

PSR Base Module



The base unit of the SkyRadar Modular Radar Training System provides a fully operational close range radar. The abbreviation PSR stands for primary surveillance radar and emphasizes the conceptual proximity of the PSR and large size radar towers in air traffic surveillance.

Description

Technically, the SkyRadar Base Module is based on a pulsed noise radar. It is operable in Pulse and Doppler mode. The SkyRadar Base Module allows for experiments ranging from basic working principles like validating the radar equation to most complex radar scenarios. The system operates with the SkyRadar FreeScopes Software which provides many scopes (A-Scopes, B-Scopes, PPI), control interfaces and filters. The module allows for highest flexibility in the learning process, while providing high-resolution at close distance with an

electromagnetic emission of a small fraction of that of a mobile phone.

Features

- Operating Modes (enabled in the hardware)
 - Pulse
 - Doppler
 - Moving Target Indication (MTI)
- Scopes (enabled through FreeScopes)
 - A-Scope
 - B-Scope
 - Plan-Position-Indicator (PPI)
- Amplification
 - Amplification of raw signal (IQ signal) at receiver
 - Amplification of filtered signal in the scopes
- Filters and Signal Treatment
 - Sensitivity Time Control (STC)
 - Signal Threshold and Limiter
 - Range Calibration and Extension
 - Cutting out selections of the signal range
 - Moving Target Detection and Indication and more



Topics

FreeScopes is available for the following subjects:

- Experiments on Pulse and Doppler (speed)
- Experiments on A-Scope, B-Scope and Plan-Position-Indicator (PPI)
- Calibrating a radar using amplification, filters and settings
- Experiments in a fixed position as well as through panning and rotation (rotary tripod required)
- Experiments on amplification of source as well as of the signals
- Clutter processing e.g., through Sensitive Time Control (STC)
- Radar Cross Section (RCS) analysis allowing for an understanding of the varying detectability of objects based on material, absolute and relative size, reflection angle, distance and strength of the signal.
- Allows analyzing performance and false alarm tolerances through adjustment of the sensitivity.
- Adjustable decision threshold allowing for experiments on background noise.
- And much more.

Parts

The PSR Base Module consists of:

- one (1) mounted pair of horn antennas
- one (1) base unit, including
 - one (1) digital signal processing unit (DSP)
 - one (1) transceiver
 - one (1) motor control unit (only activated when rotary unit is added)
- one (1) cable set.

Prerequisites

- Computer with latest HTML5 enabled browser. Current versions of Chrome, Firefox, MS Internet explorer, Opera and Safari are able to read HTML5.
- [SkyRadar FreeScopes](#) (comes free with the SkyRadar Base Unit).

Extension

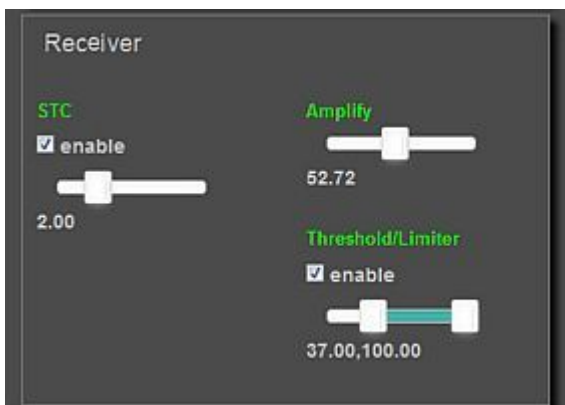
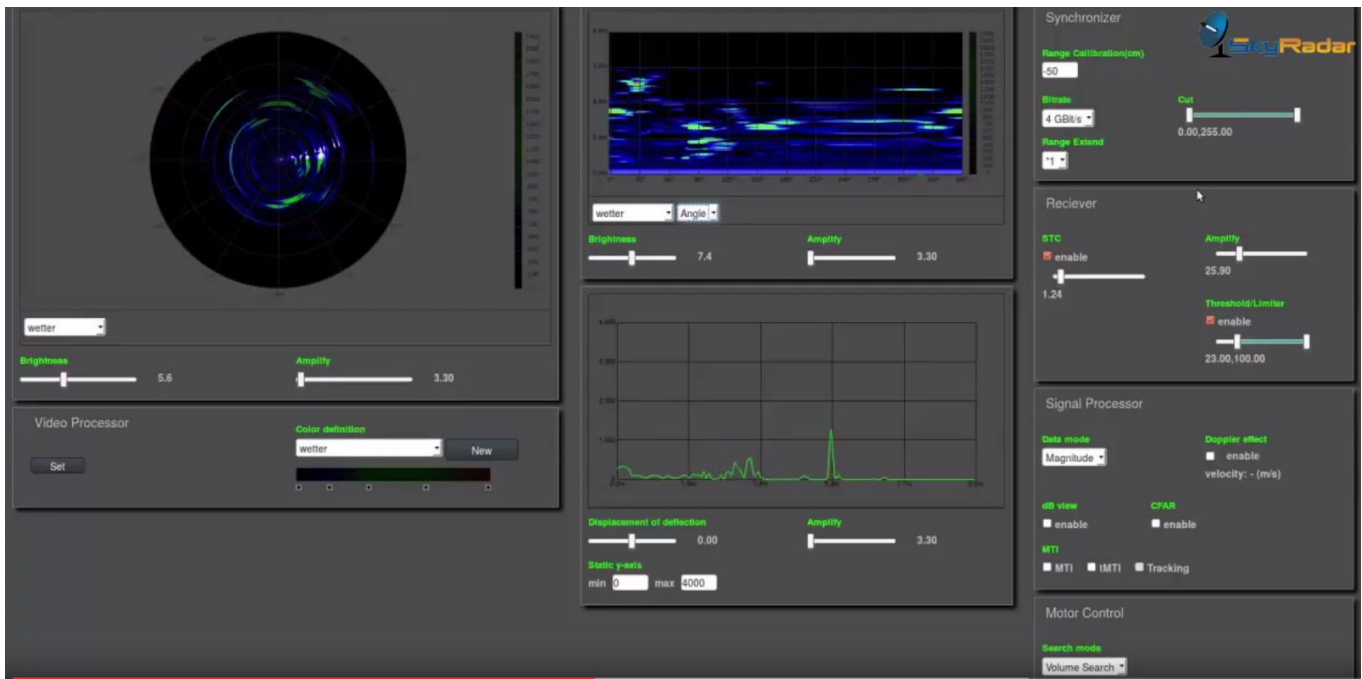
- [SkyRadar Rotary Tripod](#) (recommended)
- [SkyRadar Parabolic Reflector](#) (recommended)
- [SkyRadar Cloud Server](#) (recommended)
- [SkyRadar Target Tracker](#) (comes free with the base module)
- [SkyRadar Security](#)
- [SkyRadar Target Subsystems](#)
- [Vessel](#)
- [Quadcopter](#)
- [SkyRadar ADS-B Experimenter](#)

The SkyRadar PSR Base Module is accessible by an unlimited amount of concurrent users.

At the heart of the system, the server card controls a so-called noise radar. This noise is electronically converted into a pulse radar. The transmitter can emit very short pulses through the antenna and monitor the reflected pulses. The pulses are reflected of fixed objects (buildings, trees...) and moving objects (cars, people...) which pass the antenna beam. The Base Module also provides the opportunity to study Doppler effects.

The signals are digitally processed using a Digital Signal Processor (DSP), data is visualized through the analysis and visualization software SkyRadar Scopes.

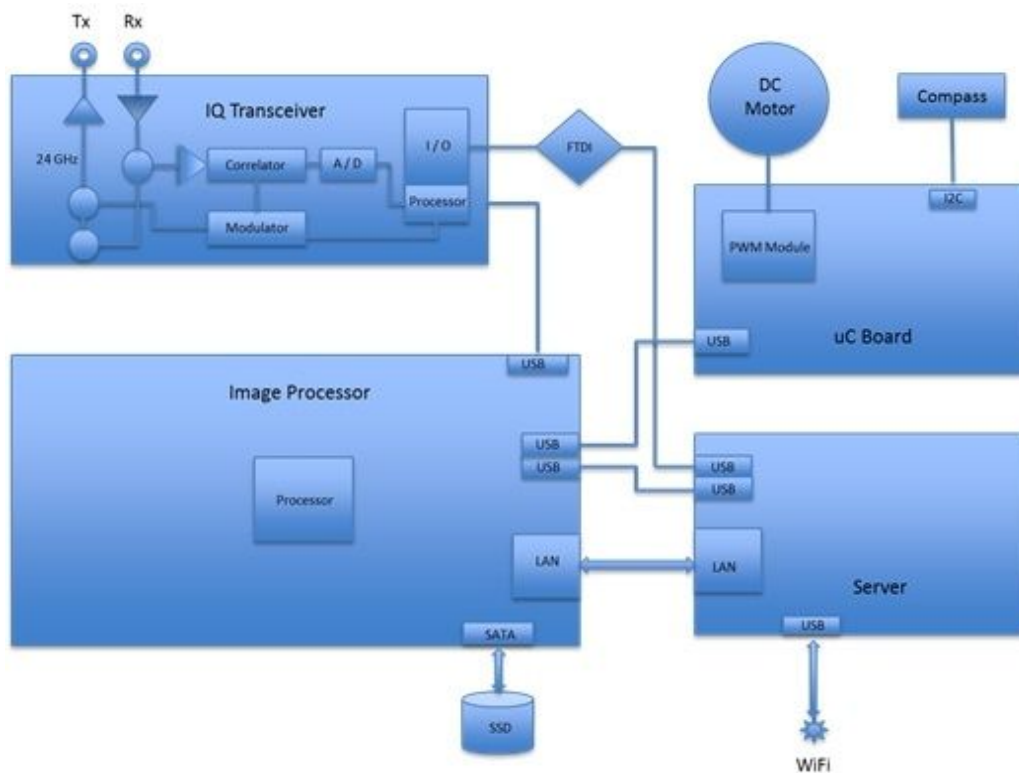
General Features



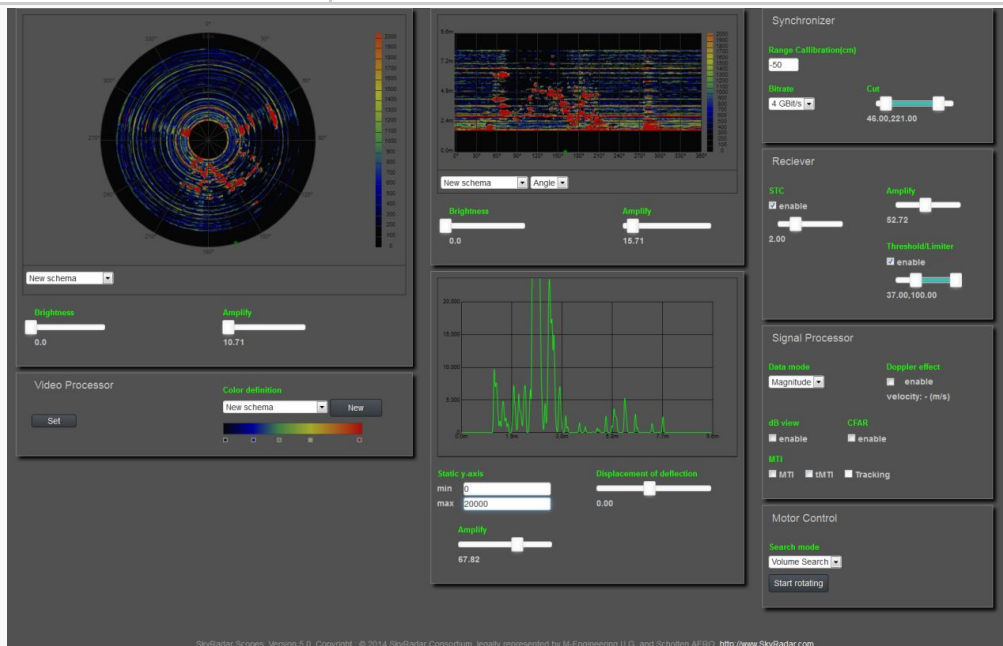
- Active radar, designed for perfectly save indoors and outside operation (transmitter output power significantly lower as such of a mobile phone)
- The following operating modes can be technically enabled in the hardware
 - Pulse
 - Doppler
 - Moving Target Indication
- Antenna
 - Standard: Double Horn Antenna
 - Default operation 24 GHz
 - Antennae can be exchanged in plug-and play concept

- Powerful and fast radar image processor.
- All measurements are performed in real time. No sub-sampling or substitution techniques.
- Optimized for detection of real targets in a 3-dimensional space within laboratories or outside, remote controlled remote controlled aircrafts. No limiting target table or rail system required.

System Features



Power Requirements	12V, 5V
Output Density at the antenna	-2 dbm / 630 μ W
Maximum Range with parabolic reflector	more than 40 m
Sampling Rate of I/Q Data	internal 1 - 4 Mbits/s
Dimensions	without horn antennas: 141mm x 143mm x 195mm; with horn antennas: 141mm x 143mm x ~240mm
Net Weight	500g - 750g



Power Requirements	12V, 5V
Output Density at the antenna	-2 dbm / 630 μ W
Maximum Range with parabolic reflector	more than 40 m
Sampling Rate of I/Q Data	internal 1 - 4 Mbits/s
Dimensions	without horn antennas: 141mm x 143mm x 195mm; with horn antennas: 141mm x 143mm x ~240mm
Net Weight	500g - 750g

Transmitter Features

Supply Voltage	24V
Supply Current	300 mA
Operating Temperature	-20 ... + 60 °C

Table: General operative characteristics of the Transceiver

Carrier Frequency	24 Ghz	24,125 GHz	24,250 Ghz
Transmitter Output Power:	-6dBm	-2 dBm	+2 dBm
Transmitter Output Power:	0,25 mW		1,58 mW
Spectral Width	20 GHz	...	28 GHz
Spectral Density	-30 dBm	-30 dBm	-30 dBm
Frequency Drift vs Temperature	-0,3 Mhz / °C	-0,3 Mhz / °C	-0,3 Mhz / °C
Spurious emission	-30 dBm	-30 dBm	-30 dBm

Table : Operative characteristics of the Transmitter (subsection of the Transceiver)

Receiver Features

Antenna Gain	17 dBi
Receiver Sensitivity	- 91 dBm
Overall Sensitivity	-106 dBc

Table : Operative characteristics of the Receiver (subsection of the Transceiver)