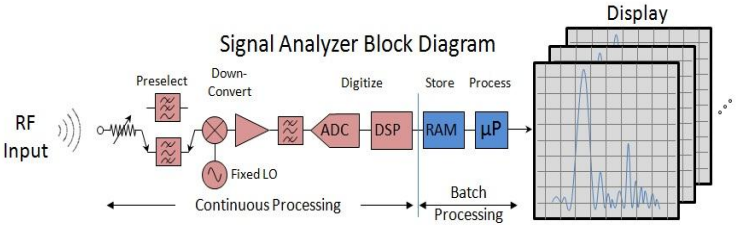
Spectrum Capture and Analysis Solutions

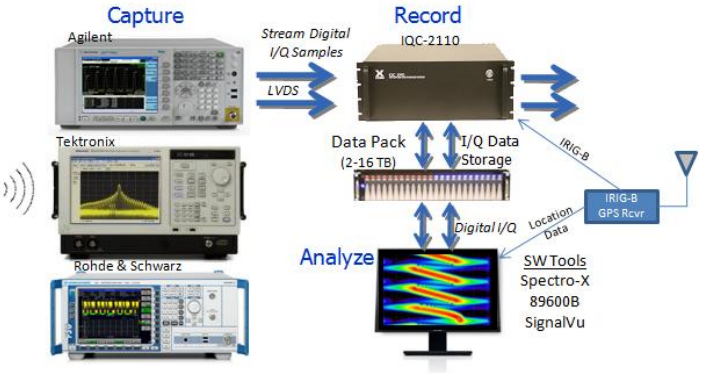
X-COM Systems

RF and microwave engineers who design electronic warfare, surveillance, radar or other wireless equipment and systems can greatly benefit from the ability to record operating environment spectrum and then search through and modify those files. Current generation signal analyzers (SA) provide superior SFDR along with gain and phase flatness that create a high fidelity window through which the desired spectrum is viewed. In real time, they can digitize input signals in to digital I & Q samples and, through mathematical transforms, present spectrum views that capture a detailed time slice across a bandwidth up to 110MHz. But, due to processing loads and available memory, that time slice is relatively short; on the order of a few seconds or less. In addition, once the SA begins the transform and display processing, it cannot capture another time slice until it is finished processing the previous one. Long duration events cannot be fully recorded and intermittent ones may be missed.



To prevent these issues, a device is needed that can supplement the performance of the SA by recording and storing the digital I & Q samples from the SA's analog to digital converter. Ideally, this interface to the recording device is located downstream of any SA DSP circuitry that provides gain and phase flatness compensation. In the figure above, that digital I & Q interface would be at the point where processing in the SA stops being continuous and begins to work in a batch mode. The device must provide a depth of memory that allows minutes or hours of recording. In addition, the recording must be continuous. No gaps ensure all spectral events are captured.

The X-COM Systems IQC-2110 RF Capture & Storage system provides all of these functions and is plug compatible with leading signal analyzers from Agilent, Rohde & Schwarz and Tektronix that utilize a digital bus ouput option. Together they provide the user an extremely high fidelity system to continuously record RF spectrum centered at any frequency tuneable by the SA with bandwidths that are only dependent on the maximum span of the SA.



The Signal Analyzer acts as the microwave or RF front end, pre-selector and down converter, presenting digital I & Q, 16 bit samples to the X-COM IQC-2110. The superior noise floor, SFDR, amplitude and phase flatness of the SA over the span bandwidth ensures a very high fidelity signal which the IQC-2110 then captures and stores in a RAID5 disk array. The result is a high fidelity, gap-free recording of the spectrum that is stored with the ability to recover lost data should one disk drive fail in the RAID array.

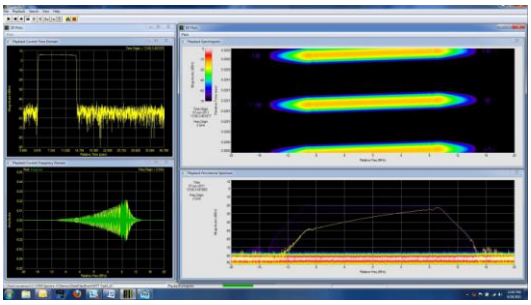
The combined system can capture and record across the full span of the SA. Depending on manufacturer, this can be up to 110 MHz. In addition, the X-COM IQC control software can implement Step & Stare functionality. Under control of a user-written software macro, the SA center frequency is tuned and the spectrum is recorded across the SA span for a user defined period of time. The macro then tunes the SA to a new frequency and the capture continues. Using Step & Stare, the user could, for example, program twenty captures, each with a span of 25 MHz and SA center frequencies such that an entire satellite transponder BW could be recorded.

The time period over which the capture bandwidth is recorded only depends on the size of the disk array connected to the IQC-2110. Using a 12TB disk array, 60 hours of capture time is possible at a 10MHz bandwidth. Fifteen hours of recording is achievable utilizing the 40 MHz capture bandwidth.

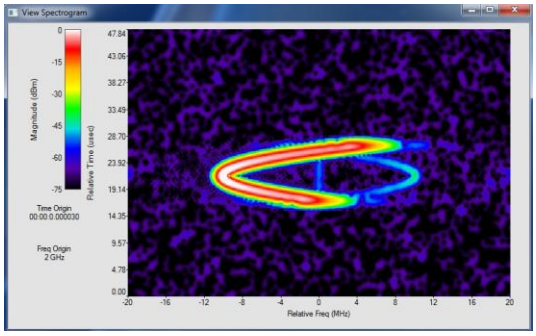
Spectrum Capture and Analysis Solutions

X-COM Systems

The captured RF is an exact replica of the spectral environment in which a new design must function. But designers are blind to important nuances in that environment or are unaware of other users of the spectrum unless they can visualize, search and analyze the recording.



The X-COM software application, Spectro-X, provides multi-domain visualization of the recorded spectrum. Shown above is a recording of a series of linear chirps. The spectrum recording can be played, re-played, paused or stopped. The four windows provide two dimensional displays of amplitude vs time and frequency vs time, as well as three dimensional displays of power frequency and time or magnitude, frequency and persistence. Other views are available such as phase, real & imaginary as well as histograms.



Spectro-X lets a user search for, clip and store the occurrences of modulated carriers, standardized wireless waveforms or user-defined, arbitrary waveforms of interest. The image above is the result of clipping and storing one of the linear chirps and then using it as the reference waveform to search through the entire capture file looking for instantiations of chirps that do not exactly match.

Once found, this particular spectrum clipping can be exported to software such as the Agilent 89600B VSA program or MATLAB® for further quantification, even to the level of digital demodulation and error vector measurements.

Signal Analyzers from leading vendors, in combination with X-COM Systems' RF capture, visualization and search products provide RF engineers very powerful tools for the design of communications devices and systems that must operate in complex, sometimes hostile communications environments. Each bring complementary, best in class capabilities to R & D labs needing exact replicas of anticipated communications channel environments.