STEREO/WAVES

Interplanetary Radio Burst Tracker

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Science Working Group Teleconf

21 March 2014

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Status

- Both A & B receivers continue to function nominally
  - No unexpected resets or anomalies
  - No trend changes in HK health and safety parameters

- Operations continue to 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**!

- We had a problem in flight software
  - A counter overflowed when we have too much uptime
    - After 390 continuous days of uptime, a counter rolls over – becoming negative
    - After another 390 days, the problem corrects itself
  - Problem causes each of 8 LRS channels to shift one
    - Partially correctable on the ground
  - A software patch was prepared and uploaded on A and B

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Science

- S/WAVES Science team has been having monthly telecons with lots of nice new results
  - Dust
  - Type III phenomenology
  - LFR Direction-finding
  - Langmuir wave physics
  - In situ type II event (Dec 1, 2013)

- Annual S/WAVES team meetings in December at Berkeley

- CalTech STEREO/WIND/ACE science meeting

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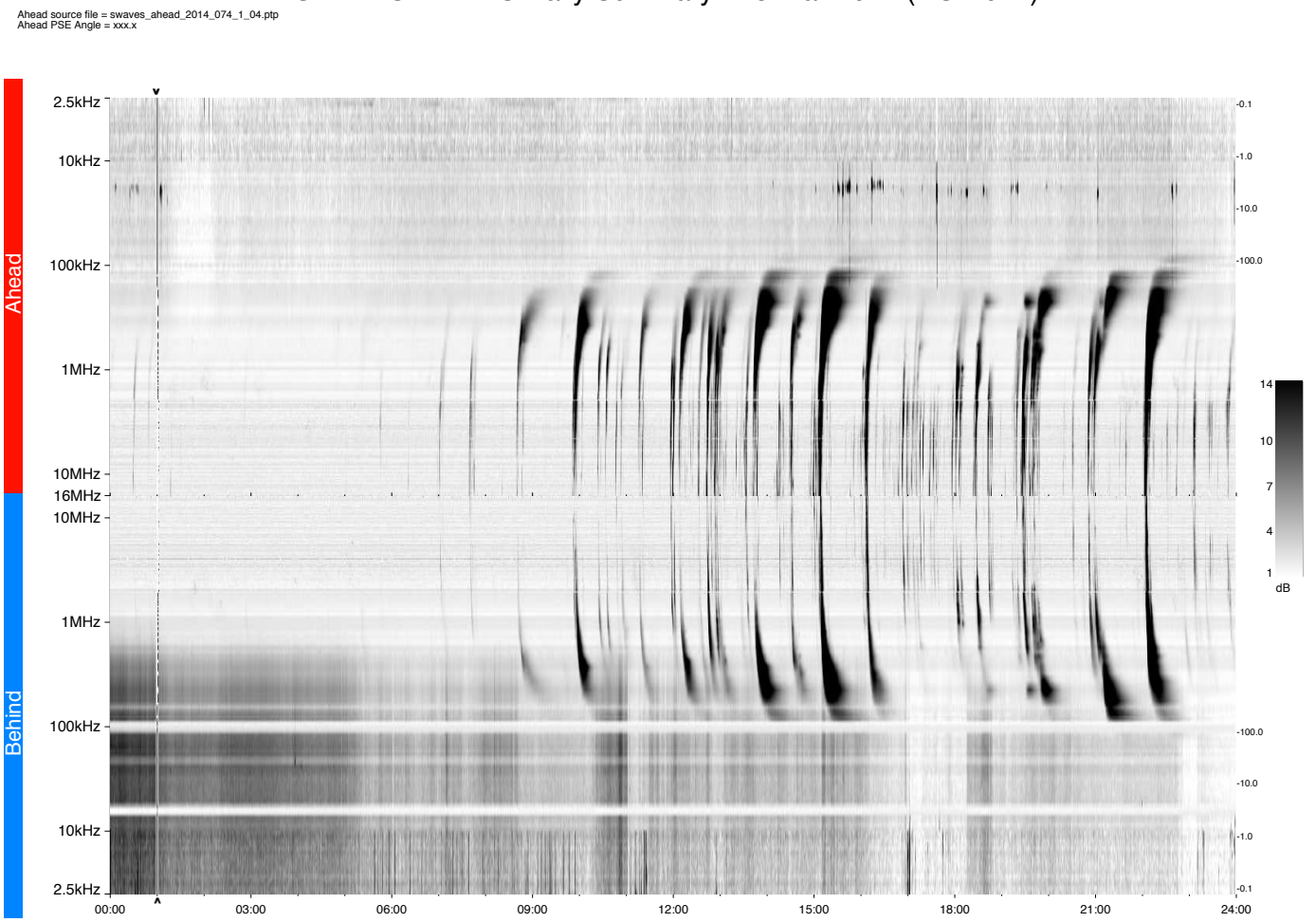
Daily summary plots available (http://swaves.gsfc.nasa.gov)



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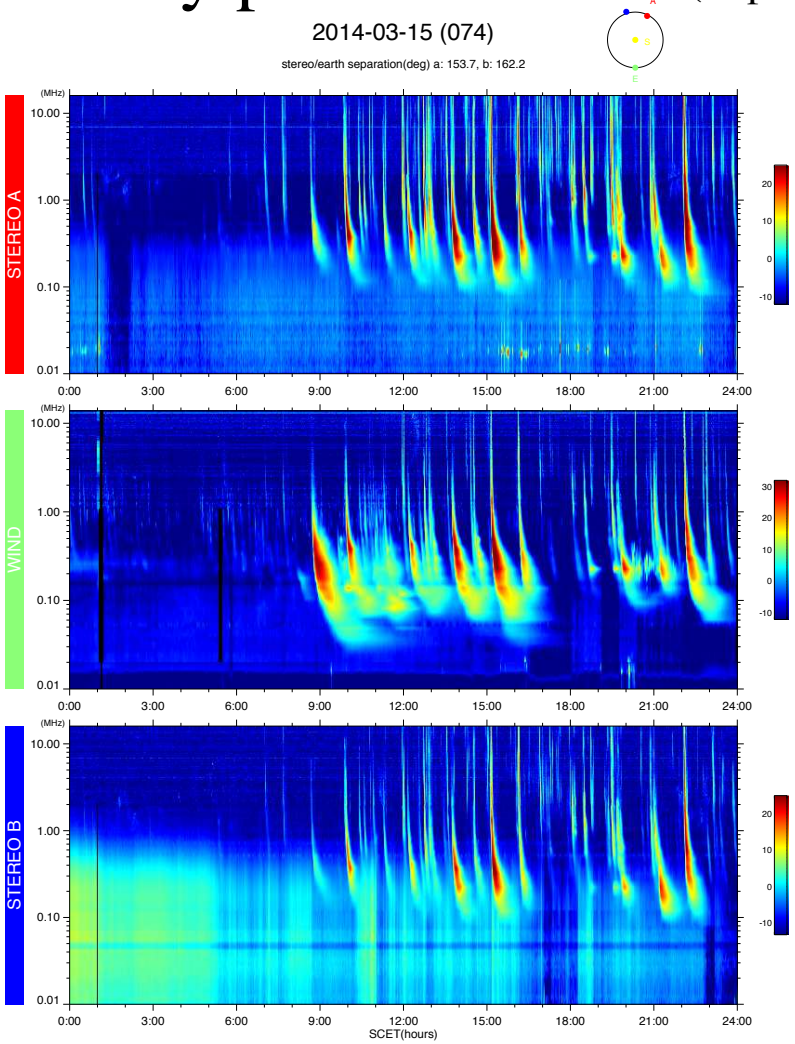

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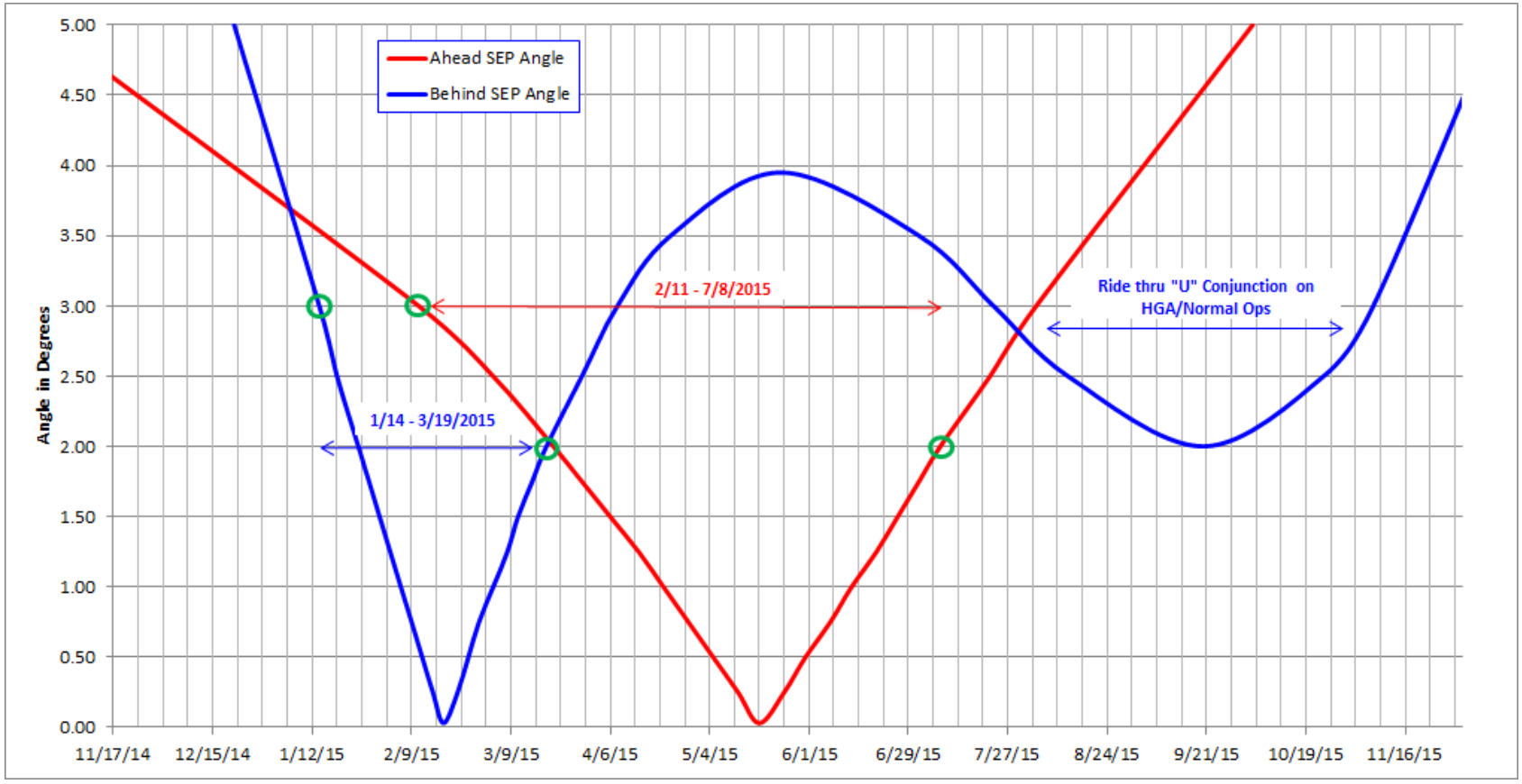
Behind the Sun



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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

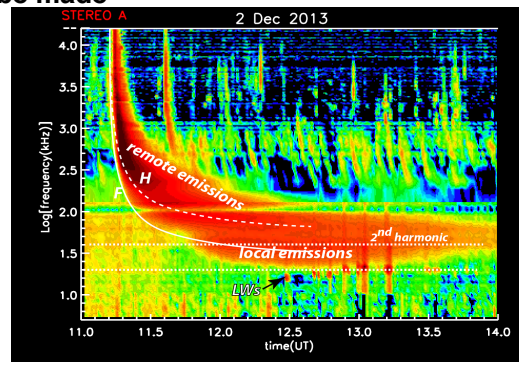
- what is the typical type III beam width near 1 AU for simple type III bursts?,
  - for multiple type III bursts?,
  - for intense, complex type IIIs (SAs), involving CMEs?

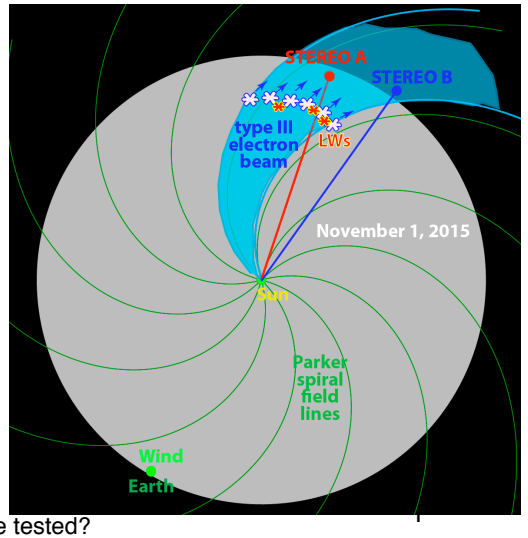
Radiation characteristic of the electron beam

- 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?





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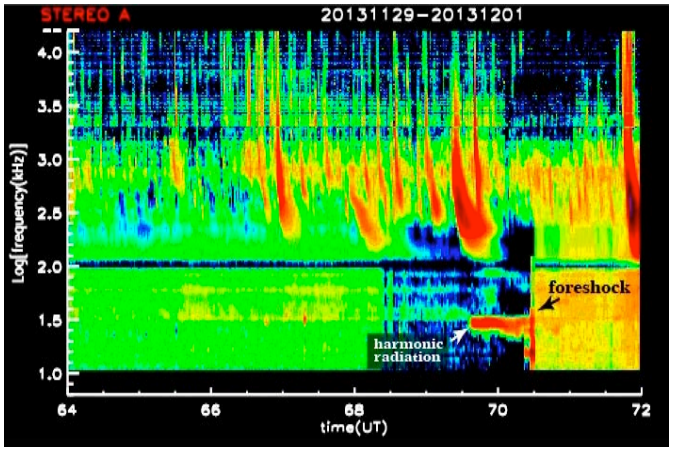
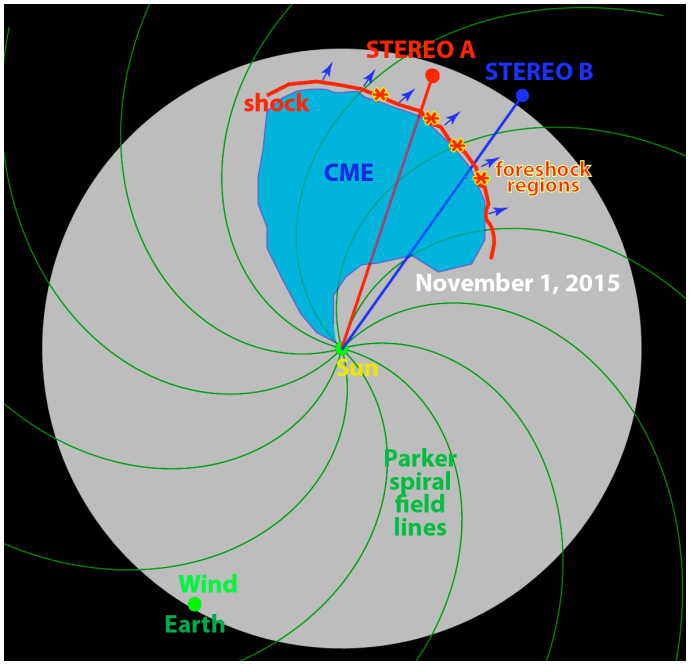
II Analysis of In-situ signatures of radiation generated by CME/shocks:

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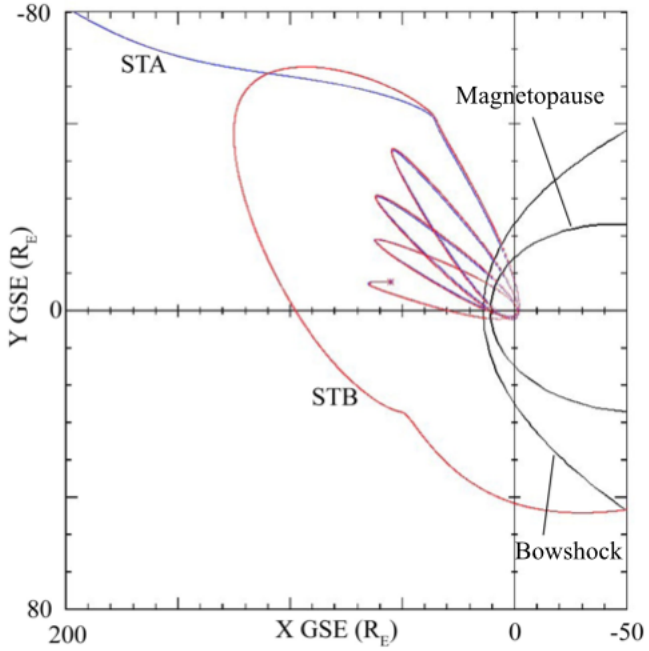
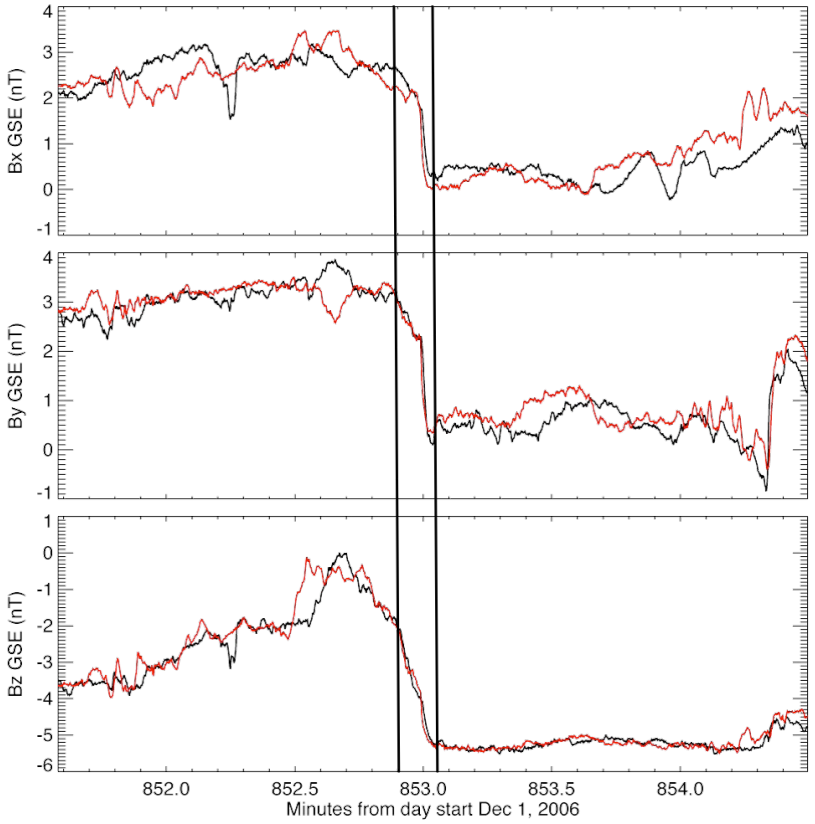
Current Sheet (CS) Observations Between STEREO A and B **at 1 AU**





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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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 useful too