# Telemedicine

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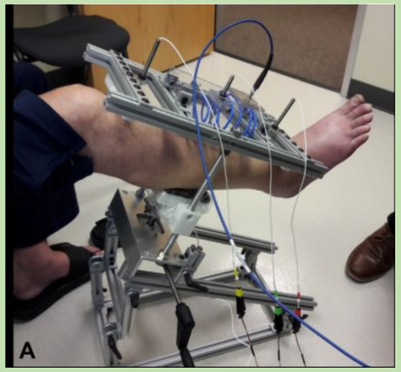
**Mission: Develop a user-friendly system for a portable medical device that can securely gather and transmit patient data.**

## Importance

- Will allow for remote monitoring of orthopedic fractures
- Lowers Covid 19 exposure by not requiring patient to drive to clinic for checkups
- More cost efficient than traditional orthopedic fracture monitoring techniques
- More convenient for low mobility patients, may also be more convenient for Doctors who can review data when time permits



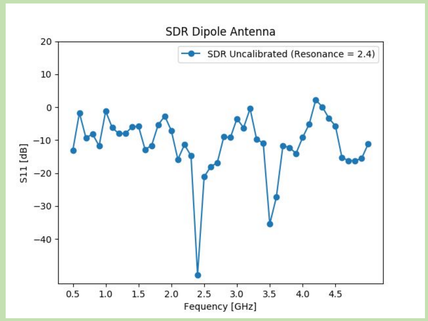

*Apparatus in which fractured bones are measured*

## User Interface

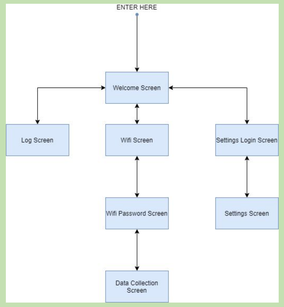
- Allows patients to control data collection process via a touch screen interface
- Patient enters at Welcome screen, which allows for navigation to logs, settings, and wifi
- Log screen allows patient potential troubleshooting ability
- Setting screen is password protected and allows for Dropbox location and Patient ID editing
- Wifi screen lists discovered Wifi's, along with allowing patient to refresh the list
- Wifi password screen allows patient to enter password or select no password option
- Data collection screen starts data collection, encrypts data, and uploads to a dropbox all with the touch of a single button

## Software Defined Radio

- NI-USRP 2901
- Programmed with a Python GNU Radio Module
- Utilizes a bi-directional coupler to obtain the forward and reverse signals of the stimulus signal
- Obtain the S11 magnitude via dividing the reverse and forward signals
- Calibration with Short and Load stanards




*SDR S11 Data of Dipole Antenna*




*Interface Flow Chart*

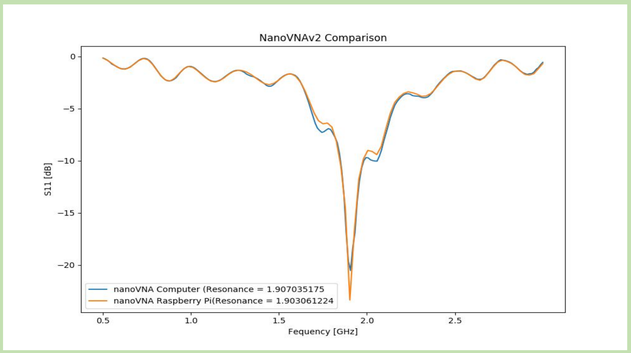

*Welcome Screen*


*Wifi Screen*


*Data Collection Screen*

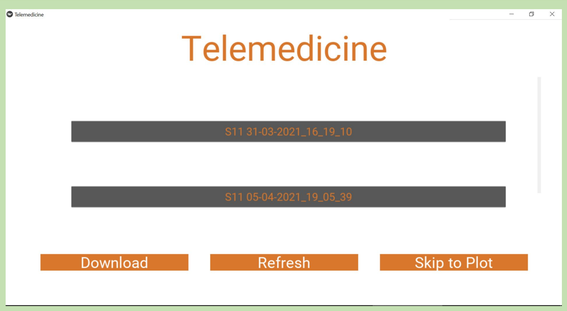
## NanoVNA V2

- Portable low cost, network analyzer
- Measure S11 and S12
- Serial Command Control, interfaced via Python
- Calibration with Open, Short, Load, and Through(OSLT) standards
- Much more accurate and quicker than the Software Defined Radio implementation




*NanoVNA Data Collected on Antenna*

## Desktop Application

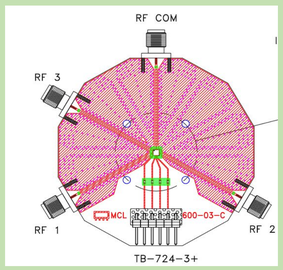



*Desktop Screen*

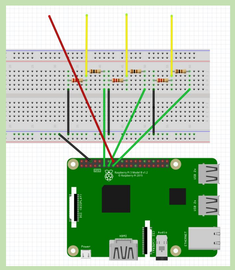
- Allows Doctor to download patient files from Dropbox
- Downloaded file is encrypted while dormant on downloader's computer
- File is decrypted within application and unencrypted data is only available while program is running
- Future functionality will plot data within application and make suggestions on status of healing

## Switcher

- RF switcher, allows for three different test devices to be measured by one port
- Controlled via GPIO pins on Raspberry Pi
- Allows for integration with NanoVNA via Python scripts to collect data from multiple antennas in one run




*Switcher Circuit Diagram*



*GPIO Control Circuit*

## Future Work

- Integration with mechanical system
- Error catching within Raspberry Pi application
- More logging information and ability to upload logs to dropbox
- Integrate RF switcher to capture data from multiple antennas
- Implement plotting functionality within the Desktop application

### Acknowledgements

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