SWAP Calibration Information

This document describes the calibration incorporated into the data pipeline (level 3), and information included in the SWAP calibration directory, which is necessary for further data processing (level 4 and higher). Currently, the pipeline includes calibration information to perform the background subtraction for all plan 0 and plan 3 measurements, and to calculate then energy labels for the spectrograms. The energy bins were calculated using an instrument model, which combined all the calibration information discussed in this document. Since the energy bins were calculated assuming ions entered the instrument in the center of the instrument, and the energy does not depend on some quantities such as the geometric factor, the energy bin calculations are primarily a function of the RPA and ESA response curves. The additional information discussed required for further data processing include: the instrument field of view, angular responses of the RPA and ESA, deflector calibration, and geometric factor. Much of the calibration data is discussed in the SWAP instrument paper. We refer to some figures in the instrument paper, and provide some further details necessary to work with our data.

1) Retarding Potential Analyzer (RPA)

The RPA response curve is shown in Figure 29 of the SWAP instrument paper over the full voltage range of the instrument. To obtain a smooth average shape several tests were used. Since each test had a different beam flux, the count rates for each test were normalized by the number of count rate at the RPA cut-off. The RPA cut-off is where the slope is the steepest. Likewise some of the tests had slightly different beam energies; therefore the x-axis is the RPA voltage normalized by the beam energy. The RPA grids consists of holes drilled in metal, and act as a series of electrostatic lenses. This causes dips and peaks not typical of wire mesh grids. Such features occur at RPA voltage to beam energy ratios less than 0.95. In the calibration directory we include the RPA response curve file (rpa_shape.tab).

The RPA response also depends on the azimuth (α) angle that the ions enter the instrument. Figure 1 defines the azimuth angle to be positive towards the top of the

6) *Field of View (FOV)*

In order to determine the field of view of the ESA, the RPA is turned off and the beam was fixed at one energy, and then the beam was moved to different roll and azimuth angles. The counts were recorded at each roll and azimuth setting until the full field of view of the instrument was covered. The field of view map is 1 degree resolution in azimuth angle and 4 degrees in roll angle. The map is a 2-D array of counts in roll and azimuth. Below we show this array normalized by the the count rate in the bin at 0 degrees azimuth and -6 degrees roll (Figure 6). We provide a field of view map (fov_mask_2d.tab) for higher level data processing in the calibration directory.

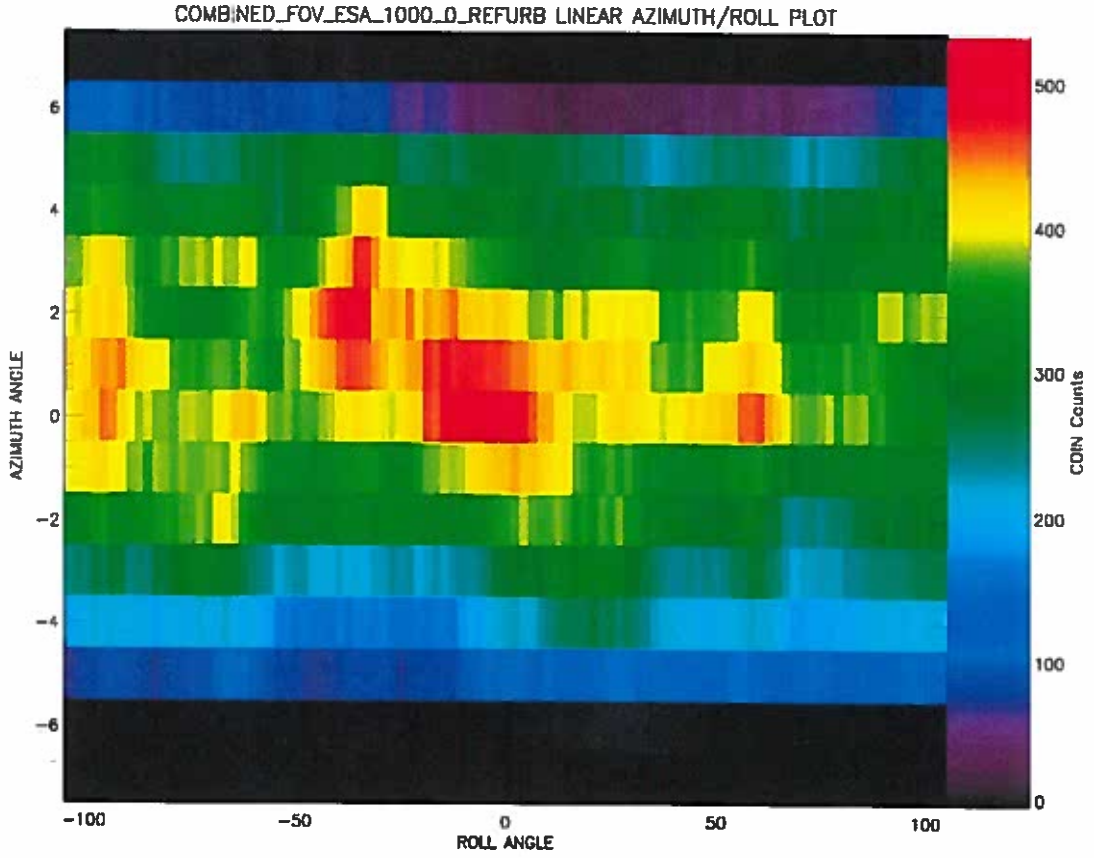

Figure 6: *Field of View of the ESA: Normalized counts in color as a function of roll angle [deg] (x-axis) and azimuth [deg] (y-axis).*