FLORIDA A&M UNIVERSITY-FLORIDA STATE UNIVERSITY
COLLEGE OF ENGINEERING

Meeting Minutes

Sponsor

National High Magnetic Field Laboratory
William W. Brey

Team Members

Asher Rich 1
Team Lead

Emil Lobachev 2
Dedicated Group Representative (DGR)

Jonathan Burt 3
Programming Lead
Documenting Lead

Kyle York 4
Research Lead

Gabriel De Leon 5
Circuit Assembly

Advisor

Rajendra Arora, Ph.D.

Instructor

Jerris Hooker, Ph.D.

Teaching Assistant

None

Keysight Oscilloscope

Friday, September 11, 2020

Attendance

Customer: William W. Brey

Team Members: Emil Lobachev, Asher Rich, Jonathan Burt, Kyle York, Gabriel De Leon

Decided to meet every week at first. Once team feels prepared, we will switch to bi-weekly meetings.

Topics

General:

1. What deliverables do you need first versus deliverables that you will need later?
2. How often do you want updates on our work?
3. How much do you want to be or will be involved?
4. How often do you want to meet?
5. How can we test the oscilloscope / test after modifications (since tests appear to take many hours/days in proposal document) / will we have access to the lab / what will be testing environment (physical environment (isolated or will there be noise to be considered) / simulation)

Technical:

1. What is the current cost? What is the new target cost? What is your purchasing budget?
2. Are the specifications in the Keysight proposal document accurate? Who made the document? >> Ask about reviewing the document if applicable
3. Will we be constructing/designing the hardware? (who designs and who builds or are we doing both)
4. In the document about the project you said, “the focus of this project can be on how to provide useful information to the scientist rather than simply to produce an accurate pulse envelope.” What information are we considering useful?

Customer Meeting Notes:

- From Dr. Brey's Introduction/Info
  - MMR
  - Measuring distances between atoms and molecules (example of what we're doing)
  - Radio Frequency Spectroscopy
  - We go up to 1.5GHz
  - Project doesn't have to address all of the users
    - A subset or single frequency can be fine
  - This is quite an interesting project and may garner some things
  - Has a contact at Penn State who is very good at labview

- Problem
  - Scientists have to adjust the coupling of RF energy into what are antennas, they call them probes.
  - Then monitor the RF energy as it goes in, may be quite a high power (1KW0, low duty cycle
  - Not unusual for probe to fail
  - User would like to know when it fails and how to adjust it
  - Usually they purchase oscilloscope
    - They must be quite fast ($$$)
    - Pulse trains are as long as 100ms ($$$) at bandwidth at 800MHz and needs a lot of memory ($$$$)
  - User just looking at the envelope, not the time discrepancy
  - End up buying an oscilloscope where they don't use most of the information provided
  - Looking to use a software defined radio (-$) to see if they can record the bandwidth
  - Nice to see the alternation of the RF pulses and see the phase
  - Looking to minimize the reflected power from the antennas
  - The instrument they use uses a low power source, but now more scientists are using high power.
    - Higher power causes the antennas to heat up
  - Spectroposict minimizes in the middle of the pulse instead of the end
  - Would like an oscilloscope that works at a range of frequencies, but would rather a clean system that works well

- General Questions (Asked by Asher)
  - What deliverables needed first to later? (going to list from first to later)
    - Prototype of a software defined radio of displaying something (pulse) off the triggers system that emulates a digital oscilloscope at a lower cost
      - Display length of sweep
      - Control frequency
      - System has enough bandwidth for the Spectroposict
      - Want to display the envelope
      - Aim for one frequency and aim for a clean system that works well
  - When to update
    - As we come up with them (Asher)
  - When to meet
    - Every week

- Technical Questions
  - Current Cost (Per Channel): $5k(For lower channels)
    - For all channels: ~$20k
  - Target Cost (Per Channel): $1-2K
    - Our big decision for the SDR system:
      - 1. Can use open source approach
        - Great if we weren't connected with fsu
      - 2. Use something that relies on NI or MATLAB
        - We have access to these
      - So either MatLab or open source like Python
  - How will we test?
    - We should have access to the maglab
    - He may have equipment to give us to use for testing
    -
  - Will we be constructing or designing the hardware?
    - Providing essential a "box" (doesn't need a display)
      - Some connectors
    - We are selecting the hardware (ordering, dealing with finding a host computer)
  - Final test
    - One half day to understand the application
    -
  - He claims that the project is difficult
  -
- Emil: What is the envelope he was talking about?
  - Pretty much want a diode detector

- Comments
  - May be other applications
  - What might drive the decision of the software?
    - The SDR will run continuously. When you trigger, then the data will be saved. Not a common (if at all) feature in SDR.
    - Trigger for when to start and stop the saving the data.
  - KeySight person suggested "Hack RF" (?)
- For prototype just one channel