IMPROVED JUPITER CHARGED PARTICLE DATA FROM THE GALILEO/EPD DETECTOR. P. Kollmann[1] , D. C. Smith[2], J. D. Vandegriff[2], C. Paranicas[2], Z. H. Lee-Payne[3], M. B. Kusterer[2], and J. E. Turner[2], [1]JHU Applied Physics Lab, 11100 Johns Hopkins Rd, Laurel, MD 20723, peter.kollmann@jhuapl.edu, [2]JHU Applied Physics Lab, [3]Aberystwyth University, Wales, UK.

Introduction: The Galileo mission was the first orbital mission around Jupiter, and it included the Energetic Particles Detector (EPD) instrument [1], which provided an excellent survey of Jupiter's radiation environment. EPD measured electrons and various ion species in the energy range of tens of keV to tens of MeV. Galileo orbited Jupiter close to the spin equator and had perijoves near the Galilean satellites. In contract, the active Juno mission is in a polar orbit designed to minimize time in the planetary radiation belts.

At the end of the Galileo mission in 2003, a subset of the EPD data were archived in NASA's Planetary Data System (PDS). Galileo's primary antenna failed, and the secondary antenna had a much lower bandwidth. EPD and the other instruments were reconfigured to accommodate the lower telemetry rate. For most time periods, EPD was in a low time resolution mode, and then most of the data that went to the PDS was also in a low resolution mode. These data came from an operating mode called Galileo's "real time" mode, and the archived data from the real-time mode were supplied in the units of count rate, which is not a physical unit. Also, only 14 of the 35 directionally resolved channels were provided in the PDS. Data in the higher time resolution "record mode" was archived but since that time, new calibration information was developed.

Corrections: We present EPD data with multiple corrections applied. The simplest is a background subtraction which is possible because the telescopes were regularly stepped behind a "foreground shield" which allows an approximation of this quantity. Such shielded time periods were used to create a time-dependent background function. Another correction is needed when the radiation is very intense, which caused some counters to saturate. Figure 1 shows particle intensity versus distance from Jupiter, where this distance is expressed as the magnetic L-shell value. (When studying charged particle fluxes, a dipolar or general L value is preferred to a radial distance parameter, because L accounts for the magnetic latitude of the spacecraft.) Saturation occurs when the intensities reach around 10^5 particles/cm^2/ster/keV/sec, and this can be seen in Figure 1 as a flattening that appears inward of L ~ 11 (i.e., around the radiation belts).

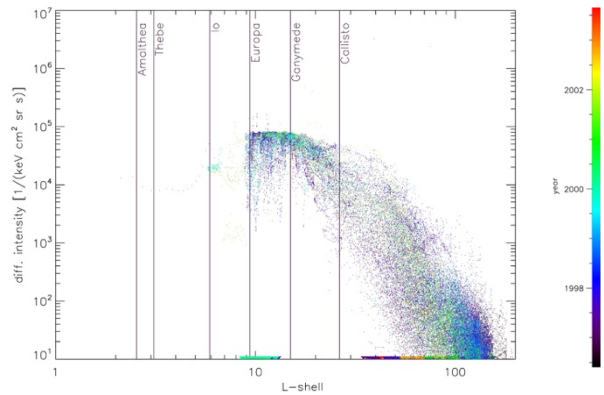

Figure 1: Uncorrected intensities versus distance show an artificial flattening around 10^5.

By comparing the ways in which various channels saturate, it is possible to derive the dead time in each channel, and this can be used to compute the actual count rate when saturation is detected. Figure 2 shows an improved version of the intensity versus distance data from Figure 1. Note that the intensities now extend above 10^5 in the same units

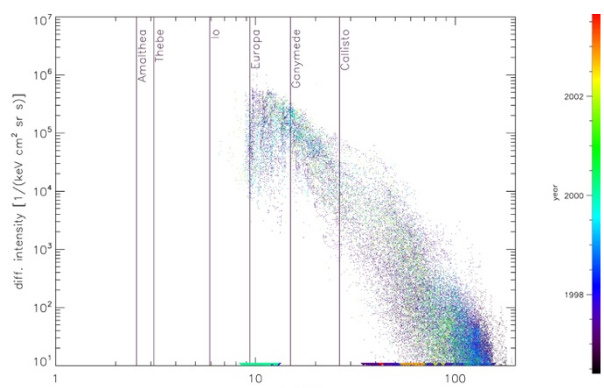

Figure 2: Corrected intensities versus distance in which the dead time has been used to infer the correct count rate.

Further processing: Jupiter's >MeV electrons are a prototype for particle acceleration in space and a hazard to any spacecraft at Jupiter. EPD's >MeV electron measurements cannot all be simply related to a flux because they combine electrons above threshold energies without energy distinction. We use the instrument response from Garrett et al. [2] and a forward model to derive calibrated spectra up to tens of MeV.

In the new data products, electron intensities are provided for all times, not just as averages at given L-shells.

Data Products: We present significantly cleaned up, calibrated, and corrected EPD data that can be used without specialized instrument knowledge. Archive products for both the updated data and also the initial raw data (all channels and resolutions) are being delivered to the PDS. From the Composition Measurement System (EPS/CMS), we have also extracted event data, which will be included in our PDS delivery and can be used to derive high-resolution energy spectra.

User Guide: We provide a user guide that describes the EPD data, outlines the underlying calibration / processing, and presents example data including applications and limitations.

Conclusion: The new products we have created include a much more up-to-date processing of the EPD data. This is especially relevant in regions of high radiation, where background and saturation effects were studied in much greater detail than during the mission itself. Prior to publication in the PDS archive, a set of comma-delimited text files containing the newly processed data can be accessed at this URL:

http://sd-www.jhuapl.edu/Galileo_EPD/

References: [1] Williams, D.J., McEntire, R.W., Jaskulek, S., Wilken, B. (1992) *Space Science Reviews*, 60, 385-412, 1992. [2] Garrett, H. B., Kokorowski, M., Jun, I., Evans, R. W. (2012) Galileo Interim Radiation Electron Model Update—2012, http://henry.garrettassociates.net/resources/