

STEREO/WAVES

Interplanetary Radio Burst Tracker

- Stuart D. Bale, Keith Goetz, Milan Maksimovic

Science Working Group Teleconf

13 June 2014

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University of Minnesota
University of California - Berkeley
Goddard Space Flight Center
University of Colorado - LASP

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Status

- Both A & B instruments continue to function nominally
 - No unexpected resets or anomalies
 - No trend changes in HK health and safety parameters
- S/WAVES operations go well
 - Commands go up
 - Telemetry comes down – reduced to rate C – recently gappy
 - Associated data products are produced and made available
 - APL operations team continues to get us our bits – **thanks!**

Behind the Sun

As the angular separation between the STEREO s/c decreases during the 2014 – 2016 time frame new and unique observations of the electron exciter beam characteristics for solar type III bursts and for in-situ type II radiation can be made

Unique Science Questions:

I Analysis of In-situ signatures of Type III electron beams:

Spatial extent of the electron beam

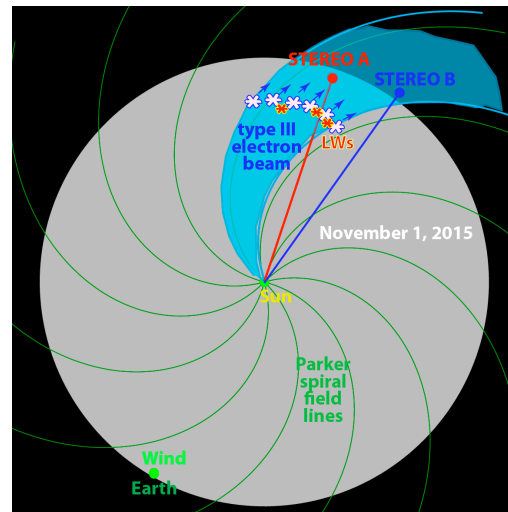
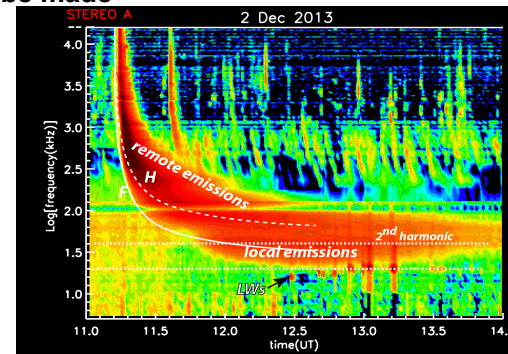
- what is the typical type III beam width near 1 AU for simple type III bursts?,
 - for multiple type III bursts?,
 - for intense, complex type IIIs (SAs), involving CMEs?

Radiation characteristic of the electron beam

- how are in-situ LWs and local emissions near 1 AU distributed longitudinally and radially within the electron beam?
- how do the intensities and durations of LWs and local emissions vary at different spatial locations within the electron beam?,
 - with plasma & magnetic field parameters?
 - with exciter speeds?
- what is the spatial range of the local emissions observed near 1 AU?
- how often are local emissions and LWs observed simultaneously near 1 AU?
- when both STEREOs observe local emissions, will this radiation in the type III source region have the same harmonic structure?,
 - will the TDS waveforms exhibit the same harmonic structure?

Exciter speeds within the beam

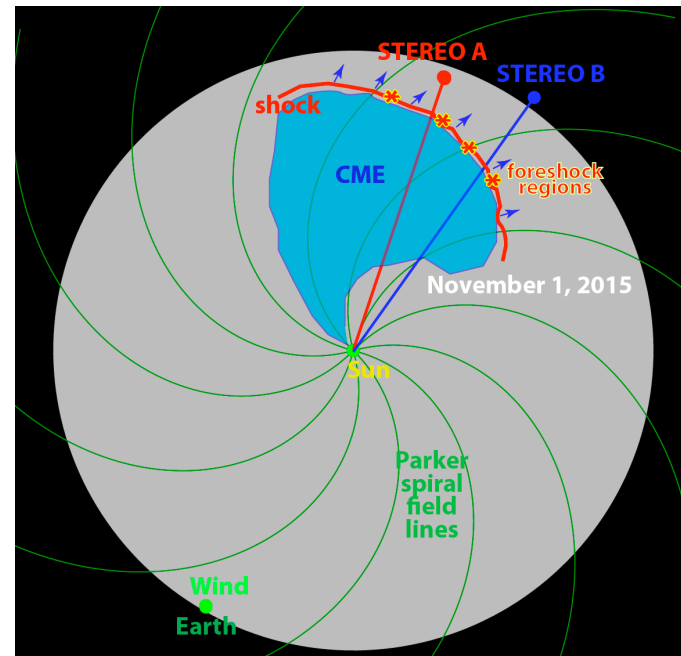
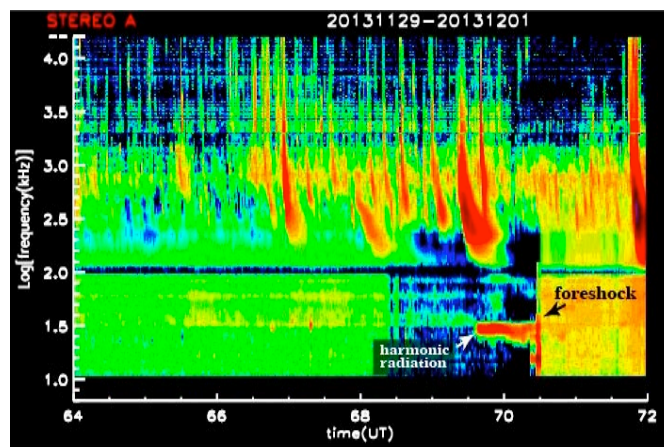
- is there an exciter speed variation across the beam?
- do the type III exciters decelerate as they propagate through the IPM to 1 AU?
- can we directly measure, by time-of-flight, the exciter speeds near 1 AU where in-situ plasma waves analyses are generally done and where theories are tested?



Behind the Sun

II Analysis of In-situ signatures of radiation generated by CME/shocks:

- how often are signatures of locally generated type II emissions near 1 AU observed?
- how are type II source foreshock regions distributed over the shock front near 1 AU?
- what is the spatial extent of a type II foreshock source region at the shock front near 1 AU?
- how long does a typical type II foreshock region generate radio emissions?
- how does the local type II radio intensity vary with shock location and geometry (quasi-perp vs. quasi-parallel)?
- how does the local type II intensity vary with the plasma and magnetic field parameters?
- why is remote type II radiation sometimes observed only at the fundamental of the plasma frequency, other times only at the harmonic, and sometimes at both?



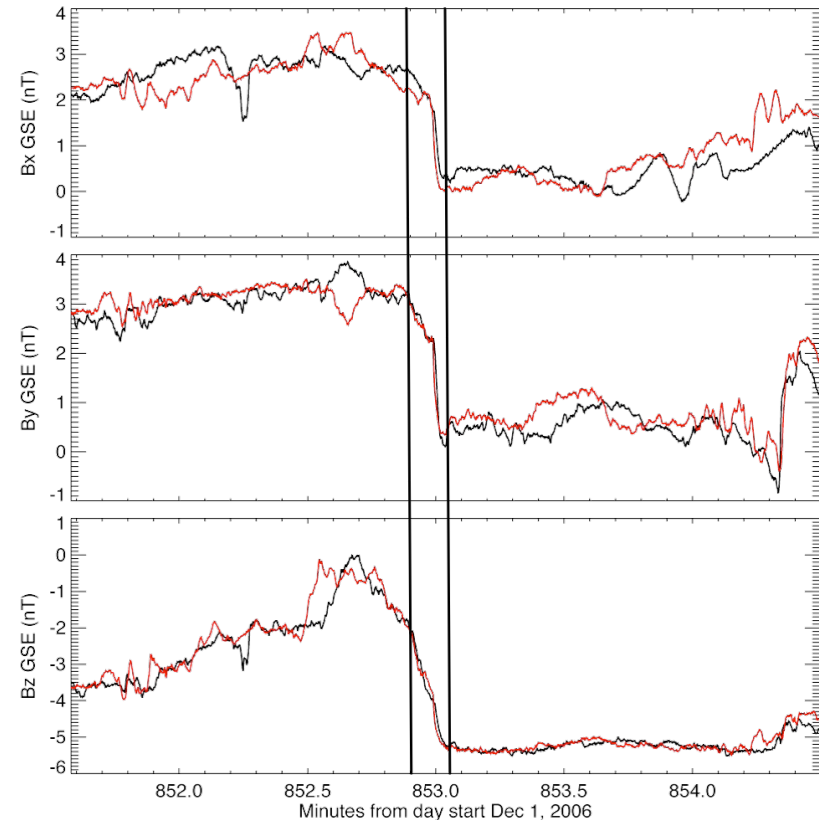
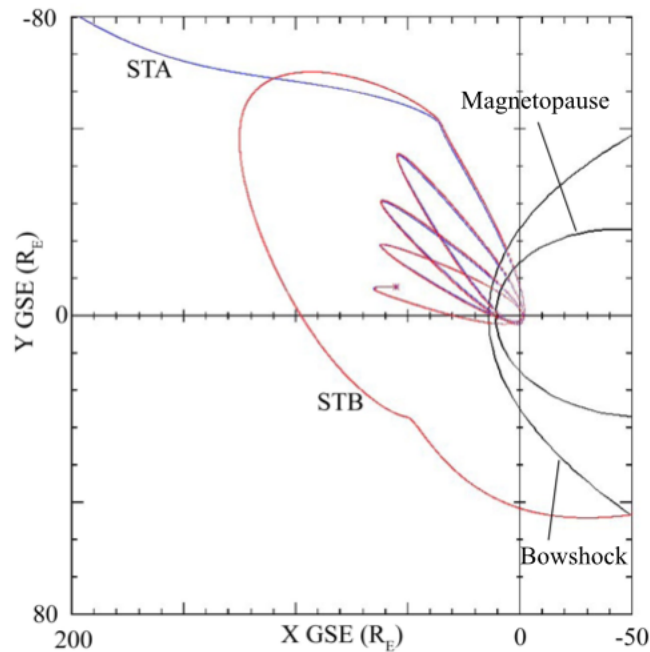
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Behind the Sun

Current Sheet (CS) Observations Between STEREO A and B at 1 AU



Fundamental question:

Are small- and large-scale CS fundamentally different?
(turbulent-driven vs. flux tubes representative of solar magnetic field origins?)

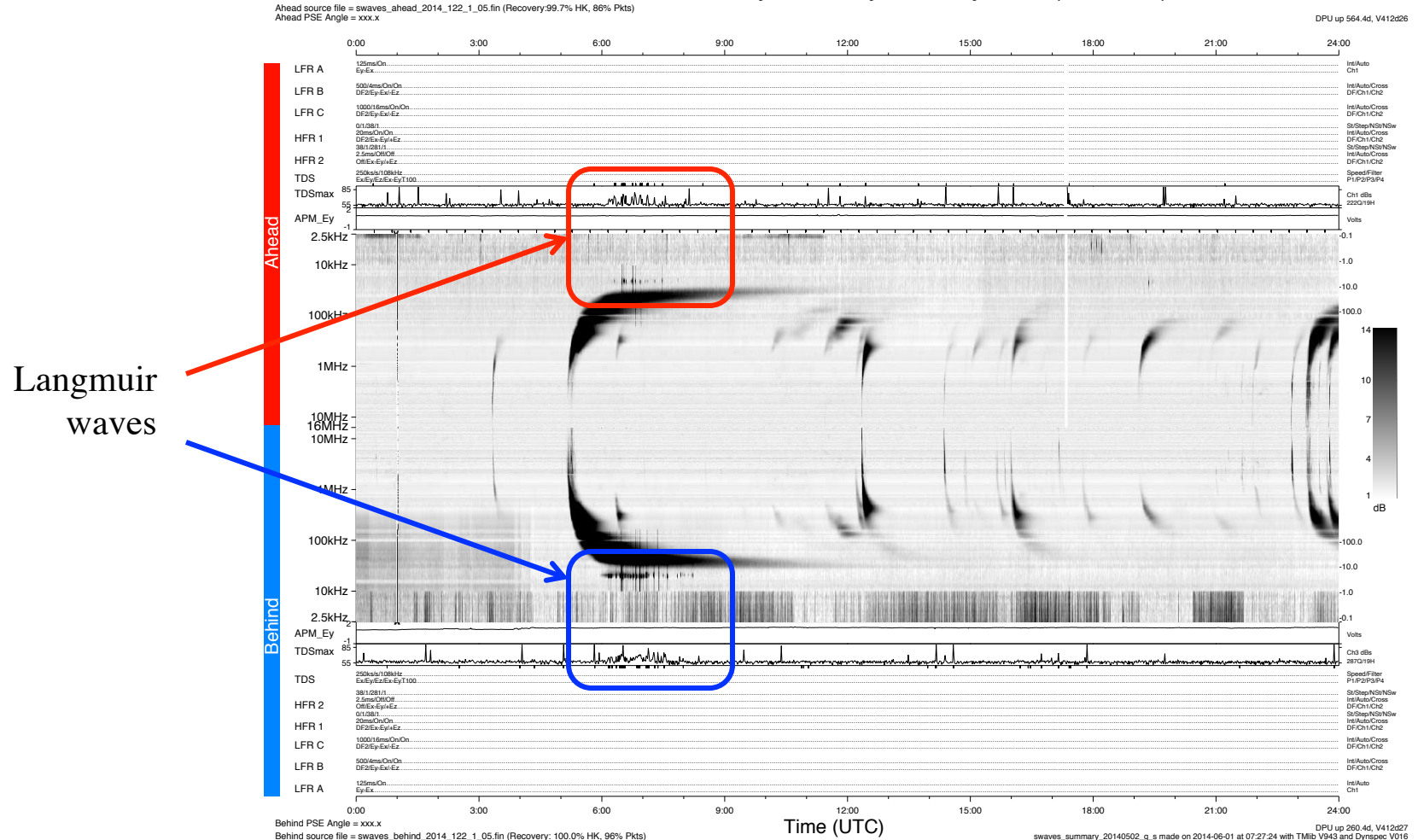
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Type III in-situ on A and B

STEREO/WAVES Daily Summary - 02-May-2014 (DOY 122)



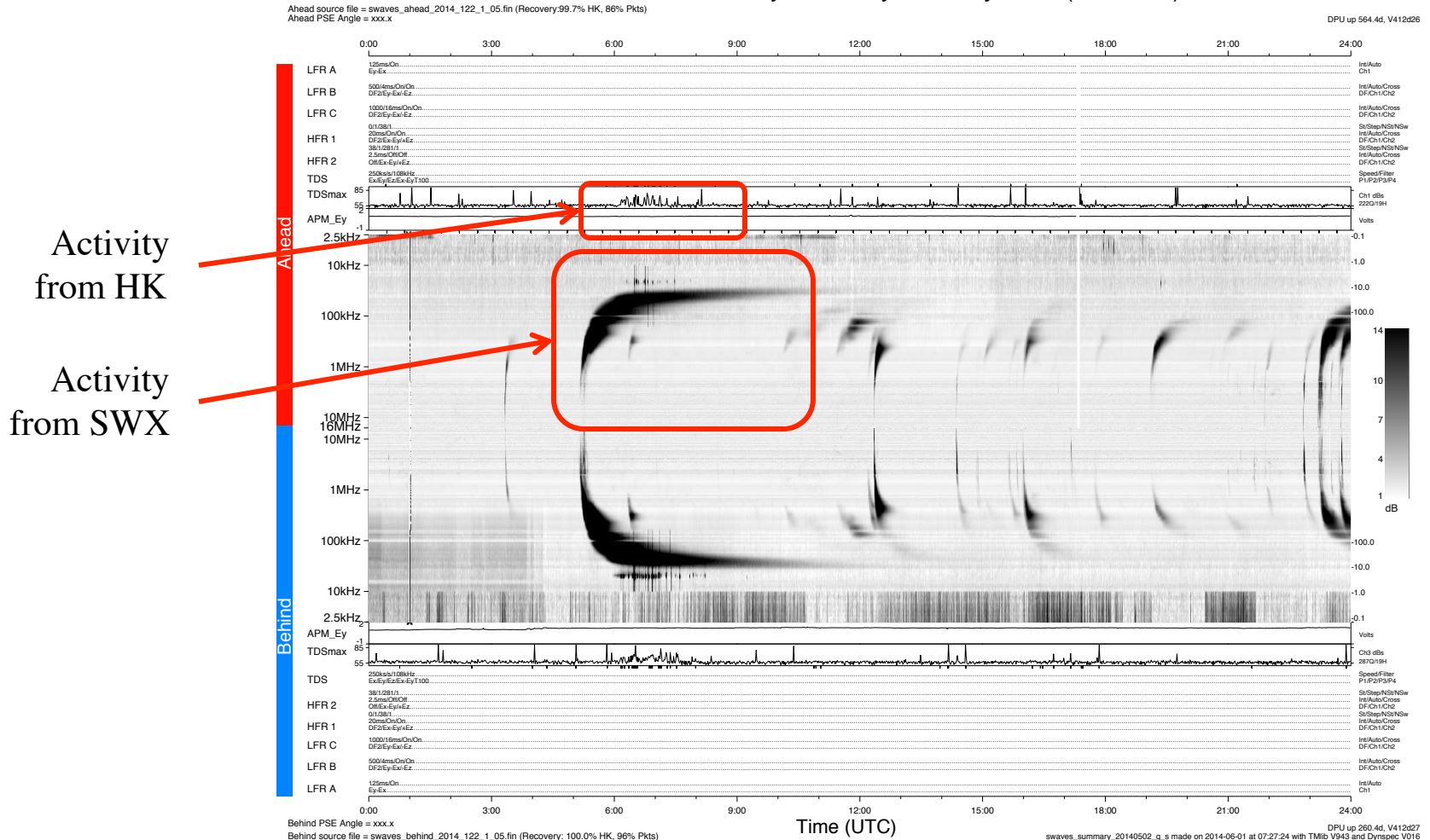
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Type III in-situ

STEREO/WAVES Daily Summary - 02-May-2014 (DOY 122)



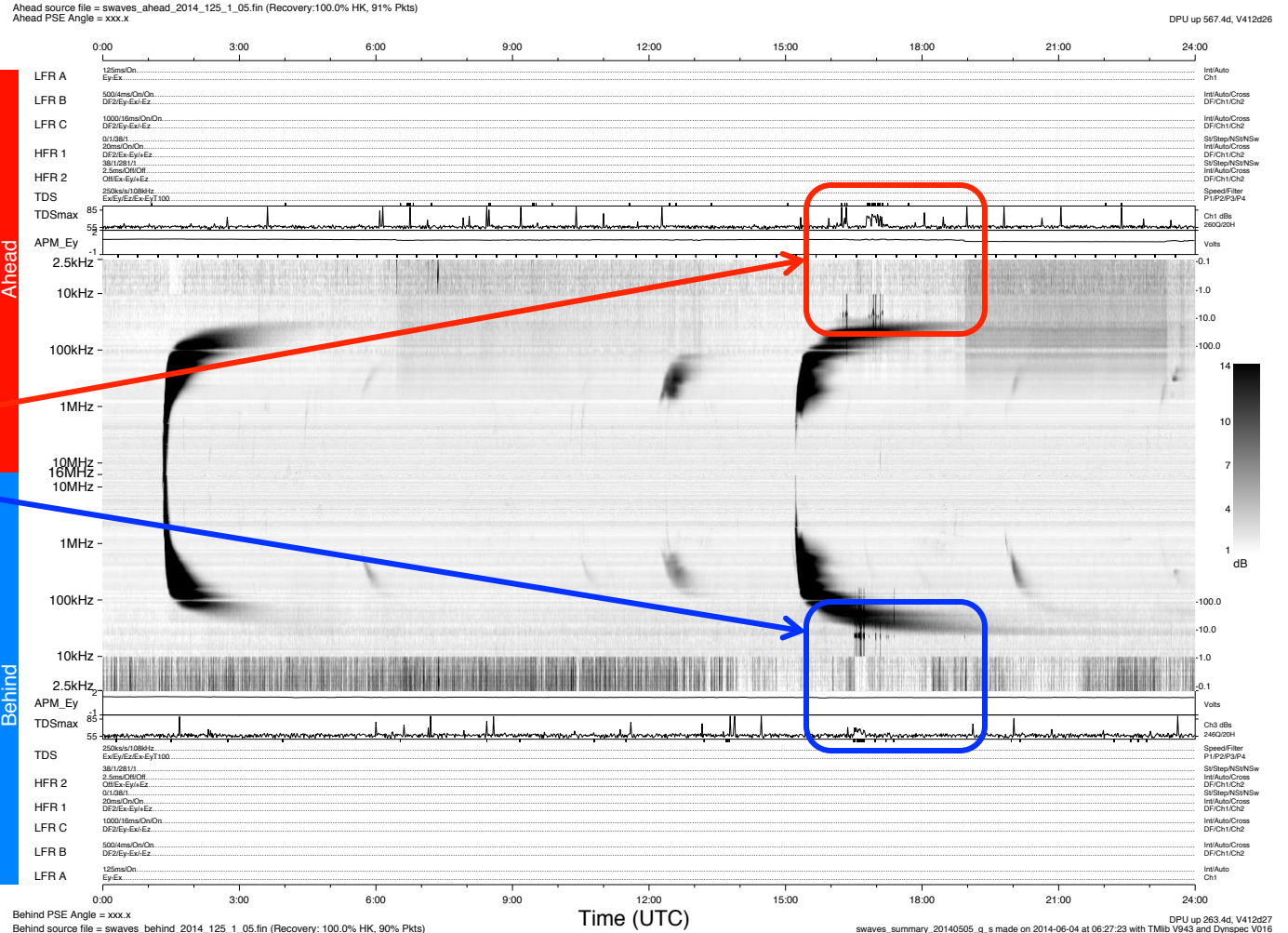
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Type III in-situ on A and B – again!

STEREO/WAVES Daily Summary - 05-May-2014 (DOY 125)



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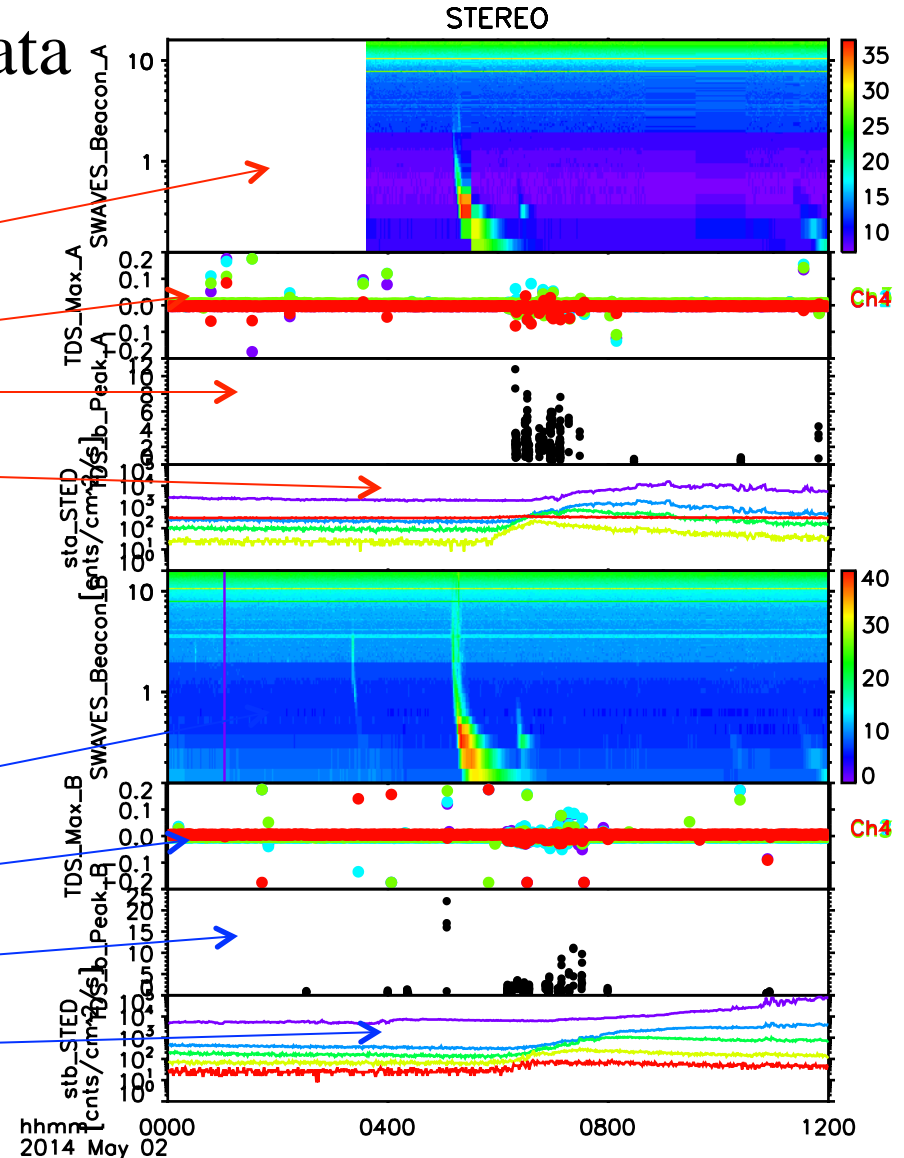
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Space Weather/Beacon/HK data

S/WAVES SWX STA
SWAVES HK STA
SWAVES TDS STA
IMPACT SWX STA

S/WAVES SWX STB
SWAVES HK STB
SWAVES TDS STB
IMPACT SWX STB



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Reduced operations

- S/WAVES normally uses 1 packet per second
 - 58 packets/minute of science by default (2,104 b/s)
 - Reduced as we move away
 - Rate A: 2,104
 - Rate B: 1,897
 - Rate C: 1,674
 - 1 packet per minute of HK (36 b/s)
 - 1 packet per minute of SWX (36 b/s)
- Reduced science can be done with HK and SWX alone
- Some science with ~3 hours per day
- Better science with A-B overlap
- Magnetic field vectors would be good too

Behind the Sun

- S/WAVES could do some good science
 - Luck might give us some **great** stuff
- We have not done a lot of power-ons in the blind
 - Would likely work perfectly well
- We do not have an internal non-volatile stored command table
- We could build and upload a flight software patch
 - Giving desired behind-the-sun mode and bit-rate by default
 - Telecommands – when available – would allow a return to *normal* mode
 - Writing to S/C SSR partition
 - FSW development is more or less straight forward but not funded
- Giving us great recorded far-side science
- IMPACT
 - MAG would be very useful
 - STE suprathermal electrons would be very useful