

# FAST

## Mass Spectrometer (TEAMS)

### Known Data Problems and Limitations

#### Mismatch Between PAC Voltage and Lookup Table

**Cause:** PAC discharge, change in nominal PAC voltage, or DPU reset

**Period Affected:** Sporadically throughout the mission

**Comments:** Symptom is m/q peaks substantially different from nominal (1, 2, 4, 16) values. Do not use data from these periods

#### Self-Stimulation

**Cause:** A test mode occasionally requested by the experimenters

**Periods Affected:** Occasionally during early years of the mission

**Comments:** Creates an artificial signal at a commandable pixel and time of flight. Should be obvious as the signal overwhelms any naturally occurring signals. Do not use data from these periods

#### Changes in Nominal MCP Voltage

**Cause:** Request by experimenters

**Period Affected:** A few intervals, most of them early in the mission

**Comments:** Do not compare data across an MCP voltage change. Do not use data from 16-26 June 1998 (orbits 7188-7296), as the MCP voltage was changed several times during this period in order to conduct an instrumental experiment.

#### H<sup>+</sup> Counts Contaminate He<sup>++</sup> Channel

**Cause:** Inherent width of H<sup>+</sup> TOF peak

**Period Affected:** Entire mission

**Comments:** Use HiMass data to check degree of contamination; if no separate He<sup>++</sup> peak, do not use He<sup>++</sup> data. A similar problem affected He<sup>+</sup> data from the Freja mass spectrometer

## **Elevated Noise Floor at All Times of Flight**

**Cause:** Accidental coincidences at high counting rates

**Period Affected:** Cusp and radiation belt crossings; periods affected by ram or spacecraft charging

**Workaround:** Some routines allow background subtraction (check the IDL documentation for details)

## **Counts Displaced into Wrong Solid Angle Bin**

**Cause:** Timing error in accumulator board logic

**Period Affected:** Intermittently from spring 1997 onward

**Workaround:** A technique described in K. Seki et al., J. Geophys. Res. 105, 15931, 2000, allows recovery of the initial distribution by assuming the angular distribution is identical to that of the IESA

## **Peaks at 6 and 9 AMU/q ("C<sup>++</sup>" and "Be<sup>+</sup>")**

**Cause:** Resonance frequencies in TEAMS electronics

**Period Affected:** Intermittent periods during entire mission

## **Long TOF Tail for O<sup>+</sup>**

**Cause:** Energy loss when passing through carbon foil

**Period Affected:** Entire mission

**Comments:** This limitation has prevented the detection of molecular ions

## **Intermittent Dropouts of High-Energy Counts**

**Cause:** Not determined; believed to be timing error in DPU logic

**Period Affected:** Northern hemisphere passes from December 1996 onward

**Comments:** Believed to be interference from certain fields modes, aggravated during contacts

## **Ram**

**Cause:** Spacecraft velocity with respect to background plasma

**Period Affected:** Traversals of any region with significant cold ( $< 10\text{eV}$ ) O<sup>+</sup>

**Comment:** Primarily affects O<sup>+</sup>, since the kinetic energy of O<sup>+</sup> at 7 km/s (a typical spacecraft speed) is about 8 eV. Can skew moments calculations since these codes assume that the spacecraft velocity is negligible compared to particle velocities

## **Spacecraft Charging**

**Cause:** Photoelectron emission and/or problems with E-field sphere bias

**Period Affected:** Intermittently during fall 1996; all traversals of density cavity when spacecraft is in darkness; all data from fall 2000 onward

**Comments:** Obvious in the low energy ion spectra. Current moment calculations do not account for the spacecraft potential

## **Incorrect Magnetic Field Phase in the Header**

**Cause:** Data collected while magnetometer is off

**Period Affected:** Low-latitude (equatorward of 60 degrees invariant) data from about June 2000 onward

**Comments:** Primarily affects calculations involving pitch angle. Should be fixable in the same way as for the ESA data.