

DIII-D Frontier Science Runtime

- FES has funded an additional week of DIII-D operation in FY2017 and FY2018 for fundamental plasma science experiments
- Goal: provide access to high-temperature (collisionless, high Lundquist number, etc) magnetized plasma for studying important processes relevant to, e.g., space and astrophysical plasmas
- Access to parameter regime and size not available in single-PI scale devices or in intermediate scale user facilities (e.g. LAPD, Big Red Ball)
- Hope to increase engagement with university programs; attract users outside the traditional laboratory plasma physics/fusion community to FES facilities

FY17 & FY18 Experiment Selection Process

- DIII-D FS Committee: Troy Carter (Chair FY18), Richard Buttery, Cary Forest, Greg Howes, Mark Koepke, Bill Heidbrink, Jan Egedal, Bill Daughton, John Sarff, George McKee, Don Spong, Carlos Paz-Soldan
- First two years, committee reached out to the community & solicited proposals
- Committee wanted to identify experiments that would address important fundamental science topics but also were well aligned with DIII-D capabilities and had a high likelihood of success
- Submitted proposals were voted on by the committee and a recommendation for run time allocation was made

FY 17 Selected Proposals

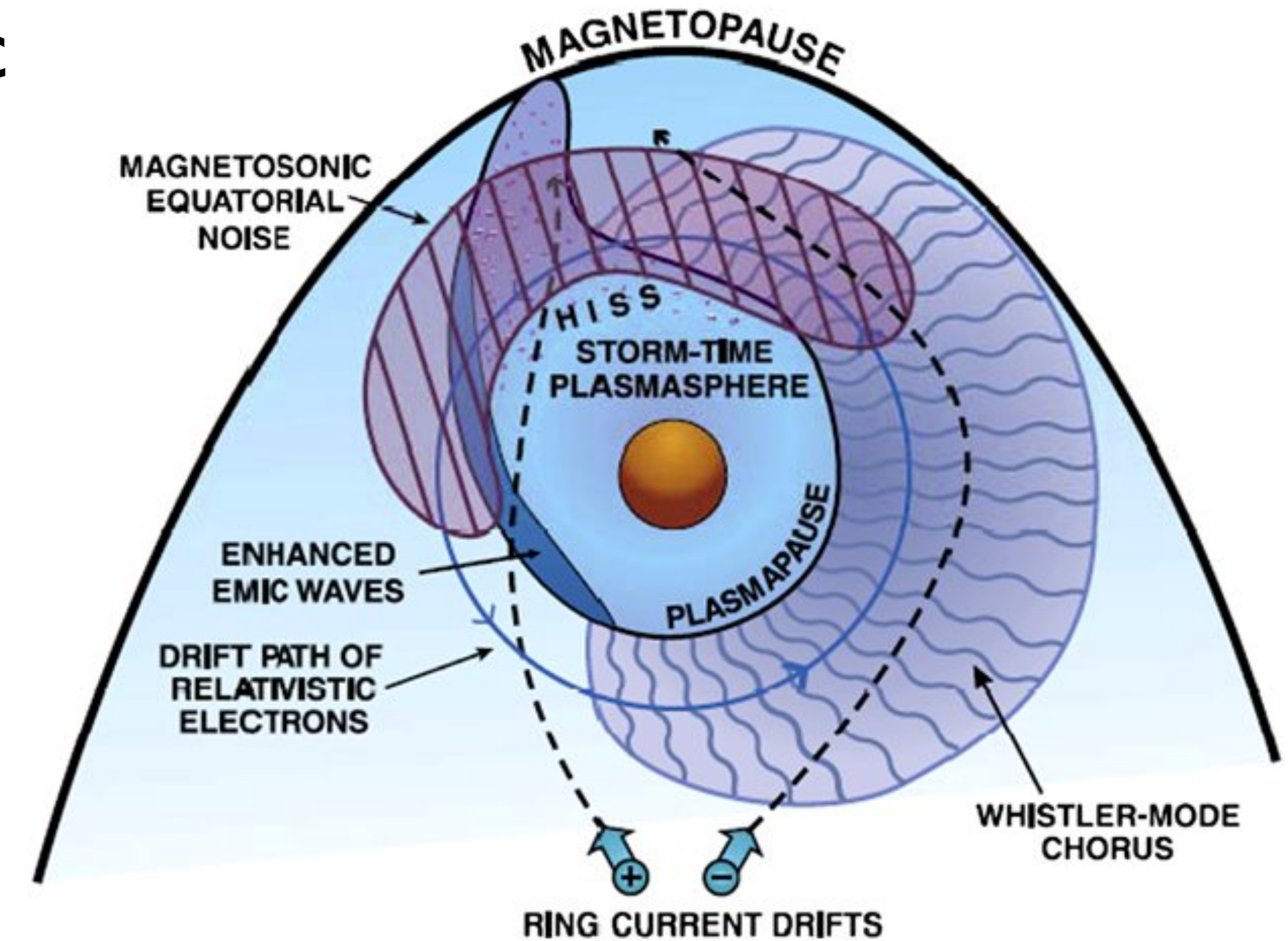
- **Self-organization of Unstable Flux Ropes - Universal Structures in Space/Astrophysical Plasmas:** Paolo Piovesan (Consorzio RFX)
- **Impact of Magnetic Perturbations on Turbulence – Zonal Flow Interactions and Saturation:** John Sarff (U. Wisconsin) (Invited Talk Zach Williams PI2, Wednesday Afternoon)
- **Alfvén/Whistler Fluctuations and Runaway Electrons:** Don Spong (ORNL) (Invited 2017 DPP)
- **Self-consistent Chaos in Magnetic Field Dynamics:** F. Skiff (Iowa)

FY18 Selected Proposals

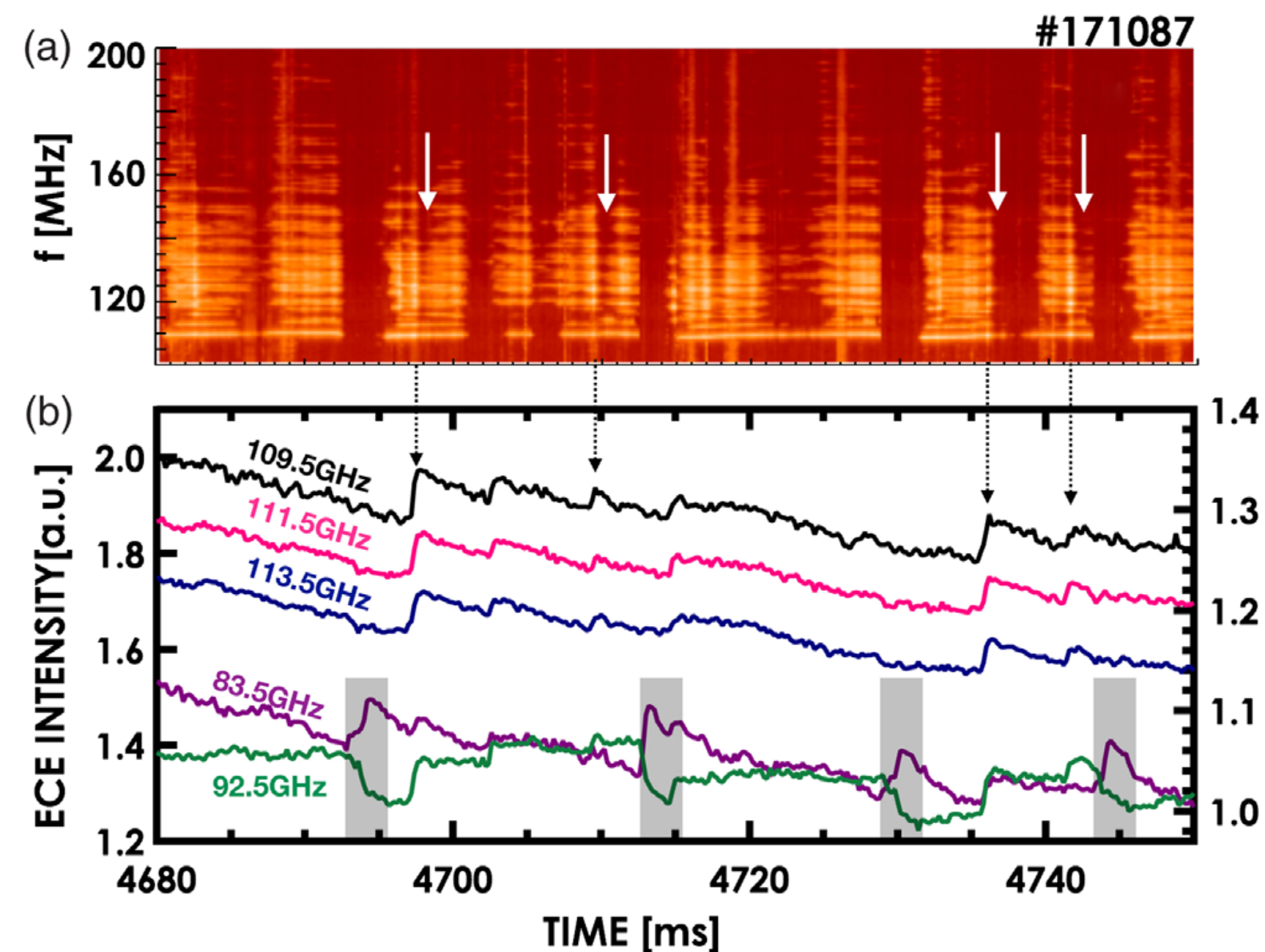
- **EMIC waves in multi-ion DIII-D Plasmas:** C. Kletzing (Iowa), S. Vincena (UCLA), W. Heidbrink (UCI) (G. Degrandchamp has poster on this experiment: NPI 1.00120)
- **Alfvén/Whistler Fluctuations and Runaway Electrons:** D. Spong (ORNL) (Poster from new data K. Gage NPI 1.00118)
- **Generation of positrons in DIII-D** P. Aleyinkov (IPP)
- **Reconnection Physics and Two Fluid MHD Tests Through Sawtooth Behavior:** W. Fox (PPPL)

Two DIII-D FS Experiments address physics important to Earth's Radiation Belts

- Radiation belts: population of trapped, energetic electrons (relativistic) and protons
- Significant interest in fundamental physics controlling these populations (processes that lead to energization and scattering/loss); also significant interest in controlling/remediating these populations
- Wave-particle interaction physics is key: Whistler waves and Electromagnetic Ion Cyclotron (EMIC) waves play important roles in energizing and scattering radiation belt particles

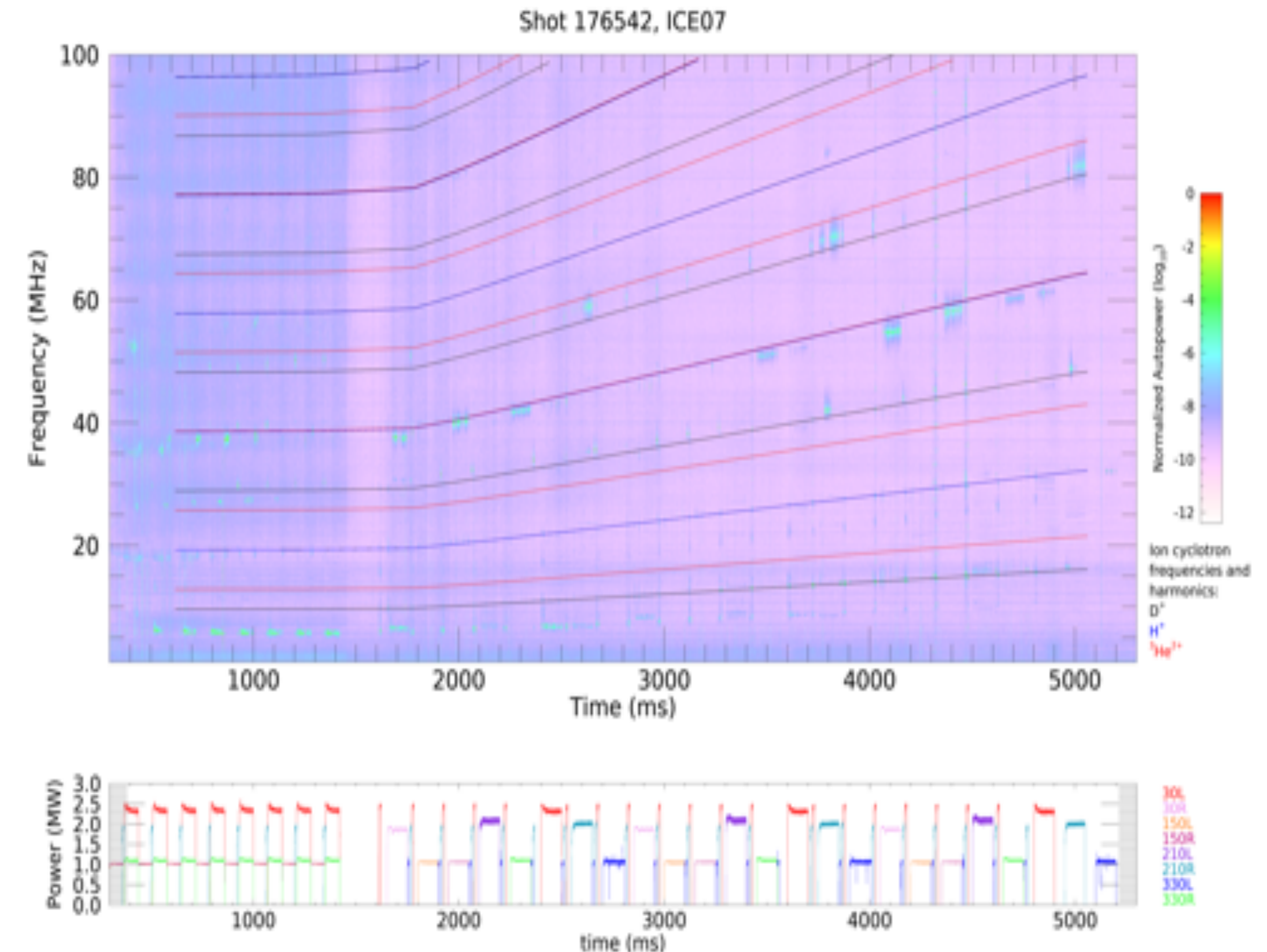


Two DIII-D FS Experiments address physics important to Earth's Radiation Belts



Nonlinear feedback between whistler waves and runaway electron population in DIII-D

Spong, et al. PRL 120, 155002 (2018)



EMIC waves in DIII-D: H/D/He3 plasmas, see AEs excited by NBI ions in “upper band”

What's Next? Possible Runtime in FY20

- Due to DIII-D LTO, no plan for FS runtime process for FY19
- FES may support runtime in FY20
- Question to the community: does it make sense to continue (what is the level of interest in this runtime (can potentially gauge by asking for proposals)) — should take stock of FY17, FY18 results
- Need to move to open process (either proposal solicitation or open ROF-like process) for selection of run time