

IZT ESIS RF Environment Simulation System	Version: 1.0
Rainer Perthold	Date : 2009-09-21


Innovationszentrum Telekommunikations-
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ESIS Emitter Simulation System

Version 1.0



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Revision History

Date	Version	Description	Author
2009-09-21	1.0	Initial Release	Rainer Perthold

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1. Applications

The IZT ESIS RF Environment Simulation System is intended for operator training and test and validation of COMINT systems.

It stores and replays artificial and real world signals as elements of complex time variant RF environment simulations. If desired, it can be expanded for highly accurate stimulation of interferometric DF systems.

2. Technical Overview

The highly effective processing and signal quality of IZT's digital receivers and multichannel RF sources is key to a most realistic approach to RF environment simulation:

- continuous coverage from 9kHz to 3000 MHz
- up to 127 independent signals per IZT S5000
- up to 31 independent signals per IZT S1000

The RF signals are stored in a scalable file system as I/Q data sampled at the minimum required data rate. Therefore, many hours of continuous content can be stored and streamed in real-time.

The operator creates „scenarios“, assigning geographical positions and trajectories to the transmitters (emitters) and the receiver.

While the virtual transmitters and the assumed receive site are moving, the system continuously calculates propagation delays and path losses applying them to all active signals. Antenna diagrams can be programmed into the system as well.

In a full scale ESIS RF environment simulation system, several thousand individual signals can be superimposed.

The output of the signal sources is combined and then split to either the receiver stations, which are controlled by the trainees, or an automated COMINT/DF system under test.

The combination of 26 IZT S5000 complemented by IZT S1000 will allow continuous coverage of the frequency band from 100kHz to 3GHz. The receivers can then be operated freely within their frequency range as if they were in a real world scenario.

The test signals can be derived from actual recordings and stored as they are or after offline postprocessing. The postprocessing, allows to extract signals of particular interest from the recording. Existing signal files (for example in *.wav-format) can be easily imported.

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3. Components

3.1. IZT R3301

The IZT R3301 is the preferred means for recording RF signals in the field. It uses IZT's renowned R3000 digital receiver integrated into a portable RF recorder. Two TBytes of storage space can record up to 20 MHz bandwidth over six hours with 16 Bit resolution. Multiple narrow band channels can be recorded as well.

The equipment is shielded for minimum RF emissions and optimized for operation onboard a vehicle or aircraft.

Should it be necessary to capture signals from a DF antenna, multiple IZT R3301 can be fully phase synchronized.

3.2. IZT S5000

The IZT S5000 is a unique and novel concept for a digital signal source to simulate time variant, complex and realistic RF signals.

The IZT S5000 is capable of generating up to 127 independent RF signals with excellent dynamic range from a streaming server, internal RAM or any combination thereof.

One IZT S5000 covers an instantaneous bandwidth of 120MHz anywhere in the frequency range up to 3GHz. If more signals over a larger bandwidth are required, the control software can integrate multiple IZT S5000s for continuous coverage of the spectrum with thousands of emissions.

The signal processing is performed in real-time to enable time-variant test scenarios for mobile receivers or transmitters. Multiple accurately synchronized RF outputs allow the stimulation of direction finders. For each signal, the amplitude, delay, phase and center frequency can be set in real-time. These parameters can be user defined or calculated by the IZT S5000 control software based on a given antenna pattern and relative bearing and distance between the simulated signal source and the device under test.

The IZT S5000 is a highly scalable system which offers configurations ranging from one single RF output up to 14 phase synchronized RF outputs.

3.3. IZT S1000

In the described setup, the IZT S1000 complements the S5000 in terms of wideband streaming. The IZT S5000 has been optimized for many independent channels with low to medium fixed sampling rates. The S1000 supports wideband streaming up to 24 MSamples/second. Its increased

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FPGA space allows for real-time generation of complex wideband waveforms to simulate SIGINT and ECM scenarios.

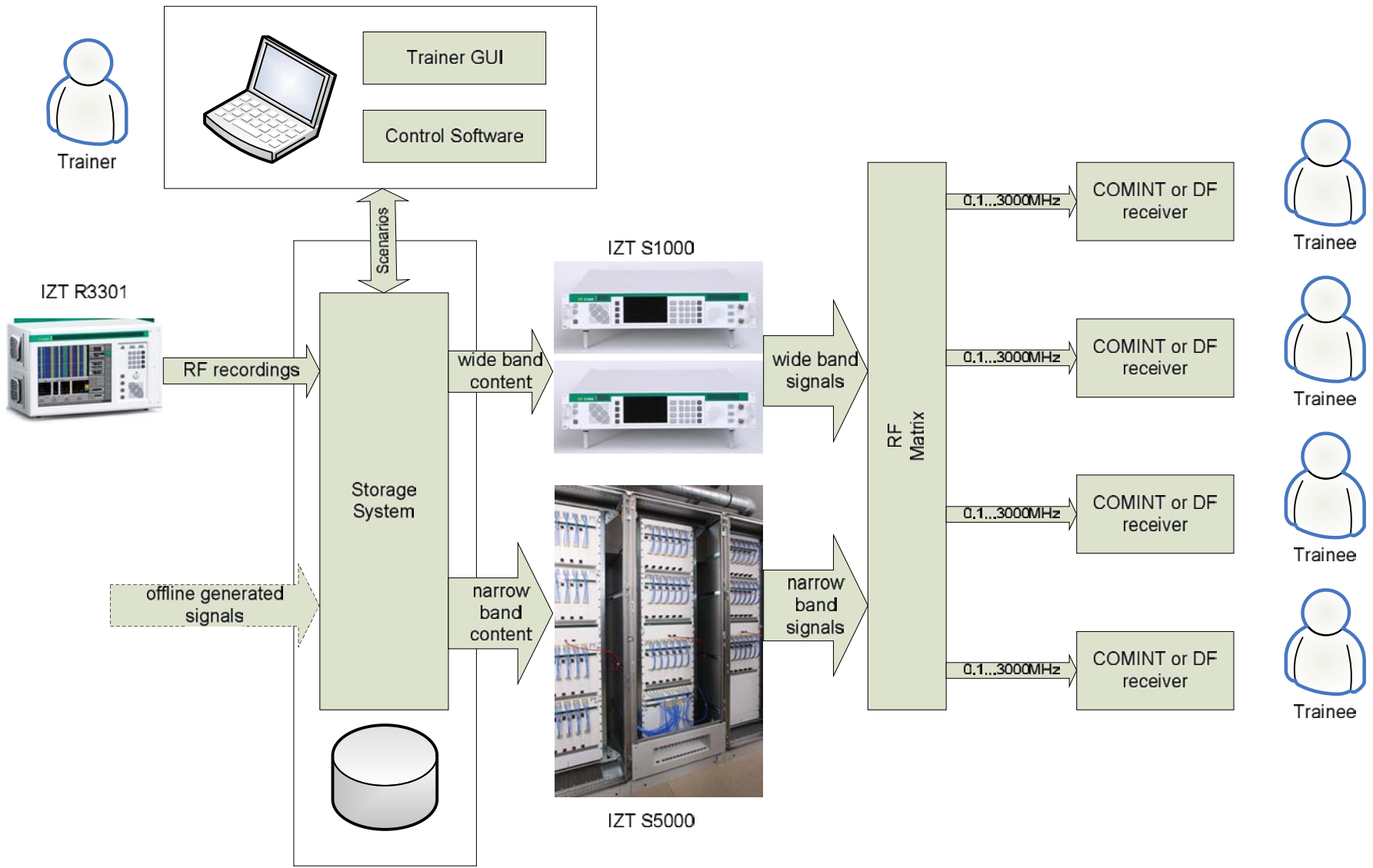


figure 1: Block Diagram