Test Report

Product

GIGASET S445

Manufacturer:

Siemens AG
8112 Cobalt Springs Drive
Plano, TX 75025

By

TEM Consulting, LP
140 River Rd.
Georgetown, TX 78628

September 2005

TYPE CERTIFICATION TEST REPORT

GIGASET S445 Base Station
Model Number *S30852-H1634-R301*

TABLE OF CONTENTS

LIST of TABLES

LIST of FIGURES

List of Abbreviations

B –	emission bandwidth
BS –	Base Station
CW –	continuous wave
dBi –	dB referenced to isotropic antenna gain
EUT –	Equipment Under Test
LIC –	Least Interfered Channel
M_L –	upper interference threshold
M_U –	upper interference threshold
MS -	Mobile Station
n.a. –	not applicable
ppm -	parts per million
PSD -	power spectral density
rf –	radio frequency
RBW –	resolution bandwidth
TDMA –	time division multiple access
T_U –	Upper Threshold
T_L –	Lower Threshold
U_M –	measurement uncertainty

1. EUT Description

The Equipment Under Test (EUT) is the **GIGASET S445 Base Station**.

Specific test requirements for this device include the following:

47 CFR 15.249	Fundamental Transmit Power
47 CFR 15.249	Spurious Radiated Power
15.205 & 15.209	
47 CFR 15.231	Occupied Bandwidth
47 CFR 15.203	Antenna Requirement
47 CFR 15.207	Conducted Emissions

The system tested consisted of the following:

Manufacturer & Model	**FCC ID #**	**Description**
GIGASET S445	**L82-S445**	**Base Station**

2. Testing Summary

The **GIGASET S445 BS** was tested and found to be in compliance with FCC Part 15, Subpart D (UPCS).

The following table details the test and evaluation results:

General Requirements				
Requirement	**FCC Part**	**Test Procedure** (Section numbers refer to ANSI C63.17 unless otherwise noted)	**Result**	**Detailed Results**
Conducted Out of Band Emissions	**15.309 (b) & FCC Part 15 Subpart B, 15.107**		**PASS**	**Separate Attachment**
Radiated Out of Band Emissions	**15.309 (b) & FCC Part 15 Subpart B, 15.109**		**PASS**	**Separate Attachment**
Labeling Requirements	**15.311 & 15.19(a)(3)**		**PASS**	**Separate Attachment**
Conducted Emissions	**15.315 & 15.207**	**ANSI C63.4**	**PASS**	**5.1**
Antenna Requirements	**15.317 & 15.203**	**Declaration**	**Attestation**	**5.2**
Use digital modulation	**15.319 (b)**	**6.1.4**	**Attestation**	**5.3**

Requirement	FCC Part	Test Procedure (Section numbers refer to ANSI C63.17 unless otherwise noted)	Result	Detailed Results
Peak transmit power	15.303(f) & 15.319 (c)	6.1.2	PASS	5.4
Power spectral density	15.319 (d) & 15.107	6.1.5	PASS	5.5
Power adjustment for antenna gain	15.319 (e)	4	Attestation	5.6
Automatically discontinue transmission	15.319 (f)		PASS	5.7
Spurious emissions	15.319 (g) & 15.209	6.1.6	PASS	5.8
RF Exposure SAR Testing of Handset	15.319 (i) & 1.1307(b), 2.1091 and 2.1093	ANSI/IEEE C95.1	Attestation	5.29

Isochronous Requirements				
Emission Bandwidth	15.303(c) & 15.323 (a)	6.1.3	PASS	5.9
Listen before talk	15.323 (c)	7	PASS	5.10
Monitoring time	15.323 (c)(1)	7.3.4	PASS	5.11
Monitoring threshold	15.323 (c)(2)	7.3.1	PASS	5.12
Maximum transmit time	15.323 (c)(3)	8.2.2	PASS	5.13
System acknowledgement	15.323 (c)(4)	8.1.1 & 8.1.2	PASS	5.14
Least Interfered Channel	15.323 (c)(5.1)	7.3.2 & 7.3.3	PASS	5.15
Channel confirmation	15.323 (c)(5.2)	7.3.3 & 7.3.4	PASS	5.16
Power measurement resolution	15.323 (c)(5.3)	7.3.3	PASS	5.17
Segment occupancy	15.323 (c)(5.4)	Declaration	Attestation	5.18

Requirement	FCC Part	Test Procedure (Section numbers refer to ANSI C63.17 unless otherwise noted)	Result	Detailed Results
Random waiting	15.323 (c)(6)	8.1.3	Attestation	5.19
Monitoring bandwidth	15.323 (c)(7.1)	7.4	PASS	5.20
Monitoring reaction time	15.323 (c)(7.2)	7.5	Attestation	5.21
Monitoring antenna	15.323 (c)(8)	4	PASS	5.22
Monitoring threshold relaxation	15.323 (c)(9)	4	PASS	5.23
Duplex system LBT	15.323 (c)(10)	8.3	Attestation	5.24
Alternate monitoring interval	15.323 (c)(11)	8.4	Attestation	5.25
Fair access	15.323 (c)(12)	Declaration	Attestation	5.26
Out of band emissions	15.323 (d)	6.1.6	PASS	5.8
Frame period	15.323 (e)	6.2.2 & 6.2.3	PASS	5.27
Frequency stability	15.323 (f)	6.2.1	PASS	5.28

Table 1: Testing Summary for BS

3. Test Facility

3.1. Siemens AG Test Laboratory

Most of the tests, except for **Conducted Out of Band Emissions, Radiated Out of Band Emissions and RF Exposure SAR Testing of Handset** are performed by the Siemens AG Test Laboratory.

Siemens AG
Frankenstr. 2
46395 Bocholt
Germany

Contact: Albert Bueckers
Tel.: +49 2871 91-2786
Fax. : +49 2871 91-62786
E-Mail: albert.bueckers@siemens.com

3.2. Recognized FCC Test Facility

CETECOM, a recognized FCC test facility, has performed the tests **Conducted Out of Band Emissions, Radiated Out of Band Emissions and RF Exposure SAR Testing of Handset.**

CETECOM ICT Services GmbH
Untertürkheimerstr. 6-10
66117 Saarbrücken
Germany
Tel: +49 681598 0
Fax: +49 681598 8775

3.3. Test Equipment at Siemens AG Test Laboratory

No.	Test Equipment	Manufacturer	Model No.
1	Programmable Power Supply	Hameg	HM 8142
2	RF Signal Generator	Rohde & Schwarz	SMIQ 03B
3	RF Spectrum Analyzer	Rohde & Schwarz	FSIQ 7
4	DECT Digital Communication Tester	Rohde & Schwarz	CMD 60
5	Oscilloscope	Tektronix	TDS 714 L
6	Arbitrary Waveform Generator	Hewlett Packard	33120A
7	RF Combiner	Huber & Suhner	4901.19.A
8	Frequency Counter	Fluke	PM 6685
9	DECT Protocol Tester	TIS	
10	Personal Computer	Fujitsu Siemens	Scenic 800
11	EMI Receiver	Rohde & Schwarz	ESHS 10
12	Filter Unit	Siemens	B84311-C20_B3
13	Terminations and Connectors	Huber & Suhner	
14	CDN-M2	Rohde & Schwarz	ESH 3-Z5
15	CDN-T	Rohde & Schwarz	ENY22
16	Anechoic Chamber		

Table 2: List of Test Equipment

3.4. Test Conditions

Unless otherwise stated the normal operating conditions for the BS are:

Condition	Value
Power Supply	110V AC / 9.5V DC adapter
Temperature	25°C
Relative Humidity Content	20…….75%
Air Pressure	86…….103kPa

Table 3: Test Conditions

4. Technical Specification

The technical specifications of this device are summarized below:

Specification	Value
Operating Standard	DECT
Operating Mode	TDMA
Frame Period	10ms
Time Slot Length	416.67μs
Slots per Frame	24 slots / 12 RX, 12 TX
Slot Structure	6 active duplex pairs per frame
Bit Rate	1.152MHz
Bit Period	868.1ns
Number of Frequency Channels	5
Frequency Band	1920 – 1930 MHz
Peak Transmission Power	21dBm nominal
Emission Bandwidth	2MHz nominal
Gaussian Frequency Shift Keying	B*T = 0.5 nominal
Deviation	400KHz nominal
Speech Codec	32kBit/s ADPCM
Receiver Sensitivity	-93dBm for BER of 1.10exp-3

Table 4: List of Specifications

Frequency Channel	Frequency
CH1	1921.536MHz
CH2	1923.264MHz
CH3	1924.992MHZ
CH4	1926.720MHz
CH5	1928.448MHz

Table 5: List of Frequency Channels

5. Detailed Test Procedures and Results

5.1. Conducted Emissions

5.1.1. Test Criteria

§ 15.315 Conducted limits.
An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in § 15.207.

§ 15.207 Conducted limits.
(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	*Conducted limit (dBμV)*	*Quasi-peak Average*
0.15–0.5	*66 to 56**	*56 to 46**
0.5–5	*56*	*46*
5–30	*60*	*50*

Decreases with the logarithm of the frequency.

(b) The limit shown in paragraph (a) of this section shall not apply to carrier current systems operating as intentional radiators on frequencies below 30MHz. In lieu thereof, these carrier current systems shall be subject to the following standards:
(1) For carrier current system containing their fundamental emission within the frequency band 535–1705 kHz and intended to be received using a standard AM broadcast receiver: no limit on conducted emissions.
(2) For all other carrier current systems: 1000 μV within the frequency band 535–1705 kHz, as measured using a 50 μH/50 ohms LISN.
(3) Carrier current systems operating below 30 MHz are also subject to the radiated emission limits in § 15.205, § 15.209, § 15.221, § 15.223, or § 15.227, as appropriate.
(c) Measurements to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines. Devices that include, or make provisions for, the use of battery chargers which permit operating while

charging, AC adapters or battery eliminators or that connect to the AC power lines indirectly, obtaining their power through another device which is connected to the AC power lines, shall be tested to demonstrate compliance with the conducted limits.

5.1.2. Test Procedure

This test is performed according to ANSI C63.4.

Principle setup for Conduced Emissions at ac power line:

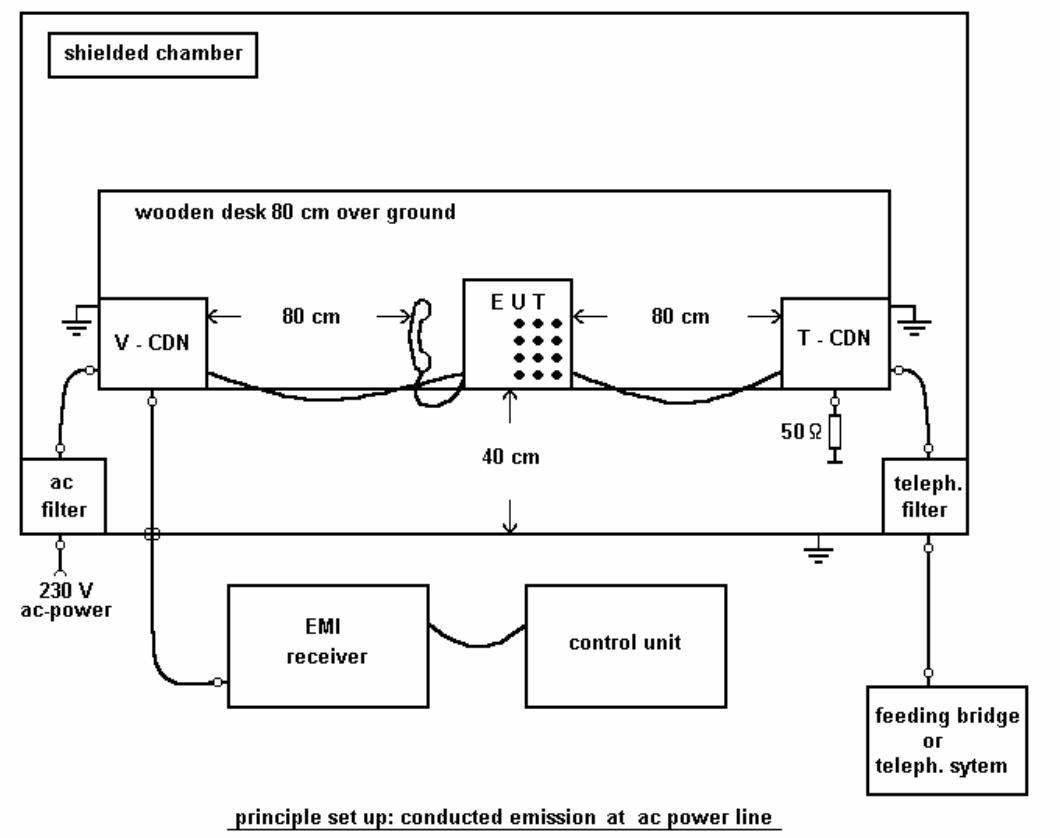

Figure 1: Test Setup for Conducted Emissions

The following test procedure is applied:

Setup	Test Procedure
1	The EUT was connected to a PBX via CDN-T and filter unit.
2	The power supply was connected to a CDN-M2. During measuring at the CDN-M2, the CDN-T was terminated with 50 ohm.
3	A communication link is setup. (Operating Mode)
4	The EUT is set into Standby mode. (Standby Mode)

Table 6: Test Procedure for Conducted Emission

5.1.3. Test Results

The test results are given below:

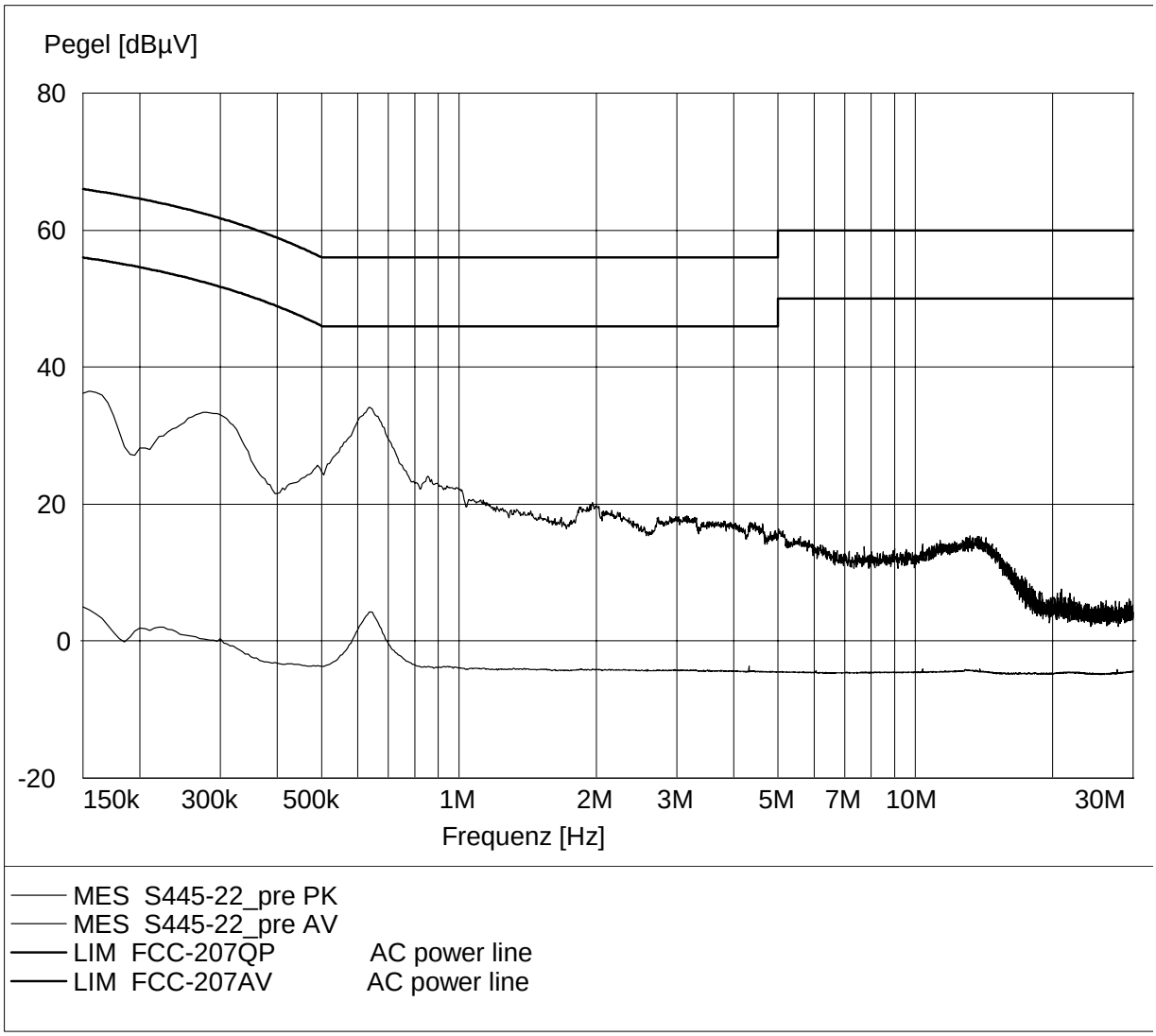

Figure 2: Conducted Emission of BS in Operating Mode

The emissions are below the indicated limits.

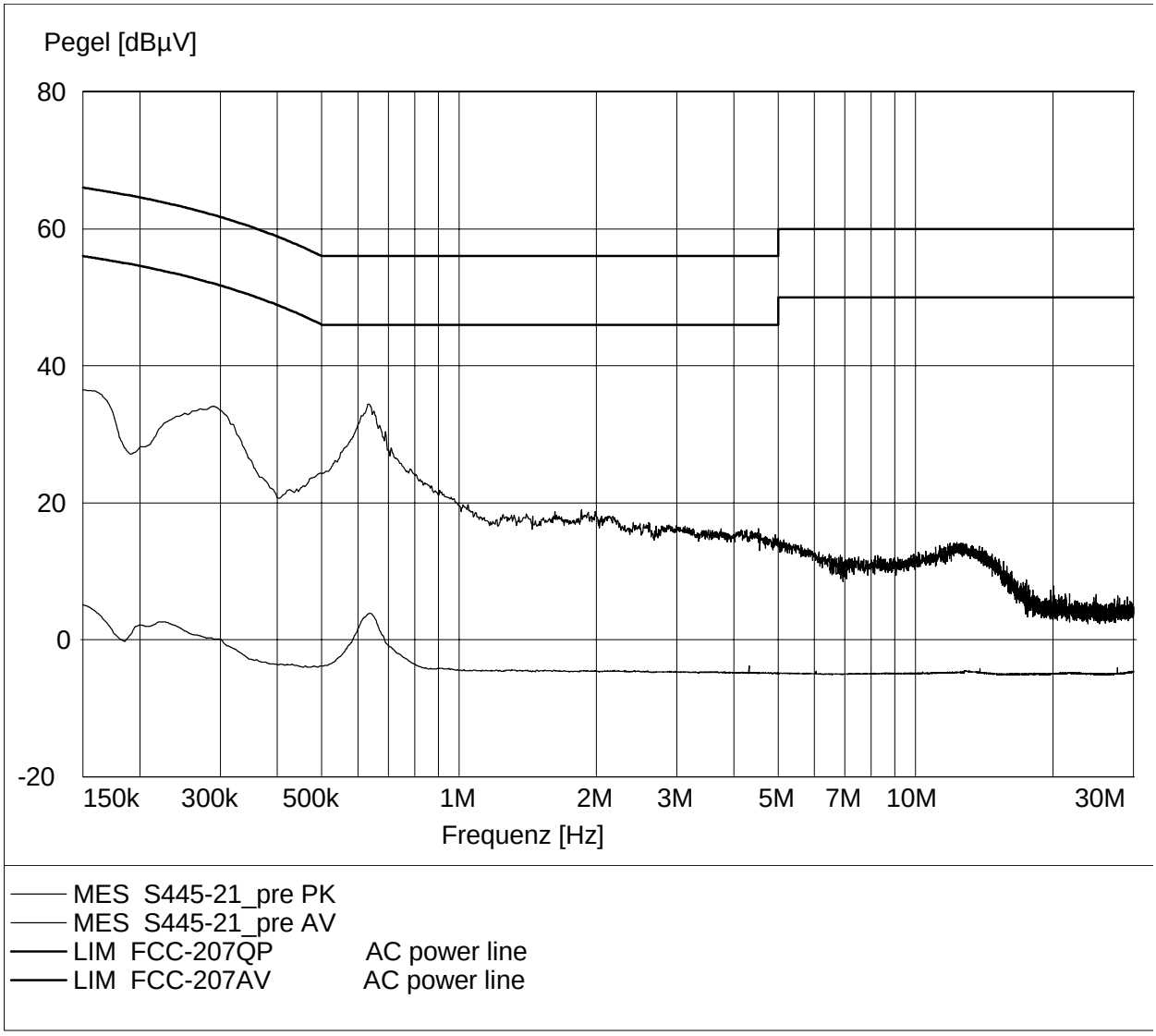

Figure 3: Conducted Emission of BS in Standby Mode

The emissions are below the indicated limits.

Result: Pass

5.2. Antenna Requirements

5.2.1. Test Criteria

47CFR15.203 Antenna requirement.
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

5.2.2. Procedure

Attestation of manufacturer supported by photos and/or description of the antenna to allow visual confirmation.

5.2.3. Attestation

The BS uses permanently attached antennae. The BS uses two antennae, a PCB antenna and an inverted-F antenna, for antenna diversity.

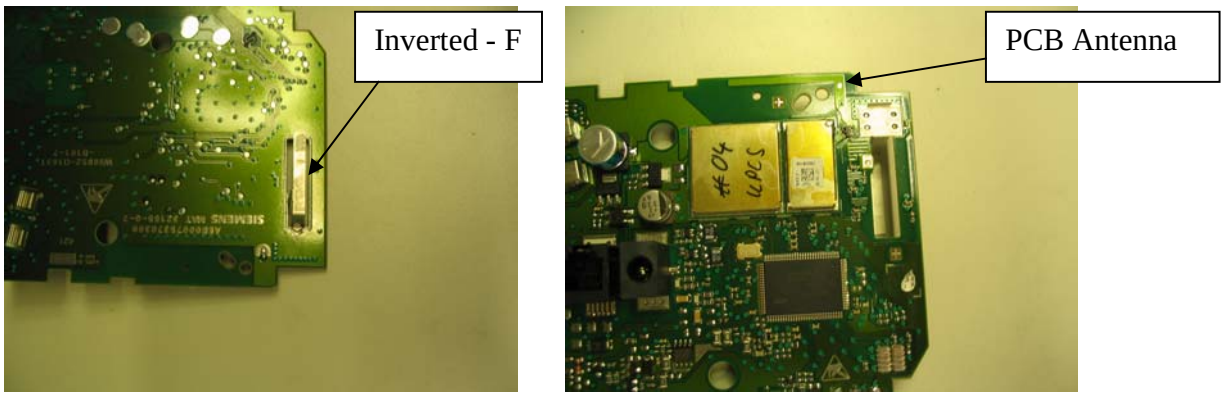

Figure 4: BS Antennae

No external antenna can be attached to the device.

5.3. Use digital modulation

5.3.1. Test Criteria

Section 15.319 General technical requirements.
(b) All transmissions must use only digital modulation techniques.

5.3.2. Procedure

Attestation of manufacturer supported by reference to relevant DECT specifications.

5.3.3. Attestation

This device is compliant with the DECT standards described in European Standards EN 300 175-2 and EN 300 175-3. DECT transmissions are MC/TDMA/TDD (Multi carrier / Time Division Multiple Access / Time Division Duplex) using Digital GFSK modulation.

For further details see operational description or relevant portions of the DECT standards.

5.4. Peak transmit power

5.4.1. Test Criteria

Section 15.319 General technical requirements.
(c) Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited resolution bandwidth capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.

5.4.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.1.2, which provides the test methodology for this provision. The EUT is controlled from a personal computer and set into continuous transmission mode.

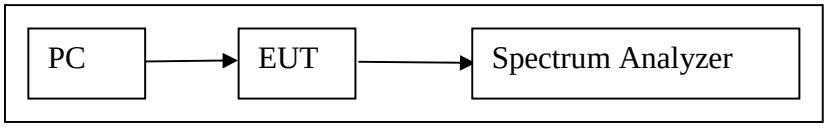

Figure 5: Test Setup for Peak Power Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.1.2:

Centre Frequency	CH1, CH3, CH5
RBW	10MHz
VBW	10MHz
Trigger	Video
Span	zero
Detection	Peak Detection
Sweep Rate	1ms
Amplitude Scale	Log
Peak Hold	On

Table 7: Spectrum Analyzer Settings for Peak Transmit Power Measurement

The peak transmit power of the BS is measured at 25°C and frequency channel CH1, CH3 and CH5.

The maximum allowable peak transmit power is described in ANSI C63.17 Clause 4.3.1.

The antenna gain of both BS antennae is < 3dBi.
Therefore $P_{limit} = P_{max}$

The emission bandwidth = 1.8MHz and therefore:

P_{max} = 5 log B – 10dBm
= 5 log (1.8exp6) – 10dBm
= 21.3dBm

The maximum allowable peak transmit power is 21.3dBm.

5.4.3. Test Results

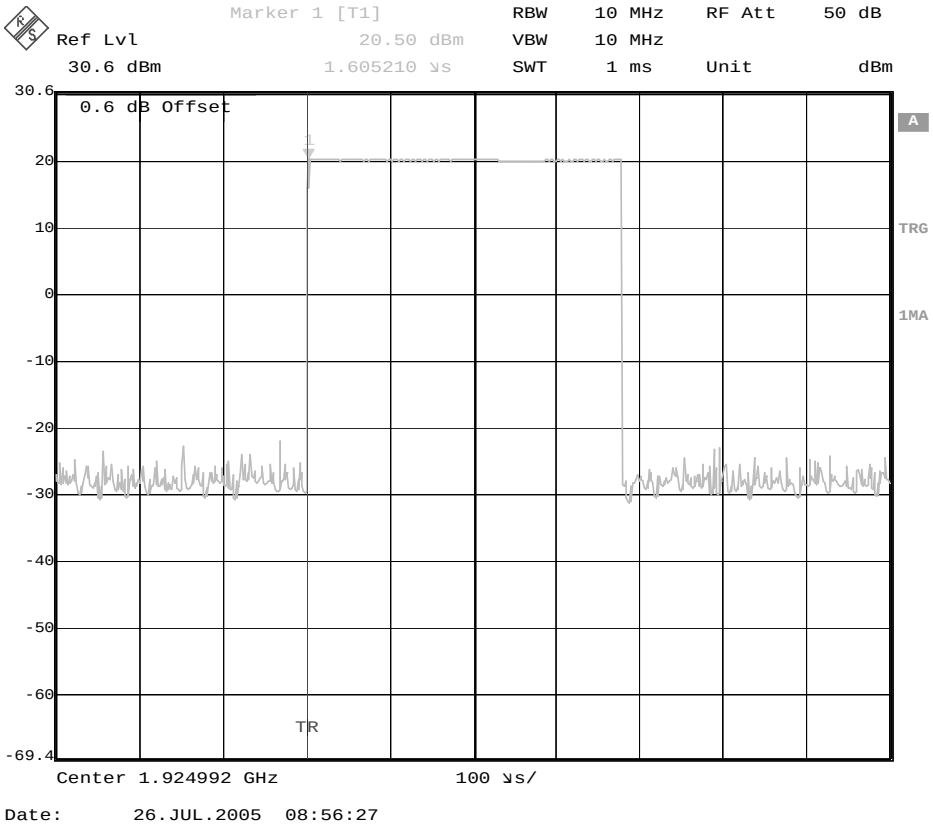

Figure 6: Peak Transmit Power of BS at CH3

The following results are measured:

Peak Transmit Power	Measurement	Result
CH1	20.6dBm	Pass
CH3	20.5dBm	Pass
CH5	20.5dBm	Pass

Table 8: Measured Peak Transmit Power of BS

Result: Pass

5.5. Power Spectral Density

5.5.1. Test Criteria

§ 15.319 General technical requirements.
(d) Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a resolution bandwidth of 3 kHz.

5.5.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.1.5, which provides the test methodology for this provision. In order to achieve pseudo random data transfer, as in reality, a connection is setup between the EUT and a Rhode and Schwarz DECT Test Device the CMD 60.

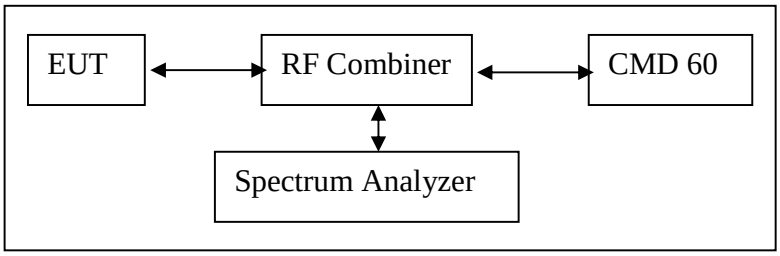

Figure 7: CMD60 and Spectrum Analyzer Test Setup

The CMD settings are shown below:

Traffic Carrier Offset	-20
Frequency Channel	4
Traffic Slot	2
RF Level	-70dBm
Data Type	PRBS

Table 9: CMD60 Test Setup for Power Spectral Density Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.1.5:

Centre Frequency	CH1, CH3, CH5
RBW	3KHz
VBW	3KHz
Trigger	Free Run
Span	10KHz
Detection	Peak Detection
Sweep Rate	20ms
Amplitude Scale	Log
Peak Hold	On

Table 10: Spectrum Analyzer Settings for Power Spectral Density Measurement

The power spectral density of the BS is measured at 25°C and frequency channel CH1, CH3 and CH5.

According to Part 15.319 (d) the maximum allowable Power Spectral Density is 3mW
PSD_{limit} = 3mW = 4,8dBm

5.5.3. Test Results

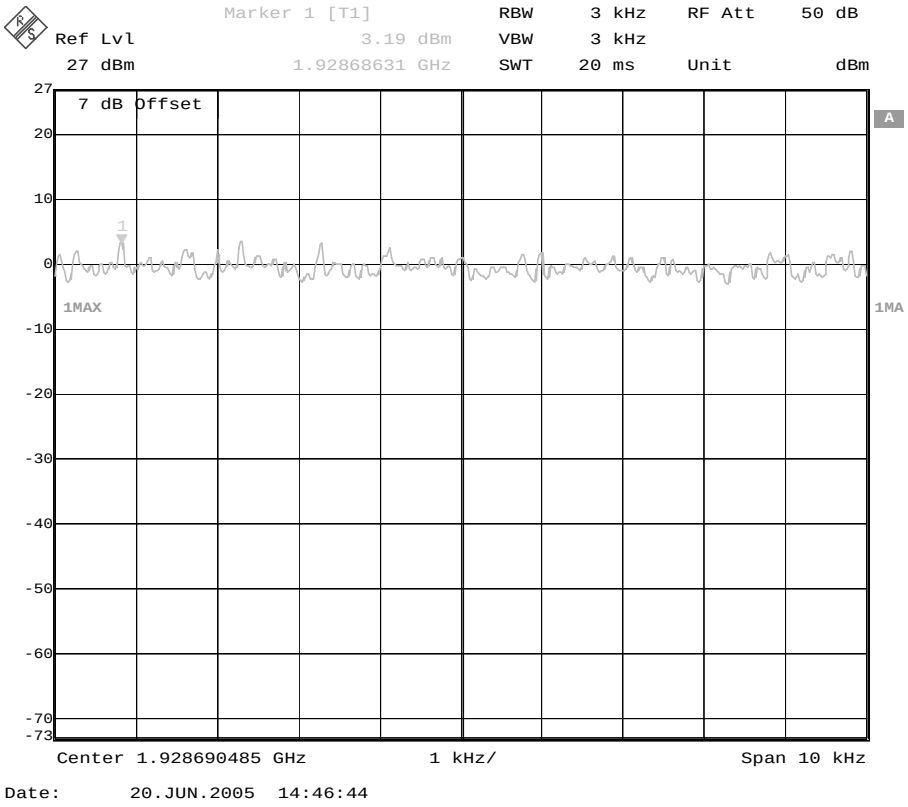

Figure 8: Spectrum Analyzer Display of Power Spectral Density of BS at CH3

The following results are measured:

Power Spectral Density	Measurement	Result
CH1	2.5mW/3KHz	Pass
CH3	2.4mW/3KHz	Pass
CH5	2.1mW/3KHz	Pass

Table 11: Measured Power Spectral Density of BS

Result: Pass

5.6. Power adjustment for antenna gain

5.6.1. Test Criteria

§ 15.319 General technical requirements.
(e) The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.

5.6.2. Test Procedure

The antenna gain of the BS is measured in an anechoic room.

5.6.3. Test Results

The antennae are separated from the rf front end and connected to external coax cable.

Figure 9: Antenna Measurement of BS

Inverted-F BS Antenna

	Vert. Ant	Hor. Ant
Min.	-17,5 dB	-27,8 dB
Max.	-0,4 dB	-1,8 dB
Mittelwert	-5,4 dB	-6,6 dB

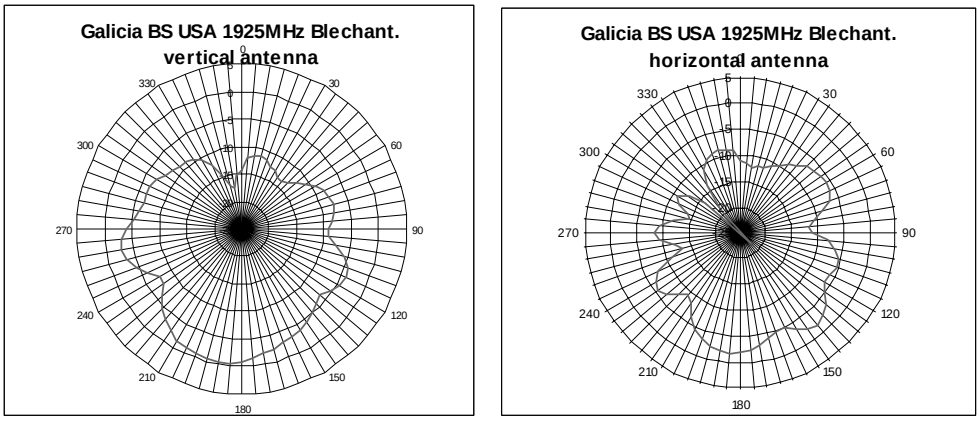

Figure 10: Antenna Diagram of BS Inverted-F Antenna at CH3

PCB BS Antenna

	Vert. Ant	Hor. Ant
Min.	-35,0 dB	-25,3 dB
Max.	-6,6 dB	-3,2 dB
Mittelwert	-11,5 dB	-7,0 dB

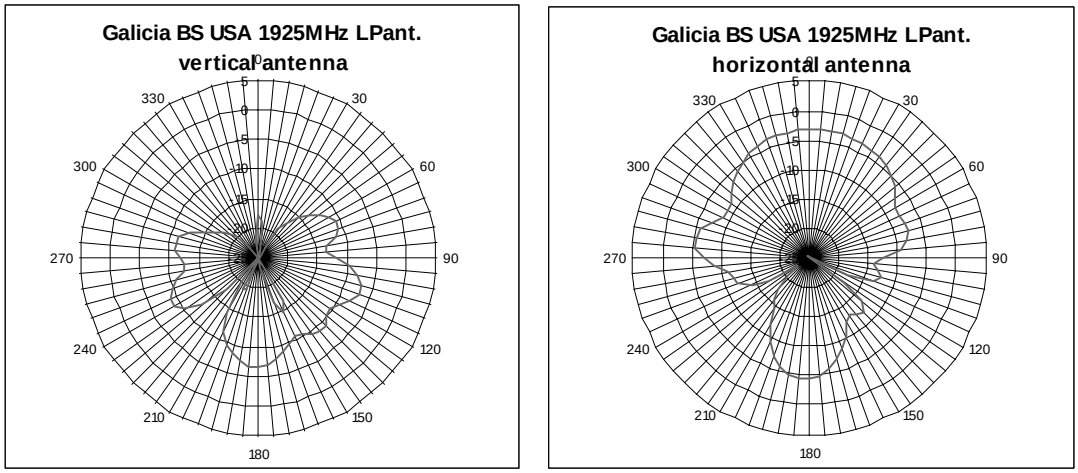

Figure 11: Antenna Diagram of BS PCB Antenna at CH3

The antenna measurements are summarized below:

	Inverted-F Antenna	**PCB Antenna**
Max Vert. Gain	-0.4dBi	-6.6dBi
Max Hor. Gain	-1.8dBi	-3.2dBi

Table 12: Summarized Test Result of BS Antenna Measurement at CH3

Result: The maximum antenna gain < 3dBi.

5.7. Automatically discontinue transmission

5.7.1. Test Criteria

Section 15.319 General technical requirements.
(f) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.

5.7.2. Test Procedure

Attestation of manufacturer supported by test results. The statement shall include a description of how the EUT operates when there is no data to transmit. This may be met by reference to relevant portions of the DECT standards. The supporting testing is as follows:

The following tests are performed after a connection is first established between the EUT and its companion device.

	Test	Reaction at EUT	Result
1	Remove Power from companion device.	A/B/C	Pass/Fail
2	Switch off the companion device.	A/B/C	Pass/Fail
3	Terminate call at the companion device.	A/B/C	Pass/Fail
4	Switch off the EUT.	A/B/C	Pass/Fail
5	Terminate call at the EUT.	A/B/C	Pass/Fail

Table 13: Test Procedure for Transmission Interruption

A – Connection is terminated and transmission ceases.
B – Connection is terminated but the EUT transmits control or signaling information
C – Connection is terminated but the companion device transmits control or signaling information

5.7.3. Test Result

The following testing is performed to confirm compliance with this provision :

	Test	Reaction at EUT	Result
1	Remove Power from companion device.	B	PASS
2	Switch off the companion device.	B	PASS
3	Terminate call at the companion device.	B	PASS
4	Switch off the EUT.	A	PASS
5	Terminate call at the EUT.	B	PASS

Table 14: Test Results for Transmission Interruption of BS

This device meets the requirement for automatic discontinuous operation. Its compliance with the DECT standards assures that transmissions are stopped when data is not available. See:

- ETSI EN 300 173-3, chapter 11.5.1: RFPI handshake
- ETSI EN 301 406, chapter 4.5.10.3: Channel release

Result: PASS

5.8. Spurious emissions & Out of Band Emissions

5.8.1. Test Criteria

5.8.1.1. Out of Band Emissions

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.
(d)(1) Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the band edge and 1.25 MHz above or below the band; 50 dB between 1.25 and 2.5 MHz above or below the band; and 60 dB at 2.5 MHz or greater above or below the band.

5.8.1.2. Spurious and In Band Unwanted Emissions

(d)(2) Emissions inside the band must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth, the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth, the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the band edge, the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. "B" is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

5.8.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.1.6, which provides the test methodology for this provision.[1]

This test procedure for the spurious in-band and out-of-band emissions evaluates the frequency range 1905MHz to 1945MHz. The whole frequency range 9KHz up to 25GHz is supplied in a separate document.

The EUT is controlled from a personal computer and set into continuous transmission mode.

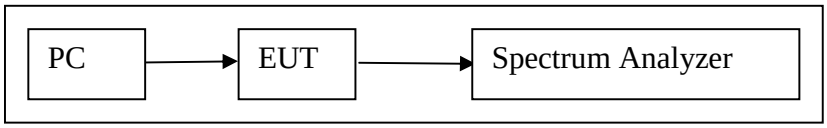

Figure 12: Test Setup for Spurious Emission Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.1.6:

Centre Frequency	CH1, CH3, CH5
RBW	20KHz
VBW	100KHz
Trigger	Free Run
Span	20MHz in-band, 40MHz out-of-band
Detection	Peak Detection
Sweep Rate	auto
Amplitude Scale	Log
Peak Hold	On

Table 15: Spectrum Analyzer Settings for Spurious Emission Measurement

The spurious emission of the BS is measured at 25°C and frequency channels CH1, CH3 and CH5.

The following limits apply:

	Out of Band Emissions	**Spurious and In Band Unwanted Emissions**
B	1.8 MHz	1.8 MHz
Peak Power	20.5dBm	21.3dBm
-30dB	Band Edge - 1.25MHz	1.8 – 3.6MHz
-50dB	1.25 – 2.5MHz	3.6 – 5.4MHz
-60dB	> 2.5MHz	> 5.4MHz

Table 16: Table of Limits for BS

[1] Where these limits are more stringent than 47 CFR 15, Subpart C,§15.209, the limits of 47 CFR 15, Subpart C,§15.209 take precedence as indicated in 47 CFR 15, Subpart D, §15.319 (g).

5.8.3. Test Results

5.8.3.1. Out of Band Emissions

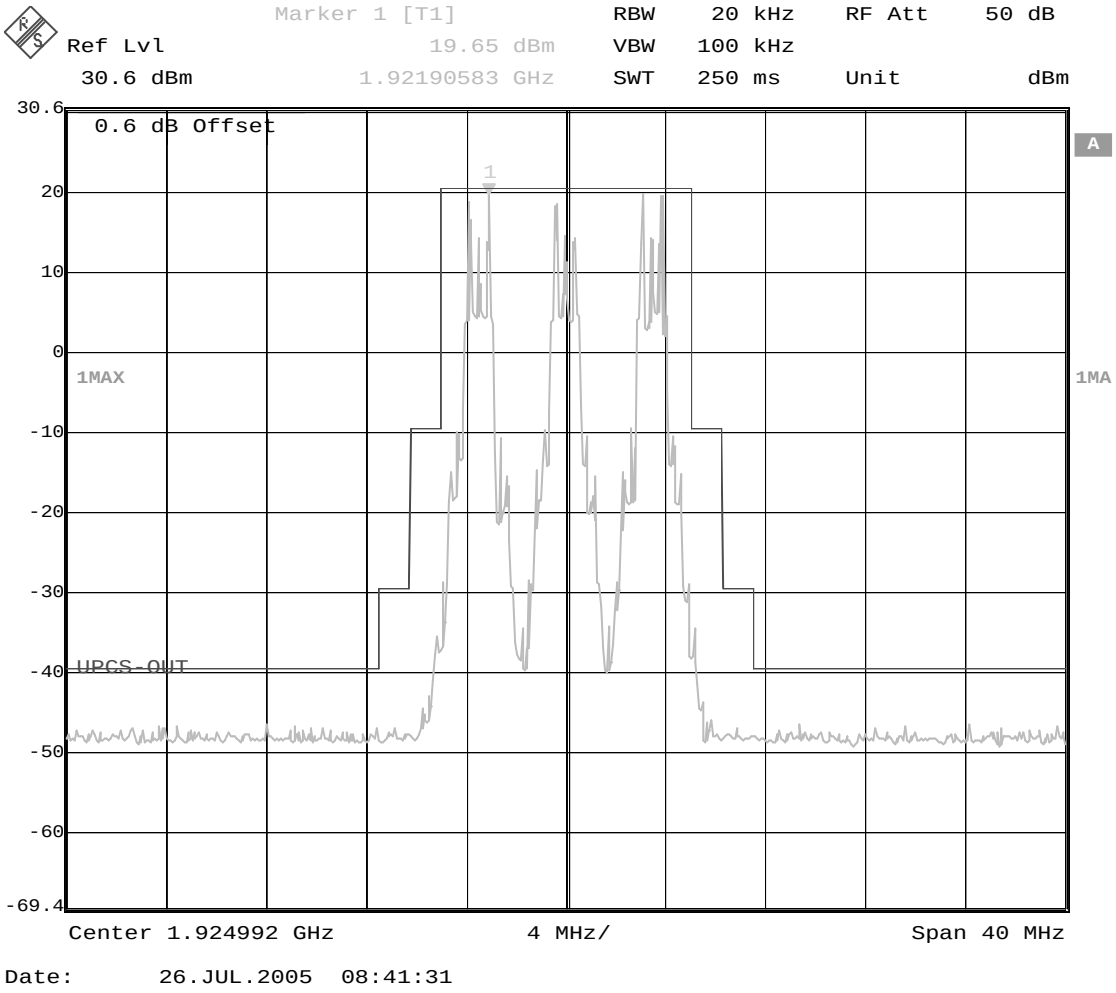

Figure 13: Out-of-Band Emission of BS at CH1, CH3, CH5

The BS spurious out-of-band transmission level is below the indicated limit.

Result: Pass

5.8.3.2. Spurious and In Band Unwanted Emissions

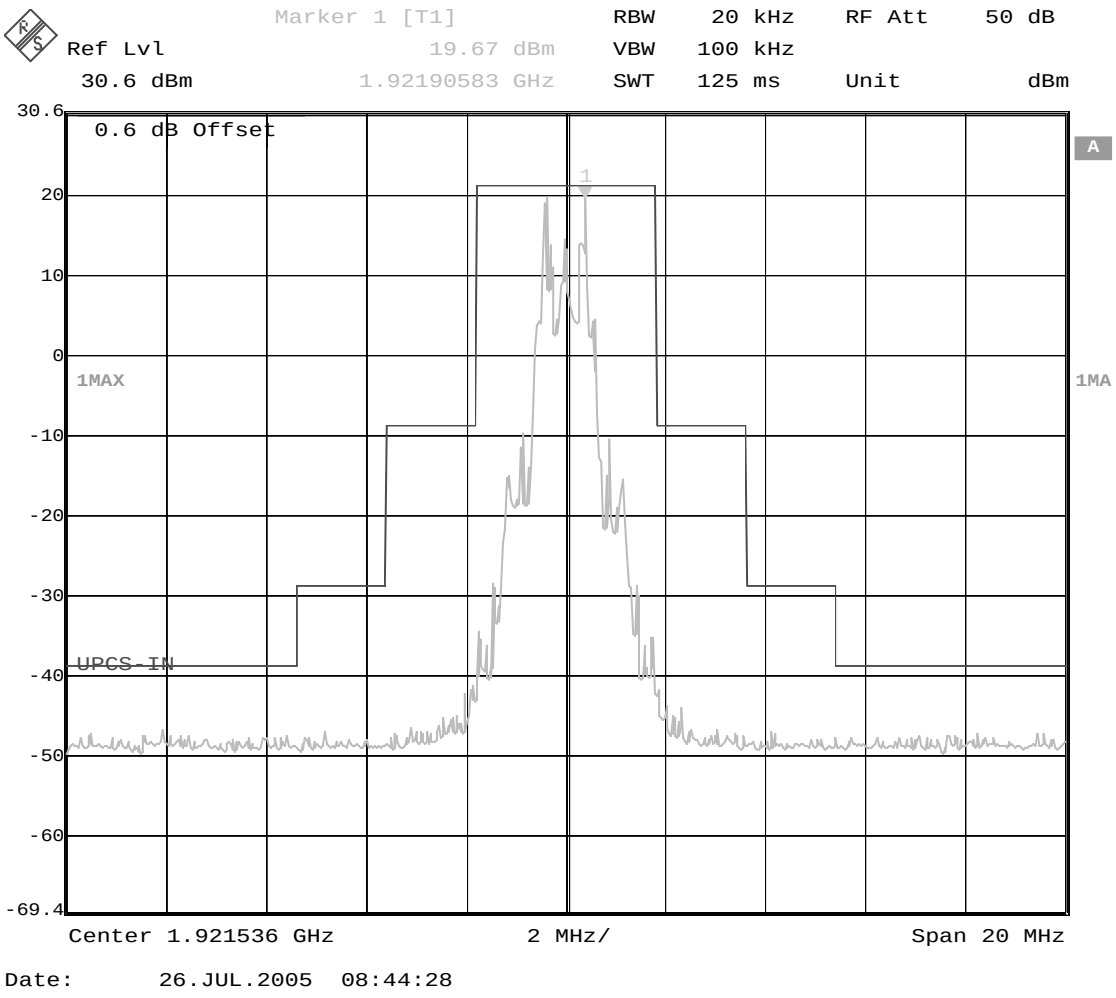

Figure 14: In-Band Spurious Emission of BS at CH1

The BS spurious in-band transmission level is below the indicated limit.

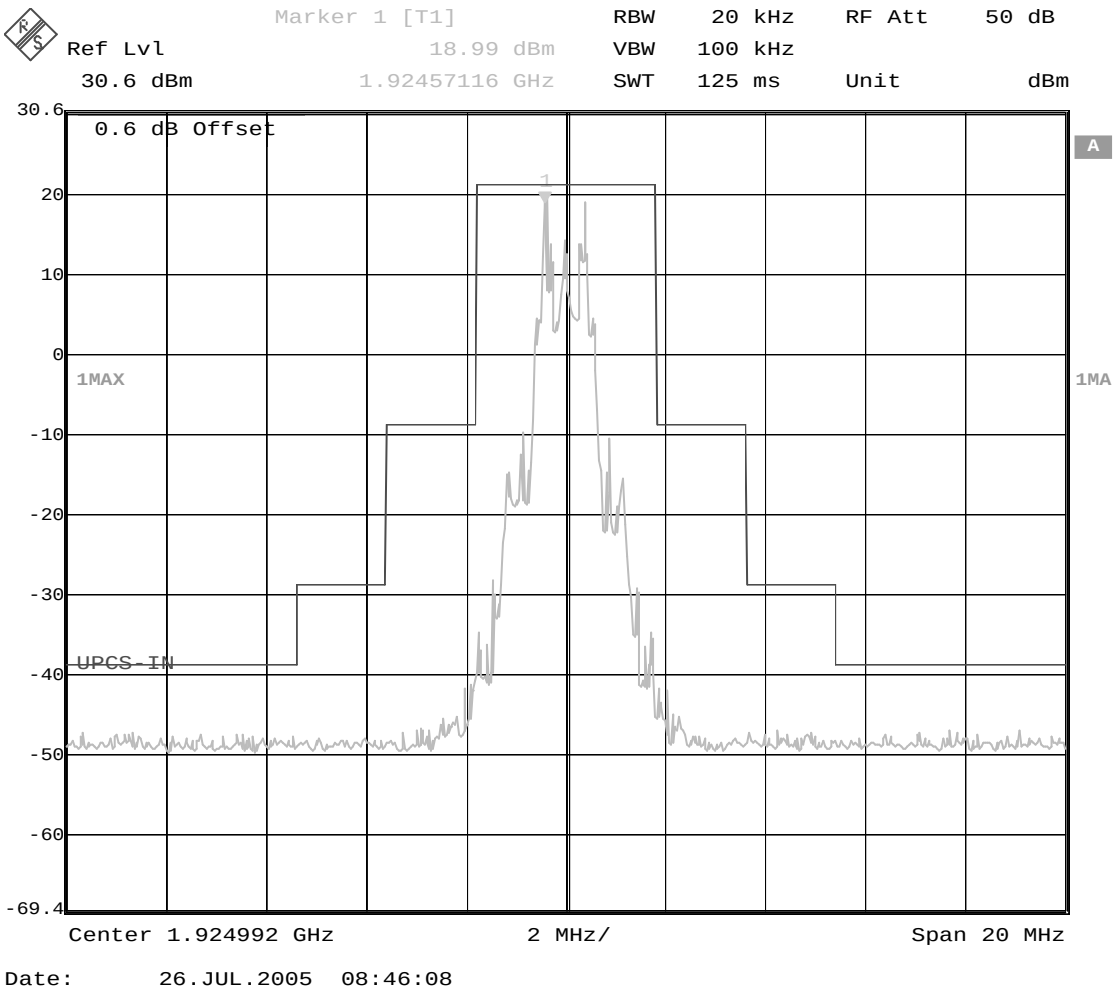

Figure 15: In-Band Spurious Emission of BS at CH3

The BS spurious in-band transmission level is below the indicated limit.

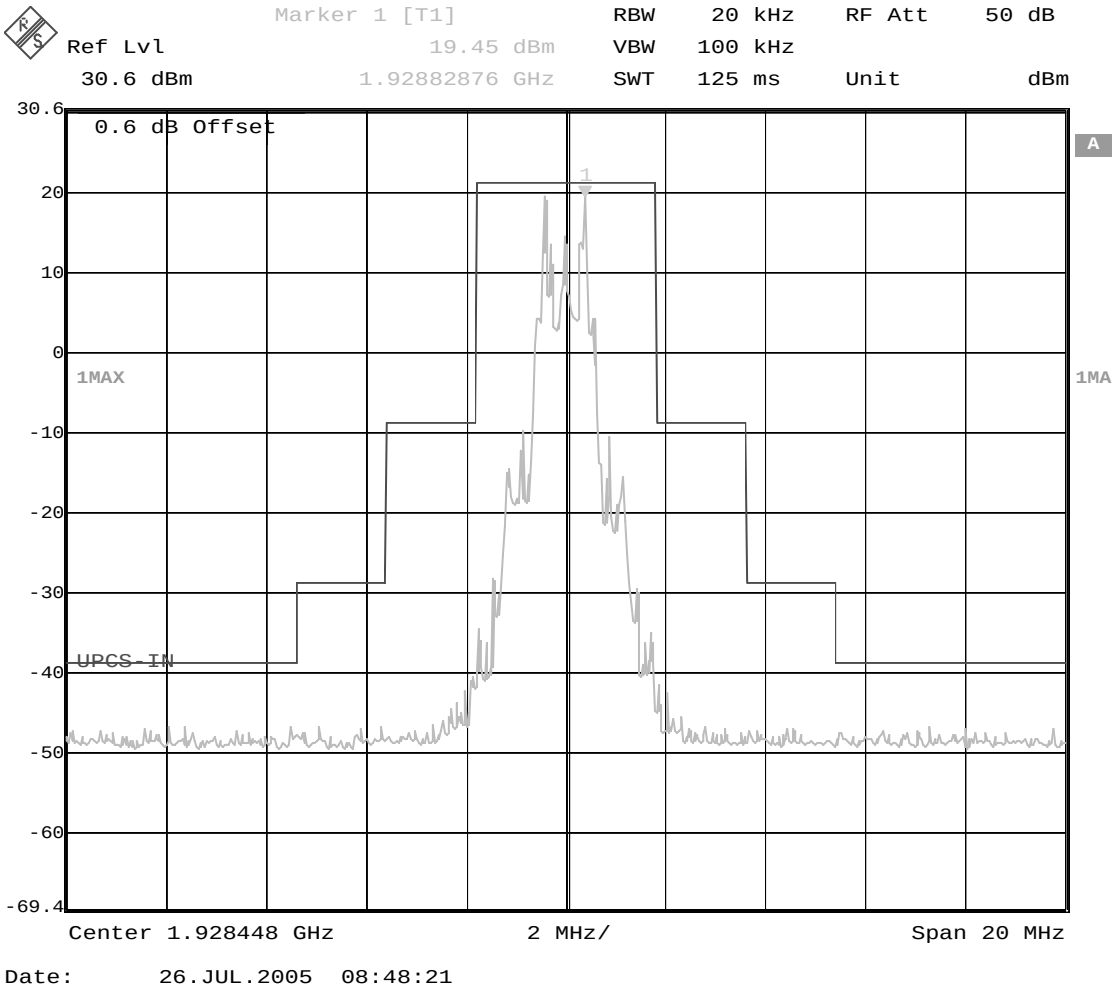

Figure 16: In-Band Spurious Emission of BS at CH5

The BS spurious in-band transmission level is below the indicated limit.

Result: Pass

5.9. Emission Bandwidth

5.9.1. Test Criteria

§ 15.303 Definitions.
(c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.
(a) Operation shall be contained within the 1920-1930 MHz band. The emission bandwidth shall be less then 2.5 MHz. The power level shall be as specified in §15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.

5.9.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.1.3, which provides the test methodology for this provision.

In order to achieve pseudo random data transfer, as in reality, a connection was setup between the EUT and a Rhode and Schwarz DECT Test Device the CMD 60.

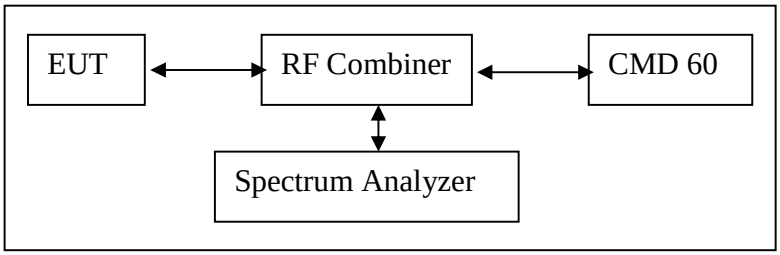

Figure 17: CMD60 and Spectrum Analyzer Test Setup

The CMD settings are shown below:

Traffic Carrier Offset	-20
Frequency Channel	4
Traffic Slot	2
RF Level	-70dBm
Data Type	PRBS

Table 17: CMD Test Setup for Power Spectral Density Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.1.3:

Centre Frequency	CH1, CH3, CH5
RBW	20KHz
VBW	100KHz
Trigger	Free Run
Span	5MHz
Detection	Peak Detection
Sweep Rate	auto
Amplitude Scale	Log
Peak Hold	On

Table 18: Spectrum Analyzer Settings for Emission Bandwidth Measurement

The emission bandwidth of the BS is measured at 25°C and frequency channel CH1, CH3 and CH5.

According to Part 15.323 (a) the maximum allowable emission bandwidth is 2.5MHz.

5.9.3. Test Results

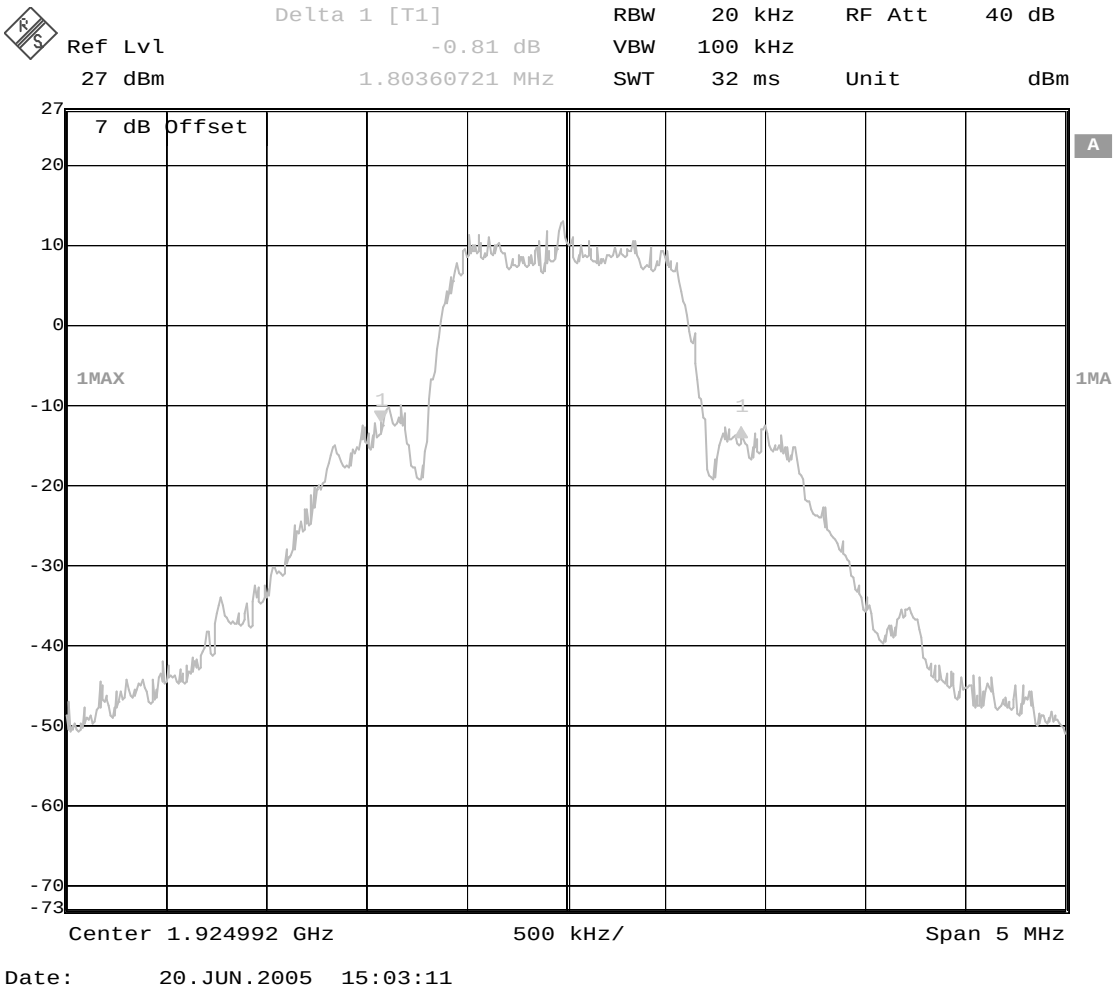

Figure 18: Emission Bandwidth of BS at CH3

The following results are measured:

Emission Bandwidth	Measurement	Result
CH1	1.8MHz	Pass
CH2	1.8MHz	Pass
CH3	1.8MHz	Pass

Table 19: Measured Emission Bandwidth of BS

Result: Pass

5.10. Listen Before Talk

5.10.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

5.10.2. Procedure

This requirement is split up into separate requirements which are covered by section 5.8 and sections 5.11 – 5.28.

5.10.3. Attestation

This requirement is met by section 5.8 and sections 5.11 – 5.28.

Result: Pass

5.11. Monitoring Time

5.11.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(1) Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 milliseconds or shorter frame period or at least 20 milliseconds for systems designed to use a 20 milliseconds frame period.

5.11.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.4, which provides the test methodology for this provision.

5.11.3. Test Procedure

The following test setup is used:

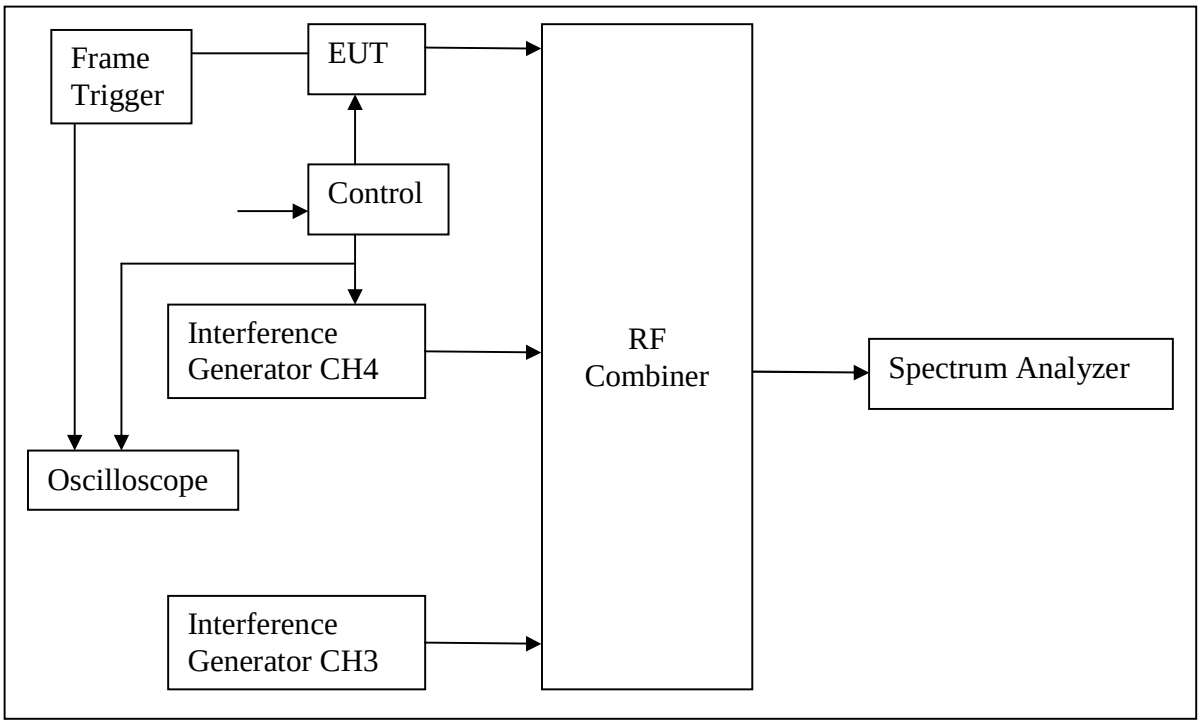

Figure 19: Test Setup for Monitoring Time of BS

The following test procedure is applied:

ANSI C63.17	Description
Clause 7.3.4 (a)	Restrict transmission to CH3 and CH4 only. Set CW interference on CH4 to a level of -60dBm. (T_U+1dB)
Clause 7.3.4 (b)	Switch ON BS and verify transmission of control signals on CH3. Switch OFF BS.
Clause 7.3.4 (c)	Apply CW interference on CH3 at a level of -60dBm (T_U+1dB).
Clause 7.3.4 (d)	Remove interference from CH4 and immediately switch ON BS. Verify transmission of control signals on CH4 within 20ms.

Table 20: Test Procedure for Monitoring Time of BS

The oscilloscope display is showing the CH4 rf disable signal and the frame sync signal from the BS. As soon as the frame sync signal appears a communication link should be setup on CH4. The communication link frequency is seen on the spectrum analyzer.

5.11.4. Test Results

The oscilloscope display is shown below:

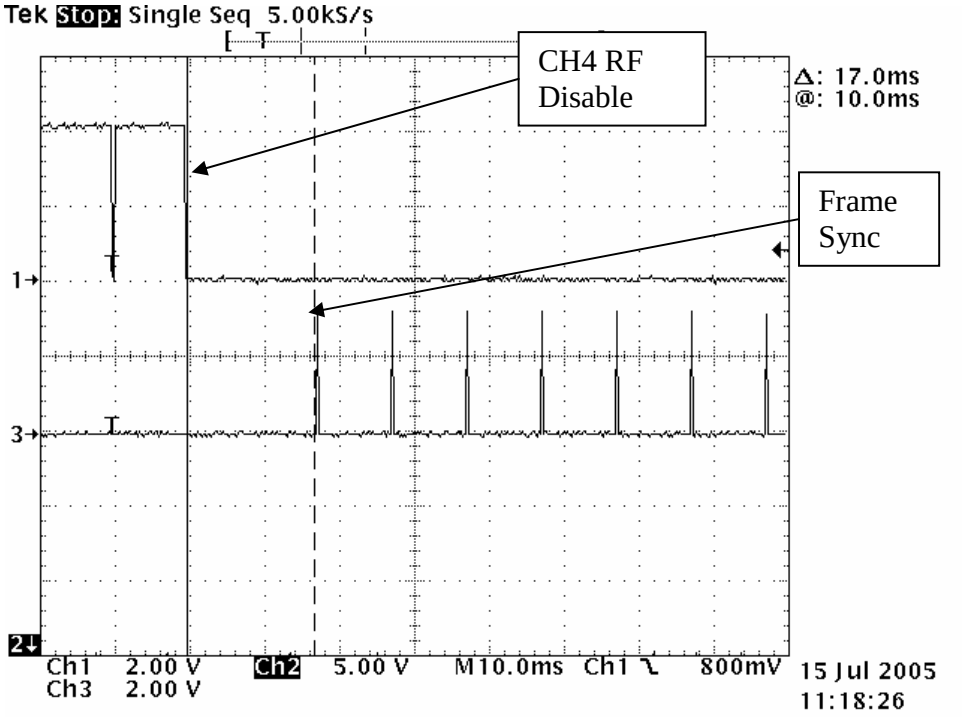

Figure 20: RF Disable and Frame Sync for Monitoring Time on BS

The following test results are obtained:

ANSI C63.17	Description	Result
Clause 7.3.4 (a)	Transmission is restricted to CH3 and CH4 only. CW Interference on CH4 to a level of -60dBm.	Pass
Clause 7.3.4 (b)	BS transmits control signals on CH3. Switch OFF BS.	Pass
Clause 7.3.4 (c)	Apply interference on CH3 at a level of -60dBm.	Pass
Clause 7.3.4 (d)	Remove interference from CH4 and immediately switch ON BS. 17ms after rf disable the frame sync signal appears, indicating control signal transmission on CH4.	Pass

Table 21: Test Procedure for Monitoring Time on BS

Result: Pass

5.12. Monitoring Threshold

5.12.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(2) The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth used by the device.

5.12.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.1, which provides the test methodology for this provision. The Clause states that the lower threshold is for devices that do not use the LIC procedure.

The equation for the lower monitoring threshold is given in ANSI C63.17 Clause 4.3.4.

$T_L \leq (-174 + 10\log B + M_L + P_{max} - P_{EUT})$ dBm

B = 1.8MHz
M_L = 30dB
$P_{max} = P_{EUT}$

T_L = -81.5dBm

5.12.3. Test Results

The GIGASET S445 utilizes a LIC procedure and transmits on the least interfered channel.

The rf sensitivity of the product for a BER of 1.10exp-3 is measured at -93dBm. The LIC procedure will be applied starting at -93dBm input power.

Result: Pass

5.13. Maximum Transmit Time

5.13.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.

5.13.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 8.2.2, which provides the test methodology for this provision.

A communication link is established between BS and MS in an anechoic room to prevent influence from other transmissions.

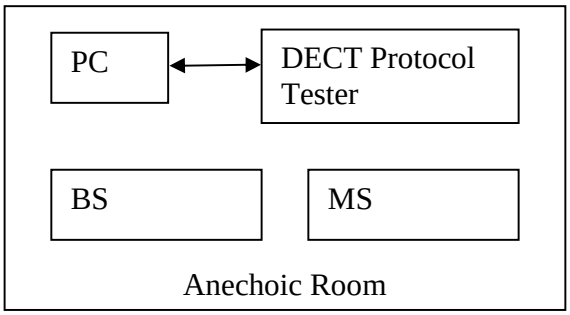

Figure 21: Test Setup for Maximum Transmit Time Measurement

According to FCC Part 15.323 (c) (3), the access criteria have to be verified at least every 8 hours. The following test is performed:

ANSIC 63.17	**Description**
Clause 8.2.2 (a)	Initiate a communication link between BS and MS.
Clause 8.2.2 (b)	Monitor the communication channel. This link is monitored by a DECT protocol tester in an anechoic room to ensure no other DECT influence except for the existing communication link.

Table 22: Measurement Procedure for Maximum Transmit Time

5.13.3. Test Results

	Absolute Time	**Time Difference**	**Result**
Initiate setup	15h30		n.a.
New Channel Access	16h07		n.a.
New Channel Access	19h02	2h54	Pass
New Channel Access	21h56	2h54	Pass
New Channel Access	0h51	2h54	Pass
New Channel Access	3h46	2h54	Pass
New Channel Access	6h41	2h54	Pass

Table 23: Result of Maximum Transmit Time Measurement

The access criteria are verified every 2:54 hour. During this procedure the channel is changed.

Result: Pass

5.14. System Acknowledgement

5.14.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.
(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:
(4) Once access to specific combined time and spectrum windows is obtained an acknowledgment from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgments must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgment, at which time the access criteria must be repeated.

5.14.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 8.1.1. & 8.1.2., which provides the test methodology for this provision.

The following test setup is used:

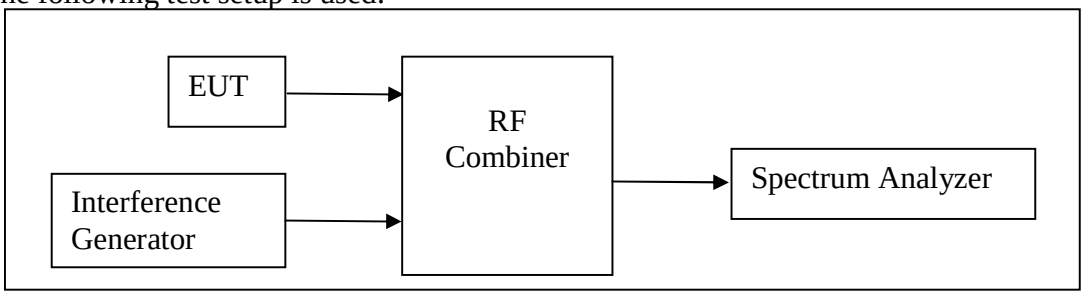

Figure 22: Test Setup for System Acknowledgement Measurement of BS

The following test procedure is performed:

ANSIC 63.17	**Description**
Clause 8.1.1 (a)	Restrict transmission on BS to CH3.
Clause 8.1.1 (b)	Verify that the BS terminates its transmission of control signals at least every 30s to verify access criteria. On the BS a Frame Sync and RSSI signal are recorded on an oscilloscope indicating the verification process. At certain frame sync positions no frame sync and no control signals are transmitted. At those positions the BS verifies the channel by measuring the RSSI level of the channel.
Clause 8.1.2 (a)	The BS is restricted to operate on CH1 or CH5 only.
Clause 8.1.2 (b)	The BS is switched on to transmit its control signals. When transmitting on either CH1 or CH5 a interference signal is introduced at the active frequency channel and level > T_U. It is to be verified 5 times that the control transmission signals are changing to the other available frequency channel within 30s.

Table 24: Test Procedure for System Acknowledgement of BS

5.14.3. Test Results

The following test results are obtained:

ANSIC 63.17	Description	Result
Clause 8.1.1 (a)	Transmission on BS is restricted to CH3.	Pass
Clause 8.1.1 (b)	After each frame sync signal the BS measures the RSSI level and therefore normally 6 channels are verified. At the cursor of the oscilloscope a missing frame sync is indicated. At this position a single RSSI measurement is done to measure the channel to renew its channel access criteria. This verification is performed every 5s.	Pass
Clause 8.1.2 (a)	Transmission on BS is restricted to CH1 or CH5.	Pass
Clause 8.1.2 (b)	Without any interference signal the BS is transmitting on CH5. After applying interference at -61dBm on CH5, within 5s the control signals are changing transmission from CH5 to CH1.	Pass

Table 25: Measurement Results of System Acknowledgement Tests of BS

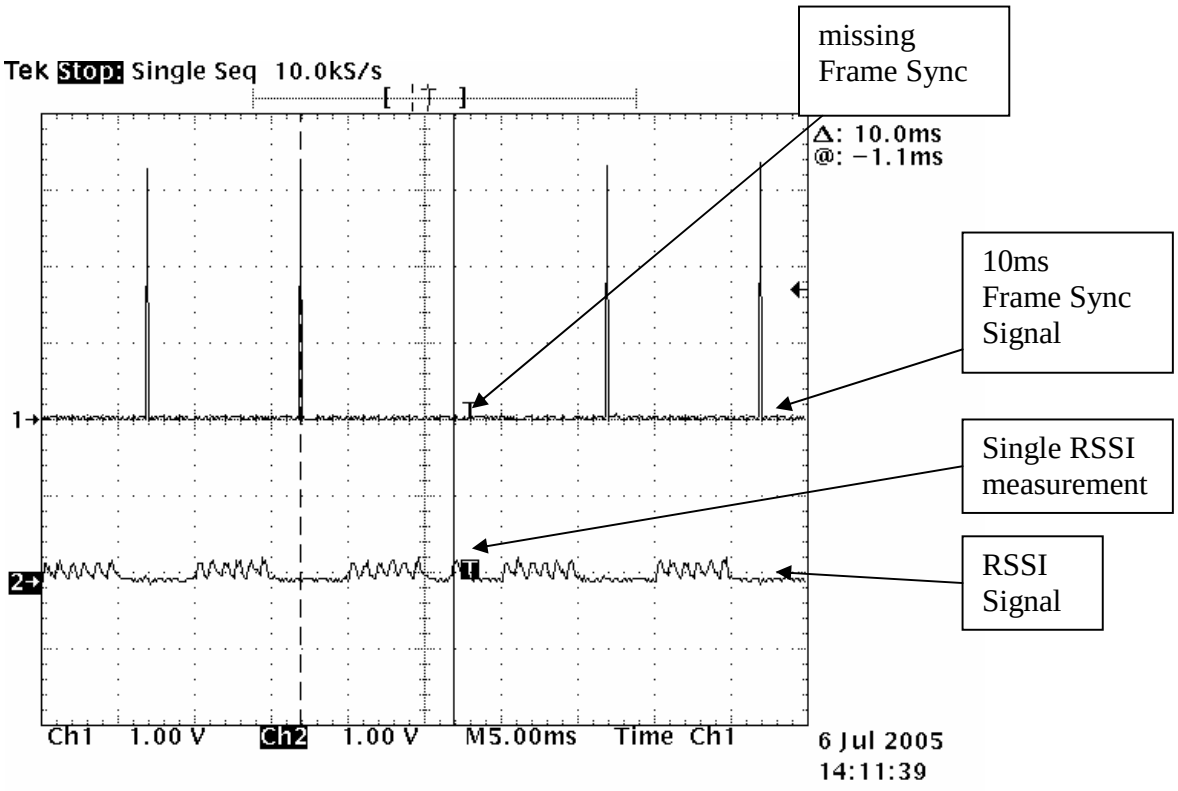

Figure 23: Frame Sync and RSSI Signal of BS

Result: Pass

5.15. Least Interfered Channel

5.15.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(5) If access to spectrum is not available as determined by the above, and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed.

5.15.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.2. & 7.3.3, which provides the test methodology for this provision.

The current product offers 12 duplex channels per frequency channel and therefore 12x5=60 duplex channels in total. Hence Part §15.323(c)(5) applies.

The equation for the upper monitoring threshold is given in ANSI C63.17 Clause 4.3.3.

$T_U \leq (-174 + 10\log B + M_U + P_{max} - P_{EUT})$ dBm

B = 1.8MHz
M_U = 50dB
$P_{max} = P_{EUT}$

T_U = -61.5dBm

5.15.2.1. Upper Threshold

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.2 (a), which provides the test methodology for this provision.

The following test setup is used:

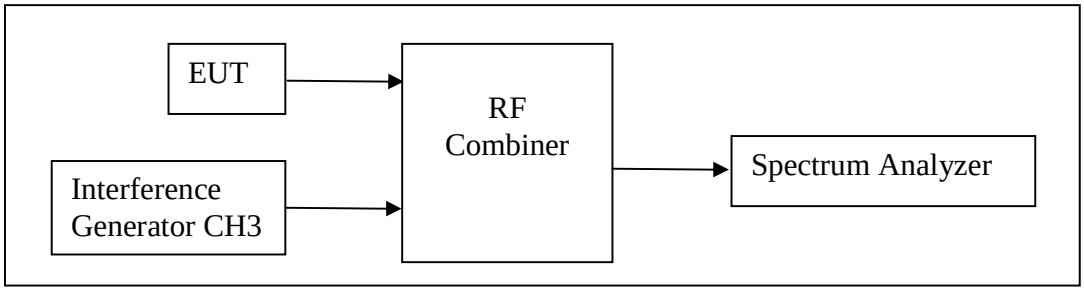

Figure 24: Test Setup for Upper Threshold Measurement of BS

The following test procedure is applied:

ANSI C63.17	**Description**
Clause 7.3.2 (a)	The BS is forced to operate on frequency channel CH3 only. Apply CW interference at CH3 and at level -51dBm (T_U +10dB). The BS is switched ON. Lower the interference level until the BS can transmit its control signals. Verify the communication link on spectrum analyzer.

Table 26: Test Procedure for Upper Threshold Measurement of BS

5.15.2.2. LIC Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.3, which provides the test methodology for this provision.

The following test setup is used:

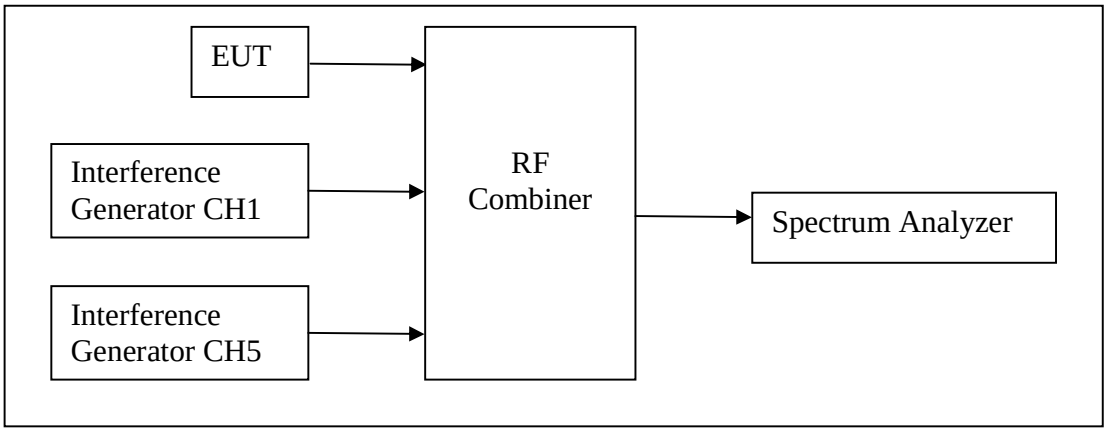

Figure 25: Test Setup for LIC Measurement of BS

The following test procedure is applied:

ANSI C63.17	**Description**
Clause 7.3.3 (a)	The EUT is restricted to transmit on either CH1 or CH5.
Clause 7.3.3. (b)	Apply interference on CH1 at level -74dBm (T_L + 7dB). Apply interference on CH5 at level -81dBm (T_L). Switch ON the BS 5 times and verify transmission on CH5.
Clause 7.3.3. (c)	Apply interference on CH1 at level -81dBm (T_L). Apply interference on CH5 at level -74dBm (T_L + 7dB). Switch ON the BS 5 times and verify transmission on CH1.
Clause 7.3.3. (d)	Apply interference on CH1 at level -80dBm (T_L + 1dB). Apply interference on CH5 at level -87dBm (T_L - 6dB). Switch ON the BS 5 times and verify transmission on CH5.
Clause 7.3.3. (e)	Apply interference on CH1 at level -87dBm (T_L - 6dB). Apply interference on CH5 at level -80dBm (T_L + 1dB). Switch ON the BS 5 times and verify transmission on CH1.

Table 27: Test Procedure for LIC Measurement of BS

Verify the communication on the spectrum analyzer.

5.15.3. Test Results

5.15.3.1. Upper Threshold

The BS is switched ON and the transmission of control signals is verified:

Interference Signal	Control Signal	Result
< -61dBm	YES	Pass
> -61dBm	NO	Pass

Table 28: Upper Threshold Measurement on BS

Result: Pass

5.15.3.2. LIC Procedure

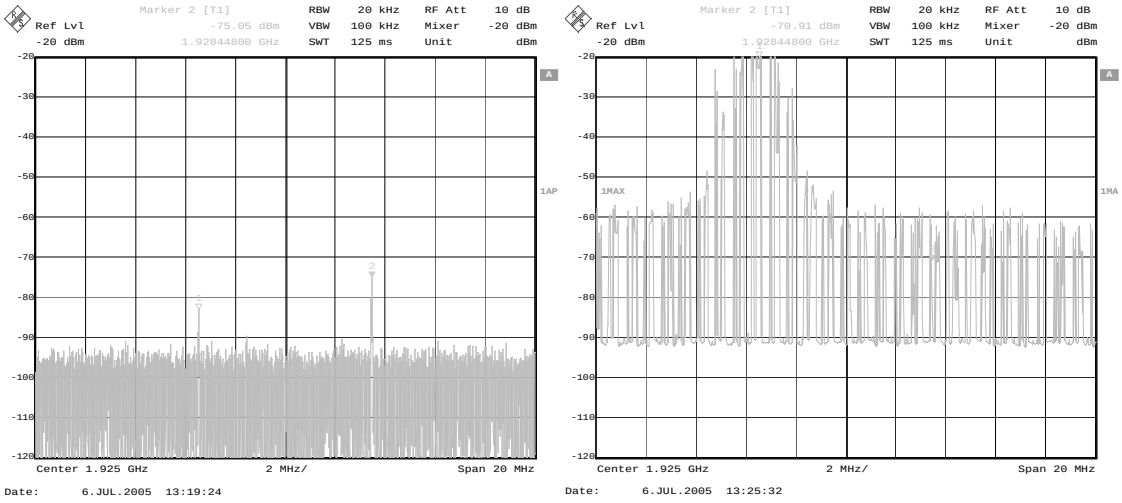

Figure 26: Spectrum Analyzer Display for LIC Procedure on BS

The spectrum analyzer display on the left shows the two interference sources at CH1 and CH5. Interference source at CH1 is at -81dBm (T_L) and CH5 is at -74dBm (T_L + 7dB). The spectrum analyzer display on the right shows the BS accessing CH1 (LIC).

The following test results are measured:

ANSI C63.17	Description	Result
Clause 7.3.3. (a)	The BS is restricted to CH1 or CH5.	Pass
Clause 7.3.3. (b)	5 x CH5 transmission of control signals	Pass
Clause 7.3.3. (c)	5 x CH1 transmission of control signals	Pass
Clause 7.3.3. (c)	5 x CH5 transmission of control signals	Pass
Clause 7.3.3. (d)	5 x CH1 transmission of control signals	Pass

Table 29: LIC Procedure Measurement on BS

Result: Pass

5.16. Channel Confirmation

5.16.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(5) A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 milliseconds frame period) immediately preceding actual channel access that the detected power of the selected time and spectrum windows is no higher than the previously detected value.

5.16.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.3 & 7.3.4, which provides the test methodology for this provision.

5.16.3. Test Results

This test was performed in section 5.11 and 5.15.

Result: Pass

5.17. Power Measurement Resolution

5.17.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(5) The power measurement resolution for this comparison must be accurate to within 6 dB.

5.17.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.3.3, which provides the test methodology for this provision.

5.17.3. Test Results

This procedure was tested in section 5.15.

Result: Pass

5.18. Segment Occupancy

5.18.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(5) No device or group of cooperating devices located within 1 meter of each other shall occupy more than three 1.25 MHz channels during any frame period.

5.18.2. Procedure

Attestation of manufacturer supported by reference to relevant DECT specifications.

5.18.3. Attestation

This device is compliant with the DECT standards described in European Standards EN 300 175-2 and EN 300 175-3. DECT transmissions are MC/TDMA/TDD (Multi carrier / Time Division Multiple Access / Time Division Duplex) using Digital GFSK modulation.

During any frame period cooperating devices will not occupy more than one channel bandwidth.

For further details see operational description or relevant portions of the DECT standards.

5.19. Random Waiting

5.19.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(6) If the selected combined time and spectrum windows are unavailable, the device may either monitor and select different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.

5.19.2. Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 8.1.3, which provides the test methodology for this provision.

5.19.3. Attestation

The option 15.323(c) (6) is not implemented by this product.

5.20. Monitoring Bandwidth

5.20.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(7) The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission and have a maximum reaction time less than 50xSQRT (1.25/ emission bandwidth in MHz) microseconds for signals at the applicable threshold level but shall not be required to be less than 50 microseconds.

5.20.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.4, which provides the test methodology for this provision.

5.20.3. Test Result

The BS uses a transceiver with the following block diagram.

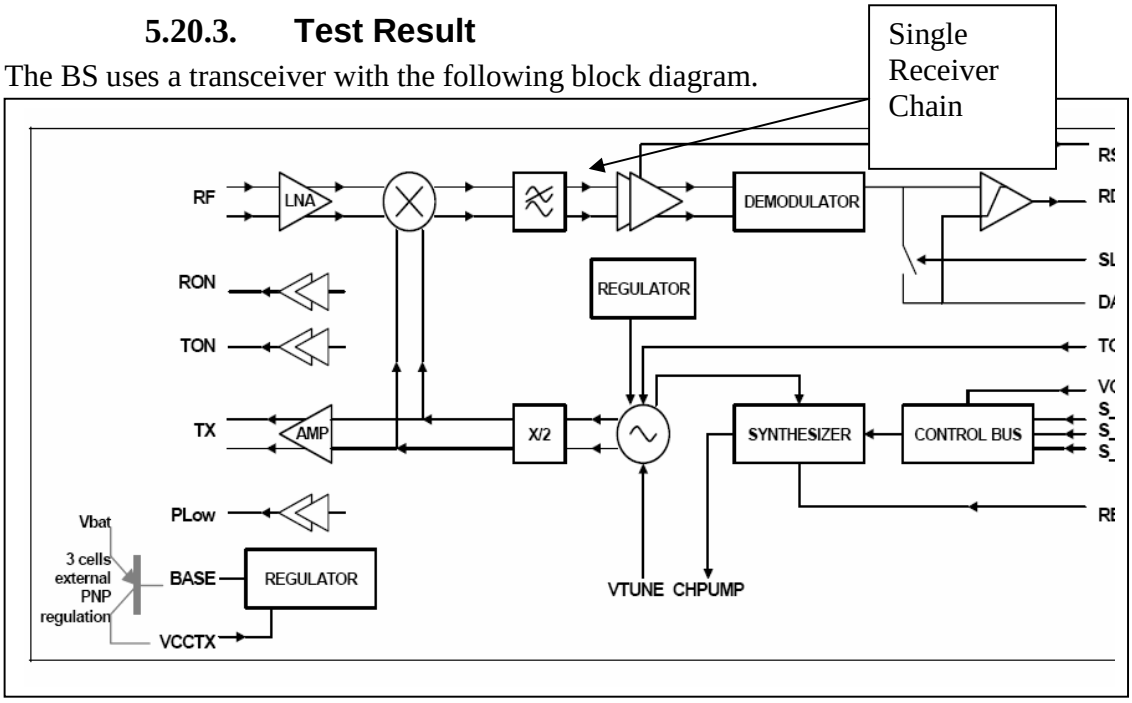

Figure 27: Transceiver Block Diagram

The monitoring feature is realized by the actual receiver and therefore the receiver bandwidth equals the monitoring bandwidth.

Result: PASS

5.21. Monitoring Reaction Time

5.21.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(7) If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT (1.25/emission bandwidth in MHz) microseconds but shall not be required to be less than 35 microseconds.

5.21.2. Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 7.5, which provides the test methodology for this provision.

5.21.3. Attestation

The MS is the initiating device and the BS is the companion device. The BS never initiates a communication link. This test is described in the Test Report for the MS.

5.22. Monitoring Antenna

5.22.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.

5.22.2. Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 4, which provides the test methodology for this provision.

5.22.3. Attestation

The BS uses two permanently attached antennae for antenna diversity, a PCB antenna and an inverted-F antenna.

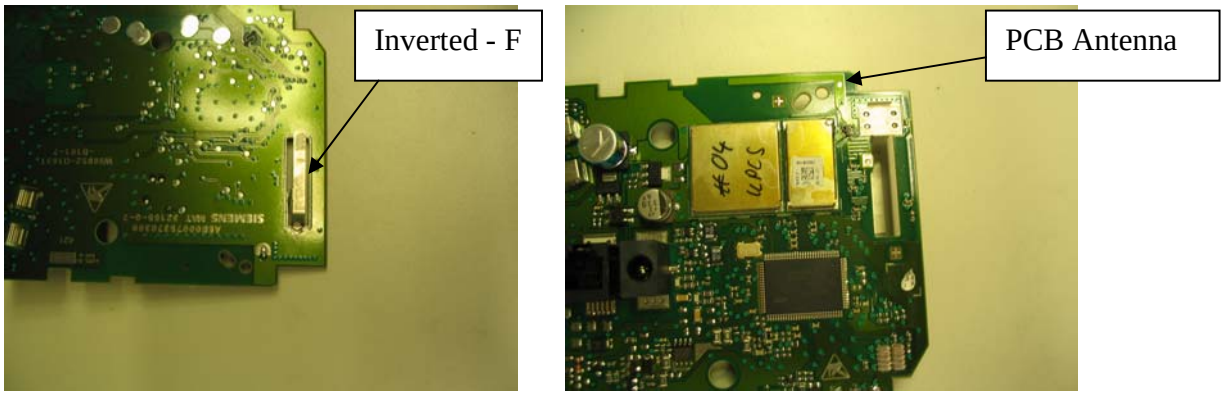

Figure 28: BS Antennae

A block diagram indicates the selection process between one of the two antennae:

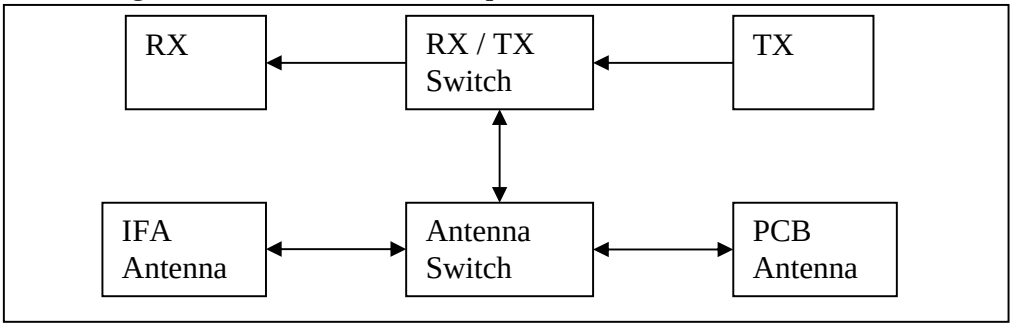

Figure 29: Antenna Diversity Block Diagram of BS

In this product fast antenna diversity is implemented. During the receive burst an antenna is selected which then also is used during the transmit burst. If for instance ANT 1 is selected during the receive burst ANT 1 will also be enabled during the transmission burst.

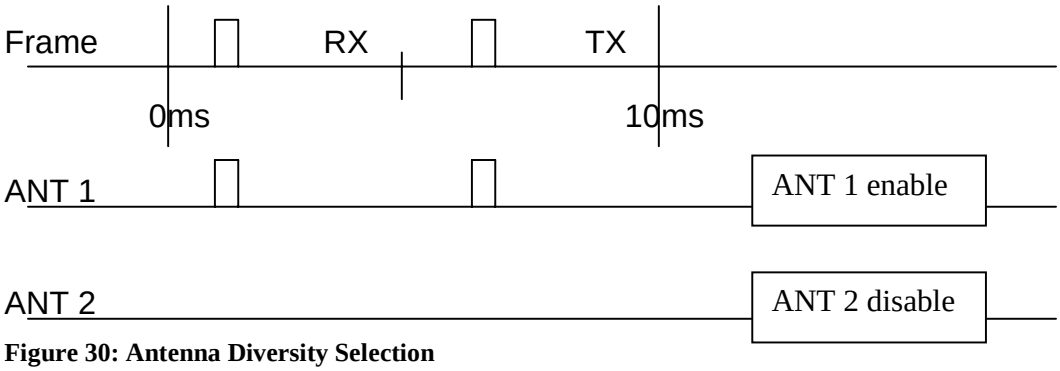

Figure 30: Antenna Diversity Selection

Within the preamble, which occurs at the beginning of each receiver burst the RSSI value of each antenna is measured. The preamble is 32 bits long and 16 bits, 8 bits for each antenna, are used for the antenna selection process.

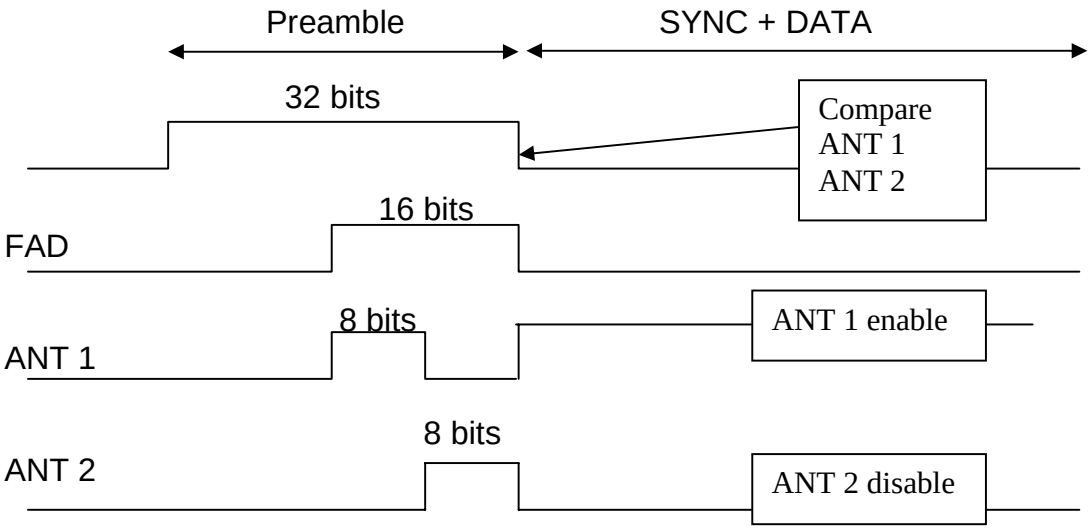

Figure 31: Fast Antenna Diversity Concept

During the 8 bits the RSSI of each antenna is measured and compared at the end of the Fast Antenna Diversity (FAD) signal. If ANT 1 proved to have a larger RSSI value it would stay active after the selection process.

5.23. Monitoring Threshold Relaxation

5.23.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(9) Devices that have a power output lower than the maximum permitted under this subpart may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.

5.23.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 4, which provides the test methodology for this provision.

5.23.3. Test Results

The monitoring threshold of this product is not linked to the output power level.

Description	Value
Permitted Upper Monitoring Threshold	-61.5dBm + 6dB
Measured Upper Monitoring Threshold	-61dBm
Permitted Peak Transmitter Power	21.3dBm
Measured Peak Transmitter Power	20.1dBm

Table 30: Monitoring Threshold Relaxation for BS

The upper threshold of the BS may be increased with up to 1dB.

Result: Pass

5.24. Duplex System LBT

5.24.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(10) An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.

5.24.2. Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 8.3.2, which provides the test methodology for this provision.

5.24.3. Attestation

The MS is the initiating device and the BS is the companion device. The BS never initiates a communication link. This test is described in the Test Report for the MS.

5.25. Alternate Monitoring Interval

5.25.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within the 1.25 MHz frequency channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commenc.

5.25.2. Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 8.4, which provides the test methodology for this provision.

5.25.3. Attestation

The MS is the initiating device and the BS is the companion device. The BS never initiates a communication link. This test is described in the Test Report for the MS.

5.26. Fair Access

5.26.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.

(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:

(12) The provisions of (c)(10) or (c)(11) of this section shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.

5.26.2. Procedure

The manufacturer supplies an attestation.

5.26.3. Attestation

This device does not use any mechanisms as provided by Part 15.323(c)(10) or (c)(11) to deny fair access to spectrum to other devices.

5.27. Frame Period

5.27.1. Test Criteria

5.27.1.1. Frame Repetition Stability

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.
(e) The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in these sub-bands shall be 20 milliseconds or 10 milliseconds/X where X is a positive whole number. Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 50 parts per million (ppm). Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame repetition rate with a frequency stability of at least 10 ppm.

5.27.1.2. Timing Jitter

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.
The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 microseconds for any two consecutive transmissions. Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.

5.27.2. Test Procedure

5.27.2.1. Frame-Repetition Stability

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.2.2, which provides the test methodology for this provision.

The EUT is controlled from a personal computer and set into continuous transmission mode. The Spectrum Analyzer is acting as a video detector, by using zero span, and the video output of the spectrum analyzer is monitored by a frequency counter.

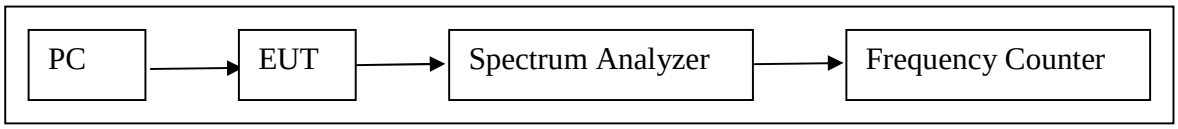

Figure 32: Test Setup for Frame-Repetition Stability Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.2.2:

Centre Frequency	CH3
RBW	10MHz
VBW	10MHz
Trigger	Video
Span	Zero
Detection	Peak Detection
Sweep Rate	2ms
Amplitude Scale	Log
Peak Hold	Off

Table 31: Spectrum Analyzer Settings for Frame-Repetition Measurement

The GIGASET S445 uses TDMA and a frame period of 10ms.

The frequency counter is gated every 10s and measurements are recorded over 1hour.

The test is performed at 25°C with the EUT set to frequency Channel CH3.

According to ANSI C63.17 Clause 6.2.2, 3 x the standard deviation of the frame-repetition stability should be smaller than 10ppm.

5.27.2.2. Timing Jitter

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.2.3, which provides the test methodology for this provision.

The EUT is controlled from a personal computer and set into continuous transmission mode. The Spectrum Analyzer is acting as a video detector, by using zero span, and the video output of the spectrum analyzer is monitored by a frequency counter.

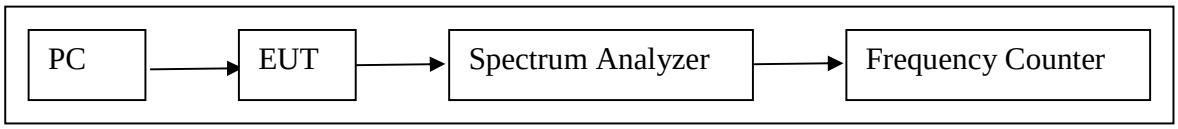

Figure 33: Test Setup for Timing Jitter Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.2.3:

Centre Frequency	CH3
RBW	10MHz
VBW	10MHz
Trigger	Video
Span	Zero
Detection	Peak Detection
Sweep Rate	2ms
Amplitude Scale	Log
Peak Hold	Off

Table 32: Spectrum Analyzer Settings for Timing Jitter Measurement

The frequency counter is gated every 10s and measurements are recorded over 1hour.

The test is performed at 25°C with the EUT set to frequency Channel CH3.

According to ANSI C63.17 Clause 6.2.3, the timing jitter should be smaller than 25μs.

5.27.3. Test Results

5.27.3.1. Frame-Repetition Stability

The mean, standard deviation and 3 x SD as the frame-repetition stability is calculated.

Mean Frame Repetition	Standard Deviation	Frame Repetition Stability	Result
99.999 936 7Hz	0.000 000 5Hz	0.015 ppm	Pass

Table 33: Frame-Repetition Stability Measurement of BS

Result: Pass

5.27.3.2. Timing Jitter

The following timing jitter was recorded:

Mean Period	Timing Jitter	Result
10.000 005 9ms	0.005 9µs	Pass

Table 34: Timing Jitter Measurement of BS

Result: Pass

5.28. Frequency Stability

5.28.1. Test Criteria

§ 15.323 Specific requirements for isochronous devices operating in the 1920–1930 MHz sub-band.
(f) The frequency stability of the carrier frequency of the intentional radiator shall be maintained within +/-10 ppm over 1 hour or the interval between channel access monitoring, whichever is shorter. The frequency stability shall be maintained over a temperature variation of -20° to +50 °C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20 °C. For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage

5.28.2. Test Procedure

Testing to ANSI C63.17 draft ballot 3.0 Clause 6.2.1, which provides the test methodology for this provision.

The EUT is controlled from a personal computer and set into continuous transmission mode.

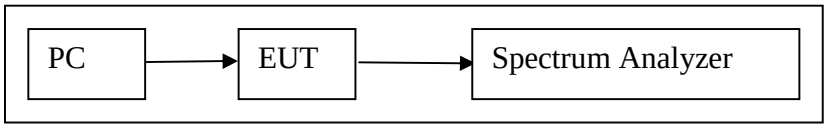

Figure 34: Test Setup for Frequency Stability Measurement

The spectrum analyzer is setup according to ANSI C63.17 Clause 6.2.1:

Centre Frequency	CH3
Mode	Vector Analyzer – DECT Demodulation
Trigger	Video
Symbol Rate	1.152MHz
BT	0.5
Reference Filter	Gaussian

Table 35: Spectrum Analyzer Settings for Frequency Stability Measurement

The frequency stability of the BS is measured at frequency channel CH3.

A +/-10ppm frequency shift is allowed at 1924.992Hz.
Frequency Shift = 10/1exp6 * 1925exp6
= 19.25KHz

5.28.3. Test Results

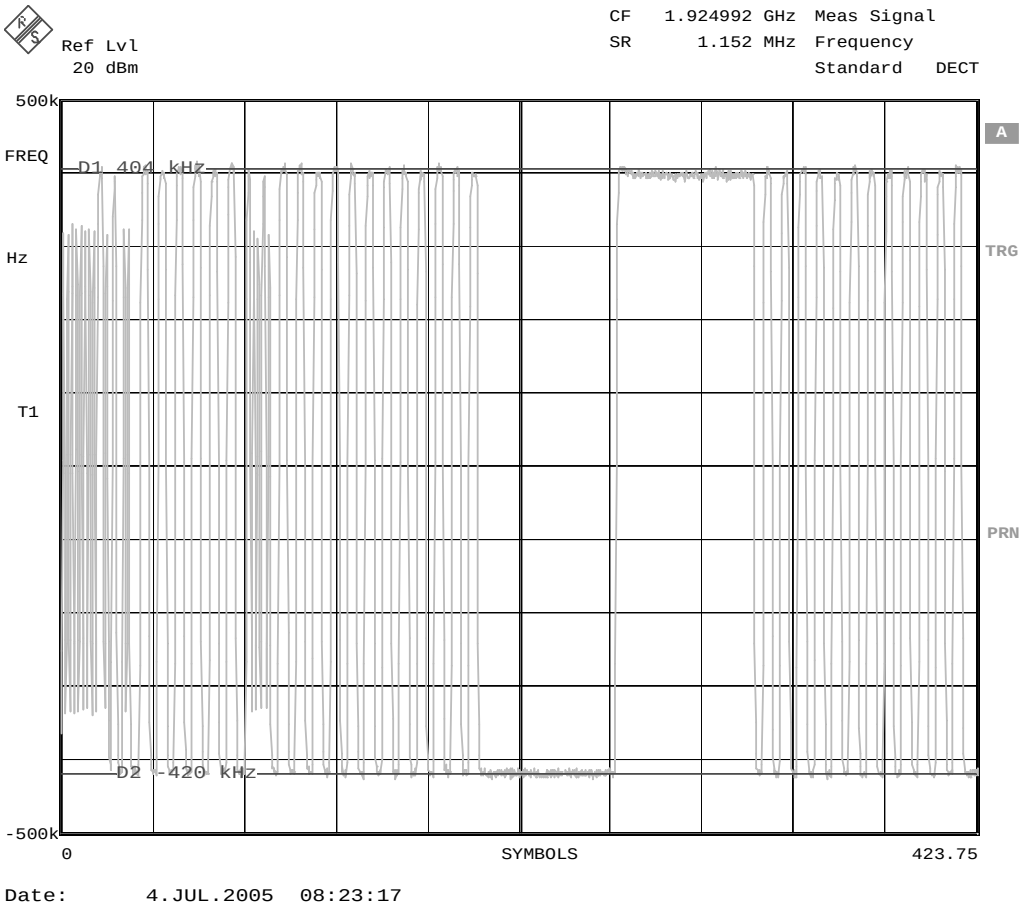

Figure 35: Spectrum Analyzer Display for Frequency Stability Measurement of BS

The following Frequency Offset was measured:

+20°C 85-115% Supply		**-20°C Normal Supply**		**+50°C Normal Supply**		**Result**
KHz	**ppm**	**KHz**	**ppm**	**KHz**	**ppm**	
-9	-4.6	-18	-9.4	+4	+2.1	Pass

Table 36: Results of Frequency Stability of the BS

Result: Pass

5.29. RF Exposure

5.29.1. Test Criteria

§ 15.319 General Technical Requirements
(i)Unlicensed PCS devices are subject to the radiofrequency radiation exposure requirements specified in §§ 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a ‘‘general population/uncontrolled’’ environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

5.29.2. Procedure

The manufacturer supplies an attestation.

5.29.3. Attestation

According to 47 CFR §2.1091 the base station is a mobile device. The base station is used in such a way that a separation distance of at least 20 centimeters is maintained between the transmitter's radiating structures and the body of the user or nearby persons. The base station ERP is less than 3W and therefore the base station is categorically excluded from routine environmental evaluation for RF exposure.