Technical-information report relevant to the requirements on the electromagnetic emission and compatibility with the human health of the ERICSSON Mini-Link BAS radio equipment.

1 INTRODUCTION

The present document states the main characteristics of a terminal radio equipment of the Ericsson Mini-Link BAS Point to Multipoint, with the purpose to evaluate the compliance with the **FCC exposure requirement 47CFR 1.1310.**

The system is composed by a node and by remote terminals. The node consists of a radio equipment that transmits/receives in the frequency band 31÷31.3 GHz through antennas installed on a mast. Each antenna radiate a 90° beam in azimuth so as to cover the surrounding area at 360°.

The terminals are installed on each remote site, composed by the same node radio equipment, but with directive antennas.

The installation has to guarantee the line-of-sight between the node antenna and each terminal antenna: such fact together with the antenna beam characteristics in elevation guarantee that in any way the building, or the node or terminals surrounding areas, cannot be exposed to electromagnetic fields of significant amount.

Notice that the terminal transmitter doesn't work continuously but it's switched.

2 TERMINAL STATION

2.1 INSTALLATION AREA

An antenna, with integrated transmission equipment, is installed on the roof, as for section 3

2.2 TECHNICAL DATA

- Operation frequency band: 31÷31.3 GHz
- Channel band 28 MHz
- Max antenna input power: 23 dB_m
- Max antenna gain (a 0°): 35.5 dB_i
- Antenna diameter: 0.24 m
- Antenna beam width (–3dB): 3.4°
- Antenna gain at -45°: 1 dB
- Antenna gain at -90°: -18 dB
- EIRP on the max. radiation direction: 58.5 dB_m
- EIRP a 45°: 24 dB_m
- EIRP a 90°: 5 dB_m

2.3 ELECTROMAGNETIC FIELDS EVALUATION

The **47CFR 1.1301**, state the exposure limit value of the population of the electromagnetic field connected to the working of telecommunication and radio-broadcasting fixed systems.

The limit values foreseen by the above decree, in the 1500 MHz-100.000 MHz frequency band, where Ericsson Mini-Link BAS is included, allows a maximum exposure equal to a power density of **1mW/cm^2** (10W/$^{m\backslash 2}$) for an averaging time of exposure of 30 minutes

2.4 TYPICAL INSTALLATION OF A MINI-LINK BAS TERMINAL

In the below figure 1 a typical installation of a Mini-Link BAS radio terminal is reported, in an urban or sub-urban environments with building and streets. The system needs line of sight between the terminal and the node station where the terminal itself is radio connected; therefore the presence of obstacles along the path doesn't allow for the correct operation. Where is possible, the terminal will be installed is such position to maintain the first Fresnel ellipsoid free. This, with the use of highly directive antennas on the terminal, have the effect of almost null electromagnetic emission out of the direction of maximum radiation of the antenna itself.

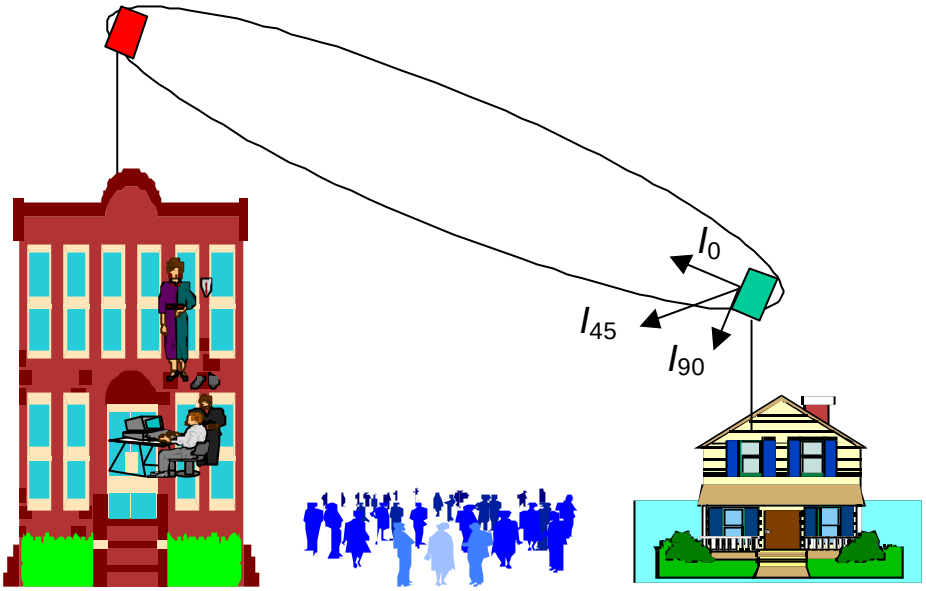


Figure 2-1. Typical scenario of the Mini-Link BAS connection. The node station is red, the terminal is green.

The figure 2-1 actually show three possible exposure situations:

- due to a partial interception of the beam in the direction I_0 from a nearness building;
- due to the radiation in the direction I_{45} of streets or other building (when the host building is very high)
- or due to the radiation I_{90} through the same host building.

Please note that in a typical installation the node station will be installed higher than all the terminals; that in order to maximise the percentage of the area in the line of sight itself. Consequently, to guarantee the best aiming to the node, the terminal antenna will be oriented higher than the horizon. That will contribute to minimise the electromagnetic emission through the building below.

2.5 MODEL TO CALCULATE THE HEALTH & SAFETY DISTANCE

Using the following formula is possible to calculate the required safe distance to avoid electromagnetic exposure higher than the limits.

(OET Bulletin 65 – Ed 97-01 – Section 2 PREDICTION METHODS)

$$S = \sqrt{\frac{P * Gi}{4 * \Pi * R^2}} \qquad \Rightarrow \qquad R = \sqrt{\frac{P * Gi}{4 * \Pi * S}}$$

R = distance to the center of radiation of the antenna (cm)
P = power input to the antenna input in mW
G_I = antenna gain of the antenna in the direction of interest relative to an isotrope antenna
S = power density (in appropriate units, e.g. mW/cm^2)

r = $\sqrt{\frac{199.52 * 3548.13}{12,566}}$ = 237.35 cm (2.37 m) $I_{0°}$

r = $\sqrt{\frac{199.52 * 2.258}{12,566}}$ = 5.98 cm $I_{45°}$

r = $\sqrt{\frac{199.52 * 0.0158}{12,566}}$ = 0.5 cm $I_{90°}$

2.6 LABELLING

As required a warning label will be placed on the antenna to inform about the safe allowed distance to be compliant with the maximum permitted RF exposure level.

**To comply with FCC
RF exposure requirement
47CFR 1.1310
a minimum safe distance of
2.5 m is required**

An example of the label positioning (antenna side) is showed in fig 3.2

3 RADIO EQUIPMENT MECHANICAL DATA

3.1 RADIO UNIT

The mechanical dimension of the radio are 266x321x78 mm (LxHxP), with weight of 7 kg (see

Figure 3-1).

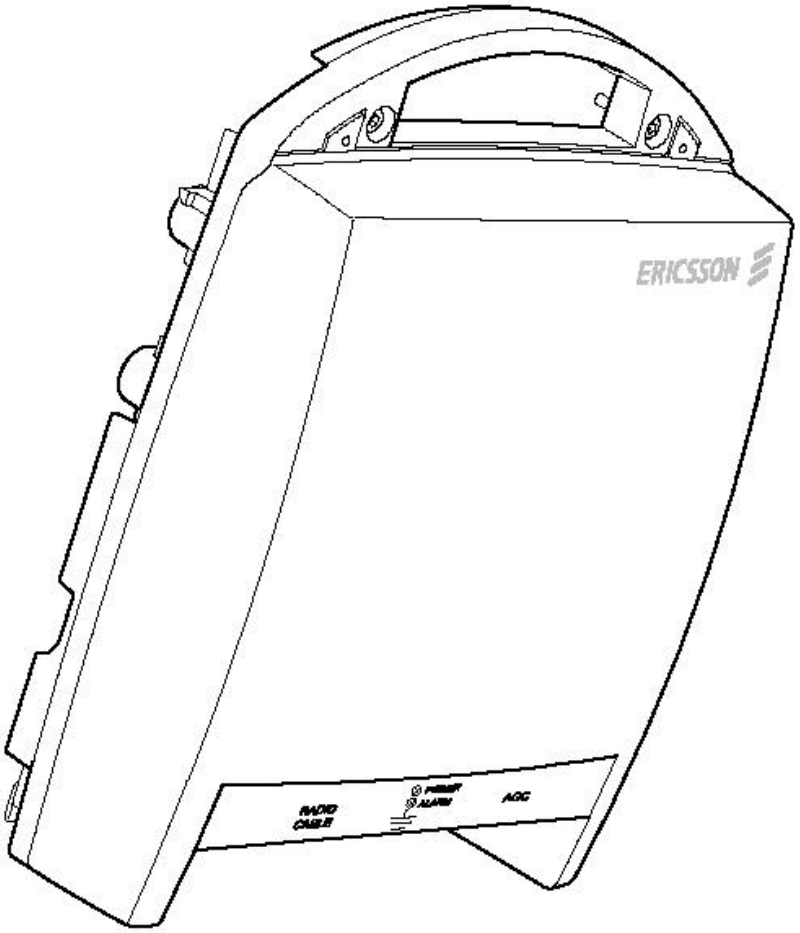
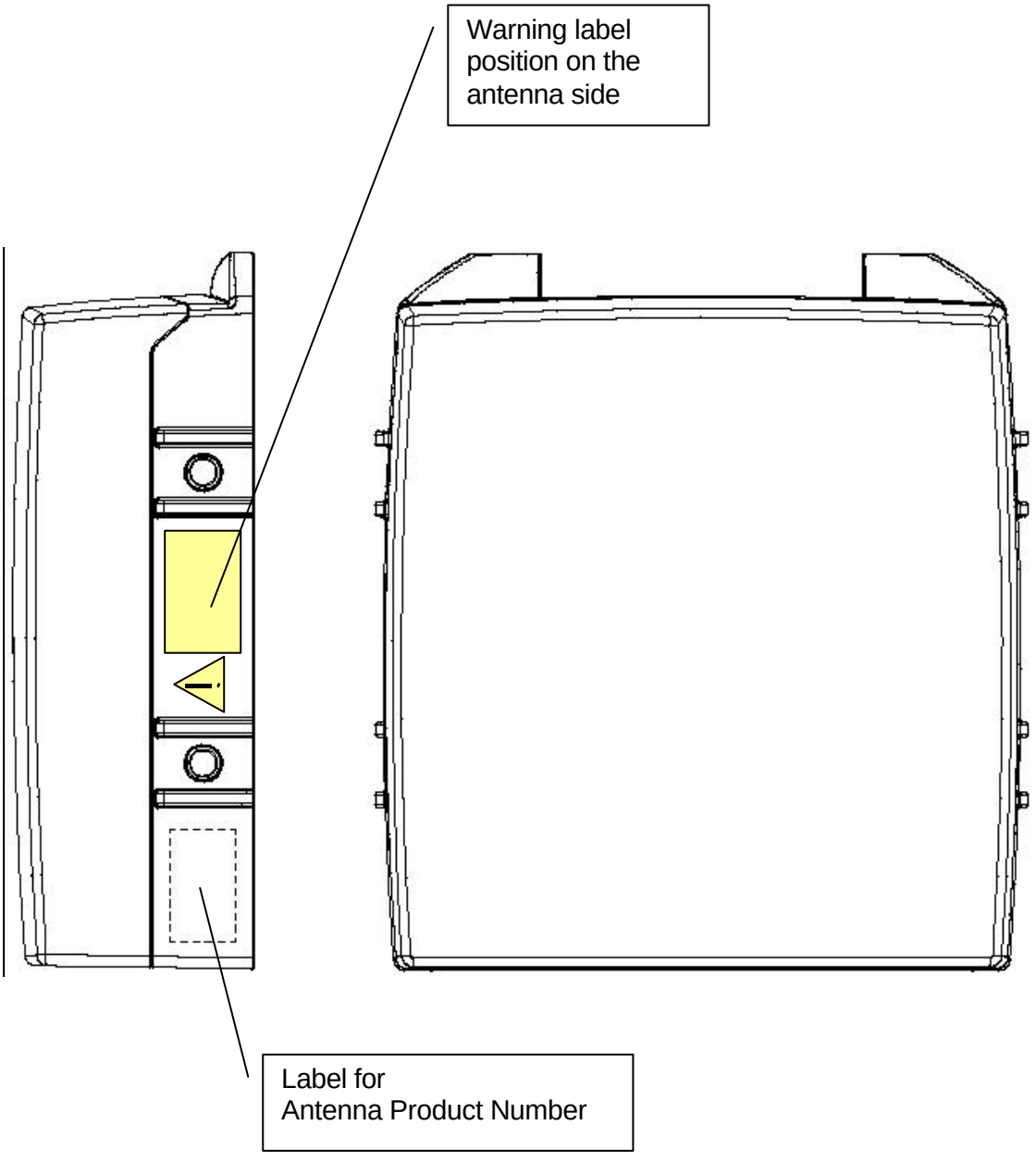


Figure 3-1. Radio Unit.

3.2 ANTENNA

The mechanical antenna dimension are: 266x296x93 mm (LxHxP), with weight of 2.5 kg

(see figure 3.2)



3.3 RADIO EQUIPMENT INSTALLATION

The radio unit and the antenna will be assembled in an unique unit (see Figure 3-3); the radio units should be mounted on a support (tripod) placed on the building roof. Such support is designed to be easily moved as it's made of small parts that can be carried on the building roof using a regular lift. (maximum length 2m).

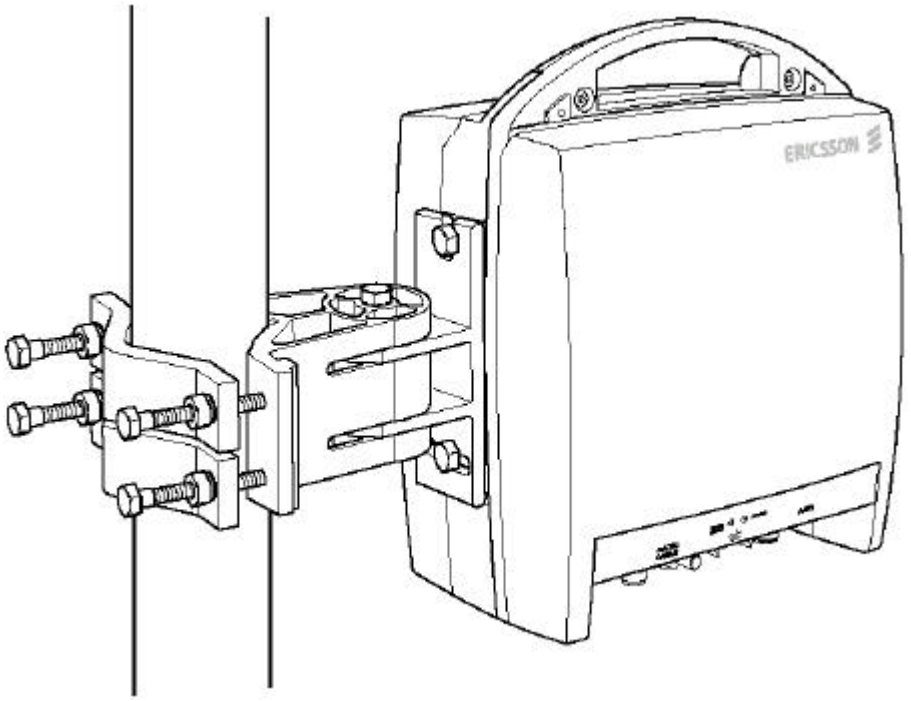


Figure 3-3. The assembled radio unit and antenna.

The support is composed by tubular elements; the lags are arranged at 120° horizontally. It's placed on the cover and held in place by concrete blocks; that means that no construction work is necessary thus avoiding any water infiltration in the floors below.

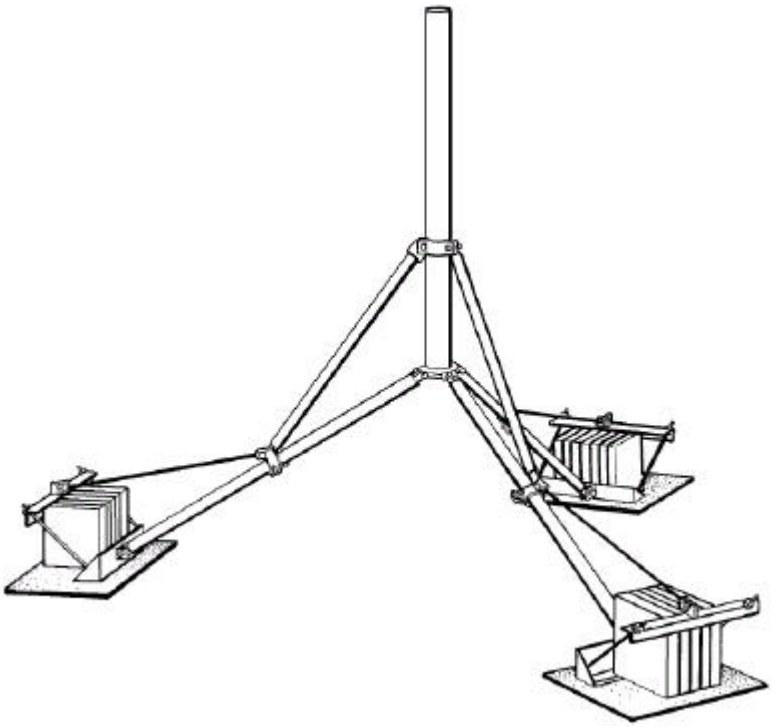


Figure 3-4. External unit support.

The total weight of the support (except for the concrete blocks) is of 65 kg; the cover must be able to sustain about 300 kg on each of the supports (700x500 mm). If the cover isn't able to sustain such weight, it's possible to reduce the block number to reach the maximum allowed load without reducing the wind resistance capability of the support; this support, actually, is designed for parabolic antennas up to 60 cm diameter and the present antennas have lower dimensions.

3.4 CABLES

The following cables are needed:

1. 1 coaxial cable 10 mm diameter for each radio equipment, from the flat to the radio

2. 1 earthing cable from each support to an earth plug on the cover; to such cable all the radio equipment will be connected so as to ensure an appropriate grounding.

3. 1 earthing cable (connected to the previous point) to connect the coaxial cable shield.

ERICSSON will control the installation of the radio equipment and will supply adequate documentation for the installation itself.