

Research Opportunities in Electromagnetics, Astronomy, and Acoustics

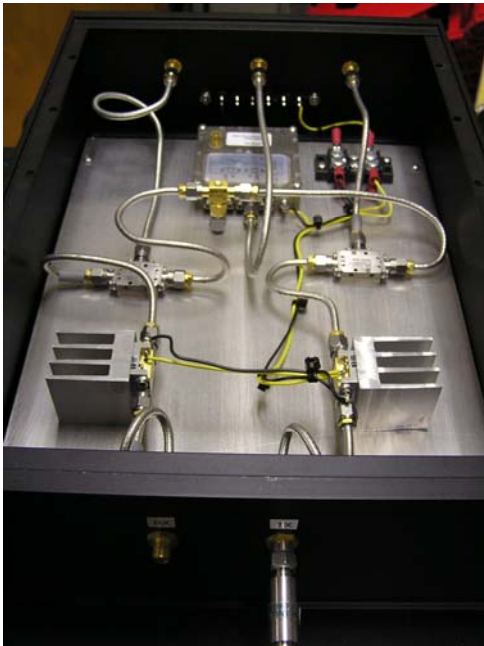
1. Radar system analysis
2. Optical astronomy
3. Radio astronomy
4. Sound/vibration measurement

Radar System Analysis

Project Goal: Use computer simulation and emulation to evaluate the performance of advanced instrumentation radar systems.

Examples:

1. Random Noise Radar
2. Inverse Synthetic Aperture Radar
3. Portable FMCW Radar



Why?

1. Stealthy radar for low-observable platforms
2. Location of radar scattering centers
3. Anti-missile applications

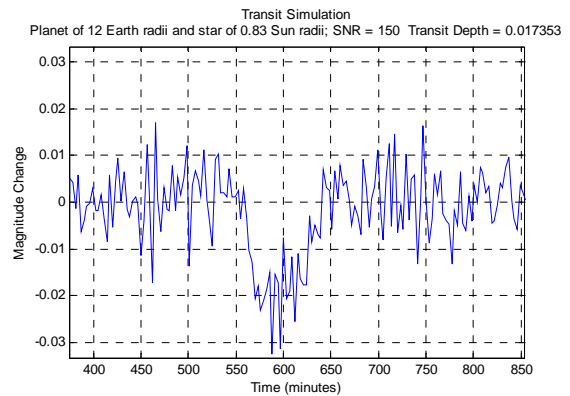
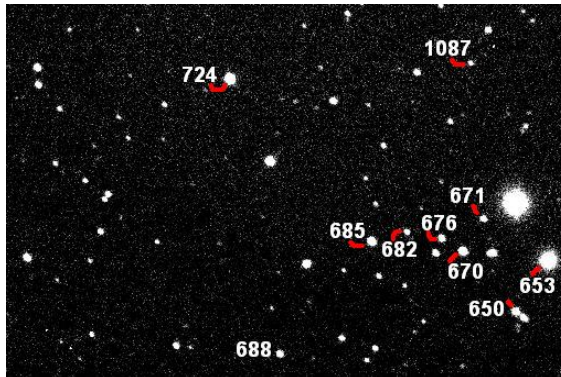
Sponsor: Star Dynamics Corporation

Specific Tasks: Project-dependent, but most involve:

- MATLAB simulation
- LabView emulation
- Analysis of data from prototype hardware

Optical Astronomy: Asteroid and Variable Star Photometry

Project Goal: Measure variation in light intensity from asteroids and/or variable stars using the 10" Lundin telescope at Weaver Observatory and CCD camera



Why? Contribute to study of asteroid properties

- Specific Tasks:
1. Review previous work
 2. Identify candidate asteroids and/or variable stars
 3. Calibrate system (telescope, camera, software)
 4. Collect data
 5. Analyze data

**Radio Astronomy: 1) Twin-helix radio telescope
2) Signal Detection Algorithms for SETI**

1) Project Goal: Calibrate and operate receiver for twin-helix radio telescope



Why? Several objects in the sky (the Sun, the galactic center, Cass A) radiate sufficiently strongly to permit detection by a radio telescope with relatively small aperture.

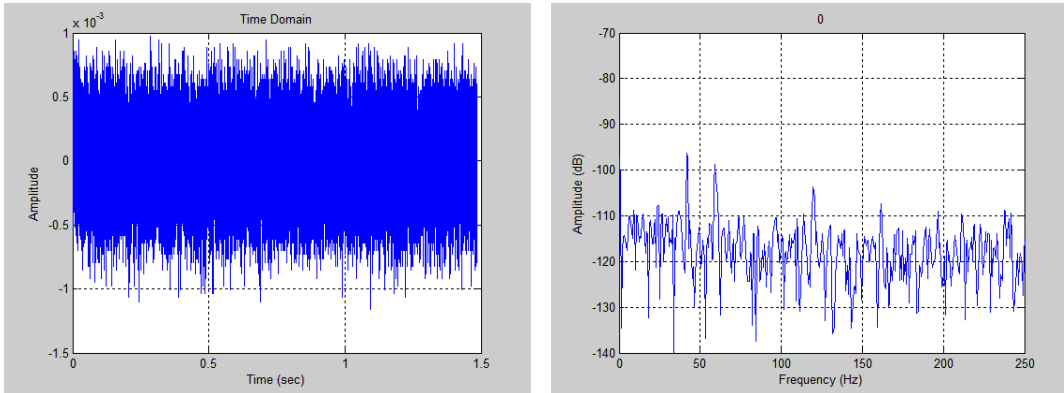
Status: Antennas constructed.
Receiver designed, fabricated and tested.
Receiver calibrated
Data acquisition system developed.
Antenna mismatch detected.

Specific tasks: Learn antenna and receiver technology
Identify cause of antenna mismatch
Test entire system using artificial and natural sources.

2) Project Goal: Evaluate the ability of the FFT and alternative algorithms to detect signals with novel time- and frequency-domain characteristics

Sound & Vibration Measurement and Analysis

Project Goal: Develop and use instrumentation and software to measure the intensity of sound and low-frequency vibrations in the environment.



Why? Environmental improvement through physics
General: Noise pollution
Specific: Homeowner Disturbance

Specific Tasks:

1. Review previous work
2. Design data-collection system
3. Assemble and test system
4. Collect data
5. Analyze data