NOKIA

Nokia InSite Base Station Product Description, DRAFT

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1 About this document

This document describes the hardware, software and function of Nokia InSite Base Transceiver Station (BTS). Nokia InSite Base Station is a picocellular indoor base station for GSM 900, GSM 1800 and GSM 1900 systems. Use this document as a reference for the following information:

- Nokia InSite Base Station features
- Nokia InSite Base Station applications and solutions
- Nokia InSite Base Station software
- Nokia BTS Manager
- Nokia InSite Base Station construction and general function
- Nokia InSite Base Station unit alternatives
- Nokia InSite Base Station technical data

For further information on products related to Nokia InSite Base Station, see separate documents for other Nokia GSM Office network elements.

2 Introduction to Nokia InSite Base Station

This chapter describes the Base Station System and Nokia InSite Base Station generally.

2.1 Base Station system

In general terms, base stations perform the radio function for the Base Station System (BSS). A Base Transceiver Station (BTS - Nokia InSite Base Station, for example) can be connected to a transmission node (Nokia InHub Data Service Unit, for example) via HDSL/E1, and to Mobile Stations (MS) via the Air interface (see Figure 1). The BSC is further connected to the Mobile Switching Centre (MSC) and to the Network Management System (NMS).

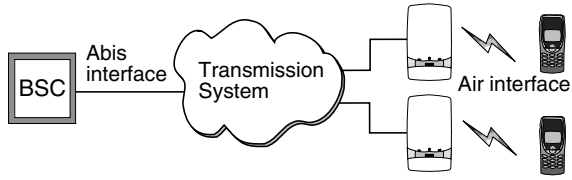

Figure 1. Base Station system

2.2 Nokia InSite Base Station

Nokia InSite Base Station is a complete picocellular 1-TRX indoor base station which is used in GSM 900, GSM 1800 and GSM 1900 systems. Nokia InSite Base Station provides indoor capacity and coverage, thus enabling wireless indoor telephony with total mobility. The standard GSM handset can be used, and therefore, only one number is needed.

Figure 2. Nokia InSite Base Station - a perfect solution for offices and other indoor locations

Indoor coverage and capacity - excellent quality

Nokia InSite Base Station is optimised for picocellular applications. It is the core element in the Nokia GSM Office solution, providing indoor radio access. However, Nokia InSite Base Station can be integrated into other mobile network applications as well.

The compact size, together with low output power and silent operation, makes Nokia InSite Base Station a perfect solution for offices, shopping malls, banks, airports and other indoor locations. In addition to its other versatile and advanced properties, the ease of network planning, installation and commissioning has been one of the main criteria when designing Nokia InSite Base Station.

Nokia InSite Base Station is fast and easy to install - with minimal preparations. It is mounted on a vertical surface, and with its aesthetic design, the BTS blends easily into any indoor environment. As it is easy to deploy, building the network is simple, cost-effective and fast.

Figure 3. Wall-mounted Nokia InSite Base Station

Nokia InSite Base Station's size and ease of deployment significantly reduce the customer's site planning and site acquisition costs. The fast start-up and the quick integration into network enable immediate revenue flow to the customer. Furthermore, the operational costs are low as the BTS management is to large extent carried out remotely from the Nokia NMS/2000. Nokia InSite Base Station provides the possibility to offer flexible capacity expansion possibilities, which keep the revenue flow uninterrupted at the times of system upgrades, and eventually increase the customer's profit.

3 Features

Nokia InSite Base Station has many unique picocell base station features. This chapter describes these features in more detail.

3.1 Indoor coverage and capacity - excellent network quality

Figure 4. Wireless office - total mobility

The heavy use of business telephony has increased the need for indoor coverage and capacity. Wireless office and total mobility - the ability to use mobile phones both indoors and outdoors - are concepts which reflect today's needs in the area of telecommunications. Nokia InSite Base Station introduces a totally new way of building indoor access. Deployment can be carried out with minimised planning effort. The customer can build indoor telecommunication coverage and capacity, thus improving the quality of indoor network. As the customer's demand for coverage and capacity grows, additional BTSs can be installed when needed, without interrupting the service of the other BTSs.

Nokia InSite Base Station supports the Dual Band solution: 900 MHz and 1800 MHz BTSs can be chained together. Therefore, the network capacity is increased by the addition of a new frequency band. The solution supports Dual Band mobiles with common transmission equipment. The Dual Band feature not only increases the capacity but also maintains the high quality of calls.

The output power and the receiver sensitivity of Nokia InSite Base Station are optimised for picocellular indoor use. This adds to the quality of calls going through Nokia InSite Base Station. If the capacity need is more than 1 TRX, the trunking gain can be improved close to having 2 TRXs in the same cell. This is achieved by implementing overlapping cells and using the Directed Retry feature. In this case, the field strength around both 1-TRX BTSs is better than if a 2-TRX BTS was used.

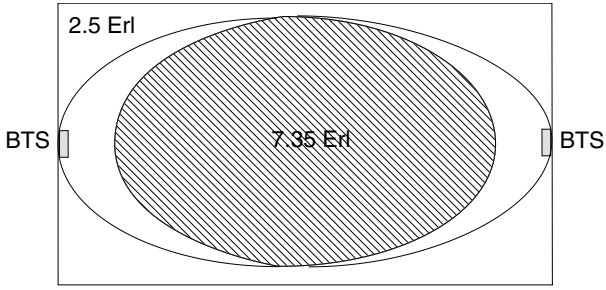

Figure 5. High capacity area (2 TRX) using Directed Retry

By implementing several distributed BTSs, the indoor environment is protected from the outside interference, which is highest close to the windows and outside walls.

3.2 Integrated antenna

Nokia InSite Base Station has an integrated antenna which is designed for picocellular applications. The antenna is located under the antenna cover.

The integrated antenna is designed to be used connected to the Nokia InSite Base Station.

For technical information on the integrated antenna, see section 6.1.5.

3.3 Easy installation, commissioning and integration

This section describes the installation and commissioning procedures of Nokia InSite Base Station. The detailed task-oriented instructions can be found in *Installation* and in *Commissioning*.

'Plug and Play' installation

Nokia InSite Base Station has features that make network planning, installation, commissioning and integration fast and easy. In cases where transmission is already available, only one site visit is needed to integrate the BTS into the network. Nokia InSite Base Station has three LEDs indicating the status, which makes the work easier for the installation and commissioning personnel. In installation, the markings inside the packing cardboard can be used when drilling the holes to the wall. For information on installation options, refer to *Requirements for Installation and Operation*.

Autodetection of BTS configuration

The Nokia InSite Base Station software includes an autodetection feature which automatically identifies the BTS hardware. This reduces the time spent on commissioning as the user does not have to enter a separate HW database for the BTS.

3.4 Cost-effective indoor solution

The installation of Nokia InSite Base Station does not require extensive site planning. Consequently, the site planning costs are reduced. Also, the ease of installation makes the process of site acquisition easier. The installation locations for Nokia InSite Base Station can be found almost anywhere - no previously dedicated place for the base station is needed.

The time spent on the Nokia InSite Base Station site is minimal. The small size and low weight of the BTS enable the installation with minimal work force. The easy commissioning and quick integration into the network ensure that Nokia InSite Base Station is up and running very soon after the installation. This means that costs are kept to a minimum and the revenue flow starts immediately.

During the operation, Nokia InSite Base Station is managed remotely from the Nokia NMS/2000. Site visits are not needed to carry out routine O&M tasks. As the need for coverage and capacity grows, the network can be expanded very flexibly: new BTSs can be added to the network without interrupting the service of the other BTSs.

3.5 Telecom features

Nokia InSite Base Station supports a number of telecom features that enable an efficient data traffic. Here, the most advanced of those features are dealt with. A detailed description of all telecom features can be found in software release documentation.

3.5.1 Speech services

- *Full Rate, Half Rate and Enhanced Full Rate Speech/Data*

  The use of Half Rate coding makes it possible to almost double the number of available traffic channels on radio path. This is achieved with the existing transmission lines on the Abis interface. Half Rate coding enables the use of 8 kbit/channels.

  Enhanced Full Rate coding improves the voice quality in all channel conditions. The coding is based on the existing GSM Full Rate channel coding.

  Full Rate Speech/Data is coded and transferred using 16 kbit/s channels in Ater and Abis interfaces.

- *Active Channel Interference Estimation*

  The BTS measures the interference level of active channels.

- *Dual Band Network support*

  The Dual Band operation supports the dual band mobiles capable of performing handovers between the bands during a call.

- *DTX support (uplink)*

  By using the DTX function (Discontinuous transmission activated by speech), a mobile station transmits only when the subscriber is speaking.

- *Directed Retry*

  One Nokia InSite Base Station TRX has seven TCHs and 2.5 Erl capacity with 1% blocking. By placing two BTSs close to each other, the trunking gain (7.35 Erl capacity with two completely overlapping Nokia InSite Base Stations) can be obtained using the Directed Retry feature.

- *Dynamic SDCCH*

  Dynamic SDCCH allocation allows the SDCCH resources to be configured according to the actual SDCCH traffic situation of a cell. When the BTS temporarily needs greater SDCCH capacity than normal, the idle TCH resources are configured for SDCCH use by the BSC.

3.5.2 Data services

- *High Speed Circuit Switched Data (HSCSD)*

  The HSCSD feature provides accelerated data rates for the end-user applications such as World Wide Web, file transfer and facsimile.

- *14.4 kbit/s GSM data services*

  14.4 kbit/s provides accelerated user data rate at 14.4 kbit/s level. The feature can be combined with HSCSD.

- *Non-transparent and transparent data (9600, 4800, 2400 bit/s)*

  Non-transparent means that the data rate can be changed automatically during the call (due to increased traffic, for example). Transparent data uses fixed data rate throughout the duration of a call.

- *SMS cell broadcast/DRX*

  Short textual messages can be broadcasted to all GSM mobile stations in a specified area.

3.6 Commissioning with Nokia BTS Manager

Currently, as the forthcoming autoconfiguration feature is not yet available, the user performs commissioning in the manual mode. In the near future, when the network supports the autoconfiguration, the automatic commissioning can be employed. Nokia BTS Manager, a PC-based tool, provides a commissioning Wizard that guides the user through the whole commissioning process.

Autodetection

The BTS software includes an autodetection feature which identifies the BTS hardware. This reduces the time spent for commissioning as the user does not have to create a separate HW database for the BTS.

Manual commissioning

Before the commissioning at the BTS site can be started the following tasks must be performed:

- The LAPD links must be created at the BSC.
- The PCM port at the BSC must be set active.

The commissioning procedure performed on site with Nokia BTS Manager includes the following steps:

- transmission configuration
- checking alarms
- Abis loop test
- creating the BTS commissioning report

3.7 Advanced operation and maintenance

The features concerning the operation and maintenance (O&M) of Nokia InSite Base Station are described in this section.

During operation, Nokia InSite Base Station is managed remotely from the NMS/2000. Site visits are usually not needed to carry out the routine O&M tasks.

3.7.1 Combining of O&M and Telecom signals

The O&M signalling and Telecom signalling can be combined into one channel to optimise the use of transmission capacity. The O&M and Telecom signalling links use the same subchannel (16, 32 or 64 kbit/s) on the Abis. By using the 16 kbit/s subchannel and the combining of O&M and Telecom signalling, 14 Nokia InSite Base Stations can be chained together, with one Nokia InHub Data Service Unit, after one E1 line.

3.7.2 BTS diagnostics and alarms

Alarm diagnostics

Nokia InSite Base Station features a BTS diagnostics system that considerably reduces the number of alarms. Relevant alarm information is easily accessible and understandable. The detailed description of Nokia InSite Base Station alarms can be found in *Alarm Descriptions*.

The alarm diagnostics system filters out spurious alarms, reporting only those alarms that directly affect the BTS service level. The alarms are addressed to the unit level, which helps the maintenance personnel to locate the faulty unit.

In the case of a mains power failure, Nokia InSite Base Station provides a sufficient back-up time for an alarm to be sent to the BSC.

3.7.3 Battery backup for Nokia InSite Base Station

The power supply unit (PBU-11) produces the supply voltage needed for the Nokia InSite Base Station and also provides battery backup for 0.5 hours.

3.7.4 Simple maintenance

Nokia InSite Base Station does not require any extensive maintenance. The product is a compact entity with no replaceable units - only the battery and the battery fuse of the power supply unit can be changed, if needed. The time spent on site is minimal. The small size and low weight of the BTS enable the maintenance with minimal work force. The quick integration into network ensures that Nokia InSite Base Station is up and running very soon after the maintenance.

3.8 Future features

There are a number of upcoming features that can be introduced without any hardware changes. Full support for these features will be provided in future SW releases. The most important of these features are described in this section.

3.8.1 Highly automated configuration

Highly automated configuration - including Automatic Picocell Planning, Channel Finder and Nokia Autoconfiguration - makes network planning, commissioning and integration fast and easy. In cases where transmission is already available, only one site-visit is needed - BTS is integrated into the network immediately. Nokia InSite Base Station has three LEDs indicating the status, which makes the work easier for the installation and commissioning personnel.

Automatic Picocell Planning and Channel Finder

When deploying Nokia InSite Base Stations into offices, a need for easy frequency planning becomes obvious. The conventional frequency planning tools do not usually adapt to the different planning work of indoor environment. Nokia has developed an Automatic Picocell Planning (APP) feature for this challenge. Automatic Picocell Planning introduces an easy-to-use tool for planning, commissioning, integration and verification. Use of any pre-planning tools for signal propagation predictions, frequency allocation or handover neighbour selection is not needed.

The Automatic Picocell Planning functionality enables BTS integration into the network at one site visit by one person. This is made possible by the following functionalities:

- Frequency allocation for Nokia InSite Base Station by scanning the network and selecting an interference free frequency
- Fully automatic detection of the neighbouring cells

- BTS parameterisation according to the predefined parameter sets
- Coverage and performance verification

In addition, the Automatic Picocell Planning functionality includes the Channel Finder for maintaining good quality in the office. The Channel Finder is triggered by the changes in the surrounding network. It helps to react to changes before the indoor quality decreases. The Channel Finder is based on statistics of reported signal levels. Active mobiles report the signal levels to Nokia NMS/2000 for processing. The Nokia NMS/2000 monitors the network quality and proposes a new, clean frequency to be downloaded to the network upon request, to maintain good indoor quality.

Nokia Autoconfiguration

The Nokia Autoconfiguration capabilities enable the customer to minimise both time and cost of network integration process. The Nokia Autoconfiguration solution provides the tools for customers to use efficient and straightforward procedures to automatically configure the transmission and integrate the BTS when expanding the cellular network.

The Nokia Autoconfiguration simplifies and automatises BTS commissioning and integration, the goal being to minimise the manual work needed. This will further help the customer to start earning revenue sooner and to save in operational costs by eliminating detailed transmission planning and shortening and minimising the number of site visits. In addition to implementing new sites, subsequent capacity extensions can be easily implemented.

The Nokia Autoconfiguration network is able to organise itself. The use of routing protocol will enable the new installed BTS to be automatically detected by the network, and further the BTS to be able to locate the correct BSC. With seamless co-operation of network planning tools and the Nokia NMS/2000 network management system, the BSC can automatically allocate the needed capacity upon the request of a newly installed BTS. After the capacity has been provided between the BSC and the BTS, the network will automatically carry out testing to verify the correct operation of the BTS and the transmission connections. The installation personnel gets immediate results of the tests to verify the success of the installation.

3.8.2 General Packet Radio Service (GPRS)

GPRS is designed to make the GSM data services more compatible with LAN, WAN and the Internet. In the GPRS, the radio resources are used only when there actually is data to be sent or received. Consequently, it is well adapted to the high burstiness of data applications. The GPRS also provides immediate connectivity and very short set-up for sending a data packet. The throughput is as high as in High Speed Circuit Switched Data (HSCSD). Nokia InSite Base Station supports GPRS coding schemes 1 and 2.

3.8.3 Nokia GSM Intranet Office

Nokia InSite Base Station will also support Nokia GSM Intranet Office solution, in which Nokia InSite Base Stations can be chained together in the same manner as in Nokia GSM Office solution. The BTSs are then connected to LAN with Nokia GSM Intranet Office network elements.

4 Applications and solutions

4.1 Applications

Nokia InSite Base Station is especially designed for Nokia Wireless Office Solutions. Nokia InSite Base Station can also be used in other network applications and it can be chained together with the other Nokia base stations - Nokia Talk-family Base Stations, Nokia PrimeSite Base Stations and Nokia MetroSite Base Stations.

With its indoor-optimised RF performance, Nokia InSite Base Station can safely be installed into any indoor environment.

Nokia InSite Base Station is an effective solution for indoor areas such as offices, restaurants, halls or airports.

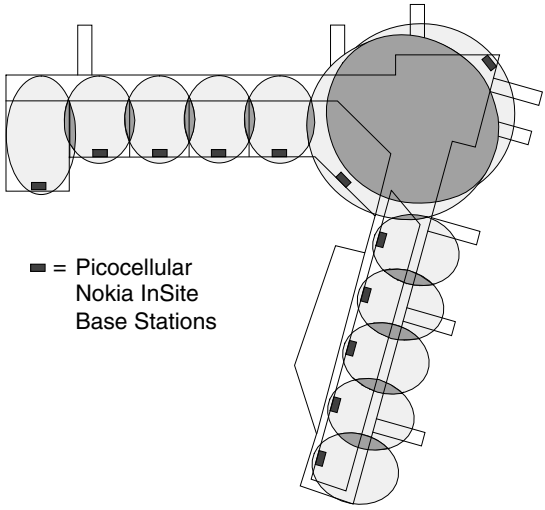

Figure 6. Airport application

4.2 Transmission solutions

One Nokia InSite Base Station accommodates 1 TRX. With an integrated transmission part (HDSL) with 2 x 1 Mbit/s connections, the capacity can be further increased by connecting 7 Nokia InSite Base Stations using normal telephone cabling. Also an E1 connection has been integrated into the Nokia InSite Base Station. With Nokia InHub Data Service Unit in use, also T1 connection can be used. Figures 7, 8and 9 give examples of different transmission solutions where HDSL and E1/T1 connections are used. Distances in the examples are given for a 0.4 mm (26AWG) cable - larger cable allows for longer distances.

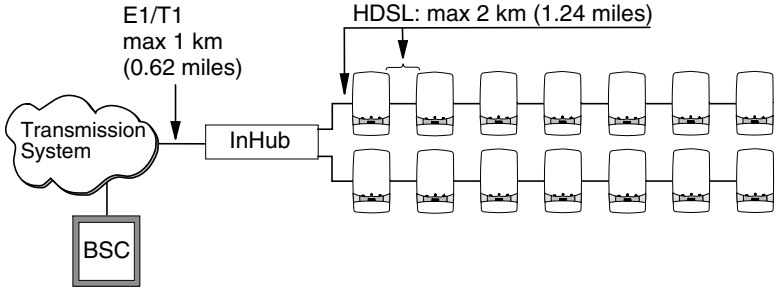

Figure 7. Nokia InSite Base Stations with Nokia InHub Data Service Unit

Note

The configuration in Figures 8 and 9 are not valid in North America because FIU and Nokia FlexiHopper/Nokia MetroHopper Microwave Radios are ETSI compatible only.

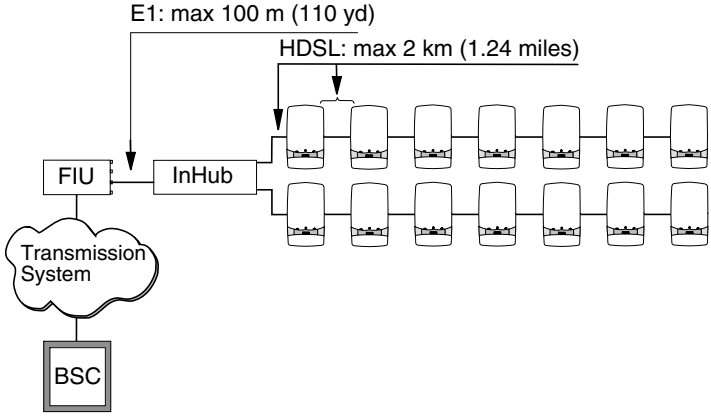

Figure 8. Nokia InSite Base Stations with FIU

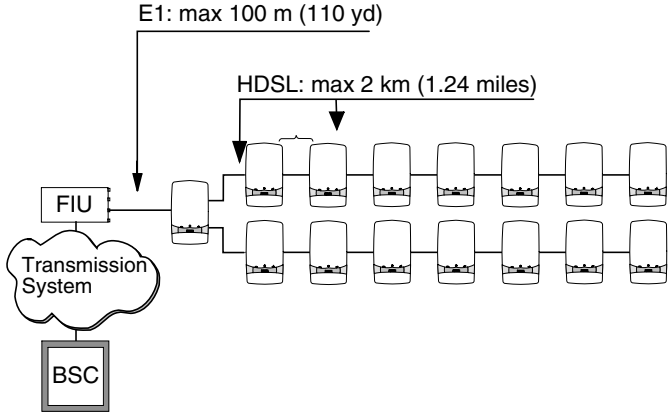

Figure 9. Nokia InSite Base Stations with Nokia InHub Data Service Unit and FIU

Nokia InSite Base Station has versatile transmission solutions. External transmission can be carried out by microwaves, using Nokia MetroHopper Radio or Nokia FlexiHopper Microwave Radio, or it can be carried out by E1/T1 wireline. HDSL wireline can be used for transmission with existing copper cables in the buildings. The supported transmission topologies are star, point-to-point and multidrop chain. E1 supports 14 Nokia InSite Base Stations when Nokia InHub Data Service Unit is used. With Nokia InHub Data Service Unit in use, also T1 connection can be used. T1 supports 11 Nokia InSite Base Stations.

4.3 Nokia Wireless Office Solutions

Nokia InSite Base Station is designed to meet the customer's need for increased indoor coverage and capacity. Nokia InSite Base Station is especially designed for Nokia GSM Office solution, which not only comprises the BTS but completely equipped sites with transmission and auxiliary equipment. See Chapter 3.8 for Nokia GSM Intranet Office solution.

4.3.1 Nokia GSM Office solution

The Nokia GSM Office is a solution for tackling the market segment with competitive tariffing and advanced cost and service management. It fulfils the customers' need for cost-efficient indoor coverage, capacity and wireline-comparable quality, with easy implementation and network planning. The Nokia GSM Office solution meets the corporate needs for mobility and includes the most important PBX services. Additionally, it enables easy implementation of corporate-specific service applications. The Nokia GSM Office solution is part of the Nokia Wireless Office Solutions which provide complete indoor solutions for wireless offices and places alike. Figure 10 shows different transmission solutions: Nokia MetroHopper Radio or Nokia FlexiHopper Microwave Radio, E1/T1 or HDSL.

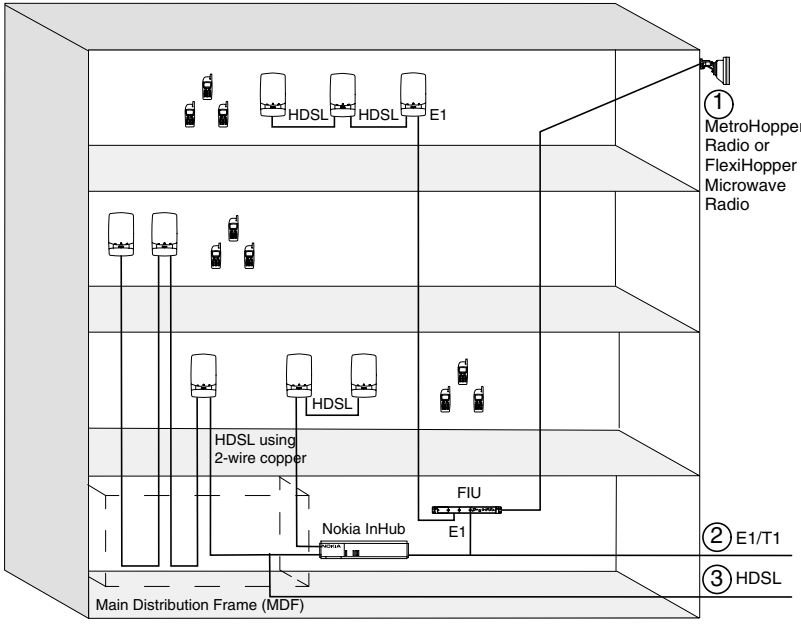

Figure 10. Nokia GSM Office solution

5 Nokia InSite Base Station related software

This chapter describes the BTS management, Nokia BTS Manager software, Nokia InSite Base Station software and the main new software features.

5.1 BTS management

Generally, Nokia InSite Base Station is managed from the Nokia NMS/2000 via the BSC. Therefore, the management tasks carried out on site can be kept to a minimum.

Nokia NMS products incorporate a full range of functions from fault, performance, and configuration management to transmission, trouble, and security management. For more information, please refer to Nokia NMS documentation.

Nokia NMS/2000 SW and BSC SW support Nokia InSite Base Station. For more information on the compatibility of Nokia InSite Base Station features and network element software, refer to software release documentation.

On site, Nokia BTS Manager can be used for BTS management.

5.2 Nokia BTS Manager software

Nokia BTS Manager is primarily used to commission the BTS and carry out maintenance tasks locally. During normal operation Nokia InSite Base Station is managed remotely from the NMS.

Nokia BTS Manager provides a graphical user interface, running in Windows NT or Windows 95/98 environment. Nokia BTS Manager provides a Wizard to ease the process of BTS commissioning. Instructions on how to use Nokia BTS Manager is given in context-sensitive online Help.

When the BTS Manager is started, transmission-related functions are automatically embedded into the user interface (Transmission menu) from InSite TRU Manager.

System requirements for Nokia BTS Manager are detailed in section 8.1.

Figure 11 shows an example of Nokia BTS Manager desktop with the following windows opened:

1. Equipment view in Supervision window
2. BTS Events window
3. Alarms window.

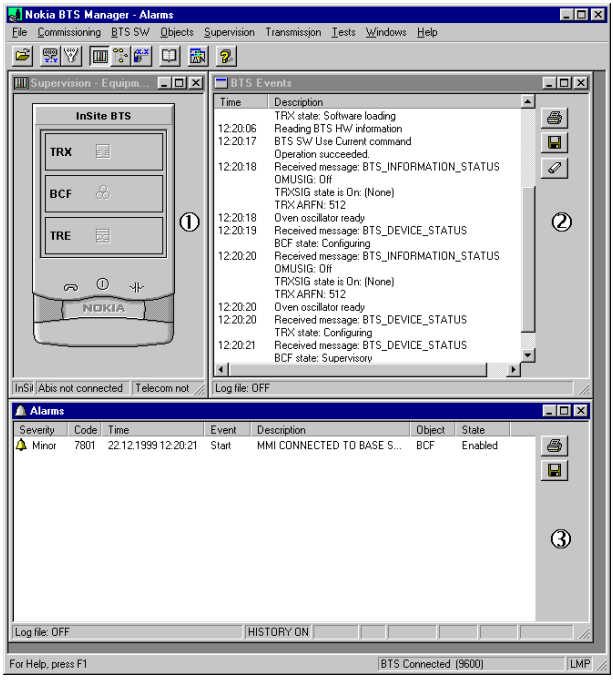

Figure 11. Nokia BTS Manager desktop

5.3 Nokia InSite Base Station software

The BTS start-up procedure has been optimised to shorten the bootup time. No time-consuming tests are performed during the BTS start-up, which contributes to rapid deployment of the BTS, and shorter breaks in service after resetting.

Alarms generated by the Nokia InSite Base Station are radically reduced by advanced diagnostics and alarm management. Correlation rules and fault diagnostic procedures ensure that the appropriate recovery procedure is activated automatically. The fault diagnostics makes it possible to locate a fault to a specific part of the BTS.

Nokia InSite Base Station can store 2 BTS SW packages in its memory. A non-ciphered SW is factory-installed, and if needed, a ciphered or partially ciphered SW can be loaded remotely from Nokia NMS/2000 or locally with the Nokia BTS Manager.

The SW for the whole BTS is integrated into the same SW package. Thus, all the functions of a BTS - including transmission - can be updated with one SW download. The Nokia InSite Base Station software can be downloaded as a background operation without an interruption in the BTS operation. The activation of new software can be done at any time suitable for the customer.

5.4 Main new software features

- Advanced BTS diagnostics and alarm management
- Combined O&M and Telecom signalling

  There are also a number of upcoming features that can be introduced without any hardware changes. Full support for these features will be provided in future SW releases. The most important of these features are described in section 3.8.

6 Construction and general function

Similarly to all the other properties of Nokia InSite Base Station, its compact construction has been optimised for picocellular solutions. The BTS is easy to install and move, and the structure supports the installation into many types of locations where there is no previously dedicated place for the BTS.

6.1 Structure

The Nokia InSite Base Station mechanics can be divided into:

- lightweight aluminium chassis
- plastic antenna cover and connector cover
- integrated antenna
- PCB including
  - transmission submodule with 2 x 1 Mbit/s single pair HDSL interfaces and E1 interface
  - baseband submodule
  - RF submodule
- external power supply unit

Nokia InSite Base Station has an infrared port. Therefore, it is classified as a Class 1 Laser Product.

Figure 12 shows the structure of Nokia InSite Base Station.

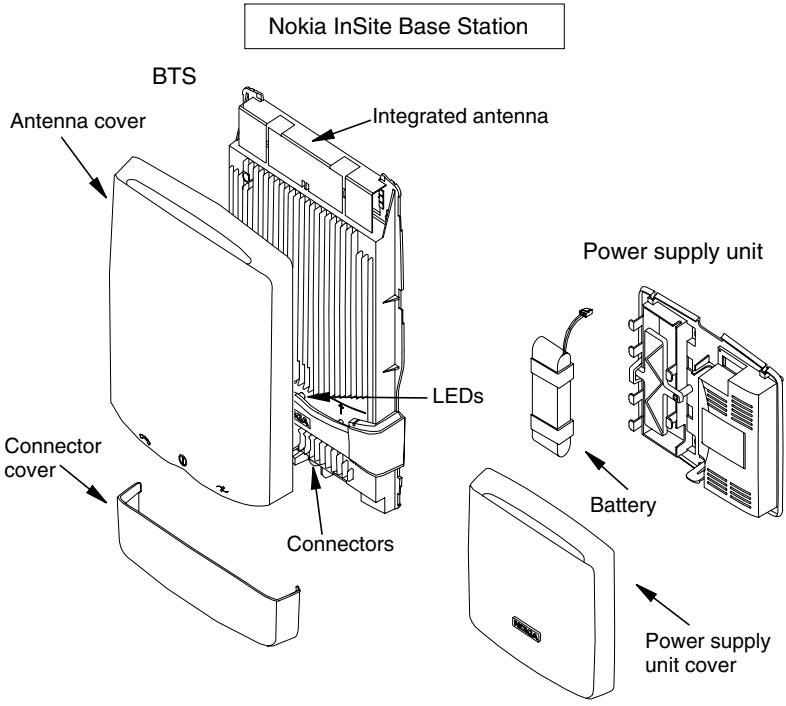

Figure 12. Nokia InSite Base Station structure

6.1.1 Transmission submodule

The transmission submodule takes care of the transmission between Nokia InSite Base Station and BSC through the Abis interface. The transmission media between the Nokia InSite Base Station and the BSC can either be a radio link or a wireline PCM. HDSL wireline can be used for chaining InSite Base Stations together in a building, or even between adjacent buildings, using existing telephone wiring. The transmission submodule includes two individual HDSL transmission interfaces and one E1 interface. The cross-connection block provides a flexible cross-connection function at 8 kbit/s level. This allows configurations of star, point-to-point and multidrop chain networks.

Nokia InSite Base Station supports combined O&M and Telecom signalling.

Locally, the transmission configuration is managed with Nokia BTS Manager.

6.1.2 Baseband submodule

The baseband submodule performs O&M and Telecom tasks and digital signal processing tasks.

6.1.3 RF submodule

The RF submodule forms the air interface of the Nokia InSite Base Station. It includes a transmitter, receiver, synthesisers and an antenna connection.

The functional parts of the RF submodule are the TX part (transmitter) and the RX part (receiver). The TX part converts modulated baseband signals to RF carrier signals. The RX part converts received RF signals to I and Q samples for the digital part.

Duplex filter connects the transmitter and the receiver to the antenna.

6.1.4 Power supply

The power supply unit is a separate unit and its design matches that of the BTS.

The power supply unit supplies the DC voltage needed by Nokia InSite Base Station, and it also provides battery backup for 0.5 hours. See *Requirements for Installation and Operation* for more information on the battery lifetime.

The output voltage range of the power supply unit is 5.5V - 8.1 V when AC mains is available, and 5.4 V - 8.2 V in backup operation during AC mains breakdown. Typical power consumption is 16 W for the BTS and 4 W for the power supply unit.

The socket outlet should be near the equipment and it should be easily accessible.

6.1.5 Integrated antenna

The integrated, picocellular antenna is located under the antenna cover. Table 1 shows the technical information on the antenna.

Table 1. Technical data for the integrated antenna

Item	GSM 900	GSM 1800	GSM 1900
Frequency of operation	RX: 880...915 MHz TX: 925...960 MHz	RX: 1710...1785 MHz TX: 1805...1880 MHz	RX: 1850...1910 MHz TX: 1930...1990 MHz
3 dB beamwidth	70°/50° H/E	60°/80° H/E	63°/88° H/E
6 dB beamwidth	100°/180° H/E	90°/160° H/E	90°/159° H/E
Gain	+3 dBi	+4 dBi	+4 dBi

The horizontal and vertical radiation patterns of the integrated antenna for GSM 900, GSM 1800 and GSM 1900 versions are shown in Figures 13 - 18 respectively.

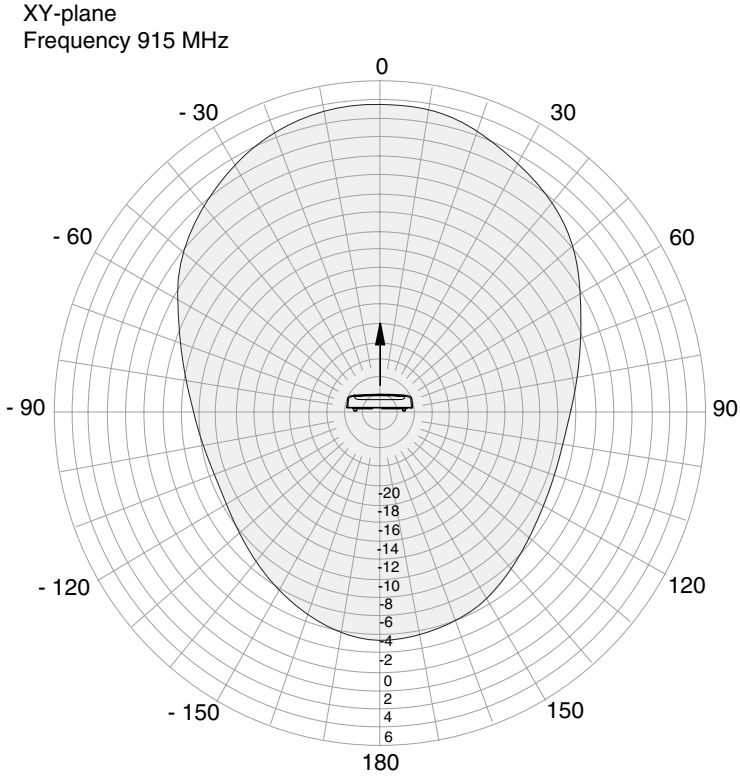

Figure 13. Example of a horizontal radiation pattern of the integrated antenna for GSM 900; top view

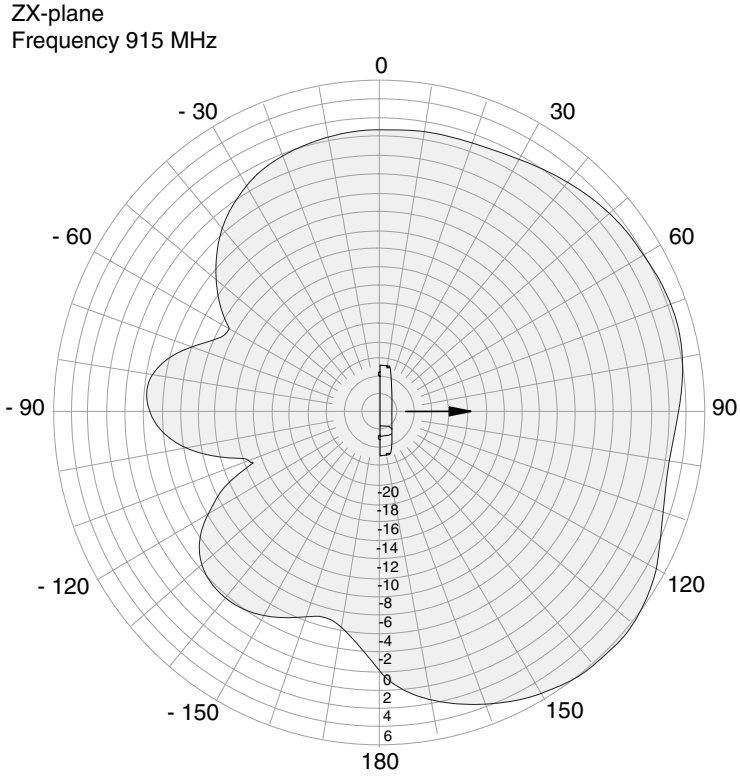

Figure 14. Example of a vertical radiation pattern of the integrated antenna for GSM 900; side view

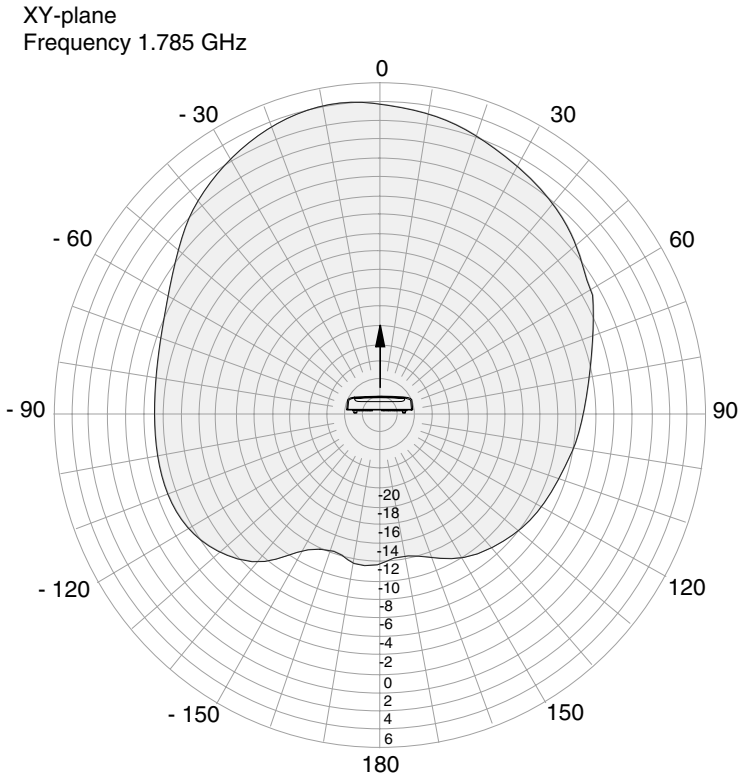

Figure 15. Example of a horizontal radiation pattern of the integrated antenna for GSM 1800; top view

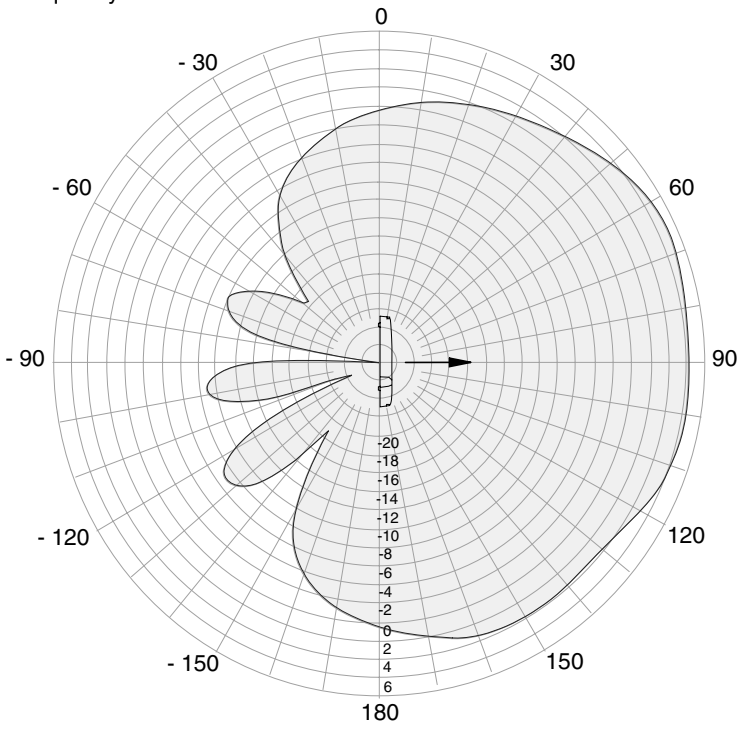

Figure 16. Example of a vertical radiation pattern of the integrated antenna for GSM 1800; side view

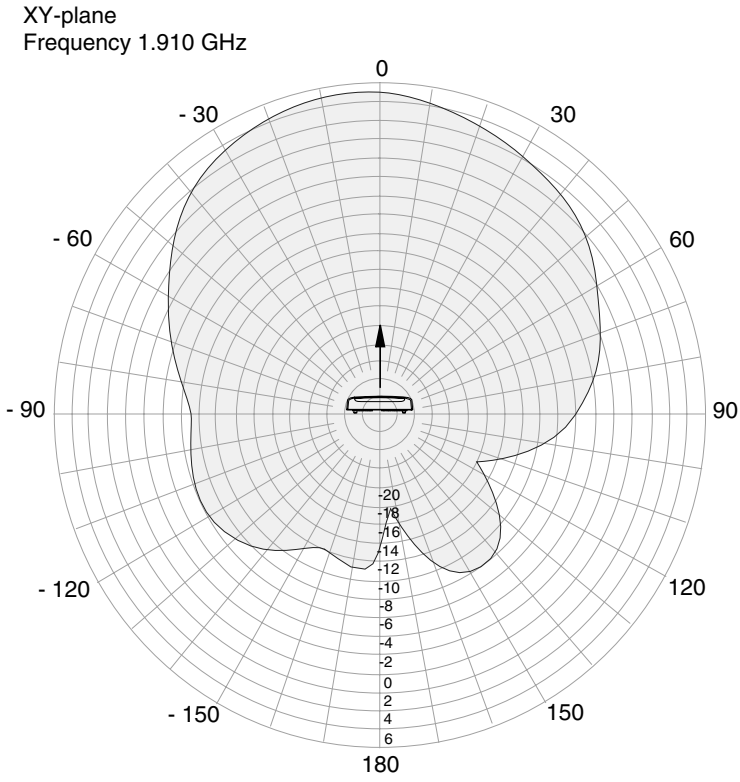

Figure 17. Example of a horizontal radiation pattern of the integrated antenna for GSM 1900; top view

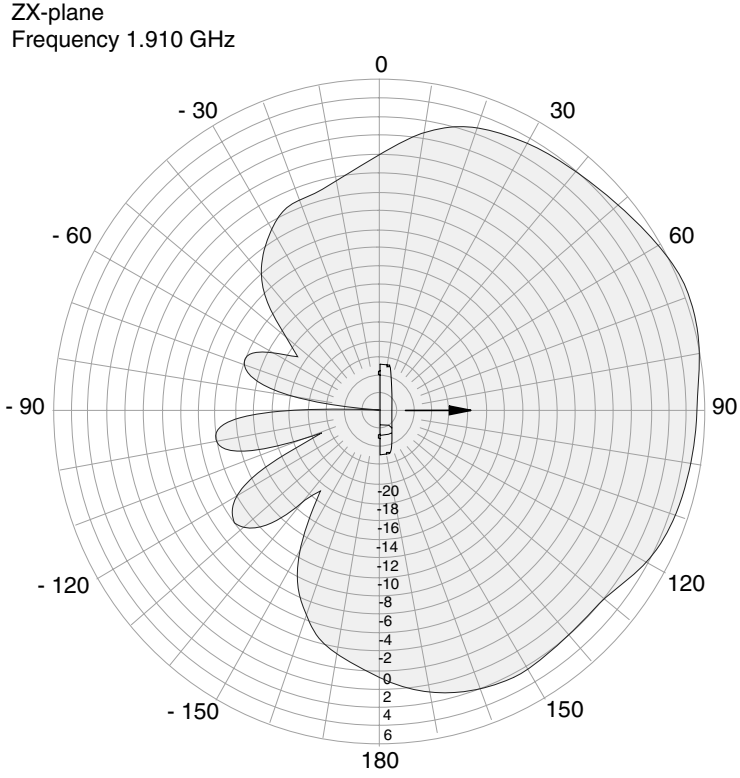

Figure 18. Example of a vertical radiation pattern of the integrated antenna for GSM 1900; side view

7 Unit alternatives and other delivery items

This chapter details the unit alternatives for Nokia InSite Base Station.

Table 2. Unit alternatives and other delivery items for Nokia InSite Base Station

Unit	Alternatives
Nokia InSite Base Station	GSM 900 GSM 1800 GSM 1900
Nokia InSite Base Station Software	Ciphered Software (A5/1) Licence Partially Ciphered Software (A5/2) Licence Non-ciphered Software (A5/0) Licence
Customer documents	Nokia InSite GSM Base Station User Manual / Nokia InSite GSM Base Station Quick Reference Guide (in the BTS package)

8 Technical specifications

The purpose of this chapter is to provide the main technical data of Nokia InSite Base Station.

Table 3. Common technical data

Property	Value	Note
BTS height	350 mm (13.8 in)	
BTS width	225 mm (8.9 in)	
BTS depth	47 mm (1.9 in)	
BTS weight	2.3 kg (5.1 lb)	
BTS volume	2.8 l	
Power supply unit height	170 mm (6.7 in)	
Power supply unit width	210 mm (8.3 in)	
Power supply unit depth	47 mm (1.9 in)	
Power supply unit weight	1 kg (2.2 lb)	
Power supply unit volume	1.2 l	
Low temperature limit	+5°C (+41°F)	
High temperature limit	+40°C (+104°F)	
Ingress Protection class	IP30	
Nominal voltage (external supply voltage range)	240 VAC 100 VAC	50 Hz 60 Hz
Permitted operating voltage fluctuation	90 VAC - 264 VAC	(47 Hz - 63 Hz)
Typical power demand (approximate value)	20 W	16 W for the BTS, 4 W for the power supply unit

Table 4. RF performance

Product Variant	Output Power	Frequency Band	Output Power Range	Static Power Levels	Typical RX Sensitivity
GSM 900 (M2 Micro BTS)	80 mW	RX: 880-915 MHz TX: 925-960 MHz	18 dB, 2 dB steps	10	-100 dBm
GSM 1800 (M3 Micro BTS)	160 mW	RX: 1710-1785 MHz TX: 1805-1880 MHz	22 dB, 2 dB steps	12	-100 dBm
GSM 1900 (M3 Micro BTS)	160 mW	RX: 1850-1910 MHz TX: 1930-1990 MHz	22 dB, 2 dB steps	12	-100 dBm

Note

RACH burst detection is limited to 3 km (1.86 miles).

Table 5. HW interfaces of the BTS

Interface	Number	Connector type/note
Antenna connector	1	SMA (female); one connector for both the integrated antenna and external antennas
Power supply connector for DC power	1	DC jack (female)
13 MHz clock interface	1	audio jack (mono)
LEDs indicating the BTS status	3	The LED in the middle is two-coloured
Standard RS-232 interface for Nokia BTS Manager (LMP)	1	RJ45
Infrared port for future tools	1	

Table 6. HW interfaces of power supply unit

Interface	Number	Connector type/Note
AC connector	1	IEC 320, C7
DC connector	1	JST 2-pin connector
Battery connector	1	JST 3-pin connector

Table 7. Integrated Abis interfaces of Nokia InSite Base Station

Interface	Number	Connector type	Max. transmission distance (26AWG/0.4mm cable)	Wiring environment	Max. line attenuation
HDSL	2	RJ11	2 km (1.24 miles)	outdoor/indoor	30 dB
E1	1	RJ45	100 m (110 yd)	indoor	6 dB

8.1 System requirements for Nokia BTS Manager

System requirements for Nokia BTS Manager are detailed in Table 8.

Table 8. System Requirements for Nokia BTS Manager

Computer	Intel Pentium-based IBM-compatible PC
Operating system	Microsoft Windows NT 4.0 Microsoft Windows 95/98
System memory (minimum)	Windows NT 4.0: 32MB Windows 95/98: 16MB

Table 8. System Requirements for Nokia BTS Manager (Continued)

Monitor	SVGA, min 800x600 resolution
Minimum disk space	40MB
Accessories	CD-ROM drive Windows compatible mouse or pointing device Windows compatible printer (optional) Cable (PC - BTS)

9 International recommendations

This section lists the recommendations referred to in the designing of Nokia InSite Base Station.

9.1 Abis interface

- Nokia Abis O&M specification
- Nokia Abis L1 functions (GSM 08.51, 08.52, 08.54)
- Nokia Abis L2 functions (GSM 08.56)
- Nokia Abis L3 functions (GSM 08.58)
- Nokia Abis Radio Resource Management (GSM 04.08)

9.2 Air interface

- Signaling protocol GSM 04 series
- Physical layer GSM 05 series

9.3 Safety

- IEC 60950 2nd edition with Amendments A1, A2, A3 and A4: Safety of Information Technology Equipment, including Electrical Business Equipment.
- IEC 60215 3rd edition with Amendments A1 and A2: Safety requirements for radio transmitting equipment.
- IEC 60529 2nd edition: Degrees of protection provided by enclosures (IP Code).

- EN 60950: 1992 with Amendments A1:1993, A2:1993, A3:1995, A4:1997 and A11:1997: Safety of Information Technology Equipment, including Electrical Business Equipment.
- EN 60215: 1989 with Amendments A1:1992 and A2:1994: Safety requirements for radio transmitting equipment.
- EN 60529: 1992: Degrees of protection provided by enclosures (IP Code).
- UL 1950 3rd Edition and CAN/CSA C22.2 No.950-95 ‘Safety of Information Equipment including Electrical Business Equipment’
- UL 50 11th Edition ‘Enclosures for Electrical Equipment’

9.4 EMC and related standards

- d-ETS 300 342-3 Radio Equipment and Systems (RES); Electro-Magnetic Compatibility (EMC) for European digital cellular telecommunications system (GSM 900 MHz and DCS 1800 MHz). Part 3: Base station and ancillary equipment and repeaters meeting Phase 2 GSM requirements, 1999.
- ETS 300 386 Equipment Engineering (EE); Public telecommunication network equipment Electro-Magnetic Compatibility (EMC) requirements Part 1: Product family overview, compliance criteria and test levels, December 1994.
- I-ETS 300 609-1 - Digital cellular telecommunications system (Phase 2); Base Station System (BSS) equipment specification; Part 1: Radio aspects (GSM 11.21 versions 4.13.1 and 4.14.1)
- IEC 61000-3-3 Limitation of voltage fluctuation and flicker, AC power port, 1995
- IEC 61000-3-2 Harmonic emissions AC power port, 1995.
- IEC 61000-4-8 Pulse magnetic field immunity, 1993 (severity level 5).
- IEC 61000-4-9 Damped oscillatory magnetic field immunity, 1994 (severity level 5).
- 47 CFR chapter 1, part 15 ‘Radio Frequency Devices’
- 47 CFR chapter 1, part 24 and RSS-133 ‘Personnel Communication Services’

9.5 Base station interface equipment - related recommendations and standards

The standards and recommendations related to base station interface equipment are described in this section.

Table 9. 2048 kbit/s E1 interface

Standard	
CCITT (Blue Book)	
G.703	Digital Interface Characteristics
G.704	Functional Interface Characteristics
G.706	CRC Multiframe structure
G.711	PCM Coding Law
G.732	Primary PCM Multiplexer
G.736	Synchronous 2Mbit/s Digital Multiplexer
G.823	Jitter and Wander
G.826	Performance parameters
I.460	Multiplexing, Rate Adaption
GSM	
03.50	Transmission Planning Aspects
08.51	BSC-BTS Interface, General Aspects
08.52	BSC-BTS Interface Principles
08.54	BSC BTS Interface Layer 1, Structure of Physical Circuits

Table 10. HDSL interface

Standard	Description
ETS 101 135	Transmission and multiplexing (TM); High bit-rate Digital Subscriber Line (HDSL) transmission systems in metallic local lines, HDSL core specification and applications for combined ISDN-BA and 2048 kbit/s transmission.