The ability to accurately detect the location of radio signals provides a wide variety of uses ranging from determining the location of a distress signal from a party or individual in need of help to locating an interfering signal that is jamming communications. The main goal of the Geolocation of RF Emitters project was to create an RF sensor which could be remotely deployed and report acquired RF data back wirelessly to a central hub for further analysis to ultimately find position of the RF signal. Information passed back to the central hub includes: Radio Signal Strength (RSS), Angle of Arrival of signal (AOA), Geo-Location of sensor (via GPS), and Phase. The entire system is designed to be scalable such that by increasing the number sensors which are deployed, the more accurate the position location of the RF emitter will be. With a small, light weight interface unit, known as a Universal Software Radio Peripheral (USRP), coupled with GPS data and a computer, our design has the ability to dynamically receive a wide range of radio signals and pinpoint their location.

**Design Concept**

![USRP1 - Software Radio](image)

The design concept includes a USRP (Universal Software Radio Peripheral) connected to two antennas, a BeagleBone Black, and a GPS unit. The USRP relays information to the BeagleBone, which processes the data using GNU radio software. The GPS provides location information, which is used to determine the signal strength of the RF emitter. The data is then communicated back to a central hub, where it is analyzed to determine the location of the RF emitter.

**Design Requirements**

- **Accurate Measurement of Signal Strength:**
  The ability to accurately measure the signal strength of the RF emitter.

- **Angle of Arrival:**
  Angle of arrival will be the measurement used to determine from which direction the emitter is relative to the receiver.

- **Ability of Mobilization:**
  A bulky fragile system would not only be difficult to move but could be susceptible to damage causing inaccurate reading.

**Project Summary**

Receiving the radio frequency through the two antennas connected to the RX Daughterboard the USRP relays information data to the BeagleBone. The BeagleBone, running the GNU radio software, does all necessary computations and manipulation. Along with the GPS information, all information is sent to the host computer where the end result is displayed through an interactive user interface.

**Hardware & Software**

**Hardware:**
- USRP 1
- BeagleBone Black
- GPS
- RX Daughterboard

**Software:**
- GNU Software Spectrum Display
- GNU Radio Software
- USRP and antennas field testing

**Budget**

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<th>Components</th>
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<td>USRP 1</td>
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<td>BasicRX Daughterboard</td>
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**Sponsor:** Department of ECE  
**Facilitator:** Dr. Jian Ren

**Team 2 - Geolocation of RF Emitter**

**Member (Left to Right Below):**
- Viktor Simovski: Team Leader
- George Godby: Document Prep
- Kenneth Wilkins: Web Design
- Matthew Roach: Presentation Prep
- Justin Mascotto: Lab Coordinator

**Job:**
- Team Leader
- Document Prep
- Web Design
- Presentation Prep
- Lab Coordinator