Section 4.
LINE-UP

9   LINE-UP OF ALFOPLUS

9.1   GENERAL

The line-up consists of the following steps:

- switch on the equipment
- alarm leds check
- connection procedure
- equipment configuration (through PC software)
- optimizing antenna orientation
- check of Ethernet connections
- quality evaluation with performance monitoring

Operations involving the use of SCT/WebLCT are roughly described here. For further details please refer to software manual.

9.2   SWITCH ON

Checks to be performed before switching on the unit are:

- check external power supply voltage
- antenna presence - check the connection between ODU output flange and antenna.

If everything is correct, switch on the ODU.

9.3   ALARM LED CHECK

On the rear panel of ODU unit there is a transparent plastic window to see the status of an internal LED dedicated to show unit alarms. Further information about ALFOplus alarms can be found onto Section 5. MAINTENANCE.

9.4   CONNECTION PROCEDURE

Connection between PC and ALFOplus can only occur if the IP address of the PC and the radio belong to the same subnet and it can be made directly or through a switch on the LAN2 connector.

Using **Subnetwork Craft Terminal (SCT)** (you know IP address):

1. press button **Options**, a window will open; select card **Connection**

2. select **Connect using local area network** (see Fig.77)

3. press **OK** and **Connect**

4. type the equipment IP address stored previously (Factory Default are 172.20.254.14/16 ODU L and 172.20.255.15/16 ODU H)

   - Default User: SYSTEM

   - Default Password: SIAEMICR

5. after connection it's possible to modify IP address, etc.....

Using **WebLCT console (WLC)** (you know IP address):

1. add the IP address of radio in the LAN address book (see Fig.81)

2. press double click over the IP address to open the browser.

Rescue connection using SCT (you don't know IP address)

1. Assign a static IP address (see Fig.78) to PC (172.20.253.14/255.255.0.0)
   ALFOplus rescue IP address: 172.20.253.13
   ALFOplus rescue subnetwork mask: 255.255.0.0

2. Connect your PC directly to ALFOplus with a LAN cable

3. By SCT, connect using Local Area Network, press **connect** button, type equipment user/password and press **RESCUE** button (see Fig.79)

4. Follow the instructions of rescue login (see Fig.80)

5. In "Rescue Connection" mode it is possible to set or recover the values for management access:

   - Agent IP Address in *General Info*, menu **Equipment Properties**

   - IP Address in *Ethernet*, menu **Port Configuration**

   - InBand/Out of Band LAN1/LAN2 in *Supervisioning*, menu **Port Configuration.**
   Warning: the supervisioning configuration is applied immediately, instead IP address and Subnet-mask requires apply store and restart.
   Warning: in Rescue modality is allows only modify the menu "Port Configuration" and "Software Info & Maint. This modality cannot be use to change Radio or Ethernet parameters.

Rescue connection using WLC (you don't know IP address)

1. Assign a static IP address (see Fig.78) to PC (172.20.253.14/255.255.0.0).
   ALFOplus rescue IP address: 172.20.253.13
   ALFOplus rescue Subnetwork Mask: 255.255.0.0

2. Connect your PC directly to ALFOplus with a LAN cable

3. By WLC, press the arrow down near the button connect and press "Rescue connection" (see Fig.81)

4. Type equipment user/password and follow the instructions of rescue login (see Fig.82)

5. In "Rescue connection" mode it is possible to set or recover the values for management access:

   - Agent IP Address in *General Info*, menu **Equipment Properties**

   - IP Address in *Ethernet*, menu **Port Configuration**

   - InBand/Out of Band LAN1/LAN2 in *Supervisioning*, menu **Port Configuration**

   Warning: the supervisioning configuration is applied immediately, instead IP address and Subnet-mask requires apply store and restart.

   Warning: in Rescue modality is allows only modify the menu "Port Configuration" and "Software Info & Maint. This modality cannot be use to change Radio or Ethernet parameters.

Rescue connection using "Command Prompt" (you don't know IP address)

1. Assign a static IP address (see Fig.78) to PC (172.20.253.14/255.255.0.0)
   ALFOplus rescue IP address: 172.20.253.13
   AFOplus rescue Subnetwork Mask: 255.255.0.0

2. Connect your PC directly to ALFOplus with a LAN cable

3. By command prompt, type "ping 172.20.253.13 -t" and press **Enter**.

4. Restart hardware ALFOplus

5. Wait till the ping reply, open Internet Explorer, type in the URL: 172.20.253.13 and press **F5** until the login menu appears

6. In rescue connection mode it is possible to set or recover the values for management access:

   - Agent IP Address in *General Info*, menu **Equipment Properties**

   - IP Address in *Ethernet*, menu **Port Configuration**

   - InBand/Out of Band LAN1/LAN2 in *Supervisioning*, menu **Port Configuration.**

   Warning: the supervisioning configuration is applied immediately, instead IP address and Subnet-mask requires apply store and restart.

   Warning: in Rescue modality is allows only modify the menu "Port Configuration" and "Software Info & Maint. This modality cannot be use to change Radio or Ethernet parameters.

Emergency connection (you don't know IP address)

1. Connection between PC and ALFOplus with serial console cable (F03594) in auxiliary connector

2. using Hyperterminal - serial COM at 115200bps, 8bits, none parity, 1 stop bit, no flow control and press "Enter" button to access in the login

3. after login will be shown the radio IP address

4. type "Config" if you want to change the boot parameters (IP address, etc...)
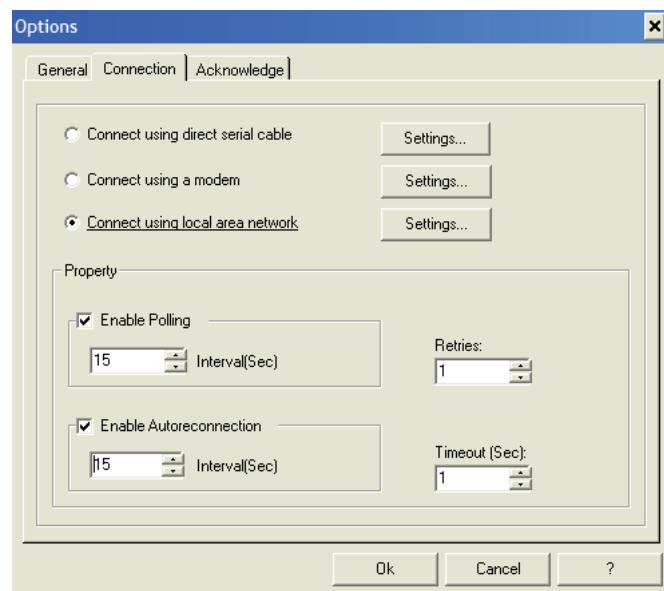
Fig.77 - Connection option
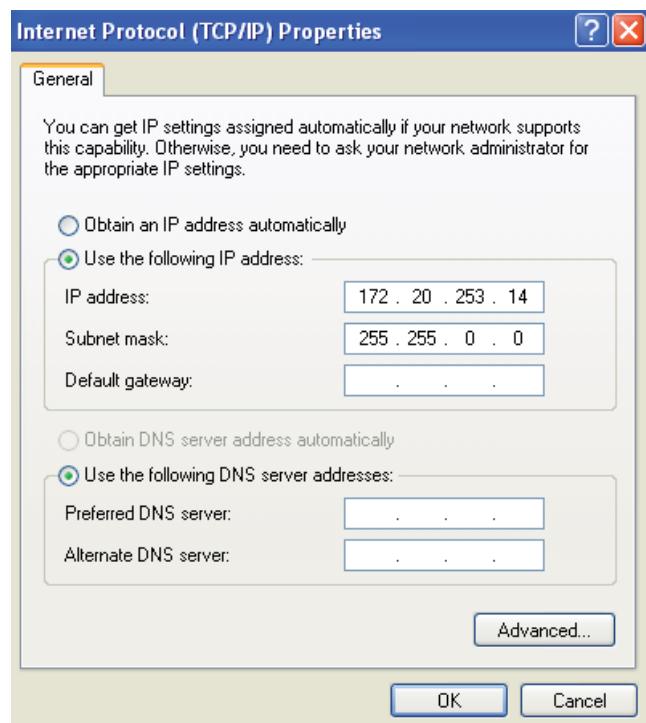
Fig.78 - IP address setting
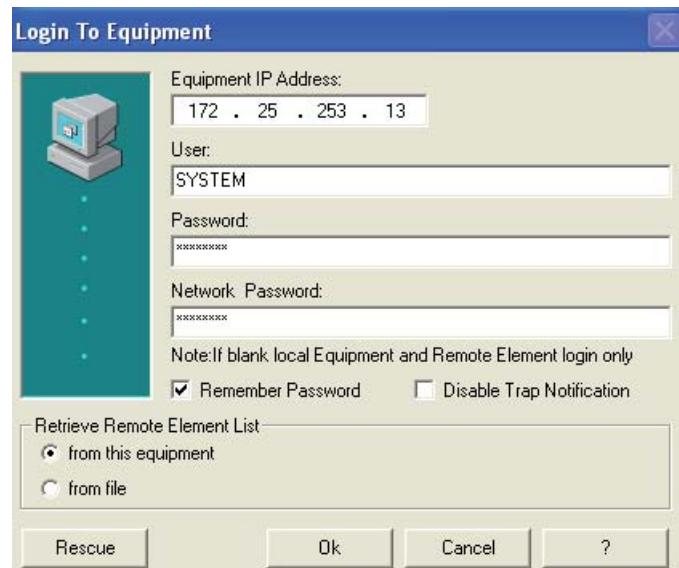
Fig.79 - Login connection using SCT
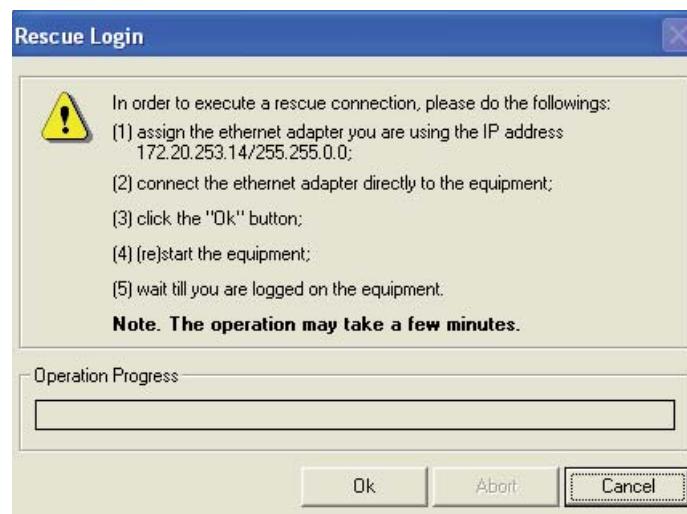

Fig.80 - Rescue login using SCT
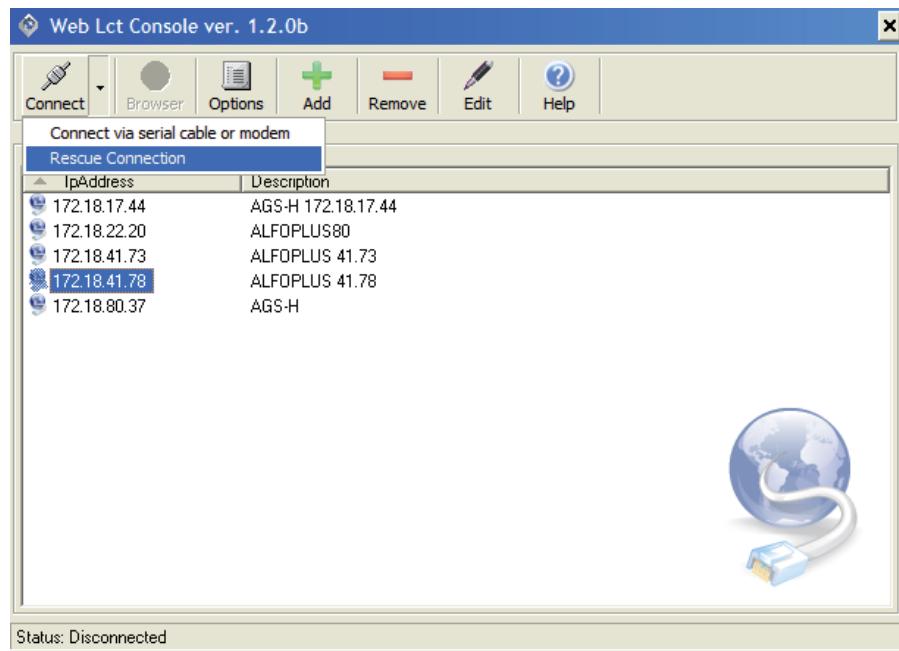
Fig.81 - Web LCT console
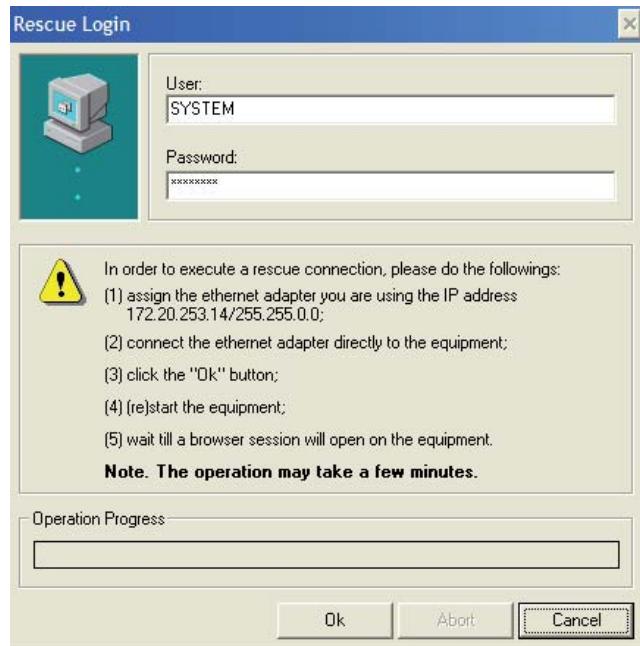
Fig.82 - Rescue connection using WLC

9.5   INITIALIZATION PROCEDURE

To activate a radio link it is necessary to program the ODU (local and remote side) in some basic items listed in the following:

- bandwidth & modulation
- Tx frequency & power
- port configuration
- agent IP address and equipment ID
- store routing table
- remote element list
- restart equipment

Bandwidth and Modulation setting

See Fig.83.

Into WebLCT at position:

- **Equipment menu**
- **Equipment - BW & MOD/LINK ID**
- In **Capacity and Modulation** card, you can select **Bandwidth&Modulation** desired. Press **Apply** and **Confirm**
- Enable or disable **ACM Engine**, if you want dynamic modulation. Press **Apply** and **Confirm**

Warning: Use the same parameters on remote unit.
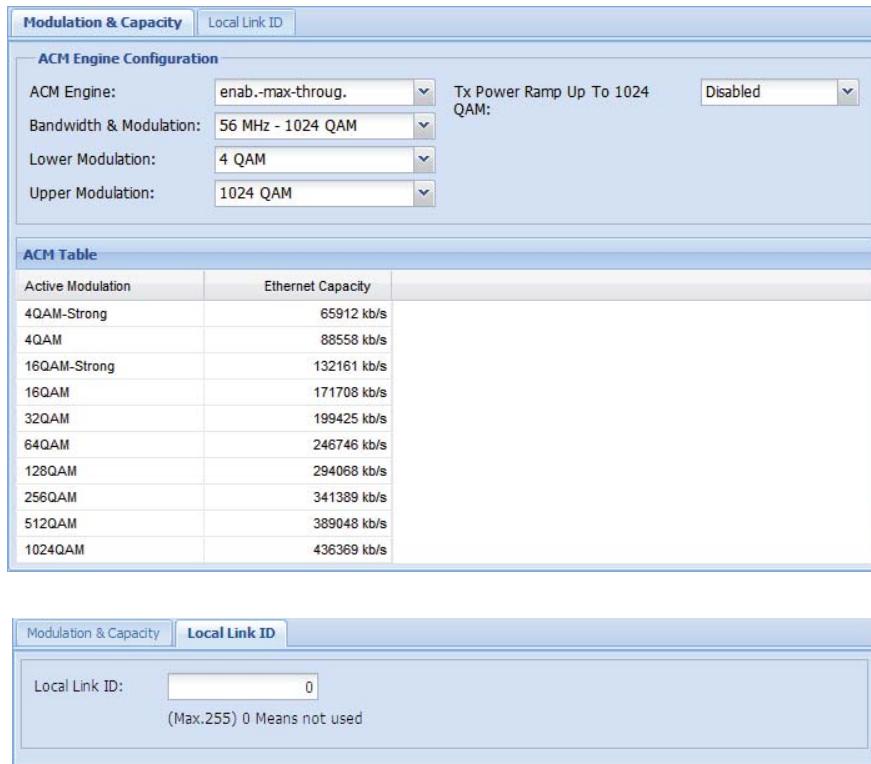
Fig.83 - Bandwidth&Modulation, Local Link ID

Tx frequency setting

See Fig.84. Into WebLCT at position:

- **Equipment menu**
- **Radio Branch**
- **Settings** card: in this card you have to select Duplex frequency and Tx frequency; Rx frequency value is shown in the top status bar and is set automatically. Press **Apply** and **Confirm**.

Local Tx frequency must be set equal to remote Rx frequency.

24GHz band is a not licensed band and duplex frequency has no fixed values.

Warning: Remember that the whole radio link can work only if ODUs chosen for local and remote side have equal sub-band and different Tx module (example of permissible pair ODU 1H and ODU 1L).

Tx power setting

See Fig.84. Into WebLCT at position:

- **Equipment menu**
- **Radio Branch**
- **Powers** card: in this card you have to set Tx power equal to radio planning value or if you do not know it to maximum Tx power; in this card it is possible to enable automatic transmission power control but it is important to set properly ATPC thresholds: Rx Level Min, Rx Level Max (see paragraph 7.1.7 ATPC and ACM interaction). Press **Apply** and **Confirm.**

Warning: Use the same parameters at remote ODU.
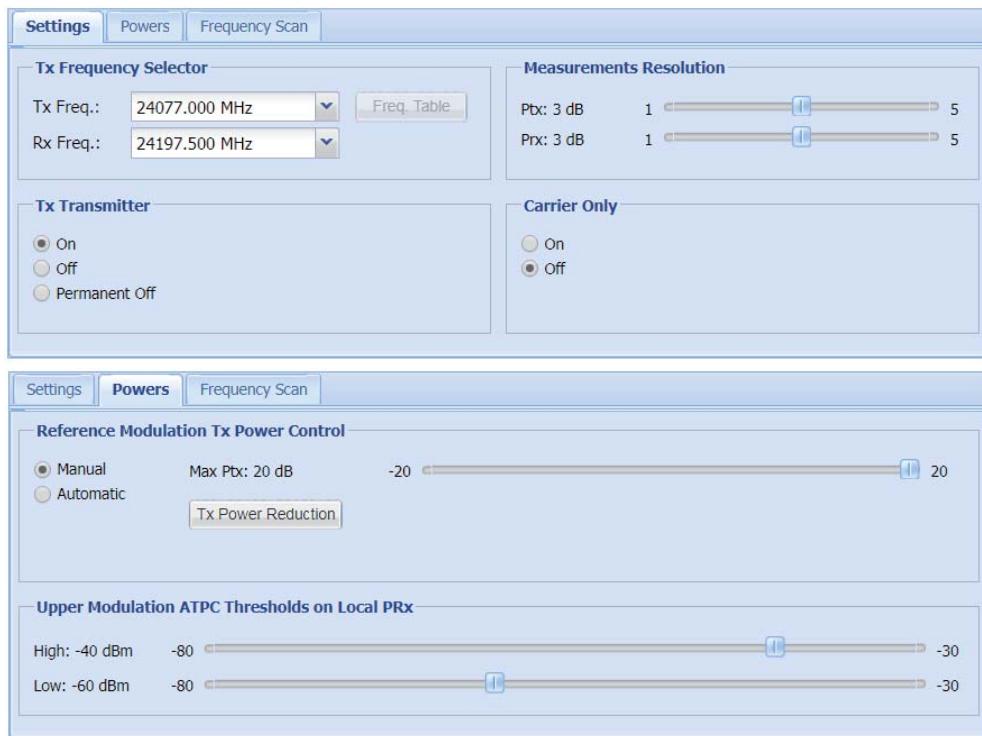
Fig.84 - Frequency and power setting

Port configuration setting

See Fig.85.

Into WebLCT at position:

- **Equipment menu**

- **Main** - **Port configuration**

- In **Ethernet** card you can modify the IP address, netmask and supervisioning parameters. Press **Apply** and **Confirm**. Press **Store** and **Confirm**.

Warning: the supervisioning configuration is applied immediately, instead IP address and Subnetmask requires apply store and restart.

Warning: for remote radio management change port settings in "Out of Band" or "Drop Node" or "In Band" on both sites.

Fig.85 - Port configuration

## Agent IP address setting

See Fig.86.

Into WebLCT at position:

- **Equipment menu**
- **Main** - **Equipment properties**
- In **General Info** card, change the **equipment ID** and **agent IP address** equal to Ethernet IP address. Press **Apply** and **Confirm**.

Fig.86 - Equipment properties

Store routing table setting

See Fig.87.

Into WebLCT at position:

- **Equipment menu**

- **Main** - **Store routing table**

- Type the default gateway IP address and select **Lan Interface** and/or add manually the routing command.

- Press **Apply** and **Confirm**. Press **Save** and **Confirm**.

Destination	Net Mask	Hop	Interface	Protocol

Add | Remove | Retrieve | Save | Default Gateway: 172.18.0.1 | Lan | Apply | Delete
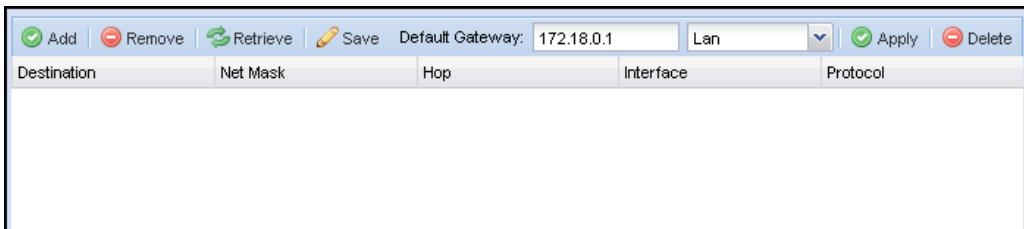
Fig.87 - Store routing table

Remote element list setting

See Fig.88.

Into WebLCT at right position:

- Press the button to expand Remote Element List window

- **Clear** and **Apply** new list

- Add station, type "SIAE LINK" and press **OK**

- Select the station just created and add local element:

    - IP address: type local radio IP address

    - type of element: managed by SCT

    Press **OK**, **Apply** and **Confirm**.

- Add remote element:

    - IP address: type remote radio IP address

    - Type of element: Remote link

    Press **OK**, **Apply** and **Confirm.**

Restart equipment

See Fig.88.

Into WebLCT at position:

- **Equipment menu**

- **Main** - **Equipment properties**

- Press the button **Restart Equipment** and **Confirm**.
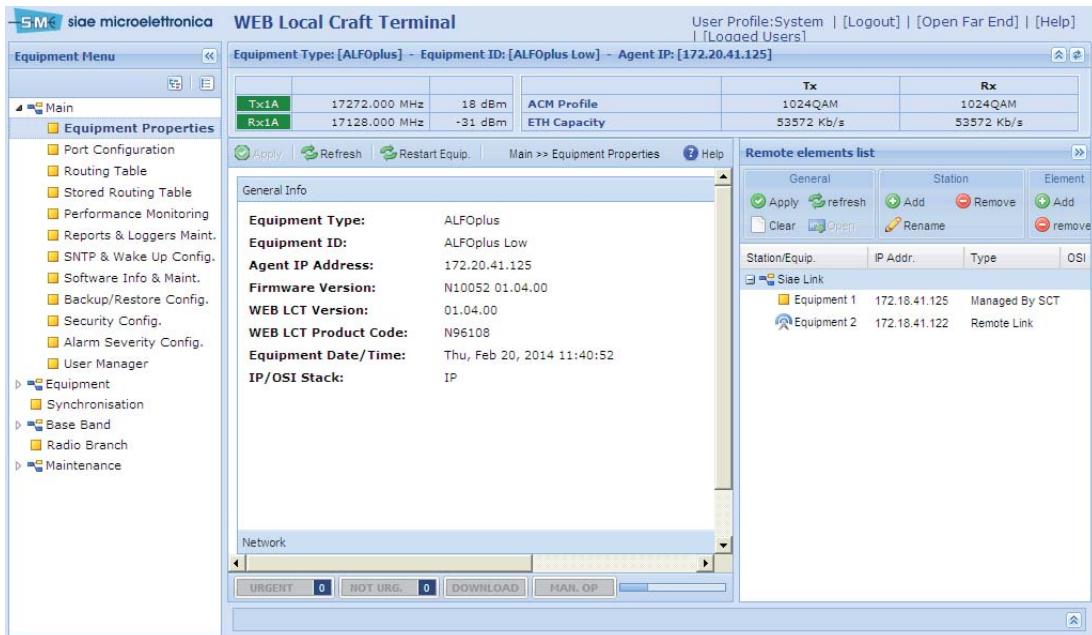
Fig.88 - Remote element list

9.6 OPTIMIZING ANTENNA ALIGNMENT WITH RX MEASUREMENT

When the whole radio link is on, antenna alignment can be optimised. Antenna alignment optimization is performed depending on the Rx signal power at local and remote equipment and evaluating both local and remote S/N value maximizing them.

There are two possibilities to see the Rx signal power level:

- through WebLCT interface
- through a voltmeter connected to Auxiliary connector on the ODU (F03608 cable - see Fig.51).

In order to get the Rx signal power level via software, connect the PC to ALFOplus (LAN2) and start the communication towards the ODU microcontroller with SCT/WebLCT supervisory program.

Into WebLCT is shown in the top status bar (Rx1A=-value dBm) see Fig.88.

If you're using a voltmeter the Rx signal power level is available on the auxiliary connector of ODU, the measurement can be performed with a proper cable (see Fig.51).

Following this last procedure, the voltage you're reading with the voltmeter is proportional to Rx power level, refer to Tab.21.

Tab.21 - Voltage measured in auxiliary port

Received Signal (dBm)	Signal Output (V)	Error (dB)
-20	4.68	±5
-30	3.51	±5
-40	2.34	±3
-50	1.17	±3

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-60	0	±3
-70	-1.17	±3
-80	-2.34	±3
-90	-3.51	±5
-100	-4.68	±5

Formula	RSSI=Offset + (Signal Output)/Slope
Slope (V/dB)	0.117
Offset (dBm)	-60

Typical Rx signal power level: ≥-40dBm. It is the most important item to optimise the antenna alignment, but in a situation of interference Rx level can be good, BER acceptable but S/N margin low. This means that when Rx fields will decrease then BER will increase fast. The situation can be easily shown with SCT/WebLCT software looking at Signal Quality level.

Into WebLCT Software select:

- Equipment menu

- Maintenance

- S/N Meas. card (see Fig.90)

The S/N at nominal Rx level, read by means of WebLCT, must be ≥38dB @1024QAM (typical S/N: 39dB) (see Fig.90).


**Fig.89 - WebLCT radio link status**

Fig.90 - S/N measurement

Antenna aiming

Antenna aiming devices allow to perform the following adjustments with respect to the starting aiming position:

- horizontal ± 15° operating on the nut (3) shown in Fig.91, only after having loosen the nuts (7), (8), (9), (10) of Fig.92.

- vertical ± 15° operating on vertical adjustment worm screw (2) shown in Fig.91 only after having loosen nuts (1), (2), (11) of Fig.92 and (4) of Fig.91
For adjustment from 0° to +30° extract nut (1) Fig.92 and position it in hole (4), extract nut (2) Fig.92 and position it in hole (6). Operate on vertical adjustment worm screw (2) after having loosen nuts (1), (2), (11) of Fig.92 and (4) of Fig.91.

For adjustment from 0° to −30° extract nut (1) of Fig.92 and position it in hole (3), extract nut (2) of Fig.92 and position it in hole (5). Operate on vertical adjustment worm screw (2) after having loosen nuts (1), (2), (11) of Fig.92 and (4) of Fig.91.

For vertical adjustment some markers, every 10°, are available on support. The bigger marker gives 0° starting aiming position. Once the optimum aiming position is obtained, tighten firmly the four nuts (1), (2), (11) of Fig.92 and (4) of Fig.91 for vertical adjustment and the four nuts (7), (8), (9), (10) of Fig.92 for horizontal adjustment. Tighten with 15 mm wrench and 32 Nm torque.

- grounding The grounding can be connected with the available bolt spring washer and flat washers as shown.
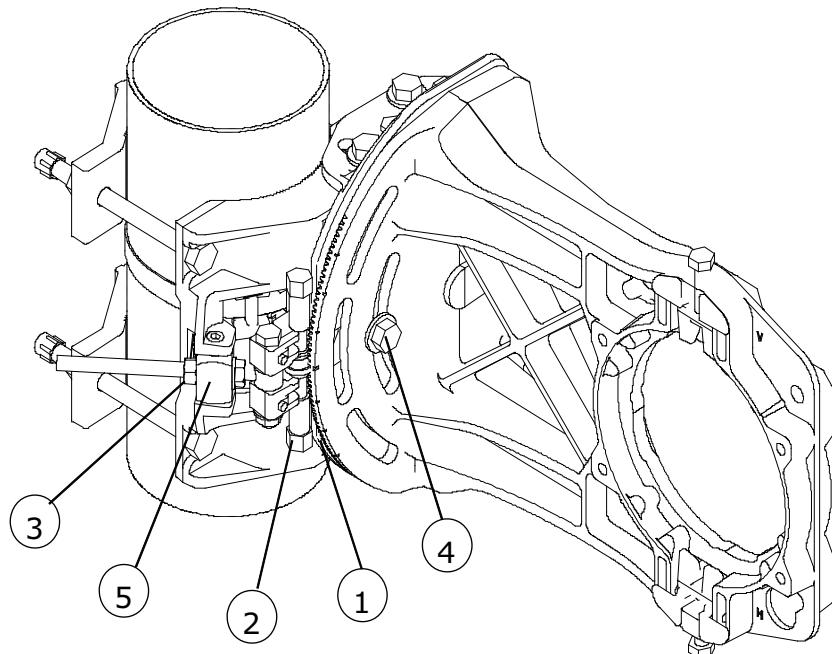
Fig.91 - Vertical and horizontal adjustment

15 mm wrench
32 Nm torque

15 mm wrench
32 Nm torque

15 mm wrench
32 Nm torque

15 mm wrench
32 Nm torque
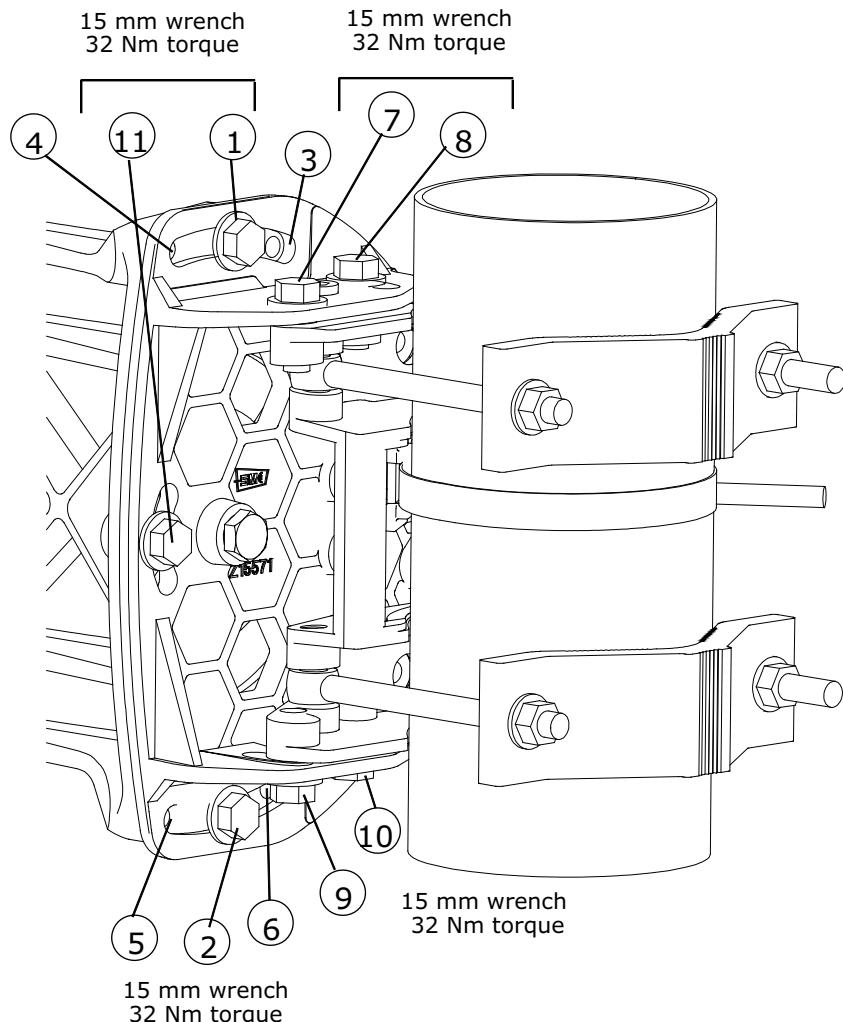
Fig.92 - Antenna aiming block

9.7   ODU ACCESSING AND REMOTE MANAGEMENT

Local ALFOplus ODU and its remote ODU can be accessed via LAN2 or LAN1 ports depending on supervisioning parameters, once the radio link has been initialized correctly (Local&Remote). In SCT the window (see Fig.93) shows the network elements belonging to selected station. In the "login" column you can check the actual user profile of equipment (System=Administrator; Monitor=Read only) and check the local radio (Local) and the remote radio (Remote Link).

To change the User Profile, select the network element and press **Login**.

To connect to remote radio you can press double click in **Remote Link Element** or select **Remote Link - Equipment - LCT interface**.

In WebLCT software press button **Open Far End** button to open and manage the remote radio window. If the remote link is not visible, it means that the Remote Element List is missing in the local ODU (in **SCT-Tools - Subnetwork Configuration Wizard**).
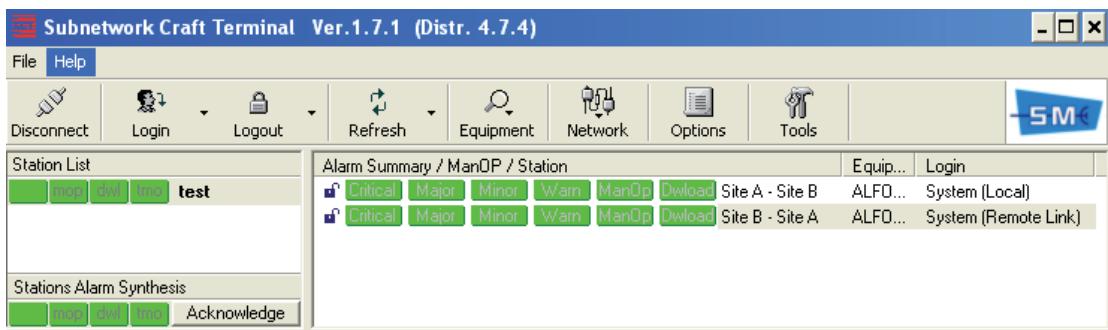
Fig.93 - Remote accessing

9.8 COMMISSIONING MEASURES FOR ETHERNET TRAFFIC

9.8.1 Ethernet connection stability

Settings

To verify the Ethernet performances apply the following settings of Tab.22 for both ALFOplus GE and ALFOplus GO.

Tab.22 - Ethernet connection stability

		Local Terminal			Remote terminal		
		LAN1	LAN2	PORT A	LAN1	LAN2	PORT A
Lan Setting	Rate Control	Full Rate	Full Rate	Port Enable	Full Rate	Full Rate	Port Enable
	Flow Control	Disable	Disable	Disable	Disable	Disable	Disable
	Master/Slave	Master	Master		Master	Master	
	M/S Autoneg.	Disable	Disable		Disable	Disable	
	MAC learning	Disable	Disable	Disable	Disable	Disable	Disable
	Speed/Duplex	Auto (1Gbit)	Auto (100Mbit)		Auto (1Gbit)	Auto (100Mbit)	
	Cable crossover	Auto	Auto		Auto	Auto	

			Local Terminal			Remote terminal		
			LAN1	LAN2	PORT A	LAN1	LAN2	PORT A
Virtual Lan (802.1Q)	Port Based VLAN	LAN1	/	Disable	Enable	/	Disable	Enable
		LAN2	Disable	/	Enable	Disable	/	Enable
		Port A	Enable	Enable	/	Enable	Enable	/
	802.1q Management		Fallback	Disable	Fallback	Fallback	Disable	Fallback
	Default Vid		101	102	111	101	102	111
Priority 802.1P			Port default 0	Port default 7		Port default 0	Port default 7	
Ethernet Switch	Max Packet size		2048 byte					
	Mac address aging time		300 sec					
	QinQ ETH Type		9100					
	Priority Radio to Lan		Native 802.1p					
	Priority LAN to radio		Native 802.1p					

After checking commissioning measures it is mandatory to fill "SIAE commissioning report" and send it to SIAE database, ready to be checked when necessary.

These reports are very important for SIAE and for the customer because they certify the conformity of SIAE link.

Only in case you don't have this document, the full backup file .bku can be generate using SCT.

9.9   FIRMWARE UPDATE

Firmware can be updated using the software SCT or WebLCT Console. There are two different memory benches: one containing the running firmware and the other the stand-by firmware. This permits to download a new firmware release to the stand-by bench without cutting the traffic.

Use the "Bench Switch" to activate the bench in stand-by (SW restart will be performed). There is a firmware version for both ODUs GE and GO:

- N10052 - ALFOplus: radio full outdoor with transport of IP Ethernet traffic.

9.9.1   Scope

Scope of this paragraph is to provide a procedure that described, step by step, how to perform the software upgrade of ALFOplus equipment.

Downloading time depends on the connection used between PC and ALFOplus.

Warning: In order to transfer data "Web LCT console" or "Subnetwork Craft Terminal" running is necessary.

9.9.2 Procedure of firmware update

Follow the steps below to perform the software upgrade of ALFOplus equipment.

Boot download

1. Unzip files E82108xxx.zip in a suitable directory of the PC used to perform the upgrade.
2. Connect to the equipment using the SCT or the WebLCT (login as "System").
3. Open the Software Download window:
   - using SCT, select **Version** from **Equipment menu** and press **Download SW setup**
   - using WebLCT, select **Software Info&Maint** (see Fig.94) from **Equipment menu** and press **Upgrade** (see Fig.95)
4. Select the file E82108.dwl (boot firmware) from the directory boot_e82108_xxyyzz.
5. Select **Only difference or not present/peripheral** as download mode.
6. Start the download and confirm by clicking on the window that pops-up.
7. At the end of the boot firmware download, the equipment Controller will automatically restart. Wait for the restart to be completed.

System version download

1. Unzip files N10052-01 XXX.zip in a suitable directory of the PC used to perform the upgrade.
2. Connect to the equipment using the SCT or the WebLCT (login as "System").
3. Open the Software Download window:
   - using SCT, select **Version** from **Equipment menu** and press **Download SW setup**
   - using WebLCT, select **Software Info&Maint** (see Fig.94) from **Equipment menu** and press **Upgrade** (see Fig.95)
4. Select the file N10052.dwl (system version) from the directory bin.
5. Select **Forced** as download mode.
6. Start the download and confirm by clicking on the window that pops-up
7. At the end of the system version download, to activate the new system version a bench switch is required: click on **Bench Switch** and confirm by clicking on the window that pops-up.

Warning: the bench switch may be traffic affecting, depending on the system version previously running.

WebLCT download

1. Connect to the equipment using the WebLCT (login as "System")
2. In **Equipment menu - Software Info&Maint - WebLCT - Upload manager**, press *Browse* and select the file Web_25_N96108_xxyyzz
3. Press **Upload** button and **Confirm**
4. After the upload it is recommended to clear temporary internet files, cookies and history of the used browser.

Warning: WebLCT can be uploaded from the *IP address/uploader.HTML*.

Fig.94 - Software download procedure
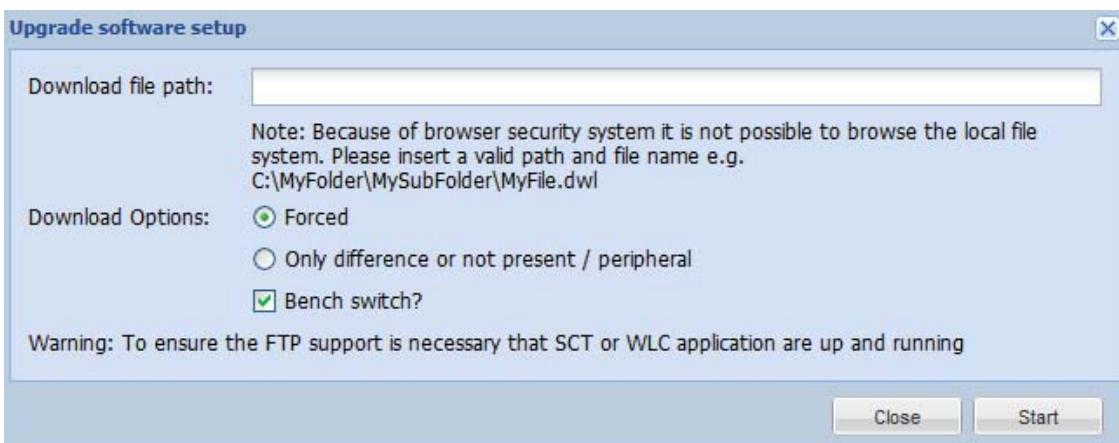
Fig.95 - Upgrade software

9.10 BACKUP FULL EQUIPMENT CONFIGURATION WITHOUT POSSI-BILITY OF MODIFYING THE PARAMETERS

9.10.1 Scope

This chapter describes the procedure to backup the full equipment configuration. This permits to recover the original equipment configuration in case of faulty or configuration mismatch.

Warning: In order to transfer data, WebLCT Console or Subnetwork Craft Terminal running is necessary.

Warning: The backup file of electric version cannot be loaded on optical version and vice versa.

9.10.2   Backup/Restore Configuration using SCT

Backup Configuration

Foreword: it is advisable to backup the configuration after the first installation. Proceed as follows:

1. Select **Equipment Configuration Wizard** from menu **Tools**; *Equipment Configuration Wizard* window will be displayed.

2. Select **Upload** and then **Backup Full Equipment Configuration**; *Template Selection* window will be displayed.

3. Select the correct equipment template (in case of uncorrected choice the backup will be aborted).

4. Press **OK** and then select the equipment to be uploaded from *Upload Configuration File* window.

5. Press **OK** and then edit the file name from *Save backup as* window.

6. Press **Save**; *Equipment Configuration Wizard: Complete Backup* window will appear.
   The window shows dynamically the backup procedure. If everything is OK, at the end of the upload will appear the word *done* showing the procedure success.

7. Press **OK** to finish.

Restore Configuration

Once the spare controller has been installed, or every time you need the primitive configuration, proceed as follows:

1. Select **Equipment Configuration Wizard** from menu **Tools**. *Equipment Configuration Wizard* window will be displayed.

2. Select **Download** and than **Restore Full Equipment Configuration** from *Equipment Configuration Wizard*. *Select Backup File* window will be displayed.

3. Select the wanted backup file with extension .bku and then press **Open**. *Download Configuration File* window will be displayed.

4. Select the equipment to download and then press **OK**; *Equipment Configuration Wizard: Complete restore* window will be displayed. This window shows dynamically the download operation. The word *done* indicates that download has been successfully.

5. Press **OK** to finish.

Warning: In case of EOC alarm proceed to restart the equipment.

9.10.3   Backup/Restore Configuration using WEBLCT

Backup Configuration

Foreword: it is advisable to backup the configuration after the first installation. Proceed as follows:

1. select **Backup/Restore Configuration** in the **Main menu**

2. in the field *Backup File name* write the name of the configuration file you are going to upload in the PC, complete with the full path of its folder

3. push **Backup**. The status of the backup procedure is shown in the *Operation Status* field.

Restore Configuration

Once the spare Controller has been installed or every time the saved configuration is necessary, proceed as follow:

1. Select **Backup/Restore Configuration** in the **Main menu**

2. In the field *Restore file name* write the name of the configuration file you are going to download in the ODU, complete with the full path of its folder

3. Push **Restore**. The status of the backup procedure is shown in the *operation Status* field. During Restore operation the equipment creates a backup configuration, you can come back to this configuration at the end of the restore pushing **Revert** (see Fig.96)

   Warning: the file full backup, making use of SCT, isn't compatible with WebLCT and vice versa.

Fig.96 - Backup/Restore configuration

Section 5.
MAINTENANCE

10   ALARMS

10.1   GENERAL

In this document is present a description of alarms in order to help operators to perform equipment troubleshooting.

10.2   ALARM SYSTEM

There are two ways to identify the alarms:

- through LEDS
- through SCT/WebLCT

For each part of SIAE radio system, groups of alarms are defined. These alarms can be independent or interdependent with each other, according to the real causes that generated them.

Alarms are divided into 4 severity levels according to the effects that an alarm might cause to the regular operation of the unit detecting it. Levels are prioritised as follows:

- Critical (red): out-of service, hw failure, urgent alarm
- Major (orange): loss of signal, minimum residual functionality, urgent alarm
- minor (yellow): failure neither urgent, high residual functionality, not urgent alarm
- warning (light blue): indication or wrong configuration, not urgent alarm
- none (green) no alarm or masked alarm.

Critical and Major alarms indicate impossibility of executing a service, hence the faulty units needs to be serviced. Minor level represents the not urgent alarms which do not prejudice service continuity.

Warning level indicates malfunctions that might be locally removed without having to replace the unit.

Alarm severity can be modified or masked in "alarm severity configuration" via SCT/WebLCT by the operator.

10.2.1   LED status

The visual indication is given by a LED, which can be green or orange or red. The information provided are:

- Red light:
  - ON - An internal alarm is active. Connect the PC for troubleshooting
  - Flashing - An external alarm is active
- Green light:
  - Flashing - No radio connection with far-end terminal
  - ON - Radio connection with far-end terminal is active
- Orange light:
  - During restart

During the power-up follows three status of display Led (see Tab.23)

Tab.23 - Bootstrap status display

Led	1st step - boot strap	2nd step - Loading We-bLCT	3rd step - Ready to management
Green	OFF	OFF	OFF/BLINKING
Red	OFF	ON	OFF/BLINKING
Orange	ON	OFF	OFF

10.2.2   Alarms group

Alarms are divided in groups to refer to a particular functionality and are characterized by programmable severity.

Alarms, with group and a short description, are listed into Tab.24.

In the following you can find a class list and the item they describe:

- COMMON – Failure or status relevant to whole equipment
- ETH LAN - Failure on Ethernet traffic
- P.M. ACM - Performance monitoring on ACM
- P.M. G.828 – Performance monitoring on signal quality
- P.M. Rx Power – Performance monitoring on received signal
- P.M. Tx Power – Performance monitoring on transmitted signal
- Plug-in module - Alarm on plug-in device
- RADIO - Alarm on Tx/Rx section of Radio
- SETS - Synchronisation alarm or status
- SNTP - Server lost (unavailable in this SW version)
- Unit - Hardware or software unit alarm

Tab.24 - Alarms

Group	WebLCT name	Description
COMMON	Equip Rmon Alarm	Statistic Counter Ethernet
	Equip Manual Operation	At least one manual operation on
	OAM FM Fail Alarm	MEP not receiving
	OAM FM MEP Configuration Mismatch Alarm	MEP not configured properly
ETH LAN	Eth Lan Phy Lacp Protocol Down	Link aggregation not working
	Eth Lan Phy Master Slave Configuration Fault	Autonegotiation GBit Frame configuration failed
	Eth Lan Phy Link Loss Forwarding	Link loss in remote port
	Eth Lan Phy Autonegotiation	Autonegotiation failed
	Eth Lan Phy Sync	Synchronization not aligned
	Eth Lan Phy Link Loss	Loss of Ethernet signal
P.M. ACM	pm ACM - 24H Alarm	ACM measurements on received radio signal
	pm ACM - 15m Alarm	
P.M. G.828	pm G828 - 24H SepAlarm	Quality measurements on radio signal received [a]
	pm G828 - 15m SepAlarm	
	pm G828 - UAS Alarm	
	pm G828 - 24H Ses Alarm	
	pm G828 - 24H ES Alarm	
	pm G828 - 15m Ses Alarm	
	pm G828 - 15m ES Alarm	
P.M. Rx Power	pm RxPwr - 24H Rlts Alarm	Rx Power measurements on radio signal received [a.]
	pm RxPwr - 15m Rlts Alarm	
P.M. Tx Power	pm TxPwr - 24H Rlts Alarm	Tx Power measurements on radio signal transmitted [a.]
	pm TxPwr - 15m Rlts Alarm	
Plug-in module	Plug-in Los Alarm	Loss of Signal on Module
	Plug-in Module Alarm	SFP module is missing
	Plug-in Module Mismatch Alarm	Wrong SFP module
	Plug-in Status Change	SFP module is active

RADIO	Radio Config Mismatch Set	BW&MOD mismatch on radio link
	Radio Rx Quality Low Warning	Received signal quality degraded
	Radio Rx Quality Low Alarm	Insufficient received signal quality
	Radio Rx AGC Fail	Automatic gain Control alarmed
	Radio Rt Vco Fail	Voltage Controlled Oscillator failure
	Radio Tx Power Alarm	Transmitted power below the fixed threshold
	Radio Rx Power Low Alarm	Received power below the fixed threshold
	Radio Modulator Fail Alarm	Alarm on radio transmitting side
	Radio Demodulator Fail Alarm	Alarm on radio receiving side
	Radio Rx Alarm Set	Low received power on radio
	Radio Invalid Frequency Alarm Set	Wrong frequency on radio link
	Radio Equip Ber Sync Loss Alarm	Bit error rate/Syncloss on received radio signal
	Radio Equip Reduced Capacity Alarm	Capacity is reduced respect the upper modulation
	Radio Equip Link Telemetry Fail Alarm	Telemetry failed to radio link missing
	Radio Equip Link ID Alarm	Wrong Link ID received
SETS	Timing Sync Active Status	Timing Sync is active
	Timing Sync Drift Alarm	Selected Synch bad quality
	Timing Sync Los Alarm	Selected Synch missing
	Timing Generator Holdover Status	Equipment in holdover status
	Timing Generator Free Running Status	Equipment in Free Running status
	Timing Generator T0 Fail Alarm	T0 synch missing
SNTP	Sntp Client Unicast Server Lost	Server is missing
Unit	Unit SW Mismatch Alarm	SW mismatch detected on the unit
	Unit HW Mismatch Alarm	HW mismatch detected on the unit
	Unit Not Responding Alarm	No response from the unit
	Unit Missing Alarm	Missing condition on the unit
	Unit Fail Alarm	Failure on the unit

a. Regarding periods of 15 minutes or 24 hours.

11 MAINTENANCE AND TROUBLESHOOTING

11.1 GENERAL

In the following pages are listed all the procedures to follow for ALFOplus maintenance.

When corrective maintenance is necessary, a troubleshooting procedure helps the operator to identify the failure unit to replace it with a spare one.

11.2 MAINTENANCE

Maintenance consists of two stages:

1. periodical checks to be carried out using SCT/WebLCT
2. corrective maintenance.

Periodical checks serve to detect correct radio performance without the presence of any alarm condition.

Corrective maintenance takes place as soon as one or more alarm conditions are in existence. Operation sequence to be carried out is shown in "Troubleshooting" paragraph.

11.2.1 Periodical checks

System routine maintenance consists in a series of routine checks aiming to verify correct operating mode of an alarm–free system.

These checks are made through SCT/WebLCT program, installed on a PC.

The items to be checked are:

- Tx power (i.e., attenuation value in dB vs. nominal value)
- Rx field (value measured must comply with that resulting from hop calculation)
- S/N (presence of possible interference)
- BER (values measured must comply with hop calculations)

How these operations are carried out is specified in "Line–up" section or, more widely, in ALFOplus software manual.

11.2.2   Corrective maintenance (troubleshooting)

Corrective maintenance starts as soon as one or more alarm indication become active.

Corrective maintenance purpose is to locate the faulty unit and replace it with spare after having verified that the cause of faulty is not external to the equipment.

Corrective maintenance does not include malfunction due to a wrong or incomplete configuration of the system or to failure due to alarm indication system itself or any other cause external to the system, i.e.: cabling damage, main voltage loss, antenna misalignment and propagation problems.

See paragraph 11.3 TROUBLESHOOTING for details.

11.3   TROUBLESHOOTING

Main purpose of troubleshooting is to identify the possible cause of alarm:

- propagations of microwave

  - interference (in a link radio turn off the Ptx module (local&remote) and monitoring the Prx during the day, active local Link ID)

  - desalign of antenna (check positions and screws, maximize the voltage AUX connector present in ODU),

  - obstacle in the 1° Fresnel Zone (tree, tower building, etc....)

  - using the "Performance Monitoring" Prx, Ptx, BER measuring

  - particular condition (heavy rain, stratification of different air temperature, flat surface)

- radio hardware faulty

  - alarms due to a wrong configurations or actual status of the radio

  - faulty (using embedded radio BER test generator and loops, to check hardware failure)

- external event

  - no constant 48 Volt power supply during the day/night

  - very high temperature, humidity inside waveguide

  - ODU operating range -33°C to +55°C; survival temperature range -40°C to +70°C

  - ODU waterproof according to IP65 environmental class

The troubleshooting procedure is performed with:

- check value of power transmitter and receiver

- reading Current Alarms and Alarm History labels and trying to figure out which part of the equipment is affected

- disabled All Manual Operations

- verifying with radio BER test a hardware failure or S/N measure

- verifying the correct initialization of the Local and Remote Radio

- HW restart

- factory default

- firmware update

- replace with a spare part.

11.4 TROUBLESHOOTING

Troubleshooting must be performed when one of the following situations occurs:

- Alarms are present (revealed by front LEDs, WEBLCT or NSM5UX/NMS5LX)
- Traffic is interrupted
- Rx signal quality and/or Rx signal level are lower than the expected
- Performances (SE, SES, BBE,…) are not the expected ones

By means of alarms, historical alarms and "Performance monitoring" the operator can discover the cause of the problem.

By means of loops causes can be confirmed and a solution can be applied.

11.4.1 Led indication

ODU Led

- Red light:
  - ON - An internal alarm is active. Connect the PC for troubleshooting
  - Flashing - An external alarm is active
- Green light:
  - Flashing - No radio connection with far-end terminal
  - ON - Radio connection with far-end terminal is active
- Orange light:
  - During restart.

Tab.25

Led	1st step - boot strap	2nd step - Loading WebLCT	3rd step - Ready to management
Green	OFF	OFF	OFF/BLINKING
Red	OFF	ON	OFF/BLINKING
Orange	ON	OFF	OFF

11.4.2 ALARM WINDOWS

- SCT: all alarms are listed in "Event History" or the active alarms can be monitored in a "View current alarms" windows.
- WEBLCT: all current alarms are present in "Event list" area.

SCT
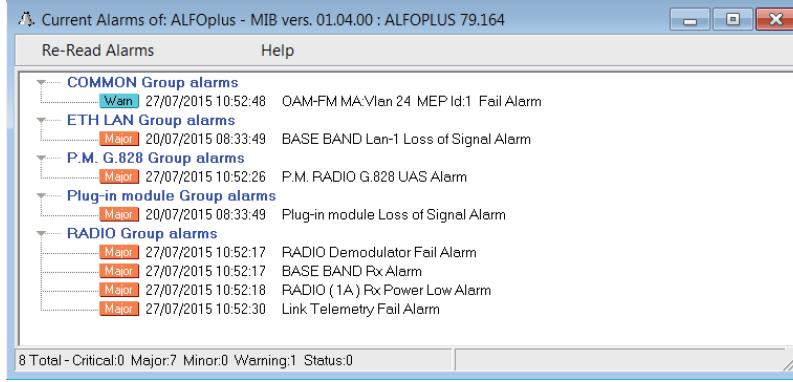
WebLCT

NMS5LX
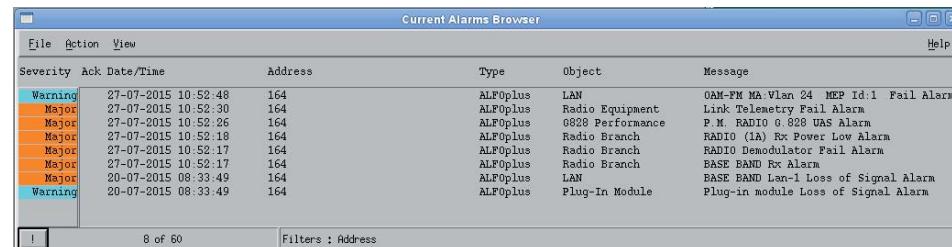
Fig.97

11.5   ALARM SEVERITY GROUP

• Critical (red) - Urgent (affect traffic - link down)
  Out-of-service, hw failure. urgent alarm

• Major (orange) - Urgent (affect traffic - link down)
  Loss of signal, minimum residual functionality, urgent alarm

• Minor (yellow) - Non urgent
  Failure neither urgent, high residual functionality, not urgent alarm

• Warning (light blue) - Non urgent
  Indication or wrong configuration, not urgent alarm

• Test - Active manual operation
  Loop, radio switch, FM test, Radio BER TEST, etc...

11.6   SYMPTOMS AND HYPOTHESIS

It's important to collect the following info:

- one link only is alarmed or also others in same area
- link is down or with Rx quality problems only
- it is a continuous or a fleeting problem
- both link ends are affected or only one of them
- one or all the LAN ports are affected by problem
- the problem can be caused or not by weather conditions
- in alarm histories of local and remote side, the same situation is present or not
- over the link have been performed or not any recent operations or commands
- the link has been without problems for a long time or the link is a "problematic" one
- the link has been just installed or not.

If local investigation is necessary be sure to have:

- spare parts (same code ODU)
- laptop with connection cables and batteries
- this troubleshooting procedure
- Ethernet instruments

First step:

- check the power supply status, (PoE status or Power Supply cable).

11.7   TOOLS

WEBLCT

Use following WebLCT facilities to investigate on the link:

- status of alarms
- performance monitoring in the last 48h (Rx quality, Modulation profile, Rx power)
- configuration
- OAM (tools to check continuity of VLAN)
- loops and manual operations

NMS5LX/NMS5UX

Use following NMS5LX/NMS5UX facilities to investigate on the link and/or network:

- status of alarms
- performance monitoring (Rx quality, Modulation profile, Rx power)
- configuration
- OAM (tools to check continuity of VLAN)
- loops and manual operations

Observation

Observation is one more way to investigate. Operator can use:

- front panel LEDs

- voltmeter reading (Rx POWER at F03608 connector)

- errors counter or traffic analyser (or any external instrument).

Warning: refer to proper software manuals for information relevant these items.

11.8   ALFOPLUS ALARMS

Alarms are divided in groups depending on functionality or hardware module that has the failure or the problem described by the alarm itself.

In the following pages are described:

- most common scenarios with the problem that has generated them

- all the alarm groups with:
    - name (number of radio branch can vary depending on configuration)
    - severity
    - explanation of the alarm
    - most common solution of the problem described by the alarm
    Eventual concatenations of alarms of that group:
    - alarms that cause an alarm in the selected group (parent)
    - alarms generated by alarms of that selected group (son)

- Quality problems: what is the cause... rain or interferences? An easy example of troubleshooting using Performance monitoring.

11.8.1   Most common situations

Rx Power Low + Adaptive Modulation Reduced Capacity (ACM Enabled)

- Propagation problems or remote Tx low/damaged (check remote)

- Installation problem, (RF part), check local and Remote

| Tx1A | 25208.000 MHz | 19 dBm | ACM Profile | 128QAM | 4QAM |
| Rx1A | 26216.000 MHz | -75 dBm | ETH Capacity | 294068 Kb/s | 88558 Kb/s |

Events			
Major	Adaptive Modulation Reduced Capacity Notification		RADIO
Major	RADIO (1A) Rx Power Low Alarm		RADIO

Fig.98

Rx Power Low + Adaptive Modulation Reduced Capacity, Radio Rx Quality Low Warning (ACM Enabled)

- Propagation problems or remote Tx low/damaged (check remote)
- Installation problem, (RF part), check local and Remote

| Tx1A | 25208.000 MHz | | ACM Profile | Tx | 16QAM-Strong | 4QAM-Strong |
| Rx1A | 26216.000 MHz | -85 dBm | l Capacity | | 132161 Kb/s | |

Events				
Warning	RADIO Rx Quality Low Warning	RADIO	Tue, Jun 30, 2015 14:32:04
Major	RADIO (1A) Rx Power Low Alarm	RADIO	Tue, Jun 30, 2015 14:28:40
Major	Adaptive Modulation Reduced Capacity Notification	RADIO	Tue, Jun 30, 2015 14:25:54
Cleared	RADIO Rx Quality Low Alarm	RADIO	Tue, Jun 30, 2015 14:31:35 / Tue, Jun 30, 2015 14:32:04
Cleared	RADIO Rx Quality Low Warning	RADIO	Tue, Jun 30, 2015 14:31:00 / Tue, Jun 30, 2015 14:31:35

Fig.99

Rx Power Low + Adaptative Modulation Reduced Capacity+ Radio Rx Quality Low Alarm (ACM Enabled)

- Propagation problems or remote Tx low/damaged (check remote)
- Installation problem, (RF part), check local and Remote.

| Tx1A | 25208.000 MHz | | ACM Profile | Tx | 16QAM-Strong | 4QAM-Strong |
| Rx1A | 26216.000 MHz | -88 dBm | TH Capacity | | 132161 Kb/s | |

Events				
Major	RADIO Rx Quality Low Alarm	RADIO	Tue, Jun 30, 2015 14:37:30
Major	RADIO (1A) Rx Power Low Alarm	RADIO	Tue, Jun 30, 2015 14:28:40
Major	Adaptive Modulation Reduced Capacity Notification	RADIO	Tue, Jun 30, 2015 14:25:54
Cleared	RADIO Rx Quality Low Warning	RADIO	Tue, Jun 30, 2015 14:32:04 / Tue, Jun 30, 2015 14:37:30
Cleared	RADIO Rx Quality Low Alarm	RADIO	Tue, Jun 30, 2015 14:31:35 / Tue, Jun 30, 2015 14:32:04
Cleared	RADIO Rx Quality Low Warning	RADIO	Tue, Jun 30, 2015 14:31:00 / Tue, Jun 30, 2015 14:31:35

Fig.100

Radio Link IS DOWN - Rx Power Low + Adaptative Modulation Reduced Capacity+Radio Demudulator Fail+Link Telemetry Fail+Base Band Rx Alarm (ACM Enabled)

- Propagation problems or remote Tx low/damaged (check remote)
- Installation problem, (RF part), check local and Remote.

| Tx1A | 25208.000 MHz | | ACM Profile | Tx | 16QAM-Strong | 4QAM-Strong |
| Rx1A | 26216.000 MHz | -90 dBm | ETH Capacity | | 132161 Kb/s | |

Events				
Major	RADIO Demodulator Fail Alarm	RADIO	Tue, Jun 30, 2015 14:44:35
Major	Link Telemetry Fail Alarm	RADIO	Tue, Jun 30, 2015 14:41:27
Major	P.M. RADIO G.828 UAS Alarm	P.M. G.828	Tue, Jun 30, 2015 14:41:24
Major	BASE BAND Rx Alarm	RADIO	Tue, Jun 30, 2015 14:41:15
Major	RADIO (1A) Rx Power Low Alarm	RADIO	Tue, Jun 30, 2015 14:28:40
Major	Adaptive Modulation Reduced Capacity Notification	RADIO	Tue, Jun 30, 2015 14:25:54
Cleared	RADIO Rx Quality Low Alarm	RADIO	Tue, Jun 30, 2015 14:44:01 / Tue, Jun 30, 2015 14:44:35
Cleared	RADIO Demodulator Fail Alarm	RADIO	Tue, Jun 30, 2015 14:43:59 / Tue, Jun 30, 2015 14:44:01
Cleared	RADIO Rx Quality Low Alarm	RADIO	Tue, Jun 30, 2015 14:43:49 / Tue, Jun 30, 2015 14:43:59

Fig.101

In case of ACM disable the alarms sequence is the same despite of Adaptative Modulation Reduced Capacity Notification:

				Tx	Rx
Tx1A	25208.000 MHz		ACM Profile	16QAM	16QAM
Rx1A	26216.000 MHz	-83 dBm	H Capacity	171708 Kb/s	171708 Kb/s

Events				
Major	RADIO Rx Quality Low Alarm	RADIO		Tue, Jun 30, 2015 12:21:33
Major	Link Telemetry Fail Alarm	RADIO		Tue, Jun 30, 2015 12:20:01
Major	P.M. RADIO G.828 UAS Alarm	P.M. G.828		Tue, Jun 30, 2015 12:19:57
Major	BASE BAND Rx Alarm	RADIO		Tue, Jun 30, 2015 12:19:49
Major	RADIO (1A) Rx Power Low Alarm	RADIO		Tue, Jun 30, 2015 07:44:38
Cleared	RADIO Demodulator Fail Alarm	RADIO		Tue, Jun 30, 2015 12:21:32 / Tue, Jun 30, 2015 12:21:33
Cleared	RADIO Rx Quality Low Alarm	RADIO		Tue, Jun 30, 2015 12:21:27 / Tue, Jun 30, 2015 12:21:32
Cleared	RADIO Rx Quality Low Alarm	RADIO		Tue, Jun 30, 2015 12:19:50 / Tue, Jun 30, 2015 12:20:39
Cleared	BASE BAND Rx Alarm	RADIO		Tue, Jun 30, 2015 12:19:48 / Tue, Jun 30, 2015 12:19:49
Cleared	RADIO (1A) Radio Rx AGC Alarm	RADIO		Tue, Jun 30, 2015 12:19:48 / Tue, Jun 30, 2015 12:19:50
Cleared	RADIO Rx Quality Low Warning	RADIO		Tue, Jun 30, 2015 11:49:43 / Tue, Jun 30, 2015 12:19:49

Fig.102

Plug-in Module Mismatch Alarm+Plug-in Module Fail Alarm+Plug-in Module Loss of Signal Alarm+Base Band Lan 1 Loss of Signal Alarm

- SFP Module Missing/Faulty/Not Compatible in Port 1.

Events		
Major	BASE BAND Lan-1 Loss of Signal Alarm	ETH LAN
Minor	Plug-in module Mismatch Alarm	Plug-in module
Major	Plug-in module Fail Alarm	Plug-in module
Major	Plug-in module Loss of Signal Alarm	Plug-in module
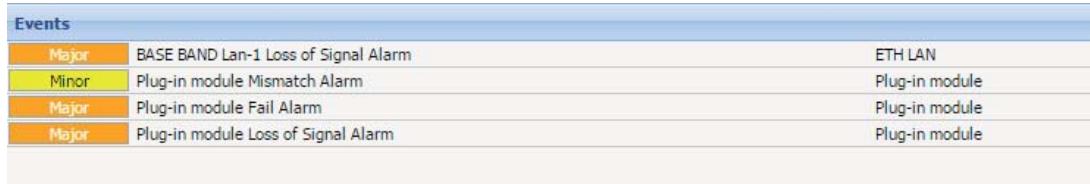
Fig.103

11.8.2   Alarm groups: COMMON

Tab.26 - Alarm groups: COMMON

Common	Problem	Solution
Ethernet Traffic Concatenation fail on radio link	Packets loss on Radio port or excessive propag delay in one stream	Check streams status/ODUs status
Ethernet Compr./Fragm. Config. Mismatch	Local and Remote have different compr/fragm setting	Check compression and fragmentation setting
IEEE 1588 PTP Configuration Mismatch	Local 1588 setting is different from the remote	Check 1588 configuration
IEEE 1588 PTP PPS Unlock	PPS signal in slave IDU has drift problems	Chcek 1588 configuration or port status
G8032 Ring: <...> Port:<...> Alarm Status	CCM message from Ring <...> not received from remote	Chcek VLAN, Domain and G8032 setting. Check Ethernet connection

Common	Problem	Solution
OAM-FM MA <…> MEP Id:<…> Fail	CCM not received by local MEP	Check VLAN config and/or VLAN pathdown
OAM-FM MA:<…> MEP Id:<…> Config. Mismatch	MEO Configuration error	OAM config. Error, check MEP names

11.8.3 Alarm groups: ETH LAN

Tab.27 - Alarm groups: ETH LAN

ETH LAN	Problem	Solution
Link Loss	Loss of Signal in indicated LAN port	Check configuration and LAN status
Physical Sync Loss	Sync error (GE frame not aligned)	Check configuration and LAN status
Auto Negotiation	LAN interface autonegot. failed	Check configuration and LAN status
Link Loss Forwarding	Link Loss Forwarding in indicated port	Check LAN status (in local and remote unit)
Master Slave Config. Fault	Gigabit Master/Slave config error	Check configuration and LAN status, SETS config error
LACP protocol down	Line trunk not working	Check config and status in LANs involved in the trunk

ETH LAN group alarms - Concatenations

Alarms that generate them and alarms caused by them.

Tab.28 - ETH LAN group alarms - Concatenations

This alarm causes a ETH LAN Group Alarm	ETH LAN Group Alarms	This alarm is caused by a ETH LAN Group Alarm
	IDU <LAN…> Loss of Signal	LTI (if the LAN port is selected as synch. source)

11.8.4 Alarm groups: UNIT

Tab.29 - Alarm groups: UNIT

UNIT	Problem	Solution
SW Mismatch Alarm	Internal Problem	Hot Reset, Cold Reset, Factory Default Reset, Substitute with spare part.

UNIT	Problem	Solution
HW Mismatch Alarm	Internal Problem	Hot Reset, Cold Reset, Factory Default Reset, Substitute with spare part.
Missing Alarm	Internal Problem	Hot Reset, Cold Reset, Factory Default Reset, Substitute with spare part.
Not Responding Alarm	Internal Problem	Hot Reset, Cold Reset, Factory Default Reset, Substitute with spare part.
Sw Mismatch Alarm	Internal Problem	Hot Reset, Cold Reset, Factory Default Reset, Substitute with spare part.

11.8.5   Alarm groups: PLUG-IN MODULE

Tab.30 - Alarm groups: PLUG-IN MODULE

	Problem	Solution
Plug-in module Status	Plug-in module has been switched on/off	
Plug-in module Mismatch	Plug-in module not managed or missing	Substitute SFP module
Plug-in module Fail	Plug-in module not detected/not working	Substitute SFP module
Plug-in module Loss of Signal	No signal received by SFP module	Check cable connected to SFP module

11.8.6   Group alarms: RADIO

Tab.31 - Group alarms: RADIO

Radio	Problem	Solution
Link Id	Wrong LinkID. Possible interference problem.	Check remote station/LinkID config (local and remote)
Link Telemetry Fail	Radio Link down (traffic is interrupted)	Check local station/propagation/remote station
Adaptive Modulation Reduced Capacity Notification	Actual Modul. profile is not the Upper	Check Link parameters/propagation status
Ber Sync Loss Alarm	BER Test Fail	Active one loop or disable Ber test
Invalid Frequency Alarm Set	Frequency not permitted	Change Frequency Channel
Rx Power Low Alarm	The Rx Power level is lower than the threshold set	Reduce the Rx Power Threshold in general preset
Tx Power Alarm	Received power below the fixed threshold	Tx off command active/Tx fail

Radio	Problem	Solution
VCO Fail	VCO Fail	Substitute the equipment
IF Fail	IF Fail	Substitute the equipment
Rx Quality Low Alarm	BER ≈ 10^{-6}	Increase fade margin or check for interference problems or look for antenna/waveguide installation problem
Rx Quality Low Warning	BER ≈ 10^{-10}	Increase fade margin or check for interference problems or look for antenna/waveguide installation problem
Radio Config Mismatch Set	BW&MOD mismatch on radio link	Fix Mode Cap Link ID in local and far end stations
Rx Alarm Set	The Link is down, fading or interference or installation problem	Check local station/propagation/ remote station
Radio Demodulator Fail Alarm	The Link is down, fading or interference or installation problem	Check local station/propagation/ remote station
Radio Modulator Fail Alarm	Modulator Fail	If it is permanent substitute the equipment
Radio Rx AGC Fail	The Link is down, fading or interference or installation problem	Check local station/propagation/ remote station

Radio group alarms - Concatenations

Alarms that generate them and alarms caused by them.

Tab.32 - Radio group alarms - Concatenations

This alarm causes a Radio Group Alarm	Radio Group Alarms	This alarm is caused by a Radio Group Alarm
	Link Telemetry fail	Radio EOC data link
	Link Telemetry fail	Rescue setup [a]
LinkID	Link Telemetry fail	

a. If Synchronisation Setup Protocol is enabled on local and remote IDUs.

11.8.7   SETS group alarms

Tab.33 - SETS group alarms

SETS	Problem	Solution
BASE BAND Sets T0 Fail	T0 missing, IDU is not synchronized by input	Synch source is missing, check it or change it
IDU Sets Free Running	Equipment in Free running status	Check the selected source input
IDU Sets Holdover	Equipment in Holdover status	Check the selected source input
IDU Sets <…> LTI Alarm	LTI: LOS of timing input (no sync source)	Check the selected source

SETS	Problem	Solution
IDU Sets <...> Drift	Drift on selected timing input	Check timing input generator, choose another source
IDU Sets <...> Active	Sync Status, IDU is synchronized	

SETS group alarms - Concatenations

Alarms that generate them and alarms caused by them.

Tab.34 - SETS group alarms - Concatenations

This alarm causes a SETS Group Alarm	SETS Group Alarms	This alarm is caused by a SETS Group Alarm
Telemetry Fail (Radio selected as synch source)	LTI	
LAN port LOS (LAN port selected as synch source)	LTI	

11.9   TROUBLESHOOTING TEST

Depending the kind of traffic, different tests can be performed:

- RadioPRBS TEST: an internal PRBS generator can be used to transmit and detect a signal into the radio link aggregate frame

- Ethernet traffic OAM: two points in the same VLAN can generate packets (CCM messages) one towards the other...if the MEPs (Maintenance end point) are situated one in loc unit and the other in the remote one, the ethernet transmission (ports, setting and radio link) can be tested

- LOOP Test: local Base Band and RF Loop to verify the equipment working

11.9.1   Radio BER TEST to check Hardware Failure

- Set Local Radio Timeout=0

- Enable RF Loop or Baseband Loop in Local Radio

- Enable Local Radio BER TEST(step a,b,c)

- Check Local status: BER,Sync Loss, Errors, Elapsed Time, events
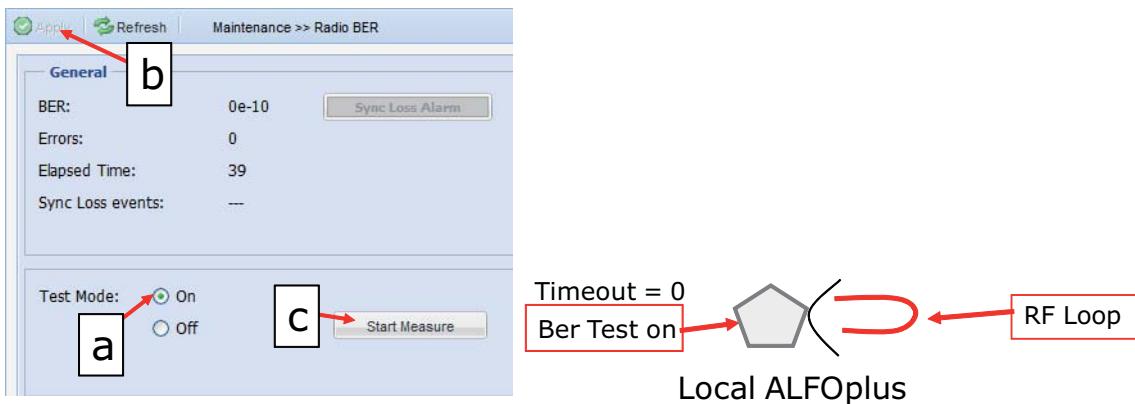
Fig.104

or for Both radio

- Set Timeout_Local= 580sec and Timeout_Remote= 600sec
- Enable Remote Radio BER TEST (step a,b,c)
- Immediately, enable the Local Radio BER TEST
- Check Local status: BER,Sync Loss, Errors, Elapsed Time, events
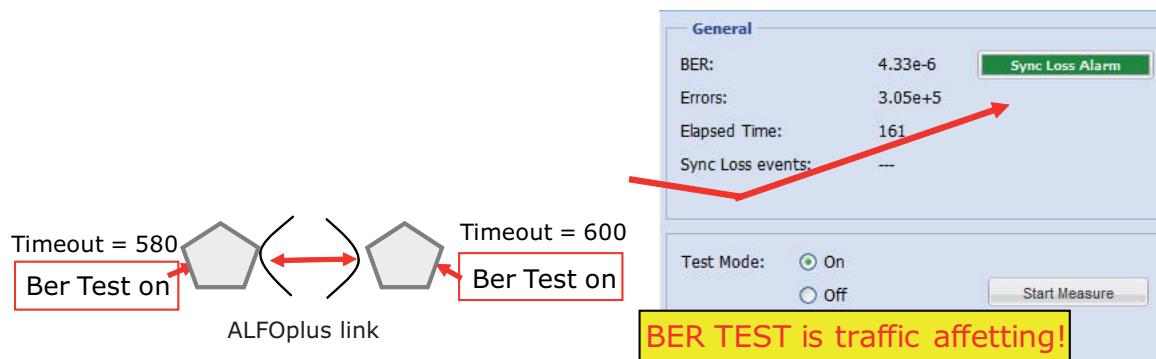
Fig.105

11.10 EXAMPLE OF LOOP - BACK TEST OVER THE ETHERNET PATCH
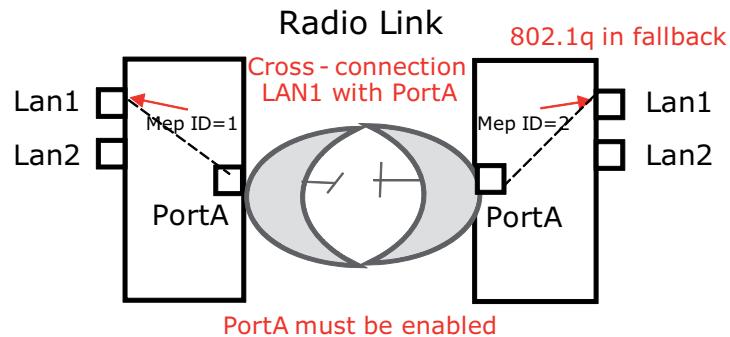
Fig.106 - Radio link
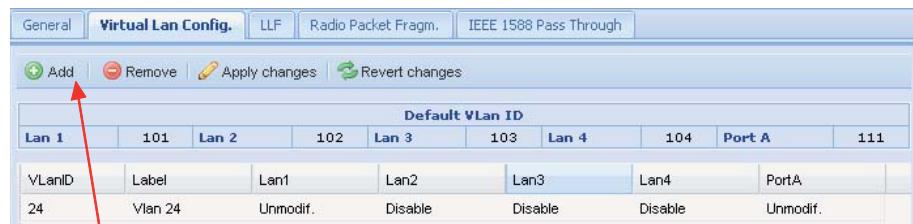
Create VLAN
(Do the same in the remote radio)

Fig.107 - Create VLAN

Create Domain
(Do the same in the remote radio)
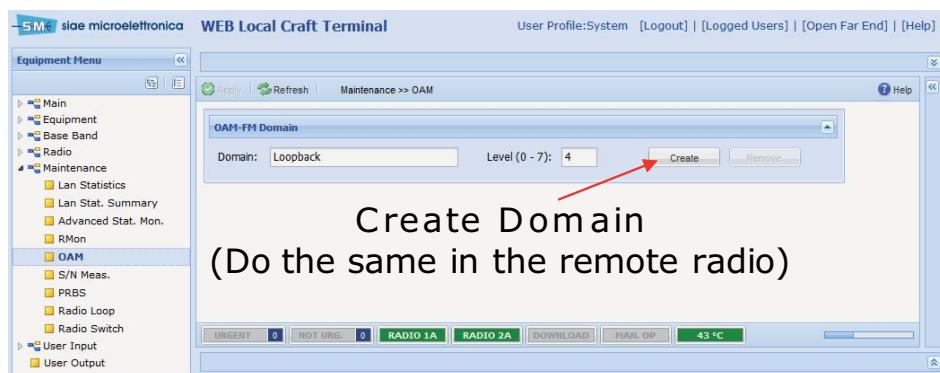
Fig.108 - Create Domain
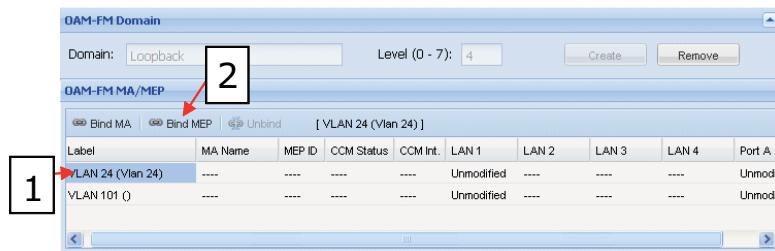
Create MEP over Vlan 24
(Do the same in the remote radio)

Fig.109 - Create MEP over VLAN 24

Set MEP ID & direction
(Different ID in the remote radio)
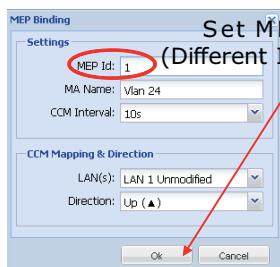
Direction

▼ = outgoing from the switch (through
    Line cable or Radio propagation)

▲ = ingoing in to the switch

Fig.110 - Set MEP ID & Direction

11.11 MEP CROSSCHECK AND TEST

Start CCM

RemoteMep

LinkTraceMessage

LoopBackMessage

4 Missing CCM
of remote MEP
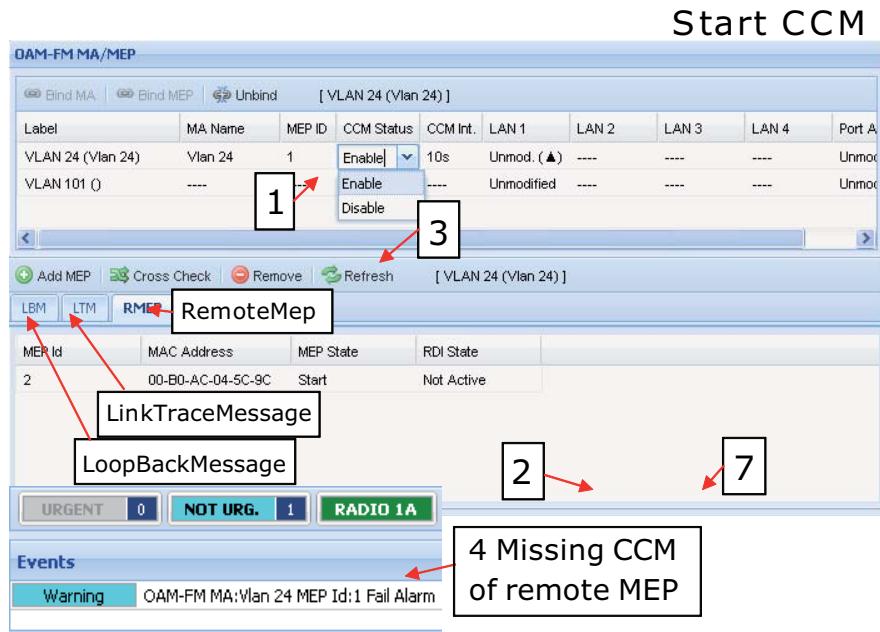
Fig.111 - Start CCM

MEP CrossCheck
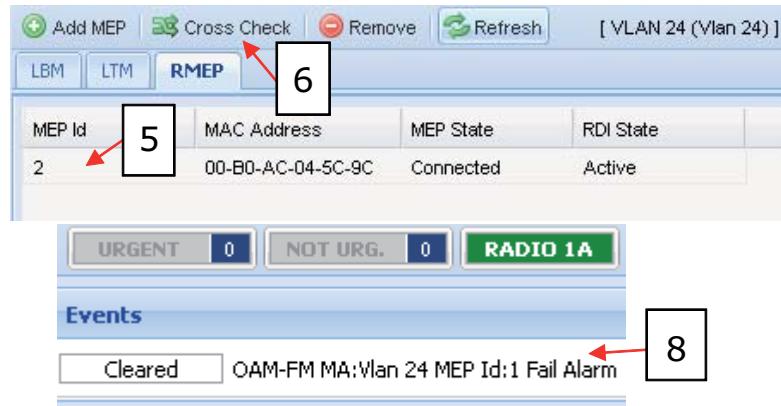
Fig.112 - MEP crosscheck

LoopBackMessage
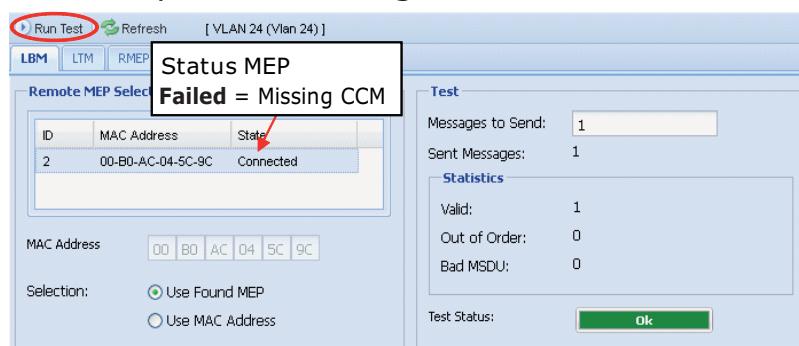
Fig.113 - Loop back message

LinkTraceMessage
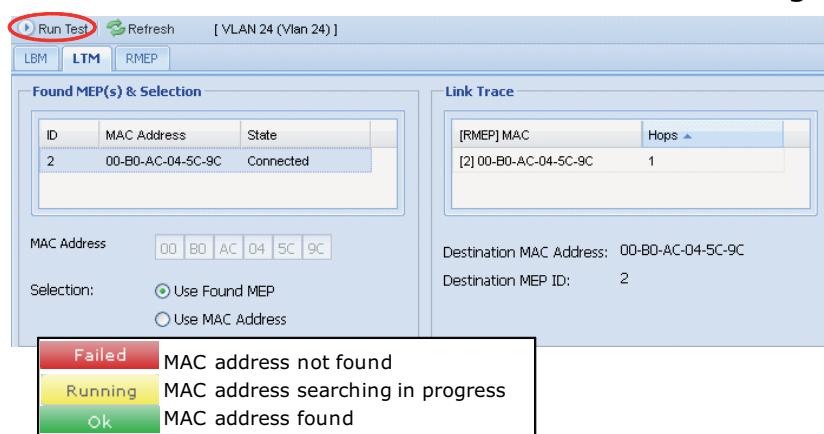
Fig.114 - Link trace message

11.12 LOOPS

Loops used with Ber Test measurement or S/N to search the failure or check the cable connections.

0 sec = disable
Manual operation
Timeout

Press Double click

Line Loop Lan (Tx -> Rx)

ODU BaseBand Loop

The packets ethernet doesn't return back, because are deleted into the switch.

Packets ethernet return back (Very dangerous for the network, because the Ethernet traffic should never be looped)

Line Loop — ALFOPLUS SWITCH — RF

The loops are combined with Radio BER Test
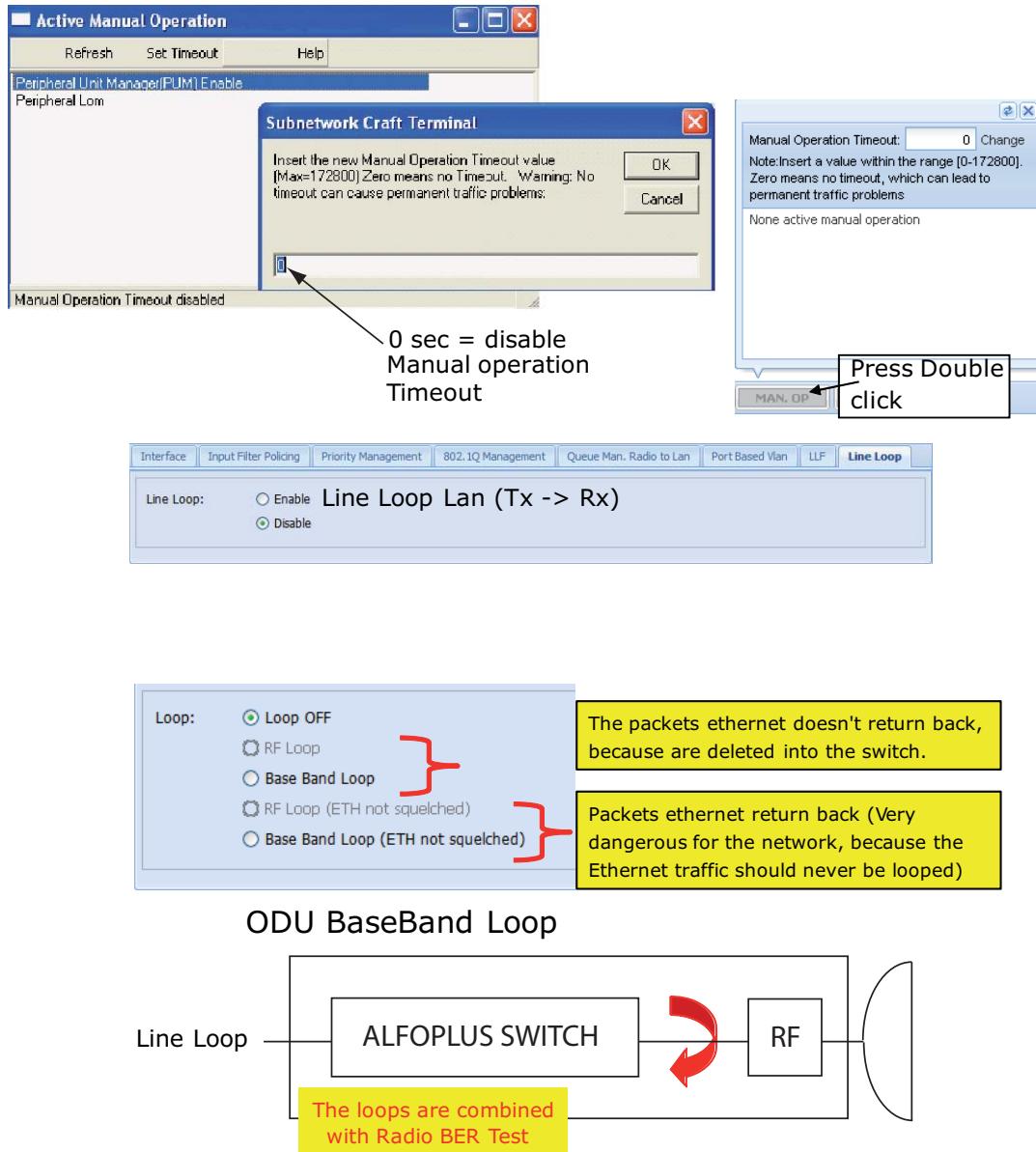
Fig.115

11.13 QUALITY ALARMS

Present alarms:

•   Rx Quality Warning $BER<10^{-10}$

- Rx Quality Alarm BER <10^{-6}

In order to understand why quality alarms are present, RxPwr performance window must be used (in NMS, WEBLCT, SCT).

Local status ->
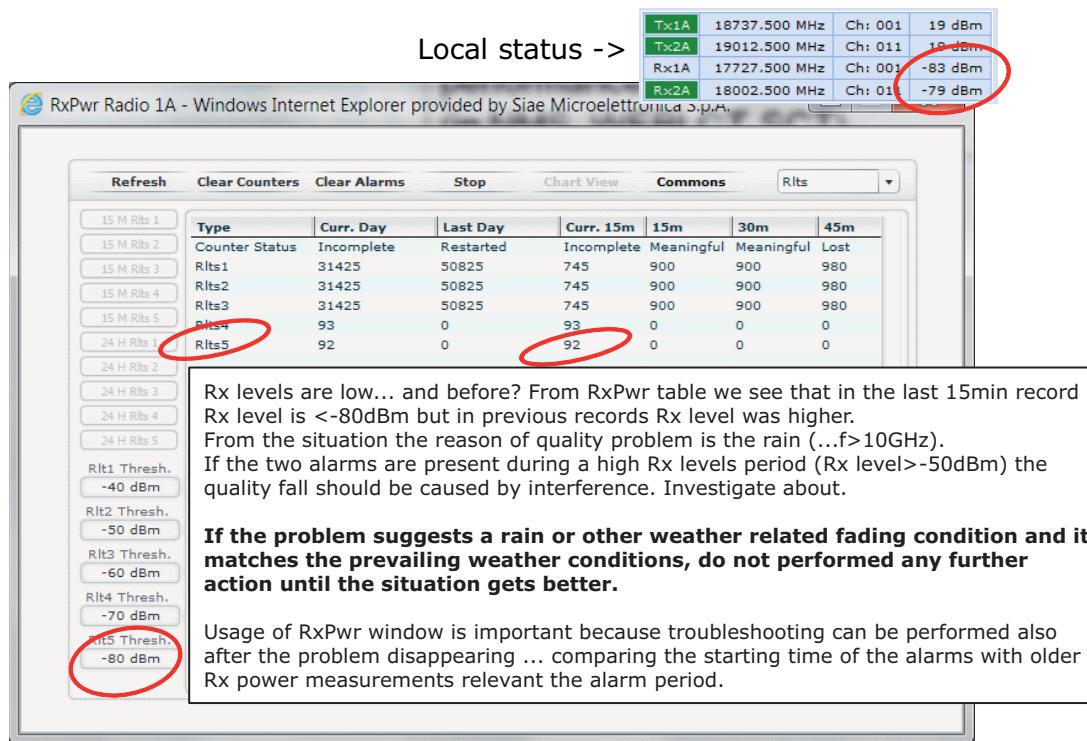
Fig.116

11.14 RADIO LINK QUALITY PROBLEMS

11.14.1 Radio link affected by fading

This problem is revealed by low Rx level (how much lower depends on the severity of tropospheric phenomena), and consequent low quality in RX signal, in both directions of the link.

Rain, multipath fading, rain drop depolarization and diffraction cause Reduced capacity notification alarm, Rx Power low, Rx Quality warning, Rx Quality alarm, Telemetry fail. These alarms are fleeting because of the fluctuating attenuation:

- F > 10 GHz the fading is given by rain (for F > 30GHz rain is a serious problem)
- F < 10 GHz the fading is given by ducting and multipath.

When propagation problems occur the link performance will be restored as the weather gets back to normal and if problems persist (Rx level remain different from normal) the reason must be searched in wrong antenna disalignment (...probably caused by strong wind or snow/ice).

11.14.2 Radio link affected by interference

Radio link affected by interference has quality problems in one direction only (possible alarms are Rx Quality warning, Rx Quality alarm, Telemetry fail…increasing the interference severity). Rx level in the interfered site is not reduced by interference.

When these symptoms occur check if new radio links have been installed in close areas (higher the frequency, smaller the search radius).

In any case interference can be confirmed by a spectrum analyser through a multi-angle investigation performed at antenna side.

Section 6. PROGRAMMING AND SUPERVISION

12 PROGRAMMING AND SUPERVISION

12.1 GENERAL

ALFOplus is programmed and supervised using SCT or WLC. This subject is fully described in the separated software manual (WebLCT ALFOplus - Software application for the management of ALFOplus equipment).

Warning: operating system compatibility for SCT and WLC is Windows XP or Windows 7.

12.2 SUPERVISION THROUGH ETHERNET

The provided structure for Ethernet traffic defines the management facilities of "ALFOplus" unit.
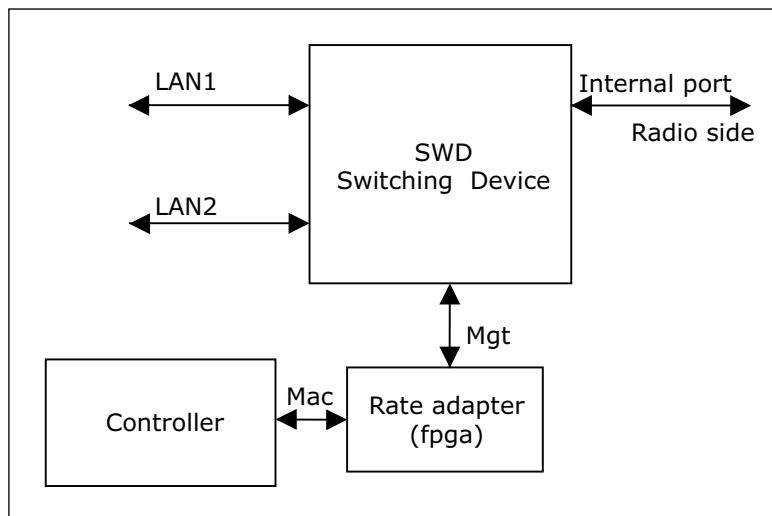
Fig.117 - Traffic management of "ALFOplus" unit

12.2.1   General

In general the management plane can be configured to be managed "in band" , that is transported with data and differentiated on the base of VLan, or out of band, where a port is exclusively dedicated to the management. In particular, for management purposed, the LAN interfaces can be configured as follow:

- Disable - the management is not transported for that LAN

- Local Access Only - LAN is dedicated to the management and it allows to reach the local CPU only

- In Band - LAN is configured to transport both management and data: management is differentiated by dedicated VLan

- Out Of Band (OOB) - LAN is dedicated to the management and the management forwarded over the radio is maintained segregated from the data (in this application the segregation is virtually achieved via LAN)

- Drop Node - LAN is dedicated to the management and it is possible to access to both local CPU and the rest of the network.

The combinations of management configuration for LAN1 and LAN2 are shown in the following.

Disable - Local Access Only (LAO)

LAN1: Disable   LAN1 is for data only

LAN2: LAO   LAN2 is local management only
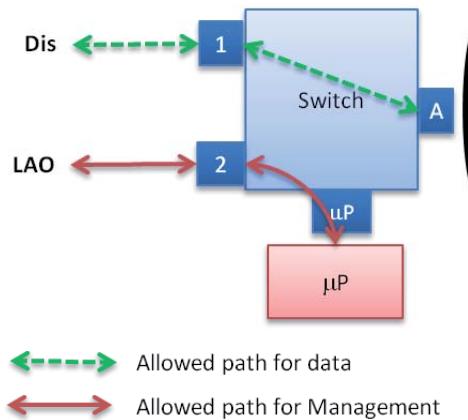
Fig.118

- Management   LAN2 Only - Untagged
- Reachability: From LAN2 only the local CPU is reachable
                      Local CPU is NOT reachable from the remote ODU
- Data   LAN1 only - Tagged/Untagged

Disable - Out Of Band

LAN1: Disable   LAN1 is for data only

LAN2: Out Of Band   LAN2 is local management only, dedicated bandwidth for the
                       management over the air
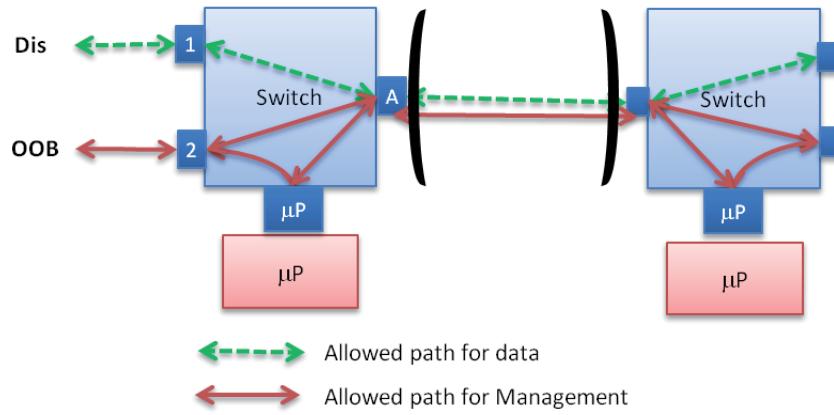
Fig.119

- Management   LAN2 Only - Untagged
                      dedicated logical channel (bandwidth reserved over the radio link)
- Reachability: From LAN2: whole network
                      From Radio: whole network
- Data   LAN1 only - Tagged/Untagged

InBand - Local Access Only

LAN1: In Band   LAN1 is for data and management

LAN2: Local Access Only   LAN2 is for local management only
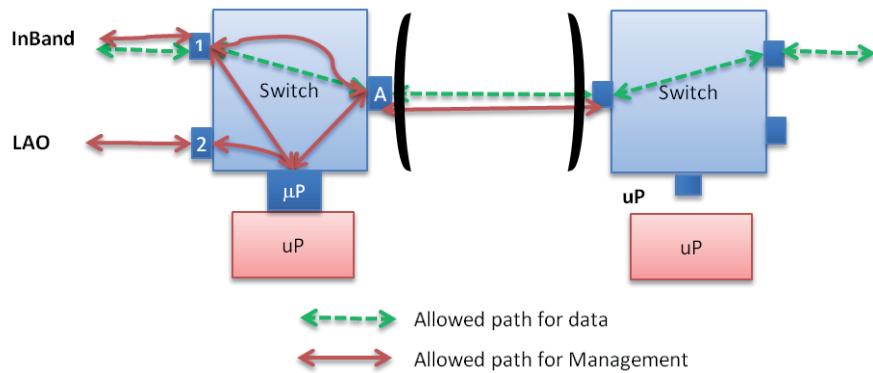
Fig.120

- Management   LAN1 - Tagged
                    LAN2 - Untagged

- Reachability: From LAN1: whole network
                    From LAN2: only local μP only
                    From remote (portA): whole network

- Data   LAN1 only - Tagged/Untagged

In Band - Drop Node

LAN1: In Band   LAN1 is for both data and management

LAN2: Drop Node   LAN2 is for management only
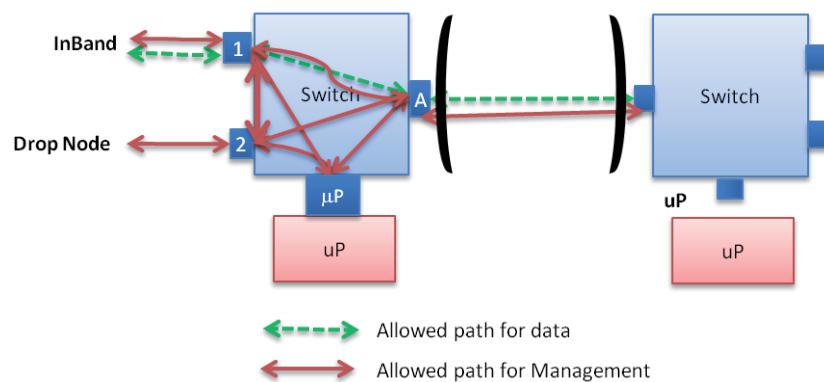
Fig.121

- Management   LAN1 - Tagged (InBandVlan)
                    LAN2 - Untagged

- Reachability: From LAN1: whole network
                    From LAN2: whole network
                    From radio: whole network

- Data   LAN1 only - Tagged and Untagged

In Band - In Band

LAN1: In Band   LAN1 and LAN2 are both for both data and management

LAN2: In Band
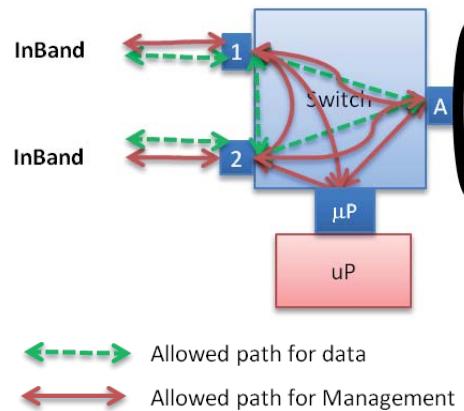
Fig.122

- Management   LAN1 - Tagged (Tag=InBandVlan)
                      LAN2 - Tagged (Tag=InBandVlan)

- Reachability: From LAN1: whole network
                      From LAN2: whole network
                      From radio: whole network

- Data   LAN1 and LAN2

In Band - Disable

LAN1: In Band   LAN1 is for data and management

LAN2: Disable   LAN2 is for data only
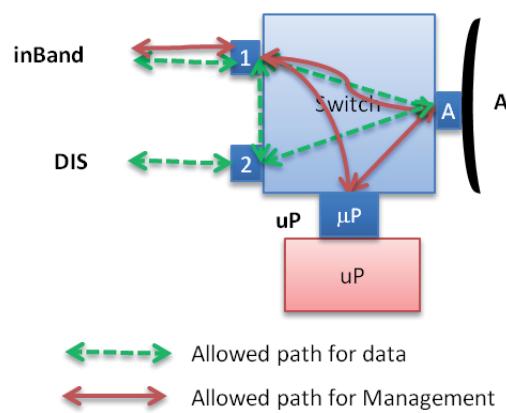
Fig.123

- Management   LAN1 only - Tagged (Tag=InBandVlan)

- Reachability: From LAN1: whole network
                      From radio: whole network

- Data   LAN1 and LAN2

12.2.2 Configurability

The management mode of equipment affects the Ethernet Channel and on the Switch configuration (RSTP, OAM, …). Therefore it is important to decide the optimal configuration of traffic Ethernet and management, to avoid blocking traffic conditions.

In out of band a dedicated service channel for management does not exist, but this is forwarded to radio side using "internal Vlan stacking" with priority7, so that traffic IP with priority 7 could affect the speed of management traffic.

The disabling of PortA interface can cause outage of management and data traffic.

12.2.3 Address

The unit uses a single IP address associated at the management port of controller and a single "default gateway".

12.2.4 Restore supervisioning access mode

The "RESTORE OF CPU ACCESS" command is available through Serial port (F03594 cable) via Hyperterminal (115200bps,n,8,1):

- Login   SYSTEM
- Password   SIAEMICR
- Type string: lao

This string restores the setting of port configuration:

- LAN1   disable
- LAN2   local access only

Section 7.
COMPOSITION

13   COMPOSITION OF OUTDOOR UNIT

13.1   GENERALS

There are several versions of ALFOplus, each of them with different hardware characteristics. If one of these is inserted improperly in local and remote side, radio link does not work.
Following statements:

- you must have 2 ODUs, the first one working in the lower selected subband and the second one working in the correspondent higher subband; e.g. 1L-1H, 2H - 2L, etc... (see Fig.124).

Unit part number, hardware layout and equipment composition are subject to change without notice.

13.2   ODU PART NUMBER

Every version is identified by a specific part number (see Tab.35) shown on a label attached on each ODU. other information such as power consumption, allowed configuration, feature key, system version, part number P/N and serial number S/N are also written.

Tab.35 - Versions

Code	Description	Go-return (MHz)	RF/Subband
GB7732-04	ODU ALFOplus 24 GO	144	24 GHz 1L
GB7733-04	ODU ALFOplus 24 GO	144	24 GHz 1H
GB9732-04	ODU ALFOplus 24 GE	144	24 GHz 1L
GB9733-04	ODU ALFOplus 24 GE	144	24 GHz 1H
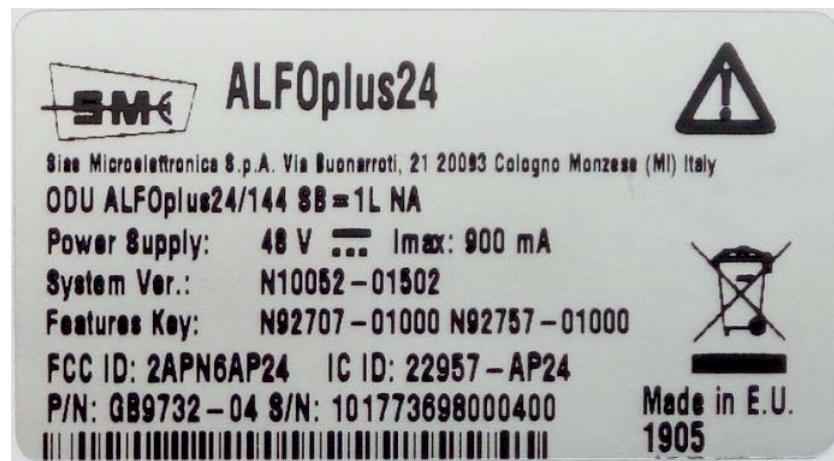
Fig.124 - Label attached on ODU

Section 8.
RF CHARACTERISTICS

14   ALFOPLUS 24 GHZ CHARACTERISTICS

14.1   FOREWORD

The equipment complies with the following international standards:

- EN 301 489-4 for EMC

- FCC CFR Title 47 Part 15.249

- EN 302 217 for digital point to point fixed radio

- EN 300 132-2 characteristics of power supply

- EN 300019 climatic characteristics (operation: class 4.1 for ODU; storage: class 1.2; transport: class 2.3)

- EN 60950-1 and EN 60950-22 for Safety

- IEEE 802.3 for Ethernet interfaces.

Any reference to characteristics for channel separations 7, 14, 28, 56MHz is not applicable for the North American Market.

14.2   GENERAL

The reported values are guaranteed if not specifically defined otherwise.

14.2.1   Available frequencies

- Frequency band   see Tab.36

Tab.36 - Frequency band

FREQUENCY RANGE [GHz]	DUPLEX SPACING [MHz]	REFERENCE RECOMMENDATION
24.05 ÷ 24.25	-	FCC CFR Title 47 Part 15.249

- Modulation scheme   4QAMs/4QAM/16QAMs/16QAM/32QAM/64QAM/ 128QAM/256QAM/512QAM/1024QAM

- Capacity   see Tab.37

- RF filter range   Wide Filter Option (see Tab.38)

- Transceiver tuning range   see Tab.37

The frequency carrier limits are given in Tab.37 and Tab.38.

Tab.37 - Net Radio Throughput in Mbit/s versus Channel Bandwidth for ALFOplus equipment

Modulation type	CHANNEL BANDWIDTH [MHz]								
	7	10	14	20	28	30	40	50	56
4QAMs	9.295	11.408	16.393	23.231	32.956	35.117	46.462	58.078	65.912
4QAM	10.872	15.328	22.025	31.213	44.279	47.183	62.426	78.033	88.558
16QAMs	16.225	22.875	32.870	46.581	66.081	70.414	93.163	116.454	132.161
16QAM	21.080	29.720	42.705	60.520	85.854	91.484	121.040	151.300	171.708
32QAM	24.483	34.517	49.599	70.289	99.713	106.251	140.578	175.723	199.425
64QAM	30.293	42.707	61.368	86.968	123.373	131.463	173.936	217.420	246.746
128QAM	36.102	50.898	73.137	103.647	147.034	156.675	207.294	259.117	294.068
256QAM	41.912	59.088	84.906	120.326	170.694	181.887	240.651	300.814	341.389
512QAM	47.763	67.279	96.759	137.004	194.524	207.100	274.009	342.511	389.048
1024QAM	53.572	75.469	108.529	153.683	218.185	232.312	307.336	384.208	436.369

Tab.38 - RF filter sub-bands for ALFOplus 24GHz

FREQUENCY RANGE: 24.05 ÷ 24.25 GHz			
Sub Band	Lower Half Limits [MHz]	Upper Half Limits [MHz]	RF Filter Range [MHz]
1	24050 ÷ 24106	24194 ÷ 24250	56

The frequency carrier limits are given in Tab.39.

Tab.39 - 24.05 ÷ 24.25 GHz band - Frequency carrier limits

Channel bandwidth [MHz]	Lower half of the band		Higher half of the band	
	Lowest Frequency Carrier [MHz]	Highest Frequency Carrier [MHz]	Lowest Frequency Carrier [MHz]	Highest Frequency Carrier [MHz]

FREQUENCY RANGE: 24.05 ÷ 24.25 GHz [a]				
SUB BAND 1				
Channel bandwidth [MHz]	Lower half of the band		Higher half of the band	
	Lowest Frequency Carrier [MHz]	Highest Frequency Carrier [MHz]	Lowest Frequency Carrier [MHz]	Highest Frequency Carrier [MHz]
7	24053.5	24102.5	24197.5	24246.5
10	24058	24098	24202	24242
14	24057	24099	24201	24243
20	24063	24093	24207	24237
28	24064	24092	24208	24236
30	24068	24088	24212	24232
40	24073	24083	24217	24227
50	24078	24078	24222	24222
56	24078	24078	24222	24222

a.   Go Return software selectable with 250kHz step. FCC CFR47 part 15 requirements in terms of "band edge emissions" is guaranteed only for 10, 20, 30, 40, 50MHz modes of operation.

14.2.2 Transmitter characteristics

- Maximum transmit power [5]   -3dBm

- Tx bandwidth   see Tab.36

- Frequency agility   following ITU-R/CEPT channel plans or at 250 kHz steps

- Built-in transmit power attenuation range   from 17dB to 22dB

- Attenuation step   1 dB step

- RTPC attenuation range   see Tab.40

Tab.40 - RTPC attenuation range

Modulation	RTPC power range [dB]
4QAMs	17
4QAM	17
16QAMs	19
16QAM	19
32QAM	21
64QAM	21
128QAM	21
256QAM	21
512QAM	21
1024QAM	22

- Accuracy of built-in transmit power attenuation   ±2 dB accuracy over attenuation range 0÷7 dB
                                                      ±3 dB accuracy over attenuation range 7÷22 dB

- Spurious emissions   according to ETSI EN 301 390

- RF frequency stability   ±5 ppm
                                                     ±10 ppm (including ageing)

---

5   FCC CFR Title 47 Part 101 states that the field strength shall not exceed 2.5V/m measured at a distance of 3m (equivalent to a maximum e.i.r.p. of 33 dBm). Consequently, the compliance with the e.i.r.p. requirements implies the usage of 1 foot diameter antenna only.

14.2.3   Receiver characteristics

-   Receiver bandwidth   see Tab.36
-   Noise Figure   10.5 dB
-   Guaranteed receiver sensitivities[6] [dBm]   see Tab.41

Tab.41 - Guaranteed receiver sensitivities [dBm]

CHANNEL BANDWIDTH [MHz]		4QAMs	4QAM	16QAMs	16QAM	32QAM
7	BER=10^{-6}	-88.0	-85.5	-82.0	-79.0	-77.0
	BER=10^{-10}	-86.0	-83.5	-80.0	-77.0	-75.0
10	BER=10^{-6}	-87.0	-84.0	-80.5	-77.5	-75.5
	BER=10^{-10}	-85.0	-82.0	-78.5	-75.5	-73.5
14	BER=10^{-6}	-87.0	-83.5	-80.0	-77.0	-75.0
	BER=10^{-10}	-85.0	-81.5	-78.0	-75.0	-73.0
20	BER=10^{-6}	-85.5	-82.0	-78.5	-75.5	-73.5
	BER=10^{-10}	-83.5	-80.0	-76.5	-73.5	-71.5
28	BER=10^{-6}	-84.0	-80.5	-77.0	-74.0	-72.5
	BER=10^{-10}	-82.0	-78.5	-75.0	-72.0	-70.5
30	BER=10^{-6}	-83.5	-80.0	-76.5	-73.5	-72.0
	BER=10^{-10}	-81.5	-78.0	-74.5	-71.5	-70.0
40	BER=10^{-6}	-82.5	-79.0	-75.5	-72.5	-70.5
	BER=10^{-10}	-80.5	-77.0	-73.5	-70.5	-68.5
50	BER=10^{-6}	-81.5	-78.0	-74.5	-71.5	-69.5
	BER=10^{-10}	-79.5	-76.0	-72.5	-69.5	-67.5
56	BER=10^{-6}	-81.0	-77.5	-74.0	-71.0	-69.0
	BER=10^{-10}	-79.0	-75.5	-72.0	-69.0	-67.0

CHANNEL BANDWIDTH [MHz]		64QAM	128QAM	256QAM	512QAM	1024QAM
7	BER=10^{-6}	-74.5	-71.0	-68.5	-65.5	-62.0
	BER=10^{-10}	-72.5	-69.0	-66.5	-63.5	-60.0
10	BER=10^{-6}	-73.0	-69.5	-67.0	-64.0	-60.0
	BER=10^{-10}	-71.0	-67.5	-65.0	-62.0	-58.0
14	BER=10^{-6}	-72.5	-69.0	-66.0	-63.0	-59.0
	BER=10^{-10}	-70.5	-67.0	-64.0	-61.0	-57.0
20	BER=10^{-6}	-71.0	-67.5	-64.5	-61.5	-57.5
	BER=10^{-10}	-69.0	-65.5	-62.5	-59.5	-55.5
28	BER=10^{-6}	-69.5	-66.5	-63.0	-60.5	-56.5
	BER=10^{-10}	-67.5	-64.5	-61.0	-58.5	-54.5

6   Typical receiver sensitivities are 2dB lower.

30	BER=10^{-6}	-69.0	-66.0	-62.5	-60.0	-56.0
	BER=10^{-10}	-67.0	-64.0	-60.5	-58.0	-54.0
40	BER=10^{-6}	-68.0	-65.0	-61.5	-59.0	-54.5
	BER=10^{-10}	-66.0	-63.0	-59.5	-57.0	-52.5
50	BER=10^{-6}	-67.0	-64.0	-60.5	-58.0	-53.5
	BER=10^{-10}	-65.0	-62.0	-58.5	-56.0	-51.5
56	BER=10^{-6}	-66.5	-63.5	-60.0	-57.5	-53.0
	BER=10^{-10}	-64.5	-61.5	-58.0	-55.5	-51.0

- Rx spurious emissions   according to FCC Part 15

- AGC dynamic range   from -22 dBm to Threshold @ BER=10^{-6}

- Accuracy of Rx level indication @ 25 C° (PC reading) ±2dB in the range -22dBm ÷ Thresholds @ BER=10^{-6}

- Accuracy of Rx level indication over the whole temperature range (PC reading)   ±3dB in the range -50dBm ÷ Thresholds @ BER=10^{-6}
±4dB in the range -49dBm ÷ -22dBm

- Maximum input level for BER 10^{-6} -22 dBm

- Residual BER (RBER) 10^{-12}

Section 9.
LISTS AND SERVICES

15   LIST OF FIGURES

16   LIST OF TABLES

17 ASSISTANCE SERVICE

Technical assistance service is provided via the *WebTicketing* portal, accessible through *SIAE Internet* Web page (www.siaemic.com).

The use of the *WebTicketing* portal requires that the user is enabled to the service: to obtain information on how to be enabled, please refer to the *Contact US* section of SIAE Internet Web page.