



SIGFOX SBS-T3
PRODUCT SPECIFICATION

Ref.: GEN-HWA-PTS12

Rev.: V1.7

Date: 06 dec 2016

SIGFOX SBS-T3

PRODUCT MANUAL

APPROVED:

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CHANGES DESCRIPTION

Version	Description	Author	Date
1.0	Creation	H. Ardiller	18/10/2016
1.1	Modification	L.Bordes	02/11/2016
1.2	Corrections content and form	A. Trombetta	14/11/2016
1.3	Update sbs datasheet	A. Trombetta	16/11/16
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1.5	Remove labels section	S. Barreiro	22/11/16
1.6	LNAC datasheet updated	A. Trombetta	05/12/16
1.7	LNAC names updated, addition of hot symbol, complete Canada warnings, correction of version, date and title	S. Barreiro	06/12/16

ACRONYMS

Acronym	Description
ETH	Ethernet
LNA	Low Noise Amplifier
LANC	Low Noise Amplifier and Cavity filter
PVC	Polyvinyl Chloride
RF	Radio Frequency
SAT	Satellite
TAP	Transfox Access Point
VSWR	Voltage Standing Wave Ratio

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1. INSTALLATION RECOMMENDATIONS

1.1 Base Station synopsis

Sigfox base stations operate on reception on a specific frequency bandwidth used by sigfox terminals. They are also able if necessary to transmit information to do single or multi-cast back to these terminals.

The base stations include a complete system described in the following synopsis.

The antenna characteristics depend on the operating frequency band and specific site constraints (gain, height, etc.).

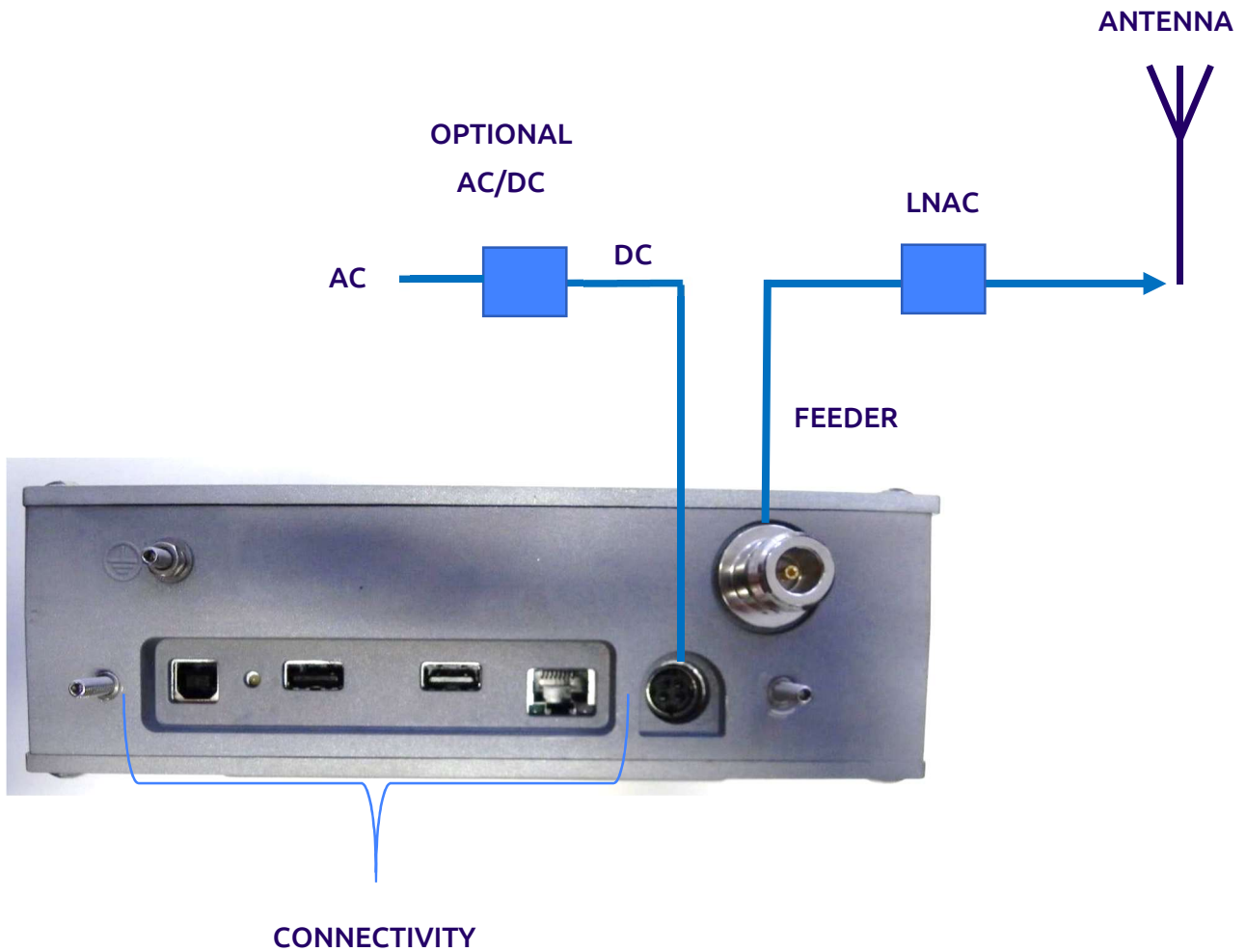
Sigfox will provide the transceiver unit called Sigfox Base Station transceiver (SBS-T) version 3 and the corresponding antenna low noise switch/amplifier (LNAC or LNA). This component integrates a low noise amplifier in reception mode and a switch that bypasses this stage in transmission mode.

This device characteristic depends also on operating frequency bands applicable in the region.

Sigfox Base Station transceiver (SBS-T) version 3 series are ultra-wide range, high linearity transceivers units and feature first class performance radio and innovative software defined processing, for use in Ultra Narrow Band Machine-To-Machine wireless communication systems.

Base Station transceiver (SBS-T) version 3 can have a pre-set receiver frequency depending on the radio regulation applicable in the region. This choice is made by a specific software configuration.

1.2 Installation synopsis



1.3 Installation site recommendations

This base station has been developed to be installed in indoor or outdoor with plastic shell.

It must be used with an LNA or LNAC.

It can be used also with a cavity filter.

The datasheets of LNACs for 902MHz operation is in annex 2.

The datasheets of LNACs for 922MHz operation is in annex 3.

The datasheets of LNACs for 868 MHz operation is in annex 4.

2. WARNING STATEMENTS / KEY RISKS

2.1 FCC Warning statement

This device complies with Part 15 of the FCC Rules and with Industry Canada license-exempt RSS standard(s).

- Operation is subject to the following two conditions:
 - (1) this device may not cause harmful interference, and
 - (2) this device must accept any interference received, including interference that may cause undesired operation.
- Changes or modifications made to this equipment not expressly approved by (manufacturer name) may void the FCC authorization to operate this equipment.
- This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. End users must follow the specific operating instructions for satisfying RF exposure compliance. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.
- This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.
- This equipment must be professionally installed. The installer is responsible for ensuring that the proper antenna is employed so that the limits in part 15 are not exceeded.
- Only antennas provided by Sigfox must be used. The antenna may not be modified. The antenna must not be co-located or operating in conjunction with any other antenna or transmitter. No additional antenna must be used.

NOTE: This equipment 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. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

2.2 Canada warning statement

"Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropic radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

- (1) This device may not cause interference, and
- (2) this device must accept any interference, including interference that may cause undesired operation of the device."

This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada.

Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

- (1) L'appareil ne doit pas produire de brouillage, et
- (2) L'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement

Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This radio transmitter SBS-T3-902 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Only an omnidirectional antenna with a gain of 5dBi or less can be used.

2.3 Japan warning statement

Japanese Radio Law and Japanese Telecommunications Business Law Compliance.

This device is granted pursuant to the Japanese Radio Law (電波法) and the Japanese Telecommunications Business Law (電気通信事業法)

This device should not be modified (otherwise the granted designation number will become invalid)

2.4 Mexico warning statement

'La operación de este equipo está sujeta a las siguientes dos condiciones:

- (1) es posible que este equipo o dispositivo no cause interferencia perjudicial y
- (2) este equipo o dispositivo debe aceptar cualquier interferencia, incluyendo la que pueda causar su operación no deseada'.

'Este equipo ha sido diseñado para operar con las antenas que enseguida se enlistan y para una ganancia máxima de antena de 5 dBi. El uso con este equipo de antenas no incluidas en esta lista o que tengan una ganancia mayor que 5 dBi quedan prohibidas. La impedancia requerida de la antena es de 50 ohms.

2.1 Symbols

Hot surfaces to keep from touching are marked with the symbol:



2.2 Battery

CAUTION: There is a risk of explosion if the battery is replaced by an incorrect type battery. Dispose of used batteries according to the instructions.

ATTENTION : Il y a risque d'explosion si la batterie est remplacée par une batterie de type incorrect.

Mettre au rebût les batteries usagées conformément aux instructions.

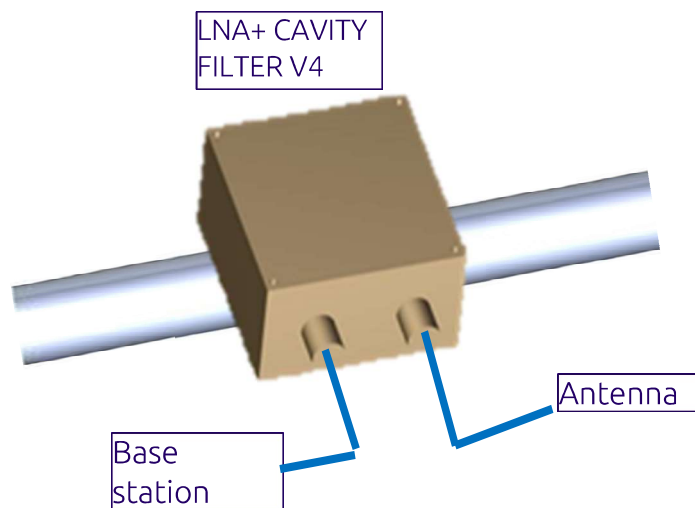
3. BILL OF MATERIAL

3.1 Base station Datasheet

RADIO CHARACTERISTICS		
	SBS-T3-868	SBS-T3-902
Standard	Sigfox Ultra Narrow Band Protocol for M2M and IoT	
Operating frequency range	865 to 870 MHz	902 to 928 MHz
Receiver Sensitivity	Typical -142dBm @ 100bps	Typical -134dBm @ 600bps
Data Rate and Modulation	100 bps D-BPSK (UL) and GFSK (DL)	600 bps D-BPSK (UL) and GFSK (DL)
Transmit Power	Max 30 dBm in conducted mode, SW configurable as per local regulations	
Pre-amplifier/filter	NF 3.5dB G≥20dB / rejection 30 dB @ +/-10 MHz	
Antenna Connector	Type N Female	
INTERFACES		
Ethernet	1 x RJ45 (10/100BaseT)	
USB port	2 x USB 2.0 female type A (optional for secondary 3G key backhauling)	
Maintenance port	USB 2.0 female type B (for maintenance only)	
POWER		
Power Consumption	30W typical (Rx mode), 60W max peak (in Tx mode)	
Power supply	10... 14 VDC / 6A max Optional 100-240VAC 50Hz-60Hz Optional 48 VDC	
MECHANICAL & ENVIRONMENTAL		
Product dimensions	199 x 150 x 68 mm (7.89 x 5.91 x 2.68 in)	
Product weight	2.15kg (4.74 lb)	
Operating temperature	-20°C to +55°C	
Storage temperature	-40°C to +85°C	
Robustness	MTBF TBC	
Protection	IP65 with protective shell	
Casing material	Coated Aluminum	
COMPLIANCE		
Safety	EN 60950-1, IEC 60950-1 EN 60950-22, IEC60950-22	
Radio	EN 300 220-2 ; EN 300 220-1	FCC part 15.247 ; ARIB STD-T108
Safety	EN 301 489-3 ; EN 301 489-1	FCC Part 15 B FCC 15.207 and FCC 15.209

3.2 LNAC choice

The LNAC can provide only RX rejection or RX and TX. In some countries TX rejection is mandatory to comply with out of band emissions and a specific LNAC must be used. These regulatory obligations are described below.



3.2.1 New Zealand and Japan

In New Zealand and Japan this base station must be installed with LNAC-922-TX described in annex 3.

3.3 Antenna and feeder

3.3.1 Antenna

This Base station was certified with an Omnidirectional Antenna with a Gain of 5dBi. See annex 1 for specifications.

3.3.2 Feeder

For outdoor antenna installation, the type of coaxial cable will depend of site configuration (distance from the antenna). It is fixed on the RF connector.

4. ELECTRICAL CONNECTION

The base station must be connected to a power point with electrical protection according to standards. The base station can operate with DC supply voltage (limits 10.5 to 14.0 V) or with AC to DC adapter.



Figure: power supply input

In case the Base station is connected to mains by its electrical cable, the electrical plug must be easily reachable in order to remove the cable.

In case the electrical plug is not easily reachable it is mandatory to have a circuit breaker system easily accessible for any technician in order to switch off completely the installation.

4.1 Earthing

Earthing all components is extremely important. The reasons are:

- Protection against lightning strikes;
- Evacuation of static electricity in the cables and equipment.

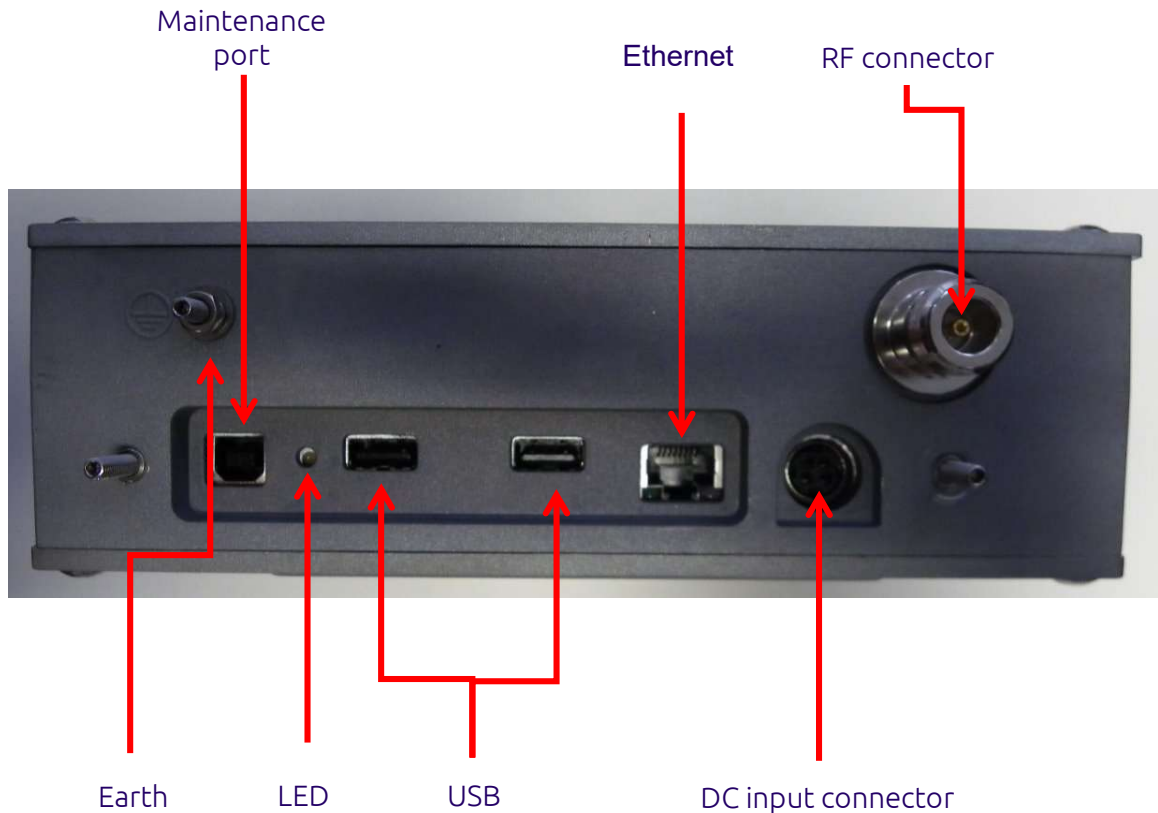
Base station earth point is marked with following symbol:



4.1.1 Earthing the base station

In order to protect the station, it must be earthed with a G/Y 6mm² wire (or AWG9). First you need to unscrew the bolt M4 to insert a grounding lug into the HC screw M4x20 and the over the 2 washers already in place. The correct tightening torque is of 2.2 N.m. If needed, you can bend the lug to ease the insertion of the wire.

4.2 Electrical connection



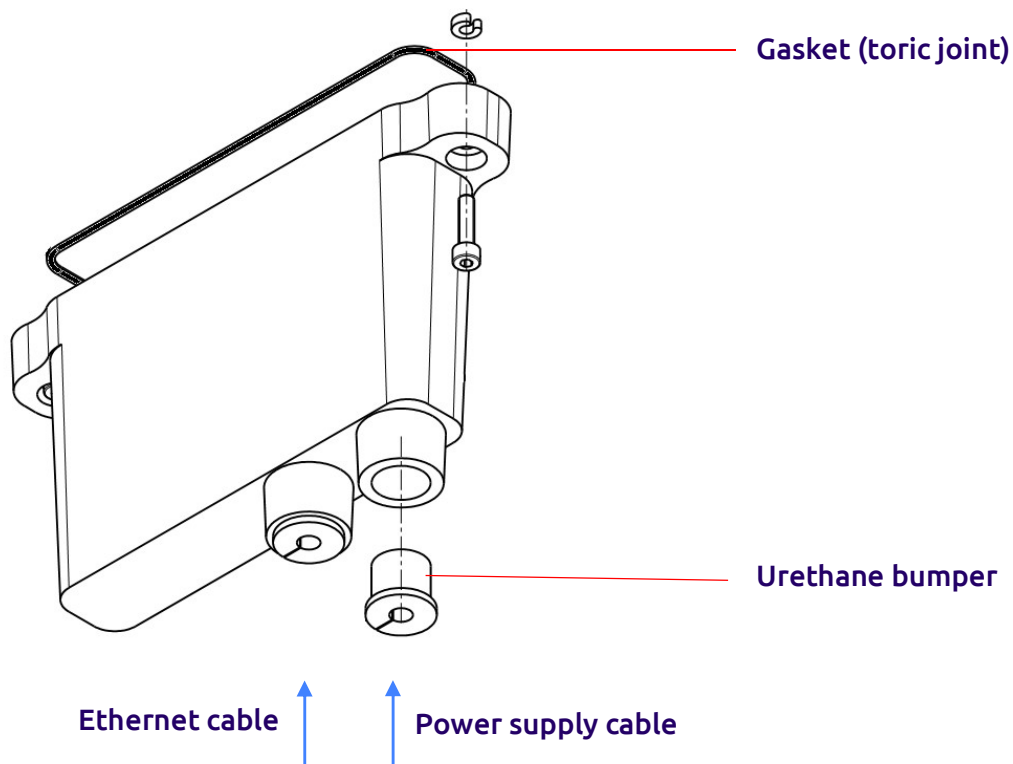
4.3 LED Status

- blinking green: boot sequence (this is a transitional state)
- blinking orange: connection to the CRA
- fixed orange: no VPN connection
- fixed red: no radio or radio error
- blinking red: power unit default
- fixed green with blinking orange: operational state (the blinking orange frequency is related to the amount of traffic sent to the backend, the more data being sent, the faster it blinks)

5. WATERPROOFNESS

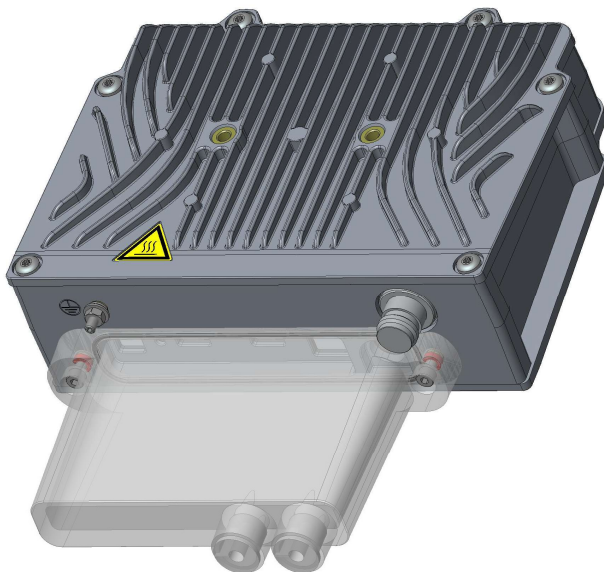
Coaxial cable, connectors, and overall cables, performance and lifetime strongly depend on waterproofness level. The main purpose of ensuring waterproofness is to avoid the direct contact with water and thus prevent connectors oxidation and also protect against steam, salt and dust.

The connectivity cover insures the waterproofness of the base station itself. The gasket must be correctly positioned in the groove of the cover. Once the USB Key is connected to the station, the Ethernet and power cable and are passed through the pipe of the cover and connected to the station, and bumpers are placed around the cables. The cover must be screwed on the front panel of the station.





Cover location



ANNEXES

Annex 1: antenna specification

ELECTRICAL SPECIFICATIONS

Antenna type	Collinear array
Frequency	860-930 MHz
Nominal Impedance	50 Ω
VSWR	2:1
Gain	5 dBi +/- .5 dB
Efficiency	60 % Min
HPBW H-Plane	360 °
HPBW E-Plane	24 °
Polarization	Vertical
Power withstanding	50 W
Connector type	N-Female

MECHANICAL SPECIFICATIONS

Plastic radome	Pultruded Fiberglass
Color	White
Ingress Protection	IP67
Weight	300 g
Wind-loading	125 mp/h
Overall Length	31.33 in

ENVIRONMENTAL SPECIFICATIONS

Operating temperature	-40 to +85° C
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Annex 2: LNAc-902

◆ **APPLICATION**

- >Lightning protection
- >IP65 Series

◆ **FEATURE**

- > High Reliability,
- > **RoHS Compliance**

◆ **ELECTRICAL SPECIFICATION**

ITEM	SPECIFICATION	
TX mode		
Frequency Range	905.2MHz ± 100KHz	
VSWR, All Ports	1.4:1 Max	
Insertion Loss	2.0dB Max	
Handling Power	5W Max, 3W Typ.(CW)	
Consumption of the module	150mA Max	
Switching in TX mode	For a voltage on the coaxial bias between 7V and 10V : the power is injected the " output" port and the switch is by-passing the LNA	
RX mode		
Frequency Range	902.2MHz ± 100KHz	
Gain	+21.5dB±1.5dB	
Consumption of the module	200mA Max	
Total NF	6.0dB Max @ 902.2MHz ± 100KHz	
Compression point @1dB at Output	+20dBm Min	
Output IP3	+30dBm Min	
Maximum Input Level (@RX Band)	Out Band	+35dBm Max @ Peak +35dBm Max @ Average
	In Band	+15dBm Max @ Peak +15dBm Max @ Average
VSWR	1.4:1 Max	
Switching in RX mode	For a voltage on the coaxial bias between 10V and 14V : the input signal is at the " Input" port and the LNA is Active	
Input/Output Impedance	50 Ohm nominal	

◆ **CAVITY FILTER ELECTRICAL SPECIFICATIONS**

ITEM	SPECIFICATION
Center Frequency	902.2MHz

3dB Bandwidth	6MHz Min(899.2MHz~905.2MHz)
Insertion Loss	1.0dB Max @ Center Frequency
Insertion Loss	1.0dB Max @ 902.2MHz ± 100KHz
Ripple in Bndwidth	0.5dB Max
Return Loss	18dB Min
Rejection	55dBc Min @ 500MHz ~ 895MHz 50dBc Min @ 920MHz ~ 1500MHz
Input Power	10W Average, 50W Max

◆ **ENVIRONMENTAL SPECIFICATIONS**

ITEM	SPECIFICATION
Operating Temperature Range	-40°C to +85°C
Storge Temperature Range	-45°C to +125°C
Relative Humidity	100%
Weather Protection	IP-65
Bias voltage on coaxial output	should be between 8 and 14 VDC with ESD protection as per standard IEC61000-4-5, and susceptibility test to surges
Switching between Rx/Tx mode	controlled by the bias voltage value on the coaxial output
AC coupling on the antenna side (input):	no DC should reach the antenna, ESD
EMC	as per FCC part 15.245
Marking	FCC UL(or equivalent) + ROHS

◆ **MECHANICAL SPECIFICATIONS**

ITEM	SPECIFICATION
Dimension	116.0 x 116.0 x 78.0(Unit:mm)
Weight	Around 1.8Kg
Mounting Points	See Outline Drawing
RF Connector	N Female Connector
Connector Position	See Outline Drawing
Finish	White color Spray coating
Silkscreening	According to specifications (TBD)
Mounting Brackets	Included, for pole

Annex 3: LNAC-922-TX

◆ **APPLICATION**

- >Lightning protection
- >IP65 Series

◆ **FEATURE**

- > High Reliability,
- > **RoHS Compliance**

◆ **ELECTRICAL SPECIFICATION**

ITEM		SPECIFICATION
TX mode		
Frequency Range		922.3MHz ± 100KHz
VSWR, All Ports		1.4:1 Max
Insertion Loss		3.5dB Max
Handling Power		5W Max, 3W Typ.(CW)
Consumption of the module		150mA Max
Switching in TX mode		For a voltage on the coaxial bias between 7V and 10V : the power is injected the " output" port and the switch is by-passing the LNA
RX mode		
Frequency Range		920.8MHz ± 100KHz
Gain		+21.5dB±1.5dB
Consumption of the module		200mA Max
Total NF		6.0dB Max @ 920.8MHz ± 100KHz
Compression point @1dB at Output		+20dBm Min
Output IP3		+30dBm Min
Maximum Input Level @RX Band	Out Band	+35dBm Max @ Peak +35dBm Max @ Average
	In Band	+15dBm Max @ Peak +15dBm Max @ Average
VSWR		1.4:1 Max
Switching in RX mode		For a voltage on the coaxial bias between 10V and 14V : the input signal is at the " Input" port and the LNA is Active
Input/Output Impedance		50 Ohm nominal

◆ **CAVITY FILTER ELECTRICAL SPECIFICATIONS**

ITEM	SPECIFICATION
Center Frequency	921.55MHz
3dB Bandwidth	6MHz Min(918.55MHz~924.55MHz)

Insertion Loss	1.0dB Max @ Center Frequency
Insertion Loss	1.0dB Max @ 920.8MHz ± 100KHz
Ripple in Bndwidth	0.5dB Max
Return Loss	18dB Min
Rejection	40dB Min @ 500MHz ~ 894MHz 30dB Min @ 500MHz ~ 916.5MHz 30dB Min @ 928MHz ~ 950MHz 45dB Min @ 950MHz ~ 1500MHz
Input Power	10W Average, 50W Max
PIMD	165dBc Min

◆ **ENVIRONMENTAL SPECIFICATIONS**

ITEM	SPECIFICATION
Operating Temperature Range	-40°C to +85°C
Storge Temperature Range	-45°C to +125°C
Relative Humidity	100%
Weather Protection	IP-65
Bias voltage on coaxial output	should be between 8 and 14 VDC with ESD protection as per standard IEC61000-4-5, and susceptibility test to surges
Switching between Rx/Tx mode	controlled by the bias voltage value on the coaxial output
AC coupling on the antenna side (input):	no DC should reach the antenna, ESD
EMC	as per FCC part 15.245
Marking	FCC UL(or equivalent) + ROHS

◆ **MECHANICAL SPECIFICATIONS**

ITEM	SPECIFICATION
Dimension	116.0 x 116.0 x 78.0(Unit:mm)
Weight	Around 1.8Kg
Mounting Points	See Outline Drawing
RF Connector	N Female Connector
Connector Position	See Outline Drawing
Finish	White color Spray coating
Silkscreening	According to specifications (TBD)
Mounting Brackets	Included, for pole

Annex 4: LNA-C-868

◆ **APPLICATION**

- > Lightning protection
- > IP65 Series

◆ **FEATURE**

- > High Reliability,
- > **RoHS Compliance**

◆ **ELECTRICAL SPECIFICATION**

ITEM		SPECIFICATION
TX mode		
Frequency Range		869.525MHz ± 100KHz
VSWR, All Ports		1.4:1 Max
Insertion Loss		2.0dB Max
Handling Power		5W Max, 3W Typ.(CW)
Consumption of the module		150mA Max
Switching in TX mode		For a voltage on the coaxial bias between 7V and 10V : the power is injected the " output" port and the switch is by-passing the LNA
RX mode		
Frequency Range		868.13MHz ± 100KHz
Gain		+21.5dB±1.5dB
Consumption of the module		200mA Max
Total NF		6.0dB Max @ 868.13MHz ± 100KHz
Compression point @1dB at Output		+20dBm Min
Output IP3		+30dBm Min
Maximum Input Level @RX Band	Out Band	+35dBm Max @ Peak +35dBm Max @ Average
	In Band	+15dBm Max @ Peak +15dBm Max @ Average
VSWR		1.4:1 Max
Switching in RX mode		For a voltage on the coaxial bias between 10V and 14V : the input signal is at the " Input" port and the LNA is Active
Input/Output Impedance		50 Ohm nominal

◆ **CAVITY FILTER ELECTRICAL SPECIFICATIONS**

ITEM	SPECIFICATION
Center Frequency	868.13MHz

3dB Bandwidth	6MHz Min(865.13MHz~871.13MHz)
Insertion Loss	1.0dB Max @ Center Frequency
Insertion Loss	1.0dB Max @ 868.13MHz ± 100KHz
Ripple in Bndwidth	0.5dB Max
Return Loss	18dB Min
Rejection	55dBc Min @ 500MHz ~ 816MHz 50dBc Min @ 916MHz ~ 1500MHz 25dB Min @ 850MHz
Input Power	10W Average, 50W Max

◆ **ENVIRONMENTAL SPECIFICATIONS**

ITEM	SPECIFICATION
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Storge Temperature Range	-45°C to +125°C
Relative Humidity	100%
Weather Protection	IP-65
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EMC	as per FCC part 15.245
Marking	FCC UL(or equivalent) + ROHS

◆ **MECHANICAL SPECIFICATIONS**

ITEM	SPECIFICATION
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RF Connector	N Female Connector
Connector Position	See Outline Drawing
Finish	White color Spray coating
Silkscreening	According to specifications (TBD)
Mounting Brackets	Included, for pole