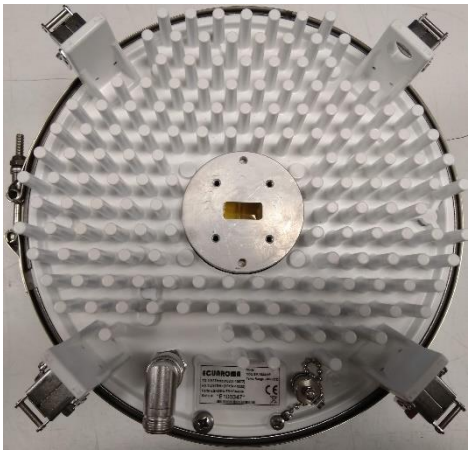
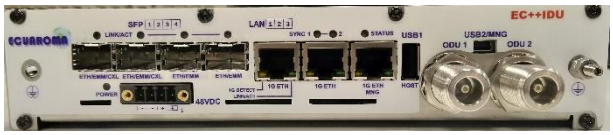
EC++LINK/SM





User Guide

System: EC++LINK/SM

Release: 1.1

Author: Gianluca Franco

SUMMARY.

List of figures

List of tables

Chapter 1 - Basic information.

1.1 Introduction.

EC++LINK is a universal IDU designed for split-architecture high-performance Point-to-Point (PtP) digital microwave links with adjustable data rate from 10 up to 1000Gbps. The whole system is designed especially for network operators interested in IP based transports and backhaul infrastructure.

EC++LINK supports both ETSI and ANSI licensed frequency bands. EC++LINK boasts hitless Adaptive Code Modulation (ACM), excellent system gain, and bandwidths for both ETSI and ANSI standards.

THIS PRODUCT USER GUIDE IS WRITTEN IN THE FORM OF COMPLETE MICROWAVE SYSTEM DESCRIPTION (IDU & ODU & ANTENNA) UNDER ECUAROMA OWN BRAND NAME EC++LINK.

1.2 Safety Information.

EC++LINK complies with the basic requirements of European R&TTE Directive 1999/5/EC Article 3 and meets the requirements contained in the harmonized standards R & TTE, in accordance with article 5 of the directive. EC++LINK complies also with the basic requirements of FCC rules according to the table below.

Table 1 : Requirements and harmonized ETSI standards

Essential requirements under Article 3	**Harmonized standards under Article 5**
Article 3.1 (a): Protection of health and safety of users (contained requirements of Directive 73/23/EEC and council recommendation 1999/519/EC)	Article 3.1 (a): Protection of health and safety of users (contained requirements of Directive 73/23/EEC and council recommendation 1999/519/EC)
EN 60950-1 (2006)	EN 60950-1 (2006)
EN 60950-22 (2006)	EN 60950-22 (2006)

Table 2: Requirements and harmonized FCC standards

Essential requirements	**Standards**
US FCC limits	System has been tested for compliance with FCC Part 101 and the general requirements of Part 2. The limits for digital devices pursuant to Parts 15.107 and 15.109 Class A have been applied.

The product complies with the basic requirements for this type of equipment and all the above technical standards. Operation of equipment is safe under normal conditions of use set out in this User Guide.

Modifying or tampering with EC++LINK product´s internal components can cause a malfunction and might invalidate its warranty.

1.3 Device labels.

For quick identification each device includes a Product Label giving the Product type, Product number, Producer and Serial number (S/N) with bar code and, if needed, any other complementary information (frequency range, ...).

1.3.1 The ODU code description.

For quick identification each device includes a Product Label giving the Product type, Product number, Producer and Serial number (S/N) with bar code and, if needed, any other complementary information (frequency range, …).

Figure 1: The label of outdoor unit

Basic Information.

ODU,SM,[Model],[Power]	outdoor unit specification (ECUAROMA labelling).
SM	Identifies the product series, ask your local representative for more details.
[Model]	Determines the main frequency band (in GHz) and related sub-band.
[Power]	Determines transmitter's version between Standard Power (SP) or High Power (HP)

Temp Range[YY/ZZ]°C

YY	Identifies minimum operating temperature recommended.
ZZ	Identifies maximum operating temperature recommended.

Sub-band information.

TX [Freq1]-[Freq2] MHz	Identifies start [freq1] and stop [freq2] frequencies of diplexer pass-band for transmitting section
RX [Freq3]-[Freq4] MHz	Identifies start [freq3] and stop [freq4] frequencies of diplexer pass-band for receiving section.

Part# [Part Number]

Part Number has following syntax:

ESKODU/xx/[Model]/[Power] where

ESKODU	Identifies the commercial name of the ODU
xx	Identifies the product configuration between FD = Full duplex TX = Transmitter Mono RX = Receiver Mono
[Model]	Determines the main frequency band (in GHz) and related sub-band.
[Power]	Determines transmitter's version between Standard Power (SP) or High Power (HP)

Serial #

Part Number has following syntax:

xyyzzzz where

x	Identifies ODU manufacturer (E=Ecuaroma)
yy	Identifies frequency band
zzzz	Progressive Serial Number

1.3.2 The IDU code description.

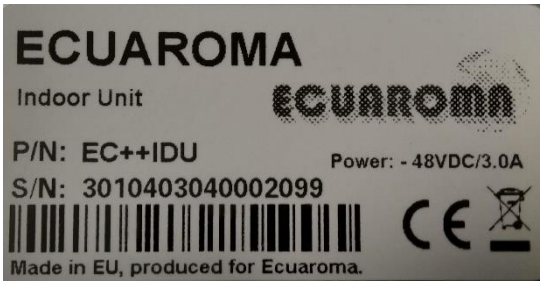


Figure 2: The label of indoor unit

P/N:	EC++LINK indoor unit identifier (ECUAROMA labelling).
S/N:	Serial Number of IDU

1.3.3 The EMM code description.

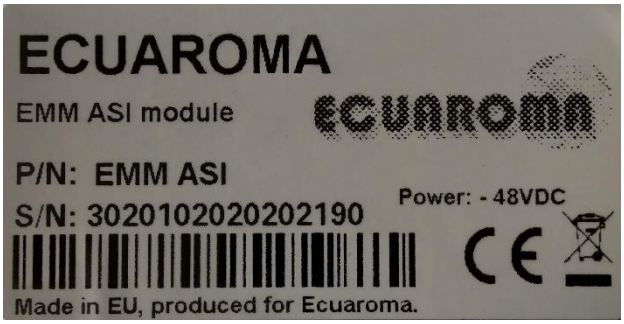


Figure 3: The label of EMM

EMM-xxx	Identification of external multiplexer module (EMM). Identifier “xxx” specifies the type of module (16xE1/T1, 4xASI, …).

Example:

EMM-16E1/T1	The EMM module with ports 16xE1/T1 (G.703/G.704).

Chapter 2 - Technical Description.

2.1 Introduction.

Digital microwave system EC++Link is designed in split mount version, the IDU - ODU architecture. There is only one universal IDU hardware version available with bandwidth up to 60 MHz and applicable maximal output power. The indoor unit (EC++LINK) is universal with respect to ETSI and ANSI bandwidth standards and universal for all frequency bands, and its configuration then depends on the loaded software license key. The outdoor units are unique for each frequency band and sub-band.

2.2 System description.

Signal received by parabolic antenna is carried via a waveguide adapter to the receiving filter in outdoor unit. The task of outdoor unit (ODU) is to convert the frequency of received/transmitted signal to/from IF. The resulting converted signal is together with management channel carried via the coaxial cable to the EC++LINK indoor unit (IDU). The signal is demodulated inside the IDU, followed by recovery of user data and management data intended for communication with ODU. As a source of user data can be used a signal for/from the Gigabit Ethernet ports or EMM modules connected over SFP module. Data for the transmission are processed similarly in the reverse order than the received signal.

The EC++Link system is technically characterized by the following basic features.

- Standard licensed ETSI and ANSI frequency bands.
- Modulation schemes.
    - QPSK, 8 PSK, 16/32/64/128/256/512/1024 QAM.
- Channel bandwidth.
    - ETSI standards 7/14/28/40/56/80 MHz.
    - ANSI standards 10/20/25/30/40/50/60/80 MHz.
- Reed Solomon with Weak/Medium/Strong modes
- Hitless Adaptive modulation (ACM).
- Two functional options (SW setting / License Key).
    - AES128/256 – AES encryption for high system security.
    - PTP1588 – option which ensure IEEE1588 support.
- Integrated traffic ports.
    - 3x Gigabit Ethernet ports (10/100/1000Base-T) for user data traffic and/or management access.
    - 4x SFP slots for additional GIGE port extension, EMM module connection or IDU interconnection (protection, aggregation).
- Integrated management ports.
    - USB-B – for separate IP management access.
    - USB-A – configuration restoration and backup by means of USB Flash memory.
- SyncE support implemented on request.
- Integrated data verification system of received corrupted packets (CRC).
- Integrated BER tester and measurement of the nature of received signal (MSE, modulation diagram of received data).
- ATPC function support (Automatic Transmit Power Control).

- Integrated spectral analyser for the detection of the free channel, or alternatively for detection of interference with the particular band.
- Unified standard management IP access – TELNET, HTTP, SNMP v.2c.
- Secure management IP access - SSH, HTTPS, SNMP v.3.

2.3 Indoor Unit (IDU).

The basic function of the EC++LINK Indoor Unit is the data multiplexing and at the same time it is the digital modem of the whole system. Both functions are easily configurable by software. The core of the unit is DSP module that generates a signal for the intermediate frequency output to outdoor unit and processes intermediate frequency input from the outdoor unit.

The indoor unit is fitted with three 1000Base-T (RJ45) user ports, where one port can be reserved either for an individual management connection or as a standard user port. 4 SFP slots are intended either for additional Gigabit Ethernet connection or for IDU interconnection (1+1/2+0/2+2) or for port extension by means of EMM module.

There is the USB-B port available in IDU for the independent management connection, second USB port (USB-A) is reserved for flash memory stick (configuration backup, logs.,.).

Management system is based on IP protocol. Outdoor unit management is integrated directly into the command set of the indoor unit and is an integral part of this unit's software. For the management itself there is used, either character-oriented IP access (TELNET, SSH) or web based GUI (HTTP, HTTPs) or SNMP based system management.

The IDU unit should be connected to power supply with a nominal voltage of -48 VDC and GND must be connected to the positive pole.

2.3.1 IDU front panel description.

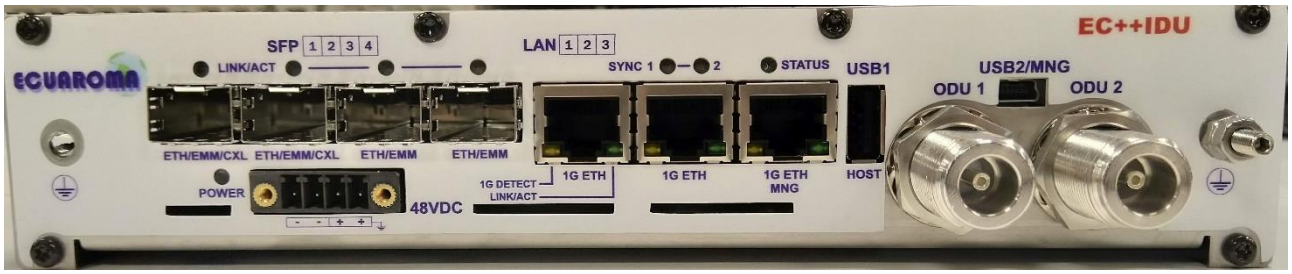


Figure 4: The front panel of the Indoor unit

2.3.1.1 Connectors on the IDU front panel

- **LAN 1/2 –** Gigabit Ethernet user ports for Ethernet connection.
- **LAN 3 –** by default it is reserved for management access (out of band management), but can be configured also for user data traffic.
- **SFP 1 ETH/EMM/CXL**– user port for alternative Gigabit Ethernet connection or IDU interconnection in case of protected or aggregate design selection.
- **SFP 2 ETH/EMM/CXL** – user port for alternative Gigabit Ethernet connection or EMM module connection.
- **SFP 3 ETH/EMM** – user port for alternative Gigabit Ethernet connection or IDU interconnection in case of protected or aggregate design selection.
- **SFP 4 ETH/EMM** – user port for alternative Gigabit Ethernet connection or EMM module connection.
- **HOST USB1 –** USB interface for connecting USB memory.
- **USB2/MNG –** USB interface for an alternative IP access.
- **-48 VDC** – power supply connector, + pole is grounded inside the device.
- **ODU 1/2 –** N connector for connecting ODU over coaxial cable (IF connection).
- **Grounding connector.**

2.3.1.2 LED indicators on the IDU front panel – system status

- **SYNC 1/2** – indication of modem synchronization (digital modem).
  - Lights – synchronization OK.
  - No light – loss of synchronization.
- **STATUS** – indication of the LOCAL device status.
  - Lights – status OK.
  - Flashes – status WARNING.
  - No light – status UNKNOWN.
- **POWER** – indication that IDU is under power.
  - Lights – power ON.
  - No light – power OFF.

2.3.1.3 LED indicators on the IDU front panel – ports status

- **SFP 1/2/3/4 LINK/ACT** – indication of presented signal at SFP port.
  - Lights – signal detected and synchronized.
  - Flashes – incorrect result from auto-detection process.
  - No light – no correct signal detected.
- **LAN 1/2/3 1G DETECT** – indication of Gigabit ETH mode on appropriate port.

  - Lights – GIGE mode ON.
  - No light – no GIGE mode detected.
- **LAN 1/2/3 LINK/ACT** – indication of link and data activity on appropriate ETH port.
  - Lights – Ethernet link detected.
  - Flashes – data activity (Rx/Tx) at appropriate port.
  - No light – no Ethernet link.

2.3.2 Block diagram of the EC++LINK Indoor Unit.

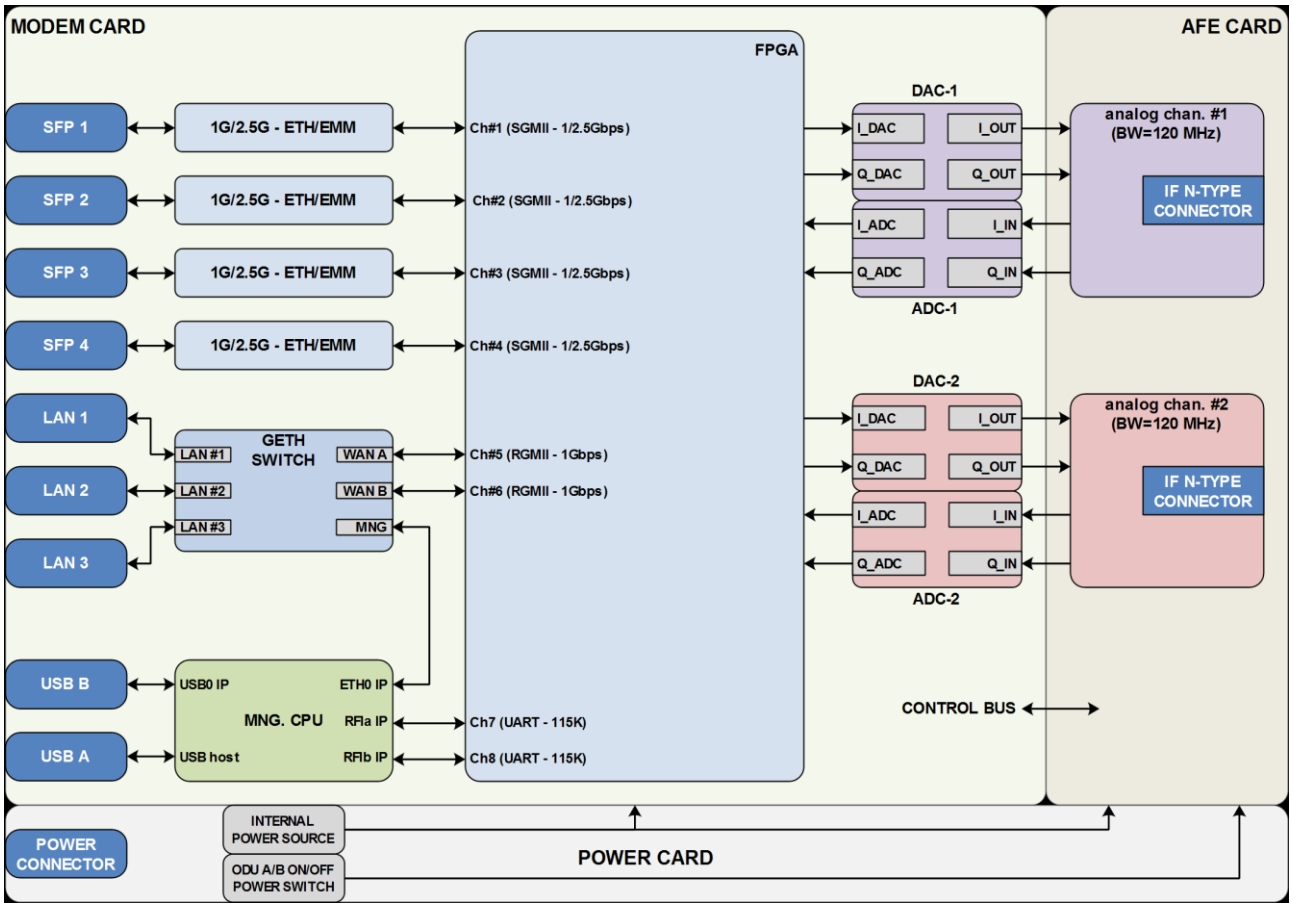


Figure 5: Block diagram of the Indoor Unit

The function of the Indoor unit is evident from the block diagram in Figure 2.

EC++LINK IDU consists of two main boards. Interface Card performs the function of data interface, packet processor and management unit. Modem Card performs the function of digital modem (DSP) and analogue modem (analog front end with mixers and filters).

Data are first processed by integrated Six Port Gigabit Ethernet Switch, where two WAN ports of this switch are connected into universal Packet Processor (PBPS – Priority Based Packet System). SFP interfaces are also directly connected into universal Packet Processor. Function of Packet Processor depends on selected design and it is described in the section which explains such particular designs. Digital modem then adds synchronization marks, FEC to the data stream and creates a digitally modulated signal, which is led to the block of analog signal processing. All these parts are interconnected inside the device over high-speed bus and are operated from the central processor unit CPU. This block (CPU) is also accessible via management interfaces and allows the user to perform all the settings both locally and remotely trough the IP interface in the EC++LINK IDU.

The function of Packet Processor is specific in dependence on selected design. Generally, Packet Processor uses priority scheme which ensures that data at the internal port ETH 4 are processed with the highest priority whereas data at the internal port ETH 1 with the lowest priority.

2.3.3 Block diagram of 2+0 mode.

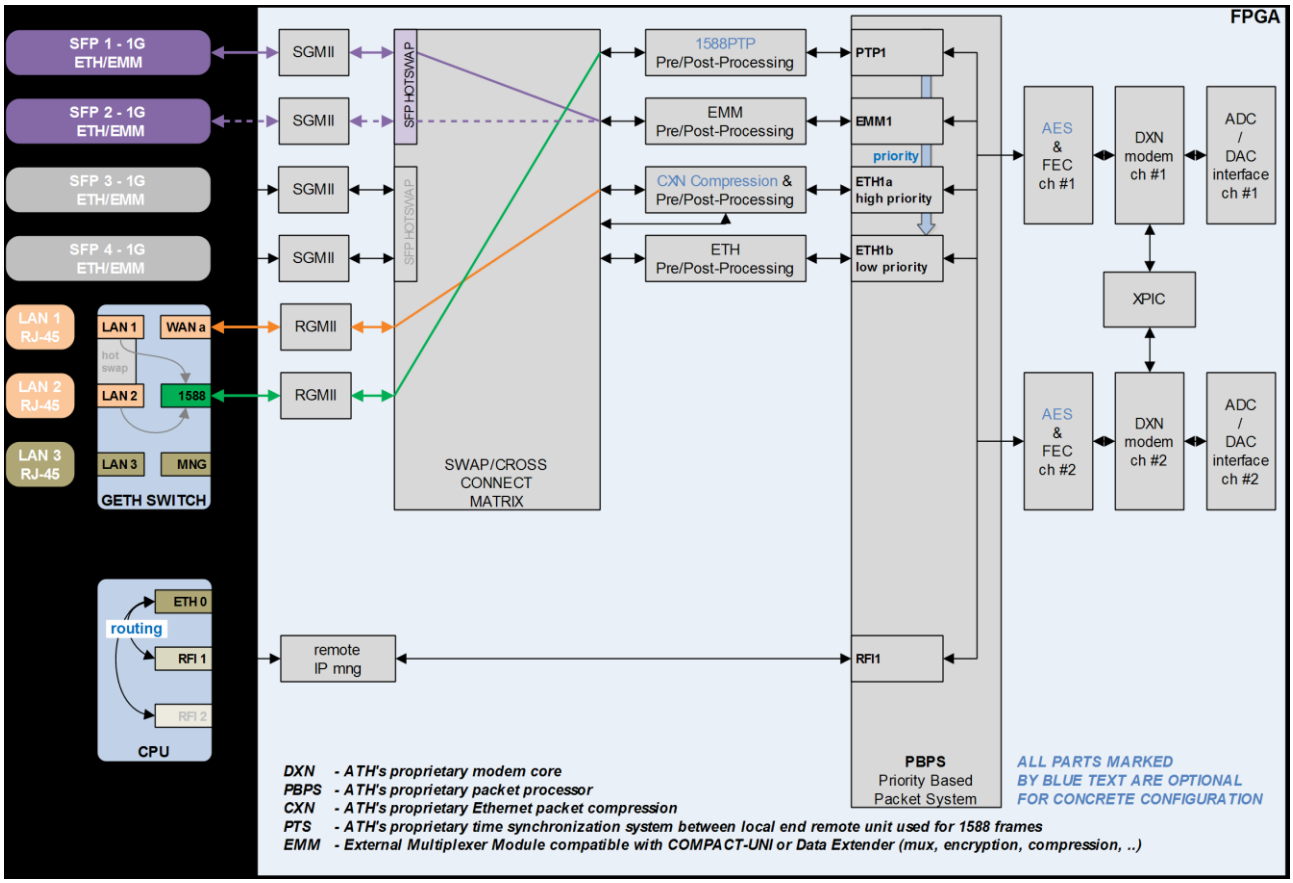


Figure 6: 2+0 Functional Block Scheme Example

2.3.3.1 Main Advantages

- IDU ready to built protected and aggregate links
- Prepared for interface expansion with E1´s, T1´s and ASI
- Remotely configurable and scalable in simple operation
- Compression on Ethernet for increased capacity
- Support of RADIUS Server authentication for the users' access
- Small IDU footprint (half-rack) for scarce space installations

2.3.3.2 Ideal for

- Fixed and mobile networks
- Enterprise and private communication networks carrying data, voice and HD video
- High capacity backhauls and backbone routes
- Critical infrastructure protection
- Future capacity growth and additional functionality enabled with license keys
- Easy branding and customization to OEM customers

2.3.4 IDU block scheme in terms of IP.

The following Figure 9 depicts a simplified block diagram of the EC++LINK IDU in terms of IP management.

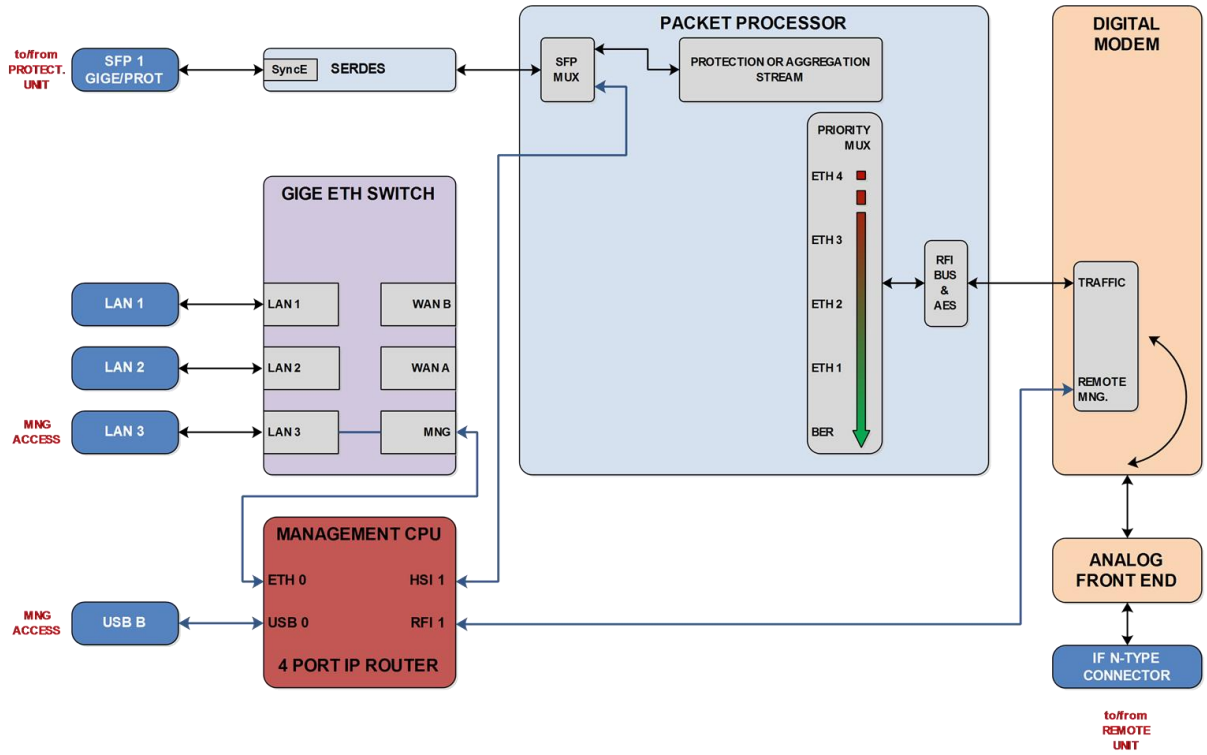


Figure 7: Detailed block diagram of IP management scheme

The processor itself performs the function of an IP router. The individual IP frames routing is based on standard routing rules, in this case on static routing.

2.3.4.1 Four IP ports enter the processor (MANAGEMENT CPU)

- **ETH 0** – Ethernet port of CPU with its own MAC address and all the standard features of Ethernet interface, Primary / Secondary addresses and appropriate subnet masks are assigned to this interface.
- **RFI 1** – ppp (point-to-point) type of interface which interconnects local CPU with the remote side CPU accessible through the separate channel inside air-frame.
- **HSI 1** – ppp (point-to-point) type of interface which interconnects local CPU with the protection unit CPU or EMM module accessible through the separate channel inside Fiber Optic-frame.
- **USB 0** – USB port which is reserved for local IP access.

2.3.4.2 Each device supports the following basic IP settings

- **The primary IP address, including the mask** – in the basic configuration, this address is identical to the ports ETH 0, RFI 1 and HSI 1 (ppp unnumbered mode), the mask indicates the range of addresses connected directly to the ETH 0 interface.
- **The address of the remote radio unit (rrfi1)** – together with this address there is automatically assigned a static route of the remote device connected via port RFI 1 (microwave connection).
- **The address of protection unit (rhsi1)** – together with this address there is automatically assigned a static route of the protection unit connected via port HSI 1 (Fiber Optic Connection).
- **Default gateway** – the address from assigned subnet for routing the frames which have different IP address than from the range of IP addresses included in the routing table.

2.3.4.3 Each device supports also the following advanced IP settings

- **The secondary IP address, including the mask** – the address is assigned to the port ETH 0, the mask indicates the range of addresses connected directly to the ETH 0 interface. When no conflict with address range 10.10.10.0/24 exists, there is not necessary to change this address.
- **The USB IP address, including the mask** – this address is assigned to the port USB 0, the mask indicates the range of addresses connected directly to such interface. When no conflict with address range 10.10.11.0/24 exists, there is not necessary to change this address.
- **The RFI1 port IP address** – it is possible to set specific IP address for internal ppp port and change ppp mode from unnumbered to numbered one.
- **The HSI1 port IP address** – it is possible to set specific IP address for internal ppp port and change ppp mode from unnumbered to numbered one.
- **The File Transfer specification** – this setting specifies file transfer destination. Local USB A port can be selected (default) or FTP server by means of FTP IP specification can be used either for firmware update from CLI or for log files storage.
- **The Remote Time Server** – this setting selects whether remote time server is used for time synchronization. NTP or RDATE type can be selected for this function, appropriate IP address of selected server must be entered.
- **Static routes** – the user can define additional static routes as well.
- **NAT** – possibility of the address translation according to the rules in the NAT table.

All above explained parameters have an influence on the type of management access either directly on the managed unit or on the whole microwave network.

2.4 Outdoor Unit (ODU).

Outdoor microwave unit EC++Link is available for full range of standard licensed frequency bands and specific unlicensed bands. Microwave units for licensed frequency bands have the same mechanical construction.

Microwave link EC++Link of point-to-point type (in the basic configuration 1+0) consists of two Outdoor Radio Units (ODU). ODU performs the up-conversion from IF frequency from IDU (350 MHz) to the desired transmission band, and vice versa, performs the down-conversion from received frequency band to IF frequency (140 MHz) for the receiving part of the IDU. Power supply for ODU is delivered through the coaxial cable (used for the connection between IDU - ODU) as well as the software access to ODU, its management and configuration is possible only from the Indoor Unit. The management of ODU is integrated directly in the command set of the Indoor Unit and it is an integral part of the IDU software. For an easy primary set-

ting of the optimal received signal level the ODU is fitted with BNC connector where the measured DC voltage [mV] is directly proportional to the level of Received Signal Strength (RSSI).

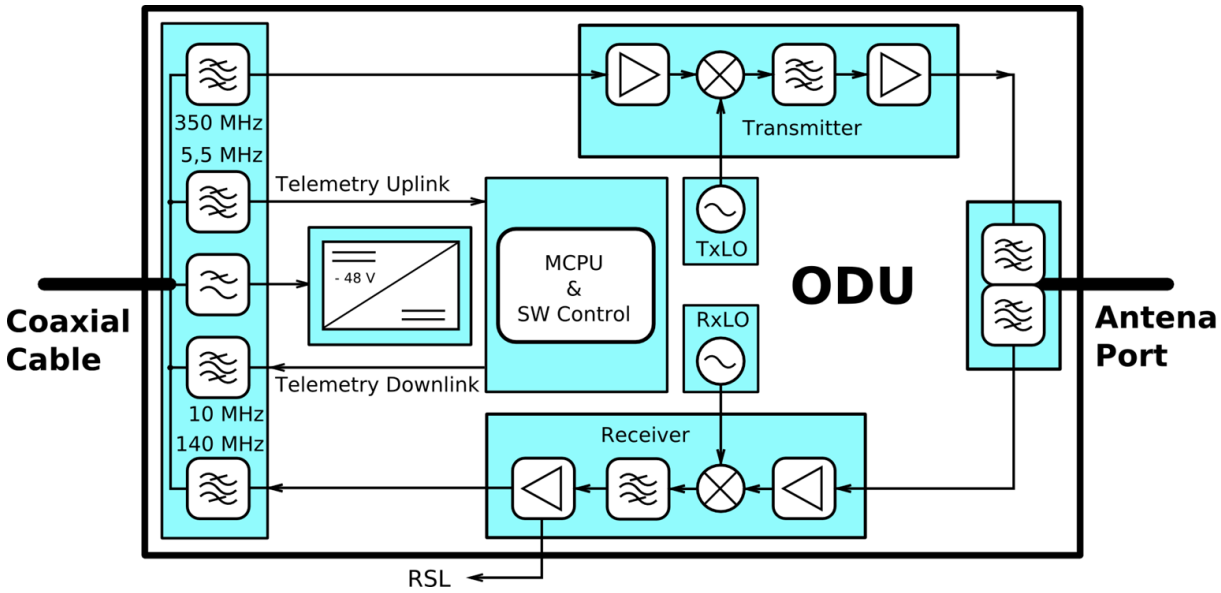


Figure 8: Block diagram of the Outdoor Unit

Outdoor unit is an integral part of the antenna system. ODU is mounted behind the parabolic antenna. In dependence on requested application distances there are available antennas with diameters of 30, 60, 99 and 120 cm.

2.4.1 ODU for license frequency bands.

Outdoor units in the version for the license frequency bands meet the international standards and requirements for this type of equipment (especially ETSI EN 302 217). The modulation scheme is adjustable from QPSK to 1024QAM, the output power is in the range between 0 to 32dBm depending on the selected frequency band and the type of modulation scheme. A maximum transmission date rate is 500 Mbps in 1+0 mode.

For technical reasons, each frequency band is covered by more (three or four) pairs of microwave units, where one pair is tuneable in the low portion of the band (in low sub-band), the second/third pair in the middle portion of the band (in middle sub-band) and the last pair in the high portion of the band (in high sub-band). Each pair then consists of two radio units (ODU), where one unit transmits in the upper part and the second unit in the bottom part of the given sub-band, the frequency separation is then known as the duplex spacing (Tx/Rx).

In consequence of the statement above the ODU, that is tuneable in lower part of the particular sub-band of given frequency, can work only with ODU tuneable in higher part of the same sub-band of the same frequency.

All the fundamental ODU technical parameters, in respect of requested data throughput, such as the transmitting power (Output Tx), sensitivity for the given type of modulation and bandwidth (BW) for each available frequency are set forth in separate documentation “Technical Specification”.

There are only two connectors accessible on the ODU, N connector for connecting with the IDU via coaxial cable and BNC connector for measurement of Received Signal Strength (RSSI). Next to the BNC connector is located grounding screw.

Figure 9: Preview of Outdoor Unit for licensed bands

Attaching the ODU to the antenna is done with an integrated waveguide transition (Microwave adapter) and it is mechanically realized with four flexible clips.

2.5 Antennas.

Outdoor microwave units are designed for direct assembly on microwave parabolic antennas to form together a compact entity. Microwave adapter which is part of the antenna kit allows the transition between the flange of antenna and the microwave ODU. There are available parabolic antennas with diameters of 30, 60, 99 and 120 cm (or 180 cm). Antennas can be used for horizontal and for vertical polarization, the right-side and left-side assembly as well.

Part of the delivery is a robust antenna mast mount including the mechanical part permitting fine calibration of azimuth and elevation after final assembly to a pole, etc.

Another possibility is the interconnection of microwave unit and parabolic antenna through a flexible waveguide. This alternative method of connection is suitable for installation of microwave link to antennas from a different manufacturer. (Flexible waveguide is not included in the antenna shipment by default. Suitability of antennas from other suppliers must be consulted with the manufacturer in advance).

Alternatively, directional coupler for 1+1 HSB protection configuration or OMT (orthomode transducer) adapter for cross polarization configuration (aggregate 2+0) can be used for two ODUs mounting behind the antenna.

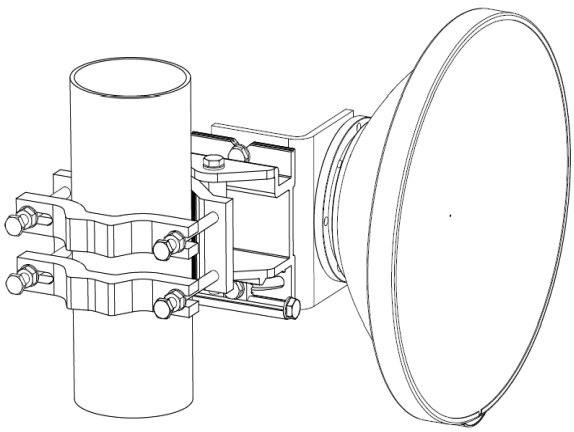


Figure 10: Parabolic antenna

2.6 Accessories.

For perfect installation of microwave link and its proper function it is recommended to use only the following parts and accessories. When using alternatives, not approved by the manufacturer, he nor distributor does take responsibility for the malfunction of the link.

NOTE: ALL ACCESSORIES, EXCLUDING IDU GROUNDING KIT, ARE NOT INCLUDED IN STANDARD DELIVERY.

2.6.1 Power supply.

The recommended power supply is 90 watts regulated switching power supply PS-230/48 with 48 VDC and 1.9 A output which is an optional accessory equipment to the delivery of microwave link. From one switching power supply PS-230/48 it is recommended to power only one side of the microwave link.

That means 1x IDU+ODU. When you connect more devices, it may overload the power supply and the function of entire microwave link may be incorrect.

Alternative power supply:

Mean Well, GS90 series- GS90A48-P1M.

2.6.2 Coaxial cable.

For connecting together Indoor Unit and Outdoor Unit of microwave link at each terminal we recommend using low-loss coaxial cable Belden, type H1000 PE impedance 50 Ohm, designed for outdoor installations (new code RF400). In general, the maximum distance between the IDU and ODU is 200 m. For more than 50 meters it is recommended to ground the cable each 50 meters.

For distances of up to 50 m it can be used cable type RG8X:

Belden - RF 240.

Belden - H155 PE.

Draka - MRC240 AFB

Nordix - LMR240

Always in design for outdoor use, that means with PE sheath!

For distances over 50 m it can be used cable type RG8:

Draka - 2.7/7.3AF

Nordix - LMR400

Cavel - LL50/4

Always in design for outdoor use, that means with PE sheath!

2.6.3 N-connector.

We recommend using only brand-name N-connectors (male) e.g. Rosenberger, Telegartner, Amphenol.

Recommended crimp N-type connectors for the cable type RG8 (H1000/RF400/ MRC400) are:

Amphenol - *172102H243*

Telegartner - *J01020A0127*

Rosenberger - *53S101-1N9N5*

Recommended screw N-type connectors for the cable type RG8 (H1000/RF400/ MRC400) are:

Telegartner - *J01020A0149*

Rosenberger - *53S10A-0N9N3*

Recommended crimp N-type connectors for the cable type RG8X (RF240, MRC240 AFB, 1.4/3.8AF, LMR240, H155 PE) are:

Amphenol - *72135*

Telegartner - *J01020A0119*

Rosenberger - *53S104-1Y8N3*

2.6.4 Coaxial cable grounding kit.

To ensure sufficient lightning protection of the radio units we recommend to install grounding kits on the cable with length over 50 m (each 50 m for long cables) and on the cable at the building entrance.

Recommended types are:

FI.MO.TEC Spa - *KMT 11-N*

BM Funktechnik - *EGK RG8 (PN-990009)*

2.6.5 Ethernet cable with RJ-45 connectors.

Twisted pair type CAT5e from Belden manufacturer is a suitable Ethernet cable.

2.6.6 Surge suppressors.

When the coaxial cable is entering the building, it is necessary to install a RF surge suppressor. The surge suppressor greatly eliminates the damages resulting from excess voltage.

Recommended surge suppressor type is:

Telegartner - *J01028A0033*

2.6.7 Grounding kit.

The part of every delivery of Compact Indoor Unit is grounding wire. We recommend grounding the IDU to the rack cabinet using the enclosed Grounding kit. Ground the ODU to the place the unit is mounted to (mast mount, pole etc.) the similar way.

NOTE: IDU GROUNDING KIT IS INCLUDED IN STANDARD IDU DELIVERY. ODU GROUNDING KIT IS NOT INCLUDED IN STANDARD DELIVERY, IT IS AN OPTIONAL ACCESSORY.

2.6.8 N plug to N jack right angle adaptor for Compact Indoor unit.

R/A adaptor is a recommended accessory for connecting the coaxial cable to EC++LINK IDU unit under 90° angle. We recommend to use only brand-name R/A adaptors e.g. Rosenberger, Telegartner, Amphenol.

Recommended R/A adaptors types are:

Amphenol - *172126*

Rosenberger - *53S201-K00N5*

Telegartner - *J01024J1096*

Chapter 3 - Installation.

3.1 Introduction.

The installation of EC++Link microwave system and its start-up can perform only manufacturer´s authorized partner. Manufacturer´s authorized partner is also liable for elimination of possible failures and troubles in warranty period. The equipment must be installed according to country national electrical codes. Power distribution to which the device will be connected has to meet the requirements of current valid standards, for example EN 332000-6 in the Czech Republic.

3.2 Required installation tools.

List of installation tools necessary for perfect installation (not included in the delivery).

Table 3: List of necessary installation tools

Cross screwdriver	for IDU rack cabinet installation
Engineer´s wrench	M7, M10, M13, M17
Vulcanize isolation tape	for N and BNC connector insulation
DC voltmeter	for RSSI measurement on ODU
BNC – DC voltmeter reduction	for RSSI measurement

3.3 Unpacking the device.

After unpacking the device, please, check that the delivery contains all the parts including the related accessories. Complete list of parts as stated on “Packing list” is included in every delivery.

3.4 Antenna installation.

3.4.1 Mounting the antenna mast mount.

On the pictures below (Figure 15-Figure 18) you can see the step by step instructions how to mount the antenna mast mount to the pole with the diameter of min. 50 mm and 120 mm in maximum. Make sure that your installation will endure even very strong winds. Only after rigorous mounting of the mast mount to the required place you are allowed to install parabolic antenna and microwave unit!

- mounting the antenna mast mount to a pole according to the pole diameter.

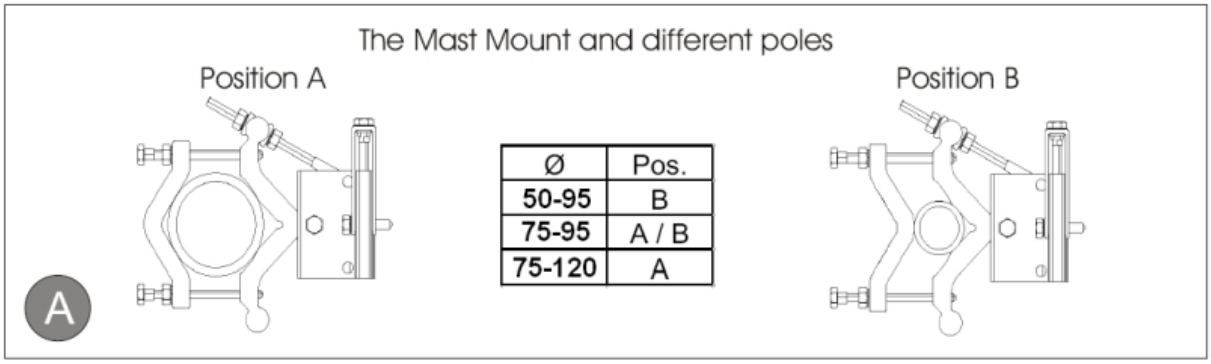


Figure 11: Mounting the antenna mast mount

- right-side or left-side mounting

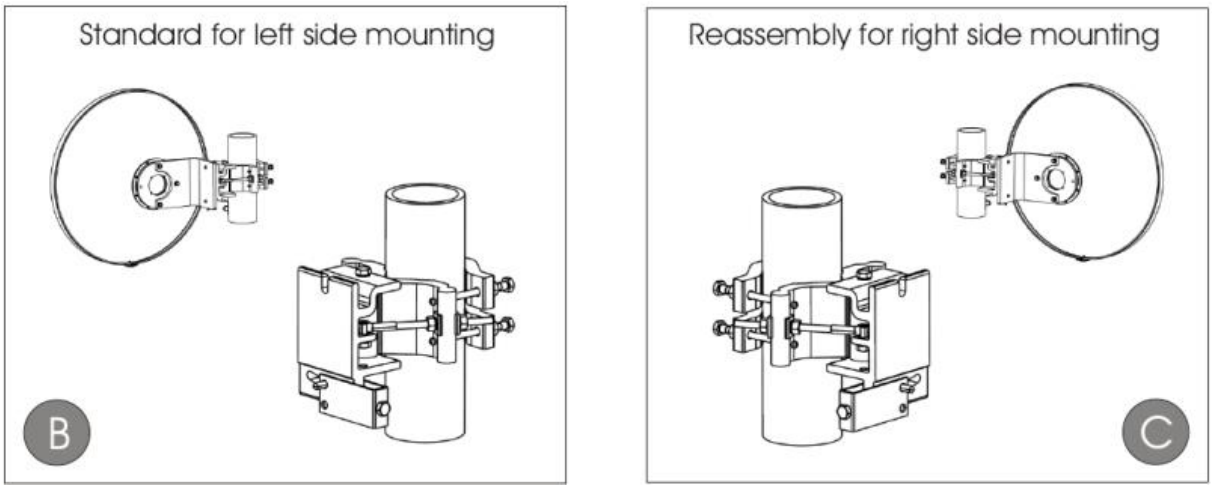


Figure 12: Right/Left-side mounting

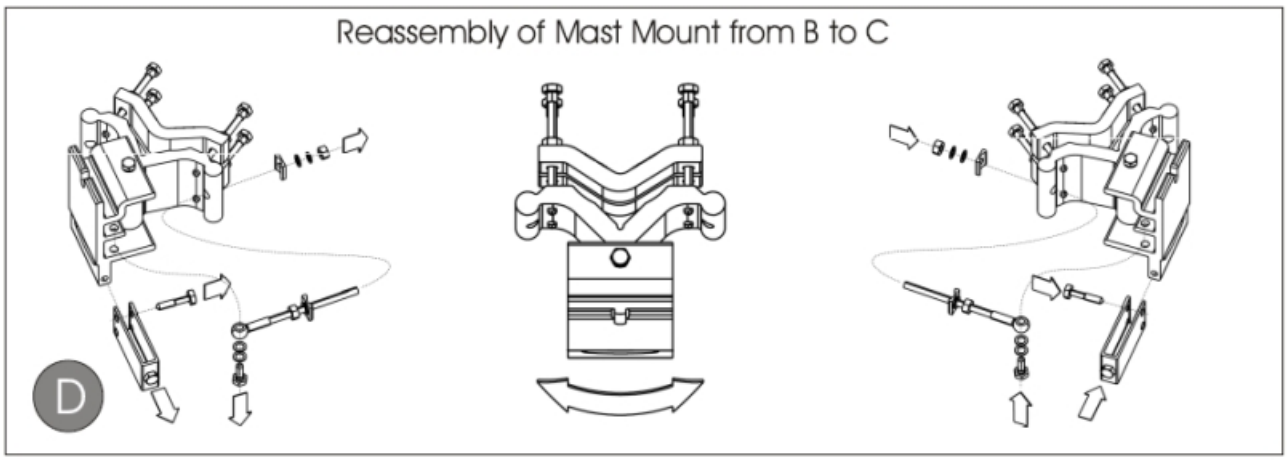
- 

Figure 13: Conversion of mast mount from B (left) to C (right) mounting

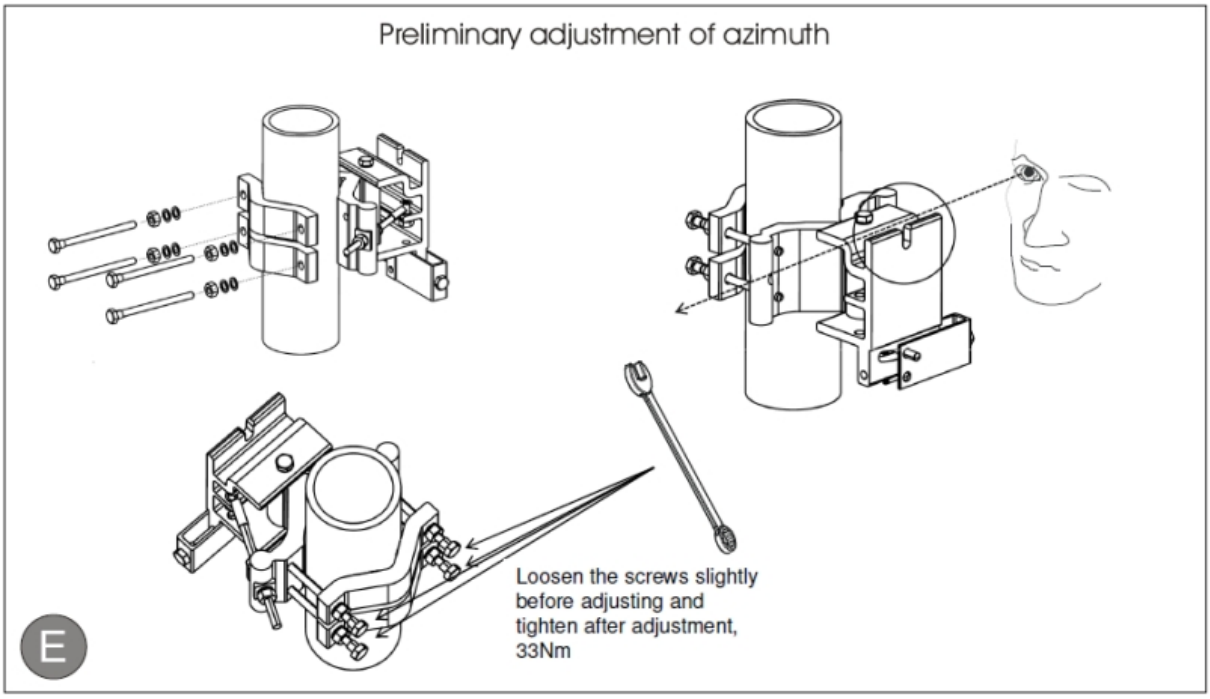


Figure 14: Preliminary azimuth adjustment

- preliminary azimuth adjustment.

3.4.2 Mounting the antenna kit for licensed frequency bands.

On the pictures below (Figure 19) you can see the individual steps for mounting the antenna kit to the parabolic antenna itself and subsequently its attachment to antenna mast mount.

Put together the antenna “Al bracket” with “Al mounting board”. Use three screws M13 and washers. Make sure that the four “hooks” from the clasp system are fixed at the corners of the “Al mounting board” first.

Fix the waveguide adapter to the antenna flange with four screws M10 and washers. Adapter slot horizon-

Figure 15: Preparing the Al bracket and mounting board, right side mounting

tal (Figure 18) = vertical polarization and vice versa.

ATTENTION: PUT A SEALING O-RING BETWEEN THE ADAPTER AND THE ANTENNA FLANGE. DO NOT FORGET TO TEAR OFF THE PROTECTING FOIL ON ANTENNA WAVEGUIDE FIRST.

NOTE: WAVEGUIDE ADAPTER ENSURES COMPACT ATTACHMENT OF ODU TO THE PARABOLIC ANTENNA. IF YOU USE FLEXIBLE WAVEGUIDE INSTEAD OF MICROWAVE ADAPTER, THEN YOU CAN UTILISE A WIDE RANGE OF ANTENNAS FROM OTHER MANUFACTURERS.

Figure 16: Mounting the waveguide adapter

Mount the AL set (prepared in step 1) on the antenna flange with four screws M13 and washers (Figure 19).

Figure 17: Mounting Al set on parabolic antenna flange

Make sure that there is fastened the hanging screw M17 and washer in the upper hole on the antenna Al bracket (see this screw in Figure 19, top right corner) for hanging the parabolic antenna on the pre-installed mast mount. Make sure that the drain hole on the antenna faces downwards as shown in Figure 19.

3.5 Attaching the antenna to the mast mount.

On the picture below (Figure 20) you can see the final assembly of the parabolic antenna and the mast mount.

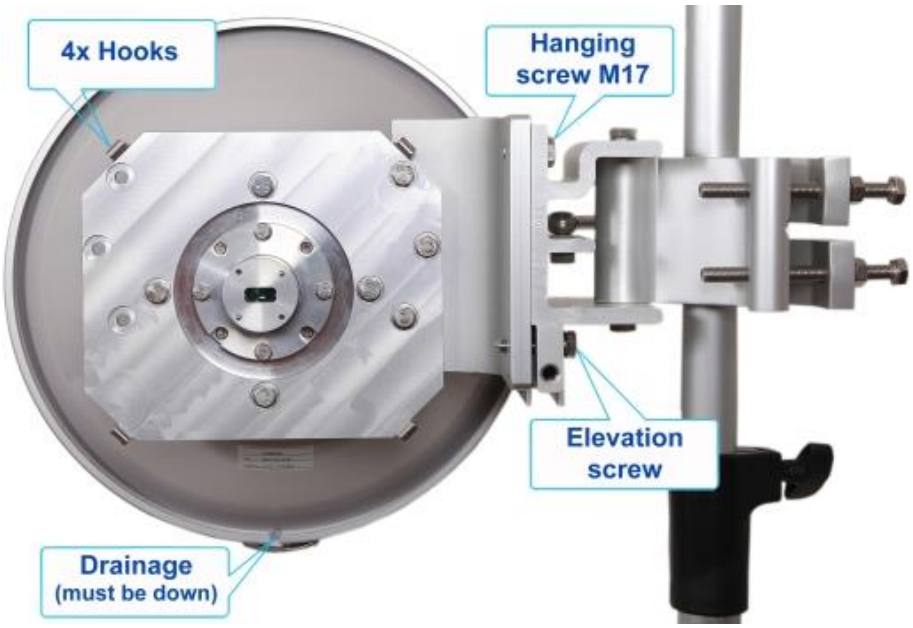


Figure 18: Final attaching of the parabolic antenna to the mast mount

3.6 ODU installation.

3.6.1 Setting the polarization.

The polarization depends only on the ODU position and relevant adapter rotation. There is an arrow symbol on the ODU case, that explicitly identifies the polarization. If the arrow points downwards or turning ODU by 180° upwards, it is vertical polarization. Horizontal polarization is turned by 90° relative to vertical polarization.

3.7 IDU installation.

The Compact IDU format was designed in accordance with mounting requirements for standard 19" rack cabinet so that it occupies the least possible height. The result is 1U height and ½ width of the standard 19" rack position. Therefore, you are able to put 2 IDUs alongside each other into 1 rack slot. Both the devices are then connected with a special “Dual IDU mount kit” (optional accessory). The depth of the unit's position towards 19" rack cabinet could be then changed just by shifting the brackets holding the IDUs in their slots.

ATTENTION: DO NOT FORGET TO GROUND THE INDOOR UNIT WITH THE GROUNDING SCREW LOCATED ON THE FRONT PANEL OF THE IDU TO THE RACK CABINET BY MEANS OF GROUNDING KIT (GROUNDING KIT IS INCLUDED IN THE STANDARD IDU DELIVERY PACKAGE).

3.8 Cabling installation.

3.8.1 IDU - ODU interconnection.

Low-loss coaxial cable with a specified impedance of 50 Ohm which is terminated on both sides with the N connectors serves for IDU and ODU units interconnection. One example could be the coaxial cable marked as BELDEN H 1000. The assumed length of cable in use between IDU and ODU is 200 m in maximum.

ATTENTION: IT IS NECESSARY TO CHECK THE CABLE IMPEDANCE OR EVEN BETTER TO MEASURE THE CABLE IMPEDANCE MATCHING BEFORE INTERCONNECTING THE ODU AND THE IDU WITH THE CABLE.

3.8.2 Connecting of management interfaces.

Use management Ethernet cable (included in standard IDU delivery) or management USB-B cable (not in standard IDU delivery).

After connecting the management Ethernet cable into the port LAN 3 on IDU front panel, it is possible to perform the primary configuration of microwave link and subsequently the management of the entire system.

Or connect the management USB cable (USB A – computer side / USB B – IDU side) into the port marked MNG / USB B (used primary for local management).

3.8.3 Connecting power supply.

The device is powered from a DC source -48 VDC where the positive pole is grounded. Before powering up the system do not forget to properly ground the ODU unit through the grounding screw to the antenna mast to which it is attached. Similarly, properly ground the IDU unit to the rack cabinet.

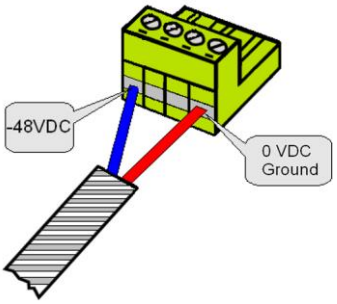


Figure 19: DC connector pinout for IDU

ATTENTION: PAY CLOSE ATTENTION TO THE CORRECT POWER SUPPLY PINOUT POLARITY. POWER SUPPLY POLE 0 VDC IS EVER INTERNALLY GROUNDED INSIDE IDU!

3.8.4 Grounding.

For reliable and safe function of the whole system a proper IDU and ODU grounding is necessary. Grounding cable for IDU is a standard part of accessories, which are packed together with IDU in shipping box. The grounding of ODU is provided by means of grounding screw (M8).

3.9 Powering up the system.

After careful checking of the coaxial cable installation (between IDU - ODU) and careful units grounding proceed to the IDU powering up. It is necessary to wait about 20 seconds before the IDU gets into normal operating state after its powering up. When the device is starting up watch the system status diodes POWER, SYNC, LOCAL STATUS, REMOTE STATUS and ODU STATUS.

3.9.1.1 Standard system LED behaviour during start-up process

- POWER LED should light after power up.
- All system LED should be off for a period of about 10 seconds after power up.
- All system LED should light for a period of about 4 seconds after previous state.
- All system LED should flash-up for a period of about 3 seconds after previous state.
- Normal LED function then indicates current system state. Following status of system LED indicates correct initial start-up.
    - POWER lights.
    - SYNC is off.
    - LOCAL STATUS is flashing-up.
    - ODU STATUS lights.

We can proceed to the initial link configuration and antennas alignment when the IDU starts up.

3.10 Preparing for link configuration.

For the initial configuration, use PC with Ethernet interface or with the USB port.

3.10.1 PC setup with LAN adapter.

In the case you are using management Ethernet cable for initial configuration you must first set your computer IP address from the range which corresponds to the default IDU factory setup. By default each IDU has from the factory the same IP address for ETH port (secondary IP address).

Default IDU ETH IP settings.

IP address 10.10.10.10, net-mask 255.255.255.0.

Therefore, it is necessary to set the PC address in the range of 10.10.10.1-254, except for the device own IP address (10.10.10.10). We recommend setting the computer as follows:

Computer LAN adapter settings.

IP address 10.10.10.1, net-mask 255.255.255.0.

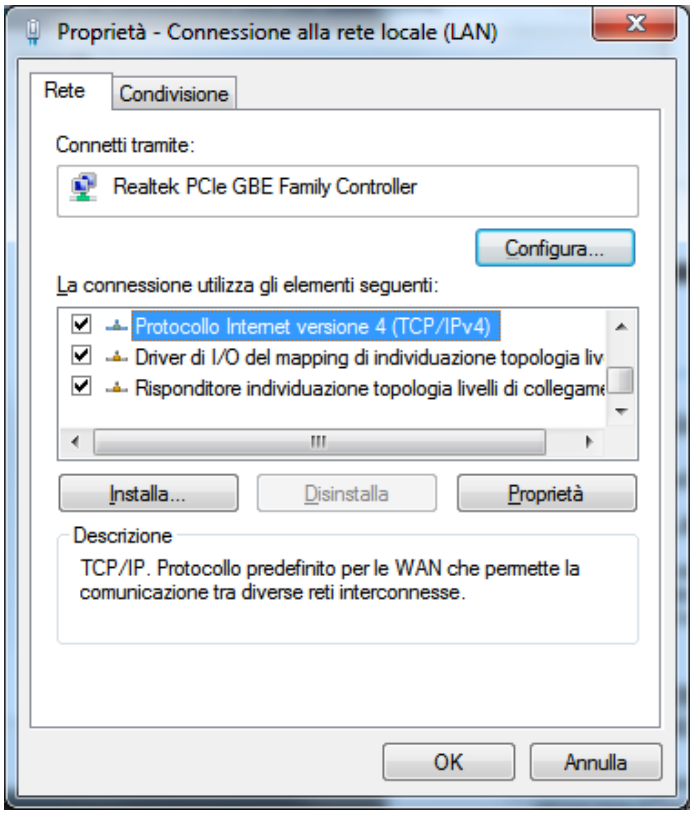


Figure 20: PC IP LAN setup – local network connection

Follow with the next step described in the figure below for computer IP settings.

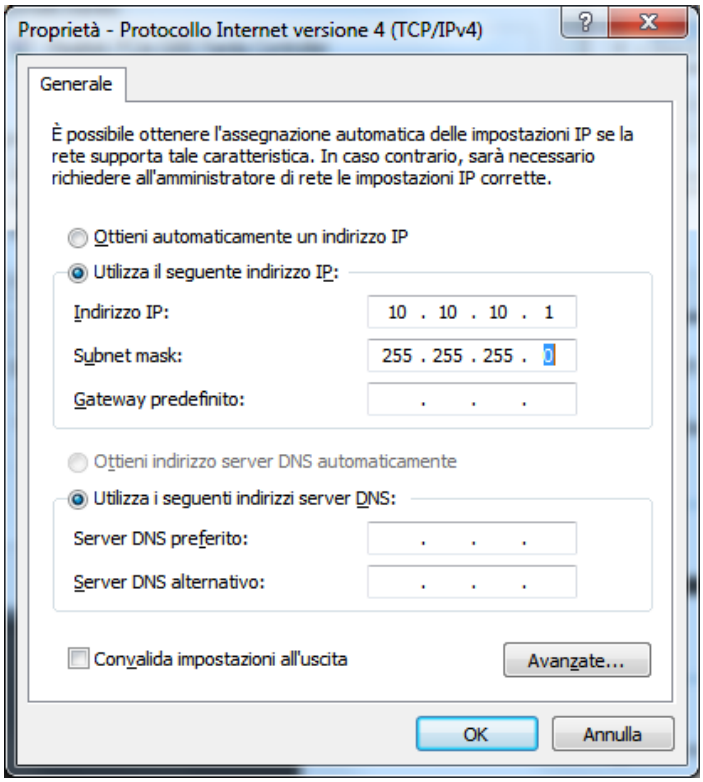


Figure 21: PC IP LAN setup – Internet protocol

3.10.2 PC setup with USB adapter.

In the case you are using management USB cable for initial configuration you must first install USB/IP driver on your computer with MS Windows OS (Linux based OS doesn't require additional driver installation).

3.10.2.1 Follow the steps described in paragraphs below

Connect the IDU to your computer (USB type A / USB type B cable is required).

Wait for Windows driver installer prompt and select appropriate driver file (usb-gadget-eth.inf). Ask producer´s representative for driver file before the installation process.

Follow the instructions of your OS.

After such installation the USB connection will be identified as an additional network adapter.

.

Figure 22: PC IP USB setup – USB network adapter

It necessary to assign correct IP address to your USB network adapter after proper driver installation. By default each IDU has from the factory the same IP address for USB port (USB IP address).

3.10.2.2 Default IDU USB IP settings

IP address 10.10.11.10, net-mask 255.255.255.0.

Therefore it is necessary to set the PC address in the range of 10.10.11.1 – 254, except for the device own IP address (10.10.11.10). We recommend to set the computer as follows:

3.10.2.3 Computer USB adapter settings

IP address 10.10.11.1, net-mask 255.255.255.0.

Follow the similar steps described for LAN adapter configuration above, just select USB adapter instead of LAN adapter.

3.10.3 Basic link set up.

It is necessary to proceed with the basic link settings only once the mechanical link installation is done so that you can align the antennas and test the connection functionality in a short test.

3.10.4 Login.

First of all, connect with the web browser to the local IDU (via Ethernet or USB cable) typing 10.10.10.10 or alternatively 10.10.11.10 address into the web address bar (Mozilla Firefox version 3.xx and higher is recommended, IE 5 and above or OPERA 9.xx and above are also possible).

The IDU login window appears as in Figure 32. There you must insert:

Login "admin".

Password "secret".

Figure 23: LOGIN window

When incorrect Login name or Password are entered the warning message “incorrect login name or password” will appear in the IDU login window.

3.10.5 GUI Basics.

After a successful login into the management system a General fold of GUI appears. Basically the web management window is divided into few essential sections as described in Figure 33.

3.10.5.1 Link Status.

Basic link parameters are displayed in this top bar section. A content in this section is common to all GUI pages.

3.10.5.2 Main Menu

Main folders are accessible from each GUI page.

3.10.5.3 Sub Menu

A specific sub menu folders are displayed for each Main Menu folder.

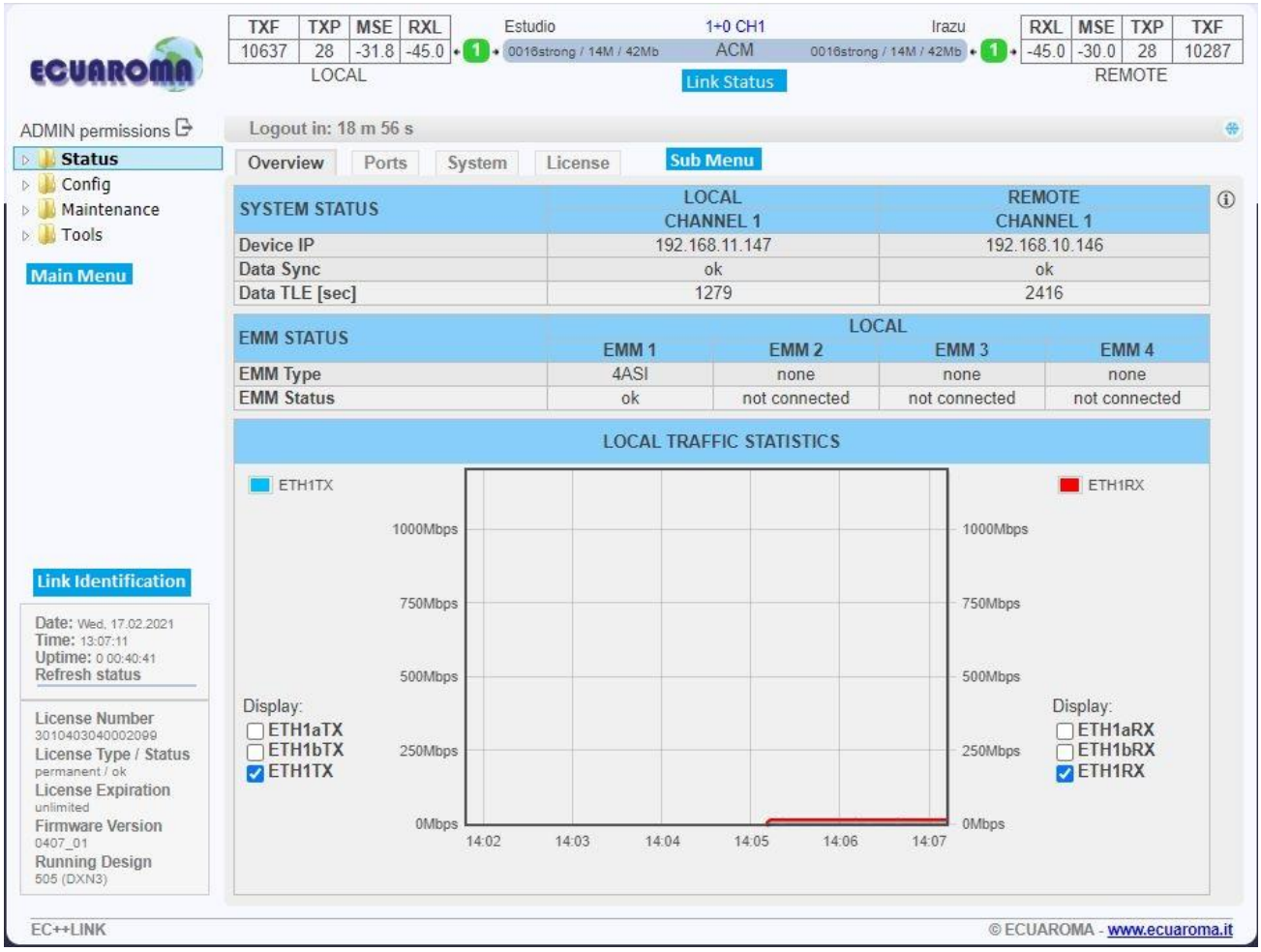


Figure 24: Overview of GUI window

3.10.6 IP setting.

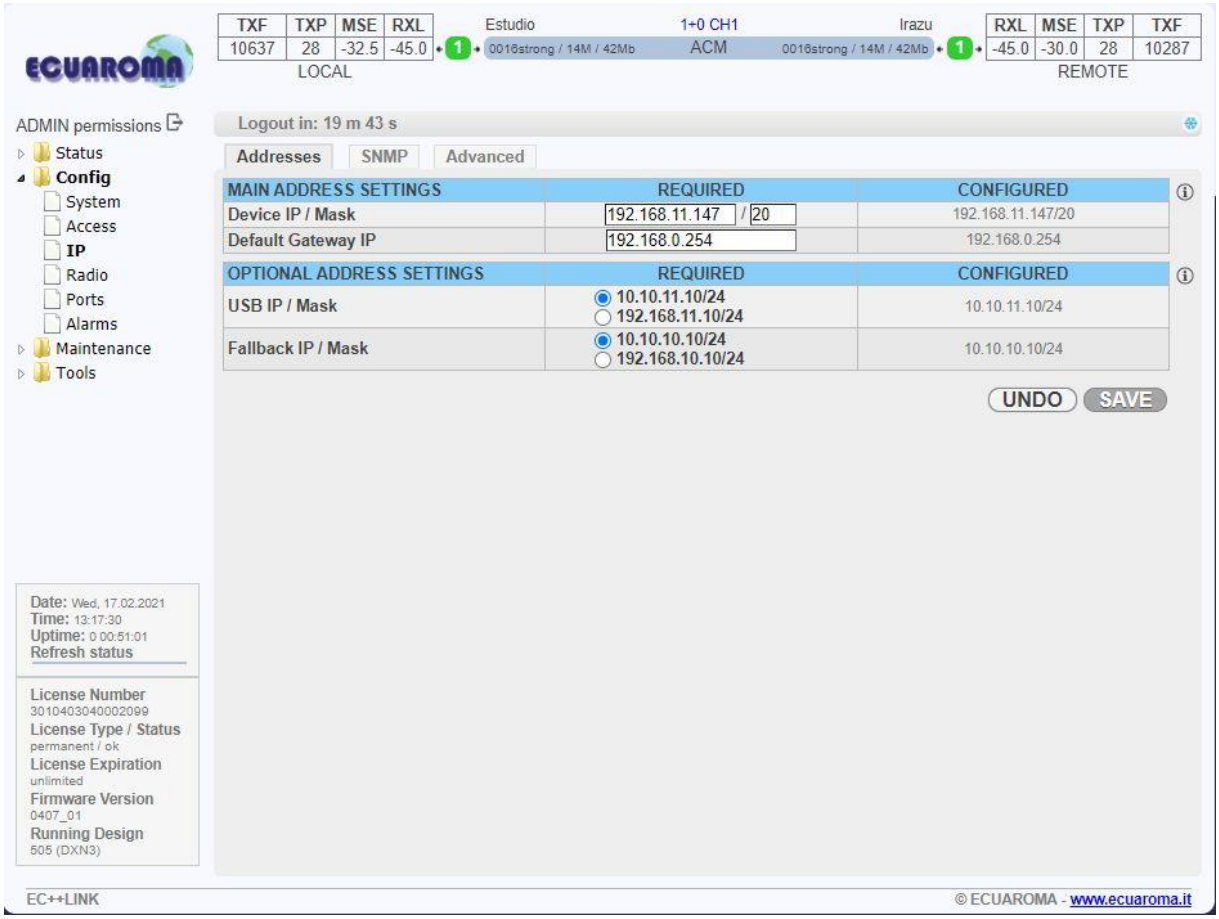


Figure 25: IP address configuration – GUI page "IP / Address"

It is recommended to enter basic IP configuration of local and unit (IDU) at the very beginning. This step is necessary for proper communication between local and remote side and optionally for ensuring remote access to IDU devices from customer´s network. In our example we use basic type of out-of-band management access (factory default configuration). Our examples suppose that remote IP access will be provided from the direction of ESTUDIO. For this mode we have set following IP addresses:

3.10.6.1 For link site with name ESTUDIO

Device IP / Mask = 192.168.11.147/20.

Default Gateway IP = 192.168.0.254.

3.10.6.2 For opposite link site with name IRAZU

Primary IP / Mask = 192.168.11.146/20.

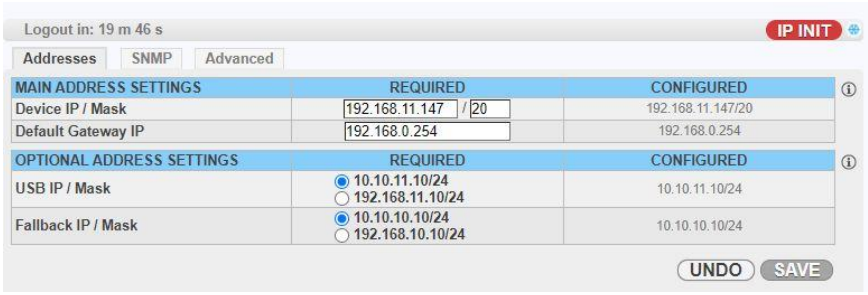
Default Gateway IP = 192.168.0.254.

Select in your web browser menu *"IP / Address"* (Figure 28). Enter the above assigned primary IP address / net-mask, default gateway IP address and IP address of remote IDU on both sites. Confirm entered values by pressing SAVE button.

NOTE: IT IS NECESSARY TO ASSIGN JUST CORRECT PRIMARY IP AND REMOTE UNIT IP ADDRESSES FOR INSTALLATION PURPOSES. INFORMATIONS FROM REMOTE UNITS CANNOT BE DISPLAYED WHEN THIS STEP IS SKIPPED. NEXT IP SETTINGS CAN BE APPLIED DURING COMPLETE LINK CONFIGURATION.

For applying any IP configuration into the running system it is necessary to subsequently confirm IP settings with pressing IP Init button in the upper/right side of the GUI. Without this confirmation just IP temporary file is changed, but IP changes aren't applied into the running system yet.

Figure 26: IP setting confirmation



3.10.7 Basic radio settings.

Further it is necessary to set the basic radio parameters which will be used for the final completion of the link installation. According to the Telecommunication Authority allocated parameters (Tx frequency, Tx power) and requested data throughput we set the microwave link into a functional configuration.

3.10.7.1 In our example – for link site with name ESTUDIO

TX Frequency [MHz] = 10637	set assigned Tx frequency for the High Sub band.
Tx Power Limit [dBm]= 30	set the required maximum output power.
ATPC Function = off	turn off the ATPC (must be off during the installation).
TX Mute Config = auto	unmuted output power.
Bandwidth = 14000_02	set the modulation to the most sensitive in assigned BW (14MHz in our case).
Max Rx ACM Profile = 0016/Strong	set the modulation to the most sensitive in assigned BW (QPSK in our case).

ACM Function= ManP1 adaptive modulation function should be off.

3.10.7.2 In our example – for opposite link site with name IRAZU

TX Frequency [MHz]= 10287 set assigned Tx frequency for the Low Sub band.

Tx Power Limit [dBm]= 30dBm set the required maximum output power.

ATPC Function= off turn off the ATPC (must be off during the installation).

TX Mute Config = auto unmuted output power.

Bandwidth = 14000_02 set the modulation to the most sensitive in assigned BW (14MHz in our case).

Max Rx ACM Profile = 0016/Strong set the modulation to the most sensitive in assigned BW (QPSK in our case).

ACM Function= ManP1 adaptive modulation function should be off.

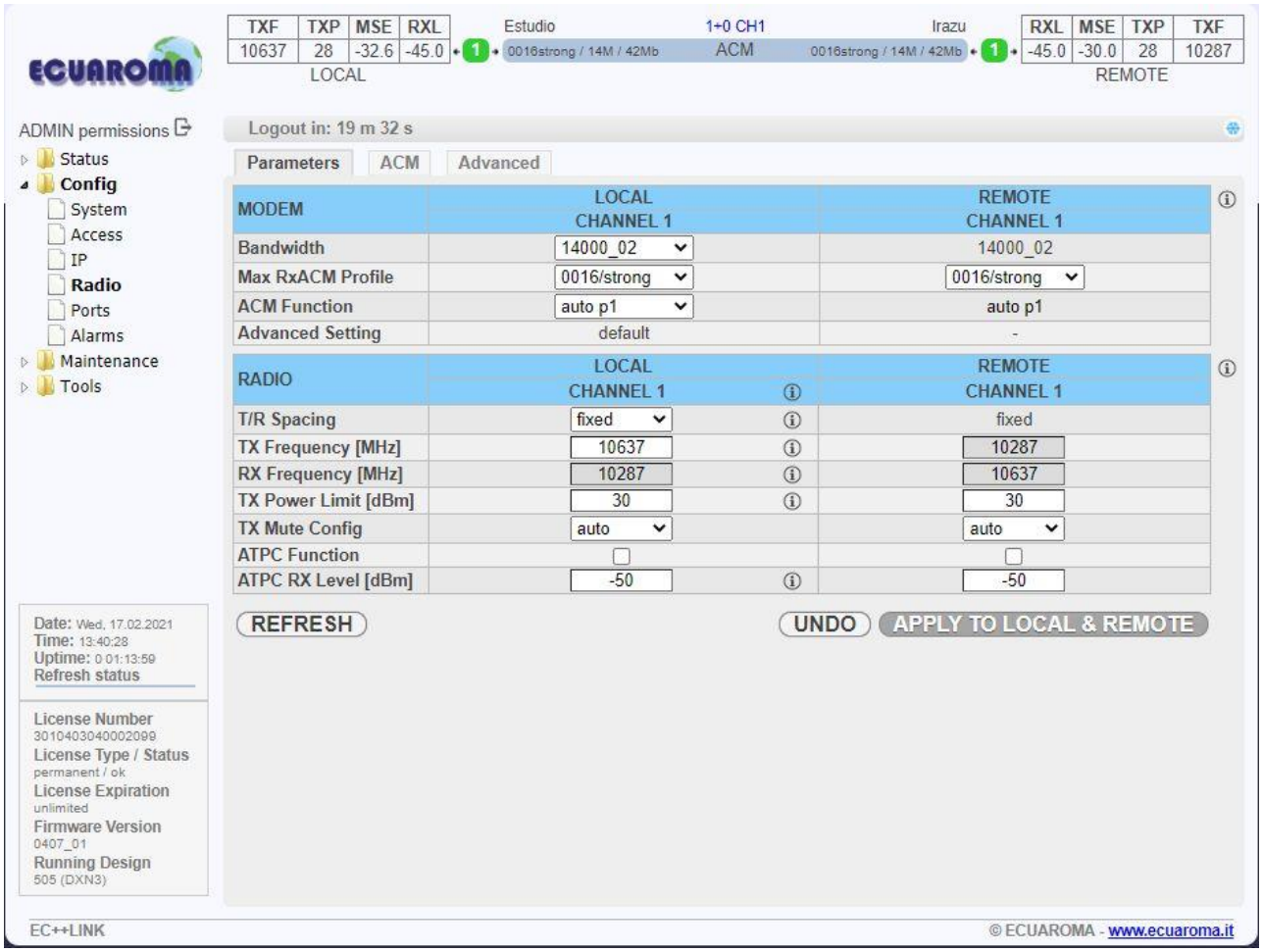


Figure 27: Radio parameters setting – GUI page "Radio / Parameters"

Set all the other parameters as depicted in the Figure 30 and confirm them with APPLY TO LOCAL button.

Then save this new configuration into start-up memory with the button WRITE at the top of GUI page. Configure the opposite side in the same way.

ATTENTION: DO NOT FORGET TO SAVE THE CONFIGURATION WITH WRITE BUTTON.

3.11 Antenna alignment.

Antenna alignment is performed with both terminals operating in normal weather conditions.

Aligning the antenna is performed in both horizontal and vertical direction using a DC voltmeter. The highest is the measured voltage, the highest is the received signal level. The voltage level is measured directly on the output BNC connector (Figure 31) on the microwave ODU (RSSI – Received Signal Strength Indication). It is recommended to use an appropriate BNC reduction.

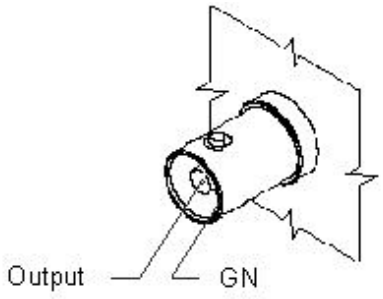


Figure 28: Pinout of RSSI connector on ODU

.

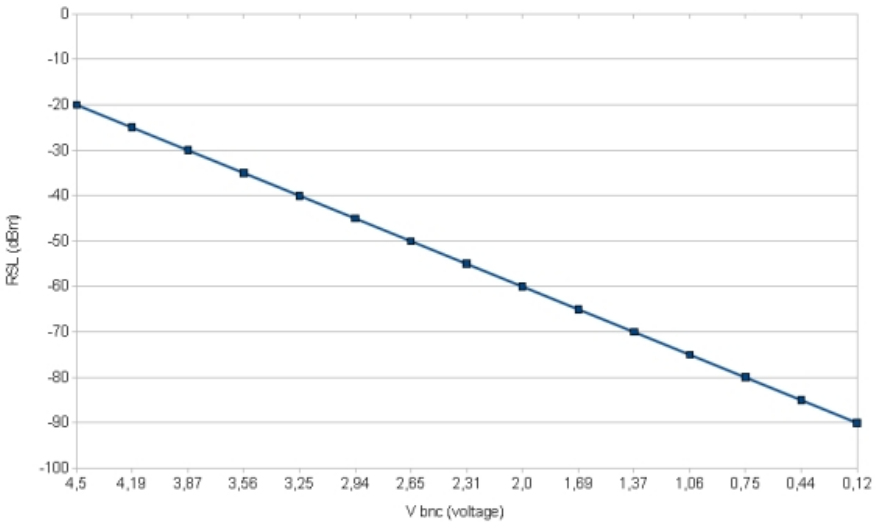


Figure 29: Curve of dependence RSL [dBm] on RSSI voltage [V]

Typical **Received Signal Level Voltage** for licensed bands is described in Figure 32.

Antenna alignment might be performed only in favourable weather conditions. Adverse weather conditions are to be considered e.g. the rain, fog, snow, smog, etc. when the value of the measured signal varies significantly, and so the measurement is very inaccurate!

The following figures (Figure 33-Figure 34) depict the final adjustment of the azimuth and the elevation of the parabolic antennas. It is necessary to tighten all screws after the final adjustment.

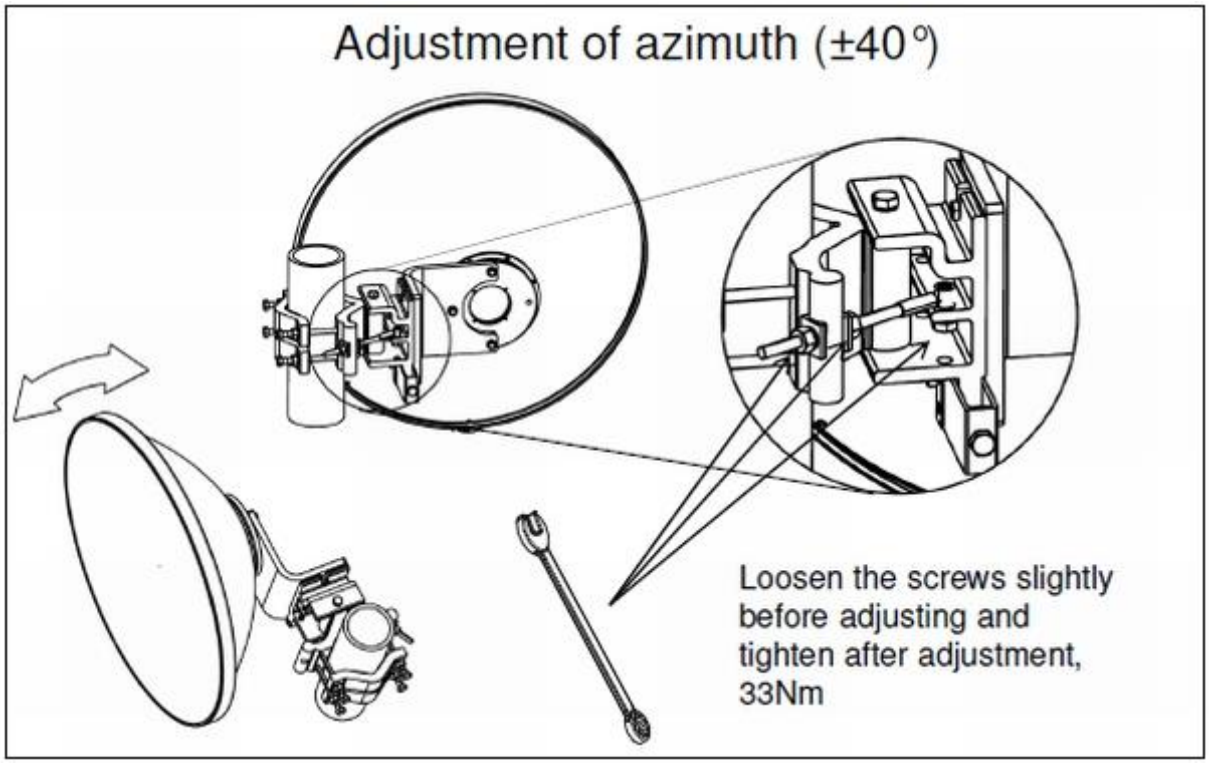


Figure 30: Final adjustment of the azimuth

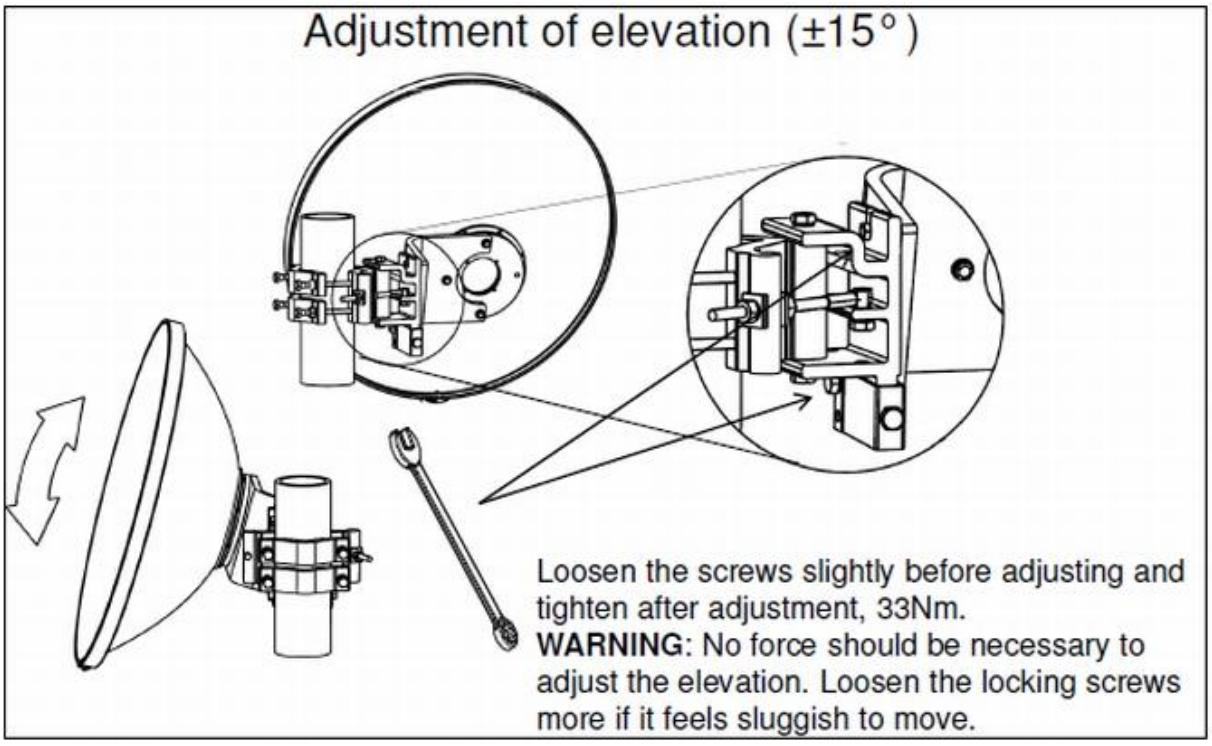


Figure 31: Final adjustment of the elevation

NOTE: WHEN ALIGNING THE ANTENNAS WATCH OUT FOR THE POSSIBILITY OF "FALSE" ALIGNMENT ON THE SIDE LOBES FROM REMOTE ANTENNA. IT IS IMPORTANT TO IDENTIFY MAIN ANTENNA LOBE, BY ROTATING THE ANTENNA TO HAVE THE MAXIMUM RSL VOLTAGE. THE VALUE OF RSL SHOULD ALWAYS CORRESPOND TO THE EXPECTED CALCULATED VALUE OF RECEIVED SIGNAL STRENGTH.

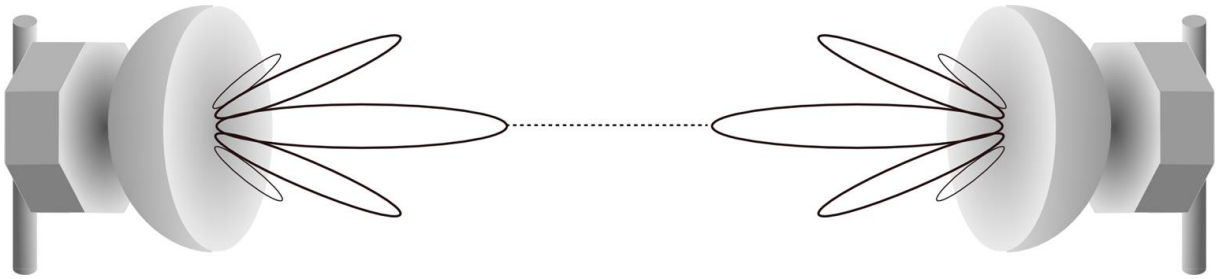


Figure 33: Good alignment

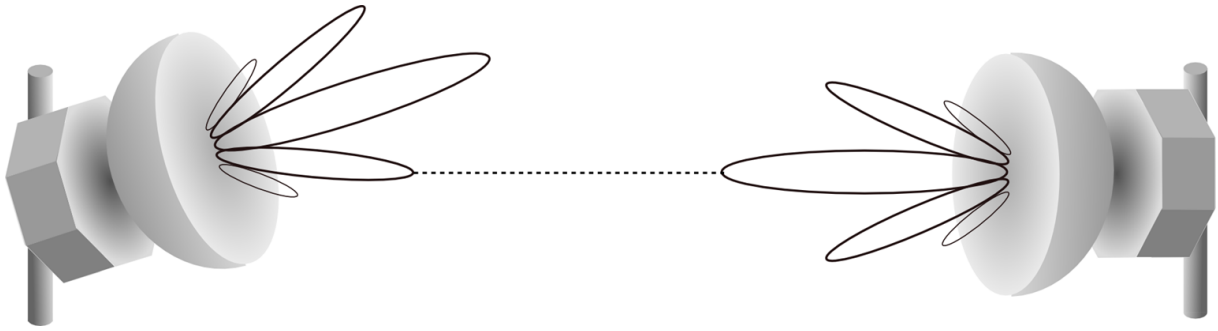


Figure 32: Bad alignment

3.12 The functional test.

Before connecting the user's ports and the link commissioning it is recommended to do a quick test of the basic device functions to verify proper microwave link installation and its error-free condition. For that, it is again necessary to connect your PC and check the basic radio parameters.

3.12.1 Obtaining the basic link information.

Connect your PC according to the procedure described above and use *"General / Status"* page for obtaining the required information (Figure 37).

Tx Power – The figure should have a value corresponding to the assignment from Telecommunication Authority.

Rx Level – The figure should be in the range of -35 to -60 dBm and should correspond to the expected level resulted from preliminary link calculation (tolerance + / - 3 dBm). Approximately the same value (+ / - 3 dBm) should be measured also on the opposite site as well.

MSE – Data should be in the range of -40 (better) to -20 dB (worse).

MSE parameter indicates quality of received signal. The MSE (mean square error) parameter refers to the average of the squared difference between the actual received symbols and the idealised points. The closer the points are in the state diagram the better. Displayed MSE value is normalised type of MSE parameter.

The values of MSE thresholds for each modulation is presented in the Technical Specification document.

The same evaluation needs to be done on the other terminal too. If the icon of the opposite terminal is not green (in the header of local terminal) it is not a problem now because it has not been made a final adjustment of all the microwave link parameters yet.

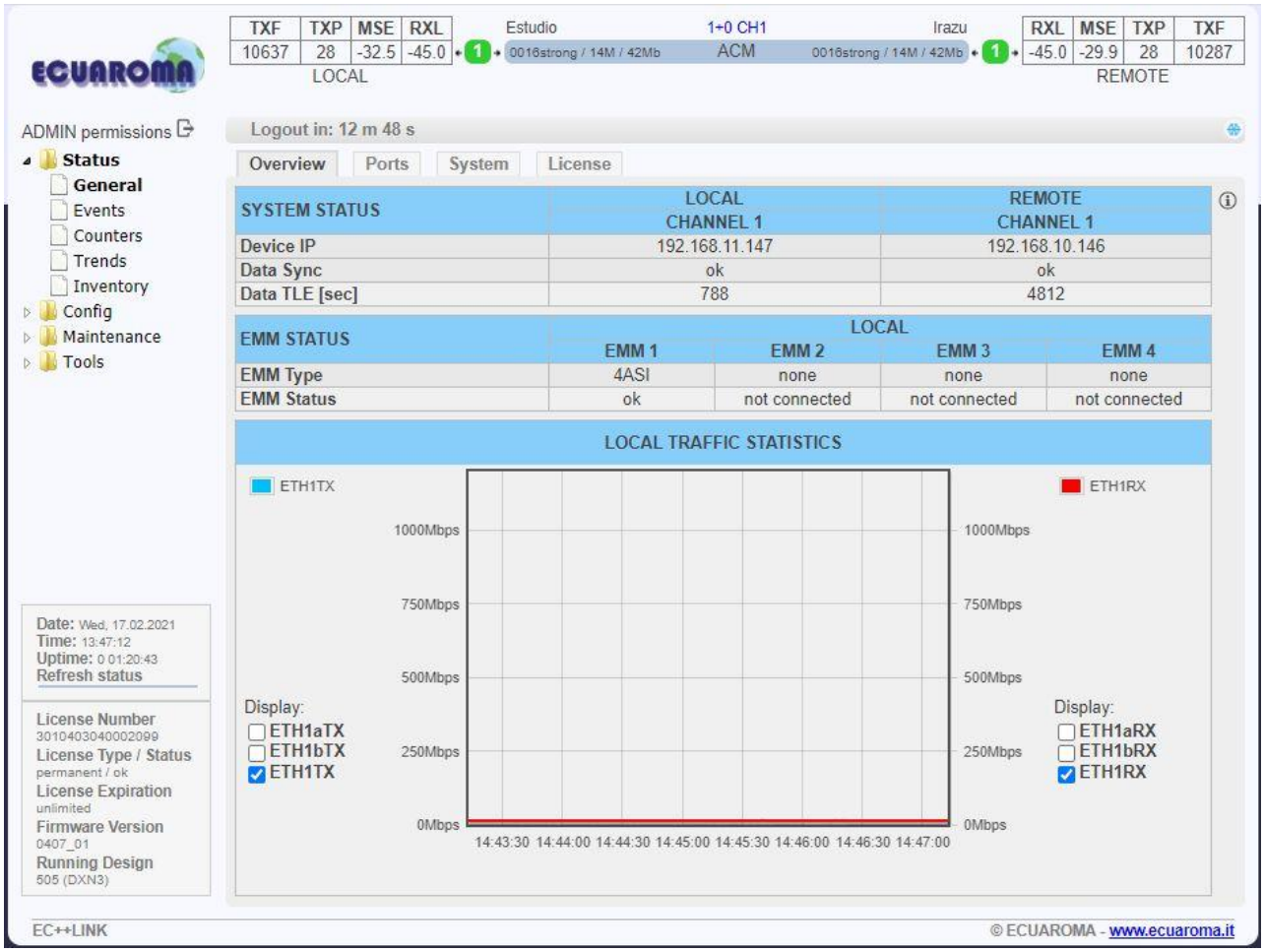


Figure 34: Main microwave link parameters – GUI page "General / Status"

If the measured values do not match the above stated ranges, it will be necessary to do a detailed control of the link adjustment.

3.12.2 Five-minute link quality measurement (optional).

The next step is a five-minute measurement test of the microwave link. The real required modulation scheme should be configured.

When updated configuration is done and MSE level stands with expected level, press button CLEAR ALL on page *"Status/Counters"* and then see the link statistics after about 5 minutes.

The result is then depicted in the Figure 38 below. To perform this test there is no need to have any data connection into LAN ports.

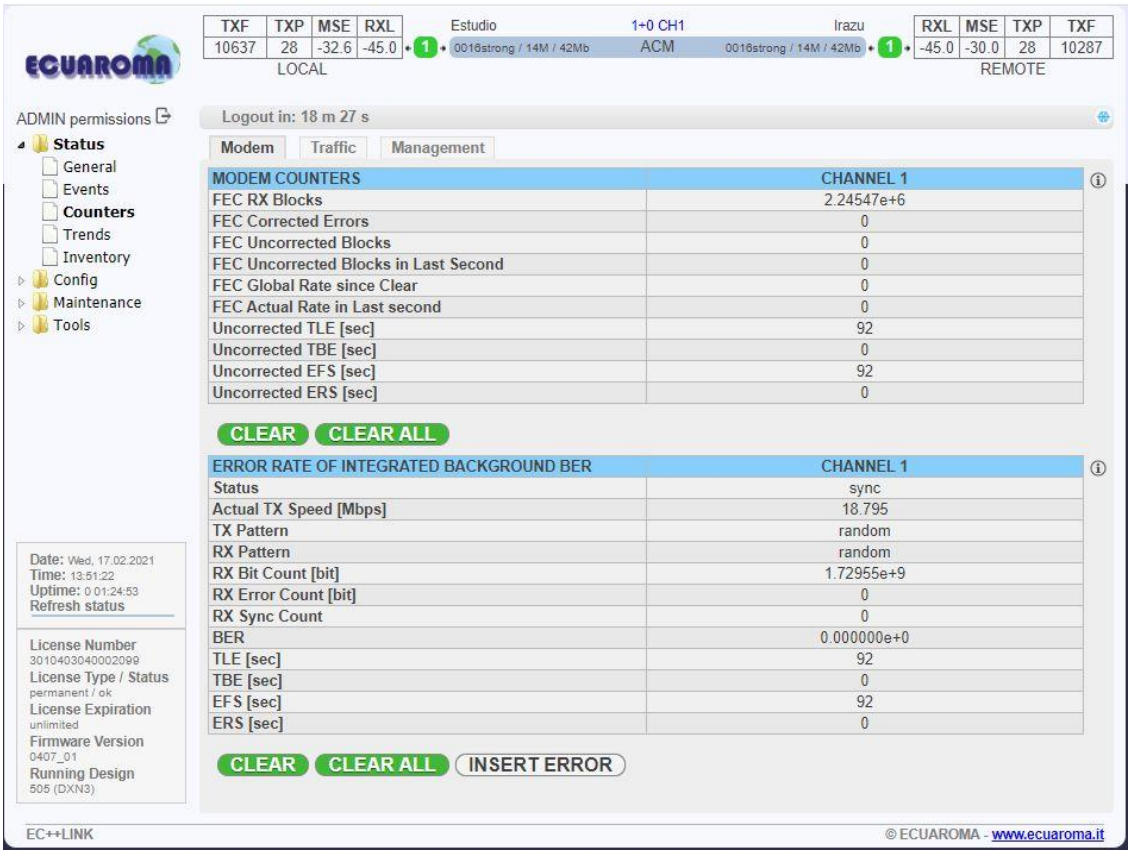


Figure 35: Basic radio link statistics – GUI page "Status / Counters"

RX Blocks – The number of correctly received air frames, large number.

Uncorrected Blocks – The number of frames which couldn't be corrected by FEC; the figure should be "0".

Protected Bytes – Important just for protection mode, the figure should be "0".

TLE – Time since last error; number of seconds from last error occurrence. It should correspond to the time since pressing the button CLEAR on the main page *"Count/Basic"* and it should be the same as EFS value.

TBE – Time between last two error events, the figure should be "0".

EFS – Error free seconds; it should correspond to the time since pressing the button CLEAR on the page *"Count/Basic"*.

ERS – Error seconds; number of seconds during which the errors occurred; the figure should be "0".

If test results are different compared to expected values, you must perform a detailed check of the microwave link installation. Similar results must be read out on the opposite terminal of the link as well or from column marked REMOTE.

3.13 Connection of external equipment.

Microwave system EC++Link is equipped with Gigabit Ethernet ports. At the same time, it is possible to insert the standard SFP modules into the free SFP slots which allow to connect external modules EMM or additional Gigabit Ethernet equipment's.

3.13.1 Connecting Gigabit Ethernet port.

Gigabit Ethernet 10/100/1000 Mbps port pinout is given in Figure 39. The user must make sure that all the four pairs of the cable according to required pinout are wired.

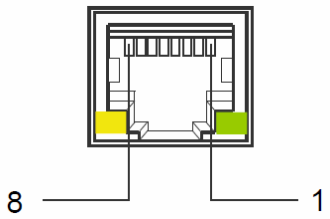


Figure 36: Gigabit Ethernet port pinout

Pin 1 - DA+, Pin 2 - DA-

Pin 3 - DB+, Pin 6 - DB-

Pin 4 - DC+, Pin 5 - DC-

Pin 6 - DD+, Pin 7 – DD-

ATTENTION: IT IS NECESSARY TO PREVENT ANY POSSIBLE ETHERNET LOOPS BEFORE CONNECTING THE ETHERNET CABLE TO THE GIGABIT ETHERNET PORTS. THEREFORE, CORRECT PORTS SETTING MUST BE CARRIED OUT BEFORE MORE THAN ONE ETHERNET CABLE IS INSERTED INTO IDU.

3.13.2 Connecting the external EMM module via port SFP 1.

Depending on the customer´s application the number of IDU ports can be extended by means of specific external multiplexer module (EMM). The EMM-16E1T1 is mostly connected into the port SFP 1 of IDU by means of a Fiber Optic cable.

IDU and EMM module must be then equipped with SFP module for connecting the Fiber Optic cable.

The recommended SFP type is:

SIGNAMAX 065-79SXMG (www.signamax.com).

The SFP module should be inserted before IDU power-up but can be plugged also when system is under power. Appropriate Fiber Optic cable with LC connectors must be used for EC++LINK and EMM interconnection (usually 0.5 m long cable is adequate).

Chapter 4 - Link Configuration.

4.1 Introduction.

After the installation of the microwave link itself it is necessary to carry out the complete set-up of all the required link parameters including IP management settings. It is recommended to write these parameters such as IP addresses, Tx frequency, Tx power, etc. in advance into a well-arranged table. Save this data list, in a case of a later replacement of a unit, previous configuration can be restored easily.

Further we will continue with description of the link set-up from a web interface. The link set-up using text commands is not part of this manual.

ATTENTION: DO NOT USE THE BROWSER FUNCTIONS "BACK" AND "PAGE REFRESH" DURING THE SET-UP OR FOR VIEW OF THE PREVIOUS WINDOW. USE ONLY THE MAIN MENU AND SUBMENU FOLDERS AND GUI BUTTONS OF EC++LINK DEVICE.

4.2 Connection and Login.

4.2.1 The local access over Ethernet LAN interface.

For the IDU set-up via a management LAN port (LAN 3 by default) there is only required a connection between PC and port LAN 3 on IDU front panel with the proper Ethernet cable.

4.2.2 The local access over USB-B interface.

For the IDU set-up via a USB port there is only required a connection between PC and USB-B port on IDU front panel with the proper USB cable.

4.2.3 LOGIN from the Web browser.

Before connecting the Ethernet management cable into the port LAN 3 or a USB management cable into port USB B at the IDU it is necessary to configure the computer's network connection.

4.2.3.1 The EC++LINK comprises of

the secondary IP address for access via LAN port, which is set by manufacturer to default value 10.10.10.10 with the network mask 255.255.255.0.

the USB IP address for access via USB port, which is set by manufacturer to default value 10.10.11.10 with the network mask 255.255.255.0.

After proper configuration of the computer's network connection a Web browser could be launched. Enter the secondary IP address of the EC++LINK, that is 10.10.10.10 into the address bar of the Web browser (example for connection over LAN 3 port). After entering this address, the login window appears.

The login into the device is active until the logout of the device is performed. Thus, it is not possible to configure the IDU from two terminals at the same time (only one terminal could be in the set-up mode at one moment). It means just one user with User or Administrator rights can be logged in.

There is an automatic timeout in the device – after period of 20 minutes from the last action (in the Web environment) any user is automatically logged out.

For the standard configuration we recommend to login in the USER mode.

Administrator level is superior to the User level. When the Administrator tries to login the system and the User is already in the system, an alert window asks if the Administrator wants to logout the User, because there may be logged only one of them at one moment, see Figure 37.

Figure 37: Alert window about already logged User

4.3 General system configurations.

4.3.1 Single or Dual scheme setting [1+0, dual 1+0].

Single scheme setting is the most basic setting of the modem. It is always present and enable a single modem to work as a 1+0 for modem 1 [*1+0 Ch1*] or for modem 2 [*1+0 Ch2*].

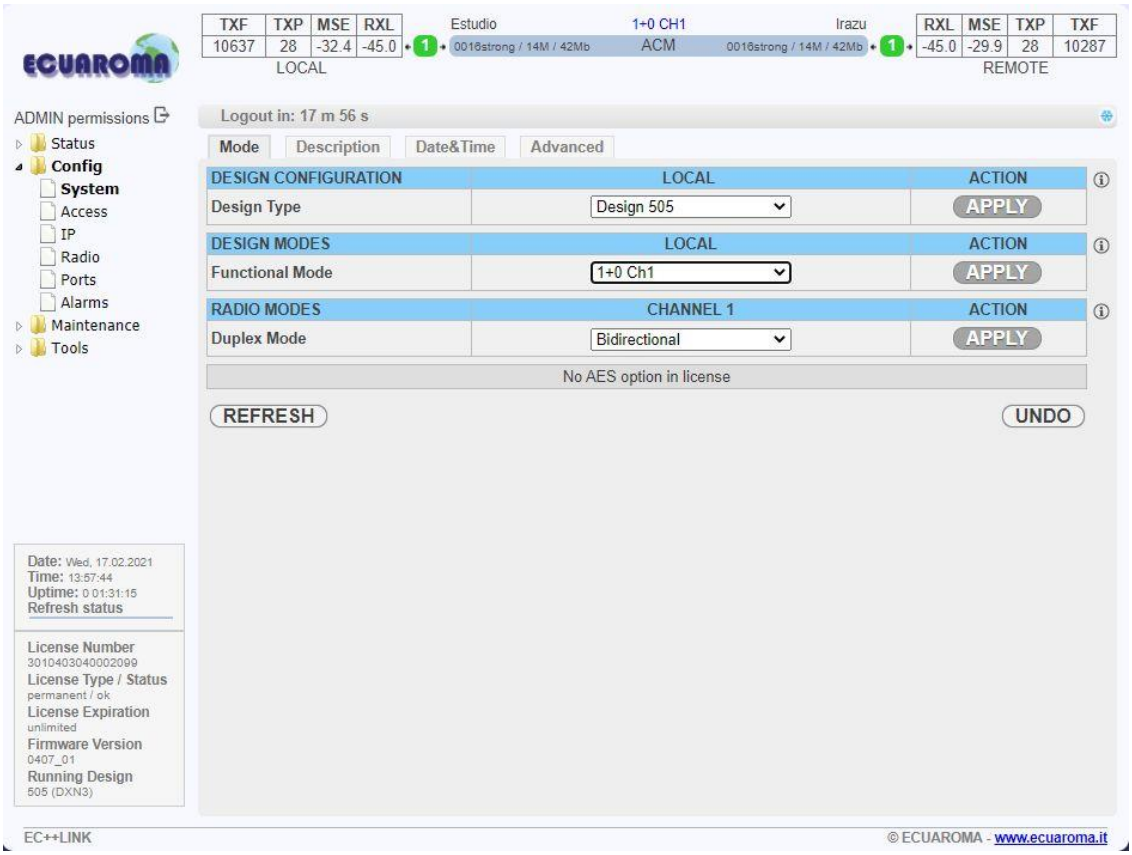


Figure 38: Initial Protection configuration– GUI page „Config / System" single scheme

Other Modes can be available based on licence installed on the System.

4.3.2 Basic Link Info.

It is recommended to fill-in the table with complete link identification. This will be helpful for next system description. Such configuration is accessible from WEB GUI page *"General / Info"* in Figure 41.

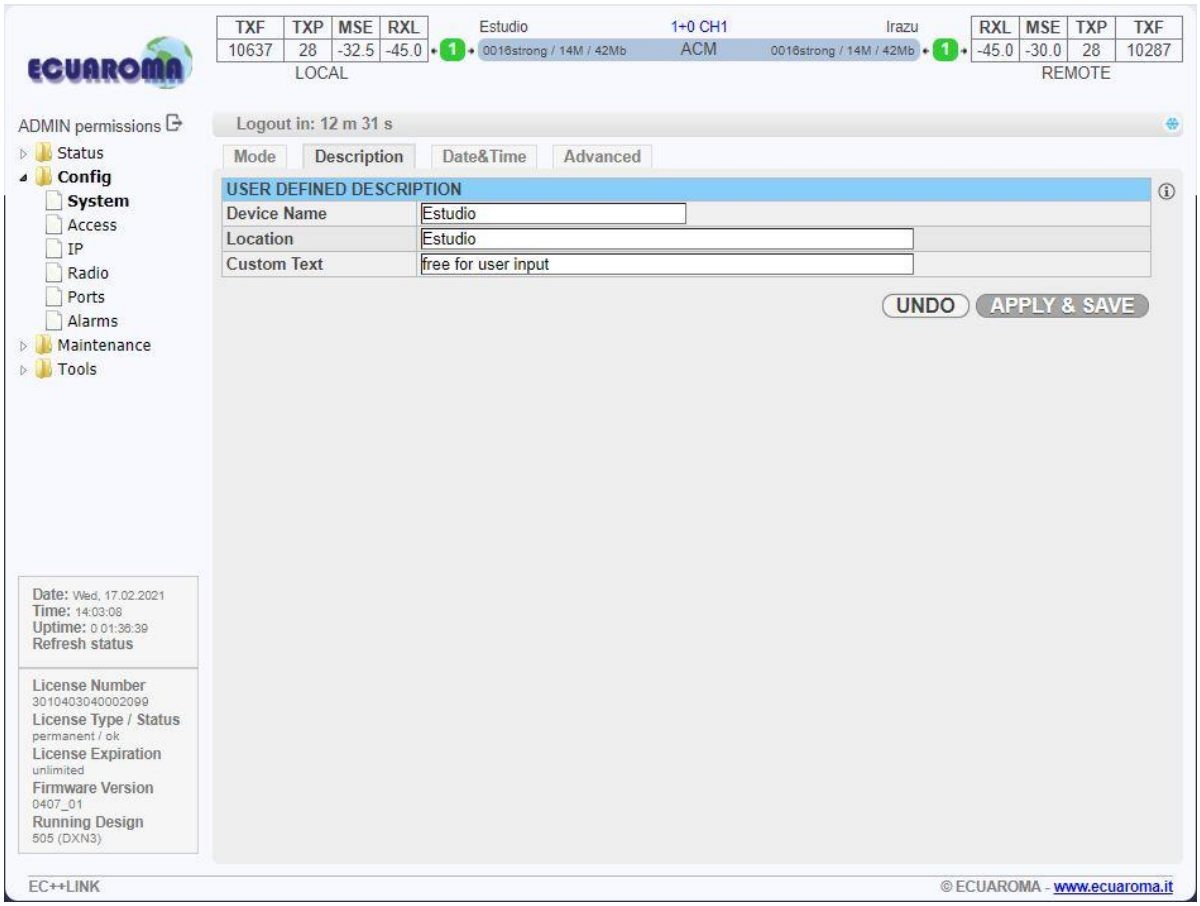


Figure 39: Wireless Link Info – GUI page „System / Description"

.

There is displayed basic system identification information like IDU/ODU Serial Numbers, Product Numbers, Firmware Specification etc. in the same page.

4.3.2.1 Description of setting and display boxes

Device Name – This text is displayed in the GUI header for identification of the unit. The same name is used as a prompt in CLI. Maximal length is 13 characters.

Location – This text is displayed in GUI header for accurate identification of the managed link. The same name should be entered at both sides of the microwave link. Maximal length is 25 characters.

Custom Text – Up to four customers´s specific descriptions can be entered. Maximal length is 80 characters per row.

NOTE: ALL SETTINGS FROM THIS PAGE ARE DIRECTLY SAVED TO A SPECIFIC START-UP MEMORY WHICH IS COMMON FOR ALL ALTERNATIVE CONFIGURATIONS W0-W3.

4.3.3 Date and Time.

It is recommended to set accurate Date and Time information at all IDU units within the microwave network. This will be helpful especially for alarm event and log analysis. The configuration is accessible from GUI page “General / Date” in Figure 42.

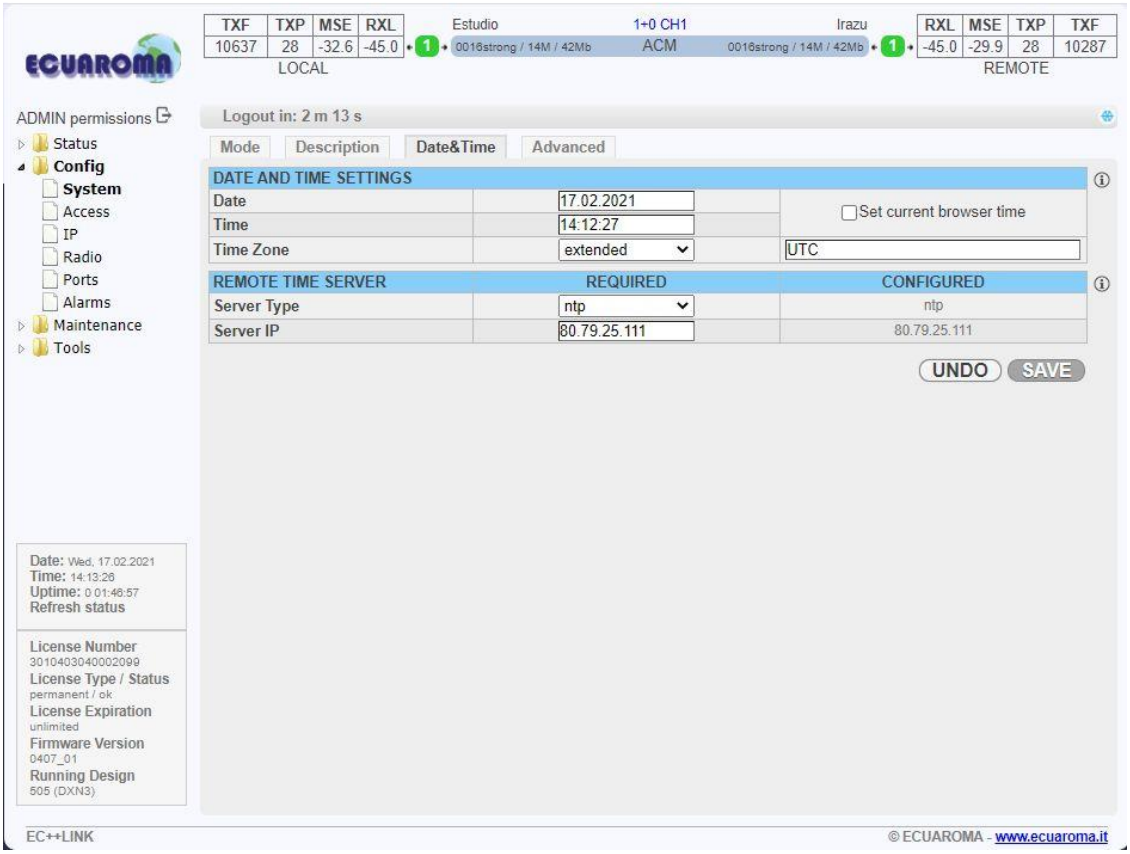


Figure 40: Date and Time specification – GUI page „Config / Date&Time”

4.3.3.1 *Description of setting and display boxes*

Date – Specification of actual date.

Time – Specification of actual time.

Time Zone – Selection of a proper Time Zone from the drop-down menu.

Set Current Browset Time – With Checking this Flag an actual PC time increased by 10 seconds is entered Date and Time boxes. 10 second offset is used, because time setting is applied not sooner than **APPLY** button is pressed.

Remote Time Server – This setting is part of IP configuration, because it is activated together with other IP parameters. When Time server option is selected, Date and Time are synchronized from external source.

4.3.4 Access Rights.

It is possible to monitor and manage the microwave link EC++Link after the login into the system only, both locally and remotely. In dependence on the login level (after entering a Login and a Password) the relevant access rights are automatically granted to the user, which affect the scope of the management capabilities for the microwave link. These login levels must be respected both in access from web interface as well as from a Telnet, SSH or SNMP connections.

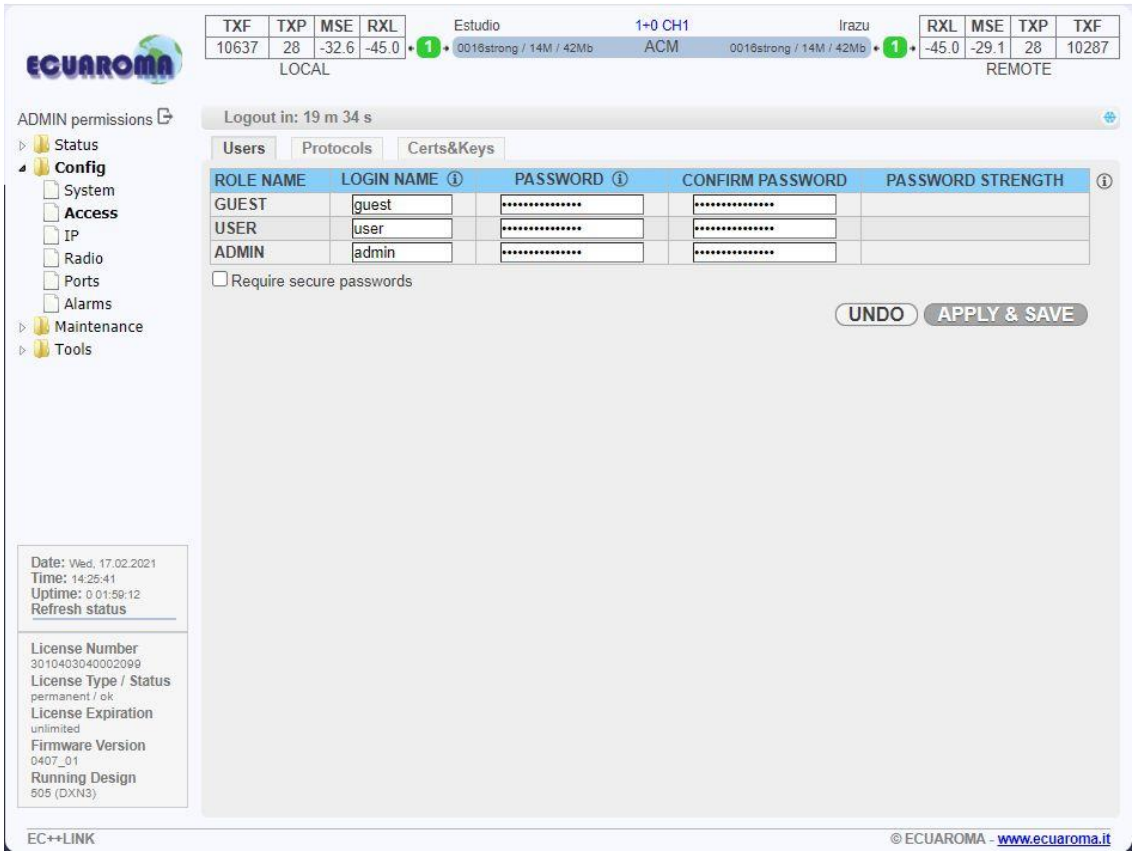


Figure 41: Access levels setting – GUI page „Config / Access"

It is strictly recommended to change default login names and passwords for access into managed networks. Such configuration is accessible from WEB GUI page *"General / Users"* (Figure 47).

Each of the three possible login modes has different rights for the system management. The following Logins and Passwords are default from the production:

Guest.

Login with a user name **guest** and a password "blank" (no character, enter only).

In this basic user mode, it is possible to monitor the traffic on the microwave link, monitor the quality of the frequency tuning, read out the values from the equipment (TxPower, etc.), clear some counters etc. Up to 3 users in maximum of the Guest level can be logged in the system at the same time.

User.

Login with a user name **user** and a password **test.**

The User has the same rights as the Guest user extended with the rights to configure and set the microwave link parameters. Only one user with the rights User can be logged in the device at one moment. At the same time up to three Guests can be in the system to monitor it.

When the User tries to log on the system and the Administrator is already in the system, an alert window informs that "The user ADMIN is already logged". The login is not performed.

Administrator.

Login with a user name **admin** and a password **secret.**

The Administrator has the same rights as Guest and User extended with the rights to upload new firmware in the equipment, control the database of users and change the user names and the passwords.

Administrator is superior to the User level. When the Administrator tries to log on the system and the User is already in the system, an alert window asks if the Administrator wants to logout the User, because there may be logged only one of them at one moment.

LOGIN NAME – 1-12 characters.

PASSWORD – 1-15 characters.

The valid characters are letters, numbers and special symbol "_". Login names must be different for each access right group.

NOTE: ALL SETTINGS FROM THIS PAGE ARE DIRECTLY SAVED TO A SPECIFIC START-UP MEMORY WHICH IS COMMON FOR ALL ALTERNATIVE CONFIGURATIONS W0-W3.

4.4 Alarms configurations.

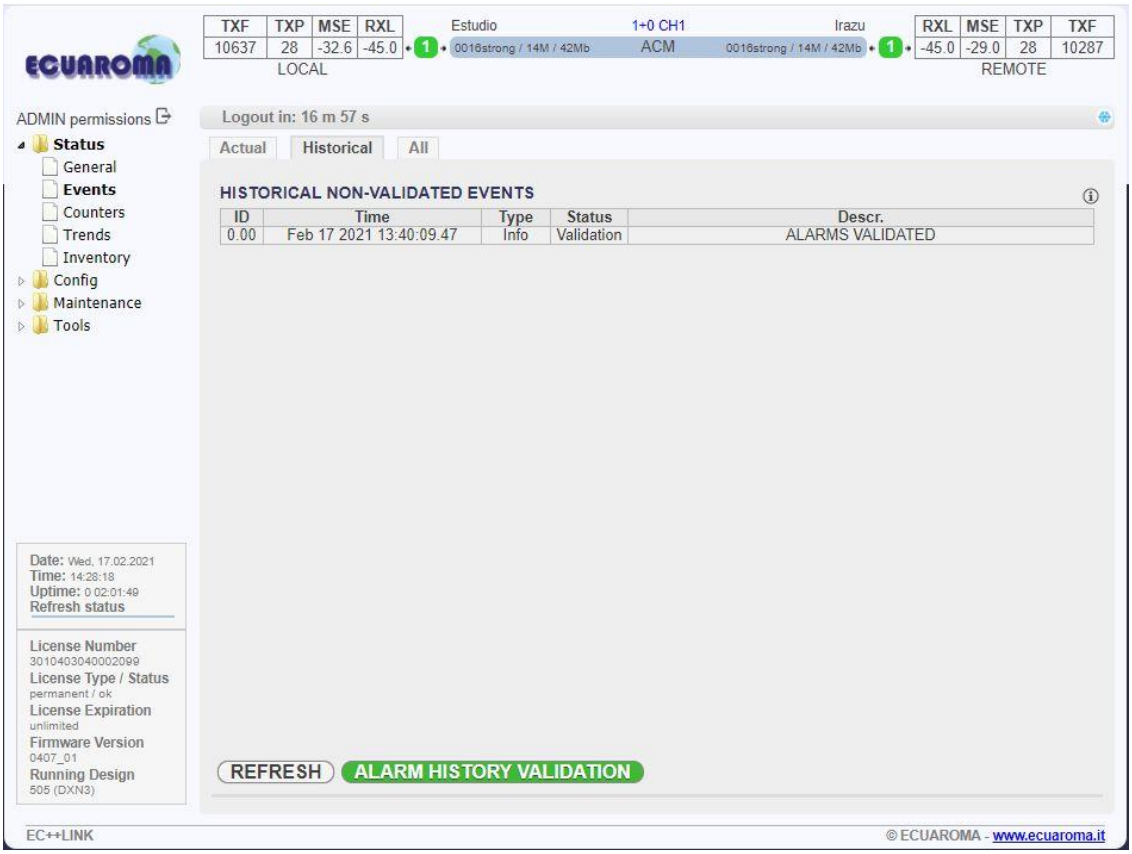


Figure 42: Alarms setting – GUI page „Status / Events"

A proper alarm configuration helps to effectively solve potential troubleshooting events and/or disclose any system instability. From the GUI page *"Alarms / Status"* (Figure 44) the status of the actual alarm is shown. From the pull-down menu can also be selected to be shown the historical alarm, or both actual and historical [both].

From the configuration point of view all the most important alarm settings are available from GUI page *"Alarms / Alarm Config"* (Figure 49) and on *"Alarms / Warning Config"* (Figure 45)

This GUI page has the form of table where it is possible to configure the following modes:

- An activation of individual alarm which influences whole IDU status. Such activated alarm will generate alarm events into internal alarm log file and SNMP trap message if this feature is configured in IP setting. When just one activated alarm ID is in the warning state, then the whole IDU is in the warning status as well. It is represented with the yellow colour of the local unit icon at the top of each GUI page.
- The activation of alarm ID at both local and remote units from the one unit (from managed unit).
- The set-up of a concrete alarm threshold values for a specific alarm IDs. Actual value is then compared with such defined alarm threshold level values.

It is also possible to check the status of alarms on the same GUI page.

- Monitoring of actual alarm status of both active and of inactive alarm IDs.
- Checking comparison values with configured but also with default defined thresholds.
- Checking detailed description for specific alarm ID reason.

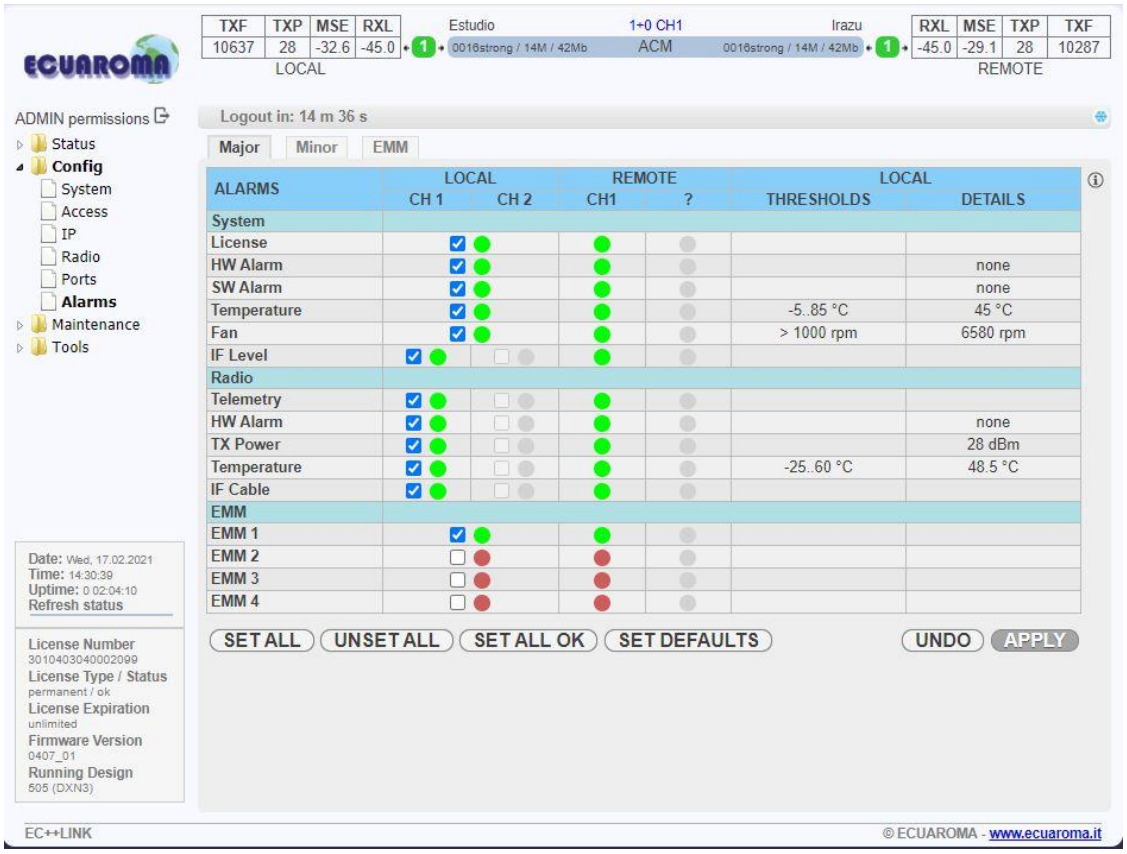


Figure 43: Alarms setting – GUI page „Alarms / Major"

Coloured icons of each alarm help to quickly understand what an actual status of the appropriate alarm ID. is

- Green Circle.
  The icon indicates that the alarm ID is activated (monitored) and no alarm status is detected.
- Dark-green Circle.
  The icon indicates that the alarm ID is not activated, and no alarm status is detected.
- Yellow Circle.
  The icon indicates that the alarm ID is activated (monitored) and the warning status is detected.
- Dark-yellow Circle.

  The icon indicates that the alarm ID is not activated but a potential warning status is detected.

4.4.1.1 Alarms

- **Modem License – ID 01.0.02**

This alarm ID indicates actual license status.

  - No alarm = License OK.
  - Warning = License is in blocked or remote violation status.

- **Modem HW – ID 01.0.04**

This alarm ID indicates actual status of IDU HW (hardware). Explicit reason for such HW alarm event is then described in column "LOCAL DETAILS" in GUI.

  - No alarm = all internal HW blocks work properly.
  - Warning = one or more internal HW blocks indicate abnormal function.

- **Modem SW – ID 01.0.05**

This alarm ID indicates actual status of IDU SW (software).

- No alarm = all internal SW blocks work properly.
- Warning = one or more internal SW blocks indicate abnormal function.

- **Modem IF Cable – ID 01.0.15**

This alarm ID indicates actual status of IF level at the IDU input.

- No alarm = Actual IDU IF level (at 140MHz) is higher than -31dBm and lower than -9dBm.
- Warning = Actual IDU IF level (at 140MHz) is lower or equal to -31dBm or higher or equal than -9dBm.

- **Modem Sync – ID 01.0.10**

This alarm ID indicates actual status of modem synchronization.

- No alarm = Modem synchronised.
- Warning = Modem sync loss.

- **Modem MUX Sync – ID 01.0.13**

This alarm ID indicates actual status of packet processor (PBPS) synchronization.

- No alarm = PBPS synchronised.
- Warning = PBPS sync loss.

- **Radio Telemetry – ID 01.0.25**

This alarm ID indicates incorrect or missing communication between the local IDU and the local ODU.

- No alarm = IDU-ODU communication is without losses.
- Warning = IDU-ODU communication failure.

- **Radio HW – ID 01.0.24**

This alarm ID indicates actual status of ODU HW (hardware). Explicit reason for such HW alarm event is then described in the column “LOCAL DETAILS” in GUI.

- No alarm = all internal HW blocks work properly.
- Warning = one or more internal HW blocks indicate abnormal function.
- Radio HW – ID 01.0.24

- **Radio IF Cable – ID 01.0.20**

This alarm ID indicates actual status of IF level at the ODU input.

- No alarm = Actual ODU IF level (at 350MHz) is in the specified range defined with appropriate ODU type.
- Warning = Actual ODU IF level (at 350MHz) is out of the specified range defined with appropriate ODU type.

4.4.1.2 Warnings

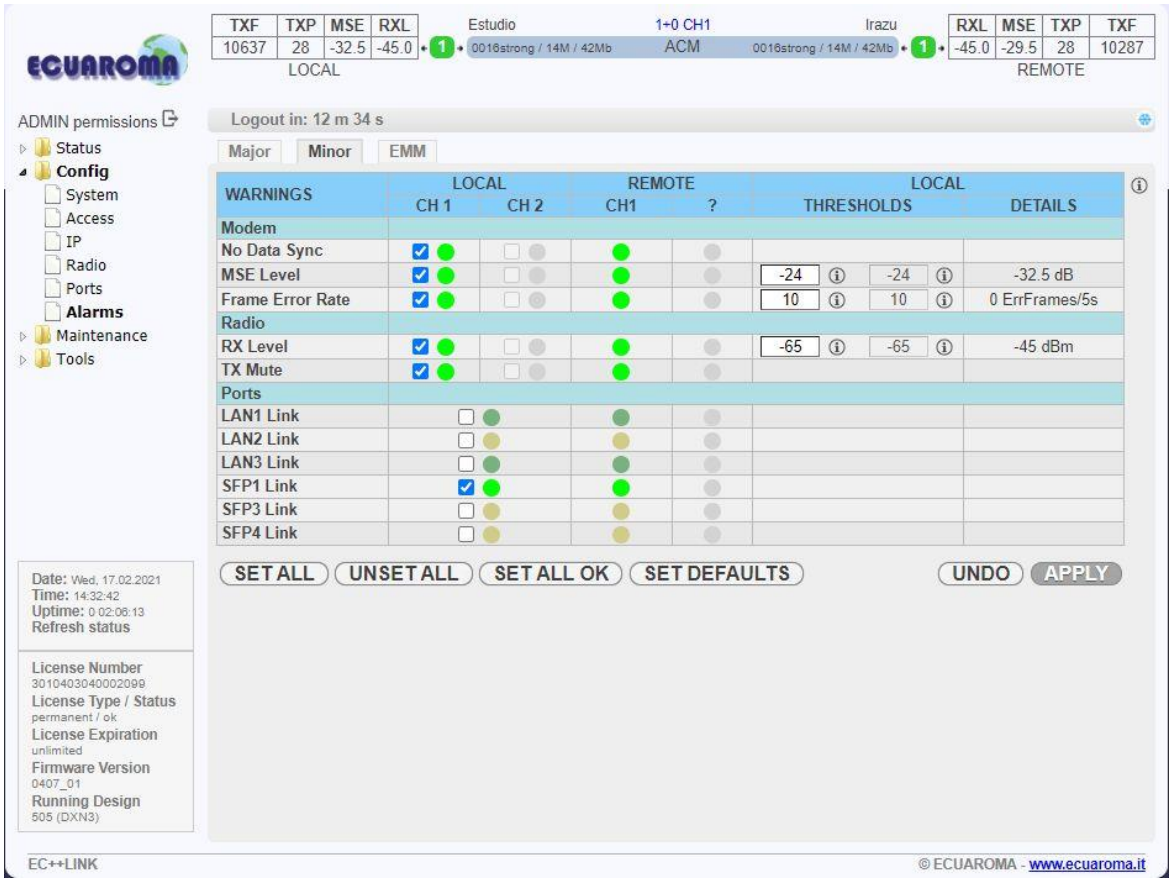


Figure 44: Alarms setting – GUI page „Alarms / Minor"

- **Modem Temp – ID 01.0.06.**

This alarm ID indicates actual status of IDU temperature.

  - No alarm = Actual temp. is in the range of -5 up to +60°C.
  - Warning = Actual temp. is out of range of -5 up to +60°C.

- **Protection – ID 01.0.03.**

This alarm ID indicates actual protection status.

  - No alarm = Protection parameters (Rx Data Source and Backup Stream) are in normal status (Rx Data Source=Main, Backup Stream=aligned).
  - Warning = One or more protection parameters are in abnormal state.

- **Modem LAN 1 Link – ID 01.0.32.**

This alarm ID indicates actual status of link at LAN 1 port.

  - No alarm = Link OK condition at port LAN 1.
  - Warning = NO Link at port LAN 1.

- **Modem LAN 2 Link – ID 01.0.33.**

This alarm ID indicates actual status of link at LAN 2 port.

  - No alarm = Link OK condition at port LAN 2.
  - Warning = NO Link at port LAN 2.

- **Modem LAN 3 Link – ID 01.0.34.**

This alarm ID indicates actual status of link at LAN 3 port.

  - No alarm = Link OK condition at port LAN 3.
  - Warning = NO Link at port LAN 3.

- **Modem SFP 1 Link – ID 01.0.36.**

This alarm ID indicates actual status of link at SFP 1 port.

- No alarm = Link OK condition at port SFP 1.
- Warning = NO Link at port SFP 1.

- **Modem SFP 2 Link – ID 01.0.37.**

This alarm ID indicates actual status of link at SFP 2 port.

- No alarm = Link OK condition at port SFP 2.
- Warning = NO Link at port SFP 2.

- **Modem SFP 3 Link – ID 01.0.36.**

This alarm ID indicates actual status of link at SFP 3 port.

- No alarm = Link OK condition at port SFP 3.
- Warning = NO Link at port SFP 3.

- **Modem SFP 4 Link – ID 01.0.37.**

This alarm ID indicates actual status of link at SFP 4 port.

- No alarm = Link OK condition at port SFP 4.
- Warning = NO Link at port SFP 4.

- **Modem MSE Level – ID 01.0.12.**

This alarm ID indicates actual modem MSE value in dB with respect to configured threshold.

- No alarm = Actual MSE value is lower than the MSE threshold defined in the same alarm row.
- Warning = Actual MSE value is higher or equal to the MSE threshold defined in the same alarm row.

- **Modem FER Alarm – ID 01.0.11.**

This alarm ID indicates status of modem frame (air-frame) error rate in the last 60 seconds with respect to the configured threshold.

- No alarm = Actual modem FER value is lower than the FER threshold defined in the same alarm row.
- Warning = Actual modem FER value is higher or equal to the FER threshold defined in the same alarm row.

- **Radio Temperature – ID 01.0.23.**

This alarm ID indicates actual status of ODU temperature.

- No alarm = Actual temp. is in the range of -25 up to +60°C.
- Warning = Actual temp. is out of the range of -25 up to +60°C.

- **Radio RX Level – ID 01.0.21.**

This alarm ID indicates status of RF received level at the ODU receiver with respect to configured threshold.

- No alarm = Actual ODU Rx Level is higher than the Rx Level threshold defined in the same alarm row.
- Warning = Actual ODU Rx Level is lower or equal to the Rx Level threshold defined in the same alarm row.

- **Radio TX Mute – ID 01.0.22.**

This alarm ID indicates actual ODU Mute status.

- No alarm = ODU is unmuted (auto unmute).
- Warning = ODU is muted (auto mute or manual mute).

4.5 Radio configurations.

4.5.1 Basic Radio settings.

The basic Radio configuration is available from the GUI page *"Radio / Parameters".* Parameters for both local and for remote units can be set together in one configuration step when appropriate boxes for local and remote unit are edited (Figure 48).

The configuration window is divided into 2 sections: Channel A LOCAL and REMOTE, Channel B LOCAL and REMOTE. The values in LOCAL column are valid parameters for local unit, likewise, the values in column REMOTE are used for remote side configuration (when communication with remote side is in operation).

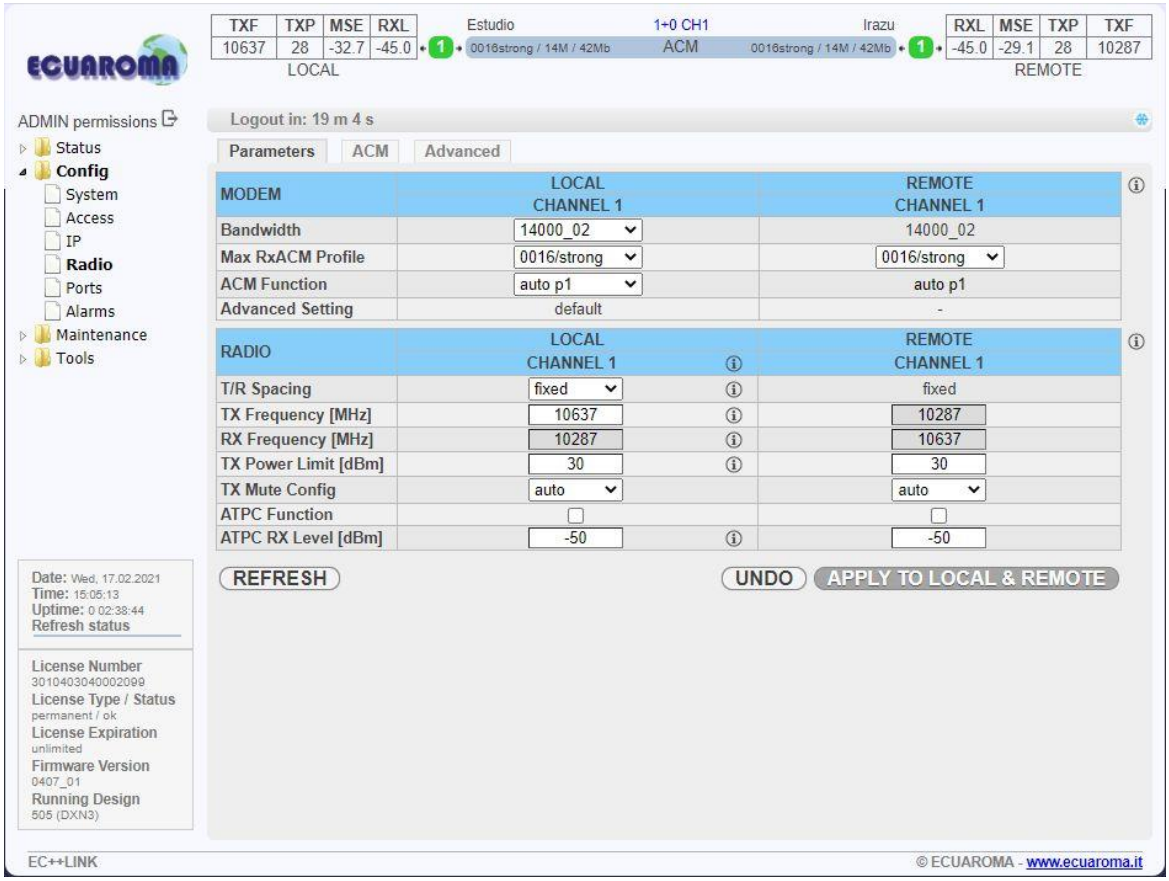


Figure 45: Radio parameters setting – GUI page „Radio / Parameters"

4.5.1.1 *Description of setting and display boxes*

TX Frequency – Transmission frequency can be set within the displayed frequency range in accordance with concrete ODU sub band specification (read from the connected ODU). Such displayed range is the edge to edge flat diplexer frequency scope and therefore respective Tx Frequency value within that scope must be increased / decreased by one half of used modulation bandwidth if that is near these edges.

RX Frequency – Receive frequency is set automatically, because majority of ODUs operate with the fixed T/R spacing. For specific ODUs, where RX Frequency can be set independently, this value box can be filled-in by customer.

T/R Spacing – TX / RX frequency distance is a real calculated value of this parameter.

TX Power Limit – Maximum transmission power parameter defines the maximum power level the transmission can ever go. The operating Tx Power then depends on:

- Configured ATPC values.
- ODU limit which depends on the used RF band and selected modulation.

TX Mute Config – Transmitter mute configuration. Two modes of this parameter can be selected. Mute mode is selected for fixed ODU mute configuration. Auto mute mode is a standard selection for this parameter. In that case a ODU is automatically muted when abnormal transmission conditions are detected by IDU or ODU:

- Initial TX Frequency is outside of available range,
- ODU cable alarm,
- Specific protection mode.

ATPC Function – Automatic Transmit Power Control enables or disables the ATPC feature. The transmitted power is automatically adjusted to ensure that the optimum RxLevel (ATPC RxL) is received at the remote terminal (hitless regulation).

NOTE: THE ATPC FUNCTION SHOULD BE ALWAYS OFF DURING THE INSTALLATION!

ATPC RX Level – Required level for Automatic Transmit Power Control. Field specifies the optimal receive level used for ATPC function.

Modem Sync – Demodulator synchronization status is the basic indicator of proper function of IDU receiver.

- ***ok*** *– It indicates that demodulator is synchronised with received air-frame.*
- ***loss*** *– It indicates that demodulator is not synchronised with received air-frame.*

XPIC Function – This function enables the XPIC mode on the radio. This can only be activated if is present on the licence of the modem

Bandwidth – Channel bandwidth selected.

Max RxACM Profile – Optimal modulation scheme selects either fixed modulation scheme for no-ACM mode or defines the highest modulation scheme which can be used in ACM mode.

Mux Sync – Multiplex synchronization status is the basic indicator of proper function of IDU receiver.

- ***ok*** *– It indicates that multiplex is synchronised with received air-frame.*
- ***loss*** *– It indicates that multiplex is not synchronised with received air-frame.*

RXIF Level – Receive IF level at IDU input (150 MHz) indicates the signal strength of IF input into IDU. This level should be in the range of -10 dBm up to -35 dBm (low signal). By standard the output RXIF level from ODU is -10 dBm. It is useful to check this value if that corresponds to supposed cable attenuation.

ACM Setting – This icon link to the GUI page "*Radio / ACM*".

Advanced Setting – Status of the advanced settings

Especially the modulation scheme settings and the channel bandwidth affect the final data rate (data throughput) and sensitivity (link distance) of microwave link. Generally speaking, the narrower bandwidth and lower modulation then lower the data rate but greater the sensitivity are.

In dependence on the type of supplied license (limit for maximum data rate) the modulation type can be changed (type of modulation can be set / changed up to a maximum transmission capacity). Microwave link can be ordered with the different licenses in accordance with actual price list and business policy. Then the transmission capacity can be changed up to the maximum data rate of supplied license.

For a limited period of time the microwave link can be supplied with a higher type of modulation (with higher data rate), e.g. for temporary testing. After the expiration of this period the maximum type of modulation is automatically downgraded to the default modulation from license and the user data transmission capacity is disabled at all (0 Mbps). It does not affect the out-of-band management channel.

The modulations are named according to the combination of the following parameters. Behind the modulation code, there is written the overall Capacity – real data throughput. Modulation name coding is described in the next example.

4.5.1.2 Example: 128/strong 28000_02

128 – code for 128 QAM**,** other possibilities are 4/8/16/32/64/128/256/512/1024.

Strong – code for Strong FEC correction**,** other possibilities are Medium and Weak based on specific modulation type.

28000 – code for 28 MHz BW, other possibilities are 07000, 10000, 14000, 20000, 25000, 28000, 30000, 40000, 50000, 56000, 60000, 80000, 112.

02 – it is code for modulation version.

Any change must be finally confirmed with pressing the <APPLY> button. All the basic parameters can be configured for local and remote terminal from this page when the proper connection is established. Save all changes and configurations with pressing the <WRITE> button.

4.5.2 Analyser Feature.

EC++ system modem has a built-in feature that helps to scan the radio band to find any interference that is transmitting within radio band itself. This is widely useful after first installation or to troubleshoot link performance problems. This is performed on the “Radio / Analyzer” page (figure 53).

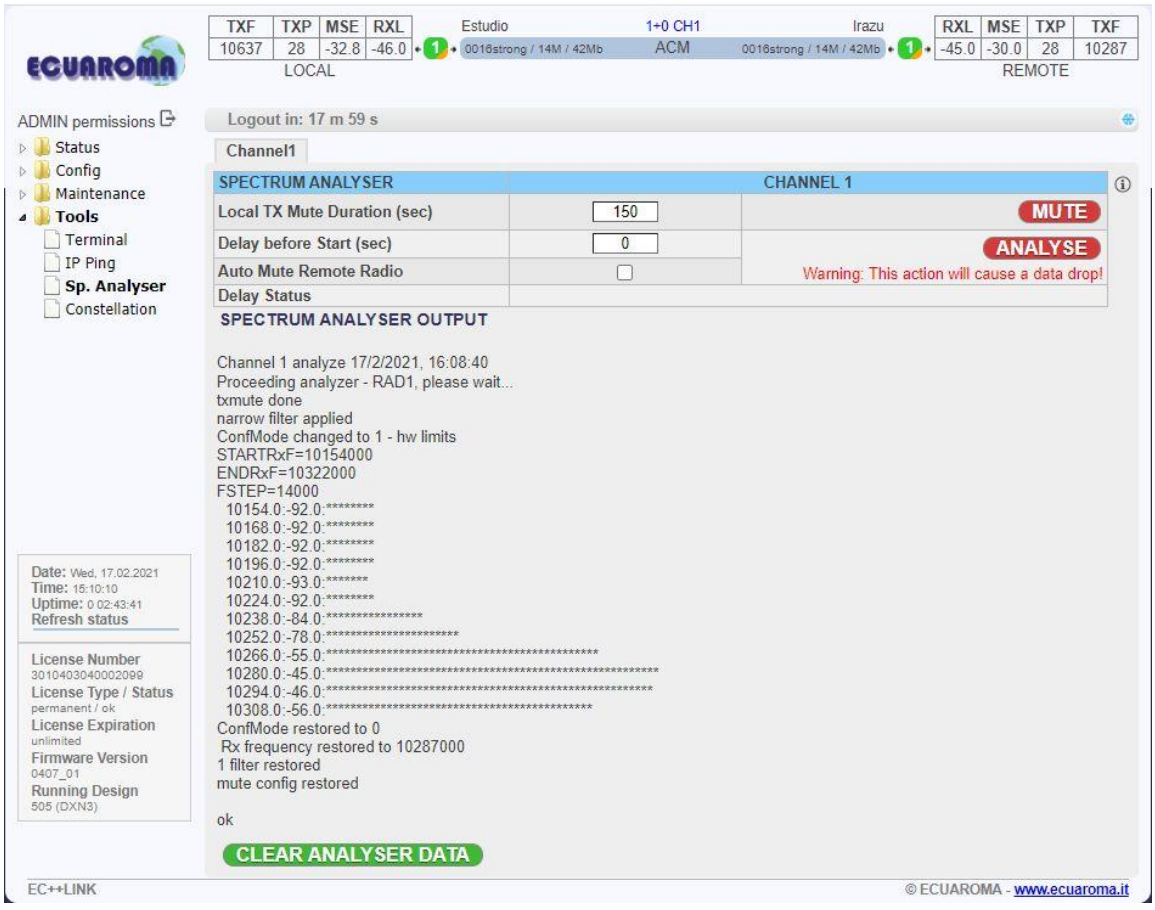


Figure 46: Radio Parameters – GUI page „Sp. Analyzer”

4.5.2.1 *Description of particular setting and display boxes*

Radio Selection – Receiving radio selection for graph scanning. Only one radio receiver at time can be selected for graph scanning.

Local TX Mute Duration – Time in seconds to auto mute the local radio. After the times expire, the radio is automatically se back on transmission. This is useful in base of scan must be done on remote, non-directly managed site. Also, a hard-mute command button is provided.

Delay Before Start – Time in seconds to delay start of receiving analyse. This is useful when a remote direct managed radio mute must be performed.

Auto Mute Remote Radio – This checkbox allows to auto mute remote radio once the analyse button will be pressed.

4.5.3 Diagram Graph.

EC++ system modem is provided with a receiving spectrum graphical analyser and a Constellation Diagram graph. This is on the "*Radio / Diagram*" page (figure 54).
Only one channel can be analysed at a time, and channel selection is provided on Radio Selection Box.

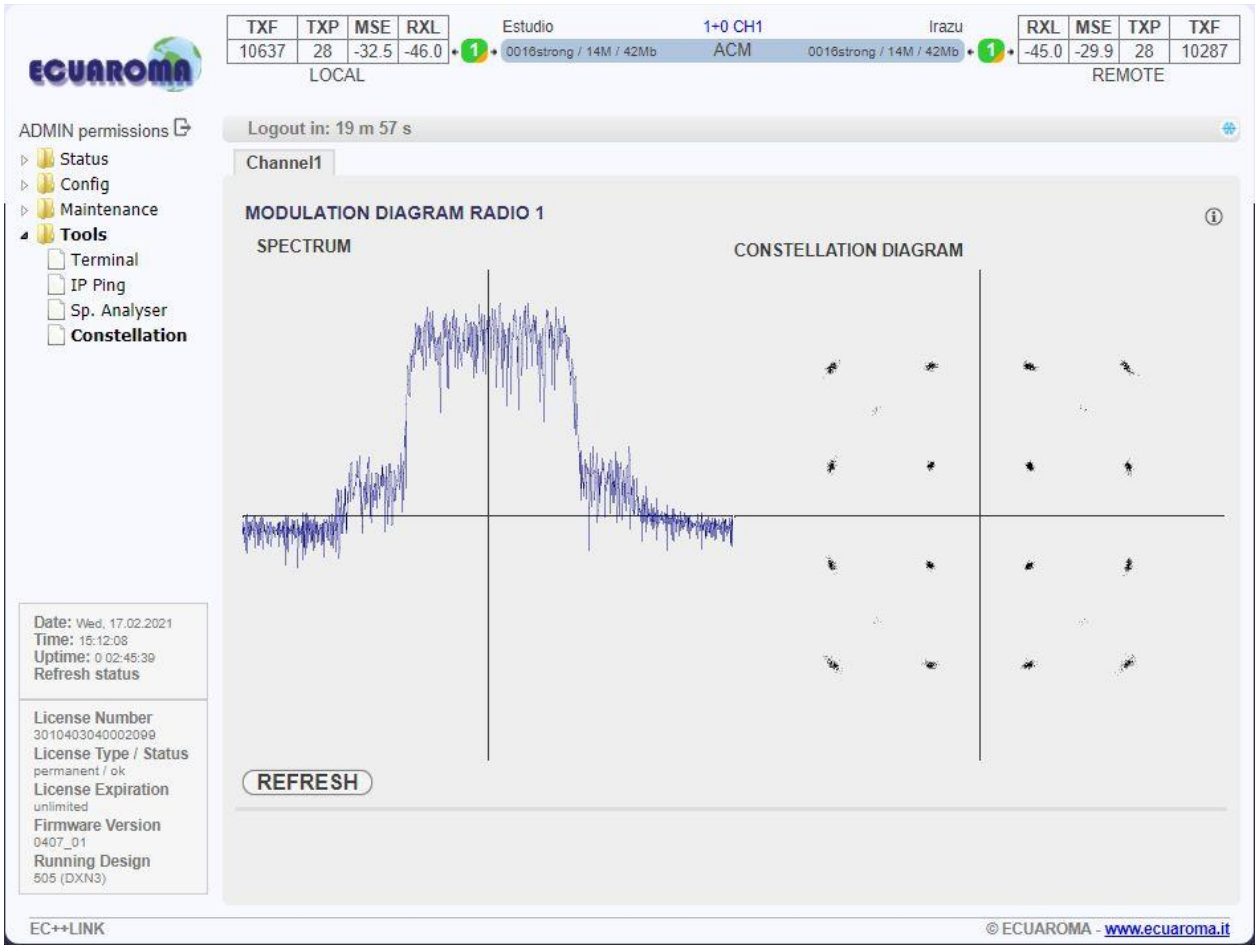


Figure 47: Radio Parameters – GUI page „Constellation"

4.5.4 ACM Settings

A proper Automatic change modulation function setting is useful to avoid link drop in case of hard fading issue or bad whether issue. This function automatically selects proper modulation based on actual MSE and radio performance. This setting can be performed on "*Radio / ACM*" page (Figure 55).

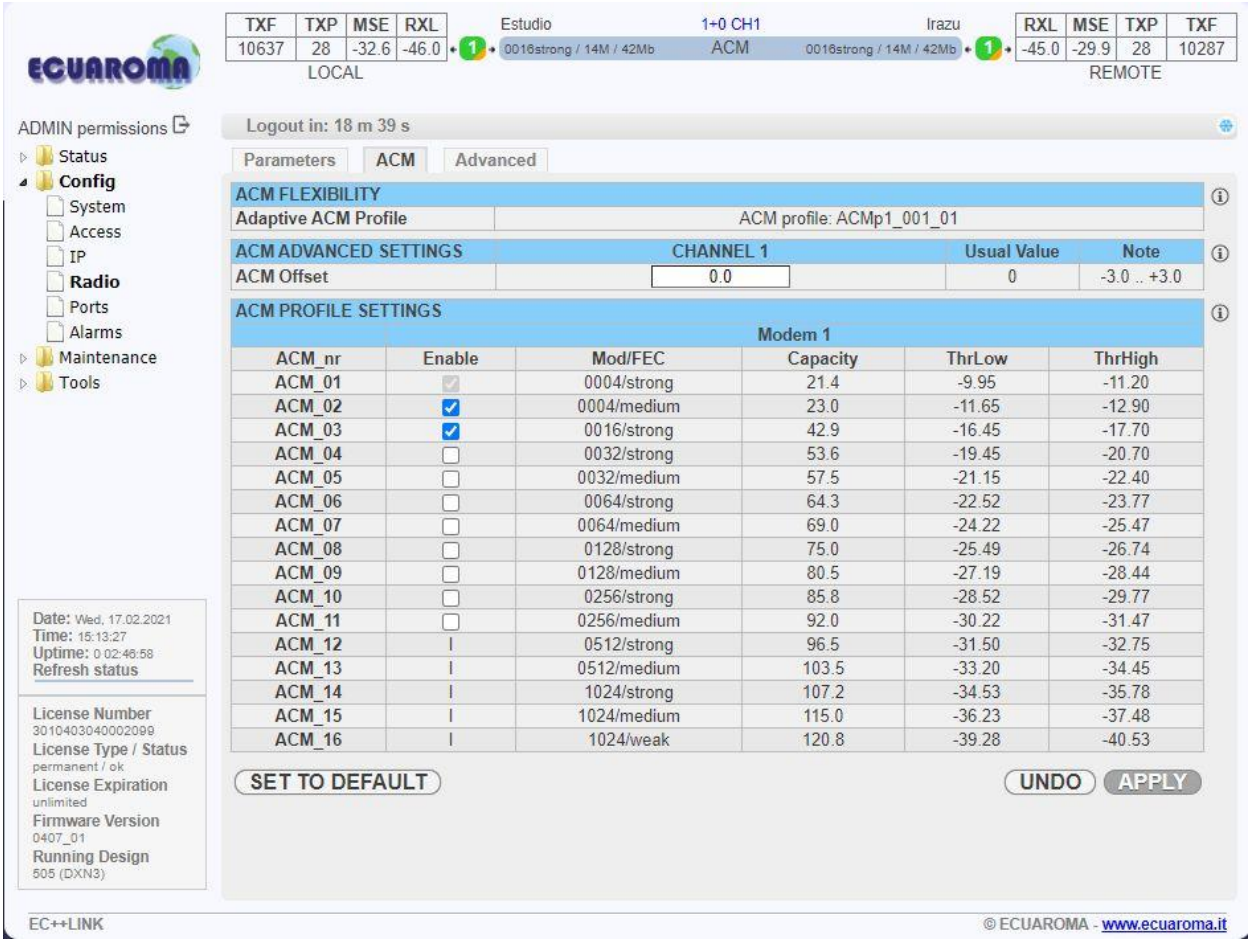


Figure 48: Radio Parameters – GUI page „Radio / ACM"

4.5.4.1 Description of setting and display boxes

ACM Function – This box select/display actual ACM status. Possible value is "auto p1" that means that ACM is active, so modulation is automatically selected, or "man p1" that means that ACM is not active, so modulation is set on parameter **Max RxACM Profile** on "Radio / parameters" page**.**

ACM Offset – This box select/display an offset to apply to MSE Low and High switching parameters. Allowed values are from -3.0 to +3.0.

ACM Profile Settings

- **ACM_nr –** Consequential identification number of ACM profiles
- **en -** enable that particular ACM profile
- **mod/fec –** Modulation and FEC identification of ACM profiles. Modulations are QPSK (0004), 16QAM (0016), 32QAM (0032), 64QAM (0064), 128QAM (0128), 256QAM (0256), 512QAM (0512), 1024QAM (1024). FEC are Strong (01), Medium (02), Weak (03).
- **spd –** Max speed of particular ACM profile
- **thrLo –** Lower MSE value for ACM switching.
- **thrHi –** Higher MSE value for ACM switching

4.5.5 Advanced Radio settings.

Advanced Radio configuration window provides extended radio parameters settings which are usually required for maintenance and operation purposes. These settings are available on GUI page *"Radio / Advanced"* (Figure 56).

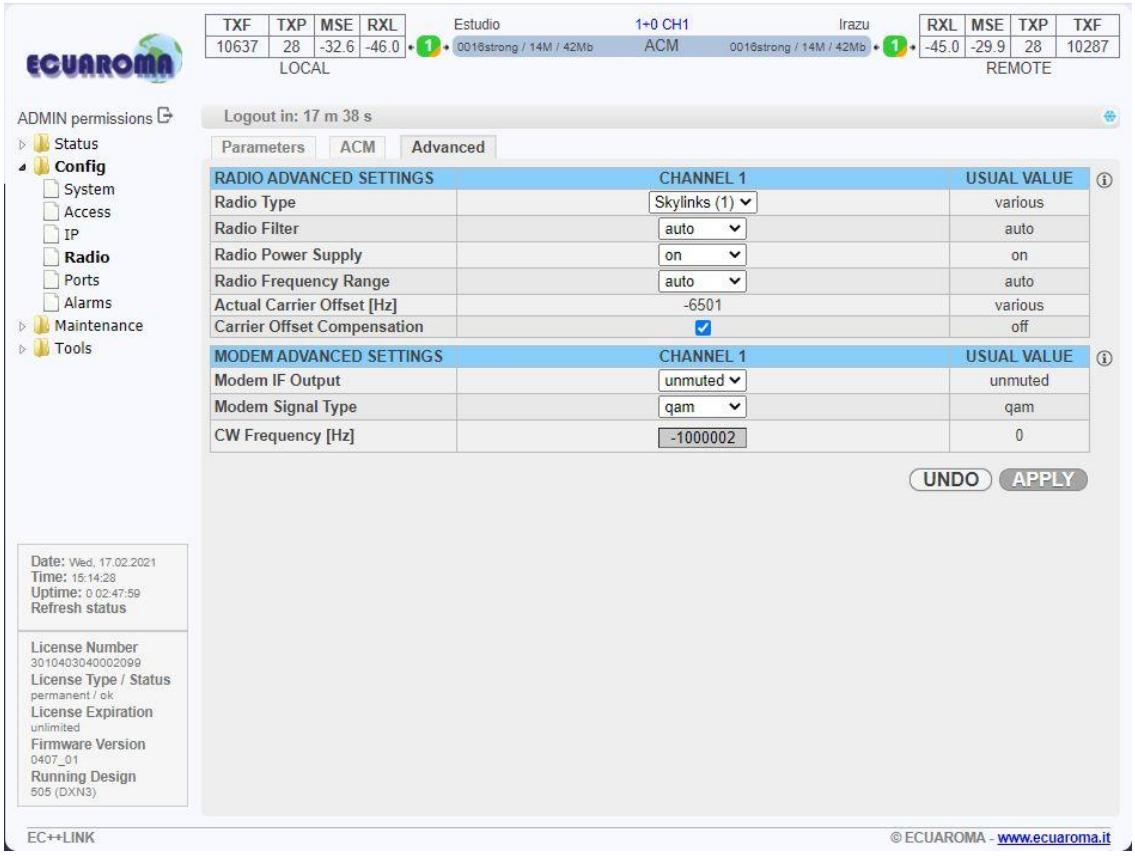


Figure 49: Radio parameters setting – GUI page „Radio / Advanced"

4.5.5.1 *Description of particular setting and display boxes*

Radio Filter – it is possible to change integrated filter inside IDU by means of this drop-down menu. The meanings of possible modes are as follows.

- ***auto* –** Filter is selected automatically according to the modulation BW (default).
- ***narrow* –** Manual selection of ODU narrow filter.
- ***wide* –** Manual selection of ODU wide filter.

Concrete filter width for narrow or wide mode depends on used ODU type.

Radio Power Supply – It is possible to turn-off power supply for ODU by means of this drop-down menu (on - ODU is powered (default), off - ODU is turned-off). Start-up configuration (RUN W0) is initiated after the switch from OFF to ON mode. Therefore data drop will occur after this switch.

Modem IF Output – It is possible to turn off modulated 350MHz modem output for half duplex receiving sites.

Modem Signal Type – It is possible to turn-off modulation on carrier frequency. Possible value are QAM where normal modulation is applied on carrier, or CW where just continuous wave is applied on carrier.

CW Frequency – Continuous wave frequency offset from carrier specified frequency.

4.5.6 Detailed Radio Information.

A raw data of some of the settings, data collected and monitored from the EC++ modem can be seen from the “Radio / Details” page (Figure 57).
This data are only used from manufacturer and are useful for advanced troubleshooting (no setting can be performed in this page).

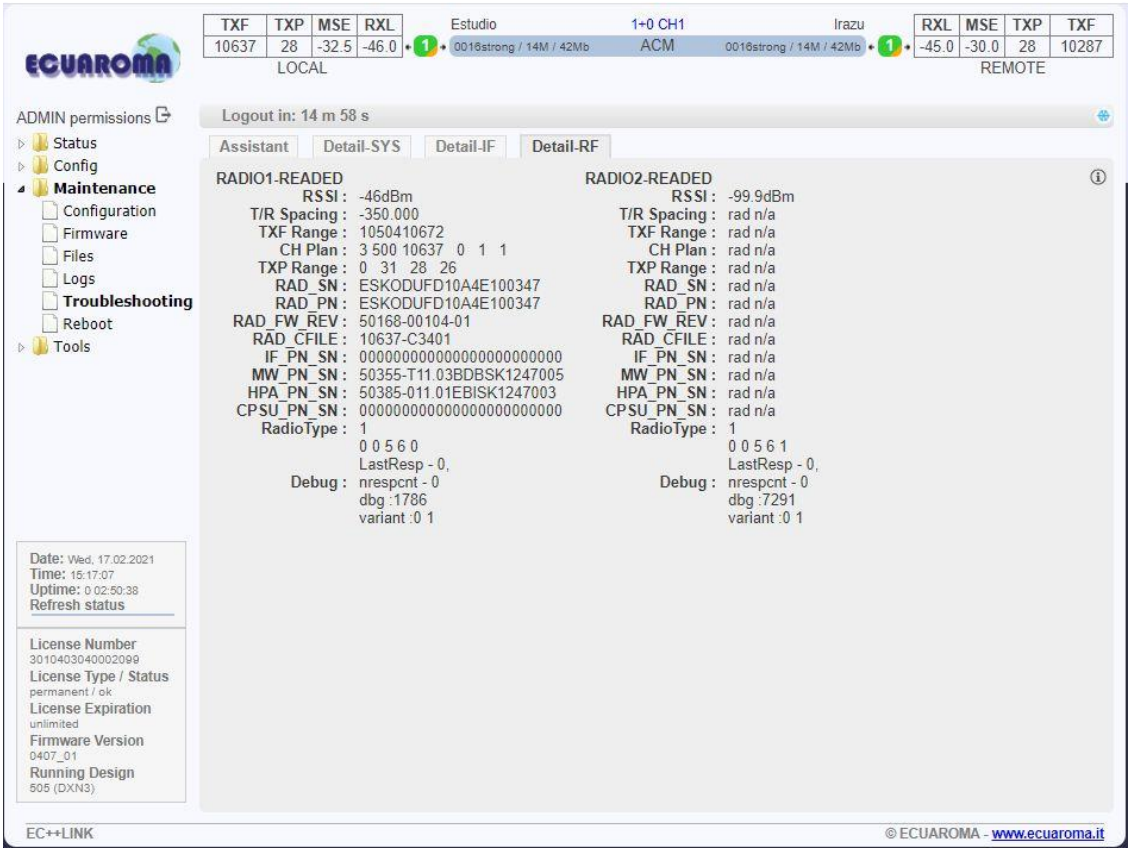


Figure 50: Radio parameters setting – GUI page „Troubleshoot / Detail-RF”

4.6 Port configurations.

Each mode type uses different port configuration scheme, so in respect of management access type, traffic modification (number of independent channels over air) and mode preference the user has to select the relevant mode type before starting any port settings. Therefore the next explanation is done individually for each mode type.

Standard configurations are based upon customer indication and requirement.

4.6.1 Basic port settings – 1+0 Ch1/2.

Port settings for single end unit activate only one modem, therefore traffic can only be allocated at one radio. There can be up to separate traffic allocation for 2 independent traffic streams (Figure 58).

The customer can use up to three LAN ports and up to 4 SFP connection for traffic connection and/or management of local/remote unit and allocate up to the maximum speed for ETH/SFP traffic over RF link.

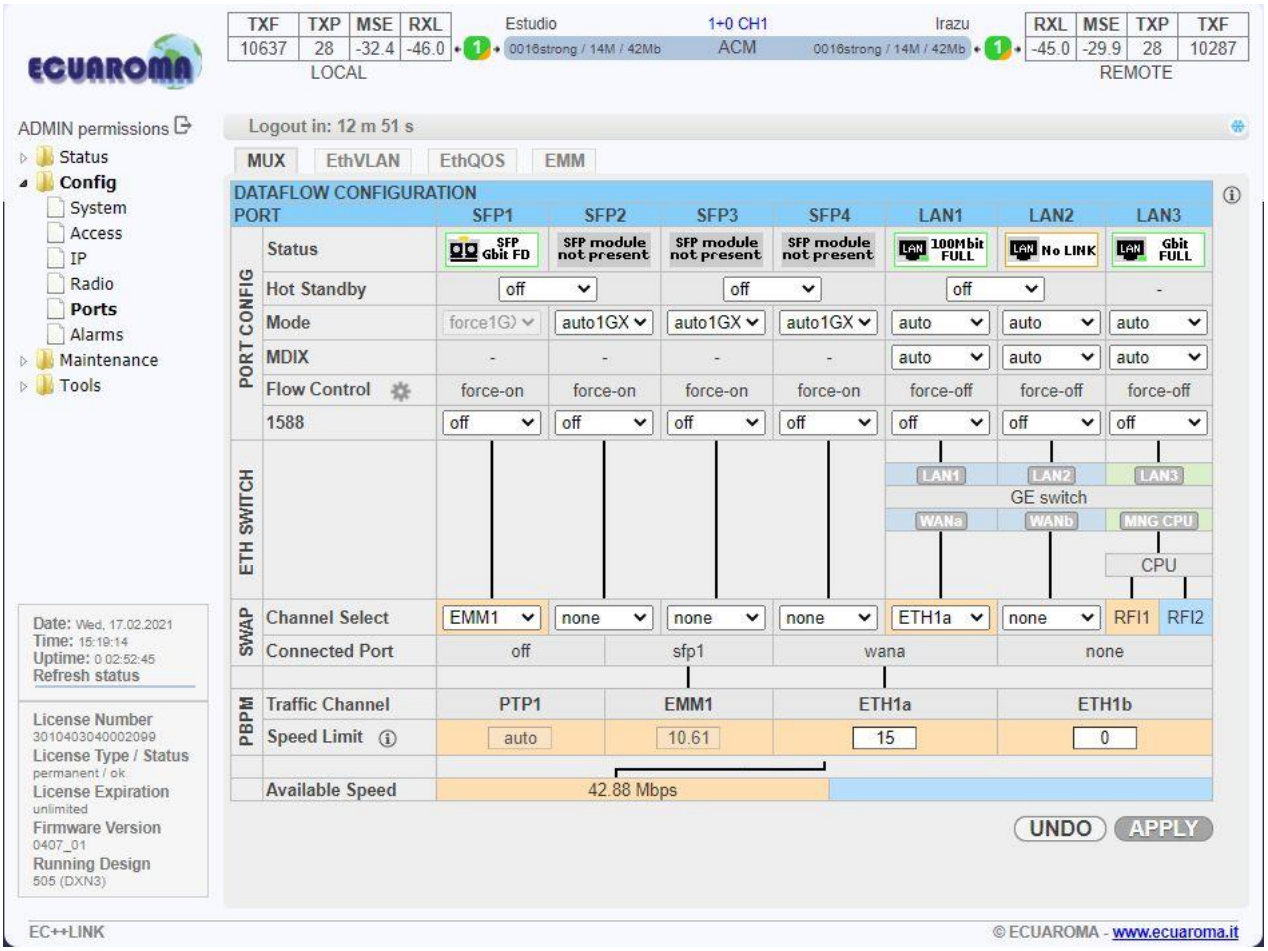


Figure 51: Ports parameters setting – GUI page „Ports / Mux" single end unit mode

4.6.2 Basic port settings – Description of particular setting and display boxes

Status – A graphical symbol which describes the actual status of particular LAN or SPF port (speed, duplex mode, link, administrative down status).

Hot Standby – In case of port failure define port switching. Possible value is off, hot swap, main and standby.

Mode – This drop-down menu displays and defines the actual port mode (auto negotiation on/off, speed/duplex, administrative down).

MDIX – It is possible to set particular ETH cable crossing like auto / mdi /mdx by means of this configuration.

Flow control – This box displays duplex flow control mechanism.

- ***off*** – Flow control is disabled.
- ***on*** – Flow control is enabled during auto negotiation process.
- ***force*** – Flow control is active, even if connected device does not support it.

1588 – This Settings enable PTP1588 process for low PDV feature.

Switch Settings – This block illustrates the ETH switch fragmentation into groups and also their interconnection with physical LAN ports and internal WAN ports. The group configuration is performed on page *"Ports / ETH VLAN".*

Channel Select – This setting selects the interconnection from switch ports, RFI channels, and SFP.

Channel Port – This box displays the interconnection from switch ports, RFI channels, and SFP.

Traffic Channels – It describes internal names of packet processor ports and eventually their interconnection with user ports.

TX Speed Limit – The over air speed of particular packet processor channel can be reduced by means of this parameter. When the input number is invalid it will become red and will set the speed at maximum allowed/possible.

Licensed Speed – Maximum speed licenced for this modem.

Available Speed – Maximum speed allowed for this particular setting of mode and modulation setting.

4.6.3 ETH VLAN settings.

VLAN configuration is basically used for the separation of management traffic from other customer data traffics. It can be useful to configure ETH VLANs also for customer traffic and filter ingress data traffic by means of this settings in some specific applications.

The VLAN configuration is available from GUI page "*Ports / ETH VLAN*" (Figure 62).

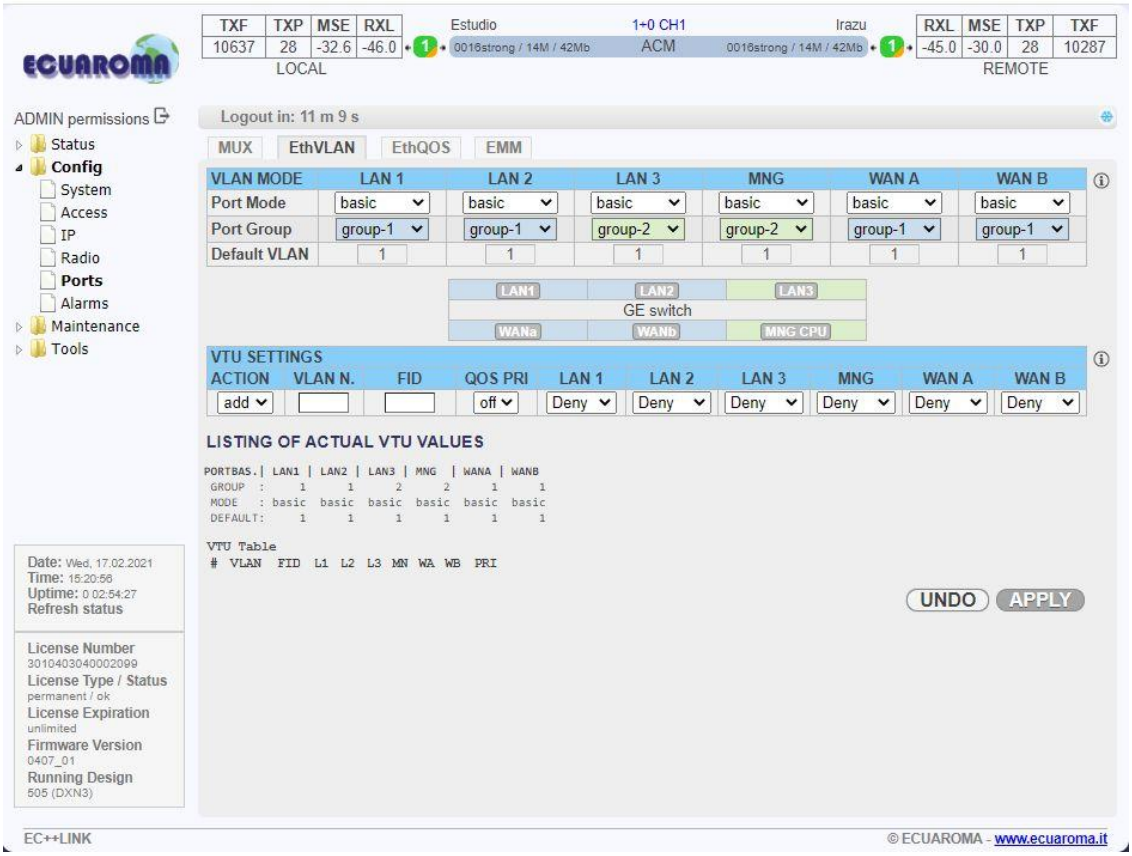


Figure 52: Ports parameters setting – GUI page „Ports / ETH VLAN"

4.6.3.1 Description of particular setting and display boxes – VLAN MODE SETTING

Port mode – it is possible to set-up separately the required VLAN mode for each ETH switch port. It is recommended to leave all ports in basic mode and edit VTU records first. The user has to be sure with correct VLAN configuration and has to set also his network into the similar VLAN support. VLAN Port modes are described below:

- ***basic*** – Transparent mode where VLAN settings in VTU table are ignored. Frames are transmitted unchanged, but they exit only those ports which are inside the same group.
- ***access*** – Port is a member of just one untagged VLAN defined with Default VLAN for the port. Only such ingressed untagged packets are accepted, whose VLAN number (VID), which is assigned from port's Default VLAN, exist in VTU table. Frames are transmitted untagged and they are allowed to exit only those ports that are members of the frame's VLAN and are inside the same group.
- ***trunk*** – Port can be a member of more tagged VLANs (VID extracted from VLAN tag) and one untagged VLAN defined with Default VLAN for such port. Only such frames are accepted, whose VLAN number (assigned from VLAN tag or port's Default VLAN) exists in VTU table and Ingress port is member of VLAN. Frames are transmitted untagged or tagged according to the specification in VTU

record for each port/VLAN and they are allowed to exit only those ports that are members of the frame's VLAN and are inside the same group.

- ***hybrid*** – When frame's VLAN number exists in VTU table the rules for trunk port are used, when the number does not exist then the basic rules are applied.

Port Group – This parameter defines some separate MAC address table domains inside the internal switch and defines also the group of ports which can communicate to each other. Only the ports from the same group can communicate with one another. The other ports are completely isolated. It is possible that isolated networks (different groups) can use the same MAC addresses without any collision in the internal ETH switch ATU table.

Default VLAN – This parameter is configured automatically with a new record into the VTU table. Default VLAN is updated for the port which is marked as untagged in the VTU record. VLAN No.1 cannot be added into VTU table and it is just fictive VLAN for internal purposes. The port cannot be configured into access mode when Default VLAN of this port is 1. When Default VLAN value for the trunk port is 1, then the port accepts just tagged frames.

4.6.3.2 The description of particular setting and display boxes – VTU SETTING

ACTION – It adds or removes VTU records. VTU record cannot be removed when contains untagged port which is configured into access mode. Just simple VLAN NO. specification is required for VTU record erase.

VLAN NO. – The VLAN number of edited VLAN (added or deleted). Every VLAN can be defined for only one Port Group, multiple records of the same VLAN for more groups is not allowed.

GROUP – It defines the port Group for which is VLAN edited.

QOS PRI – When VTU override mode is selected then the QOS priority value of original frame is overridden. This configuration has influence only on the internal frame processing by means of queue controller (QPRI defined by OQPRI instead of IQPRI bits), but frames are egressed still with the initial priority assignment (FPRI is without any change).

LAN 1-WAN B – It defines VLAN mode for each port in configured VLAN.

- ***Deny –*** Port is not a member of edited VLAN. Ports which are defined in different Groups should be set into this mode.
- ***Untag*** – Port is a member of edited VLAN as untagged.
- ***Tag*** – Port is a member of edited VLAN as tagged.

4.6.3.3 The description of particular setting and display boxes – LISTING OF ACTUAL VTU VALUES

List of VTU records (defined VLANs) in the ETH switch. The abbreviations in this list correspond to the first letter of the port mode definition in VTU records.

4.6.4 ETH QoS settings.

ETH advanced GUI page (Figure 63) is dedicated to additional ETH configurations which extend the basic functions of the internal ETH.

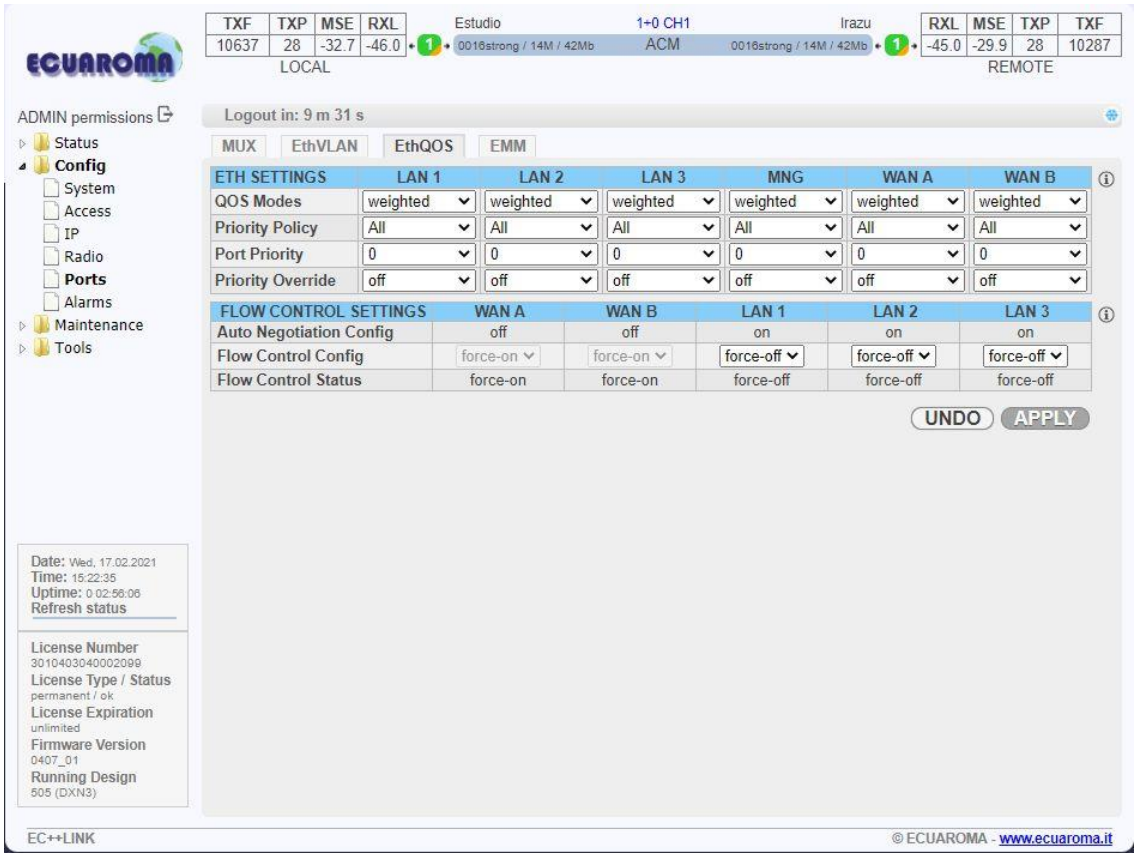


Figure 53: Ports parameters setting – GUI page „Ports / ETH QoS"

4.6.4.1 The description of particular setting and display boxes – QOS ETH Setting

This section makes it possible to configure extended QOS modes which are important for a specific traffic prioritization. The system uses four priority queues for each port where frames, with an assigned initial frame priority, an initial queue priority and an override queue priority, are mapped onto four output queues according to QPRI settings. A final frame queue priority is derived from the assigned initial queue or the override queue priority and it is used for deciding what queue will be used for frame buffering. The queue with a higher number is egressed with higher priority than the queues with lower numbers. The assigned initial frame priority is then used for replacing of frame's PRI bits in 802.3ac VLAN tag section, when the frame is egress tagged.

Priority abbreviations.

- FPRI initial frame priority 0 up to 7 (bits [2:0]).
- QPRI queue priority 0 up to 3 (bits [1:0]).
- IQPRI initial queue priority 0 up to 3 (bits [1:0]) .
- OQPRI queue override priority 0 up to 3 (bits [2:1] from QOS PRI value).
- PRI_T PRI bits from 802.ac VLAN tag.
- PRI_IP hex value of IP v4/6 frame's TOS/DiffServ/TC bits [7:2].

Port default priority.

- FPRI_D = port default frame priority, defined with Port Priority value.

- QPRI_D = port default queue priority, defined with next mapping table.
- QPRI_D = 0 when FPRI_D=0/1.
- QPRI_D = 1 when FPRI_D=2/3.
- QPRI_D = 2 when FPRI_D=4/5.
- QPRI_D = 3 when FPRI_D=6/7.

IEEE Tag priority.

- FPRI_T = IEEE Tag frame priority, defined with value of PRI bits from VLAN tag.
- QPRI_T = IEEE Tag queue priority, defined with next mapping table.
- QPRI_T = 0 when FPRI_T=0/1.
- QPRI_T = 1 when FPRI_T=2/3.
- QPRI_T = 2 when FPRI_T=4/5.
- QPRI_T = 3 when FPRI_T=6/7.

IP v4/6 priority.

- FPRI_IP = IPv4/6 frame priority, defined with following figure.
- FPRI_IP = QPRI_IP*2 + FPRI_D[0].
- or defined in another way.
- FPRI_IP[2:1] =QPRI_IP[1:0].
- FPRI_IP[0] = FPRI_D[0].
- QPRI_IP = IPv4/6 queue priority, defined with next mapping table (hex values).
- QPRI_IP = 0 when PRI_IP=00/04/08/0c/10/14/18/1c/20/24/28/2c/30/34/38/3c.
- QPRI_IP = 1 when PRI_IP=40/44/48/4c/50/54/58/5c/60/64/68/6c/70/74/78/7c.
- QPRI_IP = 2 when PRI_IP=80/84/88/8c/90/94/98/9c/a0/a4/a8/ac/b0/b4/b8/bc.
- QPRI_IP = 3 when PRI_IP=c0/c4/c8/cc/d0/d4/d8/dc/e0/e4/e8/ec/f0/f4/f8/fc.

There is a detailed explanation of all possible QOS modes in the following description:

QOS Modes – This drop-down menu defines egress queue policy function. The function is independent of any other QOS configurations. Each egress frame is assigned with such queue whose number is identical to frame's QPRI identifier.

weighted – In the weighted scheme an 8, 4, 2, 1 round robin weighting is applied to the four priorities (8 frames from Q3, 4 frames from Q2, 2 frames from Q1 and 1 frame from Q0). This approach prevents the lower priority frames from being starved out with only a slight delay to the higher priority frames.

strict 3xxx – Strict priority for queue 3 and weighted round robin for queues 2,1 and 0. Queues 2,1,0 are served only when Q3 is empty.

strict 32xx – Strict priority for queues 3,2 and weighted round robin for queues 1 and 0. Queues 1,0 are served only when Q3 and Q2 are empty.

strict 3210 – Strict priority for all queues. Lower priority queues are served only when higher priority queues are empty.

NOTE: QOS Mode configures egress policy (output from switch) for each port, whereas other QOS setting modes configure ingress port policies (input to

switch). Therefore priority assignment is done at the input to the switch and function of queue controller is defined at the output from the switch.

Priority policy – This drop-down menu defines the initial ingress queue policy. It defines the initial rules for what output queue will be assigned to every ingress frame.

All – Next rules are used for priority assignment (from the top to the bottom order).

- tagged IPv4/6 frames.

  IQPRI = QPRI_T.

  FPRI = FPRI_T.

- tagged non IPv4/6 frames.

  IQPRI = QPRI_T.

  FPRI = FPRI_T.

- untagged IPv4/6 frames.

  IQPRI = QPRI_IP.

  FPRI = FPRI_IP.

- untagged non IPv4/6 frames.

  IQPRI = QPRI_D.

  FPRI = FPRI_D.

Port only – Next rule is used for priority assignment.

- all frame types.

  QPRI = QPRI_D.

  FPRI = FPRI_D.

Tagged only – Next rules are used for priority assignment (from the top to the bottom order).

- tagged frames.

  IQPRI = QPRI_T.

  FPRI = FPRI_T.

- untagged frames.

  QPRI = QPRI_D.

  FPRI = FPRI_D.

IPv4/6 only – Next rules are used for priority assignment (from the top to the bottom order).

- IPv4/6frames.

  IQPRI = QPRI_IP.

  FPRI = FPRI_IP.

- non IPv4/6 frames**.**

IQPRI = QPRI_D**.**

FPRI = FPRI_D**.**

Port Priority – The configuration of default port priority. Value 0 up to 7 can be entered (0 is default value) and it is then used for definition of FPRI_D and QPRI_D parameters according to the above described figures. The next possible function of this variable is a definition and/or replacement of QOS priority information based on FPRI_D for frames which are egressed with VLAN tag. Such updated frame can input into the switch with QOS priority which is different from priority of the same frame at the output from switch.

Priority Override – It offers the possibility to replace an initial queue priority with a new priority. The new priority is assigned to each frame whose VLAN ID is defined in the VTU table with properly configured QOS PRI value.

off – QOS override is disabled.

vtu – Queue priority override information (OQPRI) is derived from bits [2:1] of QOS PRI parameter defined in chapter The description of particular setting and display boxes – VTU SETTING on page 67. When this parameter is set to off state, override process is not active for appropriate VTU record, even though Priority override is enabled on the port. **.**

4.6.5 EMM settings

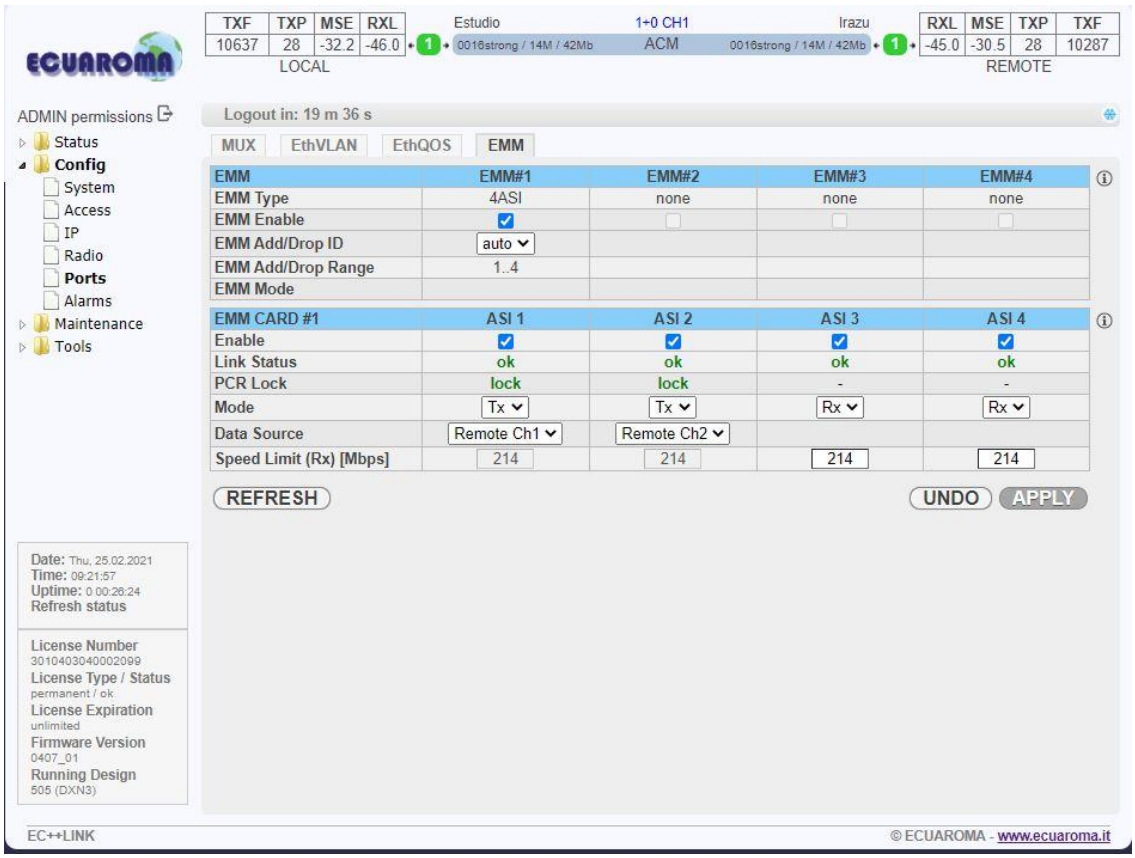


Figure 54: Ports parameters setting – GUI page „Ports / EMM”

EMM configuration is basically used for the control and management of EMM-ASI module. Its basic configuration in mandatory when ASI flux needs to be transported over the EC++Link system.

The EMM configuration is available from GUI page “*Ports / EMM”* (Figure 54).

4.6.5.1 Description of particular setting and display boxes – EMM SETTING

The monitoring and setup of EMM cards basic functions.

- ***EMM Type*** – it displays the type of connected EMM card. The 'none' type indicates that particular position is empty, the 'RELAY-SYS' indicates that the relay IDU is connected directly to device's SFP port (relay application) or to EMM secondary SFP port (add/drop configuration).
- ***EMM Enable*** – this check box enables generation/reception of data frames to/from Fiber Optic stream. When EMM is enabled then EMM occupies an appropriate range of traffic port channels (described below).
- ***EMM Add/Drop ID*** – In auto mode EMM card occupies port-channel range according to its position in EMM chain. For Add/Drop application it is sometimes necessary to set different (manual) Add/Drop ID, especially when EMM card should drop port channels from specific Add/Drop range.
- ***EMM Add/Drop Range*** – it displays appropriate port-channel range according to the EMM card position and EMM Add/Drop ID setting.
- ***EMM Mode*** – it selects the mode of connected EMM 16E1T1 card, if eventually present.

Settings for EMM-4ASI

- ***Enable*** – this checkbox selects which ASI ports are configured for DVB ASI connection. The necessary link capacity is automatically allocated according to the amount of all ASI Rx streams.
- ***Link Status*** – it displays the actual status of ASI port
  - **In Rx mode:**
    - **ok** - a valid ASI signal is presented at the appropriate input port
    - **ok** - a valid ASI signal is presented at the appropriate input port, but the port is not enabled for traffic application.
    - **Idle** - ASI signal detected and successfully synchronized, but the signal does not contain user data (MPEG stream is missing).
    - **Idle** - ASI signal detected and successfully synchronized but the signal does not contain user data (MPEG stream is missing) and the particular port is not enabled for traffic application.
    - **noSync** - indicates that synchronization was not established for current receiving ASI signal.
    - **noSync** - indicates that synchronization was not established for current receiving ASI signal and the port is not enabled for traffic application.
    - **loss** - no signal detected at ASI input port.
    - **loss** - no signal detected at ASI input port and the port is not enabled for traffic application.
  - **In Tx mode:**
    - **ok** - a valid inbound signal is presented and transmitted via appropriate ASI port.
    - **ok** - a valid inbound signal is presented, but the port is not enabled for transmission.
    - **Idle** - the low-level code is detected, but the MPEG code was lost in the service.
    - **Idle** - the low-level code is detected, but the MPEG code was lost in the service, and the particular port is not enabled for traffic application.
    - **noSync** - high-level MPEG code was not detected.
    - **noSync** - high-level MPEG code was not detected, and the particular port is not enabled for traffic application.
- ***PCR Lock*** – in Rx always 'lock', in Tx:
  - **lock** – PCR recovery loop is locked
  - **noLock** – PCR interval is not guaranteed
- ***Mode*** – specifies if the particular port operates in Rx (ingress from coaxial cable) or Tx (egress to coaxial cable) mode.
- ***Data Source*** – specifies the source for Tx signal. Either remote ASI port (Remote CH1-4) or one of available local ASI Rx port (Local Ch1-4) can be chosen. This setting is available in Tx mode only.
- ***Speed Limit*** – maximal data rate for inbound traffic to avoid overloading of overall link capacity. This setting is available in Rx mode only.

4.7 IP configurations.

In respect of management access type it is possible to use either the local connection via LAN 3 port which is connected to the Ethernet switch and it is interconnected by default with the port ETH 0 on management CPU or via USB B port which is connected directly to the management CPU over port USB 0. Other IP ports on the CPU are primarily used for management interconnection with a remote IDU.

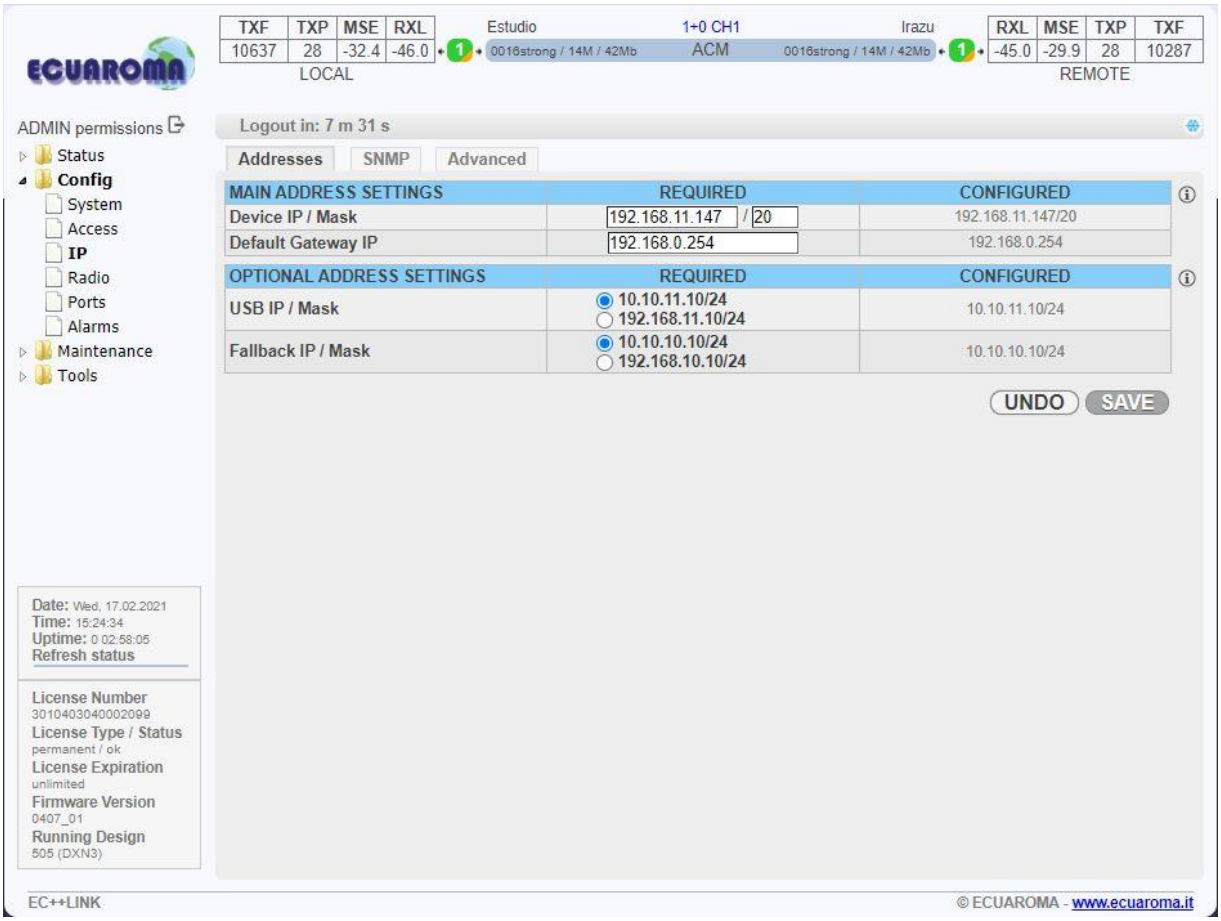


Figure 55: IP parameters setting – GUI page „IP / Address"

4.7.1 Basic IP addresses assignment.

Every device in the local network has its own and unique primary IP address. Thanks to this IP address it is possible to access each equipment in your network. While setting-up the IP address, pay attention to the configuration which needs to follow general IP addressing rules (IP address, IP netmask, IP gateway). Customer has to ensures that correct IP addresses are assigned and configured for all units in the microwave network. It is recommended to prepare short block scheme of all IDUs interconnection in such microwave network and select appropriate model for IP addresses setting according to the required type of IP management access (in-band /out- of -band).

The basic IP setting should be done during installation process. We recommend checking and update again all parameters at all IP pages. These parameters must be entered for each IDU according to the management block scheme.

4.7.1.1 Description of particular setting and display boxes

Primary IP / Mask – IP address assigned to local port ETH0 with appropriate netmask specification. Netmask value is entered in form of decimal number which corresponds to number of ones in binary subnet

mask presentation. Such net-mask for subnet mask 255.255.255.0 is presented as decimal number 24. Local network has its own and unique primary IP address.

Gateway IP – Gateway IP address is used with CPU when connection outside IP range defined in system routing table is required. Such IP address must be a part of above mentioned routing table. Routing table can be checked on page "*IP / Route/NAT*"

Unnumbered IP mode – This Checkbox Define if local RFI1/2 can have a unique assigned IP

Local A IP (rfi1) – When enabled this value to define local RFI IP address for RFI1. This is only enabled if Unnumbered IP mode is unchecked.

Local B IP (rfi2) – When enabled this value to define local RFI IP address for RFI2. This is only enabled if Unnumbered IP mode is unchecked.

Single Remote IP mode – This Checkbox Define if remote RFI1/2 have been assigned a unique IP

Remote A IP (over RFI1) – Such address specifies a remote unit IP connected over RF link for RFI1. Such address is necessary for automatic message exchange between these IDUs and also for correct out- of- band management functionality. Subnet mask is not required for this IP specification, because ppp protocol is used.

Remote B IP (over RFI2) – IF enabled such address specifies a remote unit IP connected over RF link for RFi2. This is only enabled if "Single Remote IP mode" is unchecked.

All IP settings are applied in two steps.

Temporary configuration IP file is changed with pressing <APPLY> button, but setting changes are not immediately applied to the running system. After the button press an intermediate confirmation window appears. There are two possible ways how to proceed.

When <Continue> button is pressed, then the user prefers to continue with IP changes (static routes, NAT, advanced IP setting, SNMP, ...). There is a reason for such selection because it is recommended to apply all IP changes in one step. Any change in the temporary configuration IP file is indicated by means of warning message in the status line at each IP page.

Complete IP changes will be immediately applied to the running system with pressing <Write and Apply> button in intermediate window.

NOTE: IP CONFIGURATION CHANGES DO NOT CAUSE DATA DROP IN THE USER TRAFFIC.

4.7.2 IP Advanced settings.

For a specific configuration of management access it is sometimes necessary to add/change/delete static routes or NAT records. This is especially required for Out of band type of management access. To edit these parameters noticed above GUI page *"IP / Route/NAT"* must be selected (Figure 66).

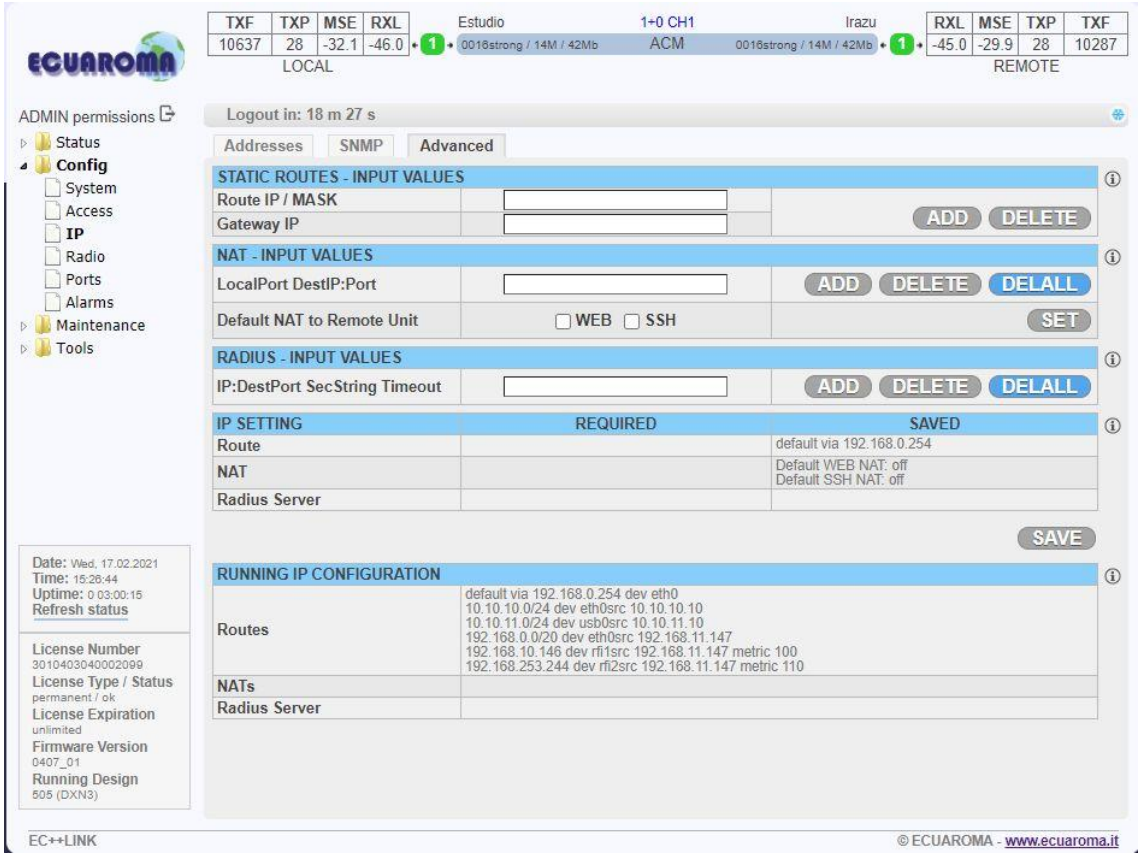


Figure 56: IP parameters setting – GUI page „IP / Address

Each static route and/or NAT record must be entered separately. The same confirmation window as for IP address configuration appears after each record input erase. The <Continue> button should be pressed for proceeding with any other IP settings. The button <Write and Apply> should be selected for applying all IP settings to running system after last record input (when other IP configuration is not required).

4.7.2.1 Description of particular setting and display boxes – Static Routes

Routed IP / MASK – The IP address from routed network and the appropriate network mask must be entered. Routed network range is calculated from entered values.

Gateway IP – The correct IP address gateway for above network must be entered.

The <ADD> button is used for entering new route into the routing table, the <DELETE> button for deleting record from the routing table.

NOTE: IT IS NOT REQUIRED TO FILL IN THE GATEWAY IP ADDRESS WHEN RECORD FROM THE ROUTING TABLE SHOULD BE DELETED.

4.7.2.2 The description of particular setting and display boxes – NAT – INPUT VALUES

LocalPort DestIP:Port – The NAT record must be entered in the form of following command:

local_port destination_ip: port.

local_port – The number of a port on local IP which is used for address translation, it must be followed with space character.

destination_ip – IP address of destination/remote unit.

port – Port number of service at destination/remote IP.

Example: 1080 192.168.4.101:80.

The <ADD> button is used for entering a new NAT record into the NAT table, alternatively the <DELETE> button for deleting record from the NAT table. Optionally the <DELALL> button can be used for deleting all NAT records in one step.

4.7.2.3 Routing Table and NAT table checking

It is possible to compare Routing and NAT tables of running system (ACTUAL) with records in temporary configuration file (CONFIGURED) in the section SETTING.

There are displayed only added routes and NATs compared to default setting in the column CONFIGURED. This section should contain default gateway record in minimum, because this one is a member of the same definition file as other static routes. There are additionally displayed static routes generated internally with the system core in the column ACTUAL. There is a small difference in form of records in CONFIGURED and ACTUAL columns.Any difference between actual and configured IP setting is indicated in the status line on all IP pages with an alert message "IP settings are not currently applied – press APPLY button".

The user can compare both sections also visually, when detailed analysis is required.

4.7.3 SNMP settings.

SNMP management can be set on GUI page *"IP / SNMP"* (Figure 67).

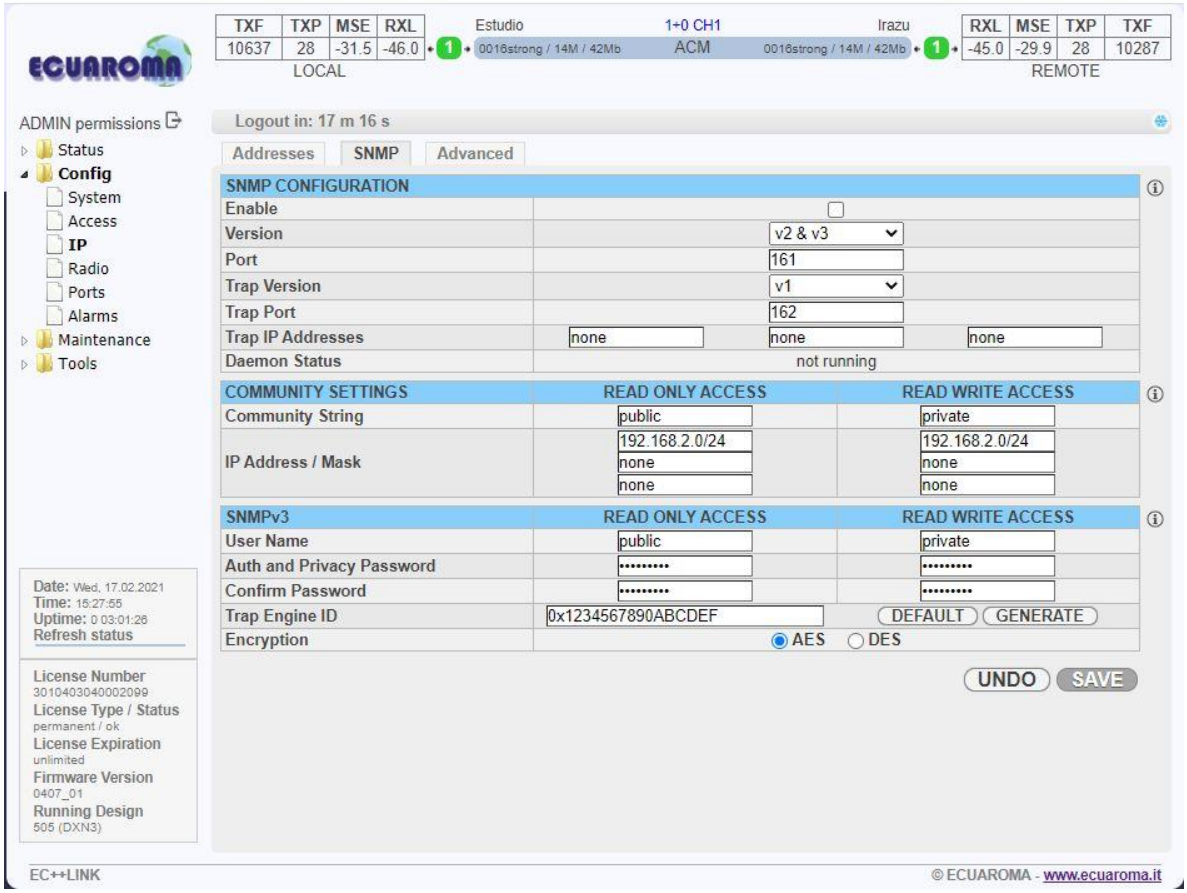


Figure 57: IP parameters setting – GUI page „IP / Address

4.7.3.1 Description of particular setting and display boxes

SNMP Enable – This checkbox define if SNMP is enabled or not

SNMP Version – This box display/define supported SNMP version

SNMP Port - This parameter specifies which port will be used for SNMP type messages. The same configuration must be set also at SNMP agent station

Trap Port – This parameter specifies which port will be used for SNMP trap type messages. The same configuration must be set also at SNMP agent station.

Trap Address – Up to three IP addresses can be configured as destination for SNMP trap distribution. Trap message events are configured in the same way as the alarm setting.

4.7.4 Advanced IP settings.

The advanced IP section makes it possible to change extended IP configuration which usually remains in default state. This can be sometimes necessary for support of specific management modes. Advanced management setting is accessible on GUI page *"IP / Advanced"* (Figure 68).

4.7.4.1 ADVANCED ADDRESS SETTING

USB IP/MASK – It specifies IP address for USB management port. When default IP address for this port is in collision with other network configuration, it can be changed with this parameter.

Secondary IP/MASK – It specifies secondary IP address for ETH 0 management port. When default IP secondary address is in collision with other network configuration, it can be changed with this parameter.

4.7.4.2 FILE TRASFER

FTP/USB Server – When "usb" is written into this box the USB - A port is used as destination/source interface for backup and/or restore IDU configuration. When box is filled in with ftp://IP/directory_structure/ an external FTP server is used as destination/source address for backup and/or restore IDU configuration.

4.7.4.3 REMOTE TIME SERVER

Server Type – Two types of time server can be specified for a time synchronization: ntp or rdate. The most useful setting is ntp mode. When "none" is selected, no time synchronization is required. when ntpds is selected then the unit operates as NTPD reference server. Time at remote units can be synchronized with this unit.

Server IP – It specifies a remote time server IP when ntp or rdate mode are selected in the box Server Type.

4.8 Counters

In this section there are system counter useful for system goodness evaluation and for advanced system troubleshoot/evaluation. This is done in the Count section.

4.8.1 Basic Counters

In this section are displayed basic receiving counters such as (figure 65):

- Received FEC blocks
- Corrected FEC blocks
- Uncorrected FEC blocks
- Uncorrected FEC blocks in the last second
- Global FEC rate since last counter reset
- Actual FEC rate
- Time from last uncorrected error in seconds
- Time between uncorrected errors in seconds
- Elapsed time with error free state
- Elapsed time with errored state

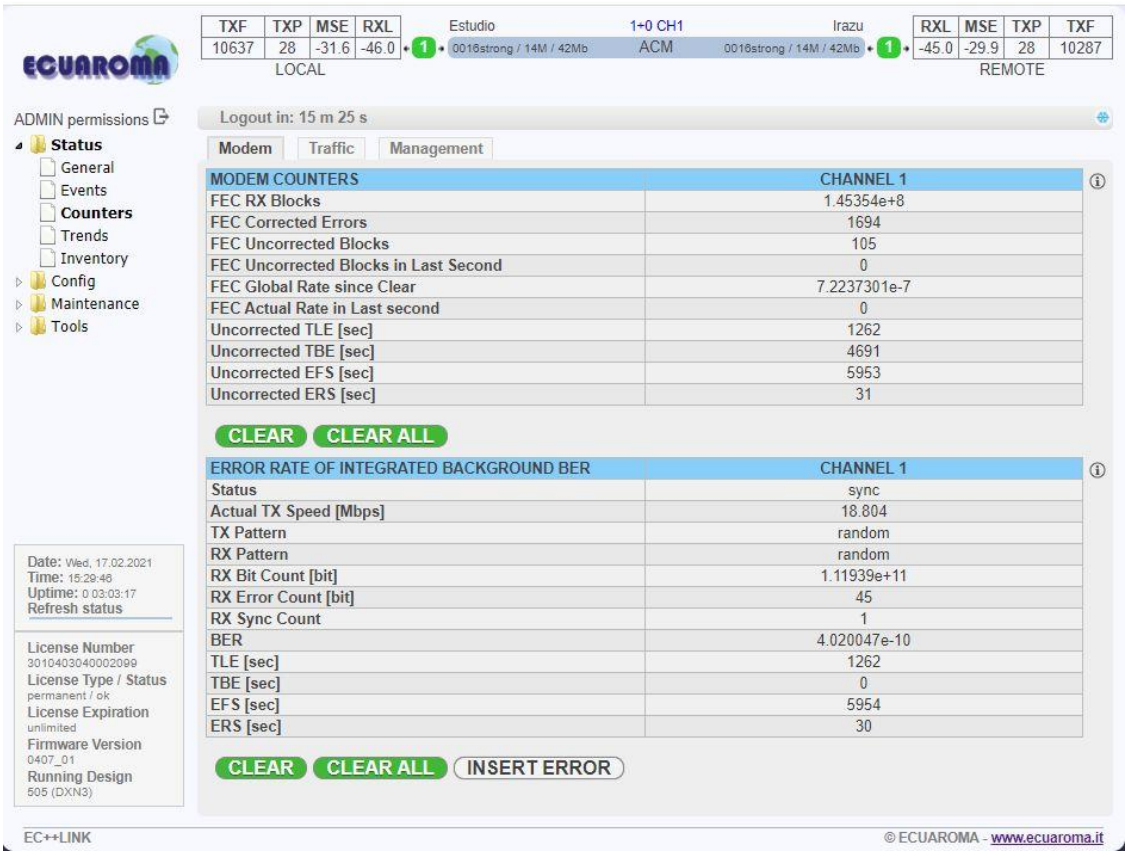


Figure 58: Counters – GUI page „Counters / Modem"

4.8.2 Bit Error Rate Counter

In this section are displayed all the bit error rate counter statistic and data (figure 65):

4.8.2.1 The description of display boxes

Status – This box define if receiving is locked. Possible values are sync and loss.

Act. Tx Speed [Mbps] – This box show actual BER band used for the measurement. This is automatically allocated

Tx Pattern – This box define pattern type for transmission used for BER measurement.

Rx Pattern – This box define pattern type for receiving used for BER measurement.

Rx Sync Count – Number of sync loss from last counter reset

BER – Bit Error Rate from last counter reset

TLE – Elapsed time from last error received in seconds

TBE – Time between 2 consecutive error are received

EFS – Elapsed time in seconds were no error were received

ERS – Elapsed time in seconds were at list one error was received

4.8.3 Ethernet Counter

In this section are displayed all the relevant Ethernet counter counters such as and not only(figure 70):

- Unicast frame Transmitted/Received
- Multicast frame Transmitted/Received
- Broadcast frame Transmitted/Received
- Errored frames
- Total frame Transmitted/Received
- Frame dived by size

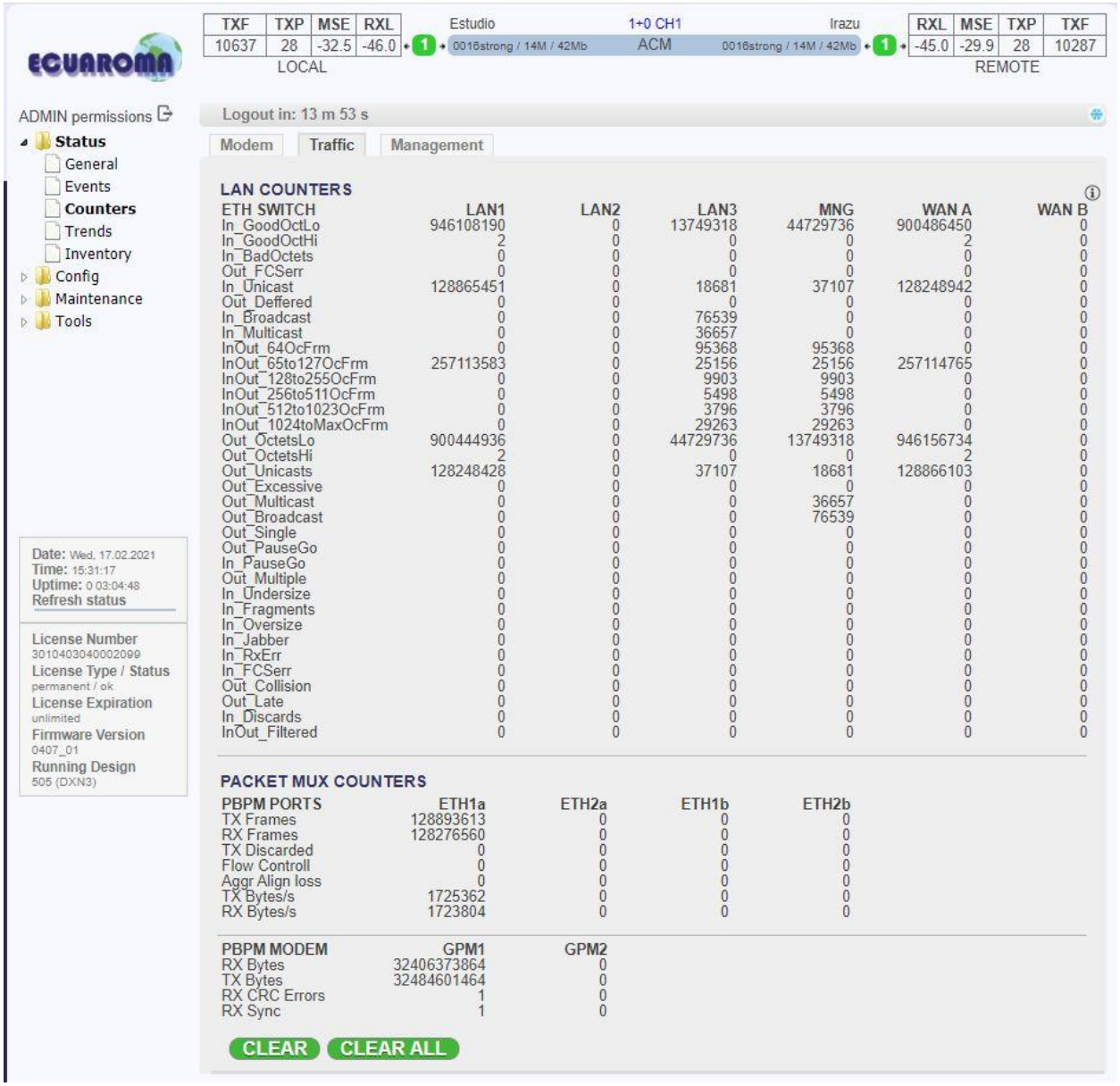


Figure 59: Counters – GUI page „Counters / Traffic"

4.8.4 Management Counter

In this section are displayed all the relevant management counter counters (figure 71):

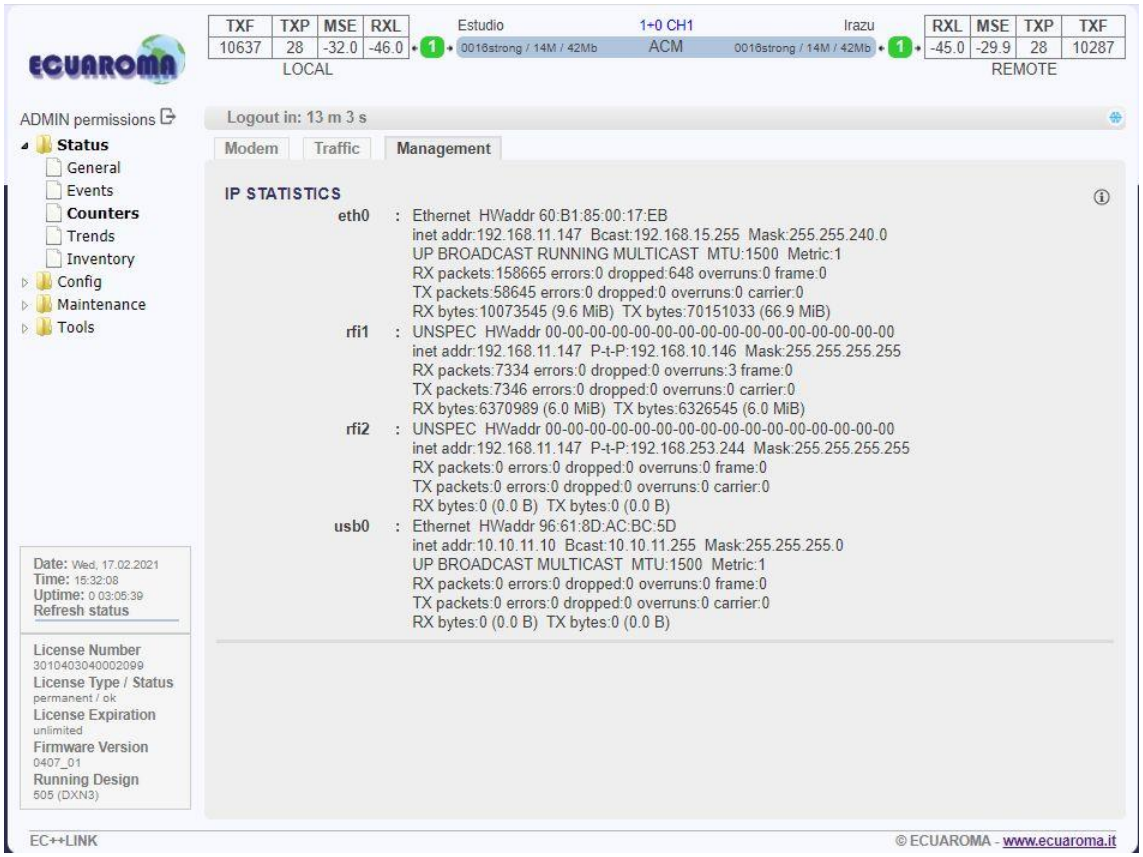


Figure 60: Counters – GUI page „Count / Ethernet”

4.8.5 Graphs

In this section are displayed various graph recorded from the time the user activate them (figure 73):

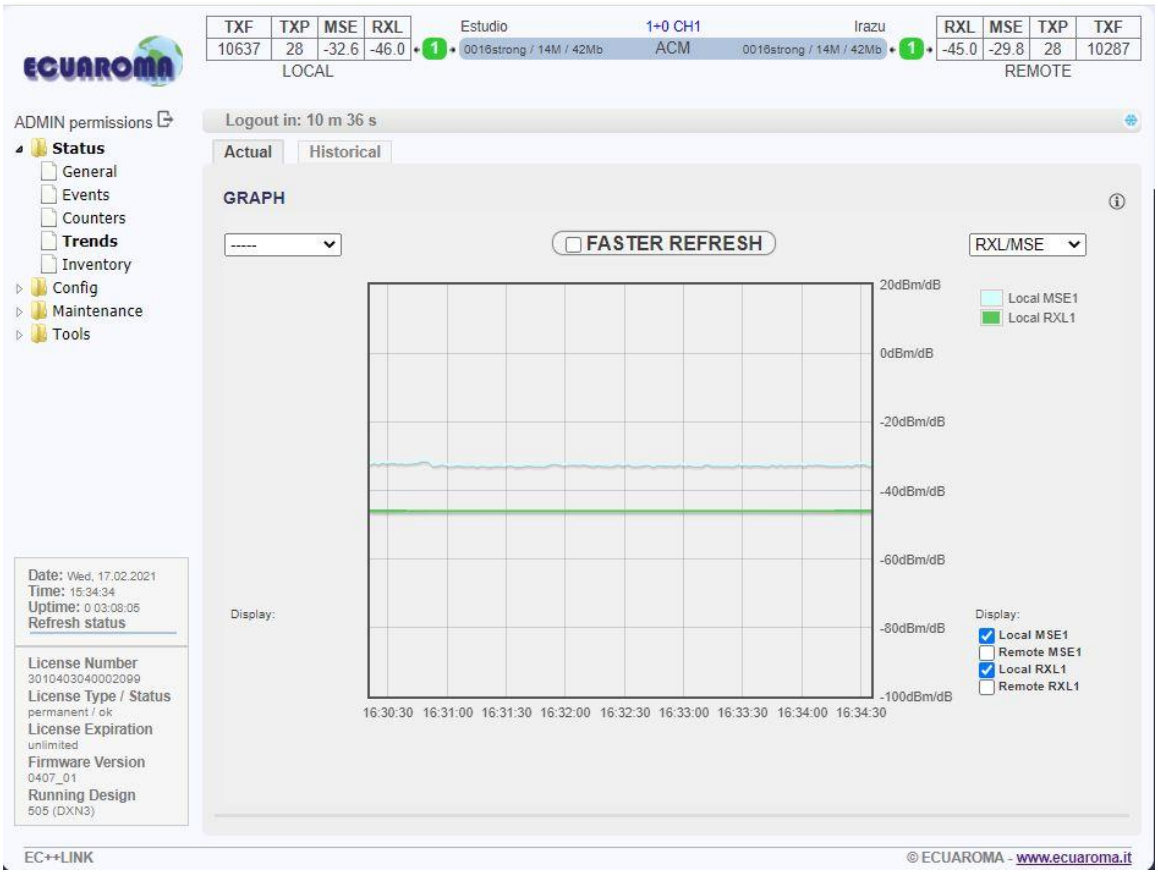


Figure 61: Counters – GUI page „Trends / Actual"

Two graphs can be displayed at a time and possible graph are:

- MSE variation
- Temperature Variation
- ACM power variation
- Receive level Variation
- ETH traffic Received/Transmitted variation
- Sync loss / Error received variation

4.9 Maintenance and advanced system configuration.

4.9.1 Saving the configuration.

In order that the configured and modified link parameters are valid even after the equipment is power cycled (or after device restart), the new configuration must be saved first. The button <WRITE> is available on each GUI page. Red background of the button <WRITE> indicates that the actually running configuration is not saved in the start-up memory yet. An intermediate window appears after the write button press (Figure 74). User can select if a configuration for local unit or both local and remote units must be stored. .

Figure 62: Confirmation page

When the configuration is properly saved, it is possible to write actual configuration also into optional memories (W1-W3). This operation saves actual settings as alternative configuration for subsequent quick restoration of such configuration scheme with relevant RUN W0 – RUN W3 button click (Figure 75).

Button <RETURN TO PREVIOUS PAGE> in the right bottom corner of GUI page helps to quick return to the previous active page.

ATTENTION: MAKE SURE THAT ALL MODES WORK PROPERLY AND REMOTE ACCESS TO IDU IS STILL POSSIBLE BEFORE START-UP MEMORY SAVING. THE AUTOMATIC RESTORE FUNCTION CANNOT RETURN TO THE STATUS BEFORE START-UP MEMORY SAVING THEN.

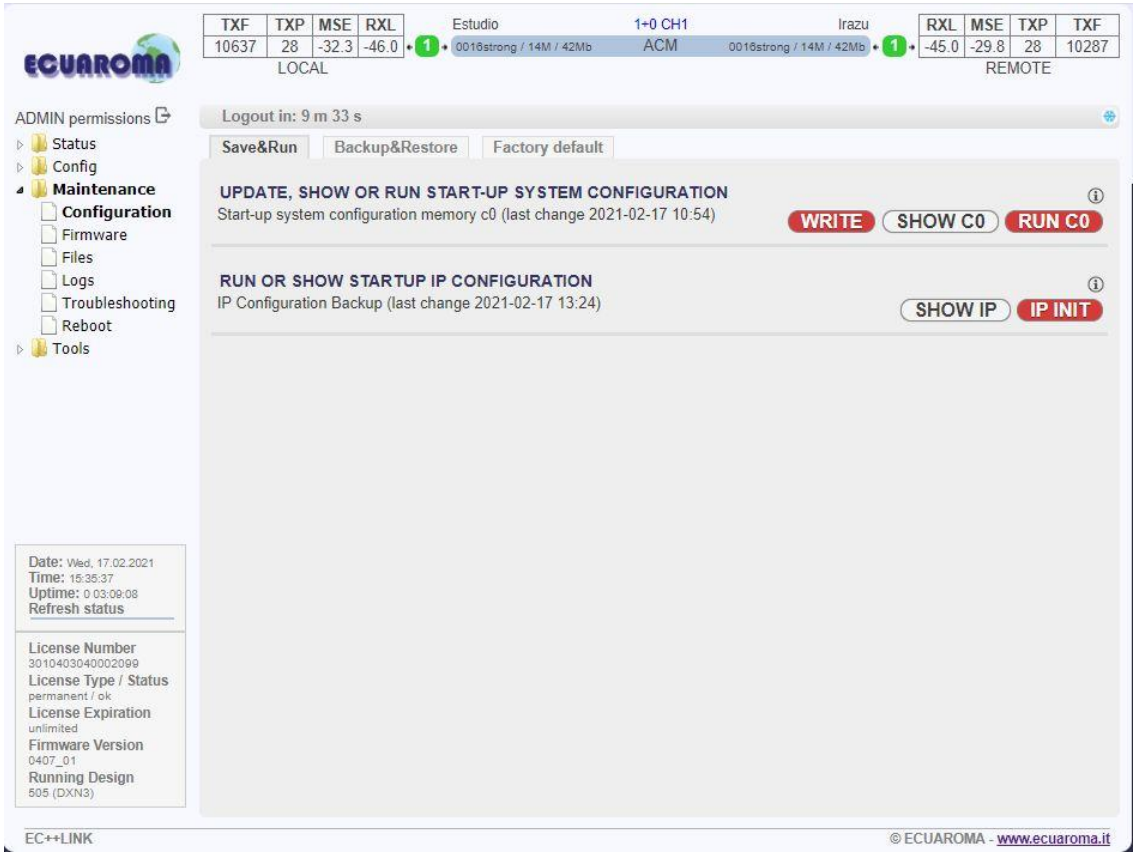


Figure 63: Maintenance – GUI page „Maitenance / Config"

4.9.2 Configuration backup and export.

It is recommended to make a backup of complete IDU configuration for an eventual system fault. In order to guarantee quick system repair or units replacement this backup configuration should be stored on reliable medium.

The access to backup process is available from GUI page *"Maintenance / Files"* (Figure 76).

4.9.2.1 Backup procedure

A description of recommended steps for the backup configuration follows:

Login over web browser with ADMIN rights.

Save currently running configuration with WRITE button, which is available on each GUI page. Then the start-up memory will contain the actual configuration.

Select Save Config checkbox in section FILES and press GENERATE.

Press right mouse button on fwconf_xxx_xxx.afw file, and select destination for this file and save it.

The configuration is now saved in your PC and alternatively in USB memory stick.

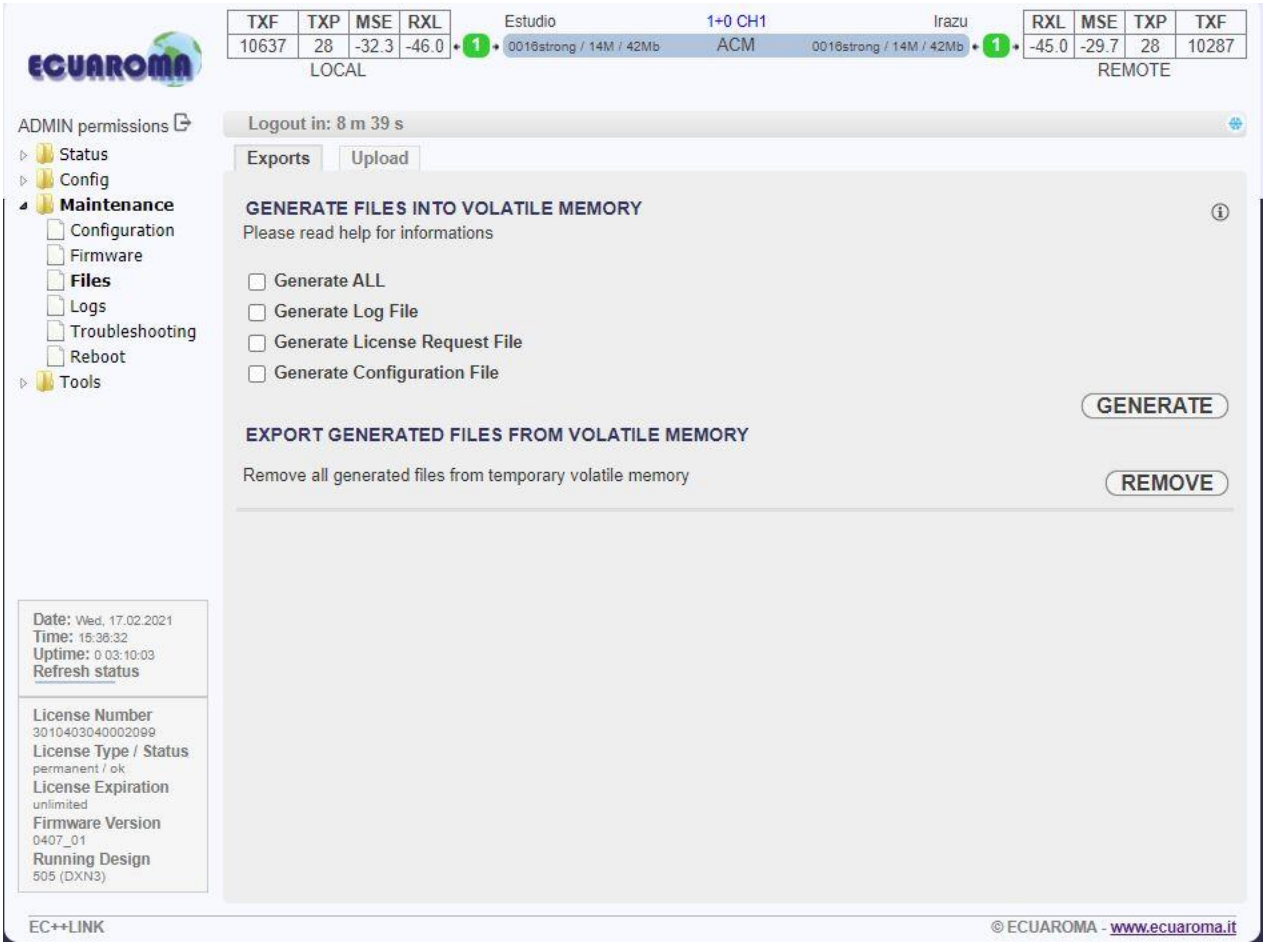


Figure 64: Maintenance – GUI page „Maitenance / Files"

A detailed description of other settings available on this GUI page follows:

4.9.2.2 FILES

It is possible to select what files are going to be generated for subsequent backup in the section FILES.

Save Log – Compressed log files in tar gzip form usually used for troubleshooting purposes.

License Request – A copy of License File in encoded form. This can be used for subsequent generation of new license by your representative. This file prevents any mistakes in defining what active license is loaded in the IDU.

Save Config – This encoded file contains the complete backup configuration of IDU. When this file is uploaded into another IDU, then all original system settings and configurations are replaced with this backup configuration.

The required files will be generated for next processing after pressing of the button GENERATE.

When a USB memory stick is attached into USB A port and USB is defined as a destination for the file transfer, then the same files will be saved also to USB memory. Generated files are visible in available files section. The save dialogue window will appear after pressing the right mouse button, then the individual files can be saved to selected destination. Name of each file is the combination of a file identifier, IDU_SN and actual time mark.

4.9.3 Firmware and License upgrade.

Firmware and license upgrade is available in ADMIN mode only.

We recommend verifying the loaded version of firmware in the IDUs before upgrading or updating the license of microwave link. It is possible that the IDU with older FW does not recognize the new designs, options or functions contained in new license key and will not run properly.

Both Firmware and License upgrade are available from GUI page *"Maintenance / Upgrade"* and use the identical update process. An intermediate window will appear after selection of this page.

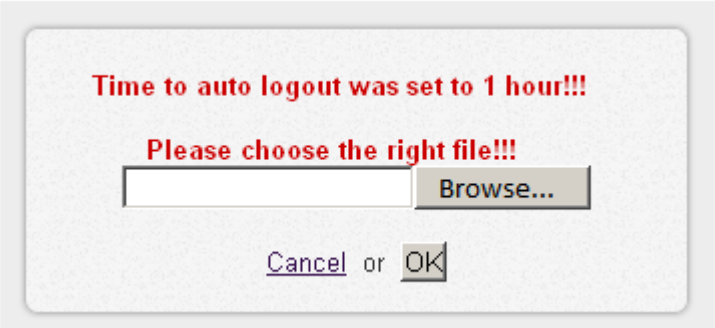


Figure 65: Upgrade intermediate window

4.9.3.1 License Upgrade

Proper license file must be selected and confirmed by OK button. Upgrade process is then monitored at processing window. New license is active after one of next events:

New license is checked by selection GUI page General/License.

New modulation is selected.

When periodical license update loop is over (once per 6 hours).

4.9.3.2 Firmware Upgrade

IDU firmware is divided into four sections in dependence on their functions. For every firmware release it is not necessary to update all the parts, but only these ones which are different comparing to the newest version. There is basic firmware parts description in the following text.

hwbase.afw – software for internal HW parts.

oskernel.afw – operating system.

***d*ev.afw** – drivers for OS.

fwbase.afw – application software (WEB, SNMP, commands , etc.).

Assistance packages are also contained in every firmware release.

checkversions.afw – This package compares the firmware version in IDU with the newest version and prints the info what parts are necessary to upload.

fw_all.afw – First of all this package compares the current version of firmware in IDU with the newest version and then automatically upload the different parts.

4.9.3.3 The description of recommended steps for firmware update

Login over web browser with ADMIN rights.

Save currently running configuration by WRITE button, which is available on each GUI page. Then the start-up memory will contain the actual configuration.

Compare currently running versions of each firmware parts (o*s_kernel, os_dev, hw_base* and *fw_base*) with the newest version by one of two below given steps.

manually compare data shown in a folder *"General / Info"* with the new version of description file *version.txt*.

Open the folder *"Maintenance / Upgrade"*, select package *checkversions.afw* and use the print-out for information, what parts should be upgraded.

Next choose one of the following steps.

Select the file *fw_all.afw* from the provided SW package. The whole file will be uploaded into the device, system compares the different versions and writes the different parts of the firmware into flash memory.

!! This procedure isn't suitable for slow access to IDU management !!

Step by step select the files *hwbase.afw, oskernel.afw, dev.afw* and *fwbase.afw* in this order (if there is not necessary to upload any part, please continue with another file) and wait for the process completion.

After the last file upload.

Restart the device from the folder *"Maintenance / Advanced"* with pressing button REBOOT.

!! During restart there is a data drop for about 20 secs !!

Login again with ADMIN rights and update start-up memory configuration with the newest functional setting available in the newest firmware. Save the new configuration with WRITE button, which is available on each page.

Make a new IDU initialization from the start-up memory. Select *Run_W0* on the page *"Maintenance / Config".*

!! During initialization there is data drop for about 5 secs !!

New firmware is now properly installed in the IDU.

4.9.4 Maintenance basic Troubleshoot.

From this GUI section a basic troubleshoot of the system is performed (figure 79)

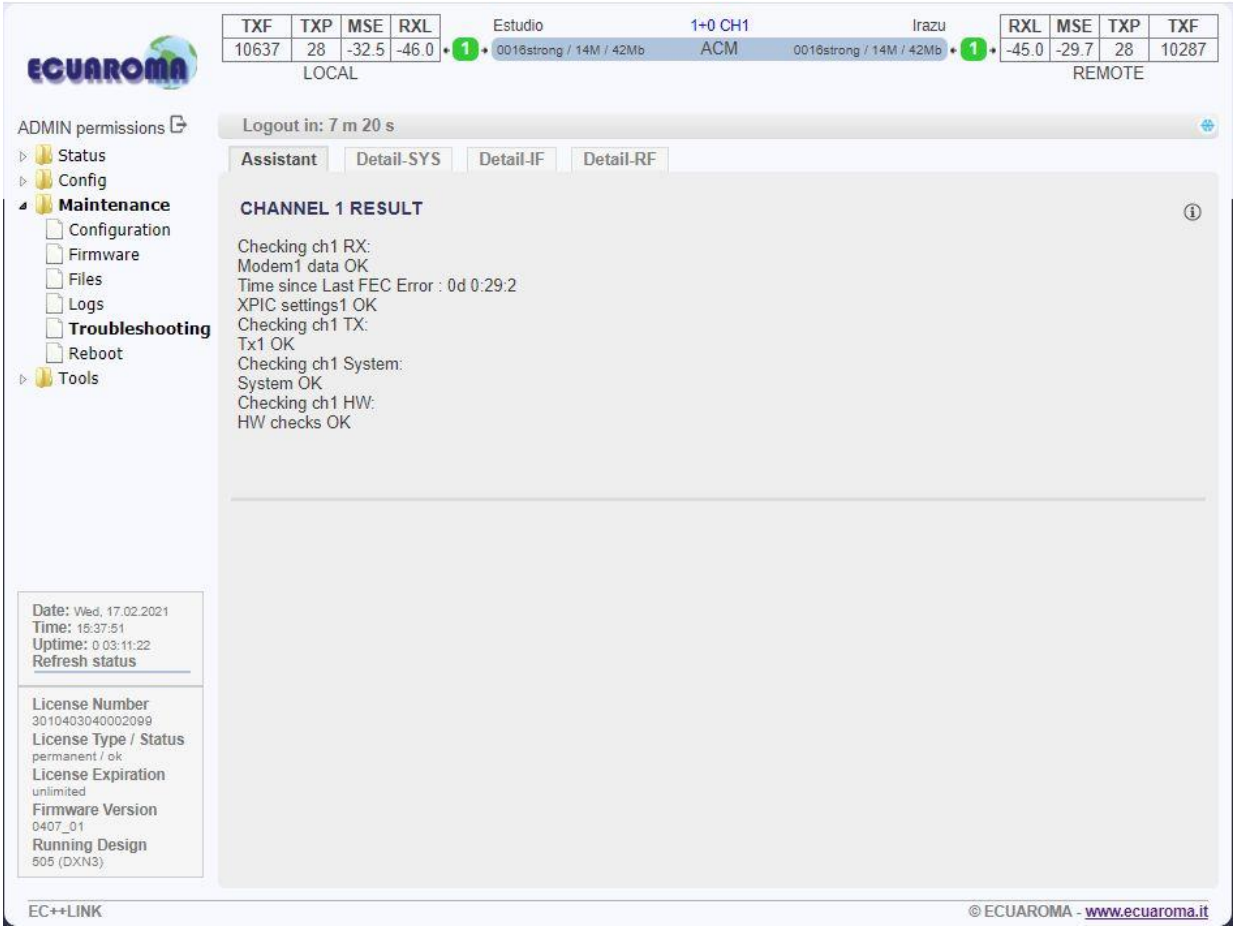


Figure 66: GUI page „Maintenance / Troubleshoot”

Chapter 5 - System Application

5.1 1+0 Single mode

- Basic point to point microwave link configuration
- Remote unit in either 1+0 Single or 1+0 Dual function
- Maximal throughput up to 630 Mbps

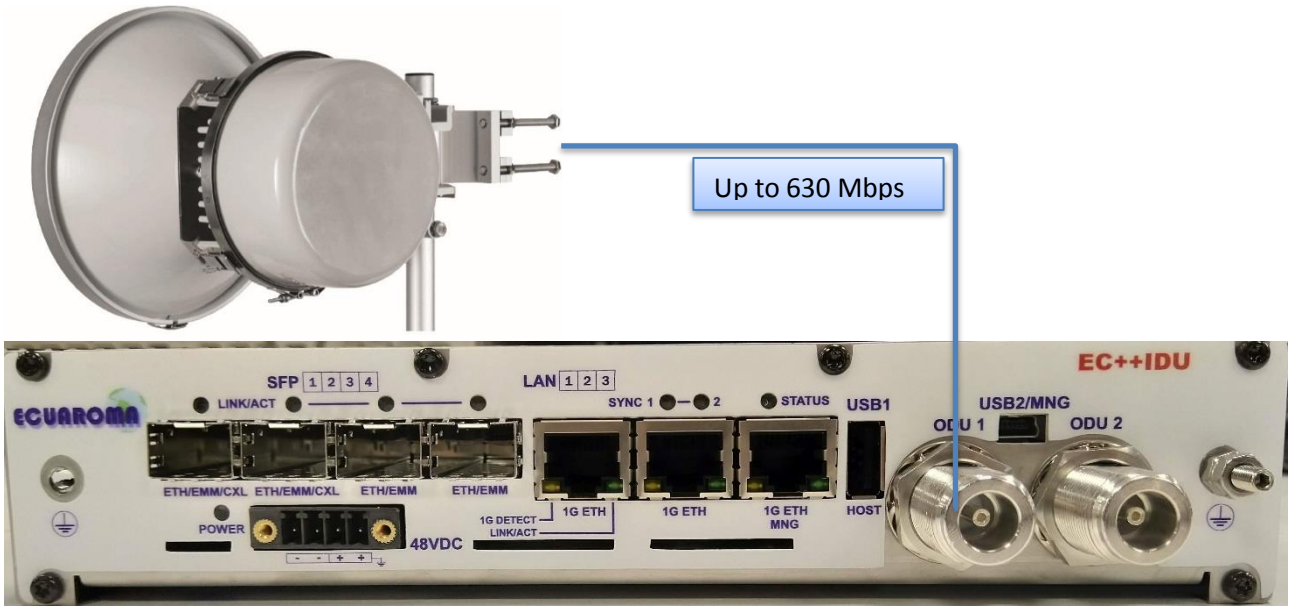


Figure 67: 1+0 Single Mode

5.2 General.

Table 4: System Parameters

Item	Parameter	Value
Frequency	Operating frequency range	6 to 42 GHz
	Frequency plans	According to CEPT/ITU-R recommendations
	T/R spacing	According to CEPT/ITU-R recommendations
Modulation	Modulation schemes	QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM and 1024QAM
	ACM	Hitless adaptive modulation
	ETSI Bandwidths	7/14/28/56/80 MHz
	ANSI Bandwidths	10/20/25/30/40/50/60/80 MHz
Transmission	Capacity allocation	Priority based packet system (PBRS) gen.3
	Path configuration	*CX1 with design 505* • 1+0 ch1 *CX1 with design 511* • Split 1+1 FD/HSB/SD protection *CX2 with design 505* • 1+0 ch1, 1+0 ch2, 1+0 dual (star topology) • 2+0 FD/XPIC aggregation • 1+1 FD/HSB/SD/XPIC protection *CX2 with design 511* • Split 1+1 FD/HSB/SD protection • Split 2+2 XPIC&FD/HSB/SD aggregation & protection
	Forward error correction	Reed Solomon with Weak/Medium/Strong modes
	Compression function	Online Ethernet L1 header compression
	Data Security	AES-128/256 Encryption
	Max. Real Data Throughput	Up to 1.26 Gbps in 2+0 mode at 80MHz channel

5.3 IDU Specification.

Table 5: IDU Traffic Interfaces

Item	Parameter	Value
1000Base-T	Number of Ports	3x (RJ-45). 4x SFP (1000BaseSX/LX)
	Basic function	user traffic interface/management
	VLAN	Up to 4096 VLANs, IEEE 802.1q
	QoS	Source Port, IEEE 802.1p, IPv4 TOS/DSCP, IPv6 TC, VLAN VID, SA/DA
	MAC table	up to 8192 addresses
	Maximum Frame Size	Up to 2048 / 10240 bytes
EMM-16E1/T1	Number of Ports	16 (16xRJ-45)
	Interface	G.703-E1 120/75 ohm for E1 mode. T1.102-T1/100 ohm for T1 mode
	Coding	HDB3 for E1mode, B8ZS for T1 mode
	Speed	2.048 Mbps for E1 mode, 1.554Mbps for T1 mode
	IDU interface	4x SFP 1000Base-SX (proprietary GIGE protocol)
EMM-ASI	Number of Ports	4xTx / 3xTx&1Rx / 2xTx&2xRx / 1xTx&3xRx / 4xRx
	Interface	4x BNC (DVB-ASI)
	Coding	8B/10B, MPEG-2 TS
	Speed for ASI channel	8-216 Mbps
	IDU interface	4x SFP 1000Base-SX (proprietary GIGE protocol)

Table 6: Ethernet traffic parameters

Item	Parameter	Value

Item	Parameter	Value
ETH Compression efficiency (L1)	64Byte Frames	Max. 21.5% from available ETH speed
	512Byte Frames	Max. 2.9% from available ETH speed
	1518Byte Frames	Max. 0.3% from available ETH speed
L1 Throughput 256QAM/56MHz Medium FEC	64Byte Frames	477.3 Mbps
	512Byte Frames	387.8 Mbps
	1518Byte Frames	375.0 Mbps
L1 CT Latency 256QAM/56MHz Medium FEC	64Byte Frames	82.1 usec
	512Byte Frames	100.9 usec
	1518Byte Frames	141.3 usec

5.4 Network Management System.

Table 7: Management Parameters

Item	Parameter	Value
Ports	Main NMS ports	ETH port LAN-3
	Additional NMS ports	USB-B in IP mode USB-B in serial mode
NMS form	Protocols	HTTP, HTTPS, SNMP v1/v2c./v.3, TELNET, SSH
	In-Band management	via VLAN
	Out-of-Band management	115 kbps
IP addresses	Addresses type	Primary IP/ Secondary IP / RFI / USB
	Additional function	Static Routes, NAT, Ping, Telnet
GUI	Type	WEB based
SNMP	Version	SNMP v1, SNMP v2c, SNMP v3
	Read access	Complete MIB
	Write access	Subset of link parameter

Item	Parameter	Value
Security	Licenses	Time limited / permanent
	Access levels	guest/user/admin with password security

5.5 Miscellaneous.

Table 8: Miscellaneous

Item	Parameter	Value
IDU Mechanical	Dimensions [w x h x d]	210 mm x 44 mm x 240 mm
	Weight	2.2 kg
	Protection	IP31 (EN 60529)
ODU Mechanical	Dimensions [w x h x d]	278 mm x 92 mm x 239 mm
	Weight	4.3 kg
	Protection	IPx6 (EN 60529)
Input Voltage Level	IDU	-20 VDC up to -60 VDC
	ODU	-30 VDC up to -60 VDC
Consumption	IDU only	*CX1 modification* • < 22 W (all ports connected) *CX2 modification* • < 30 W (all ports connected)
	ODU only	< 35 Watts
	IDU+ODU	*CX1 modification* • < 47 W (all ports connected) *CX2 modification* • < 55 W (all ports connected)
	IDU and 2x ODU (standard)	< 85 W (with CX2)
	Maximum ODU current	up to 1.9 ADC
Operational Conditions	IDU Temperature	-5° to +45°C
	IDU Humidity	0 to 95%, Non-condensing
	ODU Temperature	-33° to +55°C

Item	Parameter	Value
	ODU Cold Start	Operational at -45˚C, not guaranteed all specification
	ODU Humidity	0 to 100%

5.6 Antennas.

Table 9: Antenna Gain (Arkivator)

Gain	Ant. diameter	6 [GHz]	7 [GHz]	8 [GHz]	11 [GHz]	13 [GHz]	15 [GHz]	18 [GHz]	23 [GHz]	26 [GHz]	38 [GHz]
dB	30 cm	-	-	-	-	29.5	32.1	33.3	34.4	36	39
	60 cm	-	30.5	31.1	33.4	34.9	36.5	38.8	39.8	40.6	43.7
	90 cm	-	-	-	38	-	-	-	-	-	-
	120 cm	-	36	36.7	40.1	41.4	42.3	43.7	45	45.4	-
	180 cm	-	40.7	41.2	-	45.5	46.2	48.1	-	-	-

Table 10: Antenna Dimension (Arkivator)

Antenna type	Parameter	Value
30 cm	Dimension [size x depth]	371 x 143 mm
	Weight with Mast mount	6,6 kg
60 cm	Dimension [size x depth]	614 x 208 mm
	Weight with Mast mount	9,8 kg
90 cm	Dimension [size x depth]	910 x 350 mm
	Weight with Mast mount	13,4 kg
120 cm	Dimension [size x depth]	1260 x 410 mm
	Weight with Mast mount	41,5 kg
180 cm	Dimension [size x depth]	1800 x 945 mm
	Weight with Mast mount	117 kg

5.7 Accessories.

Table 11: External Power Supply Parameters

Power supply	85 VAC - 240 VAC
Input power	48 VDC ± 5%
Input frequency	47 Hz – 63 Hz
Operation temperature	0°C – 40°C

Power supply	85 VAC - 240 VAC
Protection	Surge and power guard, short-circuit protection
EMI	EN55022, EN55024
Dimensions H x W x D (cm)	3,7 x 6,5 x 16,7

Table 12: Basic parameters of H1000 PE cable

Impedance	50 Ω
Cable diameter	10,3 mm
Operation temperature	-40°C - +80°C
Min. temperature for installation	-5 0C
Min. bend radius	75 mm
Weight	120 (g/m)

Chapter 6 - Abbreviation list.

AGC	automatic gain control on RF cable.
AIS	continual sequence of ones on E1 data according to norm.
ANEG	auto negotiation - automatic speed and duplex set-up on LAN ports.
ATPC	automatic control of output power at ODU on the basis of Rx level at remote unit.
ATU	table of MAC addresses.
BER	bit error rate (from last clearing).
EFS	error free seconds.
ERS	error seconds.
FER	Frame Error Rate (per minute).
HWADDR	MAC address of eth interface.
IDU	Compact Indoor Unit.
MDIX	configuration for wires crossover on LAN ports.
MSE	dispersion of dots from ideal location in I/Q diagram after demodulation. The sharpest the dots of status diagram are – the better.
MUX	data multiplexer (aggregating of several parallel streams into one serial stream and back).
NAT	network address translation – translation of IP addresses (and ports).
ODU	Outdoor Unit.
PBPS	packet multiplexer.
RFI	RF interface – interface towards PBPS.
RSL	received signal level in dBm.
RSSI	received Signal Strength Indication – received signal strength in mV, measured on BNC outdoor unit connector.
SNMP	Simple Network Management Protocol – protocol for remote system management.
TBE	time between errors.
TLE	time since last error occurrence.
VLAN ID	VLAN number.
VLAN	virtual LAN – the possibility to create more logical networks on one physical medium.
VTU	table of rules for VLANs.
W0-3	names of memories in device (W0 is boot memory).