

Didactical Radar Training System

RASS-S

System Description



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1. Overview

The RASS-S Training System allows to study the operations and servicing of the radar systems applied in conjunction with the Radar Analysis Support System for Sites (RASS-S). The system is ideal for the training of service personnel in the fields of ICAO- & EASA-based ATSEP training programs (qualification training, unit training, continuation training). In particular on-the-job-training (unit & continuation) is made possible. SkyRadar makes use of standard RASS-S equipment extended by didactical system. It is technically impossible for an ANSP (Air Navigation Service Provider) to do that kind of training on an operational system without disturbing or even endangering its operations.

In addition, students can practice different fields of the primary and secondary radar theory in the classroom in a minimum amount of time.

The aim is twofold:

1. training of the student in the art of ATC radar systems
2. training of the student in the use of radar test equipment (RASS-S)

The purpose is to train the concepts of the operation of a RASS-S radar system, the training will be based on practical hands-on exercises. It includes primary and secondary radar training.

The system is didactically enhanced and works with disturbance signals, feed-in of external primary and secondary signals. Once connected to the SkyRadar Cloud Server, ADS-B based signals can be displayed via network in the SkyRadar FreeScope software on an unlimited amount of computers concurrently

A more explanation of the operation of a radar can be found on the internet on our partner page (http://www.radartutorial.eu/html/_start.en.html). The student should have a technicians or engineers degree to be able to follow the training course which is described in this document. The first step of the course is a simulation of the SSR or PSR radar in the classroom. Using an oscilloscope the student can verify the generated signals.




Afterwards the student can analyse demo data which is delivered together with the system. This data is recorded on real radars with opportunity traffic. The analysis of this real data will give the student in-depth knowledge of an SSR or PSR radar system.

In a final step the RASS-S equipment can be used in the field to study the operation (and quality) of your own radar system. This last step will complete the radar training.

SkyRadar offers 2 different systems: one for SSR and one for PSR.

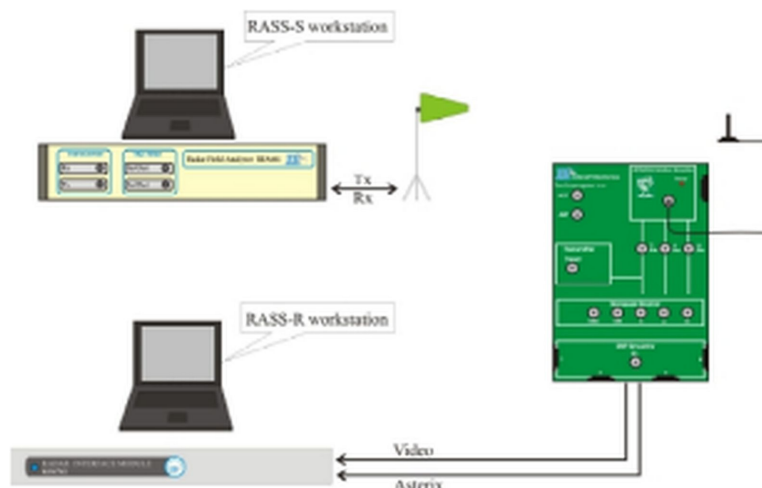
2. SSR Training System

2.1 Description

	<p>Didactical Test Interrogator, DTI: The DTI 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 monopulse output.</p>
	<p>Radar Field Analyser, RFA: The RFA can be used in a Remote Field Monitor mode, thus mimicking the operation of a transponder. Using the RFA one can study the subject of the radar transmitter and receiver (BW, STC,...).</p>
	<p>Radar Interface Module, RIM: The RIM 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.</p>

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

2.2 Set-up



2.3 Features

- Uplink measurement:
 - Antenna diagrams: Horizontal Polar Diagram, Beamwidth, Pulse shapes, Sidelobes, SLS etc.
- Downlink measurement
 - Antenna diagrams: Horizontal Polar Diagram, Beamwidth, Monopulse, Sidelobes, SLS etc.
- Receiver measurements
 - Sensitivity , bandwidth, (D)STC, sectorial (D)STC
 - Monopulse, Phase-Amplitude, alignment ...
- Transmitter measurements
 - Power, pulse shape, stagger,...
- Video recordings and analysis
 - Target Code, Pulse shape, range, azimuth
- ASTERIX recordings and analysis
 - Plot, Track ...
- ADS-B

3. PSR Training System

3.1 Description

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.

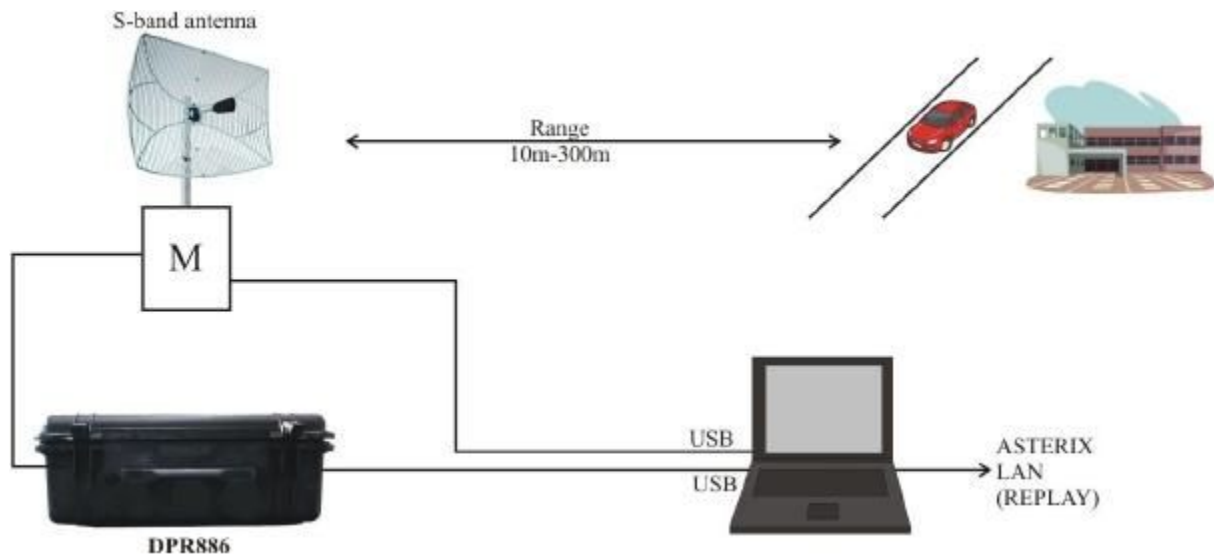


The Didactical Primary Radar, DPR consists of a motor-controlled S-band antenna (placed outside), a Transmitter /Receiver unit and PC for control and analysis. The S-band antenna can be rotated (slowly) with a motor which is controlled through an RS232 connection (workstation). The transmitter can send 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

3.2 Set-up



3.3 Features

- Antenna measurements, Gain, Beam-pointing
- Reflection measurements, recordings and analysis
 - Vector measurements I/Q,
 - Moving Target Indicator
 - Clutter processing
 - Doppler filters
 - Pulse compression
 - Target detection
- Software modules for analysis of didactical recording and real ATC radar data

4. Field Training

The RFA as well as the RIM 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.

The RFA 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 RFA 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 generations, target injection for non-pulse-compression primary radars and Remote Field Monitor (or PARROT) function.

The RIM samples up to 2 analog video signals (selected from 4 physically connected signals) and/or 4 quantised video signals, these video signals can be PSR/SSR or weather radar signals. The RIM 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.

5. Component List

5.1 Hardware

Configuration of the RASS-S Training System for SSR/PSR:

- a. Radar Field Analyser
- b. Radar Interface Module
- c. Didactical Test Interrogator
- d. Didactical Primary Radar DPR
- e. Data Recorder UDR
- f. Target Generator
- g. RASS-S workstation
- h. RASS-R workstation
- i. ASTERIX Server with Disturbance software
- j. OPTION: SkyRadar CloudServer
- k. OPTION: Live ADS-B Unit

5.2 Software Packages

The RASS-S training system includes the following software:

- RASS-S (full license)
- RASS-R (didactical use)

6. Documentation

A set of training manuals,
all technical brochures and user manuals relating to the above mentioned equipment and
software will be included in the delivery.