The objective of this project is to implement a real time spectrum analyzer with 85 MHz processing bandwidth using JDSU-provided FPGA and ADC development hardware. The measurement results shall be displayed on a connected PC running Windows or Linux.

Conventional “swept” spectrum analyzers use analog RF mixers, filters, and detectors to measure the frequency content of an input signal one point at a time. Newer FFT spectrum analyzers use fewer RF components together with a high speed Analog-to-Digital Converter (ADC) to take “digital snapshots” of the signals; FFTs of the captured signals are computed digitally to measure the signal’s frequency content. All-digital Real Time Spectrum Analysis (RTSA) converts the input signal directly to digital samples and has sufficient processing power to perform FFTs just as fast as such samples are produced. Advances in FPGA technology have enabled performing wideband RTSA on low cost, low power components. The goal of this project is to implement an RTSA with 85 MHz processing bandwidth using as few resources as possible in a modest FPGA.

The FFT output shall be at least 256 bins but no greater than 1024 bins. The sampling rate of the system should be 204.8 MSPS real, so the FFT rate will be between 400,000/sec and 1,600,000/sec. with 50% overlap. Each FFT output point shall be quantized to a nearest magnitude value (0.5 dB step size over 96 dB range should be the goal) and a count of the number of “hits” for each frequency-magnitude pair shall be accumulated. The accumulation period shall be 0.1 seconds as a goal but 1 second as a maximum. At the end of each accumulation period, the frequency-count result shall be output to a host PC for interpretation and display.

JDSU will provide the team with development hardware and software tools, as well as background materials describing RTSA algorithms and architectures.