ATI Proposal for UWB RF Digitization and RFI Excision
Initial Planning Meeting
2018-09-13

- ATI Overview
  - Due Nov 15 @ 17:00 local time
  - Total budget is $8M for ~10 projects
    - Aim for $800k total budget
    - Should include travel funds to annual NSF PI meeting
  - Supports innovative/transformative technologies
  - Enables new observations and science
  - Encourages publically accessible technologies and data
  - Supports long-duration efforts
  - Specifically mentions “methods for observing at wavelengths where there is heavy terrestrial EMI”
    - Also mentions spectrum management
  - Specific review criteria
    - Scientific motivation
    - Technological innovation
    - Public accessibility
- Preliminary Concepts for UWB RF digitization and RFI excision
  - Motivation
    - Primary Science: High precision pulsar timing/NANOGrav
    - Secondary Science: Wideband spectral studies of magnetars, FRBs, and other transients
      - Any RRL or astrochemistry applications?
  - Innovation
    - Newest, fast ADCs with high bit depth for wider bandwidth
    - New algorithms for real-time RFI excision
    - Better RFI resistence
  - Public accessibility
    - Facility instrument
    - Firmware and software publicly available
      - Relevant for existing and future observatories
  - Long-term vision
    - Frame this effort as a pilot program for eventually sampling as close to RF as possible for all GBT instruments
      - Goal is to allow for instantaneous coverage of full bandwidth provided by single-feed Rxs, and greater flexibility in trading off bandwidth/pixels for multi-pixel Rxs
      - Transformative upgrade of the GBT
      - Improve RFI resistance for all GBT receivers
      - Upgrade existing IF system with state-of-the-art technology
      - Reduce operational complexity and improve effiency
  - Broader Impacts
    - Question: Which of the above is broader impacts (e.g. relevance for other observatories)?
    - Question: What education/training programs naturally fit into this proposal?

- Discussion
  - Is there additional science that this project would support?
  - Does the above capture the most important technical developments and innovations?
  - Can we tie this into spectrum management through RFI excision?
  - How much emphasis should we place on future plans?What operational impact would this have? What do we need to plan for?
    - RFI shielding of ADCs is one obvious issue
    - Do we have the necessary network infrastructure to support this?
  - How do we frame this in the context of the UWB Rx effort?
    - No cost sharing is allowed but can we mention Moore and GBO funding for Rx as a sign of outside support?
    - We *think* we can use an expanded VEGAS for the UWB – need to be careful about how we address the need for sampling at RF
      - There is uncertainty about whether the existing system will be sufficiently resistant to RFI
  - Does this overlap with any other known submissions?
    - Richard Prestage may be planning a more general RFI mitigation proposal
  - Who else should be directly involved in this proposal?
    - CASPER/Breakthrough are obvious potential collaborators
    - Should NANOGrav be directly involved?
- Action Plan/Items
  - Draft scientific justification (Ryan, Scott, GBO sci. staff)
  - Come up with more detailed technical plan (Digital and microwave groups)
    - Identify and cost samplers
    - Estimate development efforts for firmware and RFI excision
    - Plan for how this interfaces/integrates into UWB Rx
      - Should give some consideration to how we would do this with other Rxs
  - Identify any other hardware or infrastructure development
    - Shielding (IPG group)
    - Networking? (Computing)
  - Identify necessary software resources
    - M&C integration
    - If we can output data packets with the same format as GUPPI/VEGAS, additional software development should be minimal
  - Identify effort needed by any other groups/divisions (Laura, Marty)
  - Identify broader impacts (Ryan, Sue Ann, et al.)
  - Identify measurable milestones and translate these into a project plan (Laura, Marty)
  - Continue any internal approvals/review (Laura, Marty, Ryan)
    - When is the internal due date?
  - Reach out to other potential collaborators (Ryan)
  - Contact program officer to ask about long-duration projects and how to address Moore/GBO support for Rx (Ryan)
  - Anything else?
- AOB