NOKIA

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Nokia AirScale BTS Transmission Description

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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 three Radio Access Technologies (RAT). You may find here information about solutions that are not available or supported in a specific SW release or RAT. Table Table 1: Releases covered by the document lists all SW releases covered by the content of this document. For features supported in your SW releases, see respective feature documentation chapter in the system library.

Table 1 Releases covered by the document

Product	Release
Long Term Evolution	FDD-LTE 16A, FDD-LTE 17A
TD LTE	TD-LTE 16A, TD-LTE 17A
Single RAN	SRAN 17A

Changes between issues 01 (2016-06-23) and 02 (2017-01-26)

Nokia AirScale System Module Indoor integrated transmission

- ASIA transport functions and ASIA synchronization inputs have been updated.

Ethernet optical cable FTCH

- Multimode Flexi System Fibers have been updated - phased-out variants replaced with successors.

Sync cable FTSF

- Note on Single Ended Clock has been added.

1 Nokia AirScale System Module Indoor integrated transmission

AirScale Base Station transmission functions are integrated within the AirScale Common plug-in unit ASIA.

AirScale Common unit ASIA is optimized for high-capacity Ethernet transport. The unit is equipped with three electrical 100/1000Base-T interfaces (EIF3-5) and two optional Small Form-factor Pluggable (SFP)/SFP+ slots (EIF1-2).

Figure 1 ASIA transport interfaces

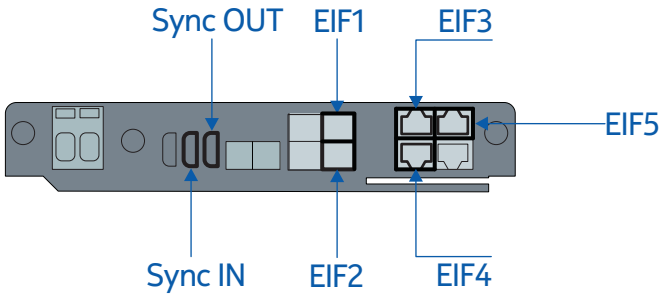


Table 2 ASIA transport interfaces - specification

Interface	Signals	Level
EIF1	1 Gbit/s 10 Gbit/s	10GBase-SR 10GBase-LR 1000Base-SX/LX/BX/ZX
EIF2	1 Gbit/s 10 Gbit/s	10GBase-SR 10GBase-LR 1000Base-SX/LX/BX/ZX
EIF3	100 Mbit/s 1 Gbit/s	100/1000Base-T
EIF4	100 Mbit/s 1 Gbit/s	100/1000Base-T
EIF5	100 Mbit/s 1 Gbit/s	100/1000Base-T

ASIA supports the following integrated transport functions:

- 3 x 100/1000 Base-T Ethernet port
- 2 x optional SFP+ (1/10GE optical)
- Ethernet based chaining and switching across up to five interfaces
- High-capacity IPsec, ASIA HW capability 5 Gbit/s (UL + DL)

- Local Management Port (LMP)

ASIA supports the following synchronization inputs:

- IEEE 1588-2008 - via transport interface
- Synchronous Ethernet - via transport interface
- Pulse per Second and Time of Day (1PPS & ToD) - from GNSS receiver or another BTS, via Sync In interface
- 2.048 MHz - via Sync In interface

2 Ethernet Small Form-factor Pluggable (SFP)/Small Form-factor Pluggable Plus (SFP+) transceivers

SFP/SFP+ are two optional interfaces on ASIA that can be used for transport backhaul.

AirScale ASIA Common unit offers two optional 1/10GE interfaces (EIF1 and EIF2) which support both Small Form-factor Pluggable (SFP) and the new Small Form-facor Pluggable Plus (SFP+) transceivers.

The following Gigabit Ethernet SFPs for optical backhaul can be ordered from Nokia:

Table 3 SFP variants

Product name	Sales item code	Description
FOSC Optical SFP 1000Base-LX 1310nm SM[1)]	471880A	Optical SFP transceiver, singlemode. It supports fiber length up to 10 km on 9/125 µm. Connector type: LC.
FOSD Optical SFP 1000Base-SX 850nm MM[2)]	471881A	Optical SFP transceiver, multimode. It supports fiber length up to: • 550 m on 50/125 µm • 300 m on 62.5/125 µm.
FOS1 SFP 1000Base-BX 10km, 1490nm/1310nm	473386A	Optical SFP transceiver, singlemode. It supports fiber lengths up to 10 km on 9/125 µm.
FOS2 SFP 1000Base-BX 10km, 1310nm/1490nm	473387A	Optical SFP transceiver, singlemode. It supports fiber lengths up to 10 km on 9/125 µm.
FOS3 SFP 1000Base-BX 40km, 1490nm/1310nm	473388A	Optical SFP transceiver, singlemode. It supports fiber lengths up to 40 km on 9/125 µm.
FOS4 SFP 1000Base-BX 40km, 1310nm/1490nm	473389A	Optical SFP transceiver, singlemode. It supports fiber lengths up to 40 km on 9/125 µm.

SFP+ is a next generation Small Form-factor Pluggable transceiver, which provides support for new optical interfaces that allow a ten-times higher backhaul throughput. This is an evolutionary step towards a 1 Gbit/s single UE peak rate feature. SFP+ is the most popular socket on 10GE systems.

A combined SFP/SFP+ slot brings the benefits of the front panel space saving and cost reducing, while offering maximum flexibility with regard to the Ethernet connectivity.

Standard 1/10GE SFP/SFP+ slot provides:

1) All FlexiBTS long-haul Gigabit Ethernet outdoor transmission cables are 9/125µm single mode fibers.
2) All FlexiBTS short-haul Gigabit Ethernet outdoor transmission cables are 50/125 µm multimode fibers.

- Multi-Sourcing Agreement (MSA) compliancy
- Module detection
- SFP transceiver type validation
- Limiting amplifier support (10GBase-SR/LR)
- Basic SFP diagnostic support
- Loss of signal (LOS) detection pin support
- Field pluggability/replacability

SFP/SFP+ module requirements:

- Compliancy with the industrial temperature range from -40°C through +85°C.
- Laser Class 1 compliancy
- Extraction bail latch actuator

Note: Do not use SFPs with MSA direct/standard push pull, dog leg latch actuator, with plastic pull tab, or without any extraction handle. Only Nokia branded SFP+ transceivers are supported.

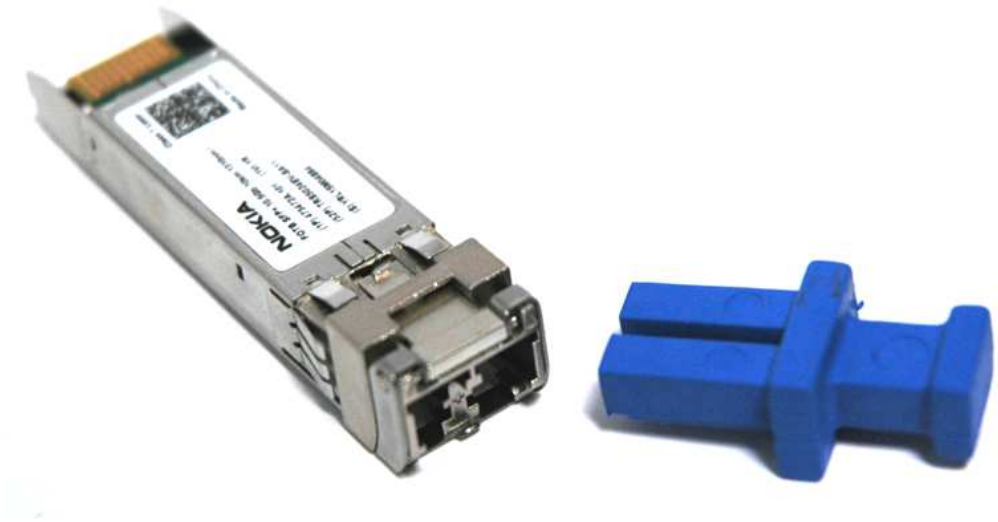
There are two types of 10GE interfaces that can be operated at the SFP/SFP+ slot.

Table 4 SFP+ variants

Product name	Sales item code	Description
FOTA Optical SFP+ 10GBase-SR 850nm MM[3)]	473471A	Optical SFP+ transceiver multimode Up to 33 m with 62.5 µm multimode fiber Up to 300 m with 50 µm multimode fiber Transmission mode: full duplex
FOTB Optical SFP+ 10GBase-LR 1310nm SM[4)]	473472A	Optical SFP+ transceiver singlemode Up to 10 km Transmission mode: full duplex

3) All FlexiBTS short-haul Gigabit Ethernet outdoor transmission cables are 50/125 µm multimode fibers.
4) All FlexiBTS long-haul Gigabit Ethernet outdoor transmission cables are 9/125µm single mode fibers.

Figure 2 10GBase interface



3 Nokia AirScale System Module transmission cables

Specification of cable variants used for transmission purposes in Nokia AirScale System Module. The cable code is imprinted on each cable.

The transmission cables as well as most of the system fibers listed below are prefabricated with special rubber gaskets, which - when used with Nokia Outdoor Base Station equipment - ensure that no water or dust gets in. Those rubber gaskets may be removed when the above-mentioned cables are deployed with Nokia AirScale Indoor Base Station.

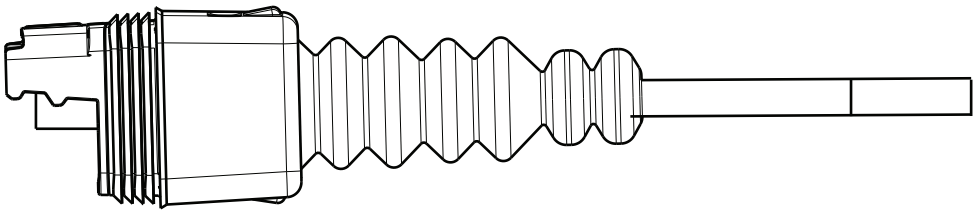
Table 5 Nokia AirScale System Module transmission cables

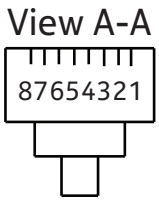
Cable name	Interface	Length [m]	Impedance [Ω]	Cable code	Sales item code
FTCR	Ethernet	15	100	995094	471408A
FTCS	Ethernet	30	100	995148	471717A
FTCT	Ethernet	50	100	995149	471718A
FTCW	Ethernet	4	100	995339	472347A
FTCH	Ethernet optical	15	not relevant	994972	470311A
FTSF	Synchronization	2	not relevant	995304	472509A

3.1 Ethernet electrical cables FTCR, FTCS, FTCT

Twisted pair cable for GE. One end is equipped with an RJ45 connector and a rubber gasket.

Figure 3 View of FTCR, FTCS, or FTCT cable



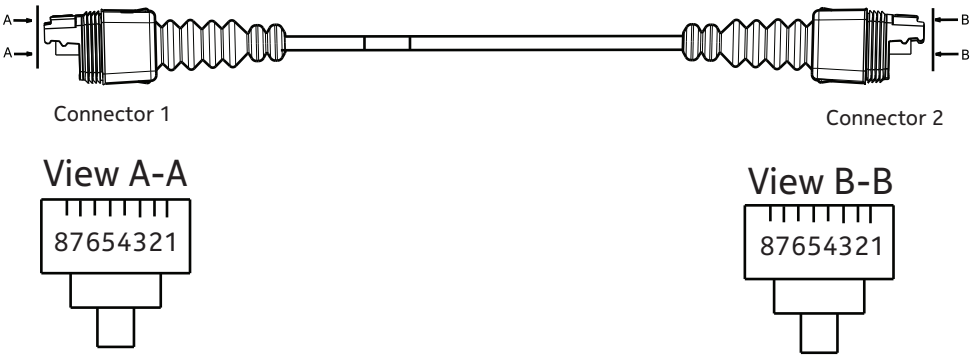


Conn. 1 Pin no.	Pair no: color
1	2: white/orange
2	2: orange
3	3: white/green
4	1: blue
5	1: white/blue
6	3: green
7	4: white/brown
8	4: brown

3.2 Ethernet electrical cable FTCW

Twisted pair cable for electrical Ethernet. Both ends are equipped with RJ45 connectors and rubber gaskets.

Figure 4 View of FTCW cable

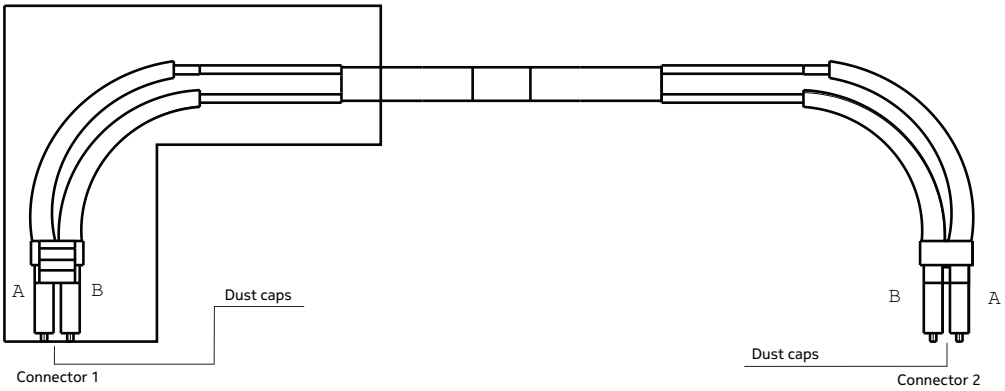


Conn. 1 Pin no.	Pair no: color	Conn. 2 Pin no.
1	2: white/orange	3
2	2: orange	6
3	3: white/green	1
4	1: blue	7
5	1: white/blue	8
6	3: green	2
7	4: white/brown	4
8	4: brown	5

3.3 Ethernet optical cable FTCH

Single mode optical fiber with 2xLC connectors and one rubber gasket.

Figure 5 View of FTCH cable



Conn. 1	Conn. 2
A	B
B	A

In principle, all prefabricated Nokia system fibers can be used for the backhaul connection. There are many variants of fibers that can be used to connect System Modules with RF Modules or Remote Radio Heads. Table 6: Multimode Flexi System Fibers presents a selection of multimode system fibers, for which the FOSD (471881A) SFP is required.

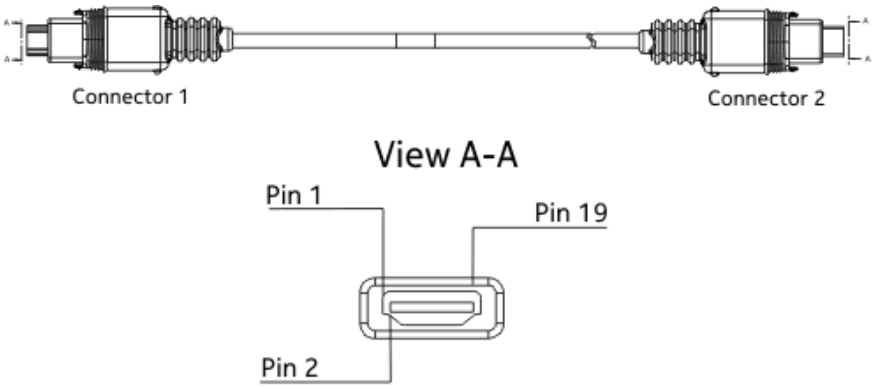
Table 6 Multimode Flexi System Fibers

Name	Length [m]	Cable code	Sales item code
FUFBB	50	995757	473304A
FUFAY	100	995755	473302A
FUFAS	2	995741	473288A
FUFBC	10	995758	473305A
FUFBA	30	995756	473303A
FUFBB	50	995757	473304A
FUFBD	200	995759	473306A

3.4 Sync cable FTSF

2xHDMI connectors with rubber gaskets. The cable is used for connecting Sync In and Sync Out ports of collocated Nokia AirScale System Modules.

Figure 6 View of FTSF cable



Conn. 1 Pin no.	Conn. 2 Pin no.	Pair: wire color
1: GPS_TIME_GSM_FC_OUT_H	1: GPS_TIME_GSM_FC_IN_H	TP-1: Black
3: GPS_TIME_GSM_FC_OUT_L	3: GPS_TIME_GSM_FC_IN_L	TP-1: Yellow
		TP-1G
7: PPS_OUT_H	7: GPS_PPS_GSM_FN_IN_H	TP-2: Black
9: PPS_OUT_L	9: GPS_PPS_GSM_FN_IN_L	TP-2: Green
11: GND	11: GND	TP-2G
2: SINGLE_ENDED_CLOCK_OUT1	2: SINGLE_ENDED_CLOCK_IN	TP-3: White
4: GND	4: GND	TP-3: Blue
6: GND	6: GND	TP-3G

Note: Single Ended Clock output on PIN 2 is used to provide 2.048 MHz output. For other Clock output measurements (for example, PIN 8 for 2 MHz and 10 MHz or PIN 19 for 100 Hz, 50 Hz, 25 Hz, 12.5 Hz or Sfn0) a standard HDMI cable has to be used. It is for R&D purposes only.

4 Environment related markings

4.1 RSS-310 compliance

This equipment complies with RSS-310 of Industry Canada. Operation is subject to the condition that this device does not cause harmful interference.

4.2 EU compliance

4.2.1 EU RoHS statement

This equipment complies with the European Union RoHS Directive 2011/65/EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment. The directive applies to the use of lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

4.2.2 CE marking

Hereby, Nokia declares that radio equipment type Flexi Multiradio Base Station, Flexi Multiradio 10 Base Station and Nokia AirScale Base Station is in compliance with Directive 2014/53/EC. The full text of the EU declaration of conformity is available at the following internet address: **https://online.networks.nokia.com**

Figure 7 CE marking

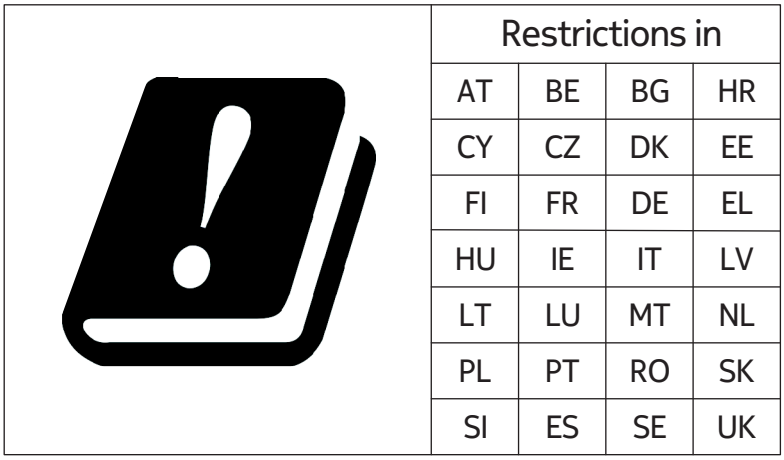
This declaration is only valid for configurations (combinations of software, firmware, and hardware) provided and/or supported by Nokia.

4.2.3 Directive 2014/53/EU (RED) Article 10.10 compliance

The radio frequency usage in EU is restricted and before taking the radio equipment in use in the commercial network the operator is to apply the band license from the local regulator.

As an evidence for the restriction, the packaging is to have the RED Article 10.10-marking describing the impacted countries.

Figure 8 RED Article 10.10-marking



4.3 FCC Part 15 compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference, in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manuals, might cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Changes or modifications not expressly approved by the party responsible for compliance could void the user´s authority to operate the equipment.

