

GRCon 2022
DRAFT-Abstract (Finger, Hansen, Hearn)-DRAFT

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Re: Abstract Submission – GRCon 2022

Title: Open-Source Antenna Pattern Measurement System: SDR-based Student Research and Development

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Weber State University (WSU) has developed an ‘open-source’ antenna-pattern measurement system physically comprised of software-defined radios (SDRs) and 3-D printed hardware. An Arduino microcontroller and low-cost stepper motors make up the position control system. The present WSU ‘open-source’ prototype integrates Python, GNU Radio Companion, and Linux on a single laptop PC. GNU Radio Companion software controls the RF link between the source (Tx) and the antenna-under-test (AUT). AUT position is controlled via Python commands sent to the GRBL-configured Arduino. The system is portable and used for education- and industry-outreach.

The Utah NASA Space Grant Consortium has generously supported engineering students on the program. Multiple student projects have investigated methods to improve measurement fidelity in non-optimal environments. For example, excellent agreement between measured and simulated radiation patterns has been obtained using coherent AM detection.

The following paper summarizes the development of the current system and presents results from student research. In addition, efforts are underway to improve the mechanical design, post-processing capabilities, and software-version compatibility. Enhanced post-processing (e.g. 3-D radiation pattern plot) is one improvement discussed in the paper.