A new approach to data analysis of trapped radiation in the inner radiation belt.

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One of the everlasting problems of data analysis in the Earth inner radiation belt is quite large discrepancies between different measurements of trapped fluxes, as a result different models based on those measurements also give different results. At some geomagnetic areas the discrepancies reach up to two orders of magnitude. The most affected regions are low drift shell (L<1.2) and high particles’ energies (for protons E>400 MeV). Qualitatively it is usually explained by a high gradient of fluxes at low drift shells, temporal variation of magnetic field, that instruments took measurements in different periods of time and the simplicity of many old instruments. But there is a lack of quantitative analyses of these factors.

We suppose that the main reason why these factors affect the data analysis is in simplified definition of geomagnetic parameters (mostly L-parameter). The point is that a value of L attributing to registered particles is usually calculated at the point of registration, while strictly speaking it should be taken the particles gyrocenter. In the latter case, particles of different energies and coming to the instrument from different directions should be attributed with different values of L. At the region of high gradient of fluxes (L<1.20) and high particle energies (E>100 MeV) it results in the fact that an instrument in such regions actually registers a mixture of different geomagnetic areas (with different fluxes), and the real composition depends on the instrument position and orientation in space and instrument’s field of view (FoV).

In the report, we will present such an analysis made for the PAMELA spectrometer for protons with energy range from 65 MeV to 3 GeV covering the part of its orbit with local drift-shells L<3.0. Our analysis showed that even for limited region of the inner radiation belt available for the spectrometer, the mixture of different geomagnetic regions within its FoV vary significantly as for different orbit as along one orbit. Such analysis if made for other instruments can not only explain the observed discrepancies in the measurements in these areas but provide a tool for their calibration.