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Developing a Program for Calibrating and Streaming from a Software-Defined Radio

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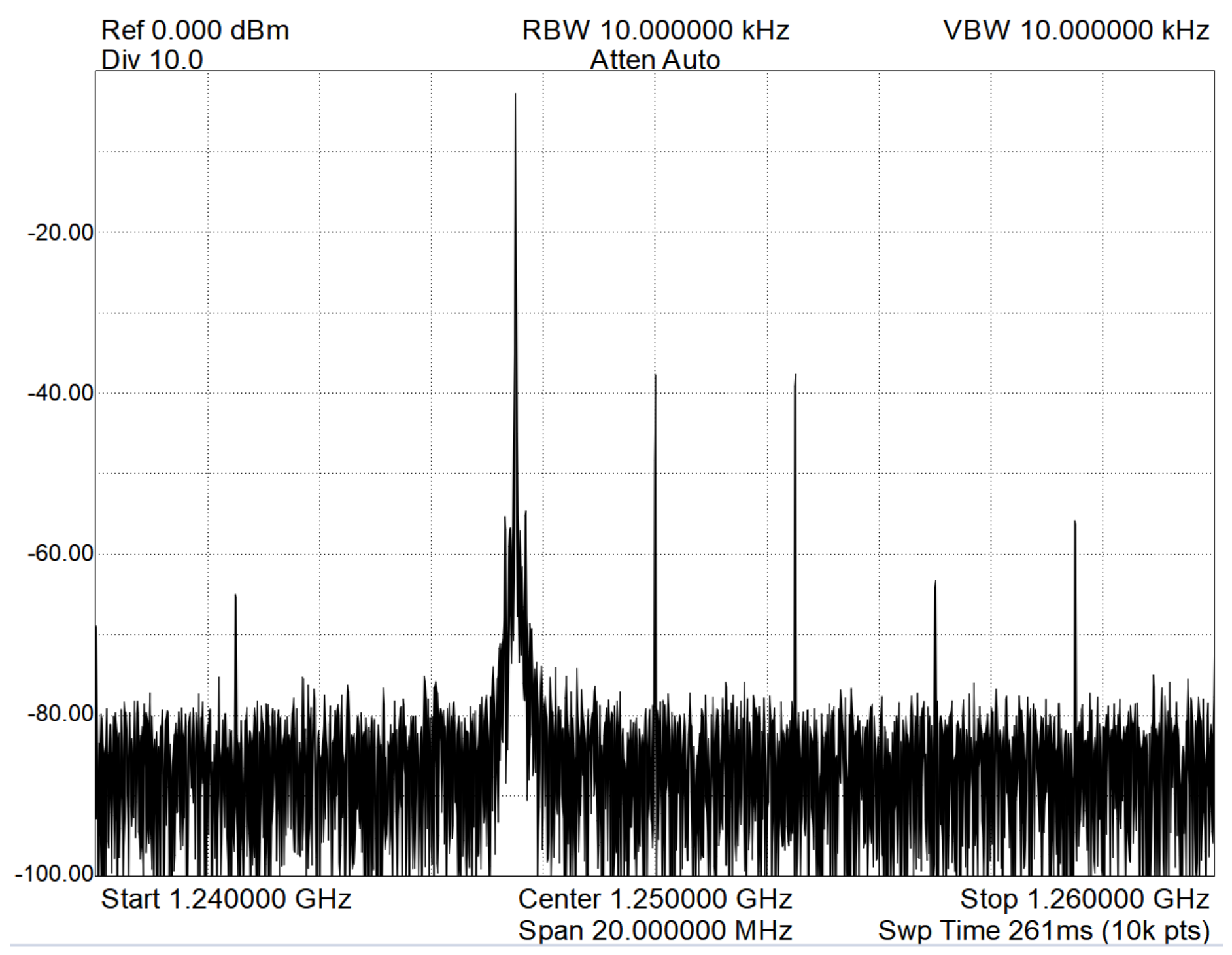
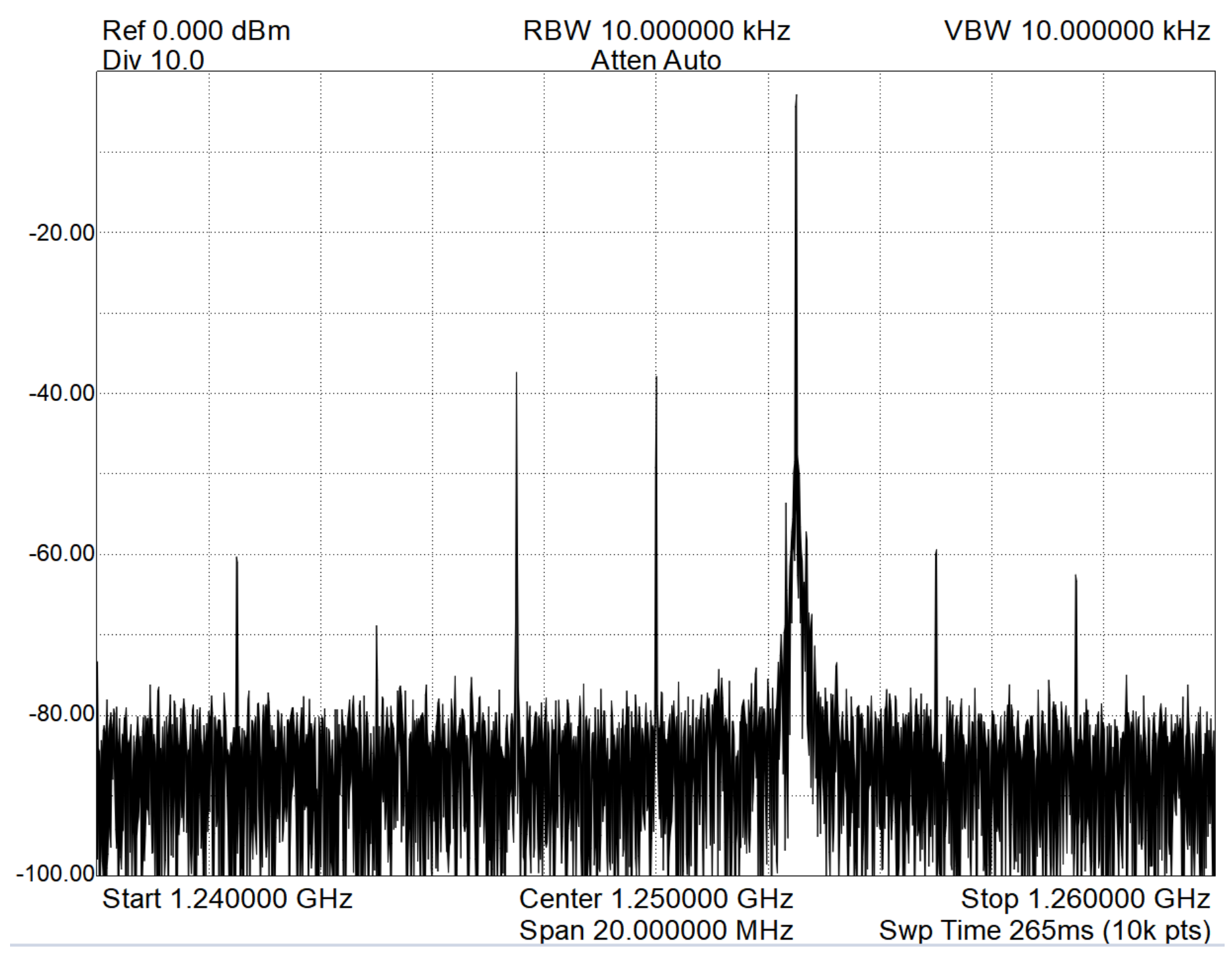
Amanda Kolbeck (Montana Tech) with mentor Kevin Negus (Montana Tech)

Results with a Carrier Frequency of 1250 MHz



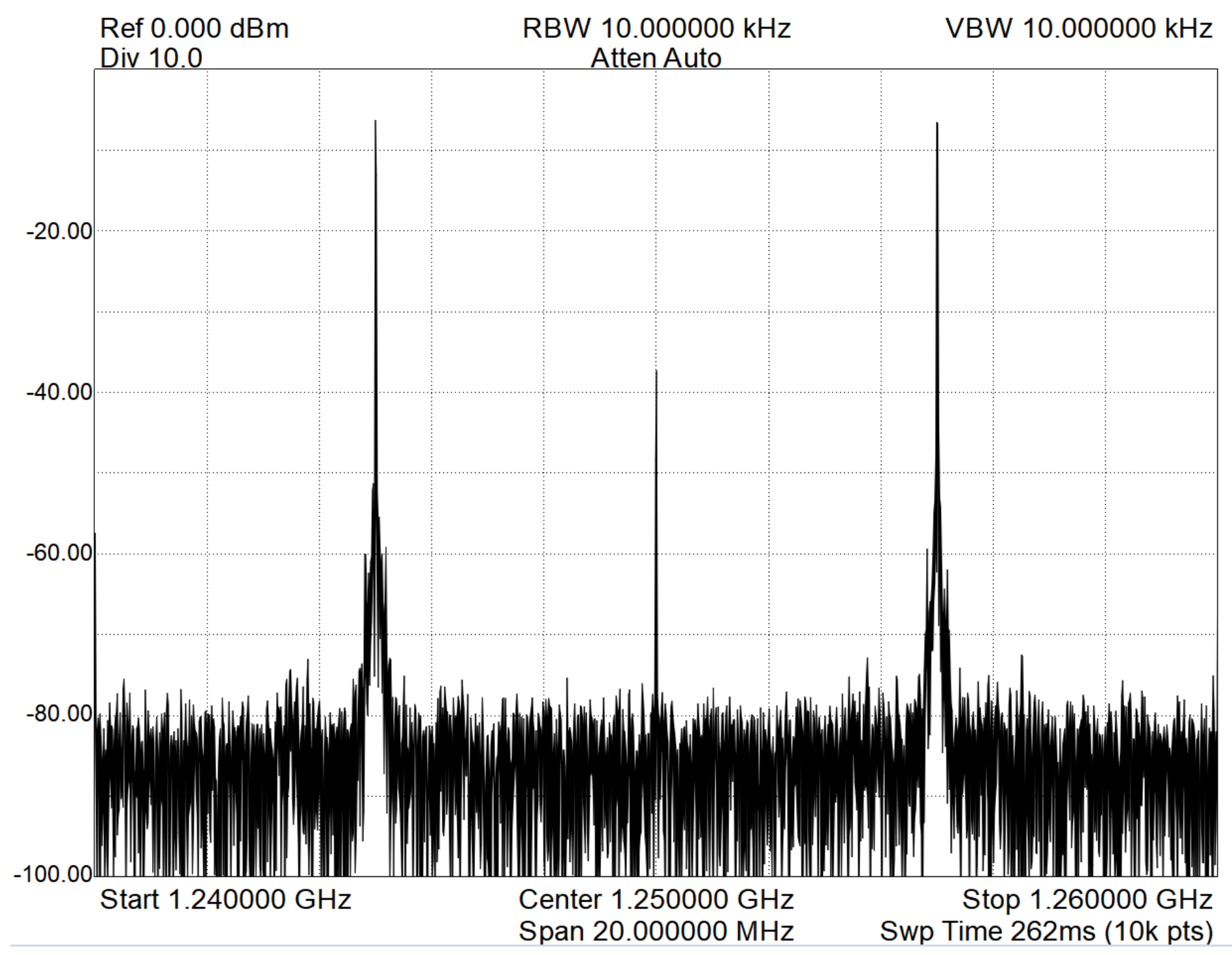
Lower Sideband Signal

Transmitted signal is below the 1250 MHz carrier signal.



Upper Sideband Signal

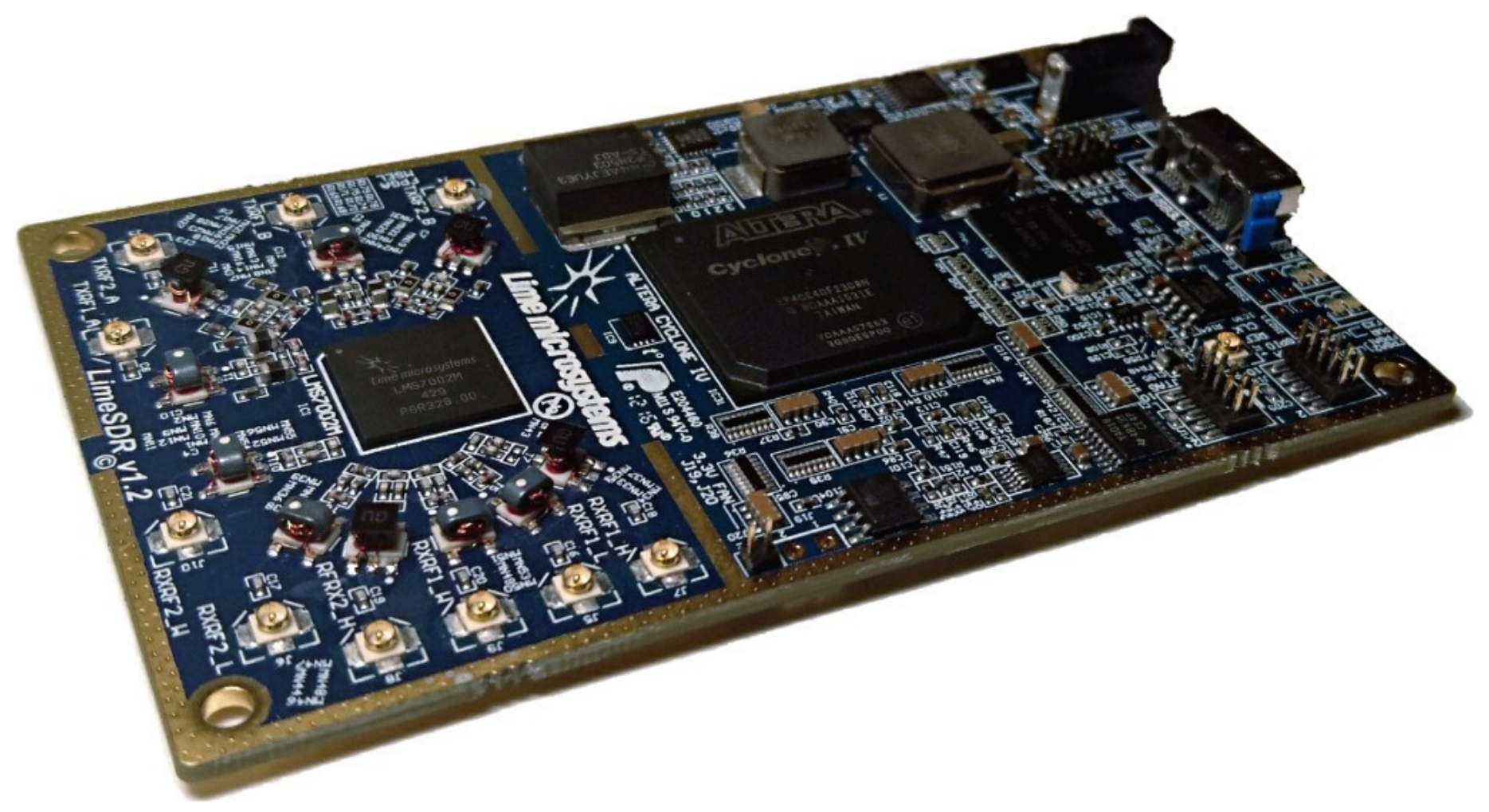
Transmitted signal is above the 1250 MHz carrier signal.



Double Sideband Signal

Transmitted signal is on both sides of the 1250 MHz carrier signal.

The board connects via USB 3.0 and has RF transceivers, a field-programmable gate array (FPGA), and microcontroller chipsets.



LimeSDR Hardware

Background and Significance

Radio transmission is a valuable tool for communicating in areas where common signals can't reach, and software-defined radios (SDRs) are the next step in radio communication.

SDRs are remote access radio systems that utilize software rather than hardware to transmit and receive radio signals.

SDRs provide a new level of customizability in radio transmission, allowing faster and easier alterations to be made to transmitting and receiving channels.

Methods

- Obtained a LimeSDR, a software-defined radio developed by Lime Microsystems.
- Developed a Python code using SoapySDR, a vendor-neutral library with a Python API.
- Created lower sideband, upper sideband, and double sideband signals in MATLAB using I/Q data.
- Played the signals and observed them on a spectrum analyzer.
- Calibrated the signals from the LimeSDR with the Python code.

Conclusions

- Signals transmitted from the LimeSDR can be successfully calibrated and tuned with a user-developed code.
- Calibration changes can be made quickly and efficiently when the LimeSDR is interfaced with computer software.
- The developed code can be further expanded upon to calibrate received signals.
- A collaborative online environment provides countless possibilities and applications for this hardware.

This project used the LimeSDR with an aluminum case. This model was $599.

LimeSDR with Aluminum Case

Acknowledgements

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