

# **NESO 2.4-A**

**DIGITAL AUDIO TRANSMISSION SYSTEM  
FOR MONITORING. USA & CANADA  
VERSION**



## **USER MANUAL**

May'24

## INDEX

<b>1. DESCRIPTION AND PICTURES.....</b>	<b>3</b>
<b>2. START WORKING WITH NESO 2.4 .....</b>	<b>4</b>
2.1 START UP .....	4
2.2 AUDIO CONECTION .....	4
2.3 NESO 2.4 TRANSMITTER AND HEARING TERMINALS PAIRING.....	5
2.4 START AND STOP RECEIVING .....	6
<b>3. HEARING TERMINALS .....</b>	<b>7</b>
3.1 DESCRIPTION.....	7
3.2 INSERTING AND REMOVING THE BATTERY (IN-THE-CANAL AND BEHIND-THE-EAR TERMINALS) AND SWITCH ON/OFF BEHIND-THE-EAR RECHARGEABLE TERMINALS .....	8
3.3 INSERTING AND REMOVING THE SPEAKER (non-rechargeable rear hearing terminal).....	8
3.4 INSERTING AND REMOVING THE SPEAKER (rechargeable rear hearing terminal).....	9
3.5 RECHARGEABLE REAR HEARING TERMINAL CHARGE PROCESS.....	9
<b>4. SPECIFICATIONS / FEATURES OF NESO 2.4 HEARING TERMINALS.....</b>	<b>10</b>
<b>5. SPECIFICATIONS / FEATURES OF NESO 2.4 TRANSMITTER.....</b>	<b>10</b>
<b>6. IMPORTANT INFORMATION.....</b>	<b>11</b>
6.1 WARNINGS.....	11
6.2 PRODUCT SAFETY INFORMATION.....	11
6.3 CARE AND MAITENANCE FOR NESO 2.4 HEARING TERMINALS .....	12
<b>7. DECLARATION OF CONFORMITY.....</b>	<b>13</b>
<b>8. WARRANTY .....</b>	<b>14</b>



### **iEXTREMELY IMPORTANT!**

Please read carefully this manual before starting any operation with your  
NESO 2.4

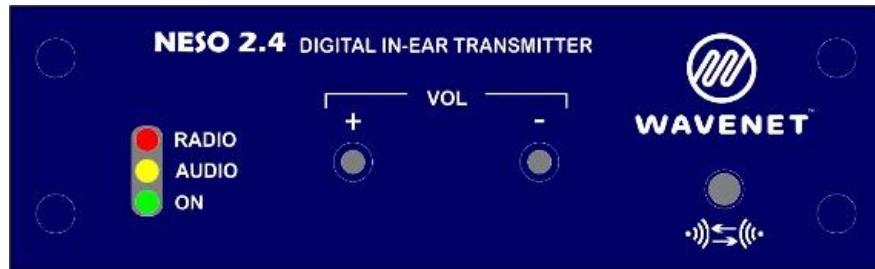
## 1 DESCRIPTION AND PICTURES

NESO 2.4 is a DIGITAL AUDIO TRANSMISSION SYSTEM for monitoring applications to be used in TV productions, TV sets, theatre, stage management, technicians, etc.

NESO 2.4 system is made of a radio frequency base station which works on the 2.4GHz ISM band, and a complete range of in-the-canal as well as behind-the-ear hearing terminals, all of them focused to high quality audio transmission/reception for professional applications.

The system is factory configurable.

### FRONT PANEL



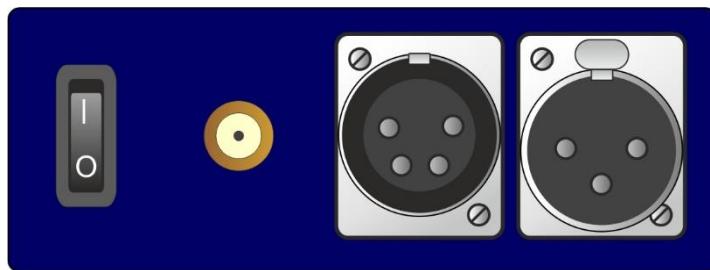
1

2

3

1. Status LED: red active carrier; yellow audio presence (peak meter); green on.
2. Up/down output volume level.
3. Pairing button.

### REAR PANEL



1

2

3

4

1. On/off switch
2. Type RP SMA antenna connector
3. XLR4 M: Power input – GND 1; + 4; 12 VDC ± 10 %
4. XLR3 H: Audio IN – Line +4 dB

## 2 START WORKING WITH NESO 2.4

### 2.1 START UP

**NESO 2.4** works in the 2.4 GHz band. Please take into account that the inherent

features of this band make you must be careful with the transmitter location, and keep in mind that human body is an obstacle, and other obstacles like walls, metallic elements, etc.

Connect the power supply and the antenna (vertical position) supplied to the proper connectors in the **NESO 2.4** transmitter. The device will be ready to be switched on.

**WARNING**

***Do not turn, change or disconnect the antenna. The antenna supplied is the one proper for the NESO 2.4 transmitter, and the one suitable for the best efficiency as well as the FCC/ISED standards and rules applied compliance.***

***Substitution or alteration of the supplied antenna could be harmful to the system efficiency and will cause the unfulfillment of FCC/ISED standards and rules applied.***

## 2.2 AUDIO CONNECTION

Please connect a line level (+ 4 dB) audio source to the XLR3 H connector. Please take into account that this input only be balanced if this option has been requested.

PIN 1 = GND

PIN 2 = SIGNAL

PIN 3 = GND

or if balanced

PIN 1= GND

PIN 2= HOT

PIN 3= COLD

There are two “+” and “-“ buttons on the transmitter front panel, which allow the output audio level fine setting.

***CAUTION. NESO 2.4 transmitter audio output level is set in factory in the middle of the scale. Adjusting audio output level in the transmitter makes that all the hearing terminals paired with it are affected by that adjustment. Please keep in mind that, the same as with other hearing devices (headphones, etc.) a high level adjusting can cause lesions in inner ear***

## 2.3 NESO 2.4 TRANSMITTER AND HEARING TERMINALS PAIRING

**NESO 2.4** system needs that the transmitter and its associated hearing terminal(s) are identified with each other. We call this process pairing or bonding.

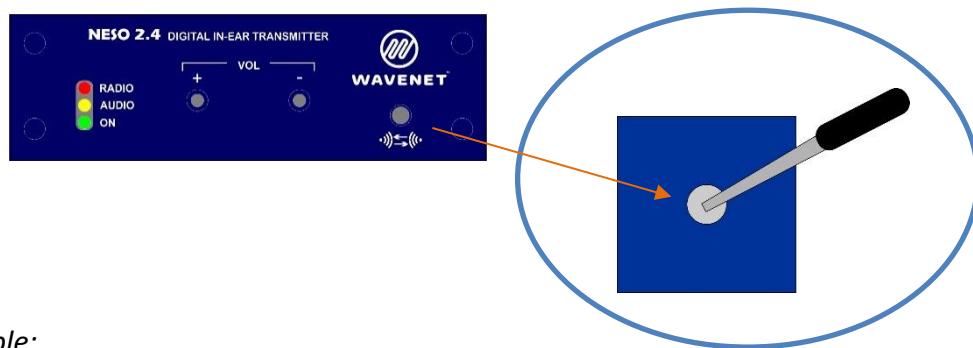
Pairing process is the following:

Supply the **NESO 2.4** transmitter with the power supply and switch it on. To ensure the pairing process, be sure that there's no audio supplying.

There are no hearing terminals limit paired with each transmitter. In addition, the transmitter can be recognized as 1, 2 or 3 by hearing terminal. That no limit of paired hearing terminals doesn't matter if bond has been done as 1, 2 or 3.

Each hearing terminal can be paired up to three transmitters, every time these three transmitter have been paired as 1, 2 or 3, that is: one hearing terminal cannot recognize two transmitter as 1 (or 2 or 3).

First step is to choose the number by which the transmitter is going to be recognized by the hearing terminal (1, 2 or 3). Then, using a proper tool (could be a little screw driver or trimmer) push the pairing button on the transmitter front panel as many times as the number chosen (1, 2 or 3). **Please keep in mind that taps must be short, if button is pushed for more than 2 seconds, the transmitter will change to a one of the factory setting modes, which can cause malfunctions on the transmitter.** If you have pushed the pairing button for more than 2 seconds, or you think that you could do it, **please switch off the transmitter, wait for a minute, and switch it on again.** This operation will make the transmitter operate in its working mode.



Example:

1. To pair the **NESO 2.4** transmitter to a hearing terminal as 1:

- Be sure that all the hearing terminals near the transmitter are switched off (no battery or battery housing open, or switched off if rechargeable terminal, see **3.2** point).
- Push the pairing button on the **NESO 2.4** transmitter just once.
- At that moment, the red led on the front panel will blink once every two

seconds to indicate that transmitter is ready to be paired as 1.

- **NESO 2.4** transmitter will keep in pairing mode for 20 seconds.
  - During this time, insert a battery and close the battery housing of the hearing terminal that must be paired.
  - Place the hearing terminal on top of **NESO 2.4** transmitter, approximately centered on the ventilation grill.
  - The red led will keep on blinking and, at the moment that pairing is done, will light steadily for 3 seconds, then will blink again and, after the 20 seconds are over, will stop to be in pairing mode.
  - Once the pairing is succesful, switch off both transmitter and hearing terminal. Supply audio line and switch on your **NESO 2.4**. To start to receive audio on the hearing terminal, switch it on by closing battery housing, wait to hear a short beep (activity indicator) and, once you hear it, push the button on the hearing terminal just once, and you will start to hear the transmitted audio.
2. To pair a transmitter as 2 or as 3, the sequence of actions is the same, but to pair the transmitter as 2 the pairing button has to be pushed twice, and to pair the transmitter as 3 the pairing button has to be pushed three times.

For these two last cases, the red led blinking will be:

- For 2: Twice every 2 seconds.
- For 3: Three times every 2 seconds.

Pairing button presses	Indicator light pattern	Transmitter identity
1	●   ●   ●   ●	1
2	●●   ●●   ●●   ●●	2
3	●●●   ●●●   ●●●   ●●●	3

#### RED LED BLINKING PATTERN REGARDING NUMBER FOR PAIRING

#### 2.4 START AND STOP RECEIVING

Once the pairing is done, the hearing terminal keeps that pairing. So, if the terminal is switched off, to start using it again just switch it on (closing the battery housing), wait for the first activity beep and, to activate the receiving:

- To receive from transmitter 1, push once the button on the hearing terminal.
- To receive from transmitter 2, push twice the button on the hearing terminal.
- To receive from transmitter 3, push three times the button on the hearing terminal.

To stop the receiving, please keep pushed the button on the hearing terminal for some seconds.

**If hearing terminal is out of the NESO 2.4 transmitter range for more than 5 minutes, the terminal will disconnect from the transmitter, and it will be necessary to push again the button on the terminal (as many times as the number of the transmitter you want to receive from) to start again the receiving.**

### 3 HEARING TERMINALS

Both in-the-canal and behind-the-ear hearing terminals are radio frequency systems that fit the ear in a total ergonomic way.

Every hearing terminal have a high degree of discretion (virtually invisible), while providing a very high audio quality.

Hearing terminals are designed to be used into the left inner ear or into the right inner ear, so there are not interchangeable between right and left.

In-the-canal terminals are marked with a blue or red spot: if blue, it is for left inner ear, if red it is for right inner ear. In addition, the filter is also colored with the same code blue and red.

Behind-the-Ear hearing terminals case, is the speaker which marks if it should be used into the left or right inner ear: the speaker shape already indicates if it is for right or left ear, and there is a red (right) or blue (left) square with the inscription "MP2".

**Hearing terminals require an especial care from the point of view of cleaning. Ear wax and other dirt cause malfunction and failure. Please keep in mind that each person is different in terms of ear wax creation, which means that cleaning cadence must be also different. In addition, please replace the filter (in the case of both in-the-canal and behind-the-ear terminals) and the open domes (in the case of behind-the-ear terminals) frequently to avoid that dirt and ear wax get inside of the device.**

#### 3.1 DESCRIPTION:

##### IN-THE-CANAL HEARING TERMINAL



##### BEHIND-THE-EAR HEARING TERMINAL



### **3.2 INSERTING THE BATTERY (IN-THE-CANAL AND NON-RECHARGEABLE BEHIND-THE-EAR TERMINALS) AND SWITCH ON/OFF RECHARGEABLE BEHIND-THE-EAR TERMINALS:**

In-the-canal terminals and non-rechargeable behind-the-ear terminals:

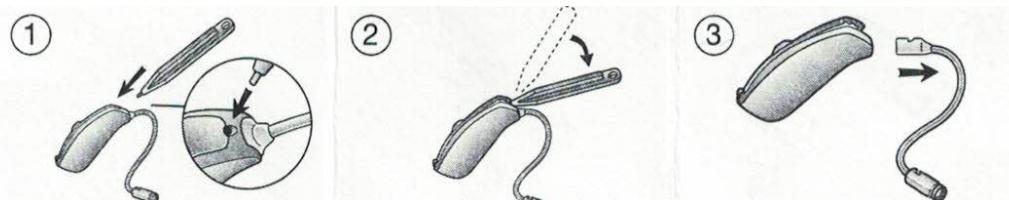
1. Open the battery housing.
2. Insert the proper battery. Remember that once the battery protection adhesive has been removed, it is necessary to wait 2 min. before installing.
3. Close the battery housing. In this moment the terminal is switched on and keeps waiting for the receiving order (see **2.4** point)

Rechargeable behind-the-ear terminals:

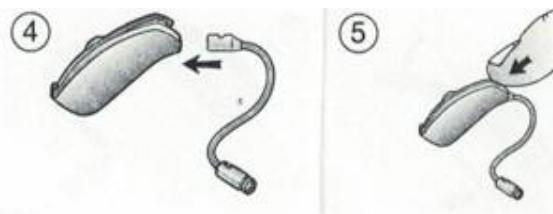
Rechargeable behind-the-ear terminals switch on/off is done using the action button placed on them. Push the button for 4-5 seconds and the hearing terminal will switch on if it was switched off, or the terminal will switch off if it was switched on.

The green LED located over the action button will light once for a couple of seconds if we have switched on the terminal. Conversely, the green LED will flash three times if we have switched off the terminal.

Once switched on, the terminal keeps waiting for the receiving order (see **2.4** point)

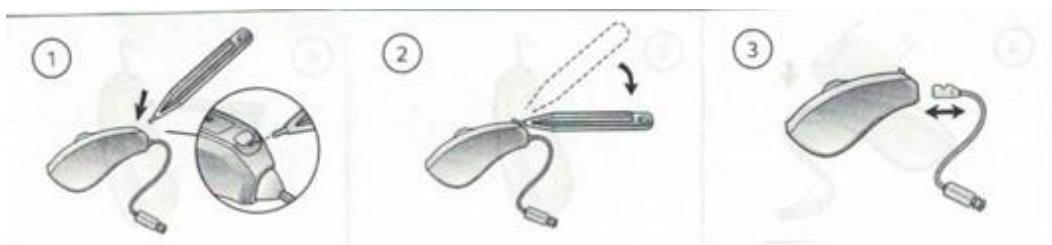


### **3.3 INSERTING AND REMOVING THE SPEAKER (battery rear hearing terminal):**



1. Using the supplied tool, insert it into the hole located on the speaker housing.
2. Pry down with the tool until the top cap is open.
- 3-4. Pull out the speaker and, with the top cap opened, place the new speaker by pushing. Please be sure that the connector position is right, and the speaker is fully introduced in its housing (whole connector wide part must be inside).
5. Close the top cap by pressing it.

### 3.4 INSERTING AND REMOVING THE SPEAKER (rechargeable rear hearing terminal):



1. Using the supplied tool, insert it into the hole located on the speaker housing.
2. Pry down with the tool until the plastic fixing tab rises up.
3. Pull out the speaker and, with the plastic tab still risen up, place the new speaker by pushing. Please be sure that the connector position is right, and the speaker is fully introduced in its housing (whole connector wide part must be inside).
4. Push down the plastic fixing tab.

### 3.5 RECHARGEABLE REAR HEARING TERMINAL CHARGE PROCESS:



**WARNING**  
**FOR SECURITY REASONS, USE ONLY THE BATTERY CHARGER SUPPLIED BY  
 WAVENET.**

*On the first charge of the case/charger, be sure that it is charging at least for three hours, even when charge indicator shows charge complete before that three hours. Be sure that hearing terminals are dry before put them into the case/charger.*

#### CASE/CHARGER CHARGE:

1. Plug the supplied power adapter into an electrical outlet and connect the charging cable to the connector on the back of the charger.
2. Three LED on the back side of the charger indicate the level of charge. One red flashing LED means low charge level; three Green LED means full charge.
3. One full charge of the case/charger allows at least three full charges for two hearing terminals.

LED	CHARGE LEVEL
●	Red flashing LED < 10% of charge
●	10-33% of charge
● ●	33-66% of charge
● ● ●	66-100% of charge

**CHARGE OF RECHARGEABLES REAR HEARING TERMINALS:**

1. Put the hearing terminals into the charge slots of the case/charger.
2. During charging process, terminal LED slowly flash until terminal is fully charged. When charge is complete (around 3 hours), the LED stands on until it is removed from charger.
3. Five LED on the front of the case/charger shows the charge level of the hearing terminals batteries. When terminals are inserted or removed these LED shows the lower level of battery of both terminals. The LED indicate this charge level of the terminals batteries for 10 seconds, and then switch off. Even so, the hearing terminals will be still charging (see point #2).

LED	BATTERY LEVEL
●	0-20%
●●	20-40%
●●●	40-60%
●●●●	60-80%
●●●●●	80-100%

**4 SPECIFICATIONS / FEATURES OF NESO 2.4 HEARING TERMINALS**

	IN-THE-CANAL	BEHIND-THE-EAR
Color	To choose	To choose
Battery	10A Zinc/Air	312 Zinc/Air
Power consumption	1,15 mA	1,13 mA
RF frequency	2,4 ISM	2,4 ISM
Audio bandwidth	100 Hz – 9,5 kHz	100 Hz – 9,5 kHz
Distortion	0,5%	0,6%
Maximum SPL	100 dB	100 dB
Regulations complying	Comply FCC (CFR 47 part 15-C), ISED and UE regulations	

**5 SPECIFICATIONS / FEATURES OF NESO 2.4-A TRANSMITTER**

Audio in level	0,775v
Audio connector	XLR3 H: Line +4 dB. Balanced
Audio bandwidth	50 Hz – 10 kHz
Latency	18 ms max.
Frequency	ISM 2.4 band (UN/85)
Output power (conducted)	NESO 2.4-A USA & CANADA VERSION +24.5 dBm (280 mW)
Antenna	RP-SMA 5 dBi omnidirectional antenna.
Modulation	GFSK
Radio service	Bluetooth
Carrier type	Frequency hopping (FH)
Range (LOS)	Up to 80 m, depending on environment
Dimensions	155 x 115 x 35 mm
Weight	300 g
Power supply	12V/1A or external adaptor 220V/50 Hz
Power supply connector	XLR4 M (1 GND, 4 +)
Operation conditions	0°- 45°C and relative humidity of < 95% (non condensing)
Homologation reference	USA FCC ID: 2BC55NESO24-23H

## 6 IMPORTANT INFORMATION

### 6.1 HAZARD WARNINGS

- Keep this system out of reach of children under 5 years.
- This system must be repaired only by WAVENET RF Engineering., who expressly FORBID any change, modification or internal handling of the system.
- Do not open or internally handle either transmitter or hearing terminal. In case of failure or malfunction please contact with WAVENET RF Engineering Technical Service.
- Use only the original accessories supplied by WAVENET RF Engineering. Using another type of accessories could cause a malfunction of the system, as well as the non-compliance of the regulations.
- Do not use the cables supplied (for example the power supply cable) for any different purpose than the planned.
- Do not operate this system in locations where electronics systems working is forbidden.
- This system must not be operated in aircrafts without the specify authorization of the flight crew in charge.

### 6.2 PRODUCT SAFETY INFORMATION

- Protect the system from excessive vibrations.
- Protect the system from shock.
- Protect the system from excessive humidity (relative humidity <95% non-condensing).
- Do not expose the system to temperature above 45°
- Never use heating systems (oven, microwaves oven, hairdryer, etc.) to dry the devices.
- Use a damp cloth to clean the devices. Never use domestic cleaning products or alcohol to clean them.
- Use only the elements supplied and suggested by WAVENET RF Engineering (power supply, batteries, charger, etc.) to power up the system.
- When system is not in use, switch it off and storage it properly.
- Radiation from X-Ray, CT or MRI may destroy and/or adversely affect to the right working of the system.
- Keep a right cleaning of the system IN/OUT connectors.
- If system is damaged, overheated, or any cable or connector is damaged, or any liquid falls on it, stop using it, disconnected it and contact the WAVENET RF Engineering Technical Service.

### 6.3 CARE AND MAINTENANCE FOR NESO 2.4 HEARING TERMINALS

Hearing terminals require a special care in terms of cleaning. Wax, humidity and another dirt cause failures and malfunction of them.

To avoid wax and dirt from entering the terminals, it is necessary to replace frequently the filter (in the case of both terminals type) and the open dome (just in the case of behind-the-ear terminals).

It is very important to keep in mind that each person is different in terms of wax generation, which means that cleaning, and filters and/or open domes replacement frequency have to be adequate taking into account this appreciation.

As general advice, we highlight the following:

1. Do not immerse the terminal in any liquid.
2. Keep the terminals dry and clean.
3. Open de battery case when terminals are not in use. This will help their drying if they have condensation moisture.
4. Clean the terminals with a soft cloth and a little brush (the kit supplied) after each use to remove any accumulated dirt.
5. To make a deeper cleaning, as well as to sanitize the terminal, it is recommended to use the **NESO 2.4** air blower (reference **PLN**) and the cleaning spray (reference **SLN**).
6. Occasionally, to sanitize the terminal, a very little alcohol can be used, but never directly on the terminal. The appropriate way is to put a drop or two on the supplied brush or cloth and clean the terminal with them.
7. Examine the open dome of the behind-the-ear-terminals after each use, and replace it with some frequency.
8. Examine the filter (in both terminals type). It is important not to let dirt and/or earwax accumulate on them, as they will end up entering the terminal, which will cause malfunction or failures in it. Replace the filter with some frequency (in the case of in-the-canal terminals the replacement frequency must be higher, because unlike of behind-the-ear terminals, they do not have the open domes, which are a first barrier to avoid dirt).
9. Keep the terminals away from excessive heat and direct sunlight. Heat can warp the case, damage the electronics, and/or deteriorate the surface.



**Cleaning KIT supplied KLN**



**Air blower PLN**



**Cleaning Spray SLN**

## 7 DECLARATION OF CONFORMITY

### EUROPEAN UNION

Servicios de Radio Wavenet, S.L. declares that this product comply with the following regulations:

#### EU:

- Technical rule of reference: EN 300.328
- This device is in compliance with the essential requirements of conformity of the 93/42/CEE directive, Annex I.
- This device is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/UE

You can ask for a copy of the Declaration of Conformity by contact the manufacture, which can be done on its website [www.wavenetradio.com](http://www.wavenetradio.com)

The operation of this system is subject to the following conditions:

1. This system must not cause interferences to other systems.
2. This system must accept any interference from other systems, including if this interferences cause a malfunction of it.

This system uses, generates and can radiate radio frequency energy. If it is not installed and operated under the manufacture instructions, can cause undesired interference to other devices and/or systems.

#### USA & CANADA:

The transmitter of this system complies with Part 15 of the FCC Rules and with RSS-247 and RSS-210 Rules of Industry Canada.

Operation is subject to the following two conditions:

1. This transmitter must not cause interferences to other systems
2. This system must accept any interference from other systems, including if this interferences cause a malfunction of it.

The transmitter has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

The system generates, uses and can radiate radio frequency energy and, if not installed and used according with this User Manual instructions, may cause harmful interference to radio communications.

Even so, there is no guarantee that interference will not happen in a specific

installation. If the system causes interference to radio or television reception (this can be determined by switching on and off the system), the user could try to correct the interference with this suggestions:

- Changing the location of the receiving antenna.
- Increase the distance between the system and the TV or radio device.
- Use a different socket for system than the used with the TV or radio device.
- Consult a radio/TV technician for help.



To comply with FCC RF exposure limits for general population, the antenna used for the transmitter of this system must be installed at least 20 cm of any person that could be around. In addition, the transmitter of this system must not be located or operating in conjunction with any other antenna or transmitter.

The transmitter of this system is a Class B digital device that complies with Canadian ICES-003. To comply with Canada RF exposure limits for general population, the antenna used for the transmitter of this system must be installed at least 20 cm of any person that could be around. In addition, the transmitter of this system must not be located or operating in conjunction with any other antenna or transmitter.

## 8 WARRANTY

In compliance of current European Union regulation, Servicios de Radio Wavenet offers a limited 2 years warranty, which is valid from date of purchase.

This warranty covers the repair of any manufacturing defects. The warranty does not cover the damages caused by an unsuitable system operation, and chemical or liquids exposure nor spare parts.

The internal device handle, repair or non-authorized changes done by external people of Servicios de Radio Wavenet, S.L., immediately null and avoid the warranty.