RBSPICE

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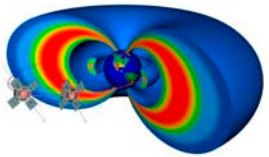
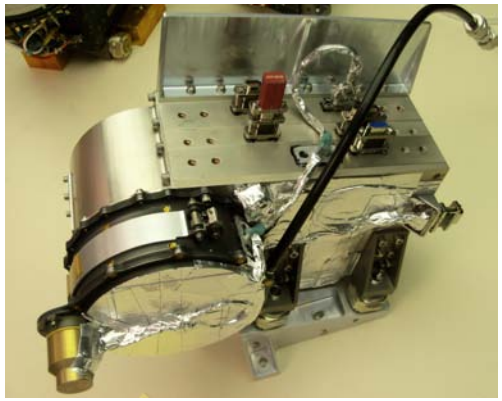


RBSPICE makes important contributions to RBSP science questions by determining how space weather creates the storm-time ring current around Earth and by determining how that ring current supplies and supports the creation of the radiation belt populations

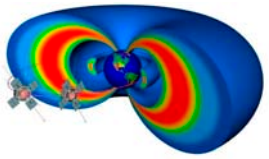
RBSPICE Electrons	**25 – 1000 keV**
RBSPICE Ions	**H:** 20 – 10000 keV **He:** 25 – 10000 keV **O:** 40 – 10000 keV



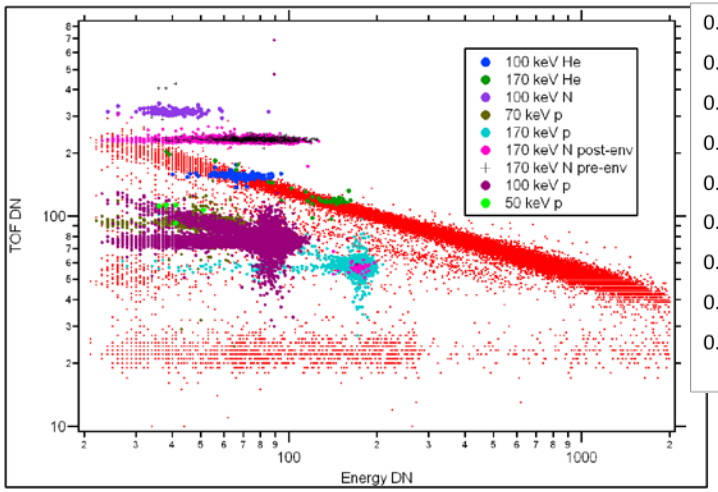
Project status:

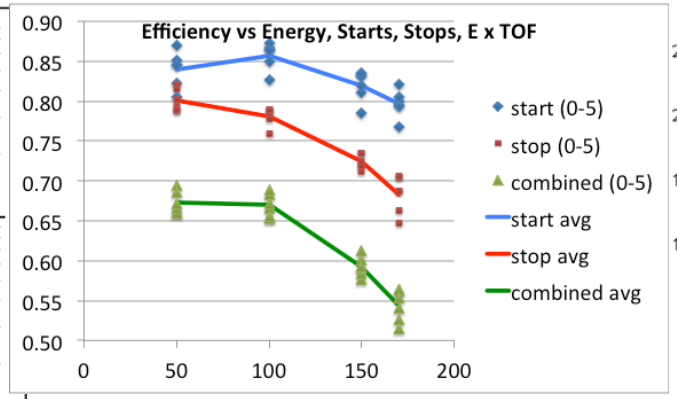
Recent Team Meeting: September 12-13
All CDR Action Items completed
Both instruments delivered, integrated
Loaded flight software v4 both instruments
Calibrations complete except for high energy background: to be done
Collimator on each instrument to be replaced after re-plating
SOC software development continuing
Instrument book chapter barely begun

Example FM Calibration Results (Pre-environmental)

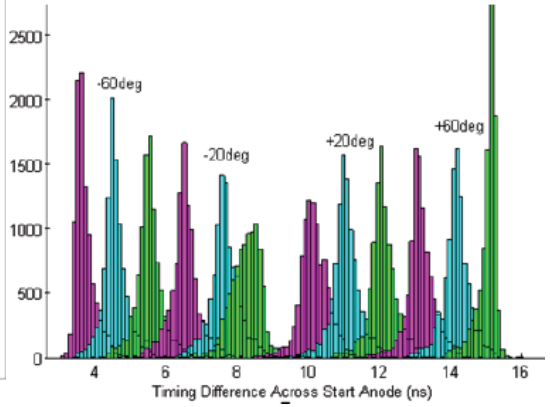


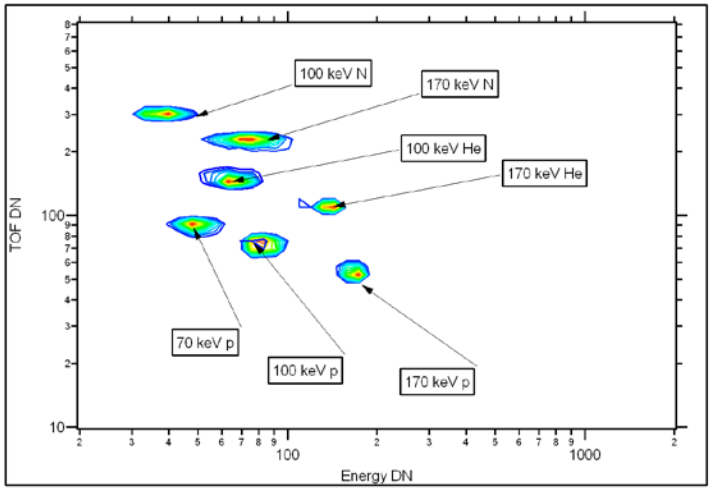
Ion mass / energy range / resolutions

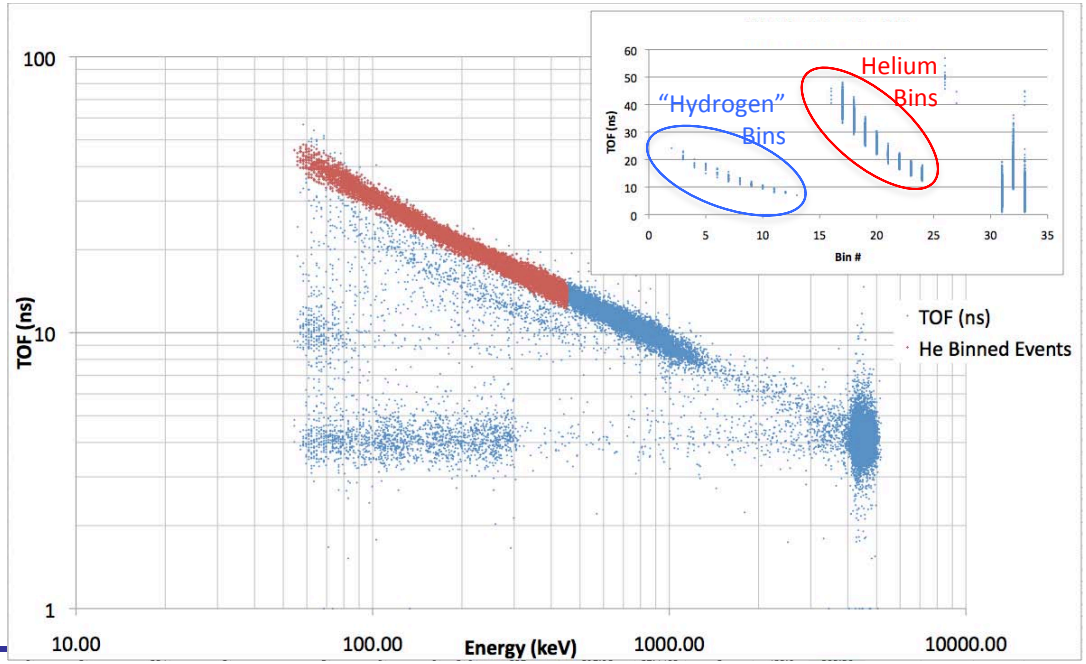




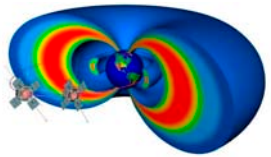
Angle Directional Imaging



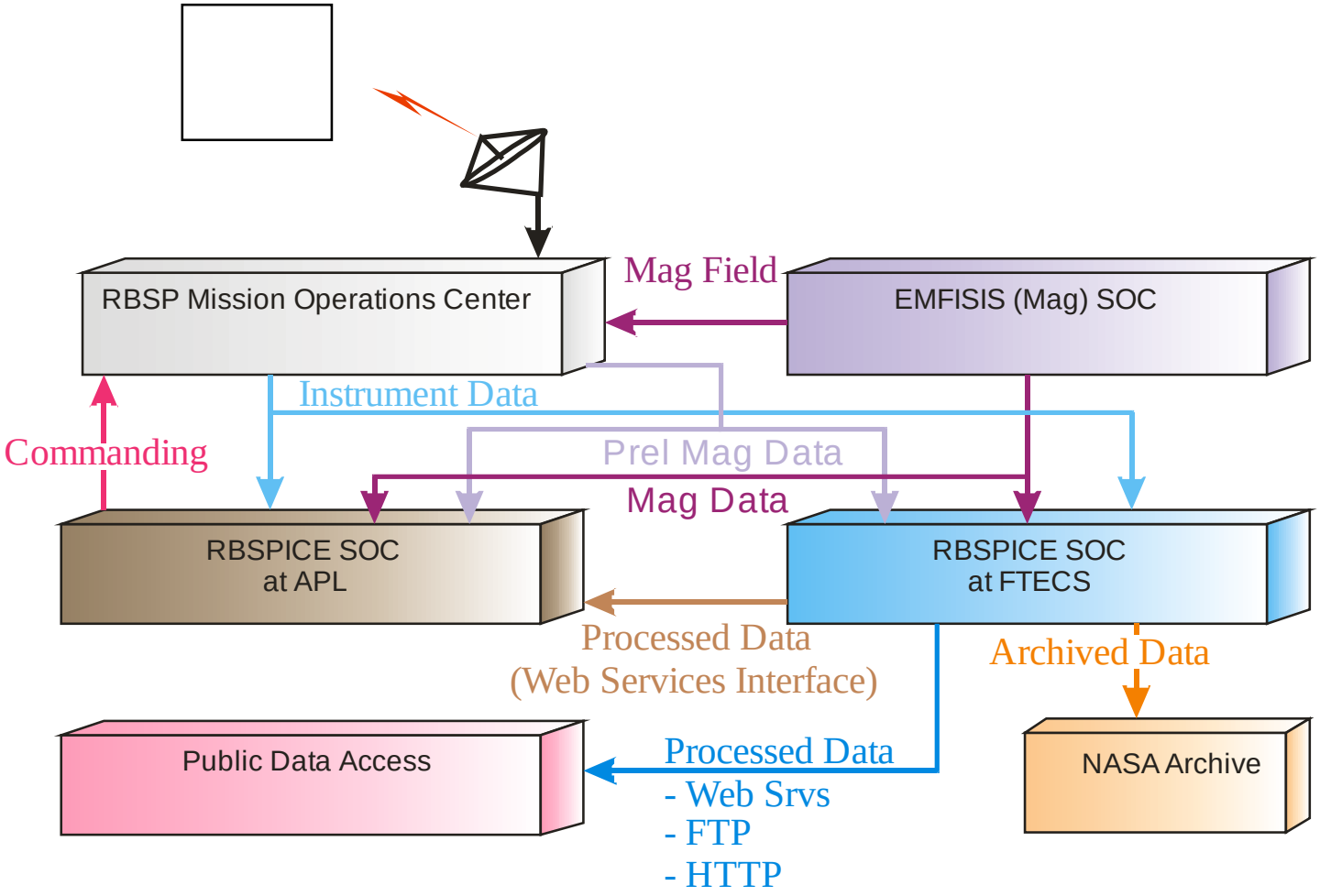




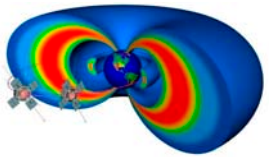
Science Operation Center
SOC Architecture Overview



RBSPICE Science Operations Center

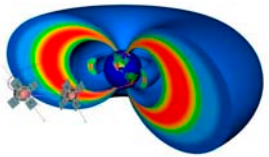


RBSPICE SOC Status



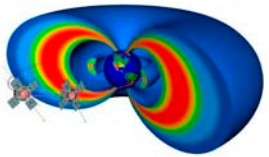
- **MOC to RBSPICE SOC at FTECS connection tested and working**
- **Payload Telemetry File download scripts finished and tested**
- **SPICE Kernel download scripts in process**
- **SPICE processing software finished and tested**
  - Have yet to test SPICE interface into the MOC SPICE Time Validation System
- **CSV writing software written and tested**
- **CDF writing software in process – working with Bob McGuire**
  - Currently developing the CDF Skeletons for each product for each level
  - Need Level 2 Standard variable names for Autoplot compliance/usability
- **Software supporting the MOC and SOC filename convention built and tested**
- **File Characterization Processing written and tested**
- **Level 0 DB and File Production Processing written and Tested**
- **Level 1 (Rate) DB and File Production Processing in process**
  - Need to incorporate R vs R
- **Level 2 (Flux) DB and File Production Processing in process**
  - Just started working on XML definitions which drive this processing
  - Need to incorporate the appropriate calibration table into the process
- **Level 3 (Pitch Angles and 1st ADM) not started**
  - Need EMFISIS Mag data file formats and test files

RBSPICE Data Products - Summary



Data Level	Product Title	Contents	Daily Volume	Format	Latency	Frequency	Public Release
L0	Raw telemetry	Raw de-commutated telemetry received at RBSPICE-SOC	~414 MB	Binary	from Receipt (T_0)	daily	No
L1	Count Rates	Sorted, time-tagged, instrument separated cts/sec	~750 MB	ISTP Compliant CDF & ASCII (CSV)	T_0- + < 14 days	daily	Yes
L2	Calibrated Flux	Calibrated and corrected physical units	~1200 MB	ISTP Compliant CDF & ASCII (CSV)	T_0- + < 1 month	daily	Yes
L3	Pitch Angle and 1st Moment	Pitch angle distributions, 1st plasma moment	~1500 MB	ISTP Compliant CDF & ASCII (CSV)	T_0- + < 3 months*	daily	Yes
L4	2nd & 3rd Moments, and Phase Space Density	Plasma moments, PSD units, adiabatic invariants, magnetic coordinates	~30 MB	ISTP Compliant CDF & ASCII (CSV)	T_0 + < 1 year	Selected events	Yes

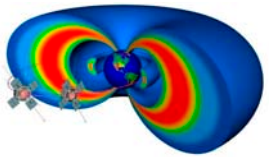
RBSPICE
Space Weather Channels



- RBSPICE SW data is derived from the TOF x Energy Proton and Ion Spectra accumulation rates.
  - The data is sent once per spin when enabled.
  - There are a programmable NF values per each spin for the fast channels, NF <=36.
  - There are a programmable NS values per each spin for the slow channels, NS <=36
  - The Fast channels are taken from the High Time resolution TOF x Proton Accumulation data.
  - The Slow channels are taken from the Low Time resolution Ion Spectra Accumulation Data.
    - The Slow 1 channel is an integral channel with no specific upper limit.

Channel	Elow (keV)	Emid (keV)	Ehi (keV)
Fast0	40.7	45	49.6
Fast1	89.9	100	109.7
Fast2	133.7	148	163
Fast3	242.4	269	295.6
Slow0	972	1021	1071
Slow1	9074	10000	

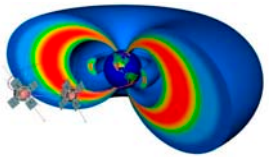
RBSPICE SOC Software Development
Rate and Flux Calculations



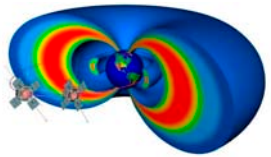
- **Following table shows the data products and fields that have rate data**

APID	Data Product	Data Pattern	Level 0 Field Names	Level 1 Field Names	Level 2 Field Names
0x311	Space Weather	Ion Species	Fast[0..3], Slow[0..1]	FRates[0..3][0..NF-1] Srates[0..1][0..NS-1]	LEFlux[0..5][0..NF-1] HEFlux[0..5][0..NS-1]
0x312	Elec Basic Rates	Electron Energy	SSD[0..5]		
0x313	Ion Basic Rates	Ion Energy	SSD[0..5]		
0x315	Ion Species Basic Rates	Ion Species	Start0, Stop0, Start[0..5], SSD[0..5]		
0x317	LER HTR Elec Spectra	Electron Energy	Counts[0..5][0..13]	Rates[0..5][0..13]	Flux[0..5][0..13]
0x318	HER LTR Ion Spectra	Ion Energy	Counts[0..5][0..63]	Rates[0..5][0..63]	Flux[0..5][0..63]
0x319	HER LTR Electron Spectra	Electron Energy	Counts[0..5][0..63]	Rates[0..5][0..63]	Flux[0..5][0..63]
0x31A	HER LTR TOFxE Ion Spectra	Ion Energy	Counts[0..5][0..63]	Rates[0..5][0..63]	Flux[0..5][0..63]
0x31B	TOFxE Proton Rates	Ion Species	Counts[0..5][0..13]	Rates[0..5][0..13]	Flux[0..5][0..13]
0x31C	TOFxE Non-Proton Rates	Ion Species	Counts[0..5][0..19]	Rates[0..5][0..19]	Flux[0..5][0..19]
0x31D	LR HTR TOFxPH Proton Rates	Ion Species	Counts[0..5][0..9]	Rates[0..5][0..9]	Flux[0..5][0..9]
0x31E	LR LTR TOFxPH Proton Rates	Ion Species	Counts[0..5][0..31]	Rates[0..5][0..31]	Flux[0..5][0..31]

RBSPICE SOC Backup Slides

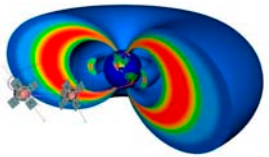


Higher Level Data Products – 1



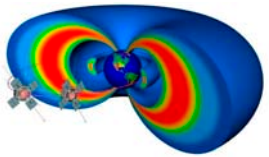
Product	Species	Energy Bins	L0 Data Type	L1 Data Type	L2 Data Type	L3 Data Type	L4 Data Type	Accumulation per (36 Sectors/Spin)
Ion Basic Rate	Ions	NA	Count	Rate	Flux			Every S sectors
Electron Basic Rate	Electrons	NA	Count	Rate	Flux			Every S sectors
Low Energy Resolution High Time Resolution Electron Species Rate	Electrons	14	Count	Spectra	Spectra Flux	PAD, 1st Adiabat		Every S sectors
High Energy Resolution Low Time Resolution Electron Species Rate	Electrons	64	Count	Spectra	Spectra Flux	PAD, 1st Adiabat		Every S*N1*N2 Sectors
High Energy Resolution Low Time Resolution Ion Species Rate	Ions	64	Count	Spectra	Spectra Flux	PAD, 1st Adiabat	PSD, 2nd, 3rd Adiabat, Pressure	Every S*N1*N2 Sectors
High Energy Resolution Low Time Resolution TOFxPH Proton Rate	Protons	32	Count	Spectra	Spectra Flux	PAD, 1st Adiabat	PSD, 2nd, 3rd Adiabat, Pressure	Every S*N1*N2 Sectors
TOFxE Proton Rate	Protons	14	Count	Spectra	Spectra Flux	PAD, 1st Adiabat	PSD, 2nd, 3rd Adiabat, Pressure	Every S sectors
TOFxE non Proton Rate	Heavy Ions	28	Count	Spectra	Spectra Flux	PAD, 1st Adiabat	PSD, 2nd, 3rd Adiabat, Pressure	Every S*N1 Sectors
Low Resolution High Time Resolution TOFxPH Proton Rate	Protons	10	Count	Spectra	Spectra Flux	PAD, 1st Adiabat	PSD, 2nd, 3rd Adiabat, Pressure	Every S sectors
TOFxE Ion Species	Ions	64	Count	Spectra	Spectra Flux	PAD, 1st Adiabat	PSD, 2nd, 3rd Adiabat, Pressure	Every S*N1*N2 sectors
Space Weather Rates	Protons/Ions	NA	Count	Rate	Flux			Every Spin

Higher Level Data Products – 2



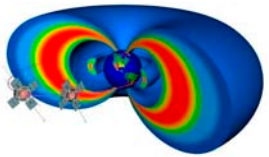
Product	Species	Energy Bins	L0 Data Type	L1 Data Type	L2 Data Type	L3 Data Type	L4 Data Type	Accumulation per (36 sectors / spin)
Ion Species Basic Rate	Ions	NA	Count	Rate	Flux			Every S sectors
Priority Events	NA	NA	Event	Rate	Flux			Every S sectors
Ion Energy Diagnostic Rate	Ions	NA	Count	Rate				Every S sectors
Ion Species Diagnostic Rate	Ions	NA	Count	Rate				Every S sectors
Raw Ion Species Events	Ions	NA	Event	Event				Every S sectors
Raw Electron Energy Events	Electrons	NA	Event	Event				Every S sectors
Raw Ion Energy Events	Ions	NA	Event	Event				Every S sectors
Auxiliary Data	NA	NA	Aux					Every spin
Critical Housekeeping Data	NA	NA	HSK					Every second
Magnetometer Data and Pointing Information			Mag			Pitch Angles		EMFISIS High Time Resolution Data

RBSPICE File System Specifications MOC and SOC



- **MOC Data Products**
  - MOC Filename Convention: rbspice_rbsp%_DDDD_APID_VV.ptp.gz
    - % = either “a” or “b” and stands for the space identifier
    - DDDD is days after launch
    - Prelaunch data named with DDDD=mddd where ddd is days before launch
    - Using August 15, 2012 for launch date
    - Example file: rbspice_em_m391_323_00.ptp.gz
      - Instrument = engineering model
      - 391 days before launch
      - APID = 323
  - MOC Directory Structure (as implemented in SOC):
    - Dataroot->RBSP->(SC)->(Instr)->Data->(Product)->(Phase)->(Year)
    - (SC) = EM or RBSPA or RBSPB
    - (Instr) = RBSPICE
    - (Product) – see product short name table
    - (Phase) = Test, PreIT, MSIM(#), Commissioning, Flight
    - (Year) = starting with data taken in 2011 till end of mission (2017?)

RBSPICE File System Specifications MOC and SOC



- **SOC Data Products**
  - SOC Archive Directory Filename Convention document
  - SOC Filename : rbsp-%-rbspice_type_descriptor_yyyymmdd_X.Y.Z.ext
    - % = A or B
    - Type = cal, com, it, lev-0, lev-1, lev-2, lev-3, lev-4, ms-3, ms-4
    - Descriptor = directory short name via product short name
    - Date = unfortunately this is month dom format
    - Version = X.Y.Z
      - X = Data format version
      - Y = Software product version
      - Z = Data revision number
    - Ext = cdf or csv
  - SOC Directory Structure (as implemented in SOC):
    - Dataroot->RBSP->(SC)->(Instr)->Data->(Product)->(Phase)->(Year)