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| **MEETING MINUTES – Sponsor & Team Meeting** |
| DATE: October 16, 2014 |
| POSTING TIME: 10/22/14 11:18:30 PM EDT |
| OWNER: Julia Kim |

**Last Edited: Tuesday, October 28, 2014 10:02:55 PM EDT**

Present: Matthew Cammuse, Patrick Delallana, Joshua Cushion, Julia Kim

Time: 5:30 – 6:30 p.m.

In regards to the block diagram that Joshua sent to Pete:

In the diagram, it said VOC instead of VCO, so that should be changed. There should be a reference signal from the FPGA to the VCO. When the oscillator is turned on, there has to be a reference, the phase of the signal that comes out. The 16-channel switch is controlled by the FPGA, so there needs to be a control signal from the FPGA as well. Also, use a single pole four throw switch for the transmit antennas.

Solid-state switches are faster than electromechanical switches, which take about milliseconds to switch and are like solenoids. There’s a piece of metal that moves to make contact but is controlled with electricity. And you want to have everything to move as fast as possible. You can get away with electromechanical for the one that switches between antennas. You have to look at the control voltage and how they are controlled, like if you have a 16 way switch. Is there a 4 line input where you have to create 4 lines to have 16 different states? Which path is activated, how that’s done, what’s the voltage level? The switch has to be able to operate with 3.3V. The logic levels for the switch have to be compatible with the drive levels from the controls of the FPGA. The FPGA programmer has to make sure that the output voltages are compatible with the hardware being controlled.

Do the switches have to be absorptive or reflective? Generally, you want to make sure they’re absorptive to keep it matched. No matter what port you switch to, the components that’s connected to the switch port sees the match.

For the overall antenna, will the transmit and receive antennas be both tilted in the direction of the scene or do only the transmit antennas have to be angled to the scene? The beam has to be pointed at the same spot on the wall.

The $20 antennas are waveguide horns. Is it best to do a waveguide to SMA adapter right on the antenna or should there be a waveguide attachment within the adapter? The adapters should be placed on the antennas right away.

Based on the design of the 20 antennas and the T-shape, the middle section where they meet, that space would be a gap? Basically you end up with 16 point on each axis that are ½d apart, where d is the distance between the center of the horns. An additional cannot be added in that gap because each one of the 16 phase centers, when we do transmit and receive, we’re going to generate an amplitude and phase value and then do a 16-point FFT. In the FPGA it’s going to be easier to do 16-point FFT rather than 17-point.

If you have a target at the center of the scene and each transmit and receive are pointed at the target, when you do transmit and receive are going to receive the same amplitude and the same phase. Let’s say amplitude is 1 and phase is 0. You basically get a rectangular function where the amplitude is 1, with 16 points, and the phase is 0. When you FFT, you get a sinc function, which is basically the image, that’s where the target is. As the target goes over the scene, you’ll get the same amplitude back into the antenna but now there will be a phase shift across all the receive antennas. And the slope of that phase ends up giving you a sinc function that gets shifted and that represents a target. Maybe we can offset the horn instead of sharing one.

We also asked Pete to meet with the ECE professors for any questions that they might have when he comes up to Tallahassee. He agreed to meeting with them.

The timing for the FPGA is going to be the most challenging part, getting the processing to work correctly. There is a backup plan for that as well. If the VCO doesn’t work out, if we can’t get the signal, we can get test equipment to generate the signal. The whole thing can be done without an FPGA. On the receive side, we can get a high speed scope and sample the data, sample the transmit and receive pair. The receive data we can sample on the sample to get the information we need so that we can generate the image later on to post-process it. If we can just do transmit and receive a signal, then it’s a big accomplishment. To get everything working, such as coordinate timing and making sure all the components in the chain are working.