Welcome to Team 301 SDR SAR Second Review Session!

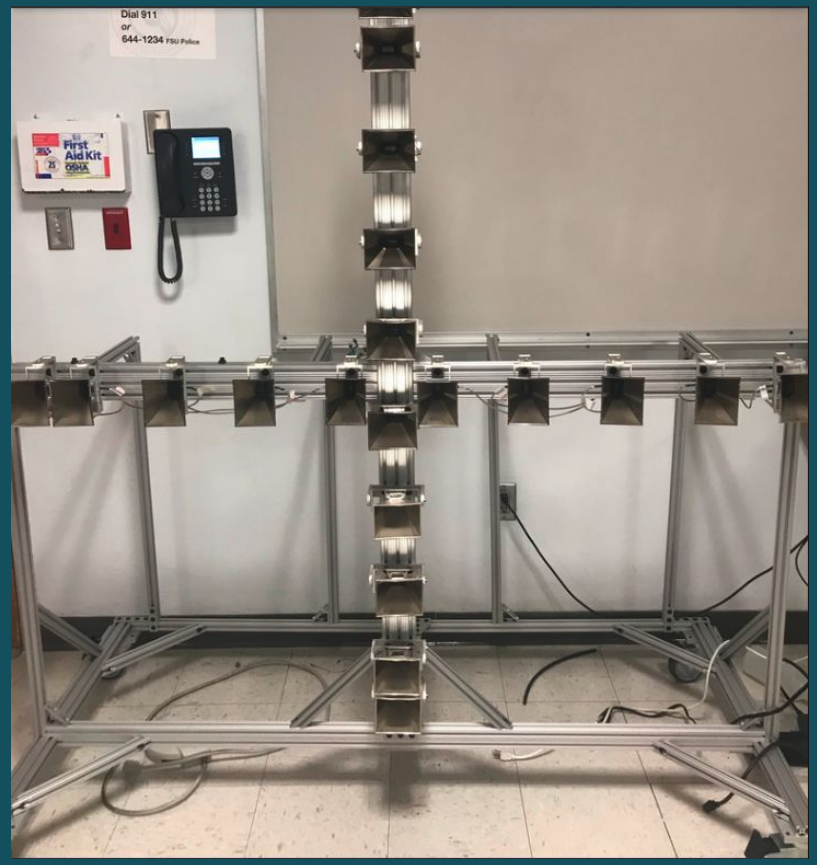
Marius Urdareanu - Hardware/Power Analyst
Grant Steans - Software Engineer
Tyree Lewis - Simulation Analyst and Data Collection
Nathaniel Henry - Front-to-Back End Integration

Background

What is the SDR-SAR?

The SDR-SAR is an ongoing project sponsored by Northrop Grumman. It is a device used to detect metal objects at a distance. There are horns lined across the SAR which bounce the input signal between them.

What is the SDR-SAR?



Speaker: Grant Steans

FAMU-FSU Engineering

Project Scope

Our goals for the project include:

- Refine the existing SAR to use SDRs to resolve the problems that occured in the previous iteration of the project.
- Ensure that metal object can be identified from at least 40ft.

Testing and Verification

Speaker: Tyree Lewis

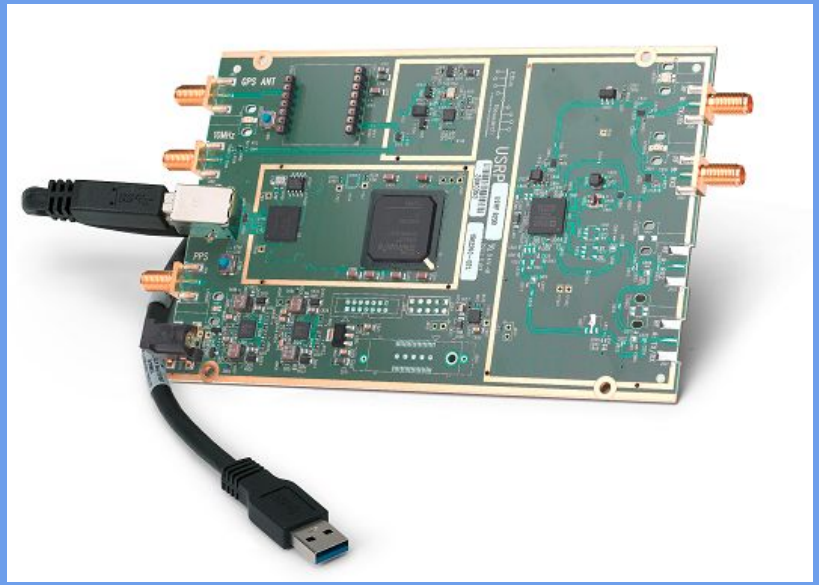
FAMU-FSU Engineering

Identifying the Problem

During the first iteration of the project, the SAR was able to successfully detect metal objects, however, there was noise leakage occurring between the horns which made acquiring data more difficult.

Implementing a Solution

To resolve the problem, the team purchased a USRP B200 radio. This radio will be used to filter the noise between horns, thus removing the leakage that occurs between horns.



Speaker: Tyree Lewis

FAMU-FSU Engineering

Implementing a Solution

Using GNU radio and MATLAB Simulink, the team has developed a method to integrate the radios into the SAR and programmably implement the resources needed to filter the noise between horns.

Implementing a Solution

Outline of the Phase I Test Plan

- Install Universal Hardware Driver Tool Chain and GNU Radio
- Transmit Verification
  - Simple sine wave generation and measuring.
  - LFM wave generation and measuring.
- Receive Verification
  - Bench source generation with GNU Radio measuring.
  - Loop back testing using a short cable from the transmit port to the receive port.

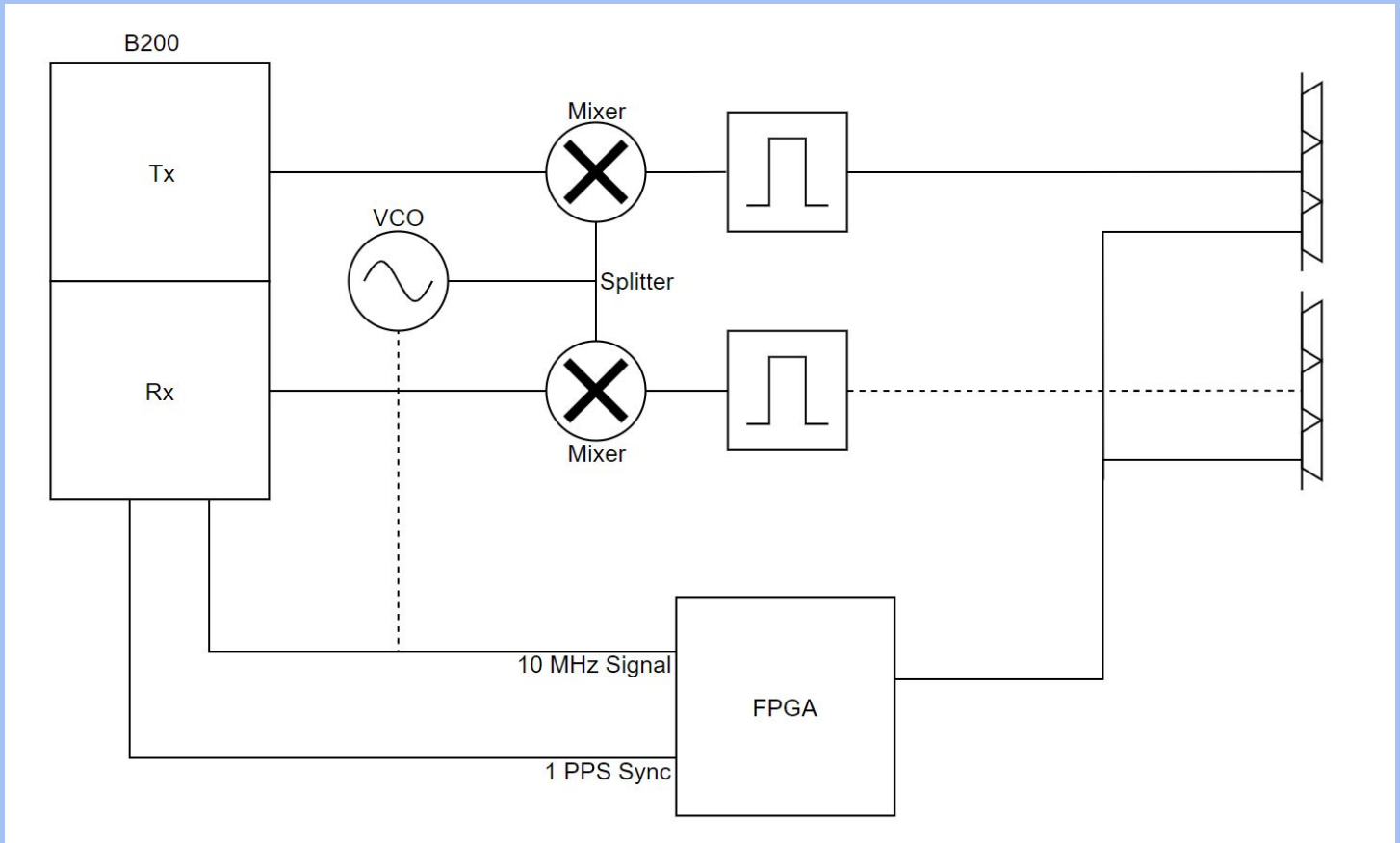
Implementing a Solution

Outline of the Phase I Test Plan (continued)

- Full thread loopback with LFM waveform GNU Model
  - Verify transmit and receive sample synchronization.
  - Test delay using LFM signal and 2-way splitters.

Results

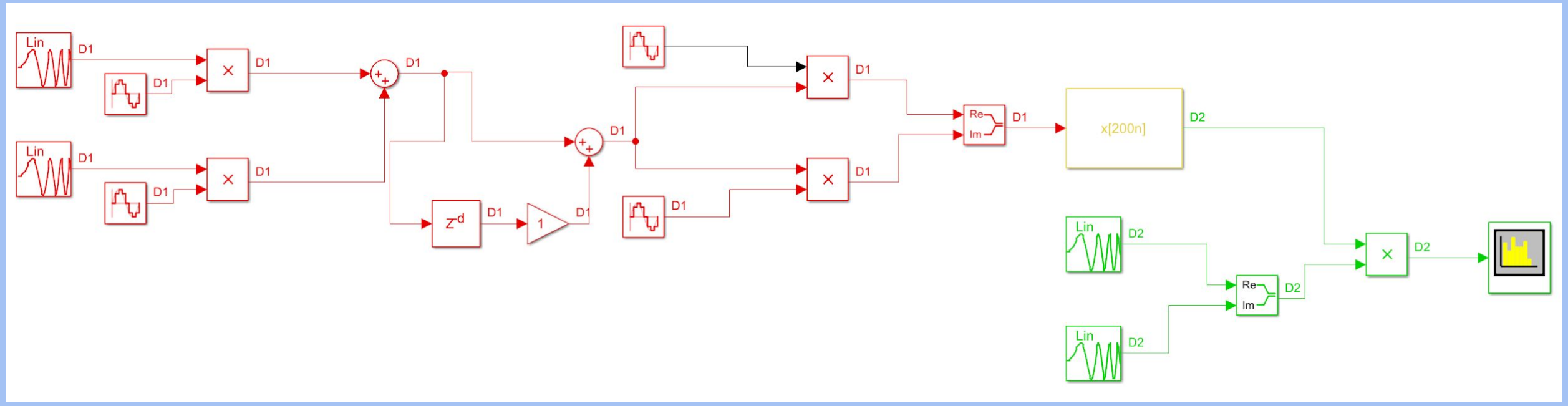
Top-Level Diagram



Speaker: Nathaniel Henry

FAMU-FSU Engineering

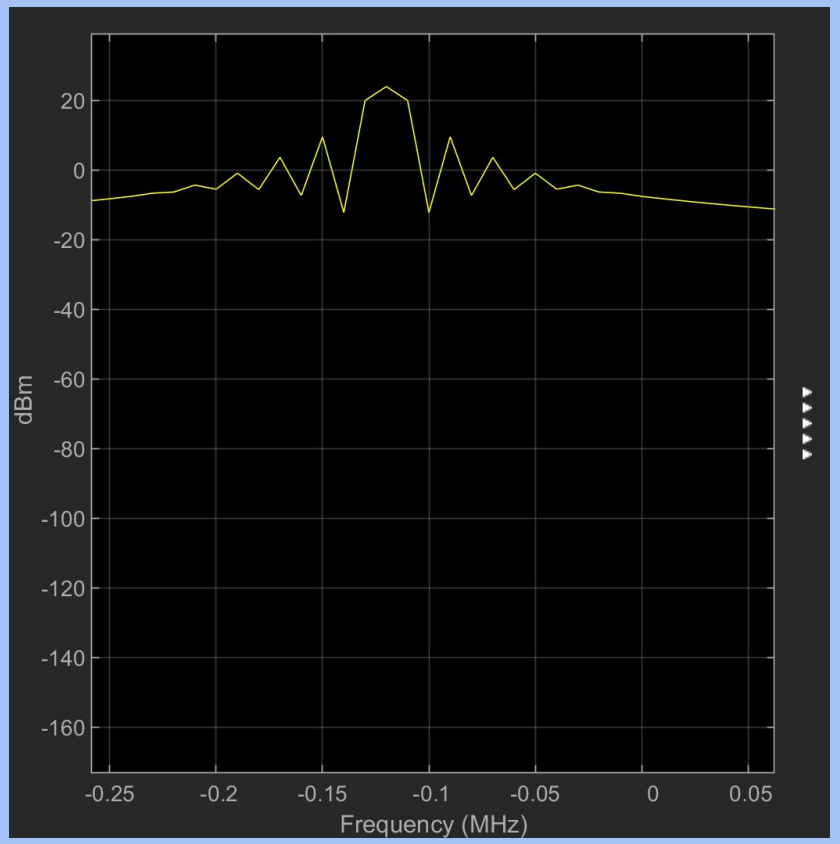
Simulink - LFM Signal Generation

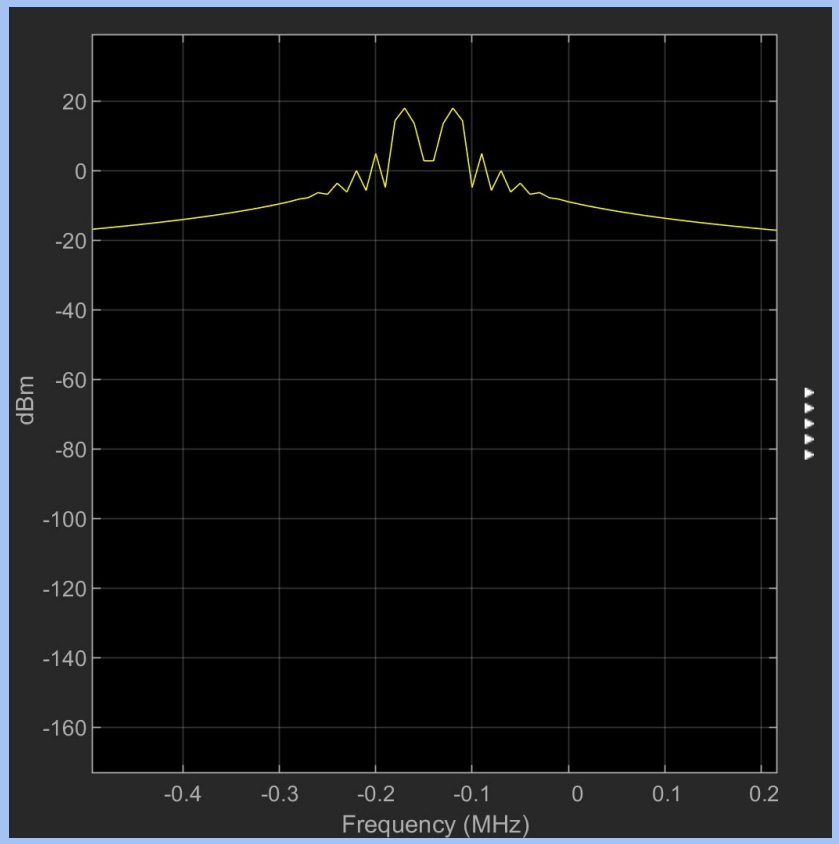


Speaker: Nathaniel Henry

FAMU-FSU Engineering

Simulink - LFM Signal Generation

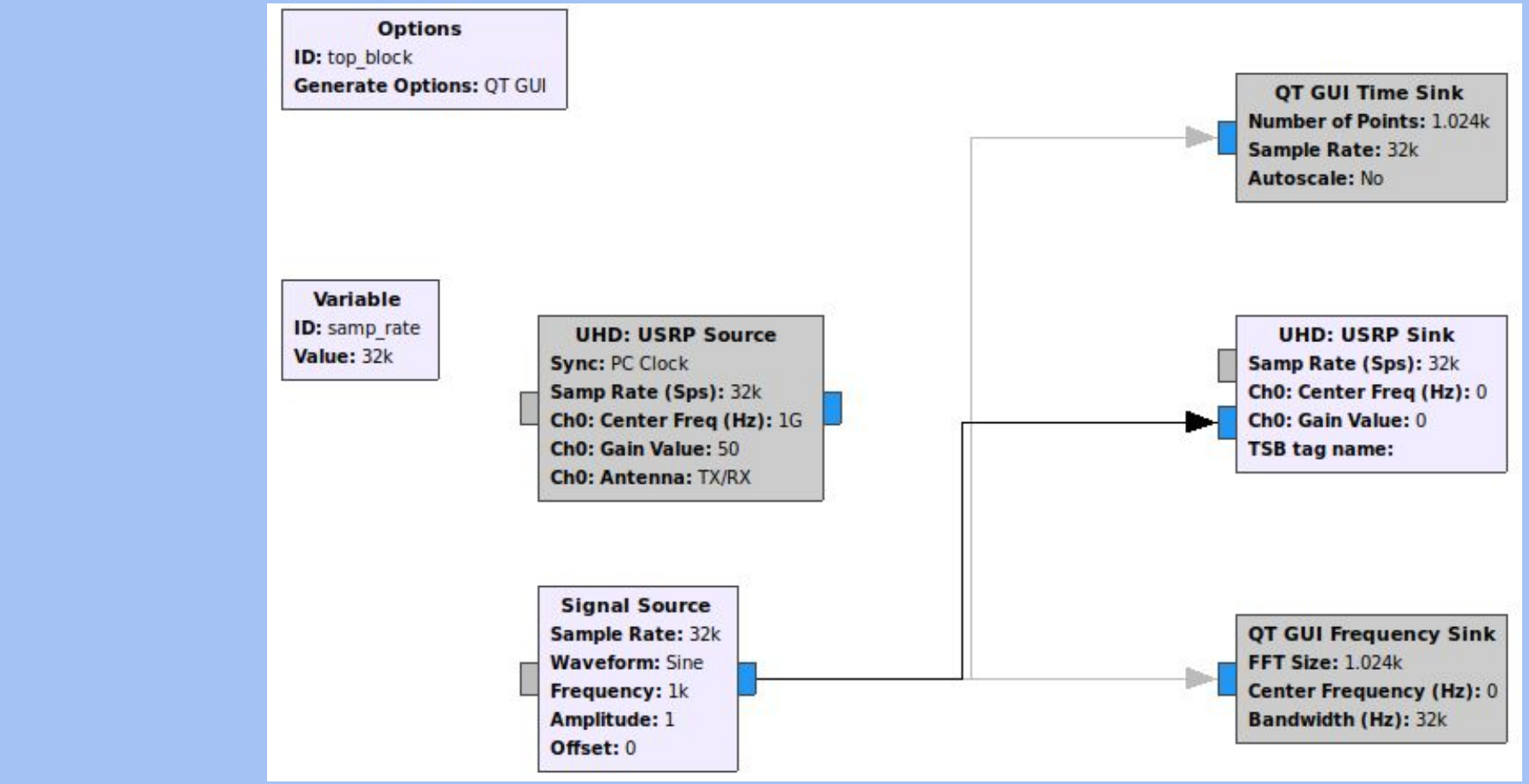




Speaker: Nathaniel Henry

FAMU-FSU Engineering

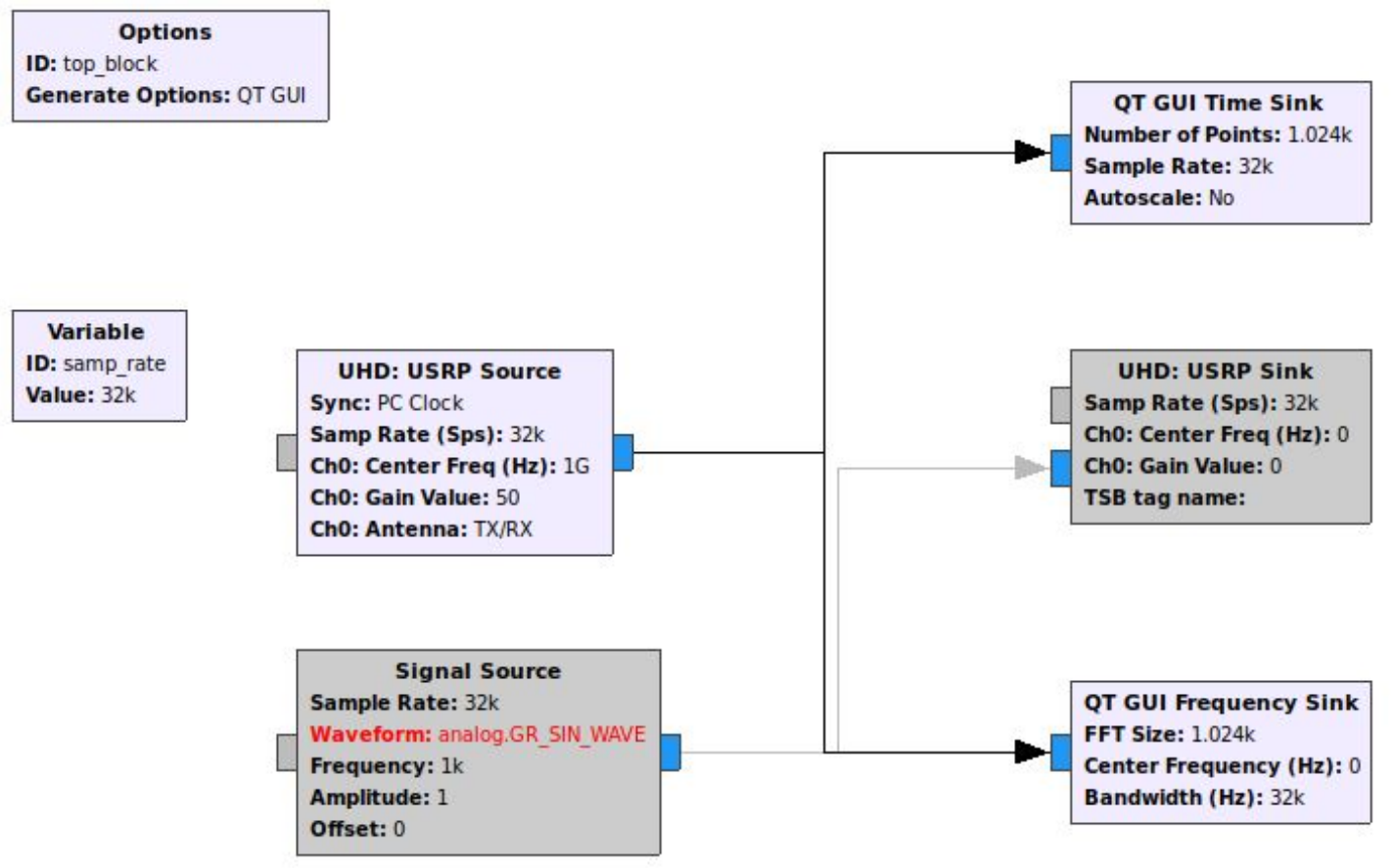
GNU Radio - Transmit / Tone Test



Speaker: Grant Steans

FAMU-FSU Engineering

GNU Radio - Receive / Tone Test



Work Breakdown

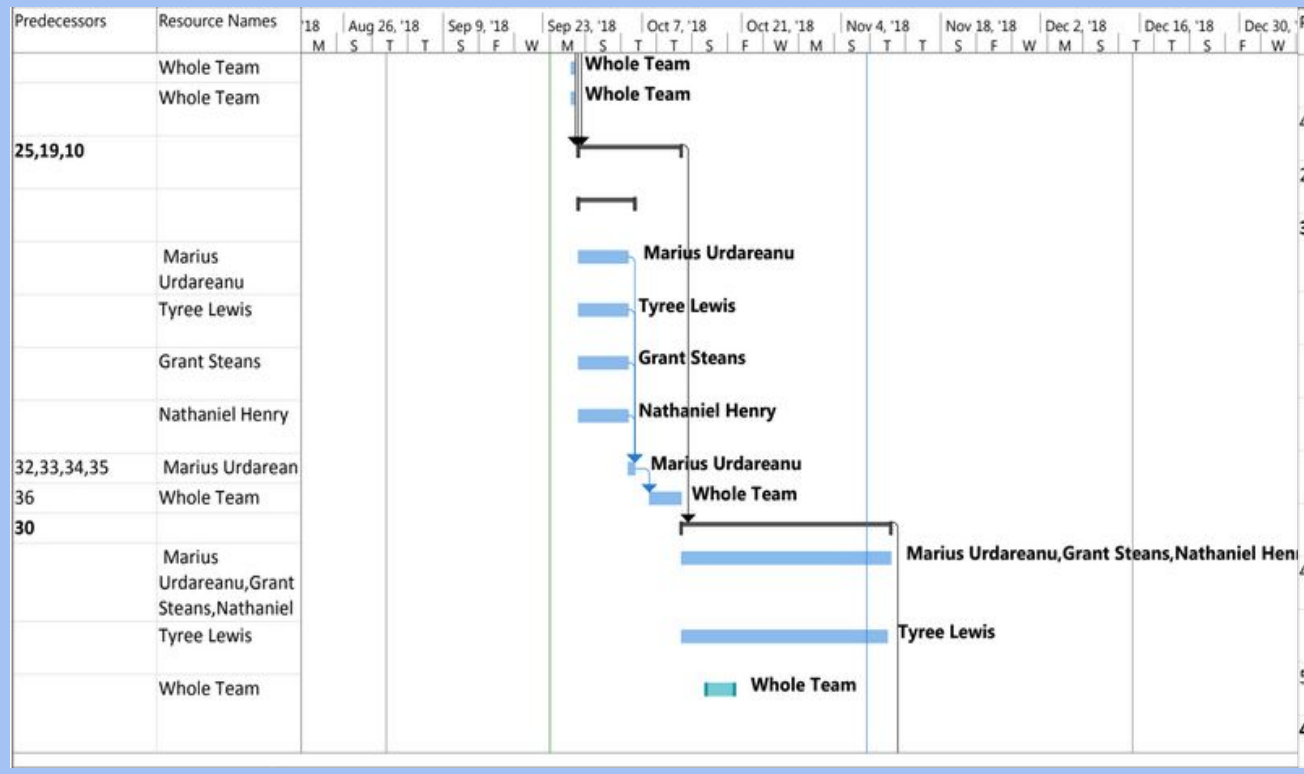
ID	Task Mode	Task Name	Description	Deliverable	Duration	Start	Finish
42		Concept Generation	Organized brainstorming of 100 concepts.	100 possible concepts	6.75 days	Sun 10/21/18	Fri 10/26/18
43		Concept Selection	Selecting a final concept.	Final concept	1 day?	Fri 11/2/18	Fri 11/2/18
44		Bill of Materials	Submit a bill of materials for purchase.	BOM	2.25 days	Thu 11/8/18	Fri 11/9/18
45		**Review Number 2 Presentation**	Descriptions to be determined as the date draws nearer.		**13.5 days?**	**Mon 11/12/18**	**Fri 11/23/18**
46		**Set Up PowerPoint Presentation**			**7.88 days**	**Mon 11/12/18**	**Sun 11/18/18**
47		Update on Overall Project Status			3.38 days?	Mon 11/12/18	Wed 11/14/18
48		MATLAB Simulation Status Update			3.38 days	Mon 11/12/18	Wed 11/14/18
49		Overall Coding Status Update			3.38 days?	Mon 11/12/18	Wed 11/14/18
50		Further Discussion about Project			3.38 days?	Mon 11/12/18	Wed 11/14/18
51		Submit VDR2		Review 2	1.13 days?	Thu 11/15/18	Thu 11/15/18
52		Risk Assesment	Complete the risk assessment assignment.	Risk Assessment	1 day?	Fri 11/16/18	Fri 11/16/18
53		Present to Review Board			5 days	Mon 11/19/18	Fri 11/23/18
54		**Work Time 2**			**4.5 days**	**Sat 11/24/18**	**Tue 11/27/18**

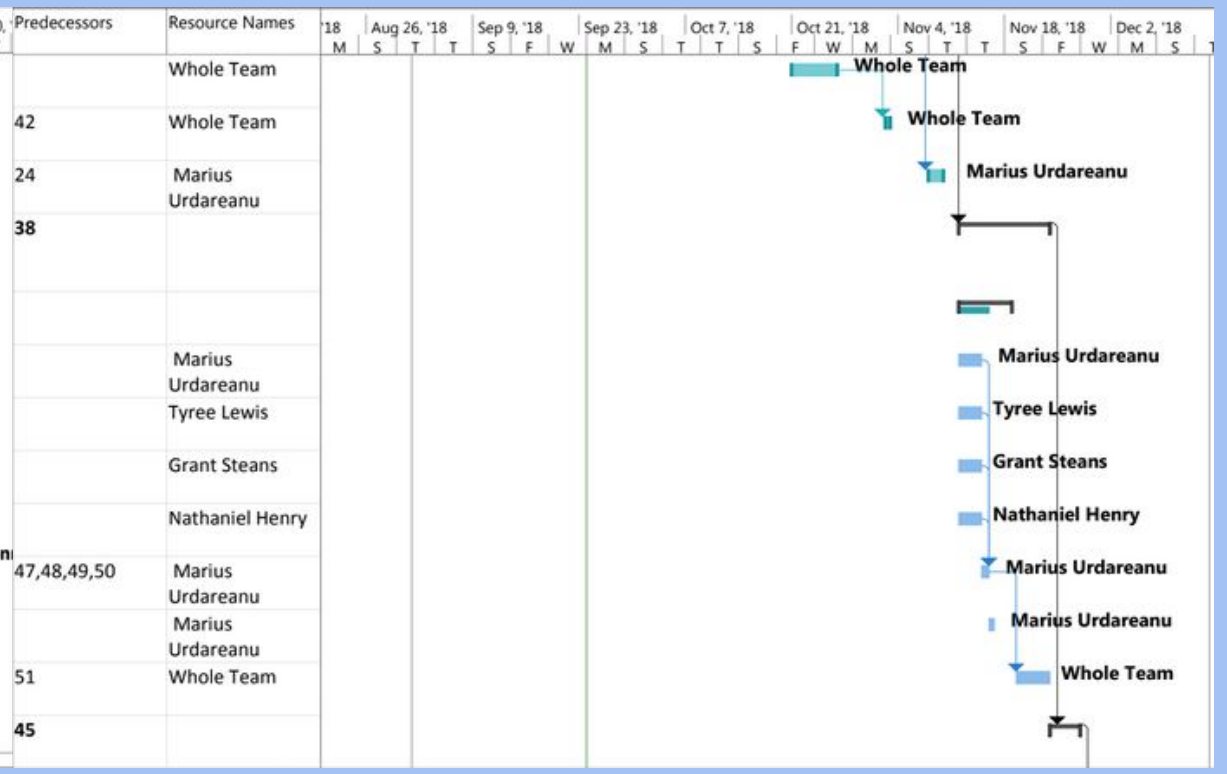
ID	Task Mode	Task Name	Description	Deliverable	Duration	Start	Finish
55		Simulink Model	Finish the Simulink model.		4.5 days	Sat 11/24/18	Tue 11/27/18
56		Radio Integration	Begin integration of the radios into the electrical box.		4.5 days	Sat 11/24/18	Tue 11/27/18
57		Radio Communication	Begin thinking about how to use coding language to integrate the communication between SDRs and rest of the system.		4.5 days	Sat 11/24/18	Tue 11/27/18
58		**Review Number 3 Presentation**	Descriptions to be determined as the date draws nearer.		**10 days?**	**Wed 11/28/18**	**Thu 12/6/18**
59		**Set Up Poster Presentation**			**3.38 days?**	**Wed 11/28/18**	**Fri 11/30/18**
60		Project Status going into Senior Design II			2.25 days	Wed 11/28/18	Thu 11/29/18
61		MATLAB Simulation Results/Update			2.25 days	Wed 11/28/18	Thu 11/29/18
62		Overall Coding Update			2.25 days	Wed 11/28/18	Thu 11/29/18
63		Further Discussion			2.25 days	Wed 11/28/18	Thu 11/29/18
64		Submit VDR3			1.13 days?	Fri 11/30/18	Fri 11/30/18
65		Present to Review Board	Poster presentation.		1 day	Thu 12/6/18	Thu 12/6/18

Speaker: Nathaniel Henry

FAMU-FSU Engineering

Gantt Chart





Speaker: Nathaniel Henry

FAMU-FSU Engineering

Bill of Materials

Customer Name: Team 301
Customer Address: 2525 Pottsdamer St, Tallahassee, FL 32310
Date: 11/9/2018

Item #	Description	Vendor	Part Number	Quantity
1	VCO	Amazon	N/A	2
2	USRP B200	Ettus	782980-01	2
3	Mixer	Amazon	N/A	3
4	LO Amp	Amazon	N/A	2
5	Splitter	Amazon	N/A	2

Assembly Number: N/A
Assembly Name: N/A
Assembly Revision: N/A
Approval Date: 12-Nov-18

BOM Level	0	1	2	3	4	5	Part Number	Part Name	Revision	Quantity	Unit of Measure	Procurement Type	Reference Designators	BOM Notes
1		*					N/A	VCO	A	2	each	OTS		Base Product Only
2			*				782980-01	USRP B200	A	2	each	OTS		Base Product Only
3				*			N/A	Mixer	A	3	each	OTS		Base Product Only
4					*		N/A	LO Amp	A	2	each	OTS		Base Product Only
5						*	N/A	Splitter	A	2	each	OTS		Base Product Only

Speaker: Nathaniel Henry

FAMU-FSU Engineering

Conclusion

So far, the progress towards completing our task is going according to plan. The radios were purchased and received on Tuesday, November 13th. With the completed flowcharts for LFM transmission and receiving on GNU Radio, we are working to get the rest of our components and do the initial simulations by the end of the semester.

Any Questions?