



MetaSensing Electronic Corner Reflectors

MetaSensing BV



MetaSensing AP Pte Ltd



MetaSensing Italia S.r.l.



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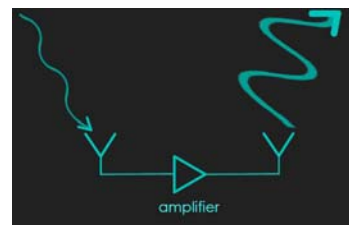
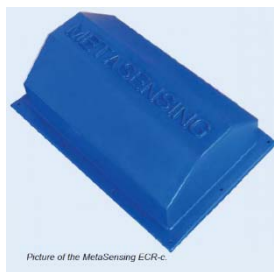
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ECR-C

- ECR stands for Electronic Corner Reflector (also often referred to as transponder or CAT)
- The model ECR-C covers the C band SAR (Sentinel-1 and RadarSAT)
- Indeed an ECR-X is under development
- The concept is to use active component for amplifying the satellite signal and send it back, allowing the use of smaller device than passive corner reflectors
- And ECR can be used also with polarimetric acquisitions and double view ascending/descending orbits



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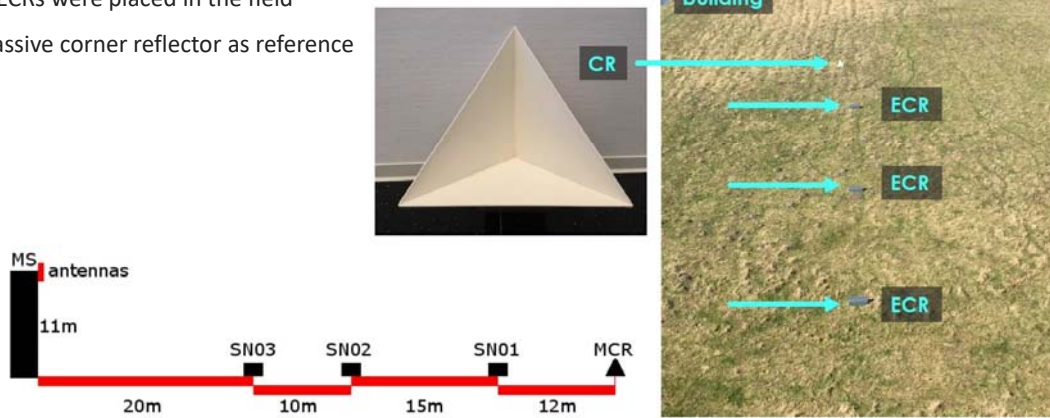
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ECR-C testing

- A C band radar was installed in the roof of a building
- Three ECRs were placed in the field
- One passive corner reflector as reference

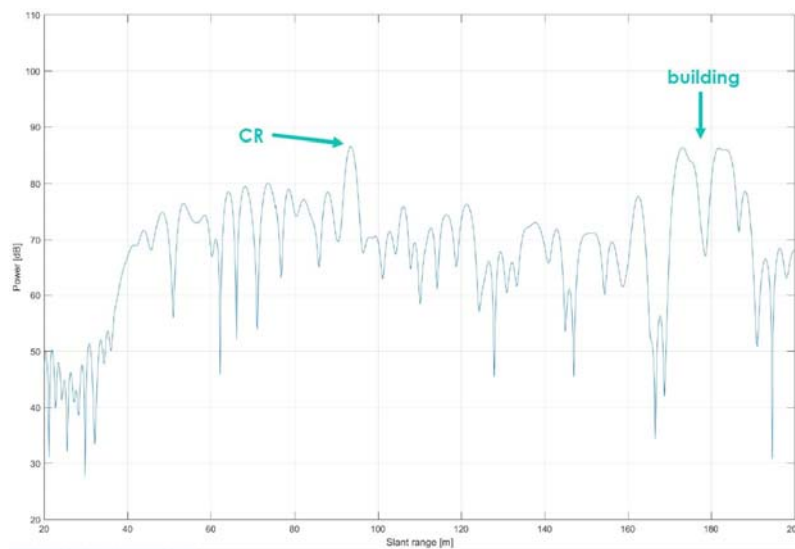


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ECR-C testing

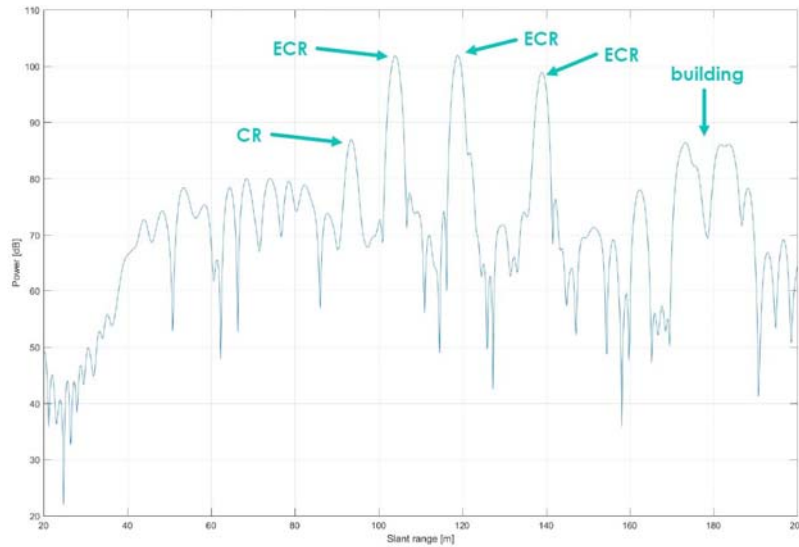


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ECR-C testing



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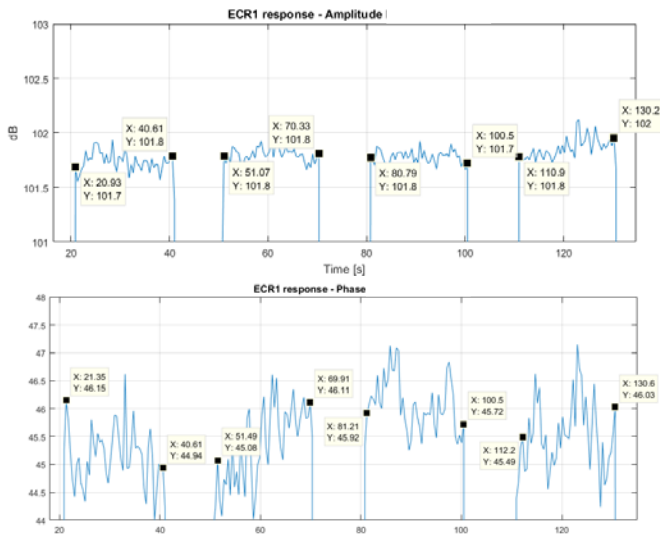
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Amplitude and phase stability



Amplitude:
Stable within 1dB

Phase:
Stable within 3°

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RCS and delay

ECR1 and ECR2



ECR3



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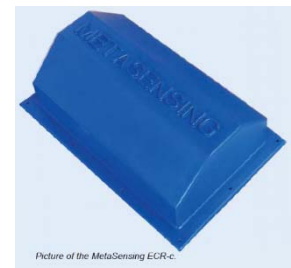
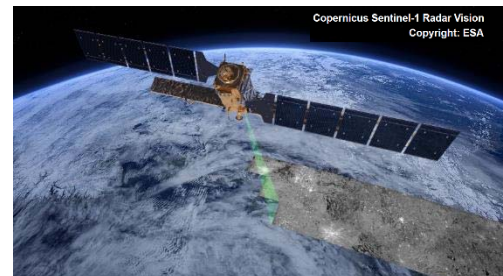
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Digital controller

- MicroController Unit (MCU) with integrated Wi-Fi & Bluetooth module;
- Integrated GPS/GNSS;
- Quad-Band GSM/GPRS module;
- Large Capacity Battery Pack (10Ah LiFePO4) that provides four weeks of power to the system without recharging;
- Fast Recharge via Solar Panel and/or AC adapter;
- Compact & Autonomous ;
- Easy to deploy also in remote areas;
- Multiple methods of settings/queries (Desktop GUI; inside Web-App; SMS; USB-UART)



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Microcontroller

- CPU: dual-core 32-bit, operating at 160 MHz + Ultra low power (ULP) co-processor
- Wireless connectivity: Wi-Fi: 802.11 b/g/n + Bluetooth: v4.2 BR/EDR and BLE
- Security: IEEE 802.11 standard security features all supported, WPA/WPA2; Flash encryption; 1024-bit OTP
- Power management: Individual power domain for RTC; Wake up from GPIO interrupt, timer, ADC measurements;
- 4 MB external SPI flash memory
- Ultra-Low Power Consumption
- Robust Design (-40°C to $+85^{\circ}\text{C}$)



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Communication card

- Quad-band 850/900/1800/1900MHz
- GPRS class 12: max. 85.6 kbps (downlink/uplink)
- SMS: Point to point MO and MT; SMS cell broadcast; Text and PDU mode
- GPS Receiver type: 22 tracking /66 acquisition-channel; GPS L1 C/A code
- GPS Time-To-First-Fix: Cold starts: 30s (typ.); Hot starts: 1s (typ.)
- Supports Real Time Clock
- Standard SIM Card
- Low power consumption
- Robust Design (-40°C to $+85^{\circ}\text{C}$)



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ECR-C Battery Power System:

- The system is constantly powered by a large battery 10Ah LiFePO4 (lithium iron phosphate)
- The battery provides more than 4 weeks of energy without any recharging
- The battery pack can be quickly recharged via solar panel and/or AC adapter
- The MCU logs the state of charge daily
- An SMS can be set to warn of a low battery
- LiFePO4 chemistry offers a longer cycle life than other lithium-ion approaches (more than 1000 charging cycles)



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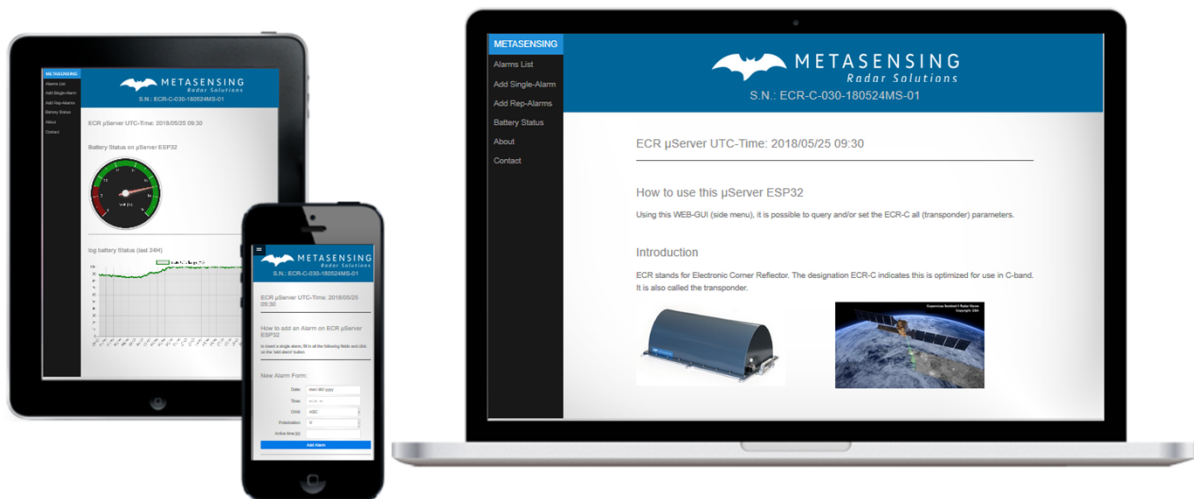
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Built-In Responsive HTTP microServer



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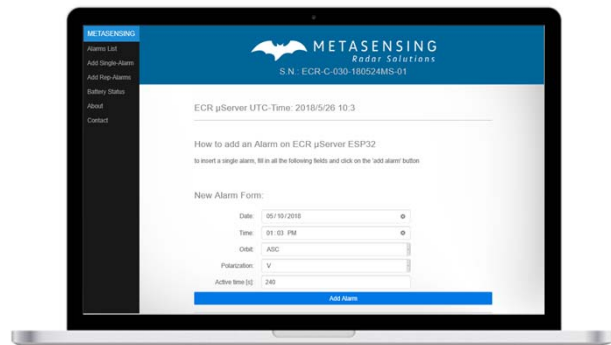
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microServer WEB-GUI example page:

- Full control of the system via web-browser.
- Example page where users can set a single alarm



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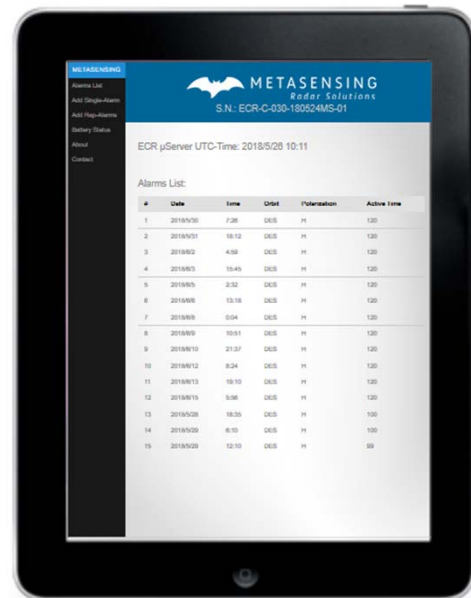
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microServer WEB-GUI example page:

- The system can always be queried
- Example page showing upcoming events



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microServer WEB-GUI example page:

- The system can always be queried
- Example page showing battery charge and battery log



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Network control software

Main Window

Display ECR Networks

Selected Node Info

Network:

Node:

Node Configuration

Acquisition Time List:

Last update (UTC): 24/05/2018 9:36:23

mode	start	period	duration	polarization	orbit
periodic	6/1/2018 9:32:49 AM	7:00:00:00	00:00:00	0	0
single	6/1/2018 9:35:43 AM	00:00:00	00:01:39	0	0

Status Feedbacks List:

Last update (UTC): 24/05/2018 9:36:23

start	period
5/24/2018 2:06:20 PM	01:00:00

Node Status

Node Critical Warnings

Display ECR
Node Configuration

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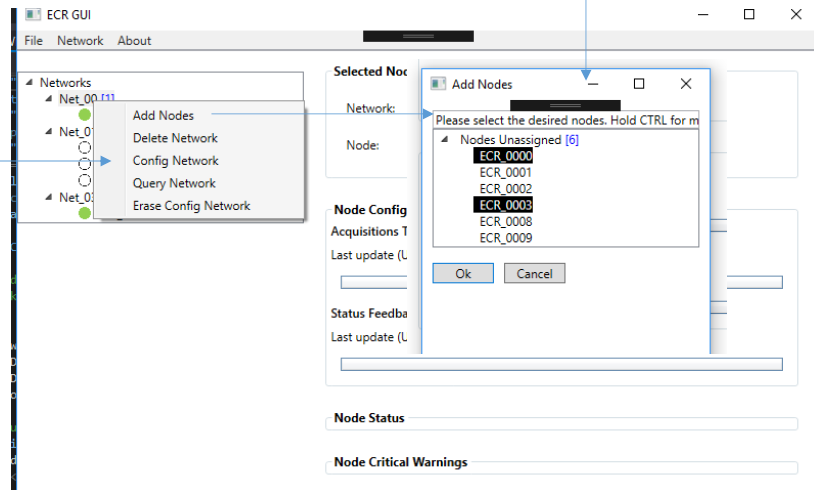


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Network control software

Network Features:

Add Nodes feature:



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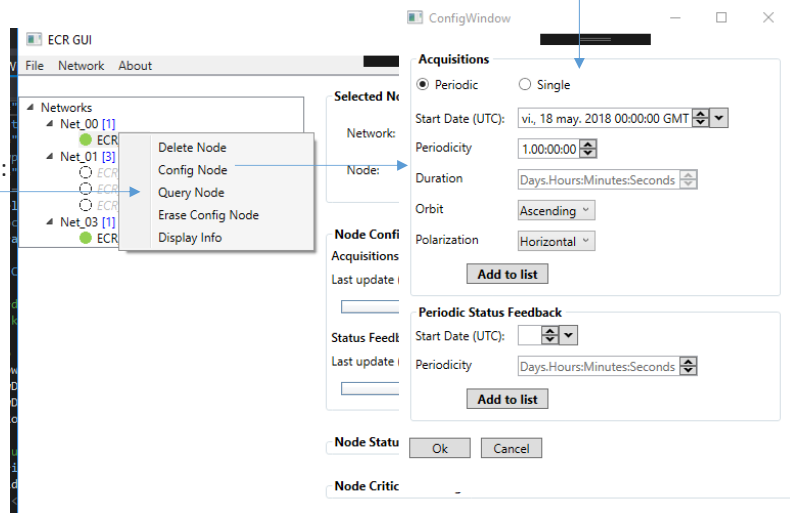


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Network control software

Node Features:

Config Node feature:



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Display Node feature:

Selected Node Info

Network:

Node:

Node Configuration

Acquisitions Time List:

Last update (UTC): 23/05/2018 11:13:42

mode	start	period	duration	polarization	orbit
periodic	5/23/2018 12:00:00 AM	01:00:00	00:00:00	0	0
periodic	5/24/2018 12:00:00 AM	02:00:00	00:00:00	0	0
periodic	5/24/2018 10:01:50 AM	01:00:00	00:00:00	0	0
periodic	5/25/2018 10:58:40 AM	01:00:00	00:00:00	0	0
periodic	5/26/2018 10:58:40 AM	01:00:00	00:00:00	0	0
single	5/25/2018 11:02:39 AM	00:00:00	01:00:00	0	0

Status Feedbacks List:

Last update (UTC): 23/05/2018 11:13:42

start	period
5/24/2018 11:13:27 AM	01:00:00

Node Status

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Network control software

Legend:

- ACK message received
- Message sent to ECR; waiting for answer
- NACK message received
- Warning message received

ECR_0004: valid acquisition times configuration

ECR_0005: missing acquisition times configuration

Selected Node Info

Network:

Node:

Node Configuration

Acquisitions Time List:

Last update (UTC): 01/01/0001 0:00:00

mode	start	period	duration	polarization	orbit

Status Feedbacks List:

Last update (UTC): 01/01/0001 0:00:00

start	period

Node Status

Node Critical Warnings

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