Product description for RBS 6601

Contents

1   Introduction

The RBS 6000 base station family is designed to meet the increasingly complex challenges facing operators today. RBS 6000 is built with tomorrow's technology and at the same time provide backwards-compatibility with the highly successful RBS 2000 and RBS 3000 product lines. RBS 6000 base stations offer a seamless, integrated and environmentally friendly solution and a safe, smart and sound roadmap for whatever tomorrow holds.

Figure 1 RBS 6000 base station family

RBS 6000 Series Key Features:

- Path to sustainability: The RBS 6000 Series ensures a smooth migration to new functionality and new technologies with existing sites and cabinets, thus providing a path to sustained revenues and profits.

- Power on demand: Reengineering the power supply and fully integrating it into the system were key objectives in designing the RBS 6000 series. The intelligent power supply provides power on demand that is exactly matched to what is needed at any given moment, thus ensuring that power consumption is kept to an absolute minimum.

- Multi-standard: All RBS 6000 base stations support multiple radio technologies.

- Integrated simplicity: New multi-purpose cabinets, an innovative common building practice for all components, modular design and an extremely high level of integration bring the functionality and capacity of an entire site down to the size of a cabinet

1.1 RBS 6601 – Main Remote Solution

RBS 6601 is a Main Remote solution, optimized to deliver high radio performance for efficient cell planning in a wide range of indoor and outdoor applications. The Main Remote RBS, in which each RRU is located near an antenna, reduces feeder losses and enables the system to use the same high-performance network features at lower output power, thereby lowering power consumption and both capital and operational expenditure. Up to twelve Remote Radio Units (RRU) can be connected to a Main Unit (MU) to match any site requirements. The small, lightweight units are easily carried to site and offer simple and discrete installation where space and access are decisive issues.

1.2 Safe, Smart and Sound Going Forward

The Main Remote concept is designed to support all technologies in virtually any combination. This means that timing in network expansion is less critical and that there is less risk in investment decisions, since base band and RRU capacity can be added as it is needed for the technology that is in demand.

Like the other members of the RBS 6000 family, the Main Remote RBS 6601 provides a common transport network solution that supports a wide range of technologies.

2   RBS 6601 Hardware Architecture

The Main–Remote solution has the similar architecture as the other products in the RBS 6000 family.

The Main Remote Solution is divided into a Main Unit (MU) and multiple Remote Radio Units (RRU) that are connected to the MU through optical fiber cables.

Figure 2 RBS 6601, Main Unit (MU) and Remote Radio Unit (RRU)
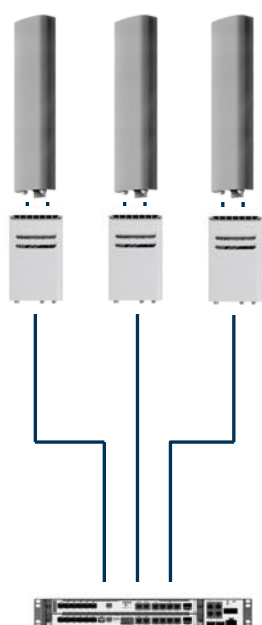
Figure 3 RBS 6601 3-sector site

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2.1 RBS 6601 Main Unit

The RBS 6601 Main Unit is indoor specified.

2.1.1 RBS 6601 - Indoor Main Unit

The RBS 6601 Main Unit is designed for indoor environments, preferably mounted in a 19-inch rack. One DUW or two DUG/DUL can be housed in one RBS 6601 Main Unit.

Some of the key characteristics of the RBS 6601 Main Unit are:

- Power distribution of -48 VDC to Digital Units

- Climate system including built-in fans and control part

In addition to the above RBS 6601 Main Unit also provides a limited number of built-in customer alarm connections as well as connection to an external Support Alarm Unit (SAU).
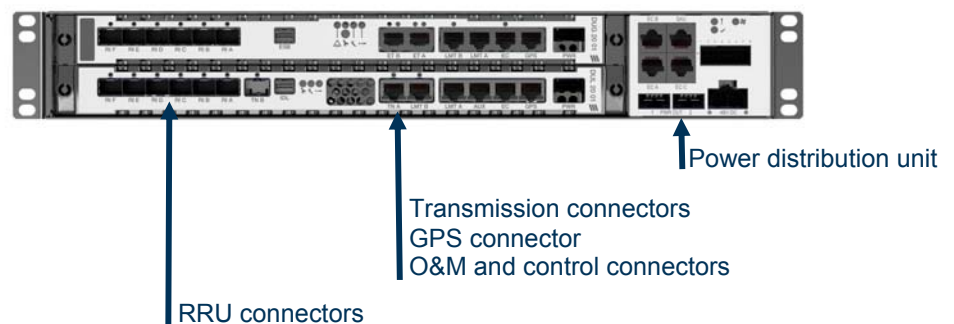
Figure 4 RBS 6601 Main Unit with DUG/DUL
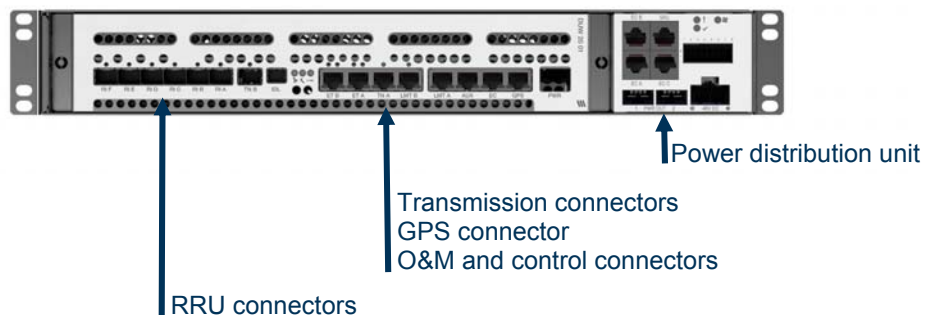
Figure 5 RBS 6601 Main Unit with DUW

2.1.2 Digital Unit for GSM

The Digital Unit GSM, DUG 20 can control up to 12 GSM carriers. If more than 12 TRXs are required, then an additional DUG can be installed in the RBS 6601 Main Unit and synchronized with the other DUG in the Main Unit.

The DUG supports the cross-connection of individual time slots to specific TRXs and extracts the synchronization information from the Pulse-Code Modulation (PCM) link to generate a timing reference for the RBS.

The DUG 20 supports:

- E1/T1 transmission interface

- Baseband processing

- Link Access Procedures on D-Channel (LAPD) concentration / multiplexing

- Abis optimization

- Multi-drop (cascading)

- Synchronized radio network, through an external GPS receiver

- Transceiver Group (TG) synchronization

- Site LAN

Figure 6 DUG

2.1.3 Digital Unit for WCDMA

The Digital Unit WCDMA (DUW) comes in three variants, DUW 10/20/30, depending on capacity demand.

The DUW contains the baseband, control, and switching, as well as the Iub and Mub interfaces. The DUW can handle different time-varying traffic mixes consisting of voice circuit-switched data, packet-switched data, and high-speed data such as High Speed Packet Access (HSPA).

Baseband resources are pooled in the DUW and the number of Channel Elements (CE) and high-speed data capacity can be optimized to fit operator requirements for user type and number of services.

The baseband capacity is pooled independently of sectors and frequencies. Two baseband pools can exist (two DUW). Each DUW is then housed in one 19", 1.5U RBS 6601 Main Unit. The two DUW in two separate 19" 1.5U RBS 6601 Main Units can be configured as one RBS node.

The DUW stabilizes the clock signal extracted from the transport network connection or optional external GPS equipment and uses it to synchronize the RBS.

The DUW provides:

- 100/1000 Base-T Ethernet

- Channelised STM-1 transport network interface

- Four IMA capable E1/T1/J1 ports

Figure 7 DUW

2.1.4 Digital Unit for LTE

The DUL contains the baseband, control, and switching, as well as the S1 and Mub interfaces for LTE RBS. The DUL supports different time-varying traffic mixes over the LTE high-speed data interface.

Baseband resources are pooled in the DUL and the high-speed data capacity can be optimized to fit operator requirements for user type and number of services.

The baseband capacity is pooled independently of sectors and frequencies. The DUL stabilizes the clock signal extracted from the transport network connection or optional external GPS equipment and uses it to synchronize the RBS.

The DUL provides:

- Full IP connectivity

- A gigabit Ethernet transport network interface

Figure 8 DUL

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2.2   TCU 02, Transport Connectivity Unit 02

For single standard radio operation only, the transmission interface in the digital unit is normally sufficient. For multi standard radio operation the TCU can be used to support one common backhaul interface. The common transmission interface can be either Ethernet or IP over E1/T1. The TCU natively supports GSM migration from E1/T1 transmission to Ethernet transmission with the BSS feature "Packet Abis over IP". The TCU 02 has the same form factor as e.g. a DUG.

2.3 Remote Radio Unit

2.3.1 RRUW, RRUS 01 & RRUS 11/61

Figure 9, Remote Radio Unit (RRUW/RRUS 01 and RRUS 11/61)

RRUW and RRUS are designed to be installed close to the antennas, and can be either wall or pole mounted. The RRUW has got WCDMA capability. RRUS is Multi Standard Radio, MSR, capable. This means that RRUS is capable of running GSM, WCDMA and LTE on the same RRU HW. Standard can be changed by software reload.

The RRUS exists in 2 different models. RRUS 01 means support for 1 Tx branch per RRU and RRUS 11/61 means support for 2 Tx branches (MIMO/Tx div) per RRU. RRUS 11 supports FDD configurations, RRUS 61 supports TDD configurations.

The RRUS 01/11 is HW prepared for running mixed mode configurations, i.e. to run two standards simultaneously. The standards supported in each frequency variant of RRUS depend on which frequencies each standard is defined in 3GPP. A table with standards supported for each frequency is found in chapter 5.1.

For GSM and LTE, up to 12 RRUS can be connected to one MU. For WCDMA, up to 12 RRUW or RRUS can be connected to the same MU.

The RRUW & RRUS sustainable average output power is up to 80W*, for very large coverage and high capacity requirements. Dual band configurations are also supported by connecting RRUW or RRUS for different frequency bands to the same MU.

*RRU and frequency dependent.

The RRUW & RRUS contain most of the radio processing hardware. The main parts of the RRU are the:

- Transceiver (TRX)

- Transmitter (TX) amplification

- Transmitter/Receiver (TX/RX) duplexing

- TX/RX filtering

- Voltage Standing Wave Ratio (VSWR) support

- ASC, TMA & RET support

- Optical interface

All connections are located at the bottom of the RRUW & RRUS.
TMAs or ASCs are normally not needed when the RRU is mounted near the antenna. Still to maximize the flexibility at site RRUW & RRUS has support for ASC, TMA and Remote Electrical Tilt (RET).

2.3.2   **RRU22**

Figure 10, Remote Radio Unit (RRU22 20W & 40W)

The RRU22 are WCDMA capable and designed to be installed close to the antennas, either wall or pole mounted. Up to six RRU22 can be connected to the same MU to match any site type.

Different types of RRU22 are available with respect to frequencies and output power (20 or 40 W). It is possible to mix different RRU types in the same configuration. Dual band configurations are supported by connecting RRU for different frequency bands to the same MU.

The RRU contain most of the radio processing hardware. The main parts of the RRU are the:

- Transceiver (TRX)

- Transmitter (TX) amplification

- Transmitter/Receiver (TX/RX) duplexing

- TX/RX filtering

- Voltage Standing Wave Ratio (VSWR) support (40W)

- ASC, TMA & RET support (see table below)

- Optical interface

All connections are located at the bottom of the RRU.

TMA or ASC are normally not needed when the RRU is mounted near the antenna. Some of the RRU types however have support for ASC, TMA, RET and RET Interface Unit (RIU). The compatibility for the different RRU is presented in the table below.

RRU Type	ASC/TMA	RET	RIU
RRU22 20 W		X	
RRU22 40 W	X	X[1]	X[2]

(1) Possible if connected via ASC
(2) Only needed when no ASC is used

2.4 Optical Interface Link

The RRU are connected to the MU through optical fiber cables. The length between the RBS 6601 MU and a RRUW or RRUS can be as long as up to 40 km.

The units can be connected to each other in several different ways depending on the site setup. The RBS 6601 supports:

- Star connection of the RRU, where each RRU is connected to the MU.

- RRUW & RRUS support cascade connections, where only one fiber cable is connected between the MU and one of the RRU. The other RRU are then connected to each other. This solution reduces the length of the optical fiber cable needed and can be used in multiple applications when the RRU are located far away from the MU.

- The RRU22 can be connected as the last RRU in a RRU cascade chain.

3 Applications for RBS 6601

The RBS 6601 offers a wide spectrum of indoor applications. It is well suited for medium- to large capacity needs and is easy and flexible to set up.

3.1 Metropolitan Indoor Site
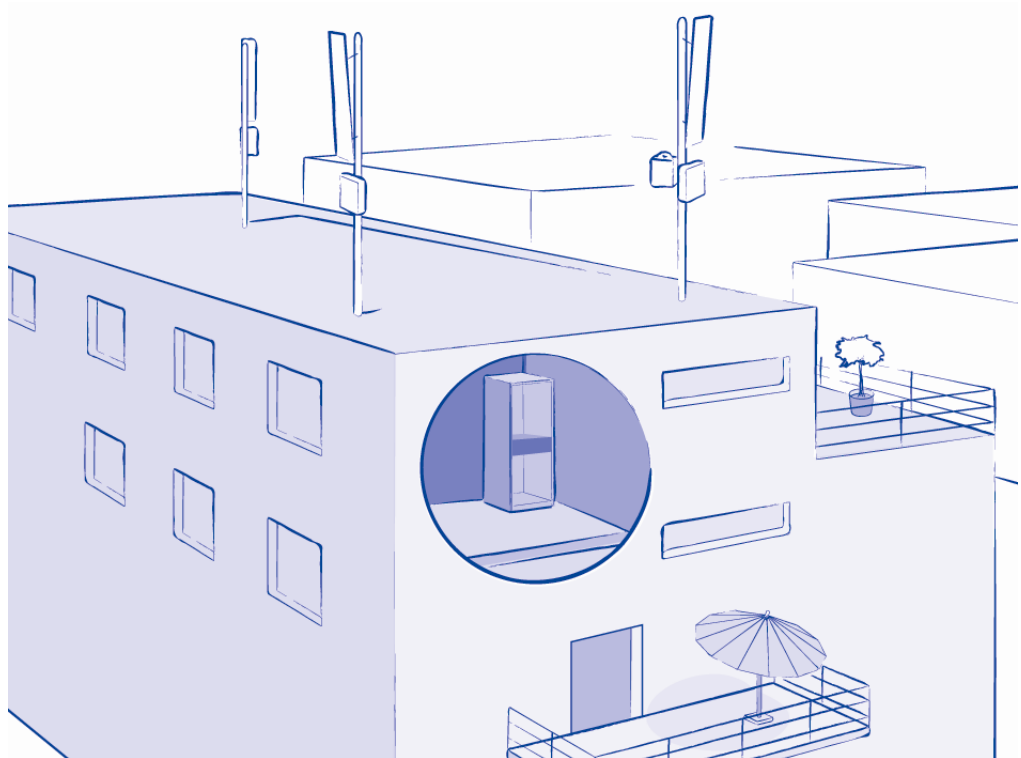
Figure 11 Metropolitan Indoor Site

The RBS 6601 is perfectly suited for metropolitan locations, with medium to large capacity needs and requirements for low power consumption. The small subunits are ideal for sites where access is limited or when site installation would result in an undesirable level of disturbance, as the included units can be carried using elevators or stairwells by hand.

The RRUs are mounted close to the antennas and the MU can be installed in an existing 19-inch rack or wall-mounting kit in an equipment room.

3.2 Suburban Shelter Site

Figure 12   Suburban Shelter Site

The RBS 6601 is a perfect solution for achieving coverage and capacity in suburban environments. The Main Remote RBS 6601 provides wide area coverage where expansion can be implemented in a cost efficient way.

Radio sites in remote areas with limited access to power infrastructure can benefit from the Main Remote RBS 6601, since it offers low power consumption and high efficiency at the same time.

The MU can be installed in an existing 19" rack in a small shelter below the tower, and each RRU is installed close to the antennas in the tower top.

3.3 Highway Coverage Site

Figure 13 Highway Coverage Site

Cost-effective coverage and capacity, low power consumption, and simplified civil works make the RBS 6601 an ideal choice for highway coverage sites. The RRU can be spread out along the highway where they easily can be mounted on roadside poles, with negligible footprints, to minimize the interference on the surroundings. The MU is mounted in a shelter with a 19" rack.

3.4 In-building Coverage Solution
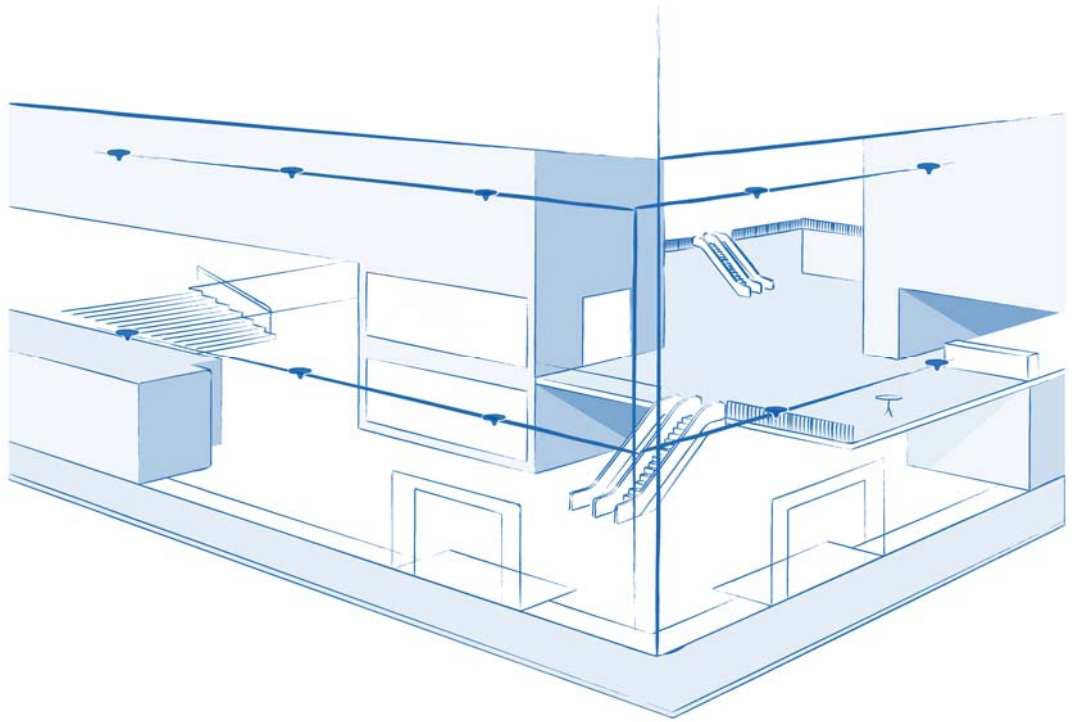
Figure 14 In-Building Coverage Solution

Using the RRU as a driver and connected to a Distributed Antenna System (DAS), the RBS 6601 is a good candidate when deploying in-building coverage. The possibility to spread out the RRU result in that one RBS can provide several buildings with exclusively tailored coverage.

This solution can preferable be deployed in locations such as shopping centers, train stations and sport arenas.

4   Site Solutions

4.1.1   Support Alarm Unit

The optional Site Alarm Unit (SAU) monitors and controls customer equipment. The SAU can handle up to 32 external alarms and four output control ports.

4.1.2   GPS

The RBS can be optionally connected to a GPS unit, which is used for synchronization of the RBS.

For more Main Remote site solution information please see the Main Remote site installation document 16/1551 – LZA 701 0003.

5 Configurations

5.1 Radio Configurations

The RRU22 is a WCDMA capable radio unit.

RRU22 Configuration	Bandwidth	Output Power*
WCDMA	2 carriers	20/40 W

The RRUW is a WCDMA capable radio unit.

RRUW Configuration	Bandwidth	Output Power*
WCDMA	4 carriers	20/40/60 W

The RRUS 01 is a multi-standard unit and can amplify two standards simultaneously. It supports one Tx branch per RRU.

Configuration	Bandwidth	Output Power*
GSM High capacity	4 TRXs	1x 20/40/60/80 W**
WCDMA	4 carriers	1x 20/40/60/80 W**
LTE	20 MHz	1x 20/40/60/80 W**

The RRUS 11/61 is a multi-standard unit and can amplify two standards simultaneously. It supports two Tx branches per RRU. RRUS 11 supports FDD, RRUS 61 supports TDD.

Configuration	Bandwidth	Output Power*
GSM High capacity	4 TRXs	2x 10/20/30/40 W**
WCDMA	4 carriers	2x 10/20/30/40 W**
LTE	20 MHz	2x 10/20/30/40 W**

* Output power from the antenna reference point. The output power and number of cell carriers/bandwith for RBS with RRUW or RRUS are set by use of HW activation codes.

** 80 W configuration is band dependent.

For radio performance information please see RBS 6000 Radio Performance and RBS 3000 Radio Performance in the Product Catalogue.

5.2 Digital Unit Configurations

5.2.1 GSM

Configuration	DUG 20	2*DUG 20
TRX	12	24

5.2.2 WCDMA

Configuration	DUW 10	DUW 20	DUW 30	2*DUW 30
Cell carriers	6	6	6	12
Channel Elements, (Downlink/Uplink)	128/128	384/384	768/512	1536/1024
DL Peak Throughput (Mbps)	42	126	252	504
UL Peak Throughput (Mbps)	12	36	48	96

5.2.3 LTE

Configuration	DUL 20
DL Peak Throughput (Mbps)	173
UL Peak Throughput (Mbps)	56
Number of users	1000

5.2.4 Transport Network Interfaces

Digital Unit	Max # of DU in MU	E1/T1	E1/T1/J1	STM-1	100/1000 Base-T Ethernet
DUG 20	2	4			
DUW 10/20/30	1		4	1	1
DUL 20	2				1

Additional interfaces and transport network configurations are available as options.

6 Technical Specifications

6.1 RRU, Supported standards

RRU22

Frequency	WCDMA
800 (B5)	X
900E (B8)	X
1700/2100 (B4)	X
1700/1800 (B9)	X
1900 (B2)	X
2100 (B1)	X

RRUW

Frequency	WCDMA
800 (B5)	X
1900 (B2)	X
2100 (B1)	X
1500 (B11)	X

RRUS 01

Frequency	GSM	WCDMA	LTE
800 (B5)	X	X	
900P (B0)	X		
900E (B8)	X	X	
1800 (B3)	X	X	X
1700/1800 (B9)		X	
1900 (B2)	X	X	
2100 (B1)		X	

RRUS 11

Frequency	WCDMA	LTE
700 (B12)		X
800 (B20)		X
800 (B26)		X
850 (B5)	X	X
1900 (B2)	X	X
1700/2100 (B4)	X	X
2100 (B1)	X	X
2600 (B7)		X
1900 - extended (B25)		X

RRUS 61

Frequency	LTE
2300 (B40) A,B.C,D,E & F	X

6.2   Power Options

Unit	Nominal Voltage
MU	−48 VDC
RRU	−48 V DC / 100–250 V AC *

* AC option comes with AC/DC converter piggy-backed to the RRU.

For power consumption information please see RBS 6000 Power Consumption and battery backup dimensioning guideline in the Product Catalogue.

6.3 Dimensions

The dimensions presented below refer to RRUS without the optional sun shield.

Unit	Height	Width	Depth
MU (RBS 6601)	66 mm	482 mm	350 mm
RRU22 20W	410 mm	334 mm	176 mm
RRU22 40W	514 mm	334 mm	176 mm
RRUW & RRUS 01	600 mm	350 mm	112 mm
RRUS 11	406 mm	416 mm	148 mm
RRUS 61	406 mm	416 mm	128 mm

6.4 Weight

Unit	Weight
MU (RBS 6601 with one DUG or DUL)	9 kg
MU (RBS 6601 with one DUW)	10.5 kg
RRU22 20W	19 kg (without Sunshield)
RRU22 40W	24 kg (without Sunshield)
RRUW & RRUS 01	20 kg (without Sunshield)
RRUS 11/61	20 - 23 kg (without Sunshield, frequency dependent)

7 Environmental Capabilities

This section contains a brief overview of standards, type approval, and Electromagnetic Compatibility (EMC).

7.1 Safety Standards

In accordance with market requirements, the RBS 6000 complies with the following product safety standards and directives:

Product Safety Compliance
EU Directives: 73/23/EEC Low Voltage Directive
Code of Federal Regulation 21 CFR 1040.10 and 1040.11
EN 60 950-1/IEC 60 950-1:2001 and IEC 60 950:1999
EN 60 215/IEC 60 215:1987
ANSI/UL 60 950-1/CSA C22.2 No. 60 950-1-03
IEC 60 825-1/EN 60 825-1

7.2 Other Standards and Requirements

7.2.1 Electromagnetic Compatibility

The RBS complies with European Community requirements regarding EMC. The product is labeled with the CE mark in order to show compliance with the legal requirements.

7.2.2 Product Approval Standards

The RBS complies with European Community requirements regarding radio performance. The product is labeled with the CE mark in order to show compliance with the legal requirements.

7.2.3 Earthquake Resistance

The RBS 6601 Main Unit is designed to withstand exposure to seismic activity in accordance with test method IEC/EN 60 068-2-57. The table below shows the vibration resistance.

Vibration Resistance	Specification
Normal operation	Max. 0.02 m2/s3
Exceptional operation	Max. 0.08 m2/s3
Non-destructive	Max. 0.15 m2/s3
Shock	Max. 30 m/s2

7.2.4 Acoustic Noise

Unit	Temperature	Sound Power Level
RRU22 40 W	+40ºC	< 43 dBA
	Room temperature	< 38 dBA

RRU22 20W, RRUW & RRUS generates no acoustic noise.

7.2.5 Operational Requirements

This section describes the operational environment for the RBS 6601.

Unit	Temperature Range	Relative Humidity
MU	+5ºC to +50ºC	5–85%
RRU22 20W	-33ºC to +50ºC	5–100%
RRU22 40W	-33ºC to +50ºC	5–100%
RRUW & RRUS 01	−40ºC to +55ºC	5–100%
RRUS 11/61*	−40ºC to +55ºC	5–100%

* RRUS 11 B7 temperature range −40ºC to +50ºC.