The Green Bank Observatory is a partnering institution in an NSF-INCLUDES Alliance called the First 2 Network. The First 2 Network aims to improve the persistence of STEM undergraduates during the first two years of their college education and targets first generation college students who face obstacles over and above their non-first generation peers (EG: Cataldi, et.al., 2018). The Alliance focuses on the first two years of college because it is within these years that more than 50% of STEM majors leave those majors (Chen, 2013).

Leveraging our participation in the NSF-INCLUDES program, our plan for broadening participation in this proposal is to offer a two-week internship experience to rising college freshmen and sophomores- engaging them in authentic participation in the development of the UWB-DSP. It is well known that engaging students in research early in their college careers can have a potent impact on their persistence as STEM majors (EG: Lave and Wenger, 1991, Graham et al., 2013). However, most student research experiences including our own Research Experienced for Undergraduates (REU) program generally targets rising Juniors and Seniors. Through this internship we will be providing a first research experience, and preparing younger students for future success in programs like REU- including our own.

The Green Bank Observatory piloted a 2-week duration internships for early first generation undergraduates in 2017 with clear success. Pre/post survey results revealed:

* High levels of STEM efficacy at both pre- and posttest, and even higher by posttest.
* Interns tended to be less concerned about barriers to STEM persistence by posttest.
* Interns were somewhat more likely to report that professors lecturing a lot in their STEM courses would be a potential challenge.
* Interns were significantly less likely to be concerned that they would be intimidated by professors.
* Interns were significantly less likely to be concerned that they wouldn’t know where to get help when they feel depressed or worried.

A two-week internship is also practical as a first experience. The two-week duration allows students to work summer jobs which is a necessary enterprise for many first generation students. The key is finding the right research project that is amendable to team work and where real progress can be made in the time frame.

**Internship Activities.** Twenty student interns will participate in the UWB-DSP research and development effort in year 2 of the project. They will work in teams to analyze archived RFI data to curate a categorized and searchable database that includes common RFI features such as frequency, bandwidth, amplitude and duration. They will test sources of RFI in our anechoic chamber to develop RFI exemplars. This work is important for testing RFI removal algorithms in a controlled manner.

Their research will be scaffolded with “just in time” learning through hands-on activities and talks on Radio Astronomy science and instrumentation, and digital signal processing. Additionally, UWB-DSP Interns will be completely immersed in the Green Bank Observatory academic culture during their residence, participating in regular activities such as colloquia and organized REU summer student activities.

We will also enlist the students in our existing REU program in near-peer mentoring. Working with GBO Educational staff, they will hold workshops to prepare our participants for college success and for future Internship experiences. Sessions will include: ”What I wish someone had told me when I started college”, Time Management, Study Tips, and Applying for Internships.

At the end of the two-week internship student teams will present the results of their work in a student colloquium for GBO staff.

**Participant Recruitment and Selection.** First generation (which generally includes URM students) STEM undergraduate students will be targeted for participation in the UWB-DSP Internship. Rising freshmen and sophomores will be eligible to apply. We will advertise through the First 2 Network and other NSF INCLUDES Alliances and Launch Pilot projects via the NSF INCLUDES National Hub website.

**Evaluation.** We will employ the Undergraduate Research Student Self-Assessment Survey to measure student outcomes related to internship participation including acquisition of STEM skills, leadership, confidence and STEM identity. (Weston, T. J., et. al., 2015). We will also participate in evaluation measures designed by the First 2 Network and provide data to the Network to add to the growing knowledge base of what works.

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