



Flexi Zone BTS, Rel. 22R1-FZ, Operating Documentation, Issue 02

Flexi Zone Multiband Indoor Pico BTS Product Description

DN09242001

Issue 06

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Summary of changes

Changes between document issues are cumulative. Therefore, the latest document issue contains all changes made to previous issues.

This document is common for all Radio Access Technologies (RAT). You may find here information about solutions that are not available or supported in a specific SW release or RAT. The [Table: Releases covered by this document](#) lists all SW releases covered by the content of this document. For features supported in your SW release, see the respective feature documentation chapter in the system library.

Table 1: Releases covered by this document

Product	Release
FDD Long Term Evolution (LTE)	FDD-LTE 16 and later releases
TDD LTE	TD-LTE 16A and later releases

Changes between issues 05 (2020-02-11) and 06 (2020-03-11)

Flexi Zone Multiband Indoor Pico BTS model FW2QQG interfaces

- This graphic has been updated

Changes between issues 04 (2020-01-20) and 05 (2020-02-11)

LTE5695: B5+B66 MBI FZ Multiband Indoor Pico (FW2CIA)

- This chapter has been added

Changes between issues 03 (2019-03-29) and 04 (2020-01-20)

LTE5647:B48+B48 (CBRS) MBI with external antenna interface (FW2QQG)

- This chapter has been added

1. Introduction to Flexi Zone Multiband Indoor Pico BTS

Brief description of Flexi Zone Multiband Indoor Pico BTS

Flexi Zone Multiband Indoor Pico BTS overview

The Flexi Zone (FZ) Multiband Indoor (MBI) Pico BTS is a small cell optimized for an indoor environment. The FZ MBI provides seamless mobility and enhanced user experience in enterprise and public indoor locations by cost effectively improving the coverage and capacity of the network, delivering the best subscriber mobile broadband experience. The FZ MBI supports multiple LTE bands, currently supporting up to three LTE bands.

The main application of this BTS is to deliver an improved mobile broadband experience by offloading data traffic from macro networks. Thanks to its small size and a fanless solution, the FZ MBI can be easily and quickly deployed in strategic locations to add coverage and capacity. The FZ MBI features a compact single enclosure.

The FZ MBI is a fully compliant 3GPP solution and supports standard network interfaces to other network elements, such as S1 and X2 in LTE. It enables feature parity with Flexi Macro BTS solutions and can easily integrate into Heterogeneous Networks (HetNets).

The hardware platform supports full throughput capability of 5 (only FDD), 10, 15, or 20 MHz LTE carriers with 2x2 MIMO (LTE main and diversity transmit). The physical transport interface is optimized for IP-based transport solutions. The FZ MBI supports varying transmit power up to 250 mW per antenna branch (up to 500 mW per branch for FW2Qxx variants). Nokia also offers a Wi-Fi solution, which integrates the Nokia AirScale Wi-Fi module AC210m within some models of the FZ MBI. It is also possible to daisy-chain up to four FZ MBI variants.

1.1 Air interface

Air interface description

1.1.1 Air interface configuration

The FZ MBI BTS transceiver supports dual-band 2 Tx and 2 Rx antenna connections for each band. Each transmit port supports a maximum transmission power of 250 mW per antenna

branch¹⁾ and operates within a maximum bandwidth window of 20 MHz.

The maximum RF transmit power should be configured according to the bands supported on the FZ MBI, as shown in table [FZ MBI RF Transmit Power Configuration per RF Band](#).

Table 2: FZ MBI RF Transmit Power Configuration per RF Band

Parameter	Object	Default Value	Parameter Range, Single Carrier	Parameter Range, Dual Carrier	RF Band
pMax	LNCEL	None	17-24 dBm	N/A	all FDD bands
pMax	LNCEL	None	17-24 dBm	17-24 dBm	all TDD bands (except model FW2QE)
pMax	LNCEL	None	17-24 dBm	N/A	unlicensed bands
pMax	LNCEL	None	17-24 dBm	17-24 dBm	Band 42 for model FW2QE

¹⁾The maximum power output for FW2QE is 500 mW per antenna branch if configured for two carriers. If only 1 carrier is configured, the maximum power output is 250 mW.

1.1.2 Diversity

Two-branch receiver diversity is supported. Single receiver configuration is supported by both receivers in case of failure of one of the receivers. Single transmit configuration is supported in case of failure of one of the transmitters or antennas, allowing a transmit mode configuration of Tx Diversity (SIMO).

1.1.3 RF output power

The FZ MBI can be configured to support a maximum of 250 mW per RF branch, or 24 dBm. The output power can be configured in 1 dB steps, from 17 dBm to 24 dBm as shown in [FZ MBI RF power](#).

Table 3: FZ MBI RF power

RF power in dBm	RF power in mW
24	250
23	200
22	160
21	125
20	100
19	80
18	63
17	50

i Note:

- The software limits B46 output power on specific channels when needed, per country specifications.
- Model FW2QE RF power is 27 dBm or 500 mW.

1.1.4 External RF antenna requirements

The Flexi Zone Multiband Indoor Pico BTS tri-band models and FW2QE model support attachment of external RF main and diversity antennas. The customer can select any RF antennas that meet the requirements specified in [External RF antenna requirements for FZ Multiband Indoor Pico BTS tri-band and FW2QE models](#).

Table 4: External RF antenna requirements for FZ Multiband Indoor Pico BTS tri-band and FW2QE models

Parameter	Value
Peak gain	≤ 6 dBi
Impedence	50 Ω
Interface	SMA connector
Return loss	≤ -10 dB recommended for best performance

1.2 Benefits

List of the different benefits Flexi Zone Multiband Indoor Pico BTS offers to the operator

The FZ MBI BTS provides a vast number of benefits for the operator.

Ease of deployment

The FZ MBI offers expanded site deployment possibilities thanks to its compact size and light weight, which makes it easy and fast to deploy. It can be used in existing buildings using Ethernet cabling for backhaul that significantly lower the costs in comparison to traditional systems. The FZ MBI can be powered via a PoE++ based solution reducing complexity, cost of ownership, and leads to faster deployments, or can be powered via an optional AC power supply. The FZ MBI supports fully automated "Plug-and-play" configuration crucial to reduce network implementation and operational costs in heterogeneous networks. The FZ MBI incurs lower installation cost as it can be deployed by a single person. The FZ MBI also reduces operating costs due to its low power consumption, yet high capacity.

Flexibility in installation

The FZ MBI is specially designed to be installed onto walls or ceilings, which makes it the perfect BTS for indoor coverage. Refer to [Installation options](#) for more details on installation scenarios.

Macro Capacity and Macro Parity

The FZ MBI seamlessly integrates into existing networks by connecting to the same core network as macro eNB, and also connecting to the legacy Nokia O&M solution. The software load running on FZ MBI has feature parity with Nokia macro base stations. This solution offers a similar user experience for outdoor and indoor subscribers. Most LTE features available for macro cells carry over to FZ MBI Pico cells, including easy software upgrades to LTE-Advanced, support by the same NetAct Operations, and Support System (OSS) as well as iSON.

Multiradio Access / Multi Technology

The FZ MBI supports both LTE and Wi-Fi access (optional). The Wi-Fi module is integrated within a single compact small form factor allowing for reduced number of boxes and shared devices.

Low acoustic noise

The FZ MBI uses passive cooling.

Easy commissioning

The FZ MBI supports wizard-based commissioning via the BTS Site Manager. The configuration can be saved to a file which can be used later as a template.

Auto-connection and auto-configuration are supported as in Flexi Multiradio BTS or Flexi Multiradio 10 BTS.

Software features

The FZ MBI reuses the Flexi Macro BTS software (SW), enabling support for relevant features.

1.3 Transport

Transport protocol description and synchronization

Transport protocol

Flexi Zone Multiband Indoor Pico BTS uses IP/Ethernet as a standard transport protocol. A copper or wire line Ethernet is the standard interface in BTS units.

When external transport solutions (such as wireless backhaul and GPON) are used, they communicate through the Ethernet connection on the BTS and the technology used is transparent to the BTS.

The FZ MBI supports the following network interfaces:

- eNodeB to MME and Serving SAE Gateway with S1 interface
- eNodeB to eNodeB with X2 interface

The physical transport interface configuration is RJ45.

Wire line Ethernet

Flexi Zone Multiband Indoor Pico BTS Base Module RJ45 socket supports 2 Gigabit Ethernet copper interfaces 100/1000 Base-T according IEEE802.3 clause 40.

1.4 Management and software

Brief description of Flexi Zone Multiband Indoor Pico BTS management and software update

The *Flexi Zone Multiband Indoor Pico BTS* can be managed remotely using:

- NetAct (applicable to all BTS variants).
- the combination of Service Aware Manager (SAM)²⁾ + Network Performance Optimizer (NPO) + Wireless Provisioning System (WPS) (this combination is applicable to FDD BTS variants only). SAM/NPO/WPS is supported in LTE17A and later releases.

Auto-connection and auto-configuration start automatically when the FZ MBI starts. In order for FZ MBI auto-connection and auto-configuration to succeed, the backhaul connection to the Core Network must be in place.

The FZ MBI can be managed locally through the RJ45 port. In LTE, it can also be managed through a Bluetooth connection. The Bluetooth connection eliminates the need for a wired connection to the FZ MBI when it is installed in a difficult to reach location. NetAct can be used to manage the FZ MBI remotely.

Note:

When the FZ MBI is managed via Bluetooth connection, the 2.4 GHz Wi-Fi should be disabled for the best performance.

The FZ MBI utilizes an internal Bluetooth antenna. The useful range for Bluetooth is influenced by the installation and environment. If multiple Wi-Fi Access Points are operating nearby, the range can be reduced as 2.4 GHz Wi-Fi operates in the same frequency spectrum. For maximum Bluetooth range, a Class 1 dongle is required. The internal Bluetooth module consists of an on-board Bluetooth transceiver. The transceiver provides a 78 channel EDR 2.1 compliant Bluetooth interface used for remote MMI and maintenance operations. All required SW is loaded and installed onto the FZ MBI Bluetooth Module as part of the overall FZ MBI product software. Contact Nokia for additional details.

The BTS automatically detects the SW version number, HW product code, version number, and serial number during start-up. This data can be retrieved remotely. The BTS controls its internal operation, ensuring that any malfunctions or loss-of-service is detected and reported to network management.

Software updates

New SW versions can be downloaded while the BTS is in operation. Software can be uploaded to BTS either locally, with the BTS Site Manager, or remotely from NetAct or SAM (as applicable for your BTS). Site visits are therefore unnecessary for routine operation and maintenance (O&M) tasks.

Typically, a local software download is done only when the NetAct or SAM connection is missing, for example, during the commissioning process. Software downloads can be run in the background of the BTS operation. The new software can be activated at any time. A reboot is required in order to activate the software.

The BTS only uses downloadable software. All software can be downloaded and updated from NetAct or SAM. As the procedure is centralized, upgrading SW for several BTSs can be performed simultaneously or individually.

The BTS keeps the current and previous software packages in its flash memory and can be updated at any moment. Updated software (current and previous) in the BTS can be seen through BTS Site Manager, NetAct, or SAM (if applicable).

²⁾The 5620 Service Aware Manager (SAM) product name has changed to Network Services Platform Network Functions Manager - Packet, or more commonly the NFM-P. You may see

references to either product name within customer documentation.

1.4.1 Reset button

The reset button is located on the connection panel of the FZ MBI module. There are two functions of the reset button:

- A momentary push of the button will result in a hard reset of the device (similar to a power up restart).
- Pressing and holding the button for more than 5 seconds will trigger the default configuration reset.

1.4.2 PoE++ solution

The FZ MBI modules support Power-over-Ethernet evolution (PoE++) technology to supply the unit with power. The PoE solution allows electrical power to pass along with data on Ethernet cabling.

Note:

The Pico can support simultaneous PoE++ and DC inputs. The PoE++ input has precedence over the DC input.

PoE++ offers several benefits to the user, including:

- Cost savings - PoE++ significantly reduces the number of electrical wiring and outlets needed inside the building
- Easy installation - there is no need to mount the power supply adjacent to the FZ MBI module
- Flexibility - it is easy to relocate the FZ MBI module in order to find optimal RF and Wi-Fi reception

The PoE++ parameters are listed in [Table: PoE++ specification](#).

Table 5: PoE++ specification

Parameter	Value(s)
Power sourcing equipment (PSE) ₂ output power	75 W
Power at powered device (PD) ₂	60 W
Voltage range at PSE ₂	50-57 VDC
Voltage range at PD ₂	42.5-57 VDC
Maximum current	1200 mA total, 600 mA/pair
Maximum cable resistance	25 Ohms per loop
CAT cable types	Cat 5e/6
Maximum cable length	100 m
Quantity of conductors used	4 pairs / 8 wires

* PSE refers to a PoE-enabled network switch or a midspan power injector and PD means FZ Indoor Pico Module.

Power injectors can either be individual or multi-port, as shown in [Figure: One-port injector](#) and [Figure: Multi-port injector](#).

Figure 1: One-port injector

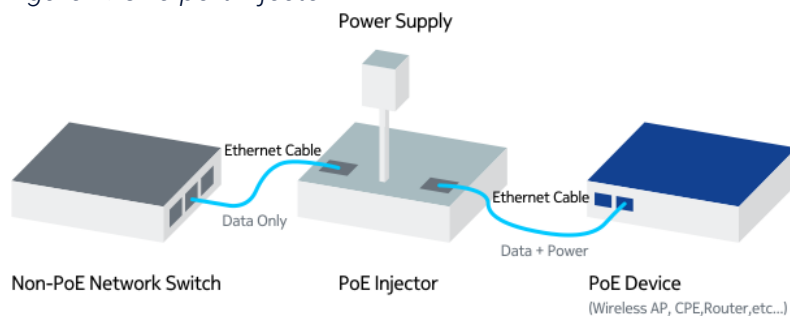
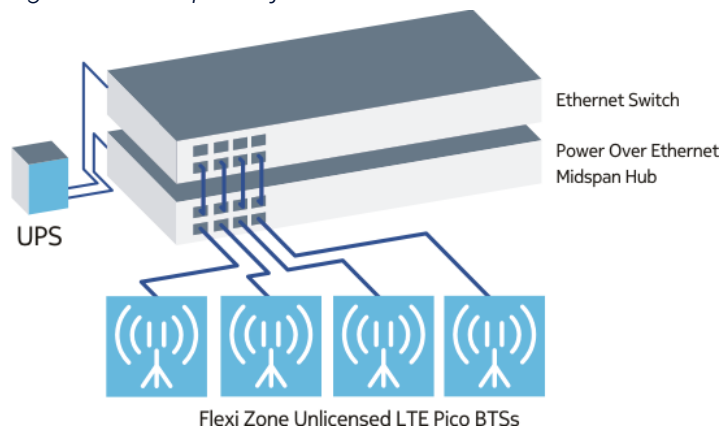


Figure 2: Multi-port injector



Nokia products require power injectors that support a 12.5K Ohm detection resistor and provide a power output of 75 W per port in a four-pair PoE (4PPoE) implementation.

Nokia recommended midspan devices are listed in [Nokia recommended midspan devices](#).

Table 6: Nokia recommended midspan devices

Manufacturer	Model	Number of ports
Micro-semi	PD-9606G/ACDC/M-NK	6
Micro-semi	PD-9612G/ACDC/M-NK	12
Micro-semi	PD-9601G/AC-NK	1
Phihong	POE75U-1UP	1

For more information and specifications, check the manufacturers' websites.

i Note:

The non-standard PoE implementation called Universal Power over Ethernet (UPOE) is not supported.

1.5 Installation options

Description of Flexi Zone Multiband Indoor Pico BTS possible installation scenarios, including wall and ceiling installations

! NOTICE:

- FZ MBI Pico BTS equipment must be installed by trained and qualified service personnel in accordance with all local codes and requirements.
- FZ MBI Pico BTS equipment is intended for installation in restricted access locations or equivalent, out of reach of the general public.
- The unit should be located away from any RF radiation sources, out of direct sun exposure, and away from potential salt spray.
- Avoid installing the device near windows to avoid external interference.
- When installing the mounting bracket onto a wall, ensure the arrows on the bracket point upwards.
- The unit may become hot and should be installed with a minimum of 50 mm (2.0 in.) of clearance from all sides to ensure proper air flow and heat dissipation. It should also be installed away from any potential sources of moisture, including heating or cooling ducts and doors/windows.

i Note:

Tighten the cable SMA connectors (GPS/GLONASS) to a torque of 0.34–0.57 Nm.

For more comprehensive wall and ceiling installation instructions, refer to the Flexi Zone Multiband Indoor Pico BTS Quick Guide.

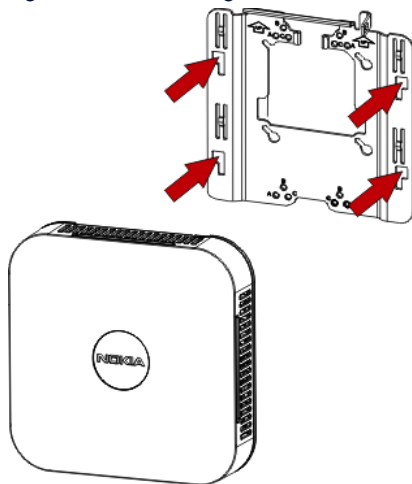
The FZ MBI module can be installed in two types of configurations.

FZ MBI BTS wall installation

i Note:

- Use the mounting bracket to install the FZ MBI BTS onto a wall.
- Since the wall material, thickness, and mounting hardware vary depending on the mounting surface, Nokia cannot provide hardware and instructions for mounting the bracket to the wall. These details are the responsibility of the installer.

Figure 3: Mounting Flexi Zone Multiband Indoor Pico onto a wall



FZ MBI BTS ceiling installation

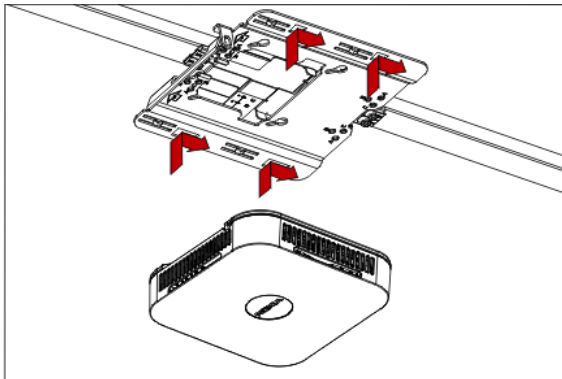
! NOTICE:

Ensure that the ceiling grid location is well supported to handle the weight of the device.

i Note:

- Use the mounting bracket and the ceiling clip delivered in the box to mount the FZ MBI Pico BTS onto a ceiling.
- Attach the mounting bracket to the ceiling clip using the supplied M4 (nylok) screws and an approximate torque of 0.6–0.7 Nm.
- Since the ceiling grid material and thickness vary, Nokia does not specify the torque which has to be used. These details are the responsibility of the installer.

Figure 4: Mounting Flexi Zone Multiband Indoor Pico onto a ceiling



1.6 Flexi Zone Multiband Indoor Pico BTS LED indicator states

Explanation of Flexi Zone Multiband Indoor Pico LED indications

Additional acronym definitions:

- TRSW - Transport Software
- POST - Power-On Self-Test
- FPGA - Field Programmable Gate Array
- BTSOM - BTS Operation and Maintenance interface

i Note:

The LED visibility can be controlled using either NetAct or the BTS Site Manager on the BTS Settings page.

Select the **LED in use** check box to enable LED visibility control and enter the timer value in minutes in the **Timer** field. Value '0' means that LED is always on.

Flexi Zone Multiband Indoor Pico BTS LED indicators are shown in [Figure: FZ MBI LED indicators](#).

Figure 5: FZ MBI LED indicators

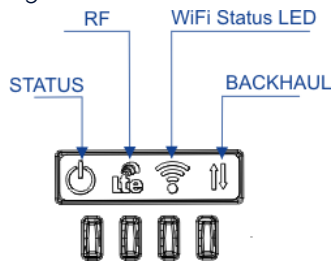
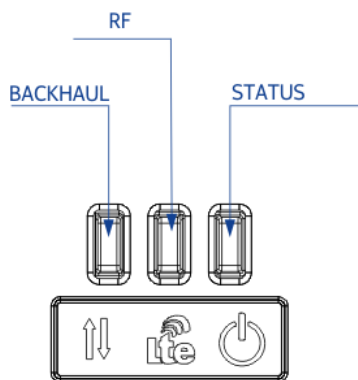


Figure 6: FZ MBI model FW2QE LED indicators



For descriptions of module LED states, see [Flexi Zone BTS LED indications](#).

Table 7: Flexi Zone BTS LED indications

LED	Color	Description	Priority* (1 is highest)
BACKHAUL (Controlled by TRSW) NOTE : This LED depicts the Transport SW States	<i>Transport / Backhaul Link Status</i>		
	OFF	BTS is booting up, and the Platform SW is starting up. LED is being controlled by HW.	1
	Stable RED	In the startup sequence, the Platform SW is up and it has taken control of the LED. This state continues until the TRSW becomes operational following Site Power-Up or Site Reset. Includes POST (in case of a power-on scenario).	1
	Stable RED	TRSW has taken control of LED and is Initializing, or a Critical or Major Fault raised on TRSW.	2
	Stable YELLOW	Critical or Major Fault raised on TRSW and Bluetooth is ENABLED automatically.	2
	Blinking RED	MINOR or Degraded alarm exists on TRSW.	3
	Stable GREEN	TRSW is ready (fully initialized) - No known Critical/Major/Degraded/Minor Transport faults present.	4

LED	Color	Description	Priority* (1 is highest)
RF (Controlled by HW)	<i>RF Transmission Status</i>		
	OFF	BTS is booting up, and the Platform SW is starting up. LED is being controlled by HW.	1
	OFF	Platform SW has come up successfully.	1
	Blinking GREEN	FPGA has taken control of the RF LED in the startup sequence.	1
	Blinking GREEN	RF Transmission OFF	1
	Stable GREEN	RF Transmission ON	2

LED	Color	Description	Priority* (1 is highest)
STATUS (Controlled by BTSOM)	<i>BTS Status</i>		
	Stable RED	BTS is booting up and STATUS LED is being controlled by HW.	1
	Blinking YELLOW	In startup sequence, Platform SW is up and is now controlling the STATUS LED. Includes POST (in case of a power-on scenario).	1
	Blinking YELLOW	Startup: Indicates BTSOM has taken control of the BTS STATUS LED. BTSOM determines that BTS is uncommissioned and performs autoconnection.	4
	Stable YELLOW	Startup-autoconfiguration, BTS is uncommissioned: BTSOM is performing autoconfiguration (SW download, configuration download).	5
	Stable YELLOW	Startup-autoconfiguration blocked, BTS is uncommissioned: SW download, configuration download via the Network Element Manager.	5
	Stable YELLOW	Startup-BTSOM determines that BTS is commissioned.	10
	Stable YELLOW	Indicates BTS and/or all CELLS are Blocked/Locked.	5
	Stable RED	Indicates BTS is Faulty: It signifies that at least one Critical Fault is currently present on BTS. Note: Includes any type of BTS faults including Transport, U-Plane, and C-Plane faults.	2
	Blinking RED	Indicates BTS is degraded: At least one Major Fault is currently active on BTS (while no Critical Faults are active). Note: Includes any type of BTS faults including Transport, U-Plane, and C-Plane faults.	3
	Blinking GREEN	Indicates a SW download is in-progress during runtime operation (for instance, SW download and configuration download are occurring outside of startup).	9
	Stable RED	Indicates a Critical Failure occurred during Auto Connection (AutoConnectionState is "Disconnected"). If failure is due to an iOMS rejection (unsuccessful AutoConnectionEstablishedReply message was received), condition will persist for 5 min until the Auto-Connection process is automatically retried. Note: If failure is due to iOMS connectivity being down (detected by Supervision on iOMS link), a Critical Fault will be active (SET).	7
Blinking GREEN	BTS in Test Dedicated State.	10	
Stable GREEN	Indicates the BTS is fully configured and nothing is preventing a CELL from transitioning to onAir (indicated in conjunction with RF LED being Blinking GREEN). This corresponds to the BTS configured, integrated to RAN, and onAir operational state.	10	

Note:

* The values appearing in the “Priority” column indicate which LED display pattern will illuminate when multiple conditions exist. If there are multiple active conditions, the LED illuminates to reflect the highest priority condition. For example, if there are both Minor and Major active BACKHAUL-related faults, the BACKHAUL LED would illuminate as Stable YELLOW because the Major fault has a higher Priority than the Minor fault.

For descriptions of the FZ MBI module Wi-Fi LED states, see [Table: FZ MBI Wi-Fi LED states](#).

Table 8: FZ MBI Wi-Fi LED states

Wi-Fi LED state	Description
Off	Wi-Fi module not present
Blinking red	Wi-Fi module boot in progress
Stable red	2.4 GHz and 5 GHz fault
Blinking green	2.4 GHz or 5 GHz fault
Stable green	2.4 GHz and 5 GHz on

2. Flexi Zone Multiband Indoor Pico BTS variants

Common elements and available Flexi Zone Multiband Indoor Pico BTS variants

The FZ MBI consists of the following parts:

- Core base station module

The core module integrates the following items into one single unit:

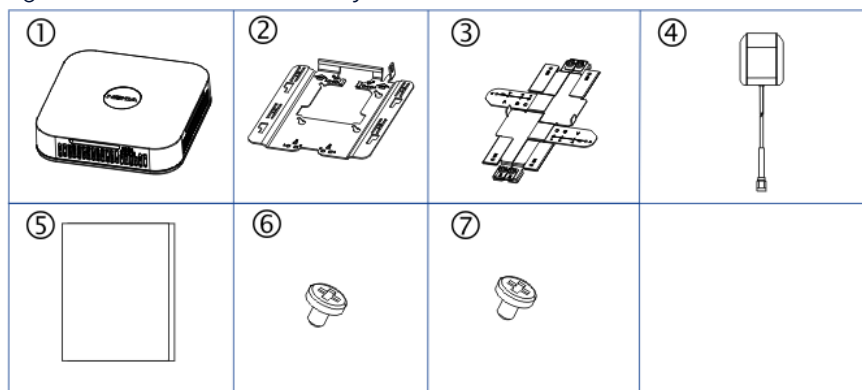
- RF
- Baseband functionality
- Clock (GPS/GLONASS) and control
- Backhaul
- Local Maintenance Terminal (LMT)

Some variants also contain an integrated Wi-Fi antenna that enables the FZ MBI BTS to function as a wireless Access Point (AP).

- Base station contents of delivery

1. Flexi Zone Multiband Indoor Pico BTS Module
2. Mounting bracket
3. Ceiling clip
4. GPS/GLONASS antenna
5. Quick Guide
6. Four M4 screws
7. Four screws for the mounting bracket

Figure 7: Contents of delivery



- Base station ancillary options that are not delivered with the product:

- Power adapter with power cable. The approved adapter model is the DVE DSA-60PFE-12 1 120500.
- PoE++ power injector.

The FZ MBI is available in the following variants:

Table 9: Flexi Zone Multiband Indoor Pico BTS variants

Flexi Zone Multiband Indoor Pico BTS Variant	Feature ID	Sales Item	Available from release
<u>FW2IRA</u>	LTE2357	473487A	LTE 16
<u>FW2IRWA</u>	LTE2357	473488A	LTE 16
<u>FW2FIA</u>	LTE2729	473123A	LTE 16
<u>FW2FIWA</u>	LTE2729	473124A	LTE 16
<u>FW2FIWC</u>	LTE2729	473851A	LTE 16
<u>FW2EHA</u>	LTE2950	473721A	LTE 16A
<u>FW2EHWA</u>	LTE2950	473722A	LTE 16A
<u>FW2GEA</u>	LTE3014	473727A	LTE 16A
<u>FW2GEWA</u>	LTE3014	473728A	LTE 16A
<u>FW2GHA</u>	LTE3015	473729A	LTE 16A
<u>FW2GHWA</u>	LTE3015	473730A	LTE 16A
<u>FW2QD</u>	LTE3168	473843A	LTE 16A
<u>FW2NHA</u>	LTE3169	473522A	LTE 16A
<u>FW2NHWA</u>	LTE3169	474219A	LTE 16A
<u>FW2GEHA</u>	LTE3382	474003A	LTE 16A
<u>FW2HWC</u>	LTE3498	474002A	LTE 16A
<u>FW2HC</u>	LTE3498	474022A	LTE 16A
<u>FW2HHWC</u>	LTE3600	474075A	LTE 16A
<u>FW2HHC</u>	LTE3600	474076A	LTE 16A
<u>FW2HHD</u>	LTE3606	474077A	LTE 16A
<u>FW2HHWD</u>	LTE3606	474078A	LTE 16A
<u>FW2QE</u>	LTE3731	474189A	LTE 16A
<u>FW2PIRA</u>	LTE3812	474220A	LTE 17A
<u>FW2QQD</u>	LTE3947	474336A	LTE 17A

Flexi Zone Multiband Indoor Pico BTS Variant	Feature ID	Sales Item	Available from release
<u>FW2QQWD</u>	LTE3947	474337A	LTE 17A
<u>FW2HIA</u>	LTE4428	474523A	LTE 17A SP1
<u>FW2HIWA</u>	LTE4428	474524A	LTE 17A SP1
<u>FW2HIRA</u>	LTE4430	474527A	LTE 17A SP1
<u>FW2ERA</u>	LTE2951	473723A	LTE 18
<u>FW2ERWA</u>	LTE2951	473724A	LTE 18
<u>FW2HRA</u>	LTE2952	473725A	LTE 18
<u>FW2NHB</u>	LTE5073	474996A	LTE 18A
<u>FW2QQG</u>	LTE5647	475553A	LTE 19B

 Note:

- "WW" stands for "World-Wide" (compliant)
- Model FW2IRWA has reached end of life

2.1 Hardware appearance and interfaces

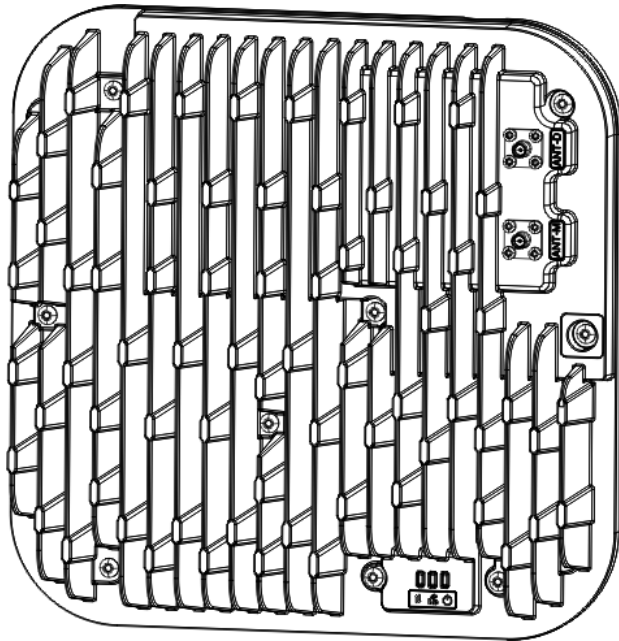
Hardware appearance and interfaces of the different Flexi Zone Multiband Indoor Pico BTS variants

Flexi Zone Multiband Indoor Pico BTS hardware appearance

Figure 8: Flexi Zone Multiband Indoor Pico BTS (except FW2QE)



Figure 9: Flexi Zone Multiband Indoor Pico BTS model FW2QE



Interfaces

Table 10: Flexi Zone Multiband Indoor Pico BTS interfaces description

Interface	Connector type	Description
BH #1/PoE++/ToP Backhaul port	RJ45	Primary Backhaul Port PoE++ Input ToP (1588v2) Sync Input
BH #2/LMT Management/ToP port	RJ45	Local BTS Management Port
DC port	3.5 mm barrel connector	DC power supply input
GPS/GLONASS antenna port	SMA Female	GPS/GLONASS antenna signal input
TX/RX Main Antenna	SMA Female	External antenna connectors for transmit and receive ₁
TX/RX Diversity Antenna	SMA Female	External antenna connectors for transmit and receive ₁

Figure 10: Flexi Zone Multiband Indoor Pico BTS dual-band module interfaces

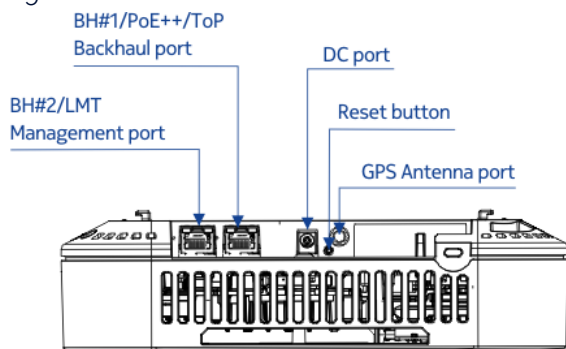


Figure 11: Flexi Zone Multiband Indoor Pico BTS tri-band module interfaces

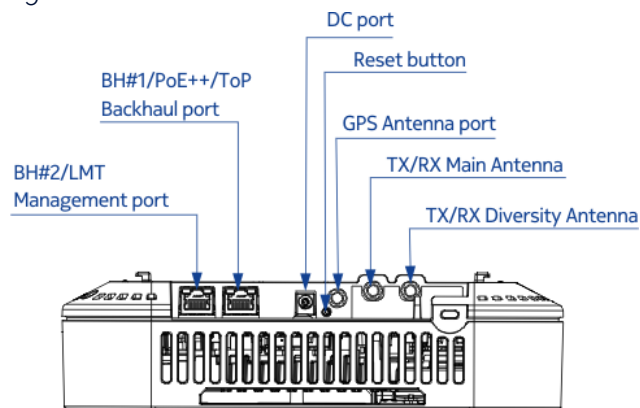


Figure 12: Flexi Zone Multiband Indoor Pico BTS model FW2QQG interfaces

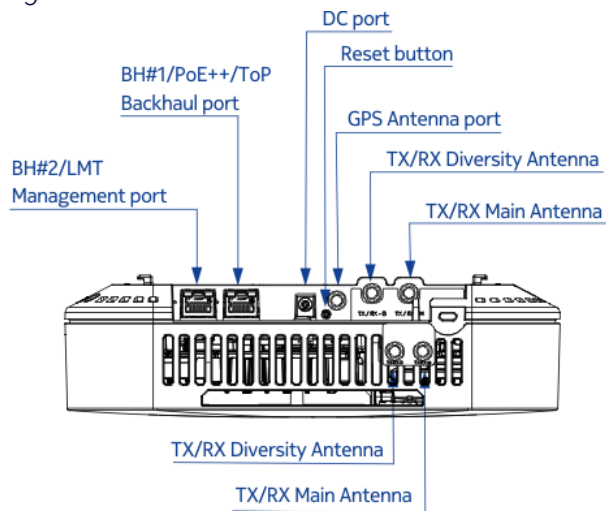
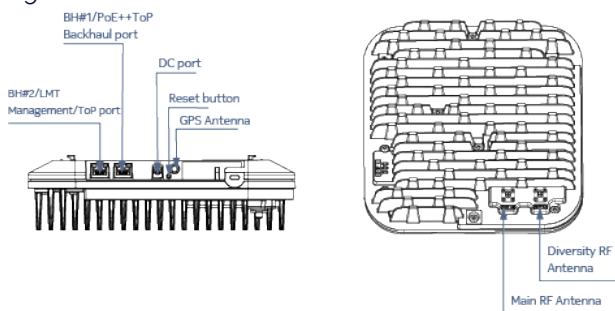


Figure 13: Flexi Zone Multiband Indoor Pico BTS model FW2QE interfaces



Note:

1. Available only for MBI tri-band and FW2QE models.

2.2 LTE2357: B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2IRA, FW2IRWA)

FW2IRA (473487A) and FW2IRWA (473488A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE2357: B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2IRA, FW2IRWA)* feature can be found in [Hardware](#)

appearance and interfaces section.

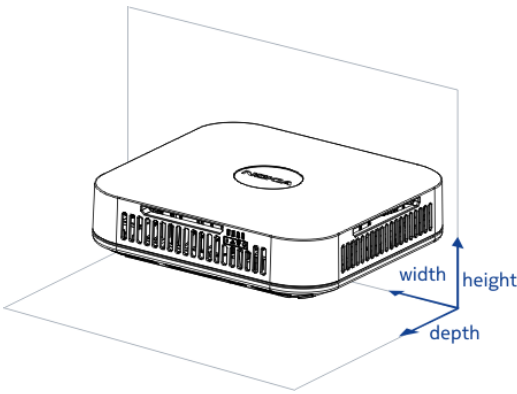
Table 11: FW2IRA, FW2IRWA functional specification

Property	Value		
Antenna output power	250 mW maximum per Tx path ₂ 1 W total output power		
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector		
Number of TXRX	2Tx/2Rx (2x2 MIMO)		
SW supported technologies	FDD-LTE		
Band	FDD Band 66	FDD unlicensed Band 46 (US) (FW2IRA)	FDD unlicensed Band 46 (WW) (FW2IRWA ₁)
Frequency	UL: 1710–1780 MHz DL: 2110–2180 MHz	DL: 5150–5835 MHz ₃	DL: 5150–5250 MHz and 5735–5835 MHz
256QAM backoff	B66: 1 dB	B46: 2 dB	B46: 3 dB
Number of LTE carriers	B66: up to one 20-MHz carrier	B46: up to two 20-MHz carriers	B46: up to two 20-MHz carriers
Supported bandwidths	B66: 5, 10, 15, 20 MHz	B46: 20 MHz	B46: 20 MHz
Mounting options	Wall/Ceiling		
Capacity	400 users		
Remote Local Access	Integrated Bluetooth Access		
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{5,6,7} : - Port 1: Main backhaul, PoE++ capable - Port 2: Can be used for local management or for daisy chaining of additional Indoor Picos BTSs		
Synchronization	GPS 1588v2 - frequency, time, phase SyncE		
Integrated antenna	Integrated Omni 2Tx/2x (2x2 MIMO)		
Integrated Wi-Fi	Integrated dual-band Wi-Fi ₄ module supporting (when applicable): - 2.4 GHz: 802.11 b/g/n - 5 GHz: 802.11 ac/n/a		

Property	Value
Operating Temperature	0°C to +40°C
Regulatory Approvals	FW2IRA: FCC (Wi-Fi not supported) FW2IRWA: Wi-Fi Alliance (World-Wide Wi-Fi compliant)

Dimensions and weight

Table 12: FW2IRA, FW2IRWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE2357 impact on other features

There are no interdependencies between the *LTE2357: B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2IRA, FW2IRWA, FW2IRWC)* feature and any other feature.

Warnings, cautions or notes related to the product

Note:

1. Model FW2IRWA has reached end of life.
2. The software limits the output power on specific channels when needed, per country specifications.
3. While the hardware supports 5150–5835 MHz, the LTE16 and later software support channels within 5150–5250 MHz (UNII-1) and 5735–5835 MHz (UNII-3).
4. The 5 GHz Wi-Fi is disabled when the B46 RF card is in use.
5. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
6. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
7. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.3 LTE2729: B2+B4/B66 Flexi Zone Multiband Indoor Pico (FW2FIA, FW2FIWA, FW2FIWC)

FW2FIA (473123A), FW2FIWA (473124A) and FW2FIWC (473851A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE2729: B2+B4/B66 Flexi Zone Multiband Indoor Pico (FW2FIA, FW2FIWA, FW2FIWC)* feature can be found in [Hardware appearance and interfaces](#) section.

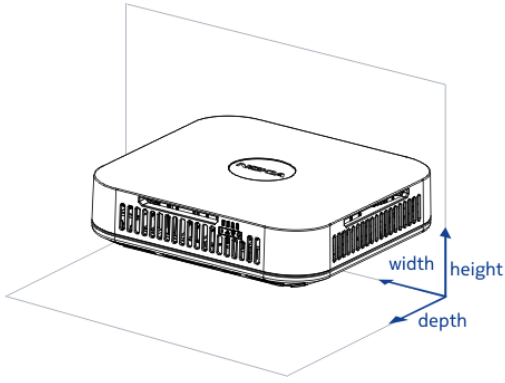
Table 13: FW2FIA, FW2FIWA, FW2FIWC functional specification

Property	Value
Antenna output power	250 mW maximum per Tx path 1 W total output power
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
Number of TXRX	2Tx/2Rx (2x2 MIMO)

Property	Value		
SW supported technologies	FDD-LTE		
Band	Band 2	Band 66	Band 4
Frequency	UL: 1850–1910 MHz DL: 1930–1990 MHz	UL: 1710–1780 MHz DL: 2110–2180 MHz	Only mobiles are supported
256QAM backoff	B2: 0 dB	B66: 1 dB	B4: N/A (for this variant)
Number of LTE carriers	Up to two per unit		
Supported bandwidths	Up to 20 MHz per band for the 3GPP licensed LTE		
Mounting options	Wall/Ceiling		
Capacity	Up to 400 users		
Remote Local Access	Integrated Bluetooth Access		
Backhaul	Two RJ45 Copper Gigabit Ethernet ports _{1,2} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs		
Synchronization	GPS 1588v2 - frequency, time, phase SyncE		
Integrated antenna	Integrated 2Tx/2Rx (2x2 MIMO)		
Integrated Wi-Fi	Integrated dual-band Wi-Fi module supporting: - 2.4 GHz: 802.11 b/g/n - 5 GHz: 802.11 ac/n/a		
Operating Temperature	0°C to +40°C		
Regulatory Approvals	Market Specific		

Dimensions and weight

Table 14: FW2FIA, FW2FIWA, FW2FIWC dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE2729 impact on other features

There are no interdependencies between the *LTE2729: B2+B4/B66 Flexi Zone Multiband Indoor Pico (FW2FIA, FW2FIWA, FW2FIWC)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.

2.4 LTE2950: B3+B7 Flexi Zone Multiband Indoor Pico BTS (FW2EHA, FW2EHWA)

FW2EHA (473721A) and FW2EHWA (473722A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE2950: B3+B7 Flexi Zone Multiband Indoor Pico BTS (FW2EHA, FW2EHW)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 15: FW2EHA, FW2EHW functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	FDD-LTE	
Band	FDD Band 3	FDD Band 7
Frequency	UL: 1710–1785 MHz DL: 1805–1880 MHz	UL: 2500–2570 MHz DL: 2620–2690 MHz
256QAM backoff	B3: 1 dB	B7: 1 dB
Number of LTE carriers	Up to two per unit	
Supported bandwidths	Up to 20 MHz per band for the 3GPP licensed LTE	
Mounting options	Wall/Ceiling	
Capacity	Up to 400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two RJ45 Copper Gigabit Ethernet ports ^{1,2} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	Integrated 2Tx/2Rx (2x2 MIMO)	
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting: - 2.4 GHz: 802.11 b/g/n - 5 GHz: 802.11 ac/n/a	

Property	Value
Operating Temperature	0°C to +40°C
Regulatory Approvals	Market Specific

Dimensions and weight

Table 16: FW2EHA, FW2EHWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	< 3.0 kg (~6.6 lbs) (not including the mounting brackets) for both LTE and Wi-Fi	
Volume	< 3.4 L (not including the mounting brackets) for both LTE and Wi-Fi	

LTE2950 impact on other features

There are no interdependencies between the *LTE2950: B3+B7 Flexi Zone Multiband Indoor Pico BTS (FW2EHA, FW2EHWA)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.

2.5 LTE2951: B3+B46 Flexi Zone Multiband Indoor Pico BTS (FW2ERA, FW2ERWA)

FW2ERA (473723A) and FW2ERWA (473724A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE2951: B3+B46 Flexi Zone Multiband Indoor Pico BTS (FW2ERA, FW2ERWA)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 17: FW2ERA, FW2ERWA functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path ₁ 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	3GPP TS 36.104 Rel-11 Local Area	
SW supported technologies	FDD-LTE	
Band	FDD Band 3	FDD unlicensed Band 46 (WW)
Frequency	UL: 1710-1785 MHz DL: 1805-1880 MHz	DL: 5150-5835 MHz ₂
256QAM backoff	B3: 1 dB	B46: 2 dB
Number of LTE carriers	1 licensed carrier and up to 2 unlicensed carriers	
Supported bandwidths	B3: 5, 10, 15, 20 MHz	B46: 20 MHz
Mounting options	Wall/Ceiling	
Capacity	Up to 400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{3,4,5} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)	
Integrated Wi-Fi	Not applicable	
Operating Temperature	0°C to +40°C	
Regulatory Approvals	ETSI	

Dimensions and weight

Table 18: FW2ERA, FW2ERWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE2951 impact on other features

The *LTE2951: B3+B46 Flexi Zone Multiband Indoor Pico BTS (FW2ERA, FW2ERWA)* feature is impacted by the following feature:

- *LTE2860: Licensed-Assisted Access*

The *LTE2860: Licensed-Assisted Access* feature provides a 3GPP Release-13 compliant LAA solution that can be used in the 5 GHz unlicensed spectrum. The LTE2860 feature introduces software support for supplemental downlink Carrier Aggregation (CA) between carriers from licensed and 5 GHz unlicensed spectrums.

Warnings, cautions or notes related to the product

Note:

1. The software limits the output power on specific channels when needed, per country specifications.
2. While the hardware supports 5150–5835 MHz, the LTE18 software supports channels within 5150–5250 MHz.
3. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
4. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
5. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.6 LTE2952: B7+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HRA)

FW2HRA (473725A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE2952: B7+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HRA)* feature can be found in [Hardware appearance and interfaces](#) section.

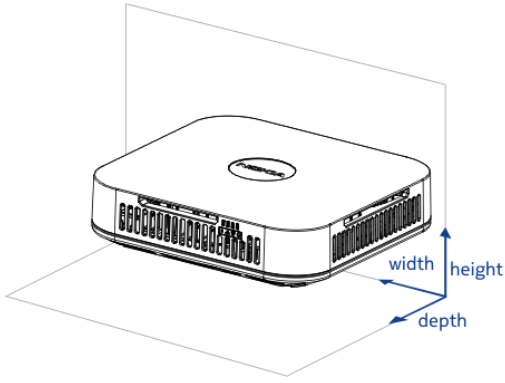
Table 19: FW2HRA functional specification

Property	Value
Antenna output power	250 mW maximum per Tx path ₁ 1 W total output power
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
Number of TXRX	3GPP TS 36.104 Rel-11 Local Area
SW supported technologies	FDD-LTE
Band	FDD Band 7 (full band) FDD unlicensed Band 46 (WW)

Property	Value	
Frequency	UL: 2500–2570 MHz DL: 2620–2690 MHz	DL: 5150–5835 MHz ₂
256QAM backoff	B7: 1 dB	B46: 2 dB
Number of LTE carriers	1 licensed carrier and up to 2 unlicensed carriers	
Supported bandwidths	B7: 5, 10, 15, 20 MHz	B46: 20 MHz
Mounting options	Wall/Ceiling	
Capacity	Up to 400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	<p>Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2_{3,4,5}:</p> <ul style="list-style-type: none"> - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs 	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)	
Integrated Wi-Fi	Not applicable	
Operating Temperature	0°C to +40°C	
Regulatory Approvals	ETSI, CEPT and OFCOM	

Dimensions and weight

Table 20: FW2HRA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE2952 impact on other features

There are no interdependencies between the *LTE2952: B7+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HRA)* feature and any other feature.

Warnings, cautions or notes related to the product

Note:

1. The software limits the output power on specific channels when needed, per country specifications.
2. While the hardware supports 5150–5835 MHz, the LTE18 software supports channels within 5150–5250 MHz.
3. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
4. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
5. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.7 LTE3014: B1+B3 Flexi Zone Multiband Indoor Pico BTS (FW2GEA, FW2GEWA)

FW2GEA (473727A) and FW2GEWA (473727A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3014: B1+B3 Flexi Zone Multiband Indoor Pico BTS (FW2GEA, FW2GEWA)* feature can be found in [Hardware appearance and interfaces](#) section.

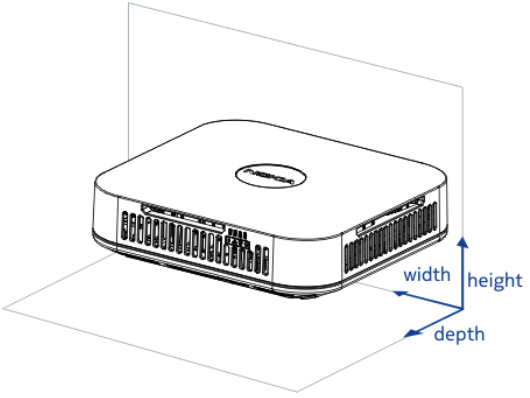
Table 21: FW2GEA, FW2GEWA functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	FDD-LTE	
Band	FDD Band 1	FDD Band 3
Frequency	UL: 1920-1980 MHz DL: 2110-2170 MHz	UL: 1710-1785 MHz DL: 1805-1880 MHz
256QAM backoff	B1: 0 dB	B3: 1 dB
Number of LTE carriers	Up to two per unit (one for each LTE band)	
Supported bandwidths	5, 10, 15, 20 MHz for each LTE band	
Mounting options	Wall/Ceiling	
Capacity	400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	

Property	Value
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz: - 802.11 a/b/g/n/ac (19 dBm per Tx path at 2.4 GHz, and 22 dBm per Tx path at 5 GHz)
Operating Temperature	0°C to +40°C
Regulatory Approvals	ETSI and Wi-Fi Alliance (World-Wide Wi-Fi compliant)

Dimensions and weight

Table 22: FW2GEA, FW2GEWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3014 impact on other features

There are no interdependencies between the *LTE3014: B1+B3 Flexi Zone Multiband Indoor Pico BTS (FW2GEA, FW2GEWA)* feature and any other feature.

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.8 LTE3015: B1+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GHA, FW2GHWA)

FW2GHA (473729A) and FW2GHWA (473730A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3015: B1+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GHA, FW2GHWA)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 23: FW2GHA, FW2GHWA functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	FDD-LTE	
Band	FDD Band 1	FDD Band 7
Frequency	UL: 1920-1980 MHz DL: 2110-2170 MHz	UL: 2500-2570 MHz DL: 2620-2690 MHz

Property	Value	
256QAM backoff	B1: 0 dB	B7: 1 dB
Number of LTE carriers	Up to two per unit (one for each LTE band)	
Supported bandwidths	5, 10, 15, 20 MHz for each LTE band	
Mounting options	Wall /Ceiling	
Capacity	400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)	
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz: - 802.11 a/b/g/n/ac (19 dBm per Tx path at 2.4 GHz, and 22 dBm per Tx path at 5 GHz)	
Operating Temperature	0°C to +40°C	
Regulatory Approvals	ETSI and Wi-Fi Alliance (World-Wide Wi-Fi compliant)	

Dimensions and weight

Table 24: FW2GHA, FW2GHWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3015 impact on other features

There are no interdependencies between the *LTE3015: B1+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GHA, FW2GHWA)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.9 LTE3168: 3.5 GHz Flexi Zone Multiband Indoor Pico BTS (FW2QD)

FW2QD (473843A) technical specifications

Functional description

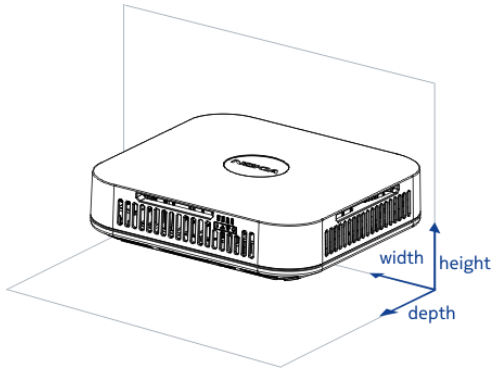
Information about the appearance and interfaces related to the *LTE3168: 3.5 GHz Flexi Zone Multiband Indoor Pico BTS (FW2QD)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 25: FW2QD functional specification

Property	Value
Antenna output power	50 mW to 250 mW per Tx branch
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
Number of TXRX	2Tx/2Rx (2x2 MIMO)
SW supported technologies	TDD-LTE
Band	Band US3550-3700 MHz CBRS BAND
Frequency	UL: 3550-3700 MHz DL: 3550-3700 MHz
Number of LTE carriers	Two (contiguous using one RF card)
Supported bandwidths	10, 15, 20 MHz per carrier
Mounting options	Wall/Ceiling
Capacity	Up to 400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two RJ45 Copper Gigabit Ethernet ports: - Port 1: for Backhaul/PoE++ (75 W Mid-span injector) - Port 2: for daisy-chain/LMT
Synchronization	RF GPS 1588v2 - frequency, time, phase
Integrated antenna	2Tx/2Rx (2x2 MIMO) Integrated Omni Antennas
Integrated Wi-Fi	Fully integrated optional Wi-Fi module
Operating Temperature	0°C to +40°C
Regulatory Approvals	ETSI, CEPT, OFCOM

Dimensions and weight

Table 26: FW2QD dimensions and weight

Property	Value	Dimensions orientation
Height	246 mm	
Depth	55 mm	
Width	246 mm	
Weight	3 kg (6.61 lb)	
Volume	3.4 L	

LTE3168 impact on other features

There are no interdependencies between the *LTE3168: 3.5 GHz Flexi Zone Multiband Indoor Pico BTS (FW2QD)* feature and any other feature.

2.10 LTE3169 and LTE3770: B40+B41 Flexi Zone Multiband Indoor Pico BTS (FW2NHA, FW2NHWA)

FW2NHA (473522A) and FW2NHWA (474219A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3169 and LTE3770: B40+B41 Flexi Zone Multiband Indoor Pico BTS (FW2NHA, FW2NHWA)* feature can be found in Hardware appearance and interfaces section.

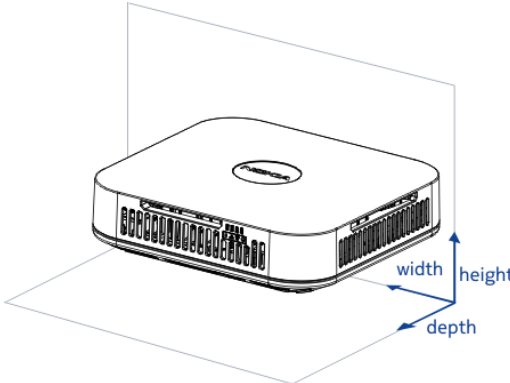
Table 27: FW2NHA, FW2NHWA functional specification

Property	Value
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Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	TDD-LTE	
Band	TDD Band 40	TDD Band 41
Frequency	UL: 2320-2370 MHz DL: 2320-2370 MHz	UL: 2575-2635 MHz DL: 2575-2635 MHz
256QAM backoff	B40: 0 dB	B41: 0 dB
Number of LTE carriers	Up to two per unit (1 per RF card)	
Supported bandwidths	10, 15, 20 MHz	
Mounting options	Wall/Ceiling	
Capacity	400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)	
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz: - 802.11 a/b/g/n/ac	
Operating Temperature	0°C to +40°C	
Regulatory Approvals	ETSI, Wi-Fi Alliance (World-Wide Wi-Fi compliant)	

Dimensions and weight

Table 28: FW2NHA, FW2NHWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3169 impact on other features

There are no interdependencies between the *LTE3169* and *LTE3770: B40+B41 Flexi Zone Multiband Indoor Pico BTS (FW2NHA, FW2NHWA)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.11 LTE3382: B1+B3+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GEHA)

FW2GEHA (474003A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3382: B1+B3+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GEHA)* feature can be found in [Hardware appearance and interfaces](#) section.

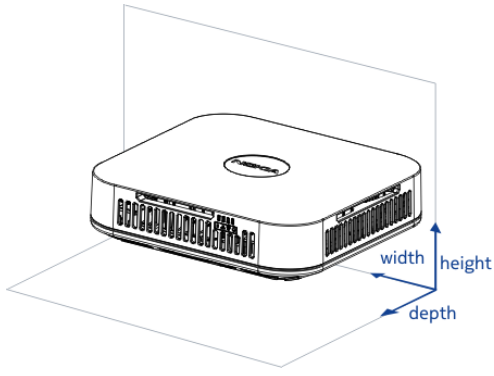
Table 29: FW2GEHA functional specification

Property	Value		
Antenna output power	2 x 250 mW maximum per band 1.5 W total output power of the FZ MBI Pico BTS ₁		
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector		
Number of TXRX	2Tx/2Rx (2x2 MIMO)		
SW supported technologies	FDD-LTE		
Band ₂	FDD Band 1	FDD Band 3	FDD Band 7
Frequency ₂	UL: 1920–1980 MHz DL: 2110–2170 MHz	UL: 1710–1785 MHz DL: 1805–1880 MHz	UL: 2500–2570 MHz DL: 2620–2690 MHz
256QAM backoff	B1: 0 dB	B3: 1 dB	B7: 1 dB
Number of LTE carriers	Up to three per unit (1 per RF card)		
Supported bandwidths	5, 10, 15, 20 MHz (each band) ₆		
Mounting options	Wall/Ceiling		
Capacity	Up to 400 users		
Remote Local Access	Integrated Bluetooth Access		
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v _{2,3,4,5} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs		

Property	Value
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	Configuration: Integrated 2Tx/2Rx (2x2 MIMO) Types: - Integrated Omni antenna (Bands 3 and 7) - External antenna (Band 1)
Integrated Wi-Fi	Not applicable
Operating Temperature	From 0°C to +40°C
Regulatory Approvals	ETSI, CEPT, OFCOM

Dimensions and weight

Table 30: FW2GEHA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3382 impact on other features

The LTE3382: B1+B3+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GEHA) feature has a dependency on the following features:

- LTE3756: Three-carrier support for Flexi Zone BTS on FDD-LTE

The LTE3382: B1+B3+B7 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2GEHA) feature

has a dependency on *LTE3756: Three-carrier support for Flexi Zone BTS on FDD-LTE* for three carrier support.

Warnings, cautions or notes related to the product

Note:

1. In the current release, only 1 W of total output power is supported.
2. The following configuration is supported: B3 + B7.
3. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
4. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
5. Other than PoE++, the backhaul functions can be optionally configured to the other port.
6. Total aggregated bandwidth supported by the Indoor Pico BTS is 40 MHz or less.

2.12 LTE3498: B38 Flexi Zone Multiband Indoor Pico BTS (FW2HC, FW2HWC)

FW2HC (474022A) and FW2HWC (474002A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3498: B38 Flexi Zone Multiband Indoor Pico BTS (FW2HC, FW2HWC)* feature can be found in [Hardware appearance and interfaces](#) section.

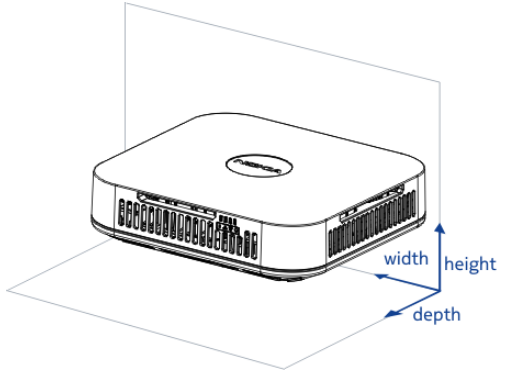
Table 31: FW2HC, FW2HWC functional specification

Property	Value
Antenna output power	From 50 mW 2 to 50 mW per TX path
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector

Property	Value
Number of TXX	2Tx/2Rx (2x2 MIMO)
SW supported technologies	TDD-LTE
Band	TDD Band 38
Frequency	UL: 2575-2615 MHz ₁ DL: 2575-2615 MHz ₁
256QAM backoff	B38: 3 dB
Number of LTE carriers	Up to two contiguous 20 MHz carriers per unit
Supported bandwidths	10, 15, 20 MHz
Mounting options	Wall/Ceiling
Capacity	400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{2,3,4} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	2Tx/2Rx (2x2 MIMO) Integrated Omni
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz: - 802.11 a/b/g/n/ac
Operating Temperature	0°C to +40°C
Regulatory Approvals	ETSI, Wi-Fi Alliance (World-Wide Wi-Fi compliant), CEPT, and OFCOM compliant with path-loss assumptions for indoor deployments

Dimensions and weight

Table 32: FW2HC, FW2HWC dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3498 impact on other features

There are no interdependencies between the *LTE3498: B38 Flexi Zone Multiband Indoor Pico BTS (FW2HC, FW2HWC)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Frequencies 2570–2575 MHz and 2615–2620 MHz are guard bands.
2. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
3. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
4. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.13 LTE3600: B7+B7 Flexi Zone Multiband Indoor Pico BTS (FW2HHC, FW2HHWC)

FW2HHC (474076A) and FW2HHWC (474075A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3600: B7+B7 Flexi Zone Multiband Indoor Pico BTS (FW2HHC, FW2HHWC)* feature can be found in [Hardware appearance and interfaces](#) section.

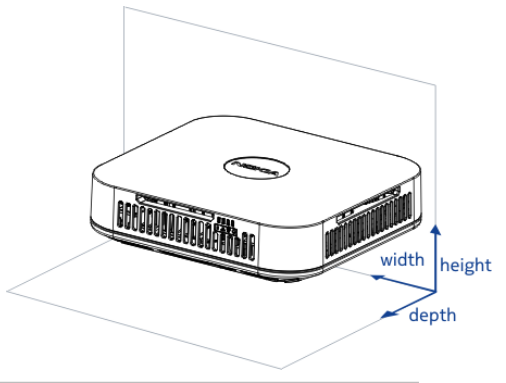
Table 33: FW2HHC, FW2HHWC functional specification

Property	Value
Antenna output power	2 x 250 mW maximum per band 1 W total output power for the FZ MBI Pico BTS
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
Number of TXRX	2Tx/2Rx (2x2 MIMO)
SW supported technologies	FDD-LTE
Band	FDD Band 7
Frequency	UL: 2500–2570 MHz DL: 2620–2690 MHz
256QAM backoff	B7: 1 dB
Number of LTE carriers	Up to two per unit (1 per RF card)
Supported bandwidths	5, 10, 15, 20 MHz
Mounting options	Wall or ceiling
Capacity	400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs

Property	Value
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz: - 802.11 a/b/g/n/ac (19 dBm per Tx path at 2.4 GHz, and 22 dBm per Tx path at 5 GHz)
Operating Temperature	0°C to +40°C
Regulatory Approvals	Industry Canada (IC), Wi-Fi Alliance (World-wide Wi-Fi compliant)

Dimensions and weight

Table 34: FW2HHC, FW2HHWC dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3600 impact on other features

There are no interdependencies between the *LTE3600: B7+B7 Flexi Zone Multiband Indoor Pico BTS (FW2HHC, FW2HHWC)* feature and any other feature.

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.14 LTE3606: B41+B41 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2HHD, FW2HHWD)

FW2HHD (474077A) and FW2HHWD (474078A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3606: B41+B41 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2HHD, FW2HHWD)* feature can be found in Hardware appearance and interfaces section.

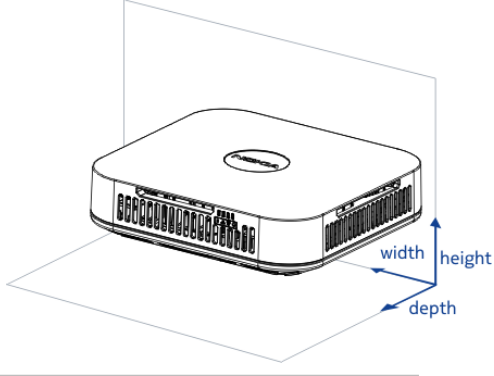
Table 35: FW2HHD, FW2HHWD functional specification

Property	Value
Antenna output power	2 x 250 mW maximum per band 1 W total output power
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
Number of TXRX	2Tx/2Rx (2x2 MIMO)
SW supported technologies	TDD-LTE
Band	TDD Band 41 (full band)
Frequency	UL: 2496–2690 MHz DL: 2496–2690 MHz

Property	Value
256QAM backoff	B41: N/A (for any of these variants)
Number of LTE carriers	Up to two per unit (one per RF card)
Supported bandwidths	10, 15, 20 MHz
Mounting options	Wall/Ceiling
Capacity	400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz: - 802.11 a/b/g/n/ac (19 dBm per Tx path at 2.4 GHz, and 22 dBm per Tx path at 5 GHz)
Operating Temperature	0°C to +40°C
Regulatory Approvals	FCC, Wi-Fi Alliance (US Wi-Fi compliant)

Dimensions and weight

Table 36: FW2HHD, FW2HHWD dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3606 impact on other features

There are no interdependencies between the *LTE3606: B41+B41 (FB) Flexi Zone Multiband Indoor Pico BTS (FW2HHD, FW2HHWD)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.15 LTE3731: B42 (NB) Flexi Zone Multiband Indoor Pico BTS with external antennas (FW2QE)

FW2QE (474189A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3731: B42 (NB) Flexi Zone Multiband Indoor Pico BTS with external antennas (FW2QE)* feature can be found in Hardware appearance and interfaces section.

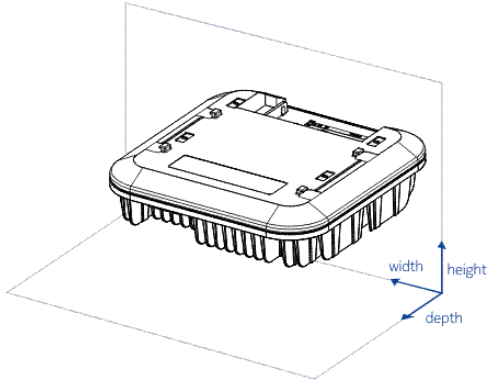
Table 37: FW2QE functional specification

Property	Value
Antenna output power	From 2 x 25 mW to 2 x 250 mW per carrier (one or two carriers) 0.5 W and 1 W maximum total output power for one and two carriers, respectively
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
SW supported technologies	TDD-LTE
Band	TDD Band 42
Frequency	UL: 3520-3560 MHz DL: 3520-3560 MHz
256QAM backoff	B42: 3 dB
Number of LTE carriers	Up to two per unit
Supported bandwidths	10, 15, 20 MHz
Mounting options	Wall/Ceiling
Capacity	400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs
Synchronization	GPS, QZSS 1588v2 - frequency, time, phase SyncE
Integrated antenna	External antenna (SMA connector)

Property	Value
Integrated Wi-Fi	-
Operating Temperature	0°C to +50°C
Regulatory Approvals	TELEC

Dimensions and weight

Table 38: FW2QE dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.52 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	2.5 kg (~5.5 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE3731 impact on other features

There are no interdependencies between the *LTE3731: B42 (NB) Flexi Zone Multiband Indoor Pico BTS with external antennas (FW2QE)* feature and any other feature.

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.16 LTE3812: B13+B66+B46 LAA Flexi Zone Multiband Indoor Pico BTS (FW2PIRA)

FW2PIRA (474220A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3812: B13+B66+B46 LAA Flexi Zone Multiband Indoor Pico BTS (FW2PIRA)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 39: FW2PIRA functional specification

Property	Value		
Antenna output power	2 x 250 mW maximum per band 1.5 W total output power		
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector		
Number of TXRX	2Tx/2Rx (2x2 MIMO)		
SW supported technologies	FDD-LTE		
Band	FDD Band 13	FDD Band 66	FDD unlicensed Band 46 LAA
Frequency	UL: 777-787 MHz DL: 746-756 MHz	UL: 1710-1780 MHz DL: 2110-2180 MHz	DL: 5170-5250 MHz DL: 5735-5835 MHz

Property	Value		
256QAM backoff	B13: 1 dB	B66: 1 dB	B46: 2 dB
Number of LTE carriers	B13: up to one 10-MHz carrier	B66: up to one 20-MHz carrier	B46 LAA: up to two 20-MHz carriers
Supported bandwidths	B13: 5, 10 MHz ₄	B66: 5, 10, 15, 20 MHz ₄	B46 LAA: 20 MHz ₄
Mounting options	Wall or ceiling		
Capacity	400 users		
Remote Local Access	Integrated Bluetooth Access		
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs		
Synchronization	GPS 1588v2 - frequency, time, phase SyncE		
Integrated antenna	Configuration: Integrated 2Tx/2Rx (2x2 MIMO) Types: - Integrated Omni antenna (Band 66 and Band 46 LAA) - External antenna (Band 13)		
Integrated Wi-Fi	Not applicable		
Operating Temperature	From 0°C to +40°C		
Regulatory Approvals	FCC		

Dimensions and weight

Table 40: FW2PIRA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets and Wi-Fi)	
Volume	3.4 L (including mounting brackets and Wi-Fi)	

LTE3812 impact on other features

There are no interdependencies between the *LTE3812: B13+B66+B46 LAA Flexi Zone Multiband Indoor Pico BTS (FW2PIRA)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.
4. Total aggregated BW supported by the Indoor Pico is 60 MHz or less: B66 + LAA (60 MHz DL / 20 MHz UL) or B13 (10 MHz DL / 10 MHz UL)

2.17 LTE3947: B48 Flexi Zone Multiband Indoor Pico BTS (FW2QQD, FW2QQWD)

FW2QQD (474336A) and FW2QQWD (474337A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE3947: B48 Flexi Zone Multiband Indoor Pico BTS (FW2QQD, FW2QQWD)* feature can be found in [Hardware appearance and interfaces](#) section.

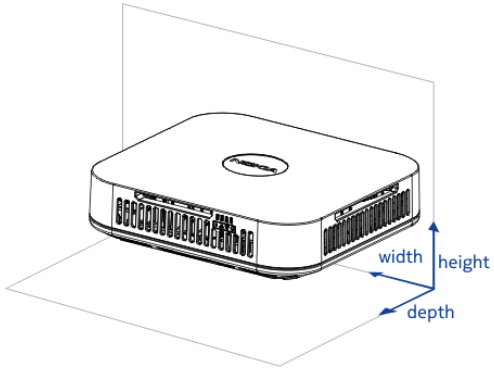
Table 41: FW2QQD, FW2QQWD functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	TDD-LTE	
Band	TDD Band 48 + Band 48 (full band) (FW2QQD)	TDD Band 48 + Band 48 (full band) + Wi-Fi (FW2QQWD)
Frequency	UL: 3550–3700 MHz DL: 3550–3700 MHz	UL: 3550–3700 MHz DL: 3550–3700 MHz
256QAM backoff	B48: 3 dB	
Number of LTE carriers	Up to two carriers supported: 40 MHz DL / 40 MHz UL	
Supported bandwidths	10, 15, 20 MHz	
Mounting options	Wall or ceiling	
Capacity	Up to 400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	

Property	Value
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)
Integrated Wi-Fi	Dual-band Wi-Fi: 2.4 GHz / 5.0 GHz (when applicable)
Operating Temperature	0°C to +40°C
Regulatory Approvals	FW2QQD: FCC (Wi-Fi not supported) FW2QQWD: FCC (Wi-Fi supported), US Wi-Fi compliant not applicable

Dimensions and weight

Table 42: FW2QQD, FW2QQWD dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE3947 impact on other features

The LTE3947: B48 Flexi Zone Multiband Indoor Pico BTS (FW2QQD, FW2QQWD) feature has a dependency on the following features:

- LTE3629: Three-carrier support (with supplemental DL carrier) for Flexi Zone BTS on TD-LTE

Feature LTE3629 enables three-carrier operation within the same Flexi Zone BTS equipped with two RF modules. The third carrier is downlink-only and can be used as a

supplemental carrier for carrier aggregation. When this feature is available, the FW2QQD model can support three carriers as follows:

- 3 x 20 MHz carriers
- 60 MHz DL, 40 MHz UL
- 10, 15, 20 MHz BW
- DL supplemental channel can be supported on either RF card
- *LTE3584: FZ (SAS) CBRS Support for 2 Radio CBSD*

Feature LTE3584 provides support for two-radio hardware with dis-contiguous CBRS grants and autonomously configuring carrier aggregation RELs for up to 3 CCs (intra-band).

The LTE3947 feature uses the *LTE3098: FZ SAS to CBSD Proxy* feature for single radio CBRS support. When the *LTE3584: FZ (SAS) CBRS Support for 2 Radio CBSD* feature becomes available, LTE3947 will then use LTE3584 for two-radio CBRS support.

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.18 LTE4048: B2+B7 Flexi Zone Multiband Indoor Pico BTS (FW2FHC, FW2FHWC)

FW2FHC (474361A) and FW2FHWC (474362A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE4048: B2+B7 Flexi Zone Multiband Indoor Pico BTS (FW2FHC, FW2FHWC)* feature can be found in [Hardware appearance and interfaces](#) section.

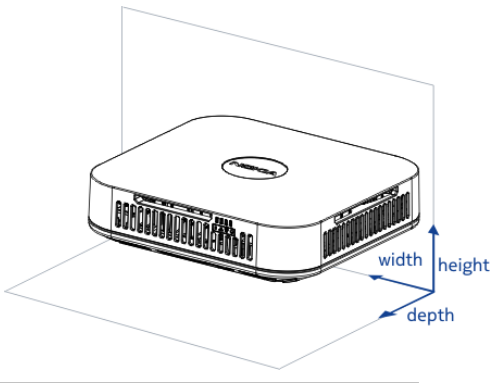
Table 43: FW2FHC, FW2FHWC functional specification

Property	Value	
Antenna output power	2 x 250 mW maximum per band 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	FDD-LTE	
Band	FDD Band 2 (full band)	FDD Band 7 (full band)
Frequency	UL: 1850-1910 MHz DL: 1930-1990 MHz	UL: 2500-2570 MHz DL: 2620-2690 MHz
256QAM backoff	B2: 0 dB	B7: 1 dB
Number of LTE carriers	Up to two per unit (one per RF card)	
Supported bandwidths	5, 10, 15, 20 MHz	
Mounting options	Wall or ceiling	
Capacity	Up to 400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)	
Integrated Wi-Fi	Optional integrated dual-band Wi-Fi module supporting 2.4 GHz and 5 GHz (when applicable): - 802.11 a/b/g/n/ac	
Operating Temperature	0°C to +40°C	

Property	Value
Regulatory Approvals	FW2FHC: ETSI (Wi-Fi not supported), CEPT & OFCOM compliance with path loss assumptions for indoor deployments FW2FHWC: ETSI, Wi-Fi Alliance (World-Wide Wi-Fi compliant), CEPT & OFCOM compliance with path loss assumptions for indoor deployments

Dimensions and weight

Table 44: FW2FHC, FW2FHWC dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE4048 impact on other features

There are no interdependencies between the *LTE4048: B2+B7 Flexi Zone Multiband Indoor Pico BTS (FW2FHC, FW2FHWC)* feature and any other feature.

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.19 LTE4428: B7+B66 Flexi Zone Multiband Indoor Pico BTS (FW2HIA, FW2HIWA)

FW2HIA (474523A) and FW2HIWA (474524A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE4428: B7+B66 Flexi Zone Multiband Indoor Pico BTS (FW2HIA, FW2HIWA)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 45: FW2HIA, FW2HIWA functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	FDD-LTE	
Band	FDD Band 7 (full band)	FDD Band 66 (full band)
Frequency	UL: 2500–2570 MHz DL: 2620–2690 MHz	UL: 1710–1780 MHz DL: 2110–2180 MHz
256QAM backoff	B7: 1 dB	B66: 1 dB
Number of LTE carriers	Up to two per unit (one per RF card)	

Property	Value
Supported bandwidths	5, 10, 15, 20 MHz
Mounting options	Wall or ceiling
Capacity	Up to 400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	Integrated Omni 2Tx/2Rx (2x2 MIMO)
Integrated Wi-Fi	Integrated dual-band Wi-Fi module supporting (when applicable): - 2.4 GHz: 802.11b/g/n - 5 GHz: 802.11ac/n/a
Operating Temperature	0°C to +40°C
Regulatory Approvals	FW2HIA: Industry Canada (IC) ₄ (Wi-Fi not supported) FW2HIWA: Industry Canada (IC), Wi-Fi Alliance (World-wide Wi-Fi compliant) ₄

Dimensions and weight

Table 46: FW2HIA, FW2HIWA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE4428 impact on other features

The *LTE4428: B7+B66 Flexi Zone Multiband Indoor Pico BTS (FW2HIA, FW2HIWA)* feature has a dependency on the following feature:

- *LTE3756: Three-carrier support for Flexi Zone BTS on FDD-LTE*

Feature LTE3756 enables three-carrier operation within the same Flexi Zone BTS equipped with two RF modules. When this feature is available, the FW2HIA and FW2HIWA models can support three carriers as follows:

- Up to 3 carriers per MBI pico within a total of 60 MHz DL (or 40 MHz UL) carrier BW with (or without) a Supplemental DL (SDL) carrier
- 60 MHz DL, 40 MHz UL
- DL supplemental channel can be supported on either RF card
- The following is supported for the B66 two-carrier case:
 - Up to 20 + 20 MHz configuration
 - Tx power (250 mW) is split over the two carriers

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.
4. CEPT & OFCOM compliance with path loss assumptions for indoor deployments.

2.20 LTE4430: B7+B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HIRA)

FW2HIRA (474527A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE4430: B7+B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HIRA)* feature can be found in [Hardware appearance and interfaces](#) section.

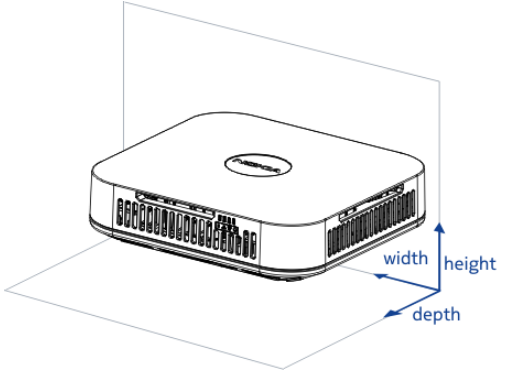
Table 47: FW2HIRA functional specification

Property	Value		
Antenna output power	2 x 250 mW maximum per band. However, the maximum Tx power on Band 46 is subject to local regulations. 1.5 W total output power		
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector		
Number of TXRX	2Tx/2Rx (2x2 MIMO)		
SW supported technologies	FDD-LTE		
Band	FDD Band 7	FDD Band 66	FDD unlicensed Band 46 (UNII-1 and UNII-3)

Property	Value		
Frequency	UL: 2500–2570 MHz DL: 2620–2690 MHz	UL: 1710–1780 MHz DL: 2110–2180 MHz	UL: 5150–5250 MHz DL: 5735–5835 MHz
256QAM	B7: 1 dB	B66: 1 dB	B46: 2 dB
Number of LTE carriers ₁	B7: Up to one 20-MHz carrier	B66: Up to one 20-MHz carrier	B46: Up to two 20-MHz carriers
Supported bandwidths	B7: 5, 10, 15, 20 MHz ₆	B66: 5, 10, 15, 20 MHz ₆	B46: 20 MHz ₄
Mounting options	Wall or ceiling		
Capacity	400 users		
Remote Local Access	Integrated Bluetooth Access		
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 _{2,3,4} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs		
Synchronization	GPS 1588v2 - frequency, time, phase SyncE		
Integrated antenna	Configuration: Integrated 2Tx/2Rx (2x2 MIMO) Types: - Integrated Omni antenna (Bands 66 and 46) - External antenna (Band 7)		
Integrated Wi-Fi	Not applicable		
Operating Temperature	From 0°C to +40°C		
Regulatory Approvals	Industry Canada (IC) ₅		

Dimensions and weight

Table 48: FW2HIRA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE4430 impact on other features

The *LTE4430: B7+B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HIRA)* feature has a dependency on:

- *LTE3756: Three-carrier support for Flexi Zone BTS on FDD-LTE*

The *LTE4430: B7+B66+B46 Flexi Zone Multiband Indoor Pico BTS (FW2HIRA)* feature has a dependency on *LTE3756: Three-carrier support for Flexi Zone BTS on FDD-LTE* for three carrier support.

Warnings, cautions or notes related to the product

i Note:

1. A maximum of three carriers is supported.
2. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
3. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
4. Other than PoE++, the backhaul functions can be optionally configured to the other port.
5. CEPT & OFCOM compliance with path loss assumptions for indoor deployments.
6. Total aggregated BW supported by the Indoor Pico is 60 MHz or less: B66 + B46 (60 MHz DL / 20 MHz UL) or B7 (10 MHz DL/ 10 MHz UL)

2.21 LTE5073: B40+B41 MBI FZ Multiband Indoor Pico with external antennas (FW2NHB)

FW2NHB (474996A) technical specification

Functional description

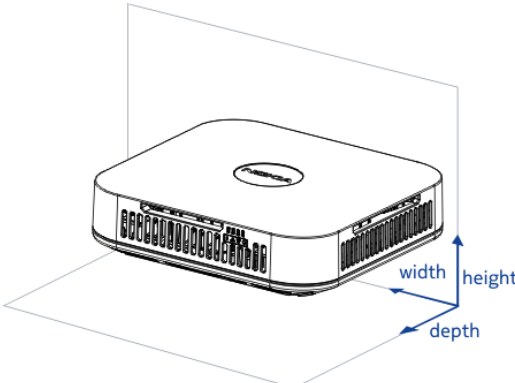
Information about the appearance and interfaces related to the *LTE5073: B40+B41 MBI FZ Multiband Indoor Pico with external antennas (FW2NHB)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 49: FW2NHB functional specification

Property	Value	
Antenna output power	250 mW maximum per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	TDD-LTE	
Band	Band 40	Band 41
Frequency	DL: 2320-2370 MHz	DL: 2496-2690 MHz
256QAM backoff	B40: N/A (for this variant)	B41: N/A (for this variant)
Number of LTE carriers	Up to two per unit	
Supported bandwidths	2 x 20 MHz contiguous carriers per band	
Mounting options	Wall/Ceiling	
Capacity	Up to 400 users	
Remote Local Access	Integrated Bluetooth Access	
Backhaul	Two RJ45 Copper Gigabit Ethernet ports ^{1,2} - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs	
Synchronization	GPS 1588v2 - frequency, time, phase SyncE	
Integrated antenna	External antenna	
Integrated Wi-Fi	Not applicable	
Operating Temperature	From 0°C to +40°C	
Regulatory Approvals	China Specific	

Dimensions and weight

Table 50: FW2NHB dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE5073 impact on other features

There are no interdependencies between the *LTE5073: B40+B41 MBI FZ Multiband Indoor Pico with external antennas (FW2NHB)* feature and any other feature.

Warnings, cautions or notes related to the product

i Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.

2.22 LTE5647:B48+B48 (CBRS) MBI with external antenna interface (FW2QQG)

FW2QQG (475553A) technical specifications

Functional description

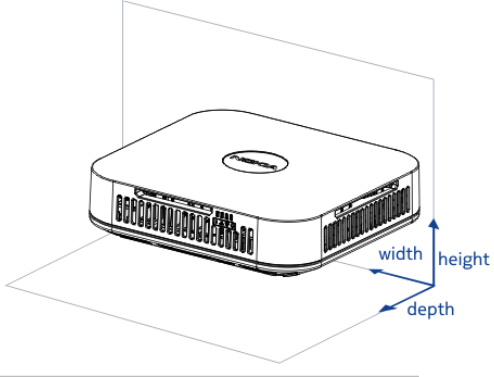
Information about the appearance and interfaces related to the *LTE5647:B48+B48 (CBRS) MBI with external antenna interface (FW2QQG)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 51: FW2QQG functional specification

Property	Value
Antenna output power	250 mW maximum per Tx path 1 W total output power
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector
Number of TXRX	2Tx/2Rx (2x2 MIMO)
SW supported technologies	TDD-LTE
Band	TDD Band 48 + Band 48 (full band)
Frequency	UL: 3550–3700 MHz DL: 3550–3700 MHz
256QAM backoff	B48: 3 dB
Number of LTE carriers	Up to three carriers supported: 60 MHz DL / 40 MHz UL
Supported bandwidths	10, 15, 20 MHz
Mounting options	Wall or ceiling
Capacity	Up to 400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	External antenna (SMA connector)
Integrated Wi-Fi	-
Operating Temperature	0°C to +40°C
Regulatory Approvals	FCC, 3GPP Local Area Base Station Class TS36.104

Dimensions and weight

Table 52: FW2QQG dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3.0 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE5647 impact on other features

The *LTE5647:B48+B48 (CBRS) MBI with external antenna interface (FW2QQG)* feature has a dependency on the following features:

- *LTE3584: FZ (SAS) CBRS Support for 2 Radio CBSD*

Feature LTE3584 provides support for two-radio hardware with dis-contiguous CBRS grants and autonomously configuring carrier aggregation RELs for up to 3 CCs (intra-band).

- *LTE3098: FZ SAS to CBSD Proxy*

Feature LTE3098 is supported with this hardware product.

Warnings, cautions or notes related to the product

Note:

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.
3. Other than PoE++, the backhaul functions can be optionally configured to the other port.

2.23 LTE5695: B5+B66 MBI FZ Multiband Indoor Pico (FW2CIA)

FW2CIA (475645A) technical specifications

Functional description

Information about the appearance and interfaces related to the *LTE5695: B5+B66 MBI FZ Multiband Indoor Pico (FW2CIA)* feature can be found in [Hardware appearance and interfaces](#) section.

Table 53: FW2CIA functional specification

Property	Value	
Antenna output power	50 mW to 250 mW per Tx path 1 W total output power	
Device input power	- Option 1: DC Input via AC power adapter - Option 2: PoE via PoE++ power injector	
Number of TXRX	2Tx/2Rx (2x2 MIMO)	
SW supported technologies	FDD-LTE	
Band	FDD Band 5 (full band)	FDD Band 66 (full band)
Frequency	UL: 824-849 MHz DL: 869-894 MHz	UL: 1710-1780 MHz DL: 2110-2180 MHz
256QAM backoff	B5: 1 dB	B66: 1 dB
Number of LTE carriers	Up to two per unit (one per RF card)	

Property	Value
Supported bandwidths	B5: 5, 10 MHz B66: 5, 10, 15, 20 MHz
Mounting options	Wall or ceiling
Capacity	Up to 400 users
Remote Local Access	Integrated Bluetooth Access
Backhaul	Two 100/1000 Base-T Copper Gigabit Ethernet ports, supporting SyncE, ToP, and IEEE1588v2 ^{1,2,3} : - Port 1: Main backhaul, PoE++ capable supporting SyncE and IEEE1588v2 - Port 2: Can be used for local management or for daisy chaining of additional Indoor Pico BTSs
Synchronization	GPS 1588v2 - frequency, time, phase SyncE
Integrated antenna	B5: External Antenna Only (via SMA connector) B66: Integrated Omni 2Tx/2Rx (2x2 MIMO)
Integrated Wi-Fi	No
Operating Temperature	0°C to +40°C
Regulatory Approvals	FCC

Dimensions and weight

Table 54: FW2CIA dimensions and weight

Property	Value	Dimensions orientation
Height	66 mm (2.59 in.)	
Depth	247 mm (9.72 in.)	
Width	247 mm (9.72 in.)	
Weight	3 kg (~6.6 lbs) (including mounting brackets)	
Volume	3.4 L (including mounting brackets)	

LTE5695 impact on other features

The LTE5695: B5+B66 MBI FZ Multiband Indoor Pico (FW2CIA) feature has a dependency on the following feature:

- LTE3756: Three-carrier support for Flexi Zone BTS on FDD-LTE

Feature LTE3756 enables three-carrier operation within the same Flexi Zone BTS equipped with two RF modules. When this feature is available, the FW2CIA model can support three carriers as follows:

- Up to 3 carriers per MBI pico within a total of 60 MHz DL (or 40 MHz UL) carrier BW with (or without) a Supplemental DL (SDL) carrier
- 60 MHz DL, 40 MHz UL
- DL supplemental channel can be supported on either RF card
- The following is supported for the B66 two-carrier case:
 - Up to 20 + 20 MHz configuration
 - Tx power (250 mW) is split over the two carriers

Warnings, cautions or notes related to the product

 **Note:**

1. Only Port 1 is PoE++ capable. Thus, in daisy-chained FZ Indoor Pico BTS configurations, only the primary (main) Pico BTS can be powered via PoE++. The subsequent FZ Indoor Pico BTSs are powered via an AC adapter.
2. SyncE-based timing cannot be passed to the downstream FZ Indoor Pico BTSs from the first FZ Indoor Pico BTS in a daisy-chain configuration.

3. Flexi Zone Multiband Indoor Pico BTS synchronization

Overview of Flexi Zone Multiband Indoor Pico BTS synchronization mechanisms.

The Flexi Zone Multiband Indoor Pico BTS (FZ MBI) supports operation in either a frequency or a phase synchronization mode. Frequency synchronization is used to maintain the accuracy of the transmitted LTE RF carrier to better than 50 ppb. In the phase synchronization mode, the LTE System Frame Number (SFN) is aligned to the GPS timescale. When operating in the TDD-LTE mode or with any of the following features it is required to operate with phase synchronization: Circuit Switched FallBack (CSFB), Enhanced Inter-Cell Interference Coordination (eICIC), Observed Time Difference of Arrival (OTDOA) and Multimedia Broadcast Multicast Service / Single Frequency Network (MBMS / SFN). When operating in the FDD-LTE mode frequency synchronization mode is used.

The FZ MBI supports the following synchronization reference sources to either phase align the system clock (phase synchronization mode) or calibrate the system clock frequency (frequency synchronization mode):

Table 55: Flexi Zone Multiband Indoor Pico BTS synchronization reference sources

Reference Source	Synchronization Mode	
	Frequency	Phase
Integrated GNSS (multi-constellation) receiver	Yes	Yes
Synchronous Ethernet (ITU-T G.8261)	Yes	No
Timing over Packet (according to IEEE1588-2008™)	Yes	Yes
Network Time Protocol (according to NTPv4)	Yes	No

3.1 GNSS

A brief overview of GNSS, followed by a summary of BTS GNSS antenna installation requirements, and guidelines for optimizing antenna installations.

Instead of using the transport network for carrying the Primary Reference Clock (PRC) traceable synchronization reference, it is possible to use a distributed PRC architecture. In

this case, every site in the network has a Global Navigation Satellite System (GNSS) or other synchronization source which provides a PRC-traceable synchronization reference signal for RAN Network Elements. It is also possible to use a combination of distributed and hierarchical master-slave architecture.

In some cases, other Network Elements (for example, transmission nodes) at the same site provide the synchronization reference for RAN NEs through external synchronization interfaces.

For installations requiring an external PRC signal, it is recommended to use the indoor puck-style GNSS antenna included in the box.

Figure 14: Indoor GNSS antenna



3.1.1 Requirements for GNSS antenna installation

Scope

Synchronization of the FZ MBI transmissions is primarily provided by a multi-constellation capable Global Navigation Satellite System (GNSS) timing receiver. A high degree of reliability can be expected from the BTS GNSS timing receiver, but the overall receiver performance is heavily dependant on the GNSS antenna installation. To realize the expected GNSS performance, the GNSS antenna installation must meet requirements regarding antenna placement, cabling, lightning protection and interference suppression.

i Note:

The FZ MBI supports an integrated GNSS receiver capable of providing synchronization from any of the following satellite constellation options:

- GPS
- GLONASS
- GPS + GLONASS
- GPS + QZSS

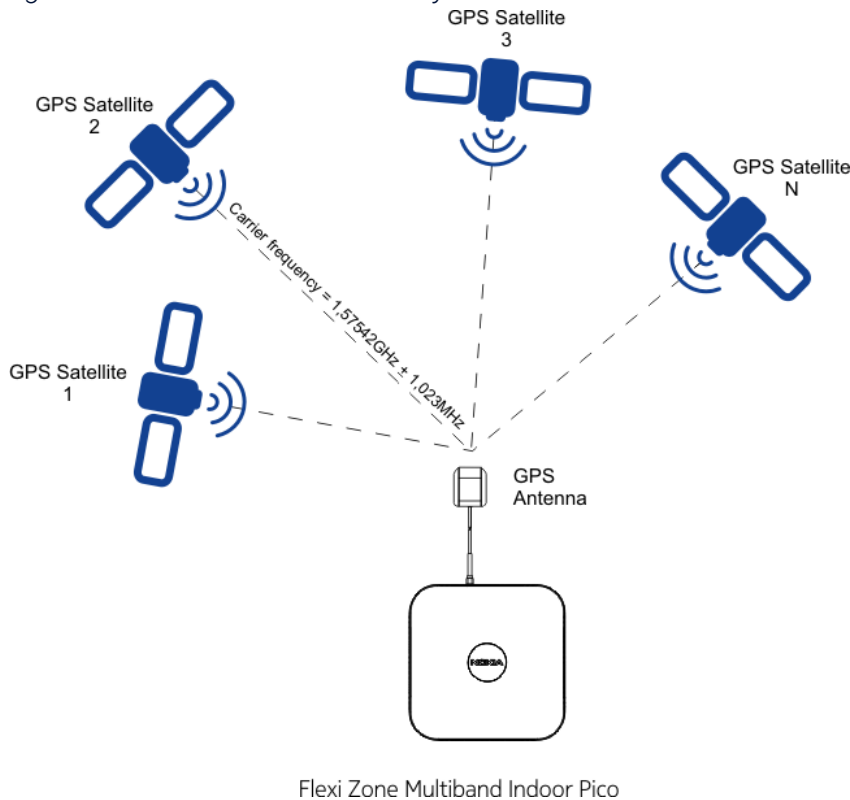
The Global Positioning System

The Coarse Acquisition (C/A) GPS is a space-based radio navigation system that provides precise three dimensional (3D) positioning and time of a day information to civilian users.

GPS satellite constellation

The GPS is designed to operate with a minimum constellation of 21 operational and three active spare satellites (24 total). The GPS satellite constellation is organized with six orbital planes each with an inclination of 55° to the equator and an altitude of 20,200 km. GPS satellite orbits are non-geosynchronous and complete one orbit in approximately 12 hours. A GPS receiver is exposed to a varying, but predictable, constellation of satellites, which are constantly moving across the sky.

Figure 15: Cell site satellite visibility



A minimum four satellites are in view anywhere on the Earth, with an unobstructed view. Typically, six to eight satellites are in view with the current GPS constellation.

GPS RF Carrier

All C/A GPS satellites employ 1.023 MHz wide spread-spectrum modulation on a common carrier frequency of 1.57542 GHz. GPS transmissions received at the surface of the Earth should have a minimum RF signal strength of -160 dBW.

3.1.1.1 General antenna positioning requirements

GNSS antenna placement is one of the most critical factors in realizing reliable BTS synchronization. When the provided GNSS antenna is attached to the FZ MBI, it allows direct reception of GNSS transmissions when operated in locations with suitable satellite visibility.

Consideration of several, often conflicting, factors is required in determining the optimal GNSS antenna position. The GNSS antenna position should be chosen to provide a maximum view of the horizon in all directions. However, sacrifices in antenna visibility are often necessary when considering other factors, such as RF interference from nearby transmit

antennas or potential antenna damage. For example, placement of the GNSS antenna atop a cellular tower would likely provide maximum satellite visibility, but also increase the probability of lightning damage or interference from nearby cell site transmit antennas. Changing environmental conditions, such as dense foliage or continued tree growth, are also important factors.

In most cases, suitable compromises can be made to obtain the necessary GNSS satellite visibility and protection of antenna hardware.

 Note:

For units mounted with the connectors facing up or in extremely dusty environments, it is recommended to cover the unused GPS port.

Required Antenna Visibility

A line of sight view is required between the GNSS antenna and any satellites used in determining a timing solution. Before the GNSS receiver can provide accurate timing information, it has to first determine the location of its antenna in 3D space. Information from a minimum of four satellites is required to determine the 3D antenna location. After the GNSS receiver has determined its antenna location, it can continue to provide accurate timing information with as few as one satellite in view.

 Note:

The LTE2063: GNSS Manual Location Entry for Flexi Zone feature introduces a Global Navigation Satellite System (GNSS) Manual Location Entry which allows GNSS phase and time synchronization with connectivity to only one GNSS satellite. The feature is used for BTS site locations that are not optimal for satellite reception.

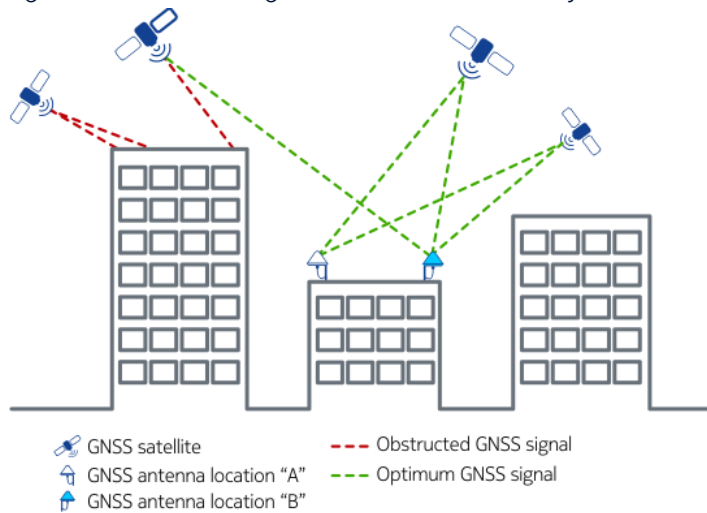
Because GNSS satellites operate in non-geosynchronous orbital patterns, the GNSS antenna can receive GNSS signals from almost any direction. The minimum constellation guarantees visibility to at least four GPS satellites from any location on Earth with an unobstructed view to the horizon. Typically, six or more satellites are visible, which allows some obstruction of the GPS antenna visibility if necessary.

Antenna Placement Optimization

The ideal GNSS antenna installation provides an unobstructed view in all directions to within 20° of the horizon. Practical limitations of cell site locations allows only for a fraction of the

desired visibility. Reductions in GNSS antenna visibility can result in increased BTS initialization times, or in reporting numerous alarms from affected BTSs. Even small improvements in visibility can have a large impact on the receiver performance.

Figure 16: Maximizing GNSS antenna visibility

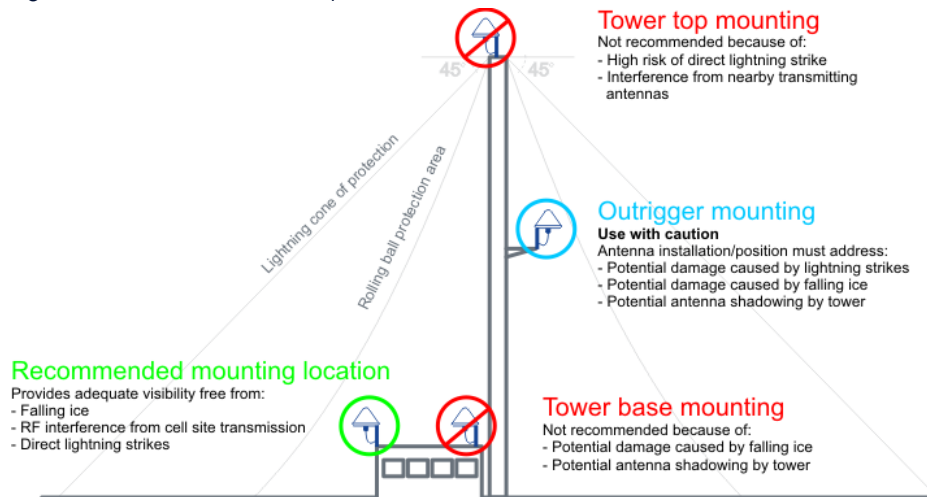


Lightning Protection

The GNSS antenna position should be chosen to minimize the damage potential due to a direct or nearby lightning strike. In cell site installations employing an antenna tower, it is recommended to mount the GNSS antenna near the tower base, which acts as a lightning rod (but not where it can be impacted by falling ice). Since higher antenna elevation means higher probability of damage due to lightning, the GNSS antenna cannot be at or near the highest elevation of its surroundings.

The GNSS antenna cabling must be grounded at the cell site master ground point. If the GNSS antenna has to be positioned on or close to the cell site tower, the antenna and cabling have to be bonded to the tower to avoid lightning flashover.

Figure 17: GNSS antenna placement considerations



Antenna Blockage

It is recommended to:

- choose proper GNSS antenna position to minimize debris or snow accumulation on the antenna surface.
- use a conically shaped radome for GNSS antennas to minimize the likelihood of blockage due to debris or snow buildup.

Mounting the GNSS antenna on a pole or mast at an elevation above any potential snow or debris buildup is a common solution. Pole or mast mounting also allows temporary ice accumulation to quickly dissipate after severe weather conditions subside.

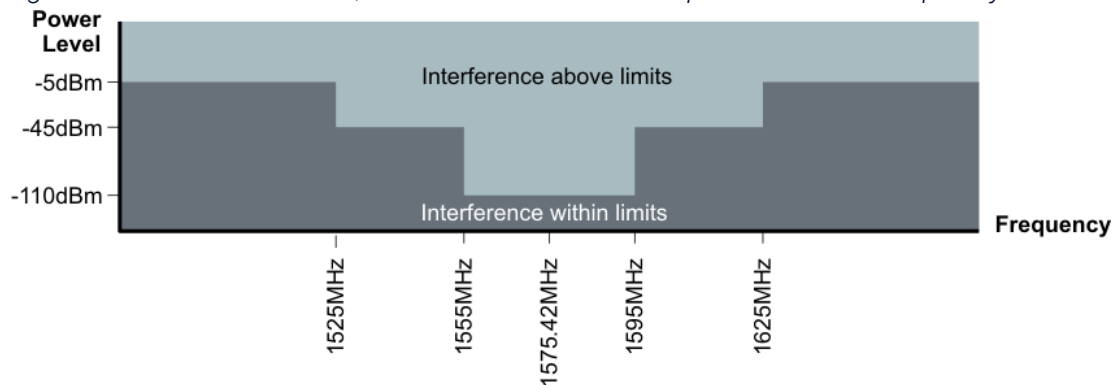
RF Interface

It is recommended to avoid placing the GNSS antenna in the direct radiation path of cellular or other transmit antennas. To minimize interference potential, the GNSS antenna has to be positioned at a different elevation and as far as possible from nearby transmit antennas.

The graph presented in [Figure: Maximum GPS/QZSS receiver interference power level vs. frequency](#) can be used to identify the maximum interference source power levels presented at the GNSS antenna surface (assuming that a Nokia recommended GNSS antenna is in use and RF signal presented to the GNSS receiver meets all level and noise figure requirements).

Different interference rejection performance can be experienced with non-Nokia recommended GNSS antenna types or when the GNSS receiver is not provided with the required minimum or maximum RF signal levels.

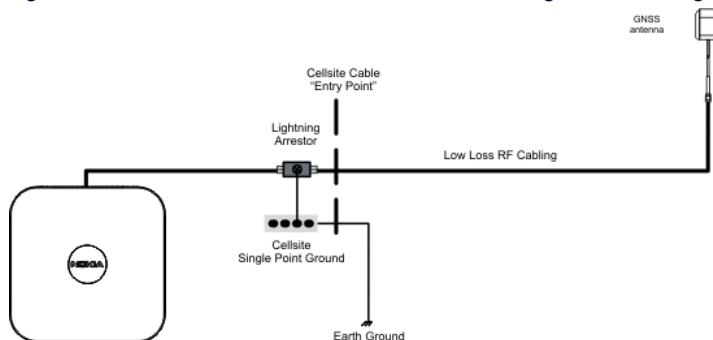
Figure 18: Maximum GPS/QZSS receiver interference power level vs. frequency



3.1.1.2 Remotely positioned antenna operation

The FZ MBI Pico BTS supports direct GNSS antenna mounting. [Figure: Remote RF GNSS antenna configuration diagram](#) depicts the connections and hardware where it is necessary to position the GNSS antenna separately from the FZ MBI.

Figure 19: Remote RF GNSS antenna configuration diagram



Active GNSS antenna

The GNSS antenna is used to capture and amplify transmissions from multiple GNSS satellites in view, while providing adequate band signals rejection. The FZ MBI GNSS antenna consists of an antenna element, pre-selector filter, and Low Noise Amplifier (LNA).

The antenna element must be capable of receiving transmissions from multiple GNSS satellites in view throughout their orbit. A suitable GNSS antenna has a nearly uniform gain throughout a 360° azimuth and to within 20° above the horizon. Extending antenna gain to elevations of less than 20° offers little benefit in terms of satellite tracking and can make the GNSS receiver more vulnerable to terrestrial interference sources.

An active antenna is used to minimize the antenna system noise figure and to maximize usable antenna cable lengths. The FZ MBI-supplied antenna incorporates an LNA and GPS bandpass filtering. The active antenna LNA is powered by a +4.6 VDC \pm 0.5 V bias provided from the FZ MBI through the GNSS antenna cabling.

The Nokia recommended GNSS antennas have proven quality with good field performance, and meet all quality and field performance requirements along with criteria outlined in the table below. While it is possible to use other antennas, considerable care must be exercised when selecting alternatives to ensure full BTS compatibility for all conditions.

Table 56: Recommended GNSS Antenna Specifications

	Requirement / Recommendations
Gain	+25 dB (Recommended)
Noise Figure	<2.5 dB (Recommended)
Operating Frequency	GPS/QZSS: 1575.42 MHz with less than 3 dB attenuation at a 1.2 MHz offset from center (Required)
	GLONASS: 1602 MHz with less than 3 dB attenuation at a 8 MHz offset from center (Required)
Filtering	>40 dB attenuation at +50 MHz offset from L1 center (Recommended)
LNA Supply Voltage	Operation with a supply voltage of +4.6 VDC +/- 0.25 V (Required)
LNA Supply Current	<30 mA (Required)
Azimuth Coverage	360° (Required)
Elevation Coverage	10° to 90° (Required)
Operating Temperature	0°C to +40°C (Recommended)

RF Cabling

A wide range of coaxial cable types can be used between the GNSS antenna and BTS connection. In choosing the GNSS antenna cable, all RF, physical installation, and environmental requirements must be considered. The GNSS antenna cable must have a characteristic impedance of 50 Ω and must meet the signal loss requirement outlined in GNSS Antenna System RF Requirements for the installation length.

The chosen antenna cable must support:

- all installation requirements, such as:
 - the minimum cable bend radius.
 - operating temperature range.
- special insulation requirements, such as:
 - ultra-violet light resistance.
 - armor jacketing for rodent proofing.
 - plenum ratings.

Signal loss and minimum bend radius information for commonly used GNSS antenna cable types is presented in the table below.

Table 57: Antenna Cable Loss / Bend Radius Data

Cable Type	Loss/length at 1575 MHz	Minimum Bend Radius	Cable Diameter
RG-142	0.56 dB/m	51 mm	4.95 mm
LMR-400	0.17 dB/m	25.4 mm	10.3 mm
FSJ4-50	0.15 dB/m	32 mm	13.2 mm
LDF4-50	0.091 dB/m	125 mm	16 mm

It is recommended to properly terminate and weatherproof all cable connections. Poor cable terminations or weather-proofing can result in degraded performance over time and eventual failures.

Cable length requirements

The GNSS cable length limit depends on multiple factors, including:

- the location of the GNSS antenna.
- the type of GNSS cable.
- the splitters and connectors.

The parameter which defines proper cable lengths is the signal strength at the inputs of the GNSS receiver. The signal strength must meet the sensitivity requirements as shown in the table below.

Table 58: GNSS sensitivity requirements

Parameter	Action type	GPS sensitivity	GLONASS sensitivity
GNSS Sensitivity*	Tracking	-161 dBm	-157 dBm
	Hot Acquisition	-161 dBm	-157 dBm
	Cold Acquisition	-147 dBm	-143 dBm
	Reacquisition	-161 dBm	-157 dBm

* - Values are valid at room temperature 25°C [77°F]

DC Block

A DC block must be used when a single GNSS antenna feeds multiple FZ MBIs. If a distribution is used for GNSS, a DC block has to be used to prevent the voltage from being back-fed into the Pico from other Pico units or distribution current sources.

Lightning Arrestor

A surge arrester always has to be employed at the GNSS antenna cable building or outdoor BTS enclosure entry point to protect cell site equipment and for operator safety. The surge arrester has to be connected to the cell site single point ground using a low impedance conductor. The surge arrester should have a low insertion loss within band(s) of the satellite constellations being used (GPS L1 or GLONASS) and must be capable of passing the antenna LNA 5 VDC supply voltage. The Polyphaser DGXZ+06NFNF-A surge arrester is recommended by Nokia due to its low clamping voltage and high surge handling capabilities. The DGXZ+06NFNF-A has the following performance specifications:

Table 59: Lightning arrestor performance specifications

Parameter	Specification
Frequency Range	800 MHz to 2500 MHz
VSWR	<1.1:1
Insertion Loss	<0.1 dB over frequency range
Turn-on Voltage	+6.5 V _{DC}
Turn-on Time	4 μS for 2 kV/μS
Maximum Surge	20 kA per IEC 61000-4-5 8/20μS waveform
Throughput Energy	<175 μJ for 3 kA, 8/20 μS waveform
User Voltage	+6.0 V _{DC} MAX
Operating Temperature Range	-50°C to +85°C

GNSS Antenna System RF Requirements

To realize optimal GNSS receiver performance, the total GNSS antenna system gain and noise figure at the FZ MBI antenna input must meet the following requirements:

- Total Antenna System Gain (G): +10 dB > G > +28.5 dB (within the GPS L1 band (1575.42 MHz +/-1.023 MHz) or GLONASS band (1601.72 MHz +/-3.66 MHz))
- Total Antenna System Noise Figure: < 4.0 dB

Operation outside of these limits can negatively impact receiver operation. Potential negative impacts include increased cell site initialization times, intermittent GNSS signal reception and a reduction in receiver interference immunity.

Antenna System Gain

The total antenna system gain can be calculated by summing the gains and losses (in decibels) of all antenna system elements using the following equation:

$$G = G_{\text{Antenna}} + G_{\text{Cable 1}} + G_{\text{Lightning Arrestor}} + G_{\text{Cable 2}}$$

As an example the antenna system gain of a hypothetical cell site GPS installation using the following elements (pictured in [Figure: GNSS Antenna Loss Budget / Noise Figure Calculation](#)) is calculated as follows:

$$G_{\text{Antenna}} = +25 \text{ dB (Antenna)}$$

$$G_{\text{Cable 1}} = -7.7 \text{ dB (50 m FSJ4-50 cable (0.15 dB/m * 50 m + 0.2 dB}_{\text{connector loss}}))$$

$$G_{\text{Lightning Arrestor}} = -0.1 \text{ dB (Polyphaser DGXZ+06NFNF-A)}$$

$$G_{\text{Cable 2}} = -0.65 \text{ dB (3 m FSJ4-50 cable (0.15 dB/m * 3 m + 0.2 dB}_{\text{connector loss}}))$$

$$G = +25 \text{ dB} - 7.7 \text{ dB} - 0.1 \text{ dB} - 0.65 \text{ dB}$$

$$G = 16.55 \text{ dB}$$

The calculated gain of this hypothetical GPS antenna system is +16.55 dB, which is within the required gain range of +10 dB to +28.5 dB. If the resulting gain were less than +10 dB, antenna system modifications (such as using a lower loss cable) to increase the overall gain would be required.

Antenna System Noise Figure

The GNSS antenna system noise figure requirement is seldom violated unless a non-recommended GNSS antenna is used or additional signal amplifiers are employed to compensate for large cable losses. The total antenna system noise figure can be calculated using the following equation:

$$f = f_1 + \frac{f_2 - 1}{g_1} + \frac{f_3 - 1}{g_1 \cdot g_2}$$

Where:

f = the total antenna system noise figure

f₁ = noise figure of stage 1

g₁ = gain of stage 1

Note:

All gain and noise figure values are absolute and not in decibels.

The noise figure of the hypothetical GNSS antenna system described in [GNSS Antenna System RF Requirements](#) would be calculated as follows:

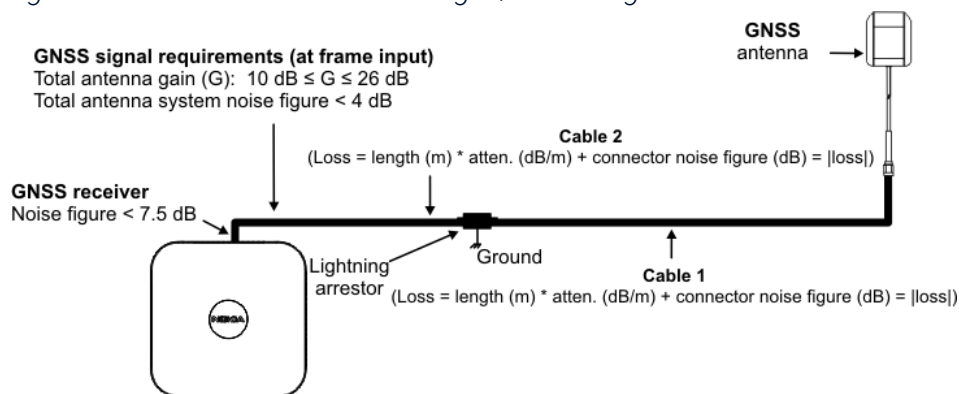
$$f = 1.535$$

$$NF(\text{dB}) = 10 \cdot \text{Log}(f) = 1.86$$

The calculated noise figure of this hypothetical GNSS antenna system is 1.86 dB which is below the required +4.0 dB maximum. Violations in antenna system noise figure can be addressed by using lower loss antenna cabling, using signal amplifiers with lower noise figures and reducing the signal losses prior to any in-line signal amplifiers. Difficulties in satisfying antenna system noise figure requirements are usually caused by using long cable

runs.

Figure 20: GNSS Antenna Loss Budget / Noise Figure Calculation



Requirements:

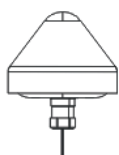
1. GNSS signal gain at input to BTS must be in range: $+10 \text{ dB} < \text{GNSS gain} < +26 \text{ dB}$.
2. Total antenna system noise figure including all signal amplifiers, cable/connector losses, and GNSS receiver noise figures must be less than 4 dB.
3. All signal gains, losses, and noise figures should be entered in the appropriate spreadsheet cells. If any elements shown in the picture are not used in the analyzed antenna system, a gain and noise figure of 0 db should be entered in the respective spreadsheet cell.

External GNSS Antennas

Many different GNSS antenna options are available for an outdoor GNSS antenna. Refer to [Table: Recommended GNSS Antenna Specifications](#) for a summary of the FZ MBI GNSS antenna requirements.

The Flexi Zone Micro GNSS antenna (FAWG, 473100A) can suit this purpose. This antenna is designed to mount directly to the female N connector on the FZ MBI, therefore it does not include a cable or mounting feature. A mounting bracket would be needed with a bulkhead female N connector and a long run of cable. The best solution for deployment of a large number of FZ MBIs with remote GNSS is a single GNSS antenna and a distribution network. Care must be taken to insure the DC block is in place. This DC block can be a separate item or included in the distribution network

Figure 21: External GNSS antenna



Distribution networks

In the case of large indoor deployments of FZ MBI units utilizing GNSS, it is often better to use a single GNSS antenna with a distribution network. This equipment is not supplied by Nokia as it is site specific. It can be used to overcome the losses incurred with long cable runs and multiple splits to accommodate separate feeds into each FZ MBI. Care must be taken when selecting the proper distribution amplifier. The key requirements are as follows:

- Active GNSS antenna bias: The amplifier must provide 5 VDC for the active antenna.
- Port Impedance: All ports (IN/OUT) must be 50 ohms.
- DC Block: All output ports must supply a DC Block to protect the FZ MBI GNSS inputs.

GPS Networking Inc. is one of the vendors that provide the type of equipment which can meet these requirements. Below are some example part numbers:

- 8-port: AL-DCB-S1X8-N/5/110
- 16-port Rack mount: RMAL-DCB-S1X16-N/5/110
- 32-port Rack mount: RMAL-DCB-S1X32-N/5/110

These models include the DC Block on all output ports, provide the 5 VDC for the active antenna, use N type connections, and are powered via 110 VAC. For other AC power options, the 110 in the part number above can be replaced with either 220 or 240 depending on the available local power. When using a distribution network, ensure that all grounding and surge suppression requirements are followed.

For more information on GNSS antenna requirements, see [GNSS Antenna System RF Requirements](#).

3.2 Synchronous Ethernet and Synchronous Ethernet generation

The FZ MBI supports frequency synchronization from an ITU-T G.8261 compliant synchronous Ethernet provisioned backhaul connection.

Synchronous Ethernet (SyncE) provides an SDH-like mechanism for distributing frequency information at Layer 1. The BTS receives the frequency information from the directly connected (next-hop) Ethernet switch or IP router through the Ethernet link.

SyncE provides a high quality frequency synchronization reference for base stations, comparable to SDH synchronization. The stability of the recovered frequency is independent of the network load or network impairments like delay variations.

The BTS SyncE and IEEE1588-2008™ Timing over Packet (ToP) features can be activated simultaneously. The features can be set individually as primary and secondary synchronization sources. When both SyncE and ToP are feasible in the priority configuration, the selection of ToP or SyncE as primary or secondary references is a key point in the design of the synchronization network, and depends very much on the characteristics of the mobile backhaul network being used to access the BTS.

SyncE daisy-chaining is not supported with the FZ MBI (i.e. the FZ MBI does not provide a SyncE clock to downstream connected devices).

3.3 Timing over Packet

The FZ MBI BTS supports frequency or phase synchronization through its primary backhaul connection from an IEEE1588-2008™ compliant master clock. ToP daisy-chaining is supported in the frequency synchronization mode with a maximum of four cascaded FZ MBI BTSs.

Timing over Packet (ToP) can be also considered as an example of master-slave architecture. The ToP master sends timing packets to ToP slaves. ToP slaves recover the timing reference from the received timing packets.

The transport network between the ToP Master and the ToP Slave, which is embedded in the BTS, must fulfill certain engineering rules to guarantee proper operation of ToP as the synchronization source, such that the stability of the frequency for the air interface meets 3GPP requirements (+/-50 ppb). These engineering rules are related to the treatment of the IEEE1588-2008™ ToP packets in the network and SLA values for Packet Loss and Packet Delay Variation.

3.4 Network Time Protocol (NTP)

The FZ MBI supports frequency synchronization through its primary backhaul connection from an NTPv4 compliant master clock. Long convergence times are often necessary when using NTP frequency synchronization to mitigate the less accurate time stamping and lower messaging rate compared to the IEEE1588-2008™ protocol. A reduced frequency accuracy requirement of 100 ppb is supported with the NTP synchronization reference source.

3.5 BTS Freerun / Holdover Operation

During the absence of an available synchronization reference source, the FZ MBI BTS can support operation in the freerun or synchronization holdover mode. The freerun mode involves the initialization of a BTS without an available synchronization reference source. The freerun mode is only possible when operating in the frequency synchronization mode, since phase synchronization requires the phase alignment of the BTS System Frame Number (SFN) counter to the GPS timescale. To initialize a BTS in the freerun mode, the BTS must have been powered for a minimum of 60 min (to ensure suitable oscillator stability), and have valid, unexpired oscillator calibration data.

The holdover mode involves the ability to maintain operation following the loss of a synchronization reference during normal operation. In the phase synchronization mode, a holdover interval of 30 min is supported for a BTS that has been powered for a minimum of 60 min. A longer phase synchronization holdover interval of 90 min is supported for BTSs powered more than 24 hours. In the frequency synchronization mode, a holdover or freerun interval of 3 hours is supported for a BTS that has been powered for more than 60 min, and a 30-day holdover is supported when powered for more than 24 hours.

When operating with the NTP synchronization reference, an extended frequency synchronization holdover or freerun interval of 150 days is supported after the BTS has been powered for more than 24 hours, due to the reduced frequency accuracy requirement.

OCXO calibration

To support freerun operation and shorten BTS initialization times, the FZ MBI BTS supports a function to calibrate its reference Oven Controlled Crystal Oscillator (OCXO).

The FZ MBI BTS supports three OCXO calibration types: Factory, Auto_Short, and Auto.

Factory calibration

At time of manufacture, a factory calibration is performed where OCXO calibration data is stored in the FZ MBI BTS electronic identification memory. The factory calibration is only valid for 30 days after time of manufacture. If the BTS is installed beyond the 30-day period, the OCXO calibration may still be used to help initialize operation but a synchronization reference source will be necessary to bring the BTS into service.

Auto_Short calibration

For BTSs that have been powered for between 1 hour to 24 hours, an Auto_Short calibration is performed against the currently selected synchronization reference source (GPS, SyncE, ToP, or NTP). An Auto_Short calibration can maintain freerun or holdover operation in the frequency synchronization mode for 3 hours. A minimum operational period of 1 hour is necessary to ensure suitable OCXO stability to support holdover operation. An Auto_Short calibration is updated at 90-minute intervals when the FZ MBI BTS is properly synchronized against a valid reference source.

Auto calibration

For BTSs that have been powered for longer than 24 hours an Auto calibration is performed against the currently selected synchronization reference source. An Auto calibration can maintain freerun or holdover operation in the frequency synchronization mode for 30 days. An Auto calibration is updated at 24-hour intervals when the FZ MBI BTS is properly synchronized against a valid reference source.

BTS Chaining

The FZ MBI BTS supports the ability to connect additional BTS sites that are downstream from the network interface terminations (S1, X2). Deployment configurations include co-located BTSs to provide multiple-sector or multiple-band developments at a single shared installation point. In addition, one site is also used as an intermediate transport termination point for a geographically separated site. The chained nodes can utilize ToP (IEEE1588-2008™) synchronization when operating in the frequency synchronization mode. Note that the maximum number of FZ MBI hops is limited to four, or by the maximum switching capacity of the main (or root) node.

4. Flexi Zone Multiband Indoor Pico BTS Wi-Fi solution

The Flexi Zone Indoor Solution offers Wi-Fi as an integral part of the mobile broadband experience. The Wi-Fi radio access is managed completely independent from the LTE solution. Specifically, the Wi-Fi is integrated with an independent Wi-Fi Gateway, Wi-Fi O&M Solution and into the operator's network via the AAA and Radius servers.

4.1 Wi-Fi coverage

Optimal mounting locations for maximum Wi-Fi coverage

The location and orientation that you choose for the FZ MBI plays a critical role in the performance of your wireless network. In general, it is recommended to install the product away from obstructions and sources of interference.

Coexistence information for operating the FZ MBI in LTE band 40 and enabling Wi-Fi in the 2.4 GHz band is described in [Working || Wi-Fi coverage](#).

Table 60: FZ MBI LTE Band 40 and Wi-Fi frequency coexistence

LTE band 40 frequency	Wi-Fi coexistence
2300 - 2370 MHz	Coexistence guaranteed
2370 - 2382.5 MHz	Coexistence performance is acceptable, but cannot be strictly guaranteed. Caution should be used in this LTE frequency range to ensure performance is ok.
2382.5 - 2400 MHz	Coexistence is not supported in this LTE frequency range. Disable Wi-Fi when operating B40 in this LTE frequency range.

Wi-Fi channels/frequencies can be disabled using the Nokia AirScale Wi-Fi Controller (cWLC).

Care should also be taken to maximize the distance between Wi-Fi and other unlicensed devices to the FZ MBI in order to minimize the opportunity for interference and performance degradation. If interference is observed or suspected from other RF devices, it is recommended to increase the distance between the FZ MBI and interfering device as much as possible to preserve FZ MBI performance.

Refer to the *Nokia AirScale Wi-Fi Module AC210m User Guide* for further information on deploying high density Wi-Fi.

Figures below show recommended ceiling locations, wall locations and corridor locations for FZ MBLs with Wi-Fi.

Figure 22: Recommended ceiling locations

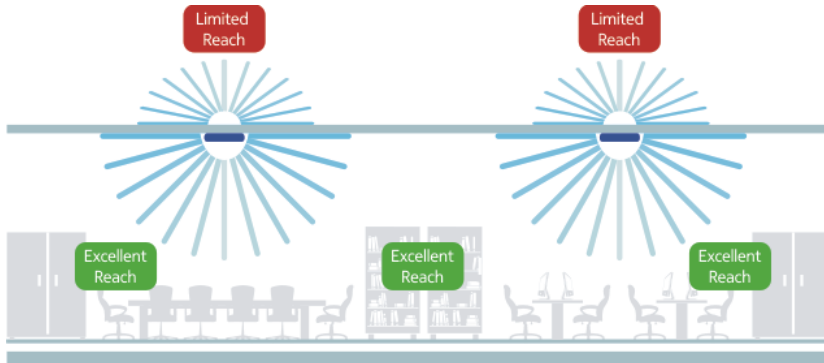


Figure 23: Recommended wall locations

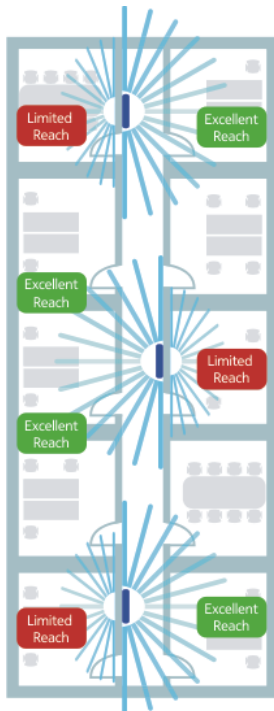
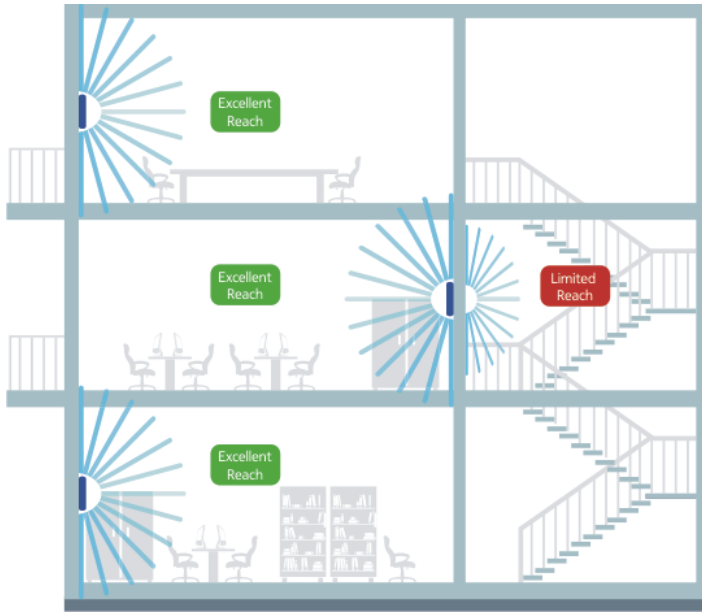


Figure 24: Recommended corridor locations



5. Flexi Zone Multiband Indoor Pico BTS Compliance statements

Compliance statements for the Flexi Zone Multiband Indoor (MBI) Pico BTS

5.1 Model List and Compliance Boundaries

Flexi Zone Multiband Indoor Pico BTS models and their compliance boundaries

Table 61: Model List and Compliance Boundaries

Sales item	Multiband Indoor Pico BTS Model	Approved LTE RF module(s) FCC/IC IDs	Approved WiFi RF module(s) FCC/IC IDs	Approved BT RF module(s) FCC/IC IDs	Uncontrolled environment	Controlled environment
474358A	FW2EDA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
474359A	FW2EDWA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
473721A	FW2EHA	CE Approved	CE Approved	CE Approved	20 cm	20 cm
473722A	FW2EHW	CE Approved	CE Approved	CE Approved	20 cm	20 cm
473723A	FW2ERA	CE Approved	N/A	CE Approved	20 cm	20 cm
473123A	FW2FIA	2AD8UFW2FADPM01, 2AD8UFW2IADPM01, 109D-FW2FADPM01, 109D-FW2IADPM01	N/A	2AD8UNBTM01, 109D-NBTM01	20 cm	20 cm
473124A	FW2FIWA	109D-FW2FADPM01, 109D-FW2IADPM01	109D-FZCWM2A01	109D-NBTM01	27 cm	20 cm
473851A	FW2FIWC	2AD8UFW2FADPM01, 2AD8UFW2IADPM01	2AD8UFZCWM2A1	2AD8UNBTM01	22 cm	20 cm
473727A	FW2GEA	CE Approved	N/A	CE Approved	20 cm	20 cm
473728A	FW2GEWA	CE Approved	CE Approved	CE Approved	20 cm	20 cm
474379A	FW2GEDA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
474003A	FW2GEHA	CE Approved	N/A	CE Approved	20 cm	20 cm
473729A	FW2GHA	CE Approved	N/A	CE Approved	20 cm	20 cm
473730A	FW2GHWA	CE Approved	CE Approved	CE Approved	20 cm	20 cm
474022A	FW2HC	CE Approved	N/A	CE Approved	20 cm	20 cm

Sales item	Multiband Indoor Pico BTS Model	Approved LTE RF module(s) FCC/IC IDs	Approved WiFi RF module(s) FCC/IC IDs	Approved BT RF module(s) FCC/IC IDs	Uncontrolled environment	Controlled environment
474002A	FW2HWC	CE Approved	CE Approved	CE Approved	20 cm	20 cm
474076A	FW2HHC	109D-FW2HADPM02	N/A	109D-NBTM01, CE approved	37 cm	20 cm
474075A	FW2HHWC	109D-FW2HADPM02	109D-FZCWM2A01	109D-NBTM01	37 cm	20 cm
474077A	FW2HHD	2AD8UFW2HBDPM01	N/A	2AD8UNBTM01	35 cm	20 cm
474078A	FW2HHWD	2AD8UFW2HBDPM01	2AD8UFZCWM2A1	2AD8UNBTM01	35 cm	20 cm
474523A	FW2HIA	109D-FW2IADPM01, 109D-FW2HADPM02	N/A	109D-NBTM01	20 cm	20 cm
474524A	FW2HIWA	109D-FW2IADPM01, 109D-FW2HADPM02	109D-FZCWM2A01	109D-NBTM01	34 cm	20 cm
474527A	FW2HIRA	109D-FW2IADPM01, 109D-FW2HADPM02, 109D-FW2RADPM01	N/A	109D-NBTM01	26 cm	20 cm
474248A	FW2HPA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
474249A	FW2HPWA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
473725A	FW2HRA	109D-FW2HADPM02, 109D-FW2RADPM01	N/A	109D-NBTM01	20 cm	20 cm
473487A	FW2IRA	2AD8UFW2IADPM01 2AD8UFW2RADPM01	N/A	2AD8UNBTM01	27 cm	20 cm
473522A	FW2NHA	Currently in progress	Currently in progress	N/A	Currently in progress	Currently in progress
474219A	FW2NHWA	Currently in progress	Currently in progress	N/A	Currently in progress	Currently in progress
474246A	FW2PIA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
474247A	FW2PIWA	Currently in progress	Currently in progress	Currently in progress	Currently in progress	Currently in progress
474220A	FW2PIRA	2AD8UFW2PADPM01, 2AD8UFW2IADPM01, 2AD8UFW2RADPM01	N/A	2AD8UNBTM01	33 cm	20 cm
474189A	FW2QE	Japan TELEC certified	N/A	Japan TELEC certified	N/A	N/A
474336A	FW2QQD	2AD8UFW2QADPM01	N/A	2AD8UNBTM01	20 cm	20 cm

Sales item	Multiband Indoor Pico BTS Model	Approved LTE RF module(s) FCC/IC IDs	Approved WiFi RF module(s) FCC/IC IDs	Approved BT RF module(s) FCC/IC IDs	Uncontrolled environment	Controlled environment
475553A	FW2QQG	2AD8UFW2QADPM01	N/A	2AD8UNBTM01	20 cm	20 cm

5.2 Federal Communication Commission Interference Statement

Applicable FCC interference statements

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device does not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and complies with the Class B digital device limits, 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 according to the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference cannot 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 taking one of the following actions:

Reorient or relocate the receiving antenna.

Increase the separation between the equipment and the 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.

FCC Caution

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RF Modules installed in this product must not be co-located or operating in conjunction with

any other antenna or transmitters, except when installed in accordance with FCC multi-transmitter product guidelines.

Operation within the 5.15–5.25 GHz / 5.47–5.725 GHz frequency ranges is restricted to indoor environment. The band from 5600–5650 MHz is disabled by the software during manufacturing and cannot be changed by the end user. This device meets all other requirements specified in Part 15E, Section 15.407 of the FCC Rules.

FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environments. This equipment should be installed and operated in accordance with the minimum distance found in the [Model List and Compliance Boundaries](#).

Note:

Per FCC Section 15.407(f) all UNII devices shall be considered to operate in a “general population/uncontrolled” environment. Any LAA unlicensed band FZ MBI model (even those with co located LTE or WCDMA RF Modules) must be installed to comply with the FZ MBI UNIT MPE "general population/uncontrolled" boundaries.

FCC UNII band Output Power Statement (FCC Part 15 Subpart E §15.407)

NOTICE:

FZ MBI BTS equipment must only be installed by trained professional maintenance personnel.

Applicable models

See [Model List and Compliance Boundaries](#) for a complete list of MBI models which comply with the FCC interface statement.

5.3 Industry Canada Statement

Applicable Industry Canada statements

This device complies with RSS-247 of the Industry Canada Rules. Operation is subject to the

following two conditions: (1) This device does not cause harmful interference, and (2) this device must accept any interference received, including interference that can cause undesired operation. Ce dispositif est conforme à la norme CNR-247 d'Industrie Canada applicable aux appareils radio exempts de licence. Son fonctionnement est sujet aux deux conditions suivantes: (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

Caution

(I) The device for operation in the band 5150–5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

(II) The maximum antenna gain permitted for devices in the bands 5250–5350 MHz and 5470–5725 MHz comply with the e.i.r.p. limit; and

(III) The maximum antenna gain permitted for devices in the band 5725–5825 MHz shall comply with the e.i.r.p. limits specified for point-to-point and non point-to-point operation as appropriate.

(IV) Users are also advised that high-power radars are allocated as primary users (for example priority users) of the bands 5250–5350 MHz and 5650–5850 MHz and that these radars can cause interference and/or damage to LE-LAN devices.

Avertissement

Le guide d'utilisation des dispositifs pour réseaux locaux doit inclure des instructions précises sur les restrictions susmentionnées, notamment:

(I) les dispositifs fonctionnant dans la bande 5150–5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux;

(II) le gain maximal d'antenne permis pour les dispositifs utilisant les bandes 5250–5350 MHz et 5470–5725 MHz doit se conformer à la limite de p.i.r.e.;

(III) le gain maximal d'antenne permis (pour les dispositifs utilisant la bande 5725–5825 MHz) doit se conformer à la limite de p.i.r.e. spécifiée pour l'exploitation point à point et non point à point, selon le cas.

(IV) De plus, les utilisateurs devraient aussi être avisés que les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5250–5350 MHz et 5650–5850 MHz et que ces radars pourraient causer du

brouillage et/ou des dommages aux dispositifs LAN-EL.

Radiation Exposure Statement

Flexi Zone Multiband Indoor Pico BTS is compliant with the cited standards at every point outside the FINAL boundary (CB) as described in the IC REL. The antenna types actually configured in the product determine the minimum safe distance. (See [Model List and Compliance Boundaries](#).) Provisions must be taken to guarantee that no public access is possible to regions within the compliance boundaries.

Déclaration d'exposition aux radiations

La BTS Flexi Zone Indoor Pico Multiband est conforme aux normes citées en chaque point à l'extérieur de la limite FINALE (CB), telles que décrites dans la publication REL de l'IC. Les types d'antennes réellement configurées dans le produit déterminent la distance de sécurité minimale (se référer au [Model List and Compliance Boundaries](#)). Des dispositions doivent être prises pour garantir qu'aucun accès public n'est possible dans les zones situées dans ces limites.

Applicable models

See [Model List and Compliance Boundaries](#) for a complete list of MBI models which comply with the Industry Canada statements.

5.4 European Union compliance

Description of compliance with EU regulations

See [Model List and Compliance Boundaries](#) for a complete list of MBI models which comply with the European Union compliance statements.

5.4.1 CE Marking

Applicable CE markings

The equipment described in this document faithfully complies with either:

- The relevant provisions of the European Union R&TTE Directive 1999/5/EC for some

products shipped prior to June 30, 2017, (see [CE marking \(EU R&TTE Directive 1999/5/EC\)](#)),

or

- European Union Radio Equipment Directive (RED) 2014/53/EU for some current products and all products shipped after June 30, 2017, (see [CE marking \(EU RED 2014/53/EU\)](#)).

Figure 25: CE marking (EU R&TTE Directive 1999/5/EC)



Hereby, Nokia declares that one or more of these Base Stations is in compliance with the essential requirements and other relevant provisions of Directive: 1999/5/EC.

Figure 26: CE marking (EU RED 2014/53/EU)



Hereby, Nokia declares that one or more of these Base Stations is in compliance with the essential requirements and other relevant provisions of Directive: 2014/53/EU.

The Declaration of Conformity is provided to customers with other technical documents upon request and is accessible from <https://online.networks.nokia.com> to authorized users.

5.4.2 RED 2014/53/EU Article 10 compliance

European Union Radio Equipment Directive (RED) 2014/53/EU Article 10 compliance

Compliance with Article 10.2 and 10.10 of European Union Radio Equipment Directive (RED) 2014/53/EU:

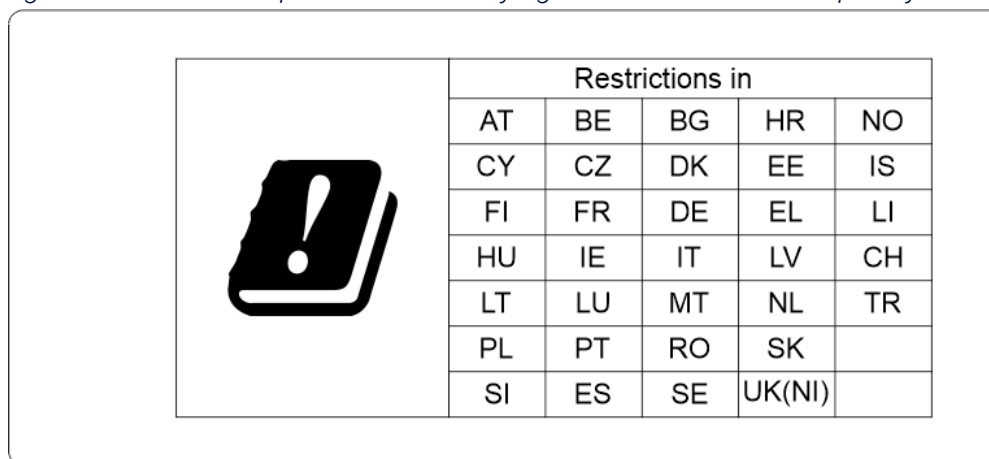
- Licensed Band:
 - This requirement is not valid for B-to-B products, such as Base Stations.
 - Operators must always apply band license from the local regulator before starting commercial network usage.
- Unlicensed Band:
 - If equipped, the 5 GHz WLAN band of this product is restricted from operating within bands 5150 to 5350 MHz except when installed indoors.

This equipment is restricted by firmware to operate on 2.4 GHz and 5 GHz in European Union, frequency range and limited e.i.r.p as below:

Frequency Range	Limited e.i.r.p
2.4000~2.4735 GHz	100 mW
5.150~5.250 GHz	200 mW
5.250~5.350 GHz	200 mW
5.470~5.725 GHz	1 W
5.725~5.850 GHz	4 W

RED 2014/53/EU requires that for products which could potentially have an issue with a non-harmonized frequency in a specific EU country, the product documentation must list the restrictions, and the packaging must carry a label reflecting that country's code.

Figure 27: Label example for a BTS carrying a non-harmonized frequency restriction



5.5 Brazil compliance

Description of compliance with Brazil regulations

Certain Flexi Zone BTS models covered in this document comply with Brazil Anatel requirements.

As part of Brazil Anatel requirements, the following statement is included in this document:

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

The Flexi Zone BTS variants that comply with Brazil Anatel requirements will also include the Brazil Anatel label when applicable:

Figure 28: Brazil Anatel label



Note:

The actual registration number below the symbol will vary.

5.6 Australia compliance

Flexi Zone BTS compliance with Australian ACMA standards

Certain Flexi Zone BTS models comply with the requirements of the relevant Australian Communications and Media Authority (ACMA) Standards made under the Radiocommunications Act 1992 and the Telecommunications Act 1997. These can be identified by the ACMA regulatory compliance symbol on the product label of those BTS variants:

Figure 29: ACMA regulatory compliance mark



5.7 Other Statements

Singapore Compliance Label

Certain Flexi Zone Multiband Indoor Pico BTS models covered in this document comply with IMDA Standards DB 103085:



Japan TELEC

See [Model List and Compliance Boundaries](#) for a complete list of MBI models which comply with the Industry Canada statements.