SRM-3000 HF/VHF Multi-channel Monitoring and Collecting Receiver

Features

- **Compact design with graphical user interface**
- **Up to 40MHz wide instantaneous real-time bandwidth**
- **Real-time IF panorama display by complex FFT algorithm**
- **High channel selectivity by digital filtering**
- **Excellent precision and sensitivity**
- **Raw data IF and demodulator AF recording**
- **Built-in direction finding processor**
- **Flexible compatibility for system integration**

Product description

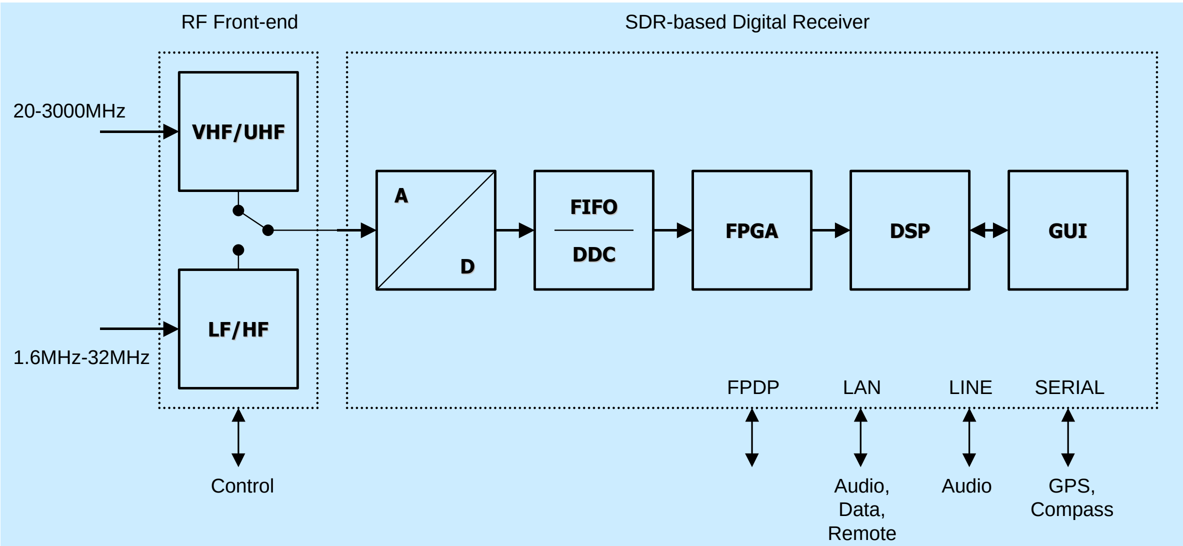
The receiver consists of the usual components of digital monitoring intercept receiver:

- RF front-end,
- HF/VHF digitizer,
- Digital filtering and
- Digital signal processor.

The SRM-3000 is a broadband, digitally implemented monitoring receiver. With a frequency pre-selector it can be used in HF bands as direct digitized receiver. (DDR) The frequency range could be extended using a VHF/UHF receiver front-end tuner with wide-band IF output. The receiver digitizes the incoming signal in its instantaneous (real-time) bandwidth. Its digital receiver channels can be tuned to given frequency in its real-time bandwidth. The data streams of the channels are processed by the digital demodulators, supporting usual number of carrier modulation waveforms and bandwidths of wireless emitters. The receiver consists of the RF front-end, digitizer and data capturing unit implemented as a computer add-on card using desktop PCI form factor and the associated driver, signal processing and user interface software components. For forming a full-functional monitoring receiver the basic components are installed in a high-grade industrial interface computer.

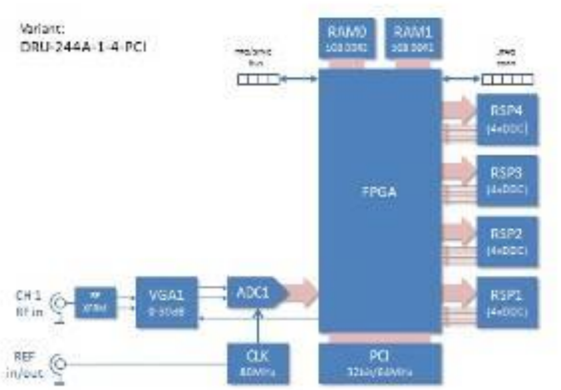
Digital receiver concept

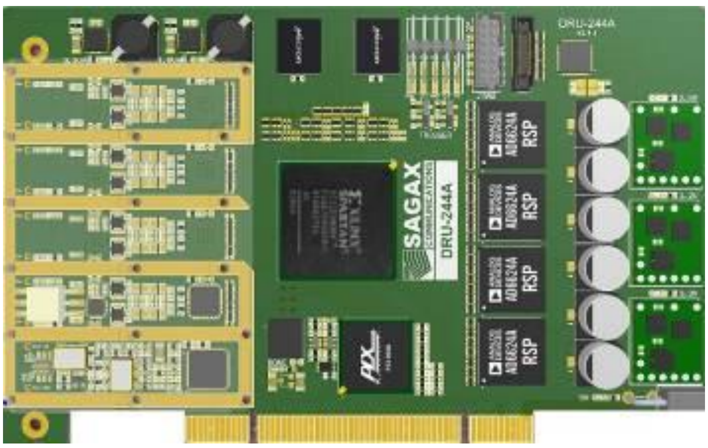
Our digital receiver concept based on the Software Defined (SDR) technology, which means to digitize the data as earlier in the signal path as possible and do all of the functionality in digital domain. Before the analog to digital conversion the required analog signal processing contains band limiting and pre-selection, variable amplification and frequency conversion in higher VHF/UHF bands. After the digitization burst memory (FIFO) or digital down-converter (DDC) is used depending on the application which could be a wide-band scanning or narrow-band monitoring reception. Programmable logic (FPGA) is used for on-board data processing and routing before the data is passed to digital signal processing (DSP) algorithm. The whole receiver is handled trough graphical user interface (GUI) which is running on the platform computer. External connections are provided by the platform computer for local and remote control.



High-tech hardware implementation

We use the latest state of the art analog processing and digital conversion technology available in the market to provide high-dynamic range, wide-bandwidth front-ends and digitizers for our receivers with 16bit resolution and 80MHz sampling rate. All of our digital signal paths are designed for +16bit sample handling.

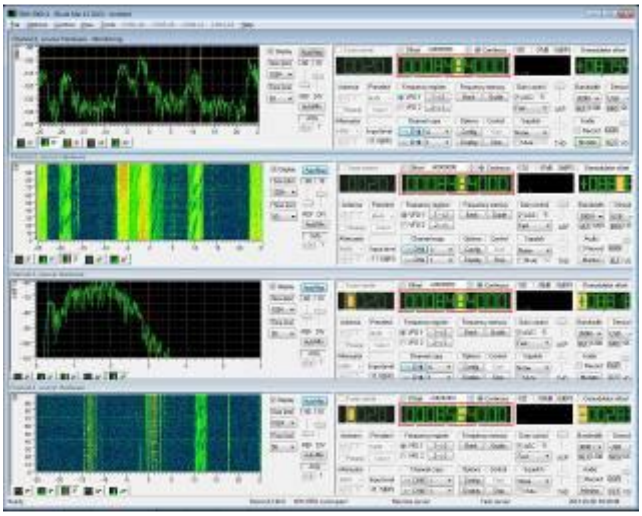




The front-end of the receiver transform the interested frequency sub-band to the IF with maximum bandwidth, which is equal with real-time instantaneous bandwidth of the receiver. This full-band signal can be used for fast scanning, parallel processing algorithm for finding signal components in the spectrum. But it is possible to use limiting the frequency range in the digital domain too to achieve higher frequency resolution or more accurate bandwidth estimation.

Graphical user interface

The receiver could be handled by the graphical user interface implemented as standard Windows based program with usual control elements and high resolution graphics.



Time domain, spectrum, waterfall and audio displays

Spectrums and spectrograms

Digital channel selection and filtering

The front-end of the receiver transforms the selected frequency sub-band to the IF with maximum bandwidth, which is equal with real-time instantaneous bandwidth of the receiver. The digital down-converter (DDC) tuner channels of the digital platform are used to select the required channel in the incoming bandwidth of the signal. After the down conversion to the base-band quadrature (IQ) samples the bandwidth limitation and decimation is implemented. Before the demodulation further conversion and filtering is available inside the digital IF bandwidth.

Advanced signal and data routing

The monitoring receiver is further enhanced with recording and replay of the demodulated audio or raw IQ data to a disk file. Beyond the disk recording facility the receiver program is able to send out the demodulated or raw IQ data trough the IP network.

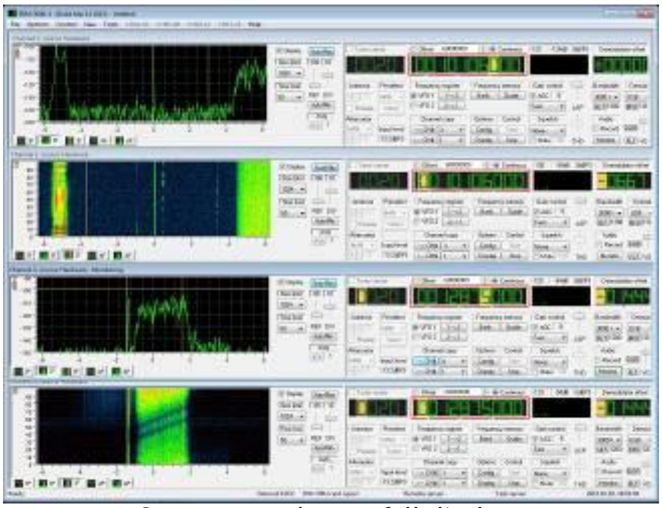
Sophisticated signal classifier

The digital signal processor of the receiver contains sophisticated algorithms for classifying the incoming signal. The occupied bandwidth and the modulation format can be determined by the receiver, which helps to extend the database record and choice the applicable demodulator.

Direction finding signal processing

The monitoring receiver is able to process the angle of arrival (AOA) for all of the incoming signal components in the IF spectrum to provide IF bearing spectrum.

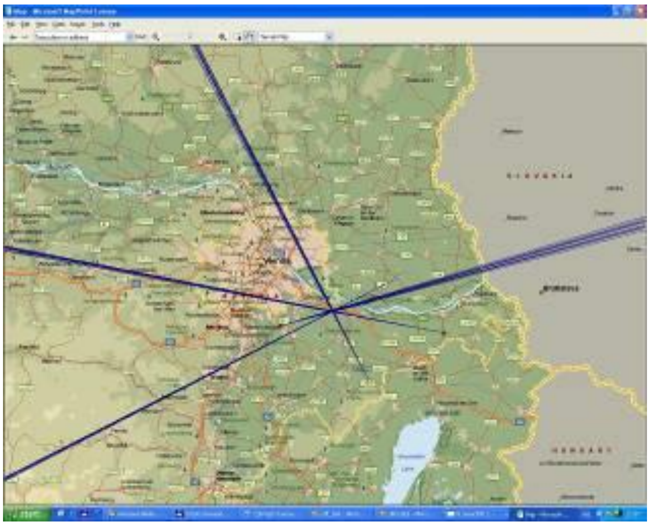
DF Antenna systems (optional)
The receiver can control the Adcock DF antenna consists dual loops and sense (HF) and 8-element circular array with derived reference. (VHF/UHF) The receiver can be connected to a separate GPS receiver and antenna for location and time reference. Mobile versions of the system can contain fluxgate compasses to provide antenna orientation data to the DF system.



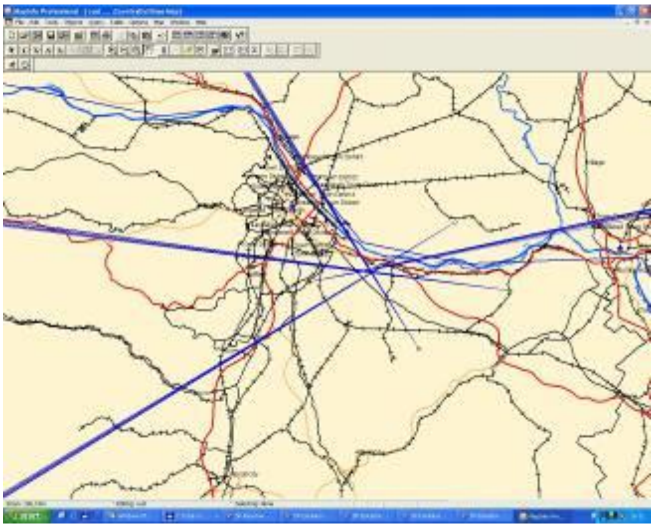
Spectrum and waterfall displays

Direction finding displays

Mapping functions (optional)
The new integrated mapping facility links to the bearing displays and mapping server allowing signals of interest to be instantly located on a map. An integrated internal mapping facility sends a data message to the map server component which is connected to the third party map visualization program to display a line of bearing. Multiple SRS-3000D WDF systems provide multiple DF overlays allowing signal location by crossing lines of bearing. The triangulation function is implemented in the map server. In addition, an API is available for customer specific mapping packages.



Mappoint display



Mapinfo display

Specification summary

Signal capturing	
Frequency settings	
Digitizer frequency range	9KHz - 320MHz (3dB)
Digital instantaneous bandwidth	40MHz - (Nyquist)
Tuning resolution	1Hz synthesized
Input frequency range (HF front-end)	9KHz-32MHz (typical)
Input frequency range (VHF/UHF front-end)	20-3000MHz (optional 6GHz)
Instantaneous bandwidth (HF front-end)	40MHz
Instantaneous bandwidth (VHF/UHF front-end)	20MHz
Frequency settings	Keypad, roll key, remote control
Frequency readout	Digital read out on control software
Internal reference accuracy	$\leq$ +/- 1 part in 10E6
Internal reference aging	$\leq$ +/0.5 part in 10E6 /year
External reference frequency	10MHz, 0dBm nominal level

Receiver parameters	
Antenna input	
RF input impedance	50 ohm, nominal
Pre-selection	12 sub-octave filters (optional)
Input VSWR	2.0:1 typical
Maximum input power	20dBm
Sensitivity	
Noise figure	10dB typical @ max. gain
Sensitivity @1KHz resolution	-120dBm @ 10dB S/N
Interference rejection	
Spurious free dynamic range	≥ 70dB, typ. 80dB
Internal spurious signals	≤ -100dBm equivalent input
Image rejection.	≥ 80dB
Gain control	
Maximum gain	30dB
Maximum attenuation	30dB
Attenuator step size	2dB
Gain control	Manual/Automatic

Signal processing		
Spectrum estimation algorithm		24 bit complex radix2 FFT
Digital bandwidth		+/-6.25/12.5/25/50 KHz
Time resolution (waterfall)		10ms, 20ms, 50ms, 100ms, 200ms, 500ms, 1s
Frequency resolution	In the band 1.5-30MHz:	1Hz, 2Hz, 5Hz, 10Hz, 20Hz, 50Hz, 100Hz, 200Hz, 250Hz, 500Hz, 1kHz, 2kHz, 5kHz, 6.25kHz ,8.33kHz, 10kHz, 12.5kHz, 20kHz, 25kHz
	In the band 30-100MHz:	10Hz, 20Hz, 50Hz, 100Hz, 200Hz, 250Hz, 500Hz, 1kHz, 2kHz, 5kHz, 6.25kHz ,8.33kHz, 10kHz, 12.5kHz, 20kHz, 25kHz
	In the band 100-3000MHz:	1kHz, 2kHz, 5kHz, 6.25kHz ,8.33kHz, 10kHz, 12.5kHz, 20kHz, 25kHz
Windowing		Built-in, high dynamic range
Averaging		1…100 samples
Demodulation bandwidth		400Hz-20kHz with 1Hz steps 2/3/4,5/6/9/15/20/50/100 kHz selectable
Demodulators		FM, AM-DSB, LSB, USB, ISB, CW, IQ
Output routing		to Wave file or to Network interface
Signal detection		Automatic squelch
Frequency changing		Two frequency registers

General data	
Interfaces	
User interface	Graphical operating software
Operating system	Windows XP professional
Data and control interfaces	LAN IEEE 802.3 (TP Ethernet)
Remote control	TCP/IP based control interface
General data	
Environmental requirements	MIL STD 810D
Electromagnetic compatibility	MIL STD 461E
Operating temperature	0°C to +45°C
Storage temperature	-10°C to +70°C
Vibration	For vehicle based application only in amortized rack.
Power supply	230 VAC +/-10%, 50Hz +/-5% power supply
Power consumption	450 W max.
Packaging	4U 19”
Weight	25 kg (without monitor)