RASS-S Training Radar

The RASS-S training consists of a primary and a secondary radar environment optimized for training purposes, connected with RASS-S equipment for secondary and primary radar. The signals can be recorded. The ASTERIX based data can be communicated to an unlimited amount of concurrent learners, which can connect through Ethernet (computers and Ethernet not part of the delivery). Key component in this arrangement is the Training Server, able to inject Disturbances and Faults. The server also allows for communication of ASTERIX data to the student computers. There, the ASTERIX data can be displayed in A-Sopes, B-scopes and the PPI.

General Features

- Active radar, designed for perfectly save outside operation (e.g. through an open window).
- Training server for comfortable training scenarios
- Modes
  - Pulse
  - SSR

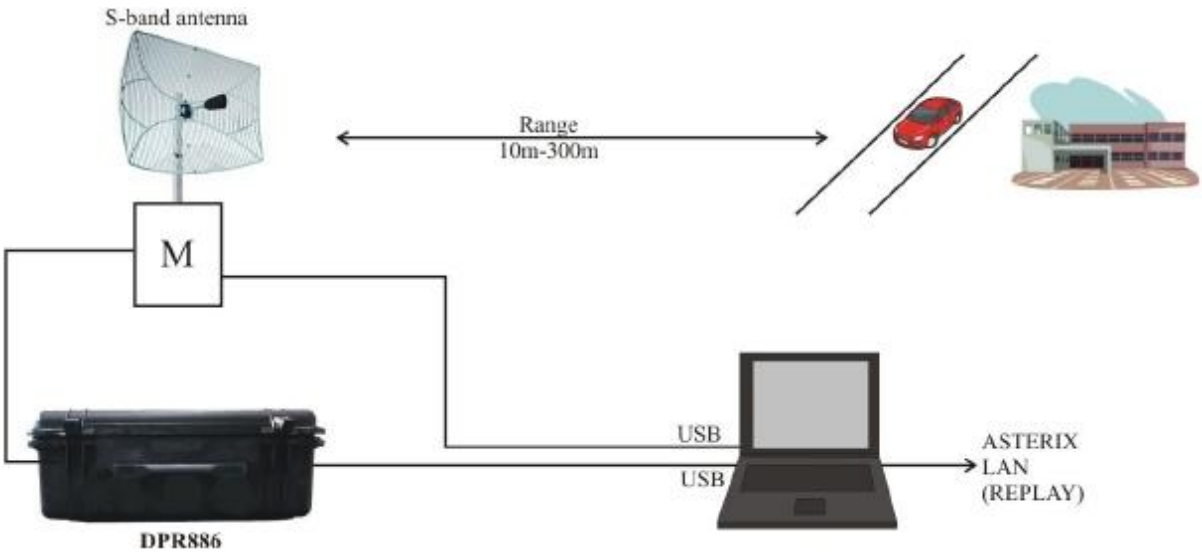
Some of the components such as the Didactic Test interrogator can be used to generate primary and secondary signals. The description of possibilities on this page is not exhaustive but rather points out possibilities.

Primary Surveillance Radar

For realistic ATC radar training we have chosen to use an S-Band Tx/Rx didactical setup for basic training amended with software tools to investigate detailed problems like clutter and Doppler.

The Didactical Primary Radar consists of a motor-controlled S-band antenna (placed outside), a Transmitter /Receiver unit and PC for control and analysis. The S-band antenna can be rotated (slowly) with a motor which is controlled through an RS232 connection (workstation). The transmitter can send very short pulses through the antenna in to the environment and the receiver will monitor the reflected pulses. The pulses are reflected on fixed objects (buildings, trees...) and moving objects (cars, person...) which pass the antenna beam. The moving cars simulate the ATC traffic on a scale 1/100th.
The students have the opportunity to study the I/Q, MTI and Doppler effects.

The signals are digitized processed and recorded using a Digital Signal Processor, data is shown on a PC. A demo campaign will be delivered together with the training system; this campaign contains real data of opportunity traffic.
The ASTERIX data can be viewed and analysed using the protocol viewer or the RASS-R display. It is also feed into the SkyRadar FreeScopes software

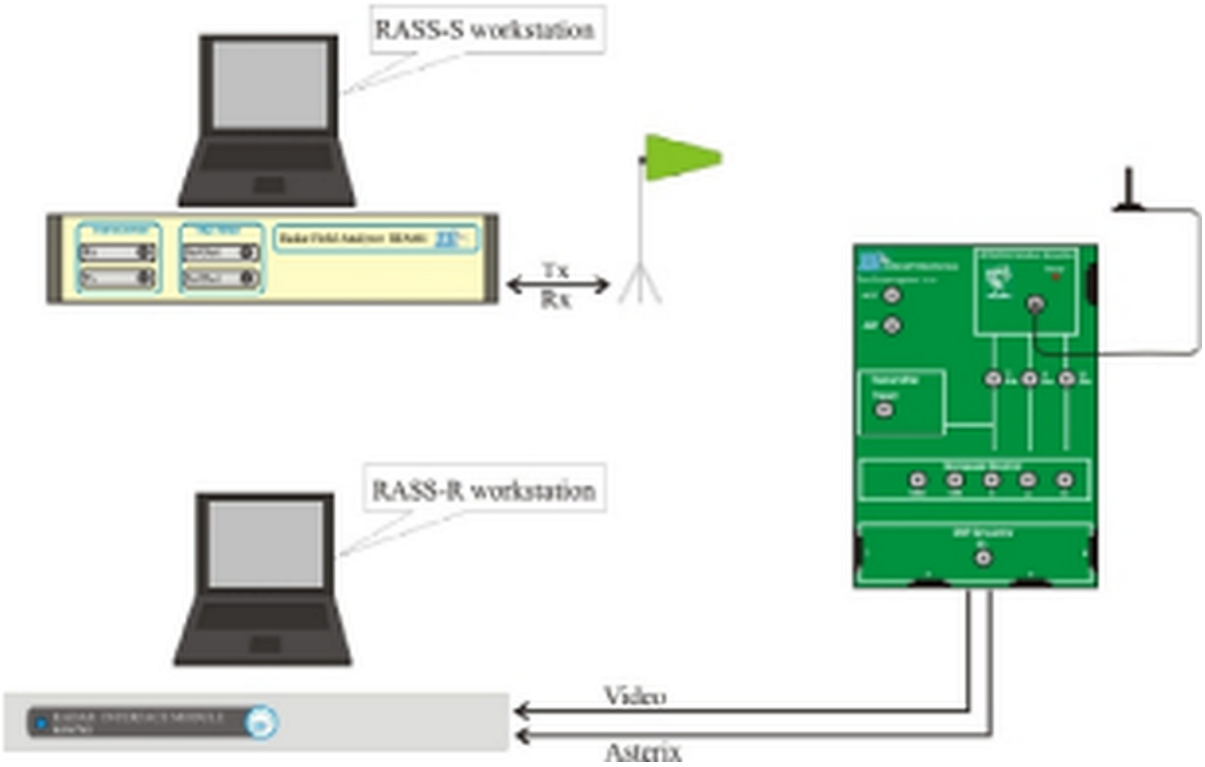


Secondary Surveillance Radar

The Didactic Test Interrogator simulates the basic signals of a surveillance radar. In order to improve the degree of realism, the structure of the instrument resembles the normal radar systems configuration: an Rf interrogator section and a video receiver module with mono-pulse output.

The Radar Field Analyzer can be used in a Remote Field Monitor mode, thus mimicking the operation of a transponder. Using the Radar Field Analyzer allows for studying the subject of the radar transmitter and
receiver (BW, STC,…).

Radar Interface Module samples and records the video and ASTERIX data of the RFM signals. The software gives the student the opportunity to analyse the pulses and codes of the video signals as well as the details of the ASTERIX data.



ATSEP Training

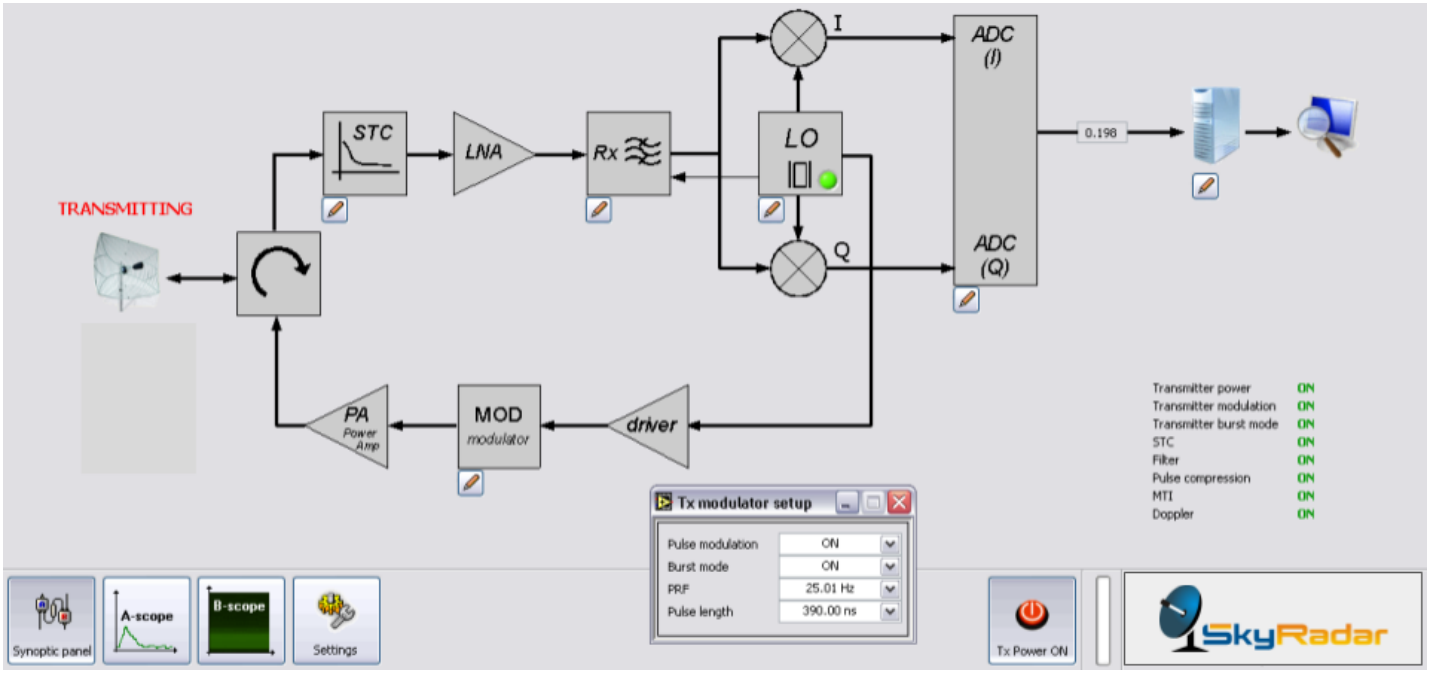
The Radar Field Analyzer as well as the Radar Interface Module can be used in the field to study the operation of a radar system with a minimum of operational impact; meanwhile the quality of the radar can be checked (as required in the frame of RASS-S).

The Radar Field Analyzer is intended for on-site performance checks of (M)SSR ATC and primary radars in L and S band. It was designed to detect errors in the radar antenna. Additionally to its usage as antenna evaluation tool (uplink measurement), the Radar Field Analyzer can perform

- Rx measurements
  - Rx sensitivity,
  - bandwidth,
  - (sectorial) STC,
  - (sectorial) DSTC),
- Tx measurements
  - power, spectrum,
  - pulse shape,

    timing,
  - mode and stagger verification
- pulse generation for downlink measurement,
- FRUIT generation
- Mode S interrogation generation,
- target injection for non-pulse-compression primary radars
- Remote Field Monitor (or PARROT) function.

The Radar Interface Module samples up to 2 analog video signals (selected from 4 physically connected signals) and/or 4 quantized video signals, these video signals can be PSR/SSR or weather radar signals. The Radar Interface Module has 2 digital RS232/RS422 synchronous serial data ports which allow to record digital data. Both the recorded video and digital data can be analysed in the RASS-S or RASS-R software.



The signal conversion chain of the Pulse Radar Module is like in a real operational radar.
Many measurement sockets allow for profound analysis of the signals throughout their conversion with an oscilloscope (not part of the deliverable).

The principle behind the design of the Pulse Radar is to provide an educational aid for the training of Primary Surveillance Radar (PSR) professionals. Use of the Pulse Radar will eliminate the need to take an operational system off line in order to complete the practical component of the training course. The system is designed with common discrete components at the RF stage which makes use of the computer's CPU power in order to perform the signal processing.

Technical Features

Peak output power	Approx. +36dBm
Pulse width	20ns to 500ns in 10ns steps
Operating Frequency	Approx. 2250MHz to 2730MHz

PRF	10.04Hz to 101.73Hz in 7 discrete steps
Burst mode	8 pulses per cycle
RF connector	SMA, female
Computer interface	USB2.0
Power supply	Universal , 100V to 240V, 110W max.
Dimensions (lid closed)	502mm x 400mm x 188mm

Table: Technical Specifications of the Didactic Primary Radar

Gain	27dBi
Frequency range	2400MHz to 2800MHz
VSWR	Better than 2.0:1
Max. power	10W
Polarisation	Linear
E-plane 3dB beamwidth	11° (±5°)
H-plane 3dB beamwidth	so (±50)
Dimensions	900mm x 700mm
Weight	3. 3kg
RF connector	N-type, female

Table: Grid Antenna of Didactic Primary Radar

RF frequency	1030 MHz
Min. RF output power	- 1dBm
PRF	488 Hz
Revolution Time	4.2 s or 8.4 s
Dynamic range of interrogation pulses	Min. 18 dB

Table: Test Interrogator