

SMALL SIGNAL TRANSMISSION ELECTRONICS

For The 449 Wind Profiling Radar

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INTRODUCTION

- This project involves designing a PCB (Printed Circuit Board) for the 449 MHz Wind Profiler's transmission electronics.
- The transmission electronics set up the proper RF signal before it is sent to the radar's antennas.
- Devices Used: RF Amplifiers, RF Frequency Mixer, RF Filters, and RF Attenuators.

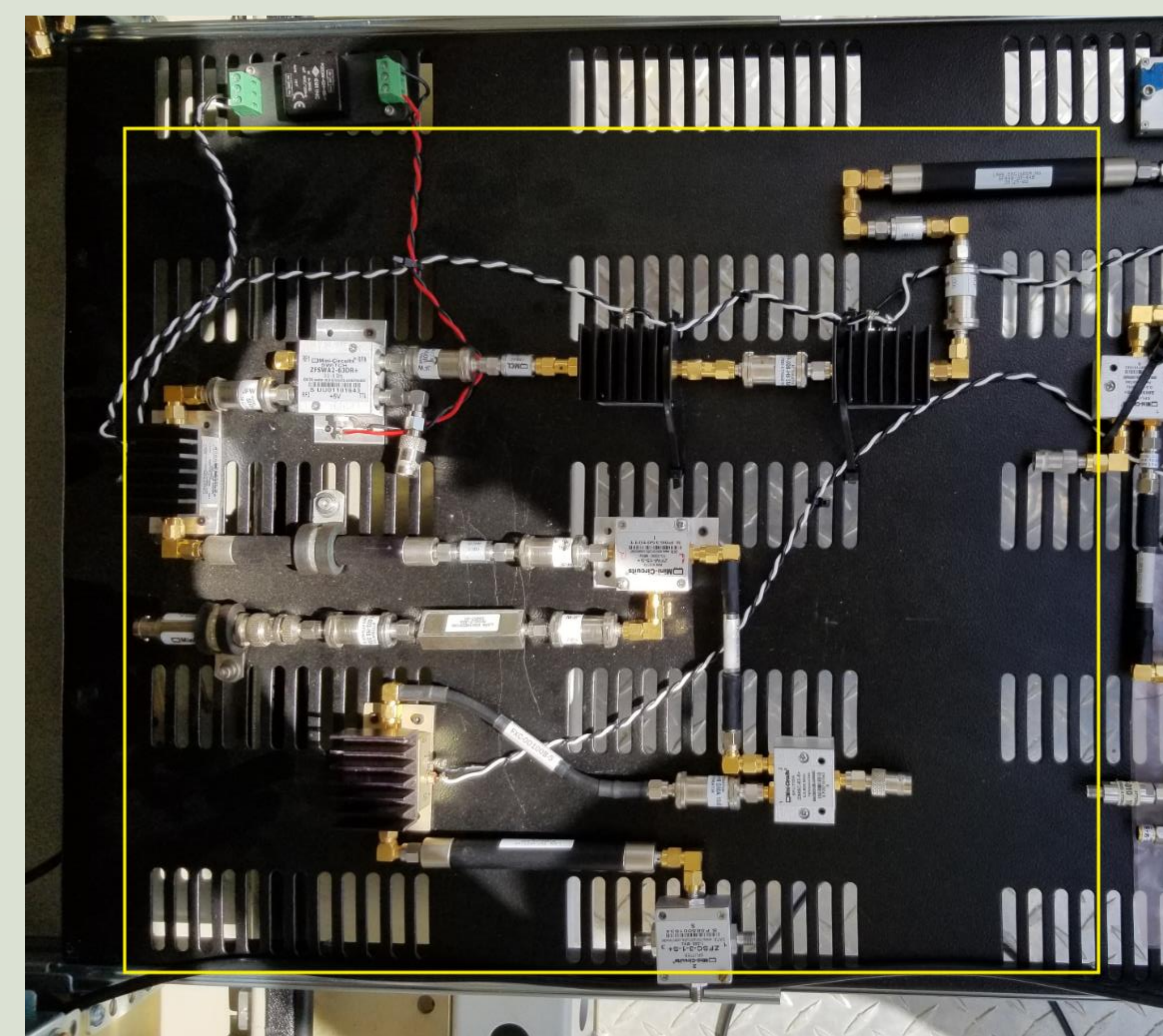
OBJECTIVE

- To condense current transmission electronics into one circuit board

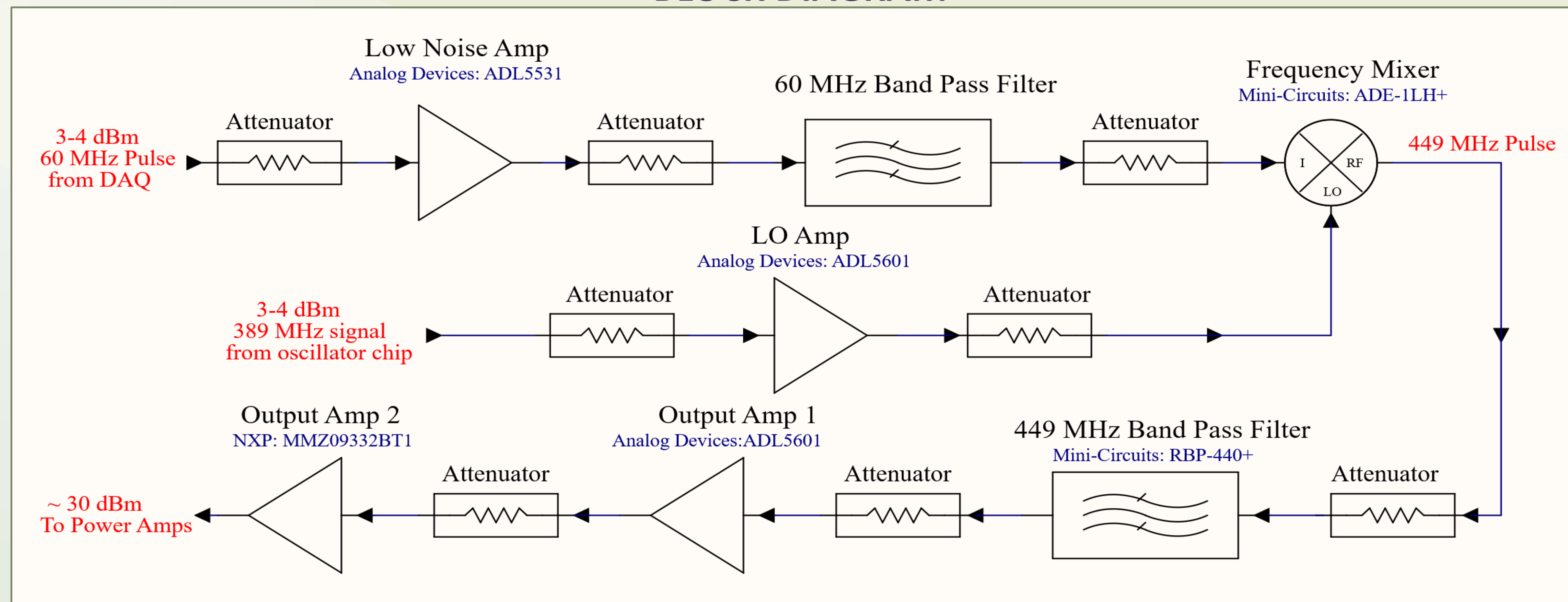
METHODS

- Researched different types of RF components to understand how and why they are used.
- Selected individual components to meet the project requirements.
- Designed and implemented 60MHz BPF.
- Used Altium Designer for schematic capture and PCB layout.

Current Transmission Electronics



BLOCK DIAGRAM



COMPONENTS

Amplifiers	Gain	Use
Low Noise Amp: ADL5531	20 dB, NF=2.5	To boost signal to sufficient level above the noise floor
LO Amp: ADL5601	15 dB	To drive frequency mixer at required power level
Output Amp 1: ADL5601	15 dB	To add gain for required output power level
Output Amp 2: MMZ09332BT	37 dB	Final gain stage to generate output level of 30-33 dBm

Filters	Insertion Loss	Center Frequency	3 dB BW	Use
60 MHz BPF: 5 th Order Chebyshev	1-2 dB	60 MHz	20 MHz	To remove unwanted frequencies From 60 MHz pulse
449MHz BPF: RBP-440+	1-2 dB	440 MHz	60 MHz	To filter 449 MHz pulse

Frequency Mixer	Insertion Loss	Use
ADE-1HL+ Level 10	5-6 dB	To up-mix two signals to generate 449 MHz signal

HOW IT WORKS

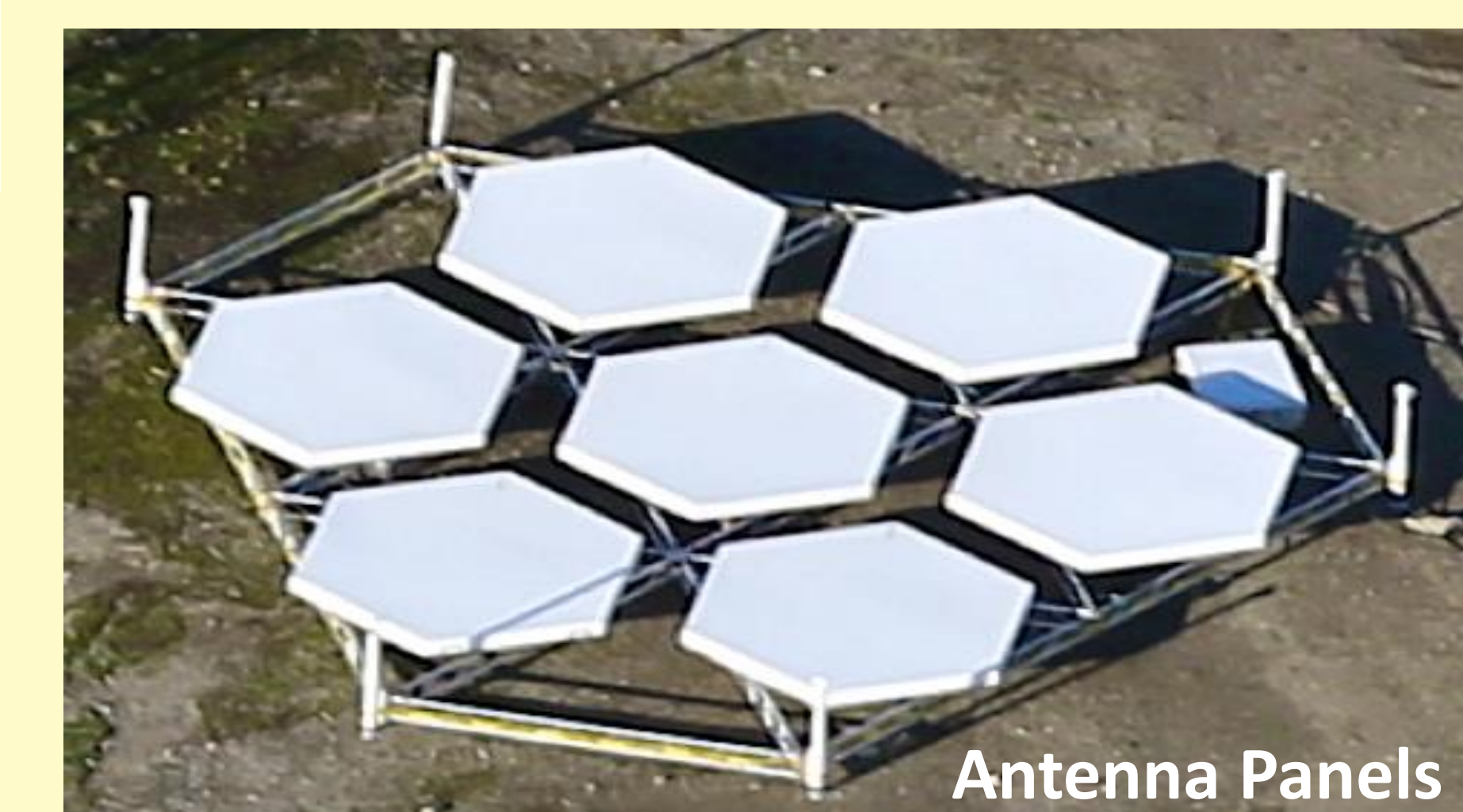
- The transmission electronics prepare the RF signal to be sent to the power amps and to the antennas. The 449 radar does this by inputting two signals of lower frequencies to be combined to generate 449 MHz. The first signal is a 60MHz pulse generated from a DAQ. This signal is amplified and filtered and sent into the frequency mixer. The second signal is a 389MHz signal generated from an oscillator chip. This signal is amplified and sent to the frequency mixer. The frequency mixer adds these two frequencies and generates a 449 MHz pulse. The 449MHz pulse is filtered and amplified to a power level of around 30 dBm.

NEXT STEPS

- Order PCB and test for desired performance
- Test the PCB for desired performance.

ACKNOWLEDGEMENTS

John Soltzak | SUPER Internship coordinators



Antenna Panels

PCB LAYOUT

