only one threshold value. This will be changed in the next upgrade of the program. The thresholds being used for the stack detectors are those given in Dick Mewaldt's memo 1997.9.12.RAMa. The M and H thresholds are those given in that same memo calculated using the TVS offsets. Although these thresholds are going to change in the near future it was not completely determined what the new values will be at this point. Once these are changed the simulation can be rerun to reflect this.

Output Files:

Three types of files are created by the simulation program, 1) geometrical factors (gf files), 2) energy losses (dE files) and 3) summaries (sum files). The gf files contain the geometrical factor in cm^2 sr as a function of energy for various rates. The dE files contain the energy lost in each detector for the first 1000 (a user defined value) particles. The sum files provide the number of particles contained in each rate outputted as well as the thresholds used and the incident spectrum.

Available Output:

Attached are graphs of geometrical factors of various elements as a function of energy for 3 different conditions - all particles, only particles stopping in the stack (eliminates side exiting particles), and particles with incident angles less than or equal to 45 degrees (A telescope on the right, B telescope on the left). The data tables used to create these plots are located in:

~cohen/ACE/simulation/10.28.97/A.telescope/

and

~cohen/ACE/simulation/10.28.97/B.telescope/

for the two SIS telescopes (which have slightly different detector thicknesses and thresholds).

The gf files for all particles are named *.HIZ, *.He, and *.H, where the * is H, He, C, O, Si, or Fe (the incident beam) and the extension refers to the type of rate (*.HIZ contains geometrical factors for particles classified as HIZ range 0 - 8). The gf files for stopping particles are named *.HIZ.noside, *.He.noside,

*.H.noside and those for angles less than or equal to 45 degrees are named *.HIZ.theta45, *.He.theta45, *.H.theta45.

The dE files are similarly named except that the * above corresponds to HdE, HedE, CdE, OdE, SidE, or FedE. The extensions explained above also apply to these files. The sum files are *.sum (containing information for both stopping particles and all particles) and *.sum.theta45 (where the * is the same as for the gf files).

There are currently no column headings in the files. The columns in the gf files are as follows:

*.HIZ and *.HIZ.theta45:
energy/nucleon, HIZR0, sigma, HIZR1, sigma, ..., HIZR8, sigma

*.HIZ.noside:
energy/nucleon, HIZR0, sigma, HIZR1, sigma, ..., HIZR7, sigma

*.He and *.He.theta45:
energy/nucleon, HeR0, sigma, HeR1, sigma, ..., HeR8, sigma

*.He.noside:
energy/nucleon, HeR0, sigma, HeR1, sigma, ..., HeR7, sigma

*.H, *.H.theta45, and *.H.noside:
energy/nucleon, HR0, sigma, HR1, sigma, ..., HR7, sigma

All the dE files have the same columns:
rate number, number of detectors the trajectory passed through, incident energy, energy lost in M1, M2, T1, T2, T3, T4, T5, T6a, T6b, T6c, T7a, T7b, T7c, T7d, T7e, T7f, T8, Window A, Window B, Window C.
The rate number, n, corresponds to the nth rate given in the gf files (i.e., n = 2 for *dE.HIZ file means the particle was classified as HIZR1).

All the sum files have the same format:
Each gf file is listed (unfortunately according to generic name - simtel.out1 = *.HIZ.noside, simtel.out2 = *.He.noside, simtel.out3 = *.H.noside, simtel.out4 = *.HIZ, simtel.out5 = *.He, simtel.out6 = *.H for *.sum files; simtel.out1 = *.HIZ.theta45, simtel.out2 = *.He.theta45, simtel.out3 = *.H.theta45 for *.sum.theta45 files) separately. For each file the rates selected are listed (by program number, but in the same order as given in the appropriate gf file) with the number of particles falling into that rate given on the next line. Then the thresholds are listed followed by the input spectrum (counts contained in each energy bin).