
Oculus R

Fully Automated, Network- Centric ITU-R Compliant Spectrum Monitoring System

Oculus R sets a new level of cost effective high performance spectrum monitoring. Designed to operate both local and remote set-ups, Oculus R provides extensive tools for the Spectrum Managing authorities. Oculus R sweeps entire 6 GHz Spectrum four times a second, detects transmitters, measures spectrum usage according to ITU recommendations and visualizes the results in intuitive ways.



Oculus R is designed for both fixed and mobile operation. The system has been packed into a highly convenient portable case for continuous or temporary use or on the move-in vehicle scenarios. The case is an IP-67 rated, ruggedized PELI case and lets the operator rapidly set-up and deploy the system for indoor or outdoor environments.

Being a network centric system Oculus R operates both as a standalone analyzer or network of distributed analyzers. When used in a distributed network, Oculus R is able to locate transmitters using TDOA techniques. Intuitive GUIs designed from ground up for effortless spectrum monitoring, help operators manage Oculus R whether it is a standalone unit or a node in a distributed network.



Key Features

- ITU-R compliant Frequency, Bandwidth, Field Strength, Modulation and Spectrum Occupancy measurements
- Double stage super-heterodyne receiver architecture
- 9 kHz – 6GHz frequency range, 250kHz – 27MHz instantaneous bandwidth
- Ultra-fast sweep rates up to 24GHz/s to capture transient signals.
- Auxiliary narrowband receiver with 6 MHz IF bandwidth for increased sensitivity in dense RF environments
- Analog demodulation (FM, AM, SSB)
- Compact antenna suitable for covert operation
- Suitable for temporary or event-related missions or fixed operation
- Rugged mechanical design with low weight and low power consumption for mobile operation
- 110-220VAC wall plug and & 12VDC vehicular power
- Network centric operation allowing strong remote control capabilities
- High performance data compression for low bandwidth communication channels
- Operated remotely via Wi-Fi, Ethernet or 3G/GSM modems
- Wide operating temperature range of 0°C to 65°C
- Optional extended operating temperature range of -40°C to 65°C for harsh environments
- Optional spectrum monitoring database integration lets classification of unlicensed transmitters
- Optional IQ data storage for further offline analysis
- Optional GPS synchronized clock for increased measurement accuracy beyond ITU-R requirements
- Optional TDOA capability to help locate transmitters
- Optional integration can be worked with 3rd party analysis systems including Angle Of Arrival (AOA)
- Mapping overlays for optional TDOA and AOA related features, leveraging online mapping services like Google Maps or Open Street Map and extensive caching mechanisms for offline operation at the measurement site.



Dual RF Frontends

Oculus R employs dual RF frontends. The wideband receiver is a multistage super heterodyne receiver, covering between 9 kHz to 6 GHz with a max IFBW of 27 MHz and sweep speeds of 24GHz/sec. Most scenarios would benefit the wide bandwidth and high sweep rates to accurately measure the spectrum, but in order to handle dense RF environments Oculus R also includes an auxiliary narrowband receiver with 6 MHz IFBW to lower the noise floor and increase the sensitivity to low level signals.

Automated Signal Detection

Using specific algorithms for each frequency region, Oculus R, detects noise floor and provides an SNR based analysis to determine signal frequency and bandwidth.

Session Based Analysis

Oculus R manages spectrum monitoring in a session based fashion. When instructed, a new session is started on the server and the session information is shared with the connected clients. Session includes all the transmitters detected together with their measured parameters. Session can be furnished with a session database, which includes lists of frequency bands and transmitters. These lists let the operator prioritize or ignore a certain band or frequency which effectively increases overall performance of the system by eliminating the bands or frequencies that is known to be standards compliant.

Reporting Tools

Oculus R provides reporting tools to summarize the contents of a measurement session. Report includes all ITU – R compliant measurements, as well as the date, time and location of the session. Optionally, Zeta may work with the customer for a specific report format.

Client-Server Architecture

Oculus R comes with an advanced messaging system to implement client-server topology. Server software runs

on the field and connected clients receive the data. Clients can be run on the server side or they can be connected over a network. Moreover, Oculus R uses effective compression techniques on the sent data.

Optional Spectrum Management Database Integration

Oculus R can be interfaced to a spectrum management database. In this case Oculus R queries the database and determines the unauthorized transmitters and unwanted interference automatically.

Self-Calibration

Oculus R receivers are factory tested for a wide range of temperatures, and ensure optimum performance within operating temperature range. The device is equipped with self-calibration capability which eliminates the need for calibration equipment, providing independent and uninterrupted workflow.

Optional Extended Temperature Range

Oculus R can be delivered with extended operation temperature range for reliable field operation. With this option, device is delivered with operating temperature range from -40°C to +65°C, making work in very harsh environments possible.

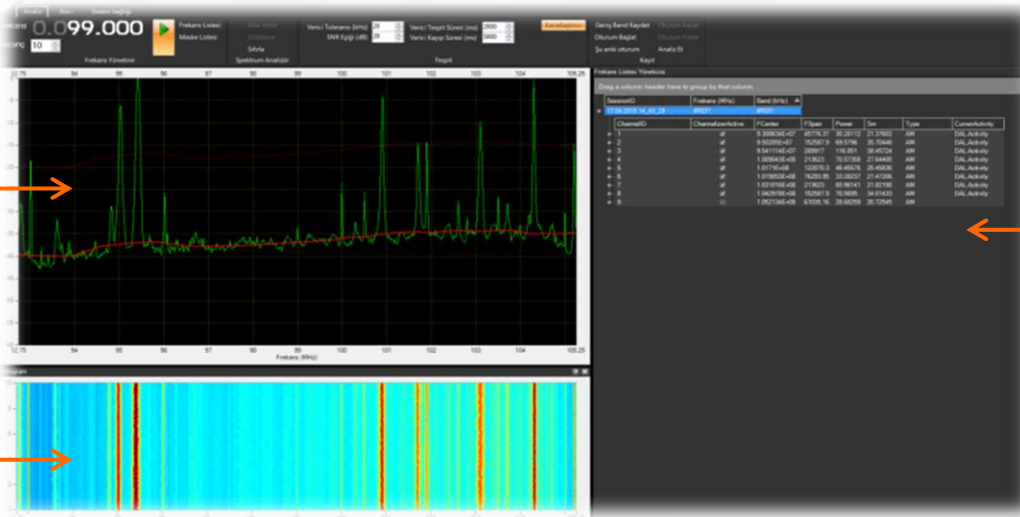
Optional TDOA

Using the optional GPS modules, Oculus R is able to precision time stamp the samples from the ADC. Using Oculus Rs located on multiple sites and leveraging the time stamps, TDOA techniques can be implemented for detected signals.

Optional 3rd party AOA Integration

Oculus R can be integrated with 3rd party AOA systems. Leveraging the integrated mapping software, Oculus R is able to visualize the AOA findings.

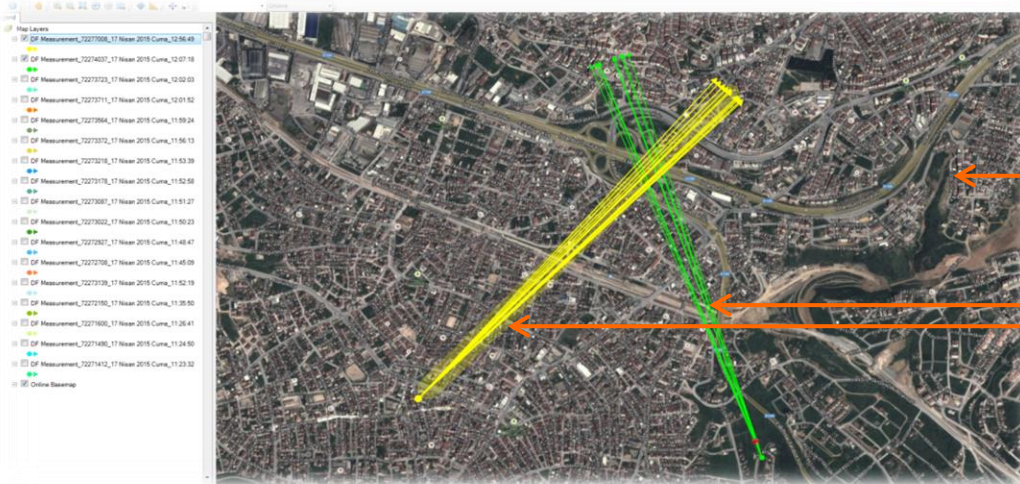




Spectrum Display

Transmitter Activity List

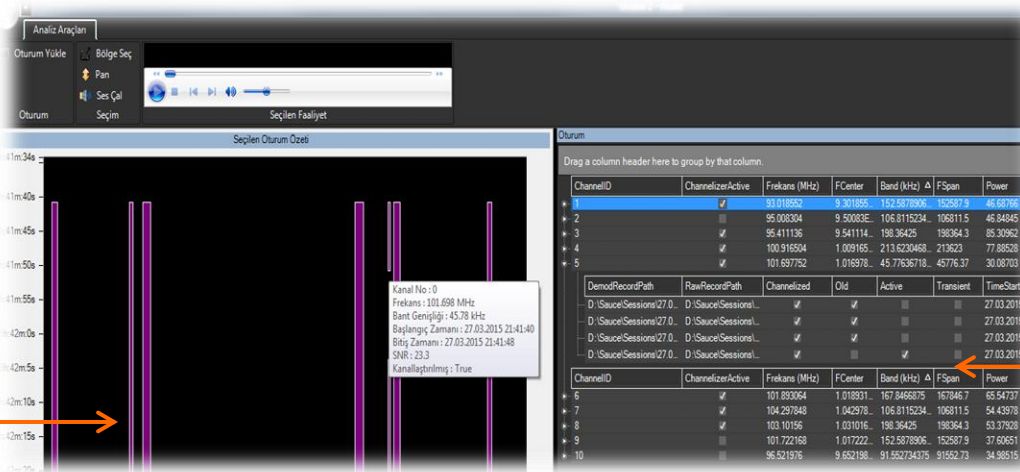
Spectrogram



Session Information

Map Display

AOA Overlay



Detected Transmitters Time Frequency Map

Transmitter Activity List

Specifications

Signal Parameter Measurements

Frequency Measurements	Per ITU-R SM.377
Occupied Bandwidth Measurements	Per ITU-R SM.443
Field Strength Measurements	Per ITU-R SM.378
Modulation Measurements	Per ITU-R SM.328
Spectrum Occupancy Measurements	Per ITU-R SM.1880

Digital RF Frontend – Wide Band

Frequency Range	9kHz – 6GHz
Instantaneous Bandwidth	250kHz - 27MHz
Internal Timebase Accuracy	±1 ppm per year
IF Center Frequency	28 MHz
Sweep Speed	24GHz/s (RBW ≥ 10kHz)
Amplitude Flatness	±2dB max
LO Leakage	-80dBm
Displayed Average Noise Level (DANL)	-140 dBm/Hz @ 9 kHz to 500 kHz -154 dBm/Hz @ 500 kHz to 10 MHz -158 dBm/Hz + 1.1 dB/GHz @ 10 MHz to 6 GHz
Residual Responses	-103 dBm max
Spurious Mixer Responses	-50 dBc (any ref level from +10dBm to -50dBm, in 5dB increments, input signal 10 dB below ref level, and ≤30kHz RBW)
IIP3	32
ADC Resolution	14 bits

Digital RF Frontend – Narrow Band

Frequency Range	20MHz – 1.8GHz
Instantaneous Bandwidth	6MHz
Internal Timebase Accuracy	±1.5 ppm
IF Center Frequency	4 MHz
Residual Responses	-120 dBm max
Spurious Mixer Responses	-65 dBc
IIP3	35dBm
ADC Resolution	12 bits
Filters, Preselectors	Tracking RF filters

General

Power	12VDC Vehicular Power Adapter 110-220VAC Wall Adapter
Dimensions	48.5 x 39.2 x 19.2 cm
Weight	6 kg
Operating Temperature	0°C to +65°C
Weather Proof Enclosure	IEC 60529, IP-67



Antenna

Isotropic Antenna Set

Different mechanical designs are available
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Options

IQ Signal Capture Storage

1 TB

Extended Temperature Range

-40°C to +65°C

Warranty

All hardware and software procured from Zeta is under warranty against manufacturing or design failures for 2 years. Customers specific demands for warranty may also be arranged.

Disclaimer

Due to ongoing R&D, Zeta reserves the right to change the product specification without notice.

Custom Services & Solutions

Zeta Defense provides customers with solutions optimized to their specific needs. This includes feasibility reports; customized training sessions on SIGINT related issues and complete turnkey solutions.

About Zeta Defense

Zeta Defense is a young company developing solutions for RF Spectrum Monitoring & Management, ELINT, COMINT fields. Our capabilities include digital signal processing, highly parallel computation architectures (FPGAs and GPUs), high and low level software development, client-server architectures based on high performance reliable messaging structures, RF hardware simulation and design and systems engineering,

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