

Innovationszentrum für Telekommunikationstechnik IZT

COMINT Technology

March 2011

Innovationszentrum  Telekommunikations-
technik GmbH

Overview

- Company Profile
- Signal Sources
 - S1000
 - COMINT Simulator
- Digital Wideband Receivers
 - R3000
 - RecPlay System
 - R4000



Innovationszentrum für Telekommunikationstechnik GmbH IZT

- based in Erlangen, Germany
- founded 1997 as spin-off from the Fraunhofer Gesellschaft, an organization for applied research („home of mp3“)
- about 50 employees
- focusing on rf technology and fast digital signal processing
 - system engineering
 - rf and microwave design
 - fast digital hardware
 - FPGA programming
- worldwide sales in different markets directly or through distributors and system integrators



Technologies and Applications

IZT combines world-class RF frontends with advanced signal processing to create high performance products for capturing, modifying and generating radio signals.

Digital Multichannel Signal Sources

- Consumer receiver testing
- RF environment simulation for MIMO receivers
- COMINT simulation and test

Channel Simulators

- Modelling the effects of a satellite link on the signal with up to 700MHz bandwidth

Digital Wideband Receivers and Analyzers

- ITU spectrum monitoring and enforcement
- Anti Surveillance operations
- Wideband radio signal capture
- COMINT and Jammer systems

IZT Signal Sources

Signal interpolation and combining in real-time

- 9 kHz...3(6) GHz frequency range
- 2x120 MHz realtime bandwidth
- Interpolation and mixing performed in real time
- Impairments (fading, phase noise, doppler, blockage) applied in real-time

Coherent System

- Phase synchronous replay of diversity signals
- Antenna diagram simulation
- Over-The-Air Testing

31 or more independent channels

- Can contain one or more emissions
- Different sample rates
- Placed anywhere in the spectrum

Signal parameters adjustable while operating

- Frequency, power, delay
- Noise, impairments, fading, phase noise

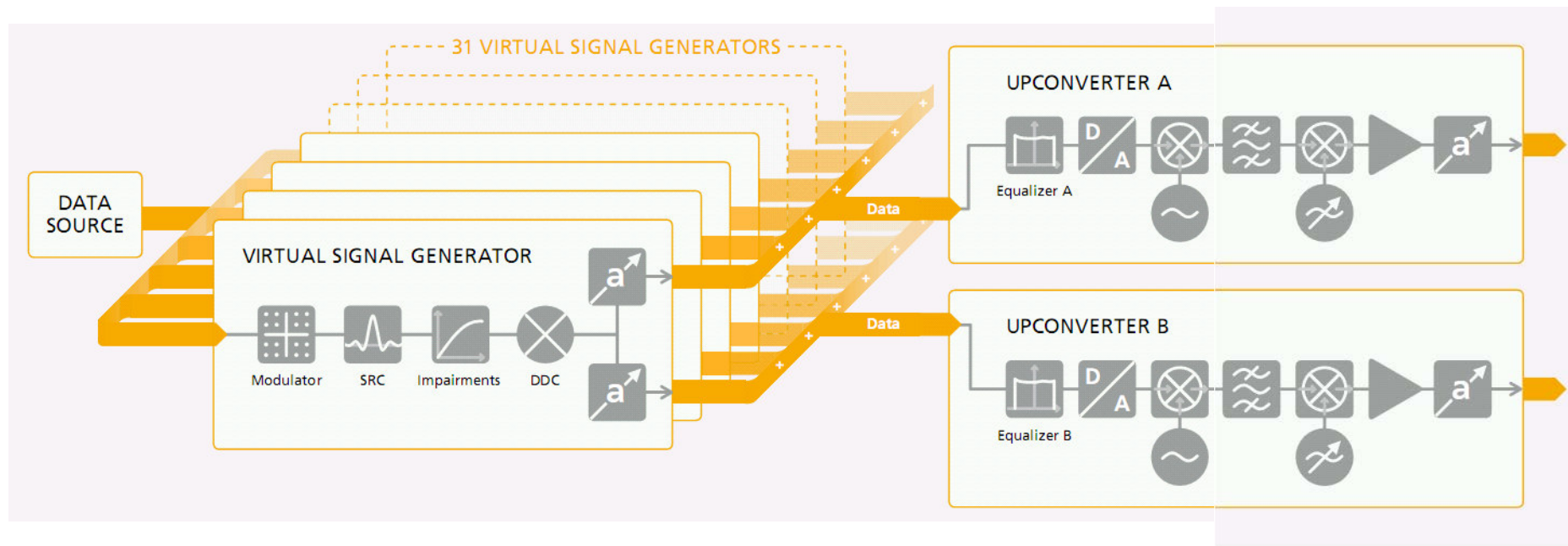
Different data sources

- 1,750,000,000 samples RAM
- Continuous streaming 2x24 MSamples/sec.
- Internal harddrive

Waveforms

- CW, AM, FM, LSB/USB, QAM, DAB, DAB+, DVB-T, DRM, DRM+, HD-Radio
- Frequency hopper simulation: > 2000 hops/sec, spread up to 120 MHz
- Real-time modulators for XM / Sirius
- Playback of recorded live signals
- Easy-to-use Matlab interface

IZT Signal Sources



Signal Generator IZT S1000

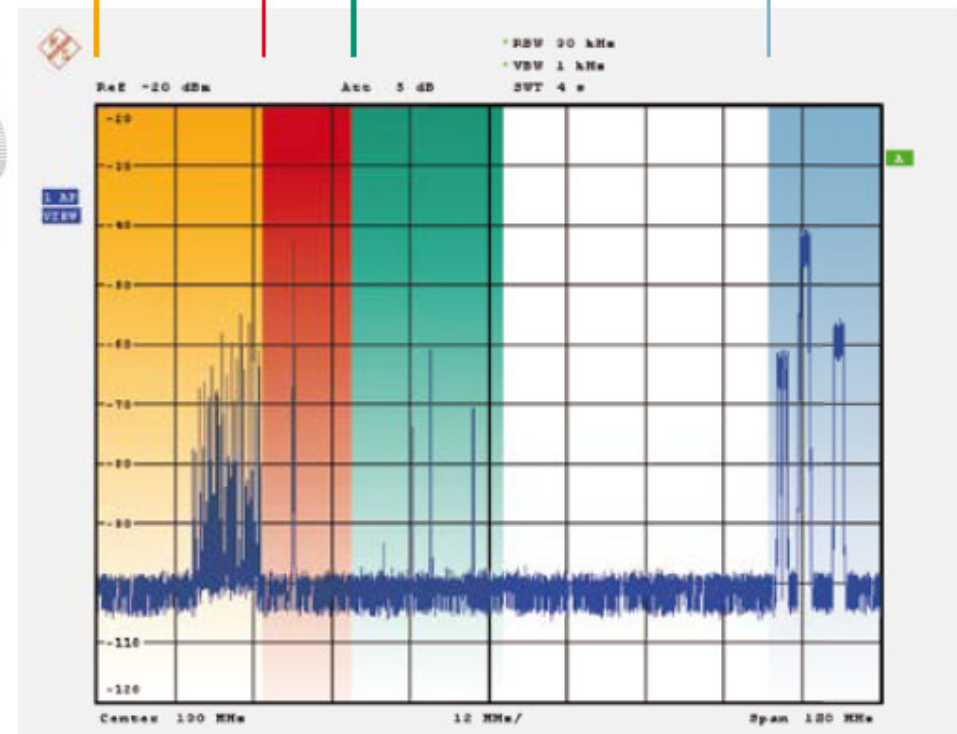


recorded FM Broadcast

synthesized HD Radio™

synthesized aeronautical AM signals

synthesized DAB signals



COMINT Simulator S5000



COMINT Simulator

- Continuous coverage of 20...3000 MHz in 120MHz blocks
- Thousands of accurately controlled signals with actual content
- Hours of RF environment scenarios
- Capability to stimulate a DF system based on
 - Antenna characteristics (steering matrix)
 - Azimuth/elevation and power for each individual signal
 - Up to fourteen antenna inputs supported
- Scalable

Applications

Applications for the IZT S1000 and S5000

- Cost effective testing of consumer radios
- Replay of recorded signals
- RF environment simulation
- Phase synchronous replay of diversity signals
- Testing of COMINT/SIGINT systems
- Testing of DF systems
- Operator training
- Chip Design
- Testing of LTE and DVB-T2 environments

IZT Receivers

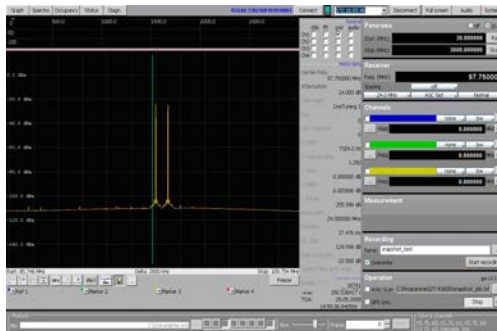
Superior Digital Processing

- Real-time PSD
- Multi-channel DDC (I/Q)
- Fully synchronous to support DF or TDOA
- Smart self-contained data format
- Very efficient use of commercial LAN infrastructure

World Class RF Performance

- Performance parameters comparable to big players in the market
- Coverage from 9 kHz to 18 GHz
- 24/120 MHz bandwidth

IZT R3000 Wideband Digital Receivers



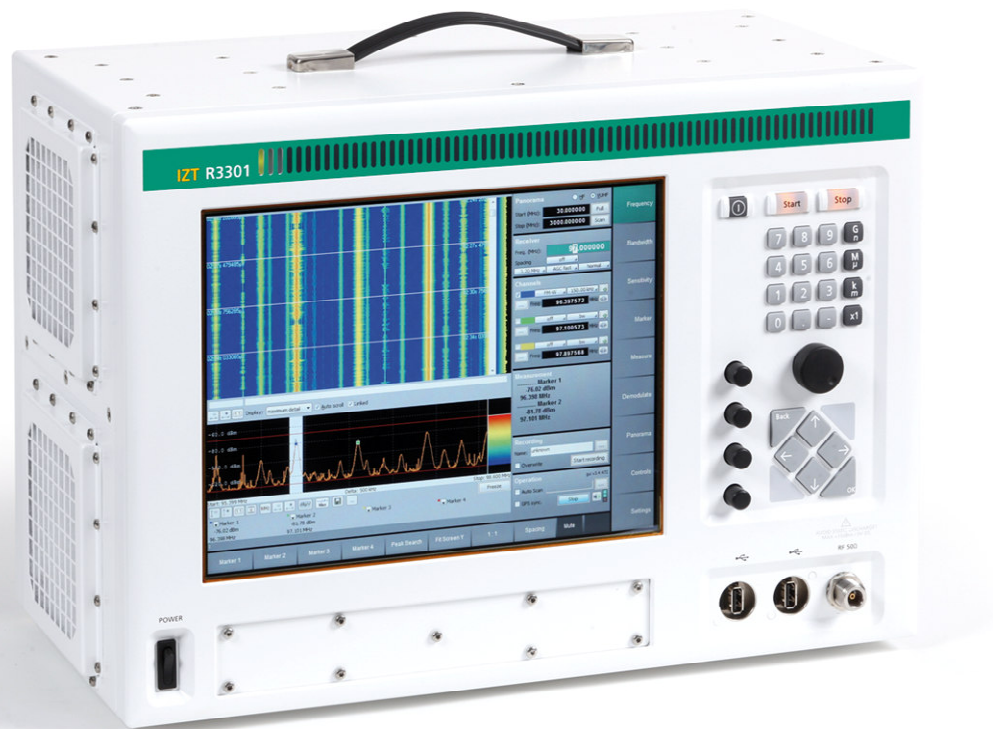
■ General

- Successful in the market since 2006
- Set the standard for new generation of digital receivers
- High SFDR (84dB @ B=100kHz in VHF; >90dB in HF)
- Four DDC channels
- Simultaneous I/Q, PSD and FFT for each channel
- GBit LAN interface directly at the FPGA supports >90% network load for data transfer

■ Applications

- Leading product for ITU spectrum monitoring (HF and VUHF)
- DOA and TDOA location finding
- Anti surveillance
- COMINT and jammers by several system integrators

R3301 Portable Wideband RF Recorder



R3301 Portable Wideband RF Recorder

- Combination of R3000 with PC
- For portable and mobile applications
- Contains UPS with AC and DC supply
- Touch screen
- Extremely low RF emissions
- Continuous recording of up to 20.5 MHz bandwidth
- 2TByte storage space for minimum 6 hours of signal
- Built-in GPS and high stability reference
- Used for capturing RF signals in the field

IZT RecPlay: Single Antenna Setup

One Channel Setup

- RF Recorder IZT R3301
- Streaming Server IZT P1x00
- Signal Generator IZT S1000

RF Recorder
IZT R3301

Server
IZT P1100



Signal Generator
IZT S1000



HDD

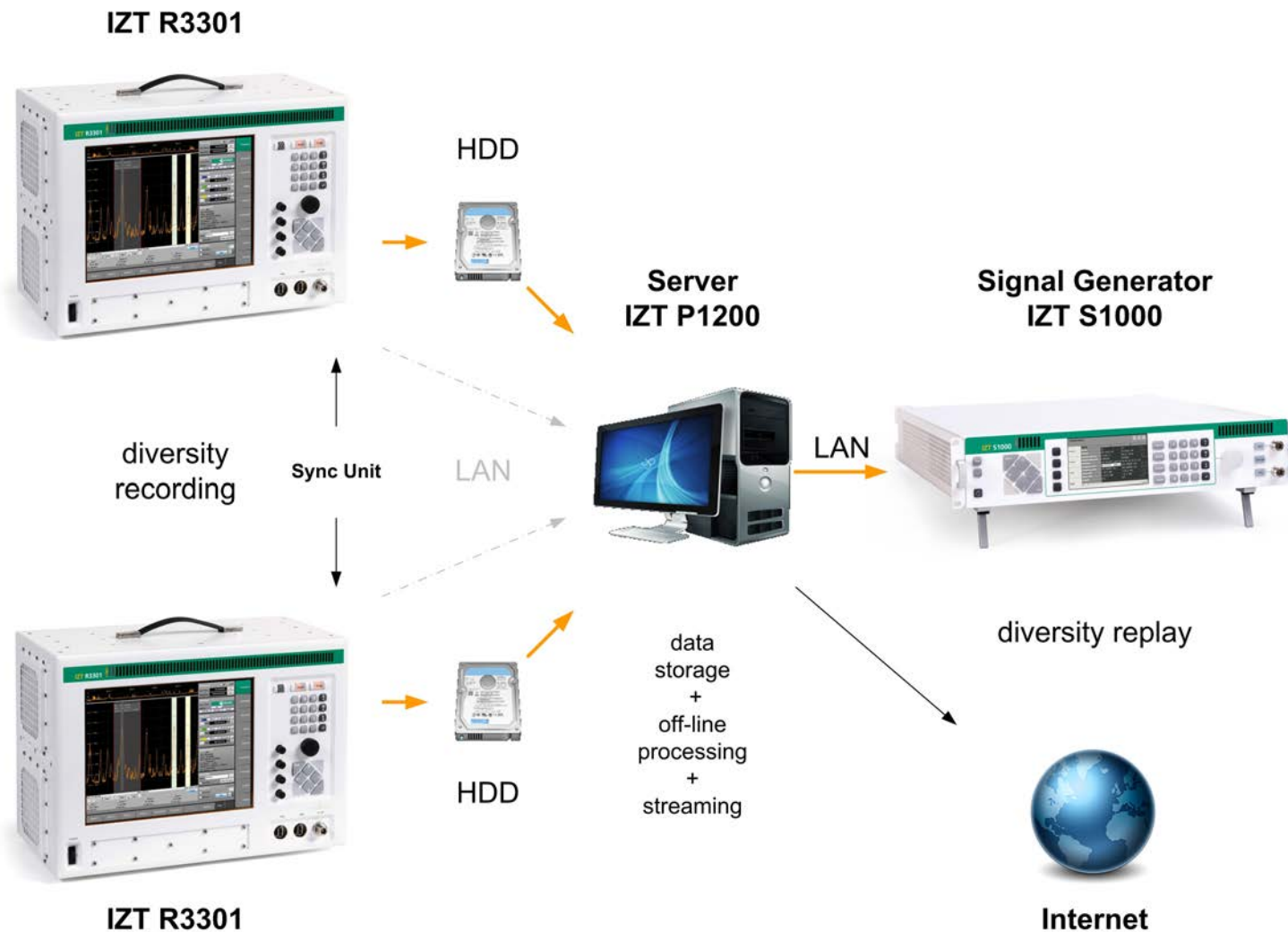


LAN



data
storage
+
streaming

IZT RecPlay: Dual Antenna Diversity Setup



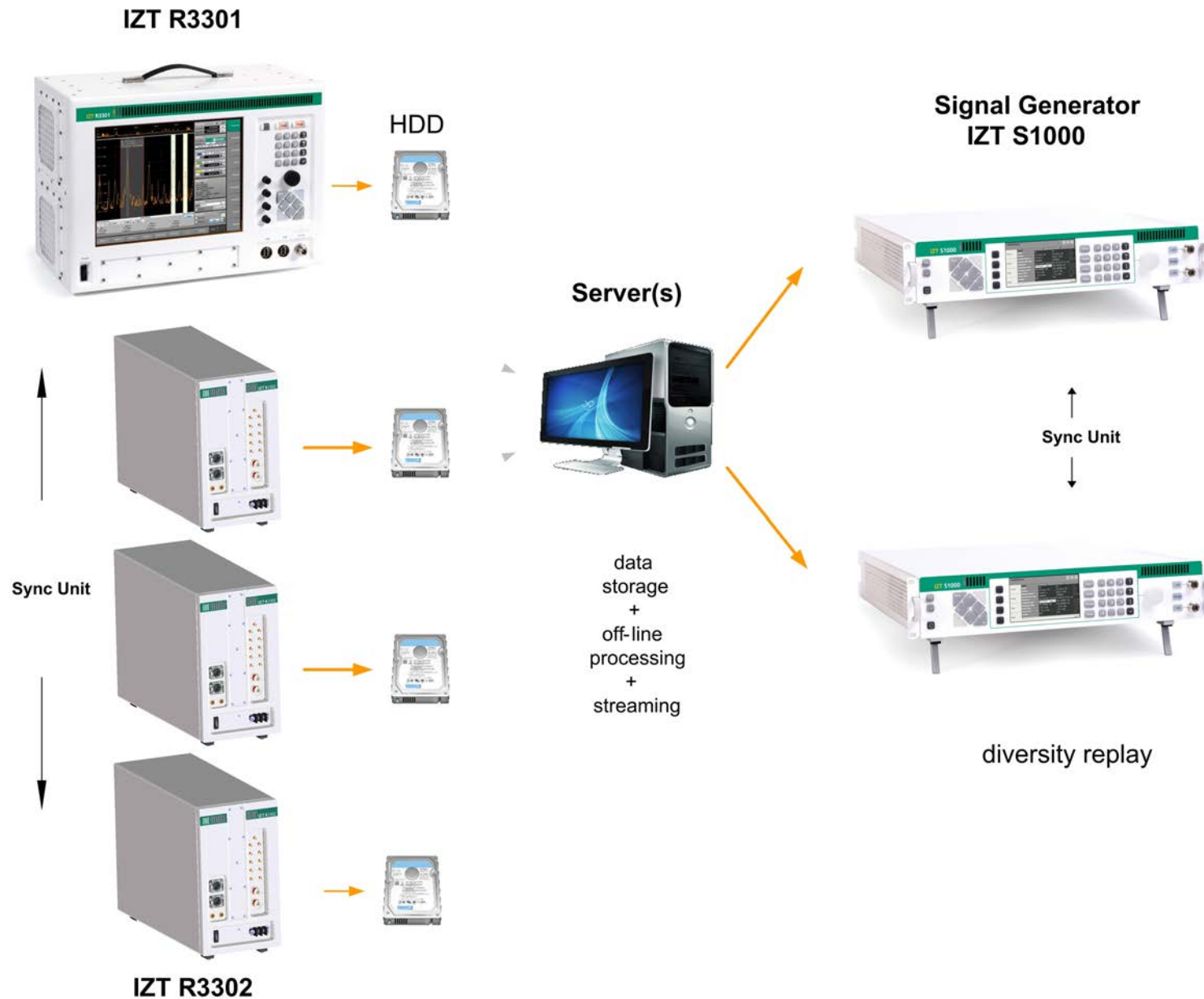
Two Channel Setup

- 2x RF Recorder
- Synchronization Unit
- Streaming Server
- Signal Generator with dual RF output
- Cal-Kits (optional)

Data Handling

- 2.5" HDDs, swappable
- Direct link via Gigabit LAN interface
- Internet VPN connection

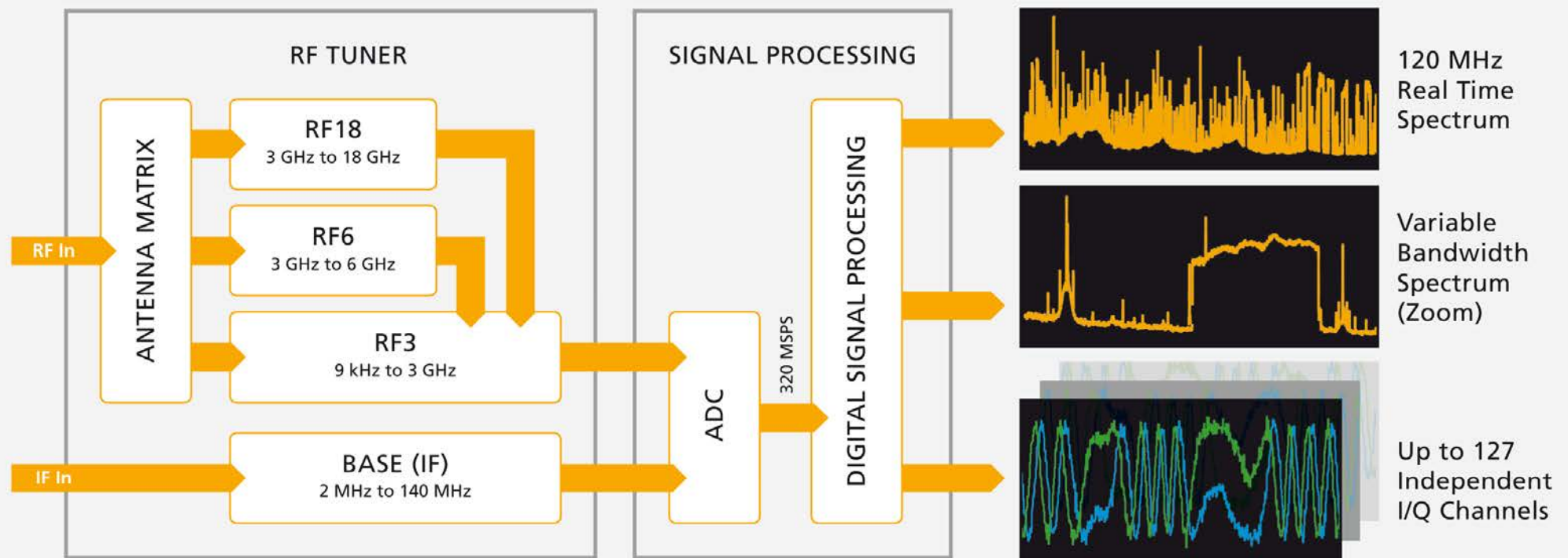
IZT Replay: Multi-Antenna Diversity Setup



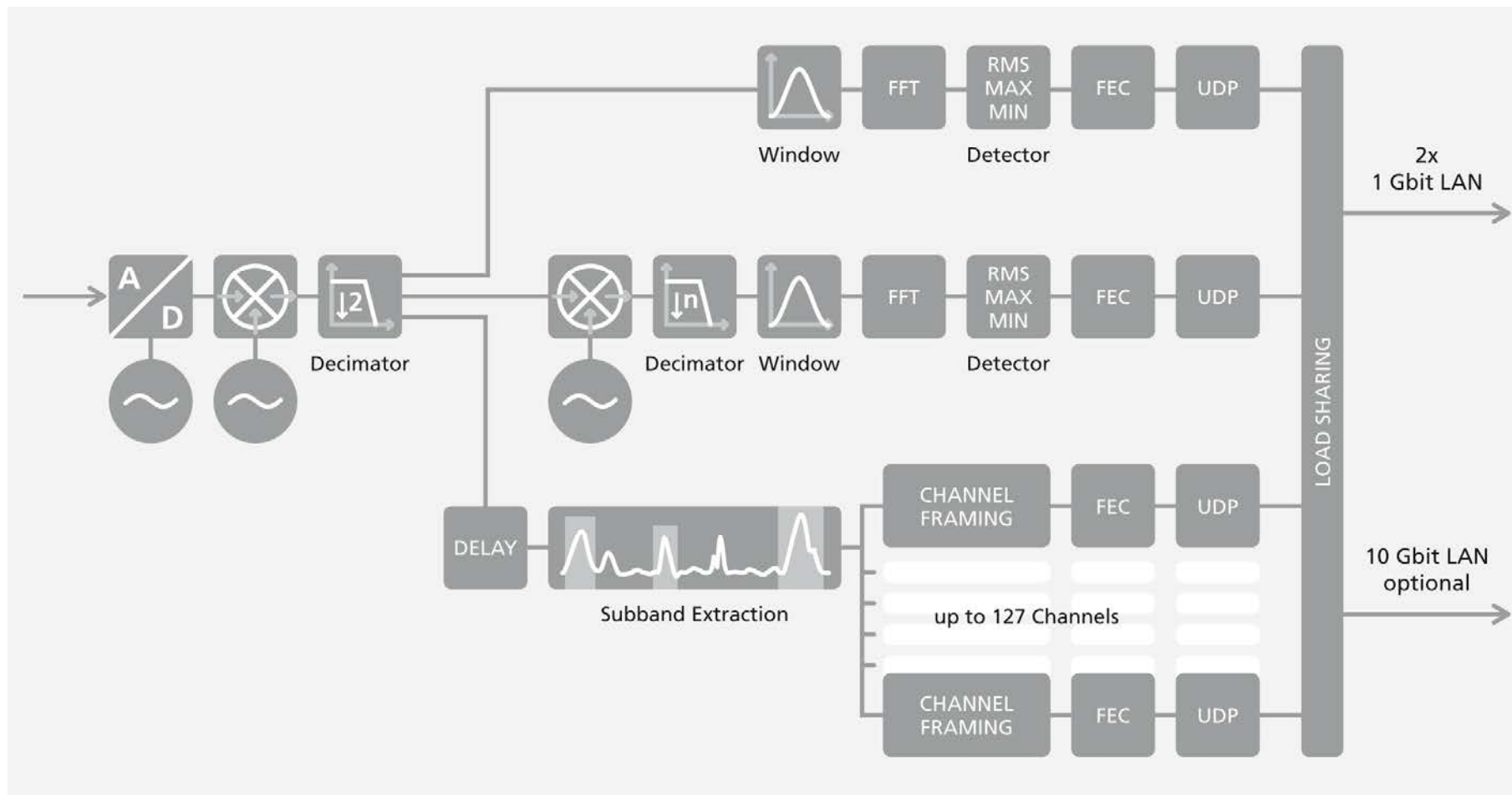
Key Features

- 120 MHz Instantaneous Bandwidth
 - real-time wideband spectrum
 - zoomed spectrum
- Selective continuous recording
 - up to 127 sub-bands
 - automatic activity detection or/and manual selection of sub-bands
 - max. ~1TByte/hour data
- Seamless online/offline operation
 - access to past or current signal
 - up to 127 work stations can access I/Q data digitally
 - analog IF outputs can be provided
- High quality RF frontends
 - up to 18GHz
 - Direct sampling up to 140 MHz
 - Configurable pre-selector

R4000 Receiver Subsystem



R4000 Digital Processing



IZT R4000 Receiver Frontends

Four different frontends

■ HVHF

- 9 kHz...140 MHz with direct sampling
- Very high SFDR
- 16 configurable pre-selector filters (~1:1.2 frequency spacing) with adjustable bandwidth
- Notch filter for FM Broadcast band

■ RF3

- Extends frequency range to 3000 MHz
- 120 MHz IF bandwidth

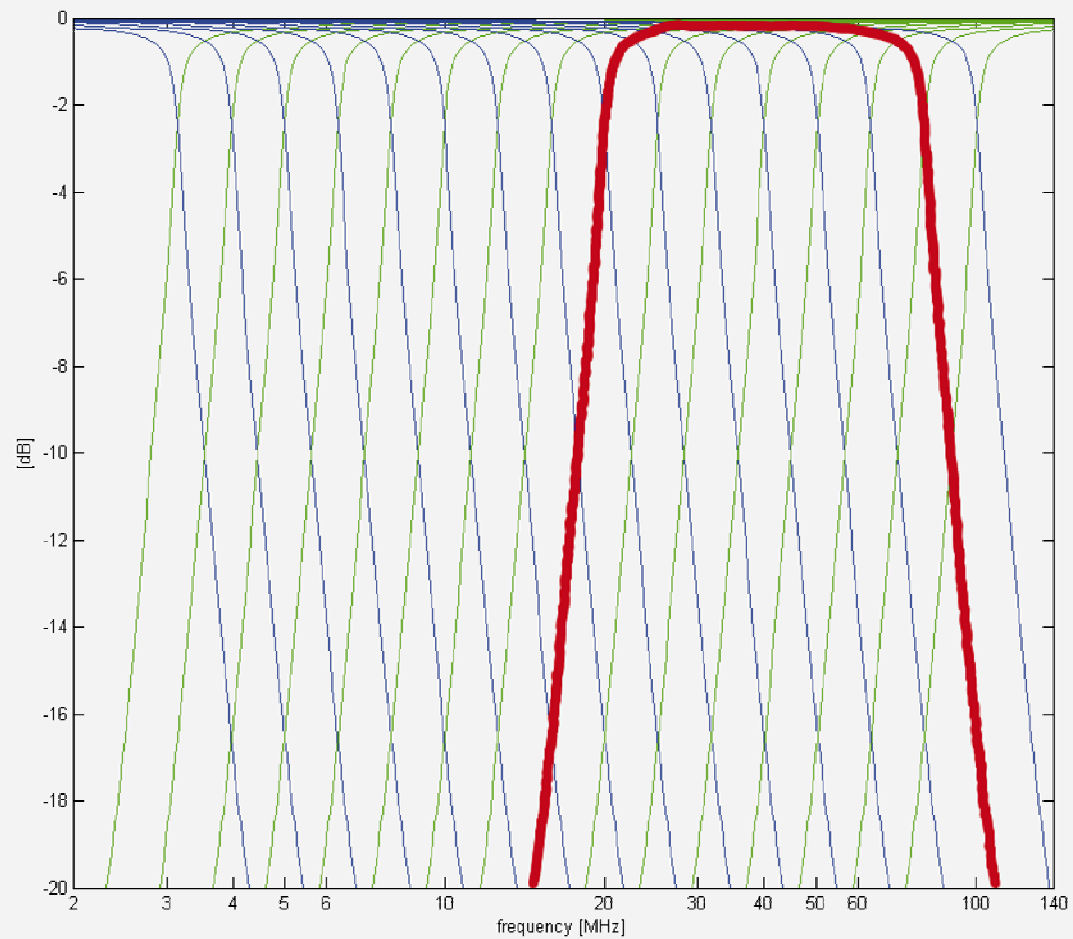
■ RF6

- Extends frequency range from 3 GHz to 6 GHz
- Dual conversion, highly linear design
- Fully phase stable

■ RF18

- Extends frequency range from 3 GHz to 18 GHz
- YIG as pre-selector
- 120 MHz IF bandwidth

R4000 Configurable Pre-Selector



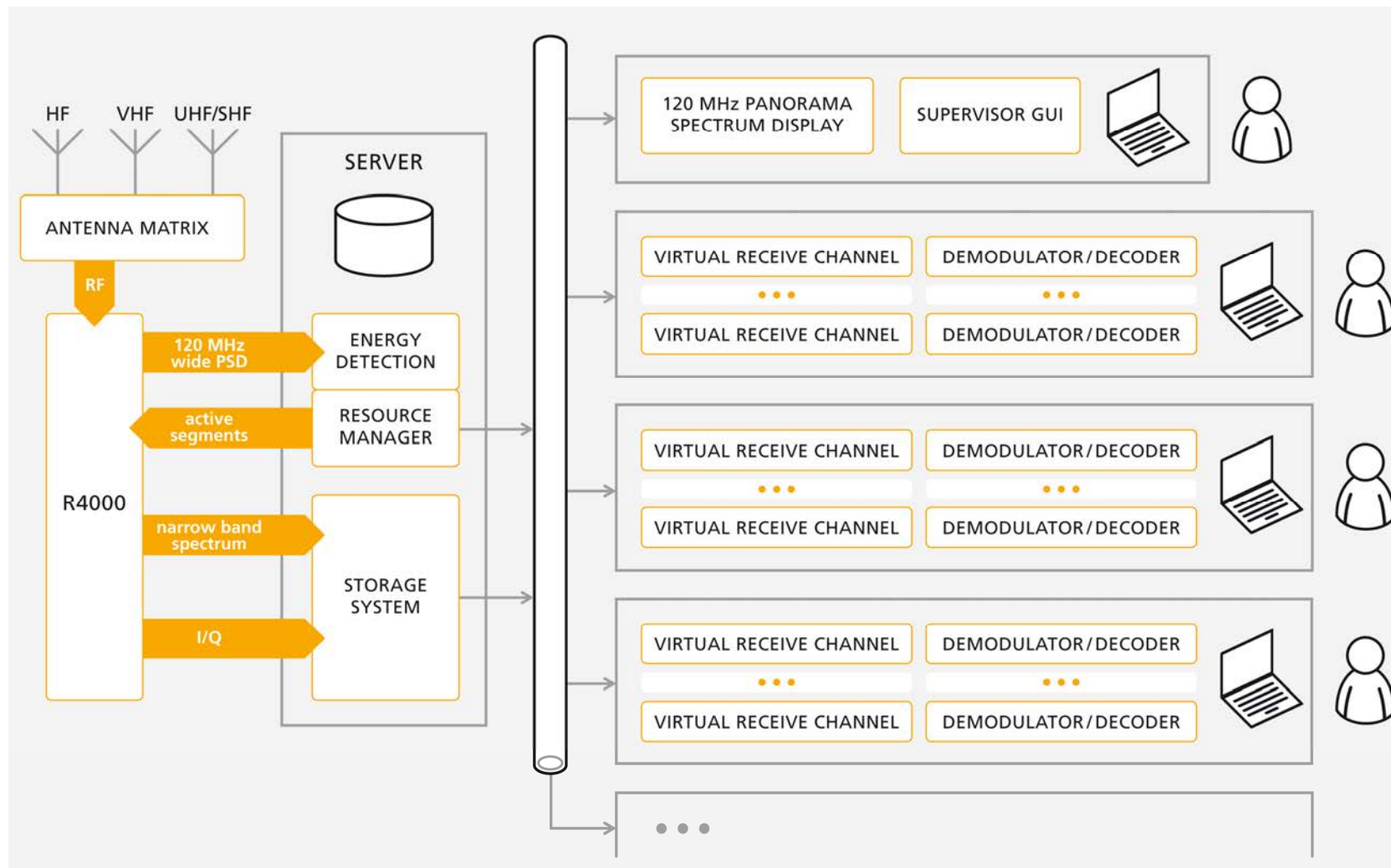


IZT R4000 Interface for System Integrators

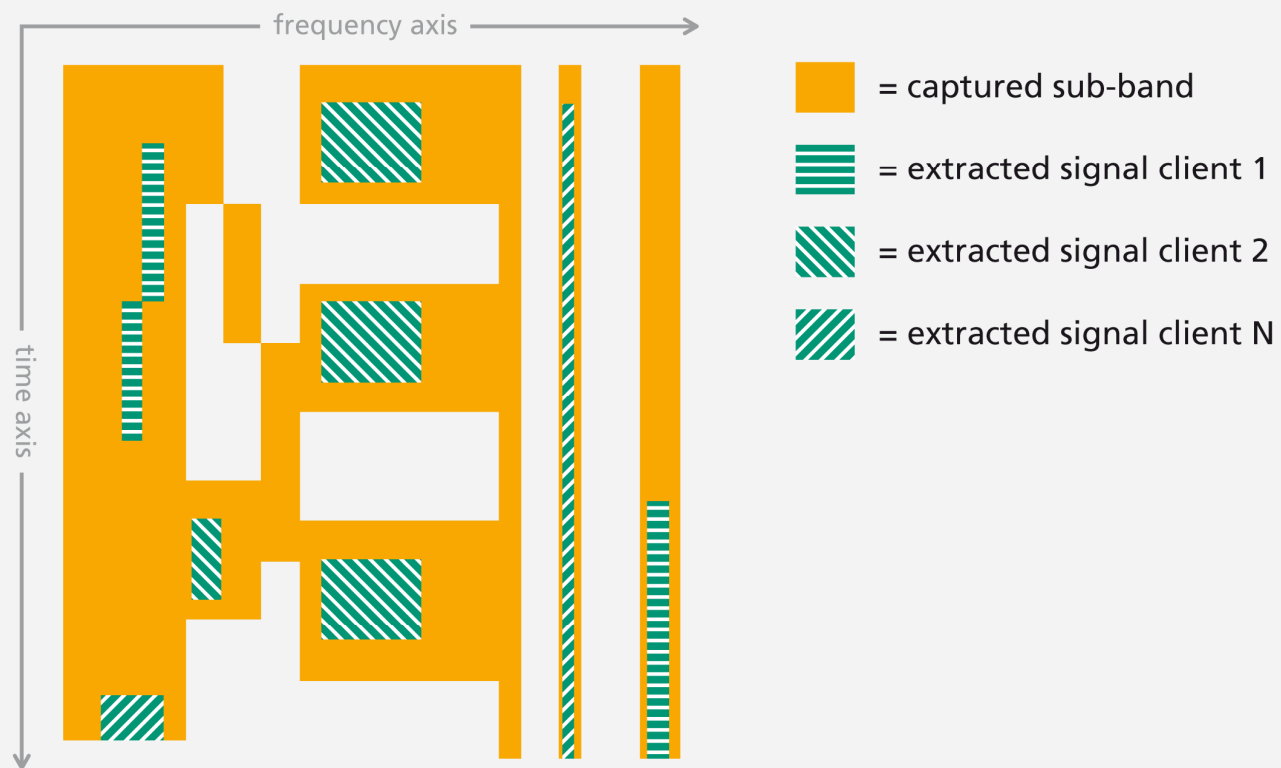
A Software Interface to the IZT R4000 will be available for System Integrators

- No direct access to R4000 LAN interface to reduce complexity
- Customer is responsible for the IT
- IZT R4000 driver software performs
 - Receiver control based on client software commands
 - Data de-compression
 - Extraction of narrow band channels
- spectrum provided in R3000 data format by low-level IZT software
- Delayed I/Q can be requested by client application (up to 127 channels) in R3000 data format
- Dual GBit Interface can handle 60....80 MHz cumulative bandwidth
- 10 GBit Interface makes full 120 MHz available

R4000 Signal Collection System

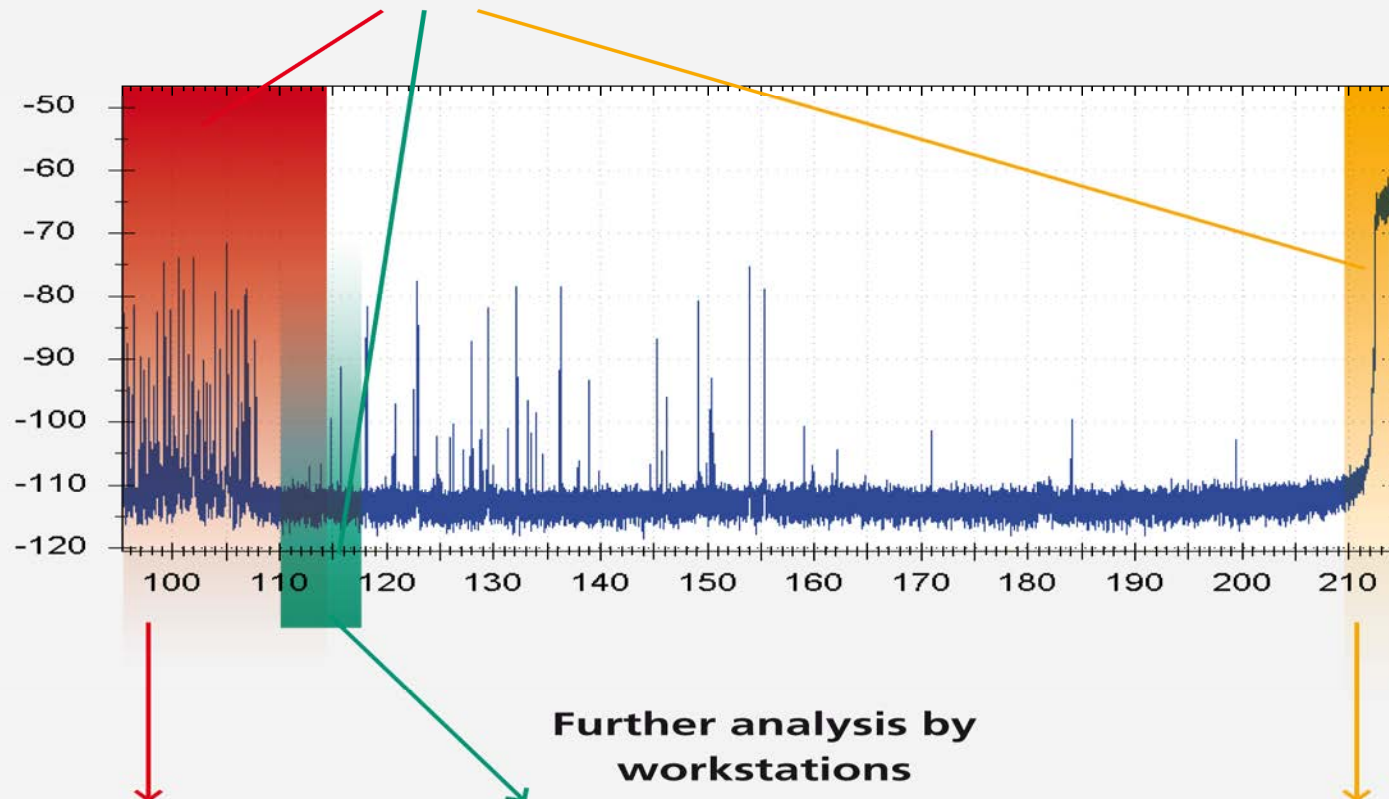


R4000 Selective Recording and Processing

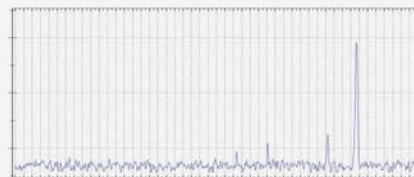
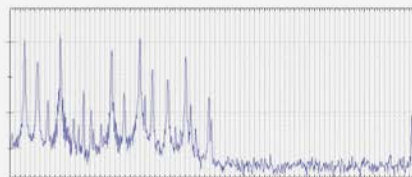


R4000 Selective Recording and Processing

Selected subbands within 120 MHz receive bandwidth



Further analysis by
workstations



R4000 Operation

Energy Detection

- Determines active subbands
 - Manual
 - Automatic modes

Signal Capture

- Active subbands are stored in a storage system

Retrieval

- Workstations request portions of the captured signals based on availability
- Receive content via LAN



Roadmap: Digitizer

Two Channel Digitizer

- 2x120 MHz instantaneous bandwidth (hardware limitation to 10 MHz possible)
- More than two channels possible
- 240 MHz I/F or baseband input
- Can be combined with IZT's frontends (HVHF/3/6/18 GHz)
- Can incorporate an electronic antenna switch
- Real-time DDC or FFT in FPGA, time stamps in the data stream
- 10GBit optical LAN output
- IP protocol in FPGA for easy interfacing to a PC or IZT S1000
- Completely shielded and industrial temperature range

Applications

- Cost effective to high performance DF systems with digitization at the antenna
- Real-time MIMO over-the-air test setups



Summary

Summary

- IZT has built a reputation as supplier for advanced high performance receivers
- R3000 is well established in the market
- R4000 covers high end applications – IT systems now have years ahead to catch up
- Extension towards cost effective and high performance hardware for DF is the logical next step
- COMINT Simulator is our master piece in terms of signal generation
- S1000 has been very well received in the civilian markets – military and government markets will be targeted next

Thank You