IZT R5071
Mobile Monitoring Receiver

- ■ Frequency range up to 6 GHz
- ■ Bandwidth up to 60 MHz
- ■ Portable & rugged design for harsh environments
- ■ Optional built-in mass storage

The IZT R5071 is a mechanically compact and ruggedized wideband receiver with frequency range from 9 kHz up to 6 GHz and an instantaneous bandwidth of 60 MHz. It features internal storage for recording of spectrum or multiple narrow-band IQ signals.
The IZT R5071 is designed for applications requiring moderate bandwidths, moderate power consumption and compact size. When combined with an external server and the necessary options of the IZT Signal Suite, the IZT R5071 becomes a wideband rf recorder with up to 60 MHz continuous recording bandwidth.

Overview

The IZT R5071 is a portable and ruggedized wideband receiver with frequency range from 9 kHz up to 6 GHz and an instantaneous bandwidth of 60 MHz.
It is designed for applications requiring wide bandwidths and moderate power consumption:

- Portable spectrum monitoring
- Mobile RF recording and monitoring
- Autonomous long-term spectrum monitoring nodes
- Detection of unauthorized transmissions

Equipped with a highly selective RF preselector, the IZT R5071 can also handle difficult RF environments. The receiver has a widerange DC power supply input which can be connected to an external battery. The optional built-in storage media with 4TBytes capacity can be used for multiple narrow band IQ signals or spectrum information. The IZT R5071 can execute complex automatic scan jobs and perform recordings triggered by user defined alarm criteria. An network of multiple IZT R5071 receivers can be time synchronized to GNSS satellite signals to support synchronous recording or TDOA applications.

When connected to a Sensor Controller with the IZT Signal Suite the IZT R5071 can be a part of a larger system comprising also other models of IZT Receivers, like the IZT R3000 or R5010/R5040 series. The receiver can be controlled via a web interface, the IZT Signal Suite software or a third party application accessing its low-level control interface. A built-in WIFI module is available for wireless acces to the IZT R5071.
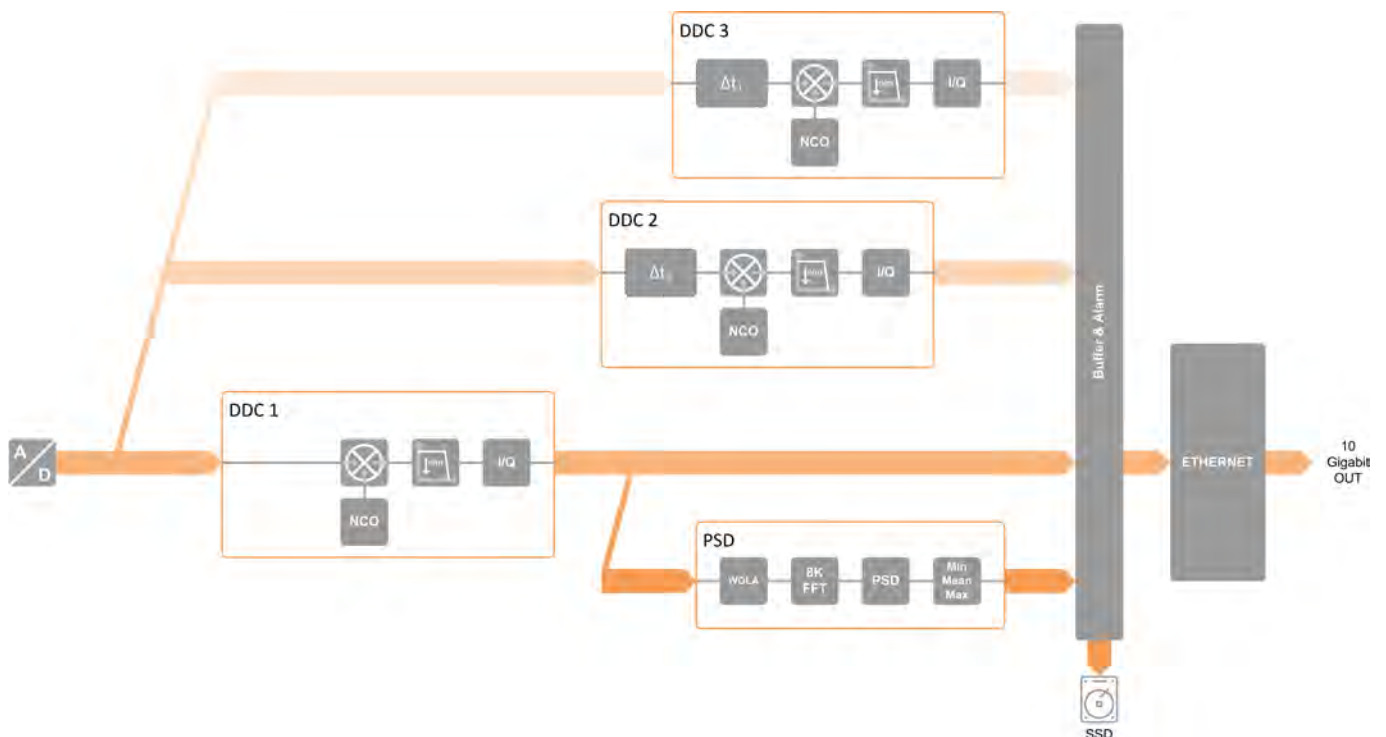

Figure 1: Block diagram of the IZT R5071 digital signal processing

Key Features

- Excellent reception quality
- Frequency range up to 6 GHz
- Real-time bandwidth of 60 MHz
- Low power consumption
- GNSS and PTP as timing reference sources
- Built-in SSD for local recording and data access
- Enhanced recording capabilities
- Ready for operation in a network of receivers
- Rubidium standard for very high frequency accuracy and long holdover time

Figure 2: Front Panel of the IZT R5071

High Reception Quality

The IZT R5071 uses a power-reduced variant of IZT's latest generation of tuners. The frequency range is from 9 kHz to 6 GHz. The lower end of the frequency range is digitized directly, while higher frequencies are passed through sub-octave preselectors and a dual frequency conversion tuner with a variable 1st IF for maximum robustness against false reception. A low-noise preamplifier can be activated for maximum sensitivity.

The instantaneous bandwidth of the IZT R5071 is 60 MHz. Built-in test equipment allows for end-to-end verification and time alignment of multiple synchronized IZT R5071 receivers. The receiver can be operated in manual or automatic gain control mode. All internal clocks are derived from a single reference oscillator, the built-in high-stability oscillator, which itself can be sychronized to an external source, the built-in GNSS receiver module or slaved to another IZT R5071 receiver via PTP.

Internal recording capabilities

An internal SSD data storage can be used to capture incoming signals. Aside from standard recording, additional features like alarm triggered recording or measurement tasks allow to maximize the use of limited storage space. Thus only signals of interest are stored for later processing.

High Frequency Stability

The IZT R5071 is available with different frequency stability options:

- TCXO (default)
- OCXO
- Rubidium Standard (w/ TCXO)

The reference oscillator itself can be slaved to a built-in GNSS module. If multiple IZT R5071 receivers are connected via a PTP local area network, they can synchronize their internal references to a dedicated master unit. Once the LAN connection is removed, their internal reference oscillators will maintain highest frequency accuracy to ensure minimum drift of the time bases between multiple receivers.

Your Benefits

RUGGEDIZED AND MOBILE

The IZT R5071 is designed for outdoor and unattended operations. The portable design of the IZT R5071 enables usage in different environments and easy transportation for various applications in open fields. The IZT R5071 is mechanically compact and usable over a wide temperature range. It is also suitable for remote operation with limited infrastructure or portable applications.

WIDE RANGE POWER SUPPLY

The wide range DC power supply provides easy connection to electrical systems in the field or in mobile application, for example from the electrical system of a vehicle.

The IZT R5071 can also be used with the included external wide range AC power adapter.

SIGNAL PROCESSING

The IZT R5071 is connected to a Sensor Controller PC via 10 Gigabit Fiber Ethernet interface and can be used with it in the same way as with other IZT receivers. IZT Signal Suite GUI applications running on the PC offer various solutions for signal monitoring, WB recording, signal analysis and post-processing.

Alternatively the IZT R5071 enables signal processing without an attached Sensor Controller PC. Triggered recordings of measurement tasks allow for autonomous operation of the equipment for later offline analysis.

COMPACT AND LIGHTWEIGHT

The IZT R5071 combines a limited weight of approx. 6.5kg with a fanless design suited for harsh environments while maintaining an excellent RF performance. Additionally, the power consumption of the IZT R5071 stands out: The receiver needs only 30 to 40 watts, depending on hardware options.

Figure 3: Interfaces of the IZT R5071

Figure 4: mounting holes on each side

Applications

Enhanced Recording Capabilities

Stand-alone Recording

For recording purposes a SSD storage drive can be installed inside the equipment. At any time the user can capture data streams with the hard disk by using the front panel or the Web GUI (Figure *5*):

- Spectrum data (PSD)
- CBB I/Q data (limited bandwidth)
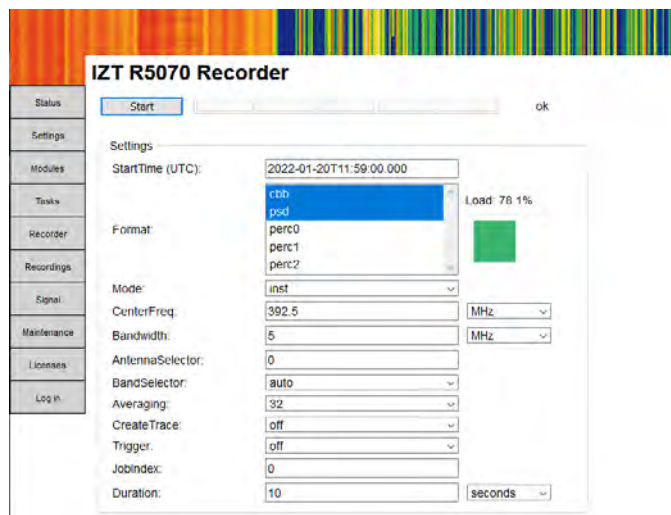- SCD data with data reduction

Figure 5: built-in recorder web interface

Reference Trace and Alarms

The operator can create or load a PSD reference trace into the equipment and specify an offset in dB. Once armed, the IZT R5071 will automatically monitor the PSD and compare the two traces, in case of alarms the user can configure which data shall be stored to internal SSD drive.

IZT R5071 can trigger recordings once a reference trace is violated. Figure *6* shows the IZT Signal Suite displaying the PSD spectrum in orange, the reference trace in blue and the difference trace in green. Using the offset in dB allows for positioning of the reference trace and for modification of the alarm condition.
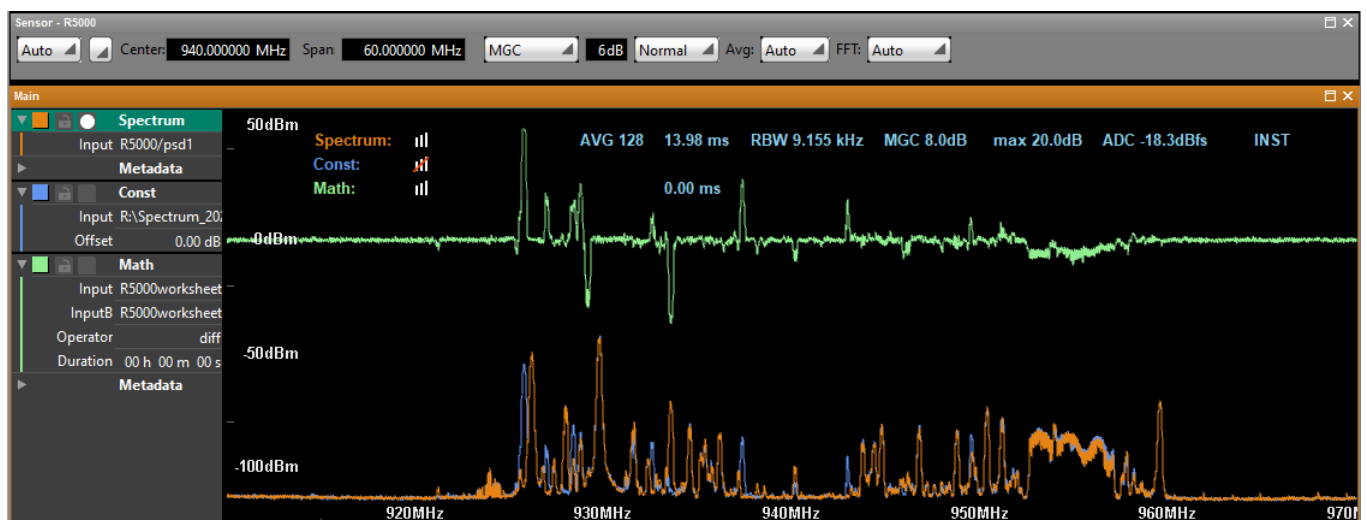

Figure 6: IZT Signal Suite showing trace and reference trace

COMPATIBLE WITH IZT SIGNAL SUITE APPLICATIONS

The IZT R5071 perfectly works together with IZT Signal Suite software solutions. Various plug-in modules can be added to the basic GUI and the I/Q wideband recording application with full continuous CBB I/Q real-time bandwith of 60 MHz (Figure 7), such as Panorama Scan, Persistence Display, Mask Triggered Recording, Long-term Spectrogram Recording, Time Scheduled Recording, Signal Analysis and Modulation Recognition or Demodulation of various modulation schemes.

TRIGGER CONTROLLED SIGNAL CAPTURE

Triggered recording with IZT Signal Suite enables signal capture up to full real-time bandwith with adjustable pre-recording and follow-up time.

The trigger event can be defined by power limits exceeding spectrum masks, captured reference traces with adjustable offset or manually by pressing the recording button or by an external trigger pulse. Captured signal events are automatically stored in subfolders with trigger log, PSD and CBB I/Q files.
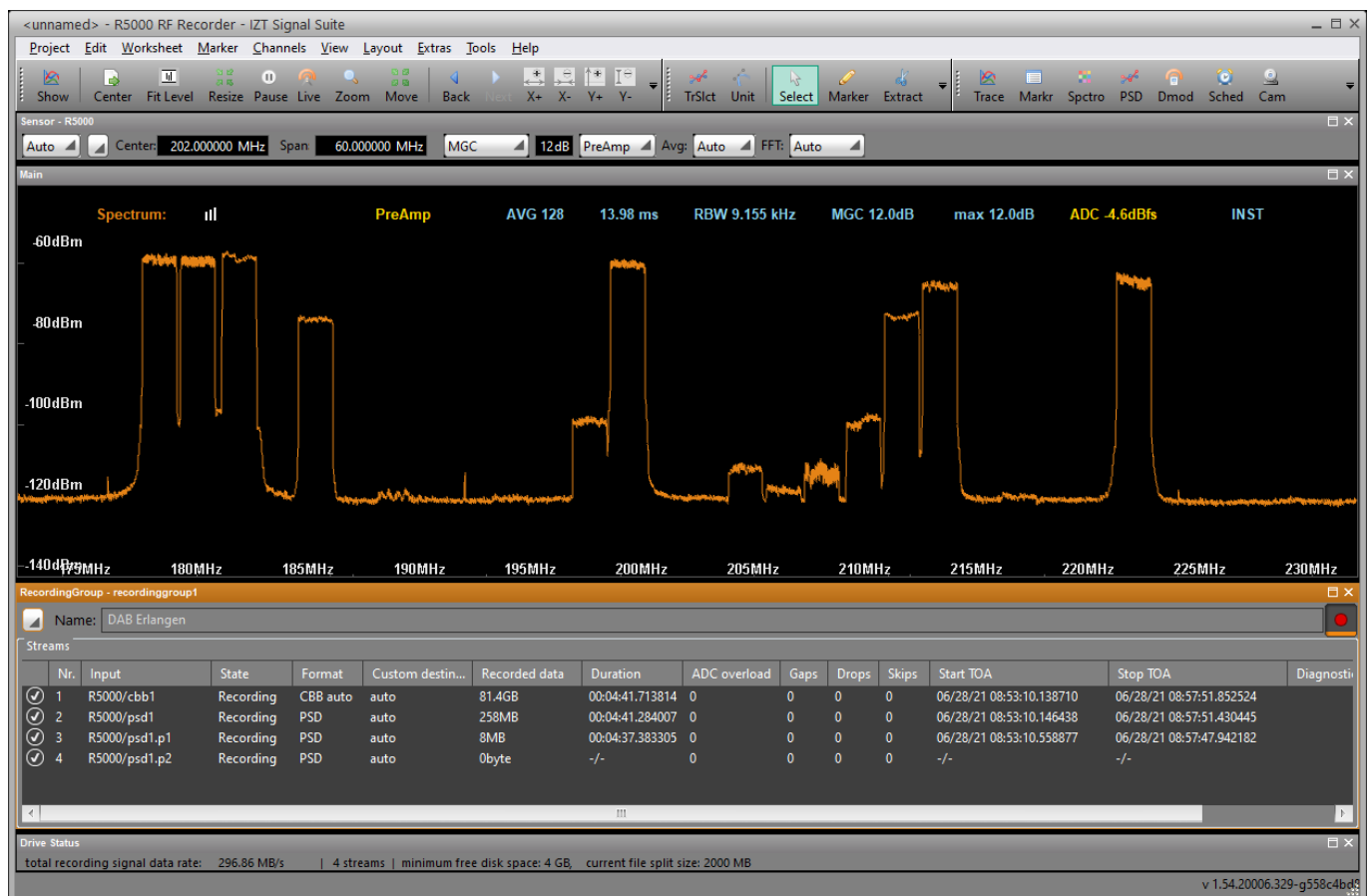

Figure 7: IZT Signal Suite IQ wideband recording with 60 MHz

Specifications

RF Input	
Frequency range	9 kHz to 6000 MHz
Receiver bands	Baseband: 9 kHz to 65 MHz RF: 20 MHz to 6000 MHz
Instantaneous bandwidth	60 MHz
Number of antenna inputs	3 (1x Baseband, 2x RF)

RF Performance	
Frequency range	20 MHz to 6000 MHz
Maximum input power	+15 dBm, preamp on
	+20 dBm, preamp off
Return loss	VSWR 1:2
IP3	+8 dBm, minimum attenuation in normal mode, typical
	-7 dBm, minimum attenuation in low noise mode, typical
Noise figure	15 dB in normal mode, typical
	8 dB in low noise mode, typical
Sensitivity	-114 dBm @ 3 kHz BW, S/N = 10 dB -105 dBm @ 25 kHz BW, S/N = 10 dB
Gain	25 dB, preamp off, minimum attenuation in normal mode 40 dB, preamp on, minimum attenuation in low noise mode
Attenuation	0 dB to 30 dB
Tuning speed	2 ms, typical
Tuning resolution	1 Hz
Tuning accuracy	< 0.2 Hz
Phase noise	-100 dBc/Hz @ 1 kHz, typical -108 dBc/Hz @ 10 kHz, typical
Frequency conversion	Dual conversion with variable 1st IF
LO1 leakage	< -100 dBm
LO2 leakage	< -120 dBm
IF1 rejection	80 dB, typical
IF2 rejection	> 100 dB
IF1 subharmonic blocking	> 100 dB
Image rejection IF1	> 120 dB
Image rejection IF2	> 100 dB

Preselector Filter	
Preselector	14 bands, electronic switching
	20 MHz to 80 MHz
	80 MHz to 120 MHz
	110 MHz to 170 MHz
	160 MHz to 260 MHz
	240 MHz to 390 MHz
	350 MHz to 570 MHz
	530 MHz to 860 MHz
	800 MHz to 1260 MHz
	1200 MHz to 1960 MHz
	1900 MHz to 2960 MHz
	2900 MHz to 3560 MHz
	3500 MHz to 3960 MHz
	3900 MHz to 4860 MHz
	4800 MHz to 6060 MHz

Baseband Performance	
Frequency range	9 kHz[1] to 65 MHz
Maximum input power	+20 dBm
Return loss	VSWR 1:2
IP2	+25 dBm, typical, minimum attenuation
IP3	+13 dBm, typical, minimum attenuation
Noise figure	5 dB, typical
Sensitivity	-124 dBm @ 3 kHz bandwidth, S/N = 10 dB
	-115 dBm @ 25 kHz bandwidth, S/N = 10 dB
Gain	19 dB, minimum attenuation
Attenuation	0 dB to 31 dB
Tuning speed	direct sampling
Tuning resolution	1 Hz
Tuning accuracy	< 0.2 Hz
Phase noise	< -140 dBc/Hz @ 1 kHz, typical
	< -150 dBc/Hz @ 10 kHz, typical
Spurious level	< -75 dBFS

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[1]Degraded performance: 9 kHz to 500 kHz

Specifications

Reference Clock		
	TCXO (standard)	**OCXO (optional)**
Frequency	10.000 MHz	10.000 MHz
Frequency stability over temperature range	$\pm 2.8 \times 10^{-7}$	$\pm 1.0 \times 10^{-8}$
Aging per day	$\pm 2 \times 10^{-8}$ (after 10 days)	$\pm 5 \times 10^{-10}$ (after 30 days)
Aging per year	n/a	$< 1 \times 10^{-7}$
Phase noise:		
10 Hz	n/a	-125 dB/Hz
100 Hz	-130 dB/Hz	-145 dB/Hz
1 kHz	-145 dB/Hz	-165 dB/Hz
10 kHz	-154 dB/Hz	-
100 kHz	-156 dB/Hz	-
ADEV	1×10^{-10}, $\tau = 1$ s	2×10^{-10}, $\tau = 1$ s
Temperature drift	n/a	$< 1 \times 10^{-8}$, 0 to 70°C

Rubidium Frequency Standard		
	with TCXO	**with OCXO**
Frequency	10.000 MHz	n/a
Aging per day	5×10^{-12}	n/a
Aging per month	5×10^{-11}	n/a
ADEV	8×10^{-12}, $\tau = 100$ s	n/a
Temperature drift	5×10^{-10}, 0 to 50°C	n/a

Signal Processing	
ADC	16 bit
PSD	8192-point FFT, WOLA-3 window Averaging by 1, 2, 4, 8, 16, 32, 64 or 128 Min/Mean/Max/Percentile trace
PSD preview	Long-term spectrogram generated during recording
I/Q	IZT R5000 CBB data format
SCD	Internal IZT SCD format reducing data amount Compatible to IZT Signal Suite for extraction
Sweep time	2 ms typ. plus time for gathering data
Scanning speed	Up to 20 GHz/s Up to 300 GHz/s within 60 MHz bandwidth[1]
Sampling rate	Variable from 6.25 kSPS (5 kHz) to 75 MSPS (60 MHz)

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[1]"staring mode" with stationary center frequency

Enhanced Recording (optional)	
Recording	Built-in recording capabilities
Storage capacity	4 TB 2.5" SSD
Alarms	Triggered recording using PSD reference trace for data reduction
Measurement	Automatic measurement campaign config. by measurement task

Interfaces	
Antenna inputs	N (f), 50 Ω
Data, monitor and control	10 Gigabit Ethernet, SFP+, 10GBASE-SR
PTP synchronization	1 Gigabit Ethernet on RJ45
10 MHz reference	SMA (f), IN/OUT
Trigger input	SMA (f), 1 PPS
GPS antenna	SMA (f), 50 Ω
WLAN antenna	SMA (f), 50 Ω
USB	3.0
DC connector	2-pin connector[2]

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[2]external AC/DC converter supplied as accessory

Specifications

Environmental Parameters	
Power supply	10 to 30 V DC
	External AC/DC adapter (100 to 240 V AC, 50 to 60 Hz)
Power consumption	40 W, typ. & 50 W, max.
Cooling	Convection cooling, fanless
Dimensions (WxHxD)	285 mm x 98 mm x 354 mm
Weight	Approx. 6.5 kg
Temperature range	Operation: 0 to 50°C
	Storage: -40 to 70°C
Humidity	Max. 90% r.H., non-condensing
IP Rating	IP 67

Certificates	
EMI / EMC	EN 61010-1:2002
	CISPR 25 class 5
Conformity	CE marking

Ordering Guide

Option	Description
IZT R5071-CHS	Base Unit, 60 MHz bandwidth, 3 DDCs incl. TCXO, wide range DC input, 8k PSD, GNSS sync & NTP
IZT R5071-RF3	RF input, 20 MHz to 3 GHz
IZT R5071-RF6	RF input, 20 MHz to 6 GHz
IZT R5071-HF	HF input, 9 kHz to 30 MHz
IZT R5071-OCX	Oven stabilized reference oscillator (replaces TCXO)
IZT R5071-RBO	Rubidium stabilized reference oscillator
IZT R5071-PTP	PTP synchronisation capability
IZT R5071-REC	Recording functionality & 4TB data storage[1]
IZT R5071-MTS	Measurement task scheduler
IZT R5071-MNT	Rack mounting kit
IZT R5071-AAI-RF5	3x3 Antenna Switch[2]

[1]Does not work with option IZT R5071-AAI-RF5
[2]Does not work with option IZT R5071-REC

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