SIGFOX SBS-T-902 v2.2 Product Specification

APPROVED:

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Changes description

Version	Description	Author	Date
1.0	Creation	P. ANTOINE	18/05/2016
1.1	Correction antenna gain	S. BARREIRO	06/10/2106
2.0	Correction on FCC ID	S. BARREIRO	11/10/2106

Acronyms

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

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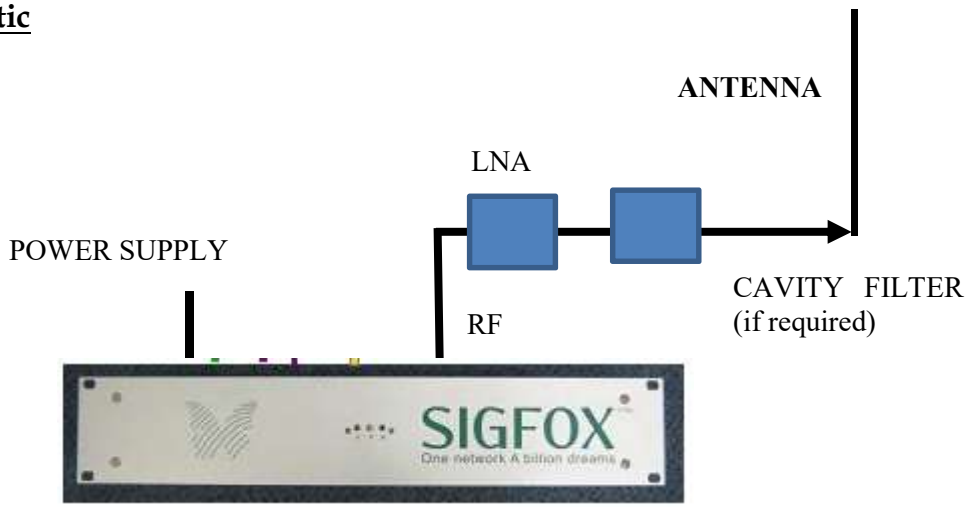
1 SIGFOX technology

SIGFOX is the first and only operator of a cellular network fully dedicated to low throughput communication for connected objects. With an extremely cost effective and very low energy consuming out-of-the-box connectivity offer, SIGFOX brings a revolution to the world of Internet of Things and M2M. The network, which already connects tens of thousands of objects, is being rolled out worldwide.

2 Base station synoptic

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 synoptic.
Some elements are provided by the SIGFOX NETWORK OPERATOR (SNO) such as the antenna.
The antenna characteristics depends 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 V2 and the corresponding antenna low noise switch/amplifier (SBS-P). 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 V2 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 V2 can have a preset receiver frequency depending on the radio regulation applicable in the region. For instance, at 868.2MHz, targeting M2M application in European ISM bands or at 902 MHz for M2M application in US ISM bands. Other frequencies are of course possible. This choice is made by a specific software configuration.
SIGFOX SBS-T series are indoor units with aluminum chassis, suitable for wall mount, rack mount or desktop installation.

3 Installation synoptic



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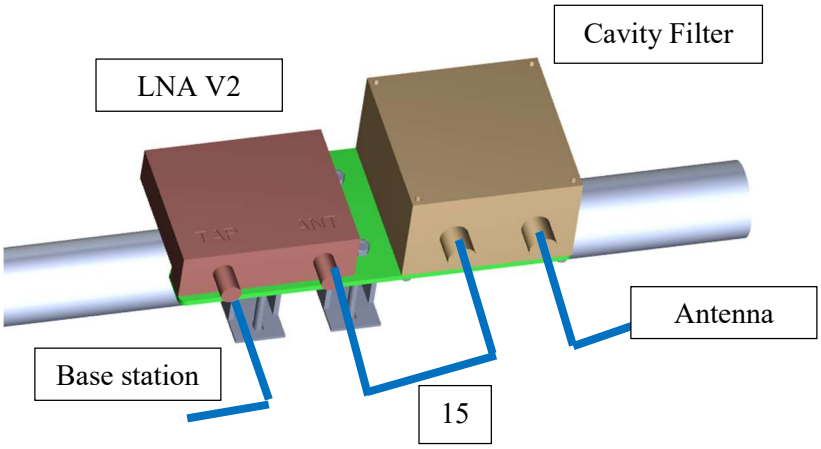
4 Installation site recommendations

This base station has been developed to be installed in indoor.
It must be used with an LNA.
It can be used also with a cavity filter.
The datasheets of LNAs for 902-928MHz operation is in annex 1.
The datasheets of LNAs for 868.13MHz operation is in annex 2.

4.1 Cavity filter option

The cavity filter use is optional in some countries.



4.1.1 New Zealand

In New Zealand this base station must be installed with the cavity filter described in annex 3 on the top of the LNA.

4.2 Antenna

This Base station was certified with an Omnidirectional Antenna with a Gain of 8dBi. **Only an omnidirectional antenna with a gain of 8dBi or less can be used.**

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5 Datasheet

RADIO CHARACTERISTICS		
	SBS-T-868 v2	*SBS-T-902 v2*
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 GMSK (DL)	600 bps D-BPSK (UL) and GMSK (DL)
Transmit Power	Max 36dBm EIRP, SW configurable as per local regulations	
Pre-amplifier/filter	NF 2dB G=20dB / rejection 30 dB @ +/-10 MHz	
Antenna Connector	Type N Female	
INTERFACES		
Ethernet	1 x 10/100BaseT (RJ45)	
USB	2 x USB2.0 ports (optional for 3G key)	
Maintenance port	RJ45 socket with specific cable (for maintenance only)	
POWER		
Power Consumption	40W typical (Rx mode), 70W max peak (in Tx mode) for v2.1 30W typical (Rx mode), 60W max peak (in Tx mode) for v2.2	
Power supply	100-240VAC 50Hz-60Hz -- 12 VDC / 7A max	
MECHANICAL & ENVIRONMENTAL		
Product dimensions	480 x 350 x 85 mm (19" 2U standard format)	
Product weight	Approximatively 8kg (16 lbs)	
Operating temperature	-20 to +50°C (v2.1) -20 to +55°C (v.2.2)	
Storage temperature	-40°C to +85°C	
Casing material	Metal sheet enclosure with Aluminium front panel	
COMPLIANCE		
Compliance	EN 300 220 EN 301 489 EN60950-1	FCC part 15 EN 301 489 EN60950-1

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6 Warning statements

6.1 FCC warning statement

This device complies with Part 15 of the FCC Rules and with Industry Canada licence-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 the antennas approved by SIGFOX must be used. The antennas 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.

6.2 IC 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 licence-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."

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

Conformément à la règlementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inferieur) approuvé pour l'émetteur par Industrie Canada.
Dans le but de réduire les risques de brouillage radioélectrique a 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.

7 Electrical connection

The base station must be installed with a power point with the electrical protection according to the standards.

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.

8 Battery

Attention: there is a risk of explosion if the battery is replaced by an incorrect type battery

9 Earthing

Earthing all components is extremely important. The reasons are:

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

The coaxial cable must be connected to ground of the tower by at least two earthing kits (in line with the coaxial cable) at two locations on the tower at the top and bottom.

Base station earth point is marked with following symbol:

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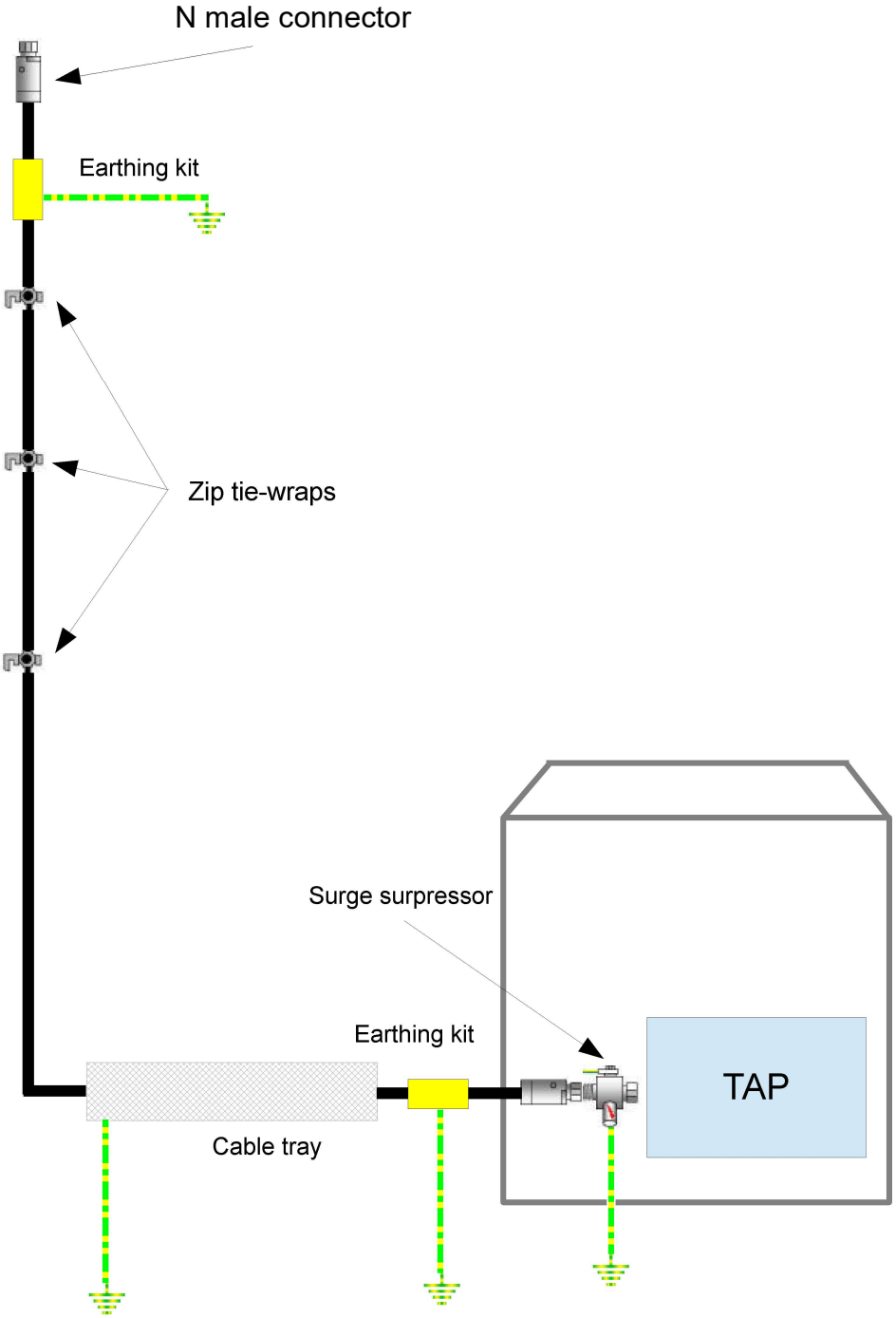

9.1 Earthing the base station

In order to protect the station, it must be earthed with a G/Y 6mm^2 wire (or AWG9).
First you need to insert a grower washer or a lock washer and a grounding lug into a hexagon socket screw M4x10. And then you must screw it into the hole provided for this purpose on the side of the station. The correct tightening torque is of 2.2 N.m. If needed, you can bend the lug to ease the insertion of the wire.

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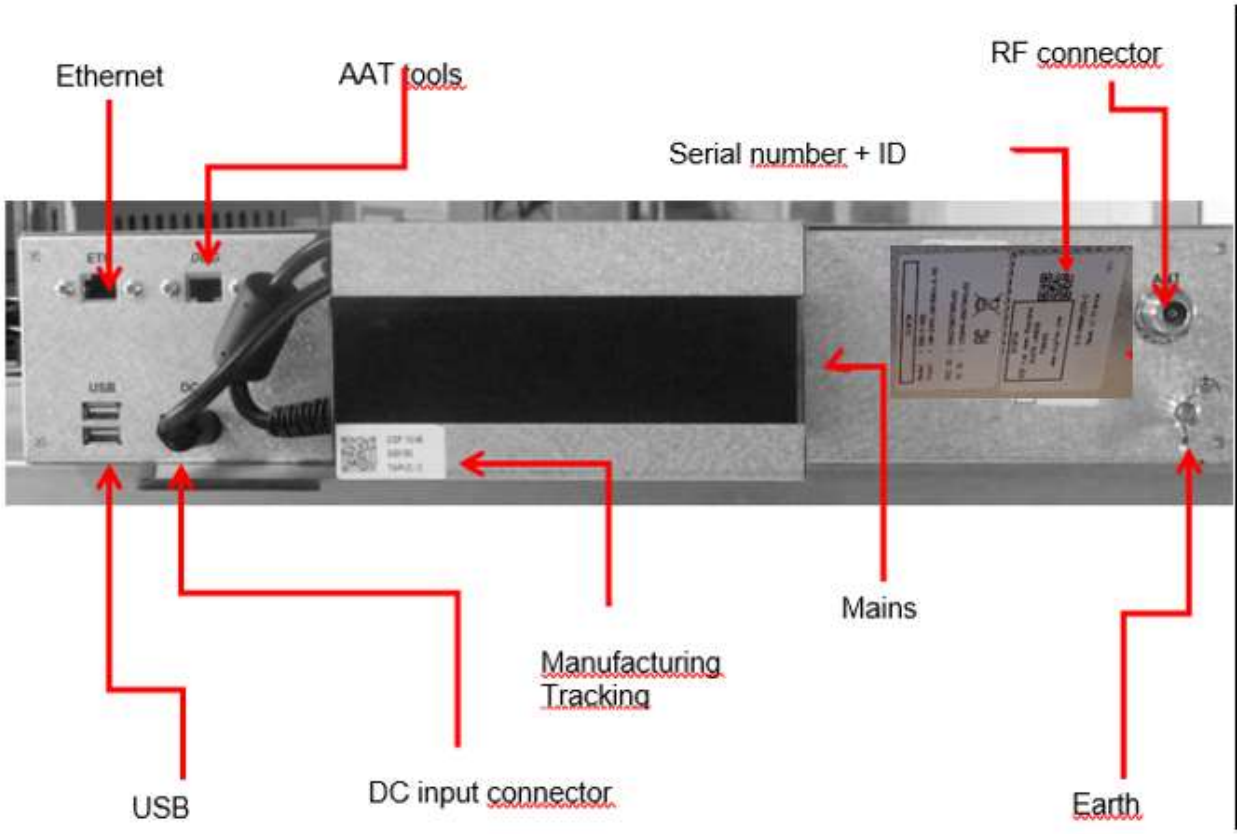
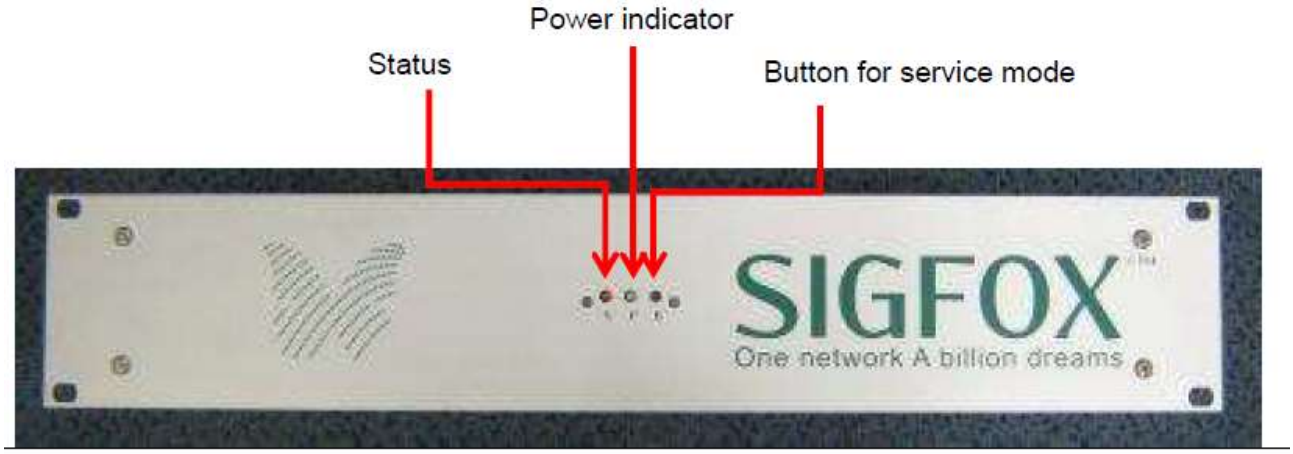
DEL Status

- **Electrical connection on the rear panel**



Example of base station

- **Front panel**



Example of a base station

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Green Led « **P**ower » :

- Green Led lights => The base station is ON (TRANSFOX and PC are ON).
- Green Led Off => The base station is OFF (TRANSFOX and PC are OFF).
- Green Led Flash => The base station will restart or shutdown (after 60 sec max).

Red Led « **S**tatus »:

- Red Led lights => operational Base station
- Red Led Off => Runtime not initialize
- Red Led Flash slowly => Runtime initialize but internet not active
- Red Led Flash rapidly => VPN not connected

Push button:

- Base station ON : long presses on the push button (>5sec until or flashing green LED) => Shutdown the base station after 60sec maximum
- Base station ON : short presses on the push button => Reboot the base station after 60 sec
- Base station OFF : short presses on the push button => Instant start base station

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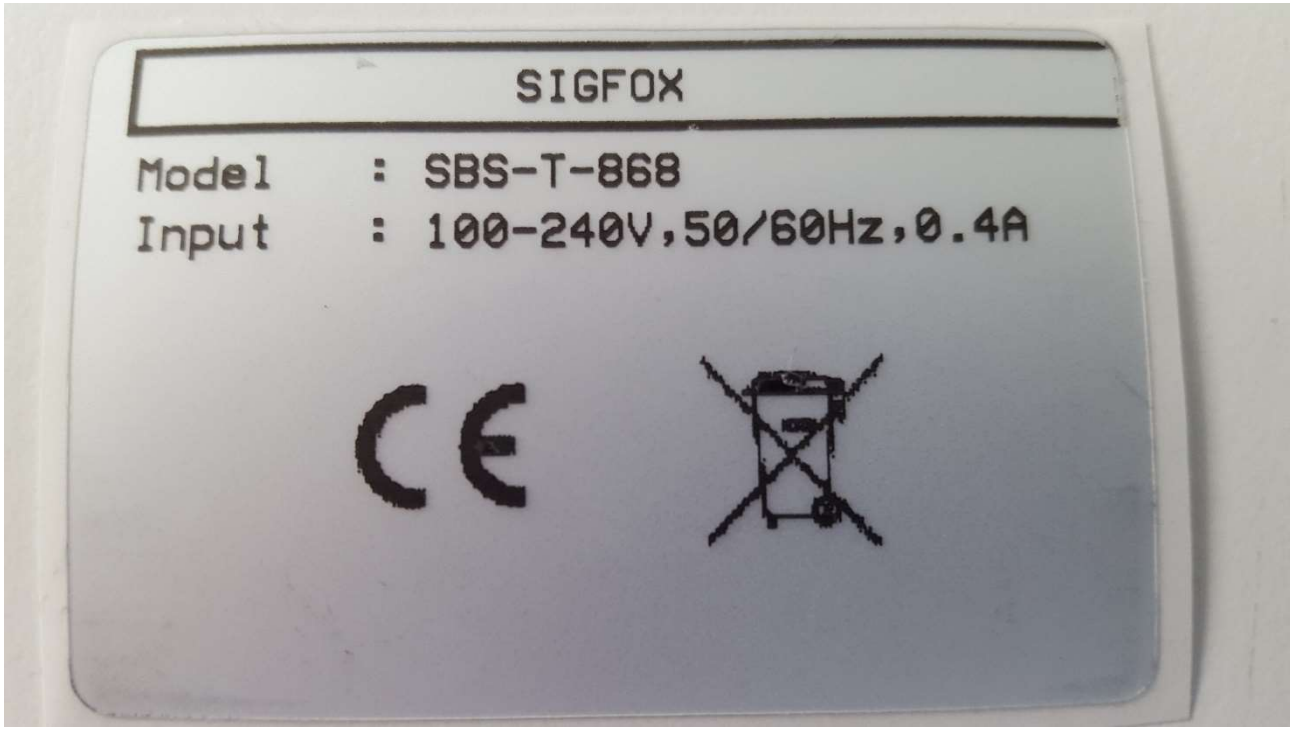
10 Labels

10.1 SIGFOX Identification

10.2 CE



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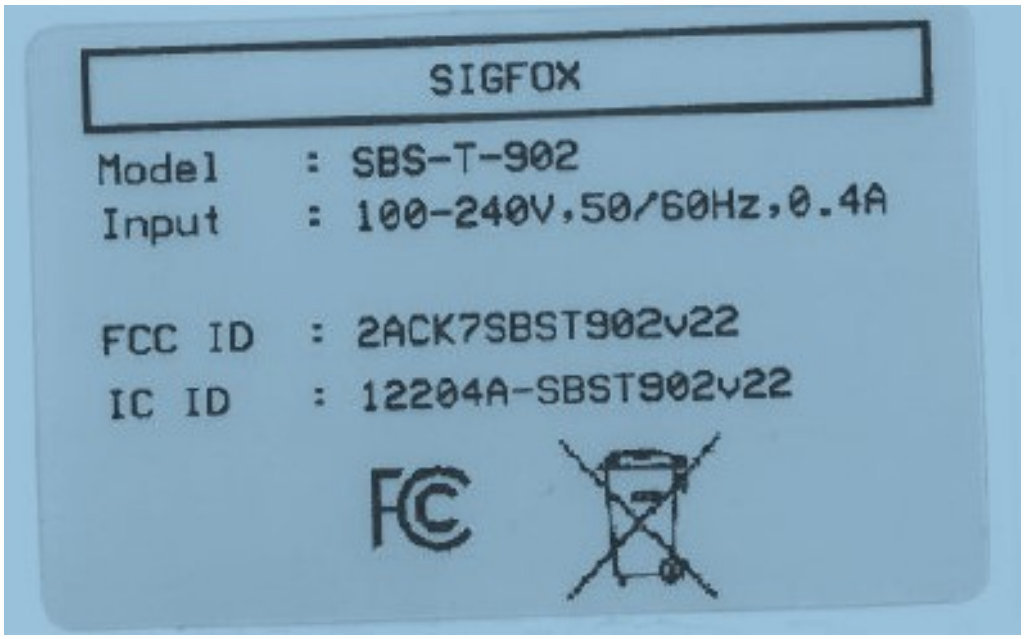
10.3 FCC



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11 Annexe 1: LNA 902-928MHz

RADIO CHARACTERISTICS	
Operating frequency range	902 to 928 MHz
Rx Gain	Rx = 22dB typ
Tx insertion loss	1.5 dB typ, 2dB max
Bandwidth	26MHz
Attenuation	800 MHz to 845 MHz > 45 dB 845 MHz to 880 MHz > 33 dB 947 MHz to 992 MHz > 13 dB 992 MHz to 1020 MHz > 35 dB 1020 MHz to 1200 MHz > 45 dB
Noise factor	3.5 dB typ
Max input level	+ 15 dBm
IP1dB	+ 7 dBm typ
IIP3	- 4.5 dBm typ
Antenna Connector	Type N Female
Rx/Tx mode selection	By DC voltage on RF feeder cable
DC threshold voltage	7 to 9 V in Tx mode (8V typ) / 11 to 14V in Rx mode (12V typ)
POWER SUPPLY	
Power supply	Rx = 12V/16mA typ | Tx = 8V/45mA typ
MECHANICAL & ENVIRONMENTAL	
Product dimensions	116 x 95 x 35 mm
Product weight	Ca 700g (1,5lb)
Operating temperature	-20 to +70°C

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12 Annexe 2: LNA 868.13MHz

RADIO CHARACTERISTICS	
Operating center frequency	868.13MHz
Operating frequency range	865 to 870 MHz
Rx Gain	Rx = 22dB typ
Tx insertion loss	1.5 dB typ, 2dB max
Bandwidth	5MHz
Attenuation	10 to 830MHz > 40 dB 830 to 845MHz > 32 dB 880 to 884 MHz > 20 dB 887 to 965 MHz > 48 dB 965 to 1500 MHz > 42 dB
Noise factor	3 dB typ
IP1dB	7 dBm typ
Max input level	+ 13 dBm
IIP3	- 4.5 dBm typ
Antenna Connector	Type N Female
Rx/Tx mode selection	By DC voltage on RF feeder cable
DC threshold voltage	7 to 9 V in Tx mode (8V typ) / 11 to 14V in Rx mode (12V typ)
POWER SUPPLY	
Power supply	Rx = 12V/16mA typ | Tx = 8V/45mA typ
MECHANICAL & ENVIRONMENTAL	
Product dimensions	116 x 95 x 35 mm
Product weight	Ca 700g (1,5lb)
Operating temperature	-20 to +70°C

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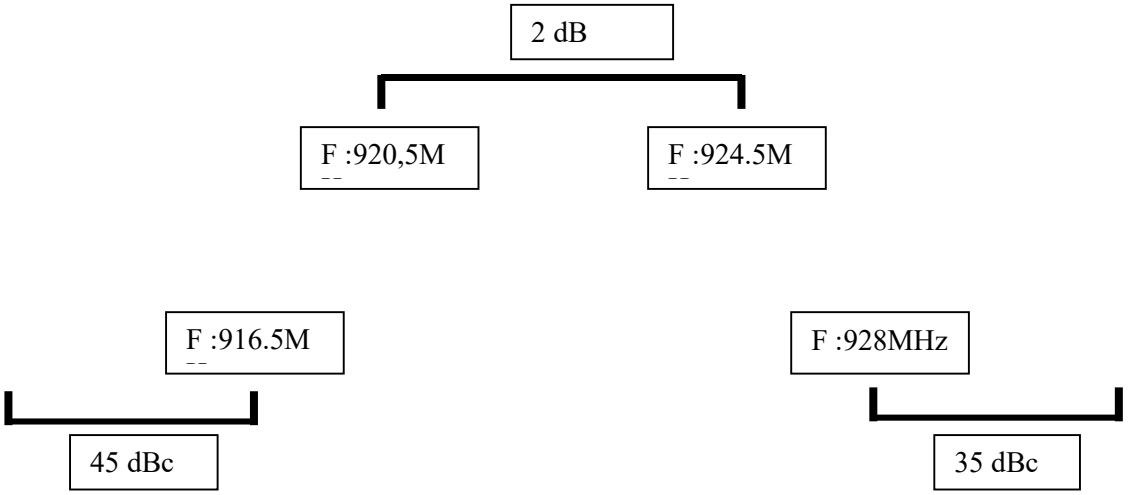
13 Annexe 3: Cavity filter

13.1 Electrical Specification

REQ	Parameter	Specification		Remark
1.1	Center Frequency	922.5	MHz	
1.2	Bandwidth	4	MHz	
1.3	Insertion Loss	1,8 @ 923,2MHz	dB typ	In band
1.4	Ripple	0.5	dB max	
1.5	Rejection 1	45@500~916.5MHz	dBc min	
1.6	Rejection 2	35@928~1500MHz	dBc min	
1.7	Return loss	18	dB min	
1.8	Power Handing	40	dBm	
1.9	Impedance	50	ohm	

13.1.1 Summary



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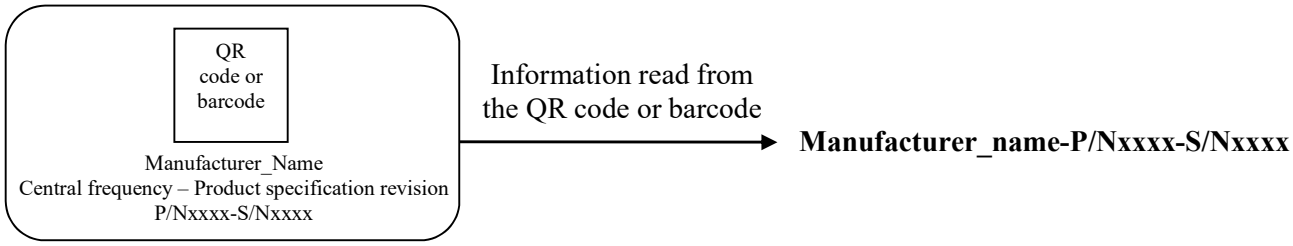
13.2 Mechanical specification

REQ	Parameter	Specification		Remark
2.1	Input Connect	N – Female		
2.2	Output Connect	N – Female		
2.3	Environment	IP 65		
2.4	Operation Temp	-40 to +70	°C	
2.5	Storage Temp	-55 to +105	°C	
2.6	Weight	850	gr max	
2.7	Dimension (W*L*H)	134 x 82 x 49	mm max	
2.8	Mounting hole	94 x 73.7 (M4x0.7)	mm	
2.9	ROHS	Yes		
2.10	Finish	Black painting		

13.3 Label Specification

REQ	Parameter	Specification	Remark
3.1	Label contains a QR code or barcode		
3.2	Information in the QR code or the barcode	“Manufacturer_name”	
3.3	Information in the QR code or the barcode	Part number written as “P/Nxxxx”	
3.4	Information in the QR code or the barcode	Serial number written as “S/Nxxxx”	
3.5	Textual information written on the label	“Manufacturer_name”	
3.6	Textual information written on the label	Part number written as “P/Nxxxx”	
3.7	Textual information written on the label	Serial number written as “S/Nxxxx”	
3.8	Textual information written on the label	Central frequency – Revision of the product specification	
3.9	Maximum dimension (W*D)	40 mm * 25 mm	
3.10	Label material	White glossy polyester	
3.11	Print technology	Thermal transfer	
3.12	Label position	Centered on the bottom face of the filter	

Example of label:



13.4 Test report Specification

REQ	Parameter	Specification		Remark
4.1	Frequency response	Yes		Per serial number

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