TitanSDR

HF Multichannel SDR Receiver

Parallel Demodulation, Recording and Analysis of HF Emissions

Main Features

- Direct conversion Front-End architecture
- 9 kHz to 32 MHz frequency coverage
- 16 frequency preselectors
- High front-end linearity
- One to four parallel Wideband channels (312.5 KHz to 2.1875 MHz wide)
- Up to 40 parallel Narrowband channels
- Modes: SSB, AM, NBFM, CW, eSSB, FSK, DRM
- High frequency resolution Panoramic Spectrum (305 Hz RBW)
- Wideband and Narrowband spectrum and waterfall (with custom palette)
- Record-and-replay of Wideband channels
- Scheduler of recording activities
- Tight integration with Krypto500 decoder by Comint Consulting
- Support for Hoka Electronic software decoders

Overview

TitanSDR is a Software Defined Radio receiver, allowing up to 40 NB (Narrowband) channels. It is operated by a commercial PC (Personal Computer), through USB 2.0 interfacing. Acquisition bandwidth can be split into up to 4 WB (Wideband) channels. WB and NB channels are provided with spectrum and waterfall plots and can be recorded on PC Hard Disk (recording can also be scheduled). WB recordings can be replayed. Interface to software decoders is through VAC (Virtual Audio Cable) or LAN Ethernet (customizable on request).
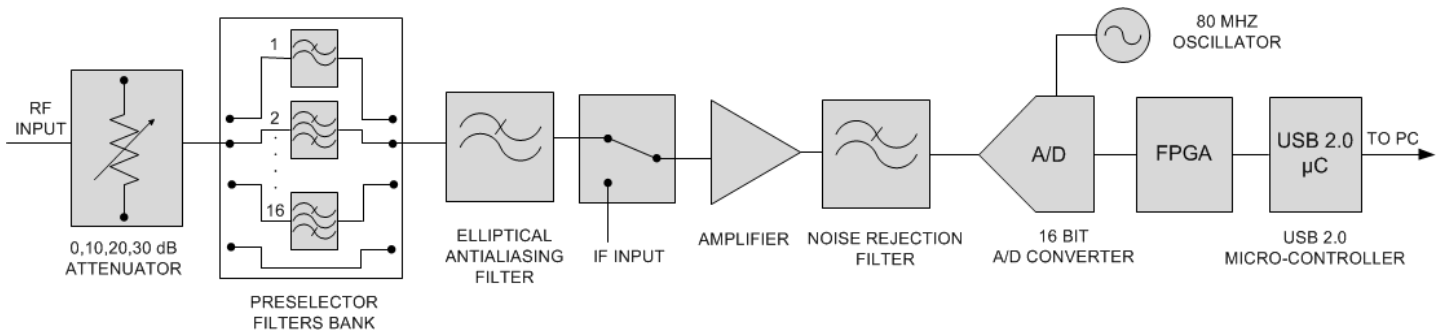
Applications

TitanSDR is an effective tool for surveillance and monitoring of the radio spectrum and can be usefully employed in the following areas:

- Homeland security and foreign intelligence (SIGINT and COMINT)
- Military communications
- Environmental protection (from electromagnetic pollution)
- Detection of interfering or illegal electromagnetic emissions (by national radio frequency agencies)
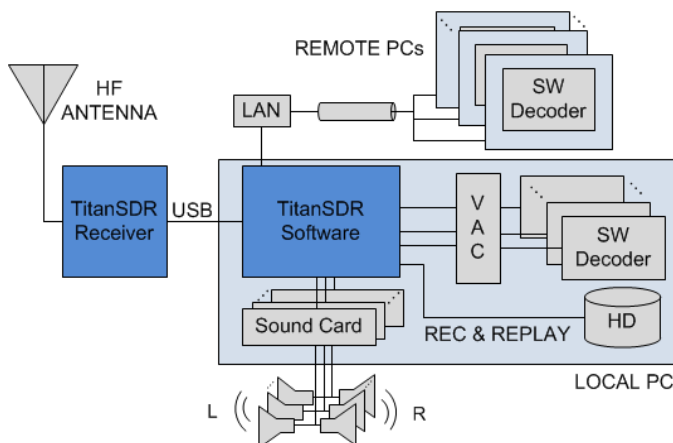
Advantages

Until recently multiple monitoring of radio channels required a distinct receiver for each channel and a multicoupler (to split the antenna signal among receivers), resulting in costly systems with significant dimensions, weight and power consumption. Instead by just connecting TitanSDR to an HF aerial, dozens of radio channels can be listened to (by PC sound cards), recorded (as .wav files) or streamed to software decoders (for decoding of digital formats) in parallel. TitanSDR is ideal to equip monitoring centers and for monitoring missions in which logistics is a critical element, thanking to its compactness.

ENABLIA
ELECTRONICS & TELECOMMUNICATIONS
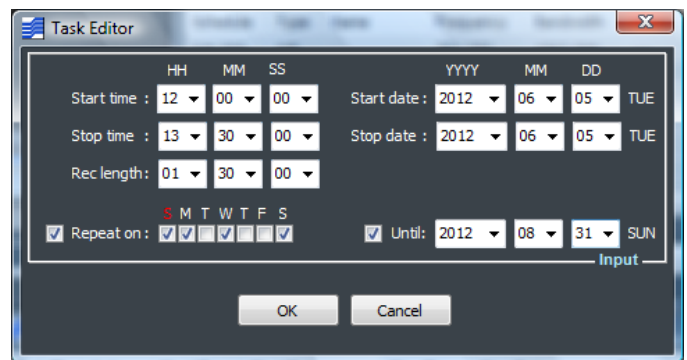
Receiver Block Diagram

Software Features

In *Receiver mode* (as opposite of *Player mode*), software input is from the receiver via USB 2.0. Front-End controls allow to set the receiver input (HF or IF), the attenuation to HF input and the preselection filter (if required). After allocating a WB channel (possible bandwidth ranges from 312.5 KHz to 2.1875 MHz), it can be tuned by mouse dragging of the corresponding shaded area over the *Panoramic Scope* (see next page, upper screenshot). NB channels are allocated on the *Wideband Scope* (down left side window) and are represented by shaded areas of the same color of their WB channel. By clicking on a NB channel shaded area, its spectrum appears on the *Narrowband Scope* (down right side window) where mode can be set, as well as channel bandwidth (by editing or mouse dragging its cut-off filter frequencies). All spectrum scopes allow averaging, zooming and choosing among several data windowing alternatives. Custom palettes can be set for NB and WB waterfall plots. Figure below illustrates how outputs of TitanSDR software may be possibly employed.
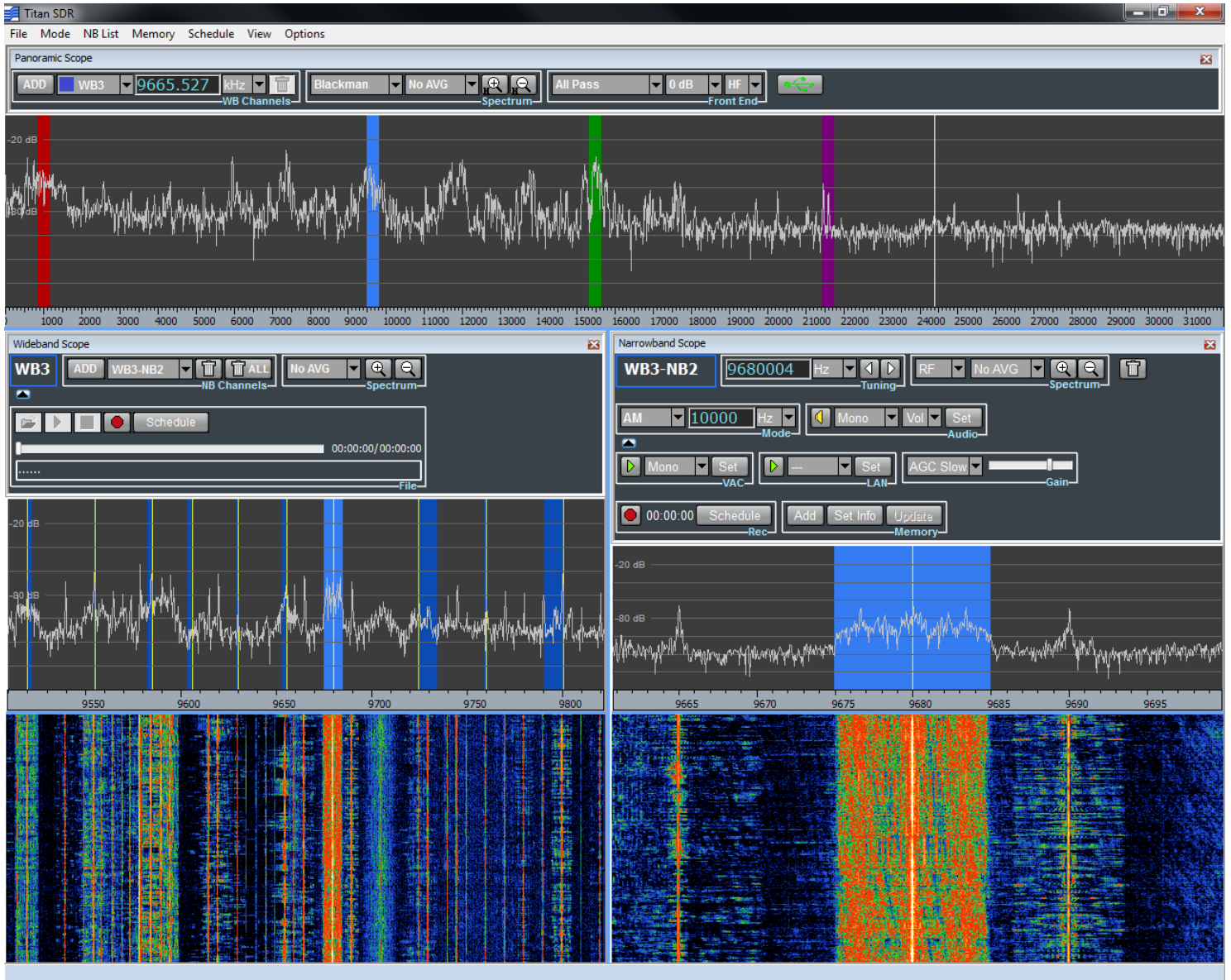

In particular NB channels demodulated output can be listened to (by PC loudspeakers), recorded on local HD (wav files) and sent to external third party software decoders, by VAC or LAN. Furthermore its spectrum can be displayed (instead of RF spectrum), as well as its waterfall plot. WB channels can be recorded and resulting archive files (proprietary format) can be played-back in *Player mode*. Recording of each NB and WB channel can even be scheduled through the *Task Editor* window (screenshot below).

All allocated NB channels are listed in the *NB Channels List* (see next page, lower screenshot), reporting their status and allowing to recall their controls by simply clicking on their rows.

DSP approach

Innovative pre-processing (based on filters banks) was implemented on FPGA, instead of conventional DDC (Digital Down Conversion), allowing for flexible partitioning of the acquisition bandwidth into WB channels and permitting tens of NB channels with reduced impact on CPU, even during replay of WB channels.

ENABLIA
ELECTRONICS & TELECOMMUNICATIONS

TitanSDR Software: *Panoramic Scope* (top), *Wideband Scope* (down left side) and *Narrowband Scope* (down right side)

TitanSDR Software: screenshot of *NB Channels List*

Technical Data

Frequency Range	9 kHz – 32 MHz
Noise Figure	**9 KHz - 1.5 MHz:** NF = 15.25dB **1.5 MHz – 32 MHz:** NF = 14.2dB
Preselectors (16)	**Low Pass:** 0-1.54 MHz **Band Pass** (1.44-32 MHz): 1.44-2.07, 1.88-2.7, 2.4-3.46, 2.96-4.26, 3.56-5.12, 4.22-6.08, 4.88-7.03, 5.53-7.96, 6.46-9.31, 7.81-11.24, 9.74-14. 03, 12.53-18.05, 16.55-23.17, 21.67-28.17, 26.67-32
Attenuation	0dB, 10dB, 20dB, 30dB
Clipping	-8dBm (@ 0dB Attenuation)
Wideband Channels	**Maximum Number of Channels:** 4 **Bandwidths** (kHz): 312.5, 625, 937.5, 1250, 1562.5 , 1875, 2187.5 **Maximum Total Bandwidth** (kHz): 2187.5 , 1875, 1562.5 and 1250 for 1, 2, 3 and 4 Wideband Channels, respectively
Narrowband Channels	8 (TitanSDR) or 40 (TitanSDR-Pro), independently tunable within Wideband Channels
Spectrum Scopes Refresh Rate	19 Hz
Panoramic Scope	0 Hz ÷32 or 40 MHz, 305 Hz RBW
Wideband Scope	312.5 ÷ 2187.5 kHz, min RBW 19.07 Hz (Spectrum & Waterfall with customizable palette)
Narrowband Scope	**RF:** 39.06 kHz, min RBW 19.07 Hz (Spectrum & Waterfall with customizable palette) **Audio:** 5512.5 ÷22050 Hz , RBW 5.4 ÷ 21.5 Hz (Spectrum & Waterfall with customizable palette)
Modes	SSB, AM, NBFM, CW, eSSB, FSK, DRM (Dream or DRM Software Radio supported)
Selectivity	100 dB (Stop Band Attenuation)

Sensitivity	-116 dBm (0.34 µV) SSB at S+N/N=10dB, 15MHz, 2.4 kHz BW
Tuning Accuracy	+/- 0.5 ppm
Recording	Up to 4 Wideband Channels (proprietary file format) All Narrowband Channels (.wav files) **Scheduler function:** recording at programmable time intervals (also day-time periodic tasks with selectable days of week)
Demodulated audio to SW decoders	By **VAC** (Virtual Audio Cable) By **LAN** to Krypto500 and to Hoka Electronic software decoders (TitanSDR-Pro only)
Support for SW developers	LAN Ethernet control of TitanSDR software application through ad hoc TCP commands set (Pro version only)
Memories	Saving allowed for NB channel frequency, bandwidth, mode, entry time, entry date, callsign, ITU code, station and user description
A/D Conversion	16 bit, 80 Msps
Image Rejection	90 dB typ.
IIP3	>37 dBm
SFDR	>108 dB
Alias Rejection	115 dB
Antenna Input	50 Ohm BNC
IF input	50 Ohm SMA - Bandwidth: 0.1÷ 32MHz
PC Operating System	Windows 7/Vista/XP
PC Interface	USB 2.0
Operating Temperature	0° - 40° (°Celsius)
Supply Voltage	6VDC +/-1V
Supply Current	2.5Amp
Dimensions	243mm x 52mm x 145mm (WxHxL)

ENABLIA
ELECTRONICS& TELECOMMUNICATIONS