

FAST

Description of the Experiments

Mass Spectrometer (TEAMS) Instrument

General Description

TEAMS (Time-of-flight Energy Angle Mass Spectrograph) consists of an electrostatic analyzer to select E/q , a post-acceleration (PAC) voltage, and a time-of flight (TOF) section. The TOF section measures the delay between the arrival of electrons knocked off a carbon foil and the ion itself, yielding a measurement of m/q . TEAMS has 16 anodes with an instantaneous field of view of 360×8 degrees. The instantaneous look plane is parallel to the spin axis, so within half a spin the full $4 \times \pi$ steradians of the sky are covered. The nominal energy range is 1 to 12000 eV in logarithmically spaced steps.

For further information, see E. M^ubius et al., The 3-D plasma distribution function analyzers with time-of-flight mass discrimination for Cluster, FAST, and Equator-S, in "Measurement Techniques in Space Plasmas: Particles" (Geophysical Monograph 102), edited by R. F. Pfaff et al., AGU, Washington, 1998.

<http://www-ssg.sr.unh.edu/tof/Papers/3dPlasmaPap/3dplasmaset.html>

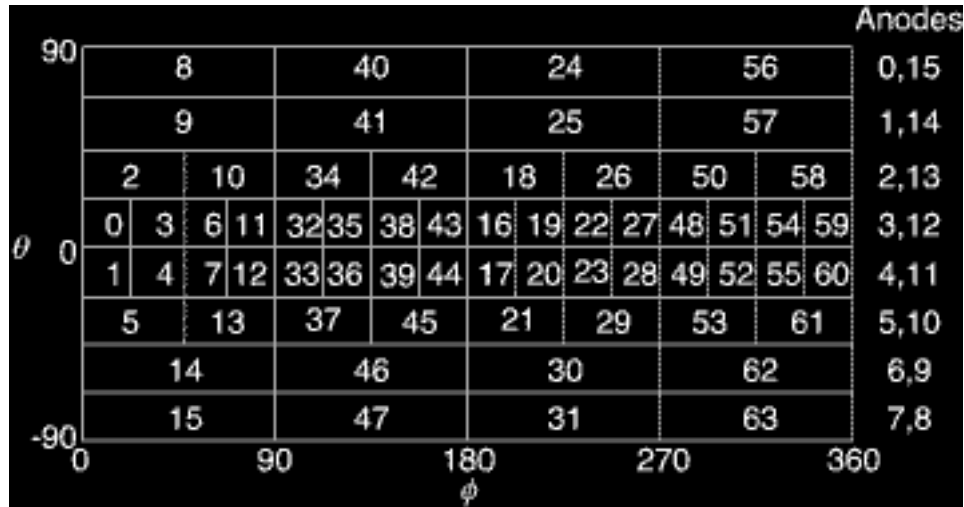
Content and Intended Use of TEAMS APID's

FAST data are sorted by type into various files. Each data type is assigned a number called an APID (application identifier), starting from 1024.

TEAMS Survey Data (APID 1027)

3-D data, 48 energies * 64 solid angle bins * 4 mass bins. Maximum time resolution 2.5 s (0.5 spin) for H^+ / O^+ , 5 s (1 spin) for He^+ / He^{++} . H^+ / O^+ always have twice the time resolution of He. General purpose science data. Departures from gyrotropy should be disregarded.

Angle bins are numbered according to the following map, which is in a spacecraft-based coordinate system:

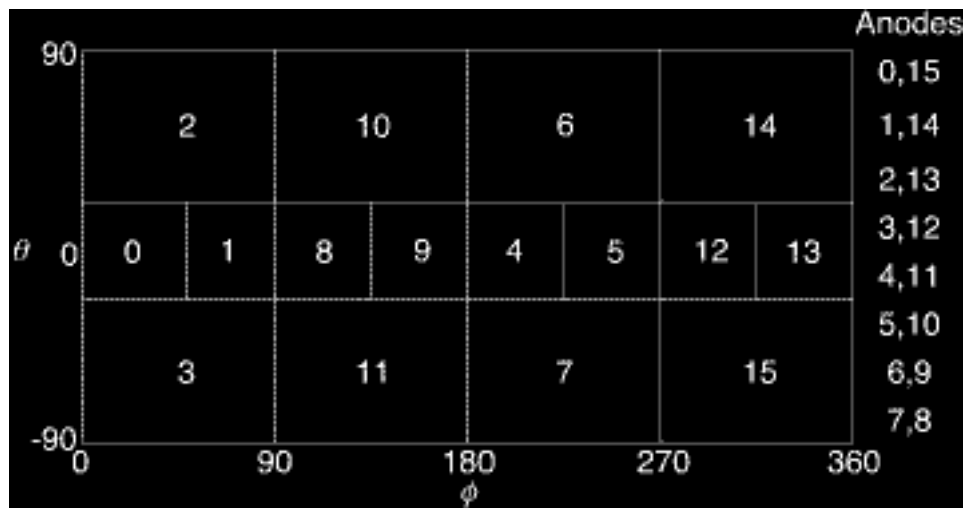


Where theta is the look direction measured from the spin plane away from the spin axis and phi is measured from the look direction of anodes 0-7 at the time of the spacecraft sun pulse. Thus for 1/16 of a spin after the sun pulse anode 3 is looking in angle bin 0 and anode 12 is looking in angle bin 16; half a spin later anode 3 is looking at angle bin 16 and anode 12 is looking at angle bin 0. Note that the definition of theta for TEAMS differs from the theta defined for the ESA's.

TEAMS HiMass Data (APID 1028)

3-D data, 16 energies * 16 solid angle bins * 64 mass bins. Maximum time resolution 10 s. General purpose science data. Each energy step covers three energy steps from the survey data. In practice, the primary use of this APID is to check for H+ leakage into He++ channel or to detect minor ion species (particularly O++). No definitive detection of molecular ions by TEAMS has been reported.

Angle bins are numbered according to the following map, which is in a spacecraft-based coordinate system:



Where theta and phi have the same meaning as above.

TEAMS Pole Data (APID 1029)

32 energies * 2 angles * 4 mass bins. Looks along and opposite to the spacecraft spin axis. Covers only the upper 32 energy steps of the survey data. Maximum time resolution one sweep (either 78 ms or 156 ms depending on instrument mode). Intended for high-resolution studies of transverse ion acceleration. Note, however, that maximum time resolution approximately equals oxygen gyroperiod at apogee.

TEAMS Monitor Rates Data (APID 1030)

Intended for monitoring in-flight calibration. Not for scientific use.

TEAMS PHA Data (APID 1031)

PHA stands for Pulse Height Analysis. Gives pixel and time of flight for all events (up to a certain maximum per spin) at an energy step which is incremented once per spin. Consult with a TEAMS experimenter before using.

TEAMS Burst Data (APID 1047)

2-D data, 48 energies * 16 angles * 4 mass bins. Time resolution is one sweep (either 78 ms or 156 ms depending on instrument mode). Coverage of off-perpendicular pitch angles is spin phase dependent. Intended for high-resolution studies of transverse ion acceleration. Limited to burst intervals.

TEAMS Housekeeping Data (APID 1059)

Intended for monitoring TEAMS instrument status. Not for scientific use.

Housekeeping Analog Control (APID 1080)

Requested by SDT when loading TEAMS data with Data Manager.