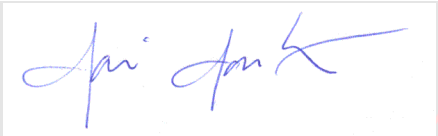
TCC Nokia

FINAS Finnish Accreditation Service T117 (EN ISO/IEC 17025)

FCC Part 15C Compliance Test Report

Test Report no.:	Tre_FCC_0535_01.doc	**Date of Report:**	7.9.2005
Number of pages:	29	**Customer's Contact person:**	Jorma Hanni
Testing laboratory:	TCC Nokia Tampere Laboratory P.O. Box 68 Sinitaival 5 FIN-33720 TAMPERE, FINLAND Tel. +358 (0) 7180 46800 Fax. +358 (0) 7180 46880	**Client:**	Nokia Corporation P.O. Box 50 Elektroniikkatie 10 FIN-90571 OULU, FINLAND Tel. +358 (0) 7180 08000 Fax. +358 (0) 7180 47222
FCC listing no.: **IC recognition no.:**	94436 3608		
Tested devices/ accessories:	**GSM phone RM-56 / Battery BL-5C, AC-charger AC-4E, Headset HS-23, Memory card MU-17, Data cable CA-53, Laptop DELL LATITUDE D600, Laptop charger PA-12, Printer HP deskjet 1600CC3540A, Digital camera FUJI DS-7, Serial cable for camera, Parallel cable for printer**		
FCC ID:	LJPRM-56	**IC:**	661E-RM56
Supplement reports:	-		
Testing has been carried out in accordance with:	**CFR 47, FCC rules Part 15 Subpart C, ANSI C63.4 (2003) and IC standard RSS-210. Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method and limit".**		
Documentation:	The test report must always be reproduced in full; reproduction of an excerpt only is subject to written approval of the testing laboratory. The documentation of the testing performed on the tested devices is archived for 15 years at TCC Nokia.		
Test Results:	**The EUT complies with the requirements in respect of all parameters subject to the test.** The test results relate only to devices specified in this document.		
Date and signature for the contents:	 Digitally signed by Jari Jantunen DN: CN = Jari Jantunen, C = FI, O = Nokia, OU = CertMT Date: 2005.09.07 15:13:10 +03'00'		

Jari Jantunen, System Manager

1. Summary for FCC Part 15C Compliance Test Report

Date of receipt	24.8.2005
Testing completed	1.9.2005
The customer's contact person	Jorma Hanni
Test Plan referred to	\EMC\TESTPLAN\
Notes	-
Document name	T:\Projects\RM-56\results\emc\FCC\Tre_FCC_0535_01.doc

1.1. EUT and Accessory Information

The EUT is a triple band (GSM850/1800/1900) mobile phone with GPRS, EGPRS and Bluetooth. Bluetooth is tested with maximum rated TX power.

Product	Type	SN	HW	MV	SW	DUT
GSM phone	RM-56	004400/58/164239/2	1101	-	03.07	**40319**
GSM phone	RM-56	004400/58/164222/8	1101	-	03.07	**40320**
AC-Charger	AC-4E	-	1.0	3.0	-	**40321**
Memory Card	MU-17	-	-		-	**40322**
Battery	BL-5C	-	-	-	-	**40323**
Headset	HS-23	-	-	-	-	**40324**
Data cable	CA-53	1141	P3		2.0	**40281**
Laptop	DELL LATITUDE D600	0009321C-12800-8A5-2913	-	-	-	**40085**
Laptop charger	PA-12	00085391	-	-	-	**40086**
Printer	HP deskjet 1600CC3540A	USB8302546	-	-	-	**40077**
Digital camera	FUJI DS-7	7102516	-	-	-	**40076**
Serial cable for camera	-	-	-	-	-	**40088**
Parallel cable for printer	-	-	-	-	-	**40087**

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1.2. Summary of Test Results

Bluetooth:

Section in CFR 47	Section in RSS-210	Name of the test	Result
15.247(b)(1)	6.2.2(o)(a3)	Peak output power	PASSED
15.247(c)	6.2.2 (o)(e1)	Band edge compliance of RF emissions	PASSED
15.247(c)	6.2.2 (o)(e1)	Spurious RF conducted emissions	PASSED
15.247(c), 15.209	6.2.2 (o)(e1)	Spurious radiated emissions	PASSED
15.207	6.6	AC powerline conducted emissions	PASSED
15.247(a)(1)	6.2.2(o)(a3)	20 dB bandwidth	PASSED
15.247(a)(1)	6.2.2(o)(a1)	Carrier frequency separation	PASSED
15.247(a)(1)(iii)	Amend I(ii)	Number of hopping frequencies	PASSED
15.247(a)(1)(iii)	Amend I(ii)	Time of occupancy	PASSED

PASSED	The EUT complies with the essential requirements in the standard.
FAILED	The EUT does not comply with the essential requirements in the standard.
NP	The test was not performed by the TCC Nokia Tampere Laboratory.

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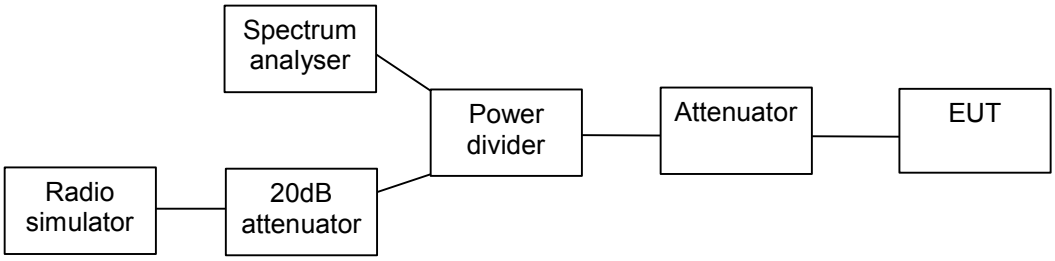
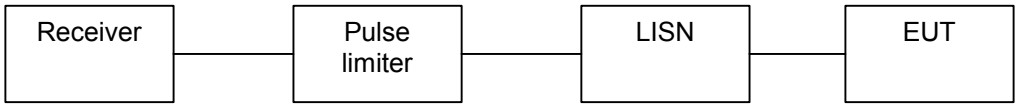
2. Test setups

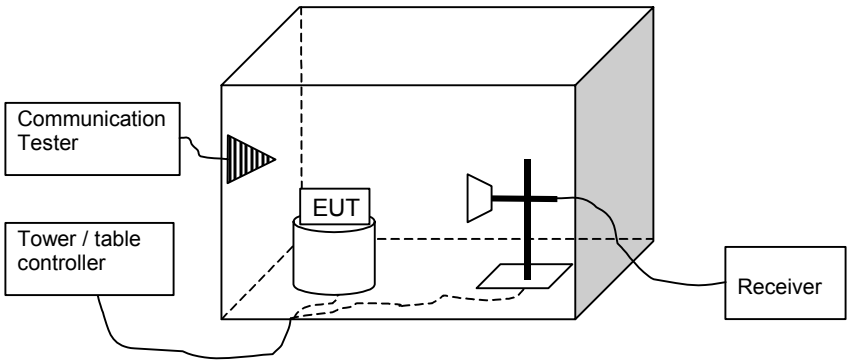
2.1. Conducted RF test setup



2.2. AC powerline conducted emissions test setup



2.3. Spurious radiated emissions test setup



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3. Peak output power

(FCC §15.247(b)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 43 / 100.9
Date of measurements	30.8.2005
Measured by	Jari Jantunen

3.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for peak output power measurements

Frequency range [MHz]	Limit [W]	Limit [dBm]
2400 – 2483.5	≤ 1	≤ 30

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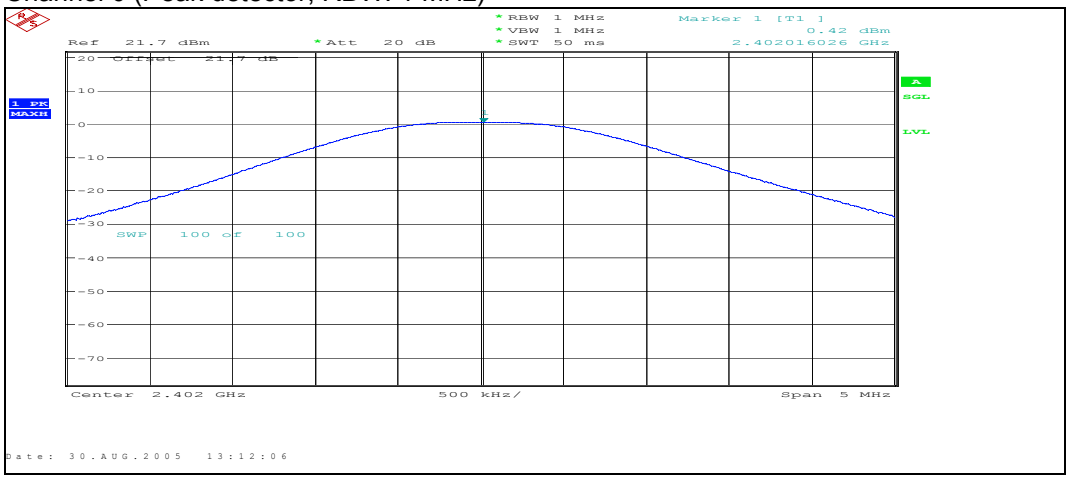
3.2. Bluetooth Test results

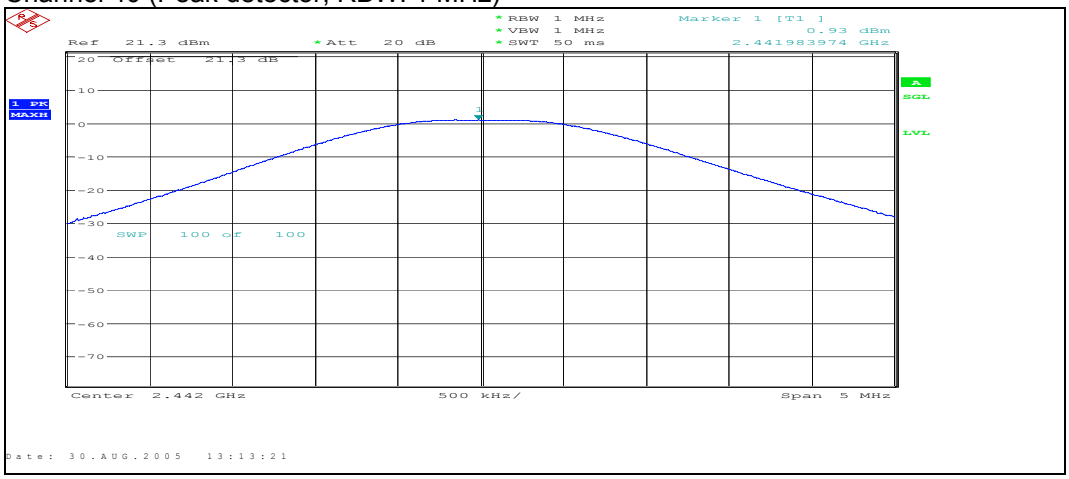
3.2.1 GSFK modulation, PRBS packet type

Channel	P [dBm]	P [W]	Result
0	0.42	0.00110	PASSED
40	0.93	0.00124	PASSED
78	-0.54	0.00088	PASSED

Channel 0 (Peak detector, RBW: 1 MHz)



Channel 40 (Peak detector, RBW: 1 MHz)



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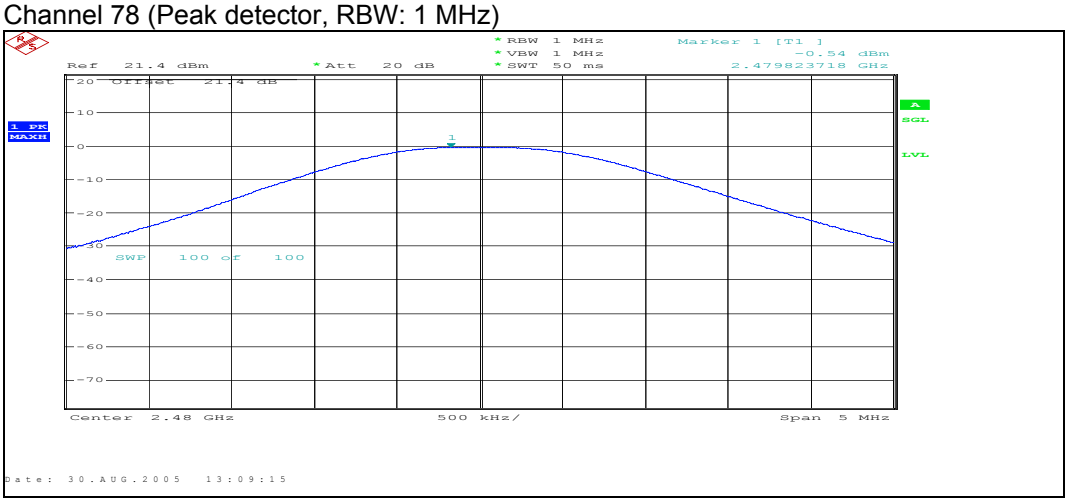
Channel 78 (Peak detector, RBW: 1 MHz)



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4. Band edge compliance of RF emissions

(FCC §15.247(c), RSS-210 6.2.2(o)(e1))

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 43 / 100.9
Date of measurements	30.8.2005
Measured by	Jari Jantunen

4.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for band edge compliance of RF emissions measurements (3 m measurement distance)

Frequency range [MHz]	Limit Average [dBµV/m]	Limit Peak [dBµV/m]
Below 2390 and above 2483.5	≤ 54	≤ 74

4.2. Bluetooth Test results

4.2.1 GFSK modulation, PRBS packet type

Average (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
0	32.29	PASSED
78	40.06	PASSED
Hopping on, low end	31.18	PASSED
Hopping on, high end	37.87	PASSED

Peak (RBW: 1 MHz)

Channel	E [dBµV/m]	Result
0	49.95	PASSED
78	62.73	PASSED
Hopping on, low end	53.56	PASSED
Hopping on, high end	64.70	PASSED

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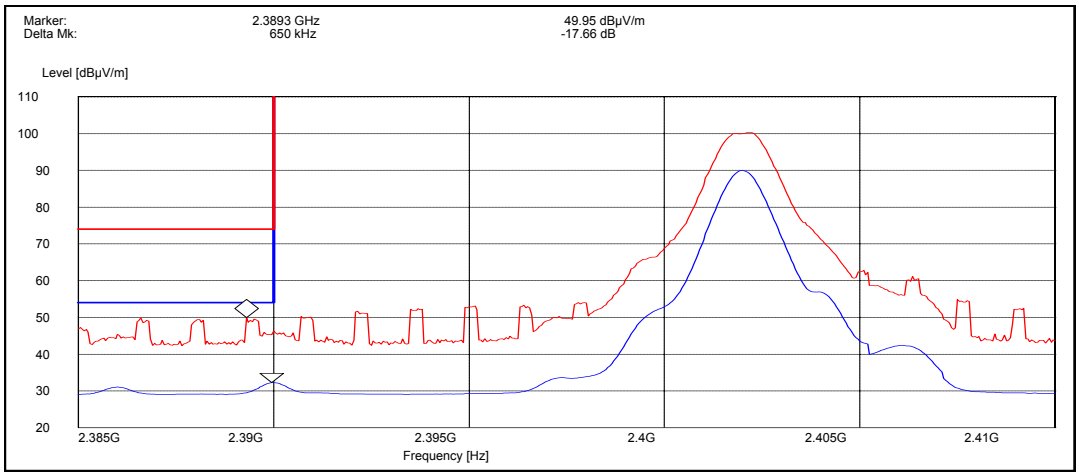
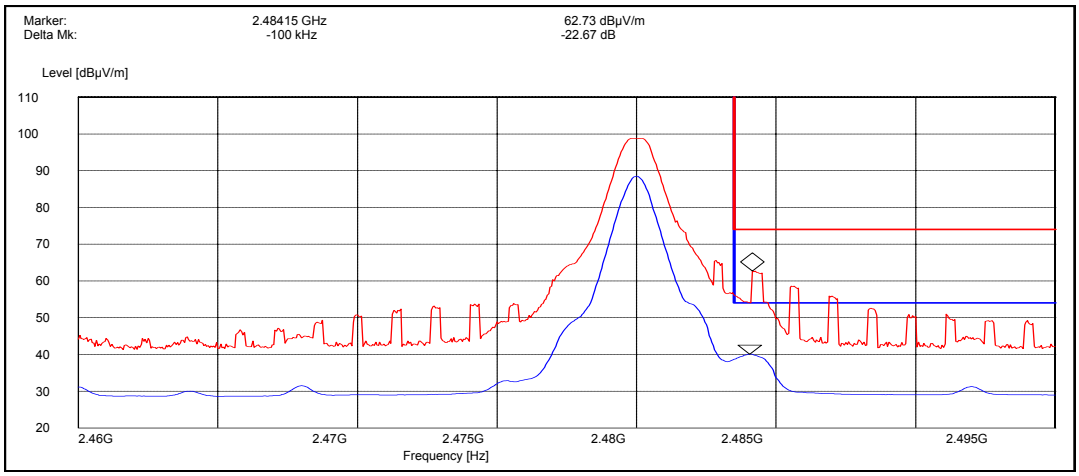
Channel 0



Channel 78



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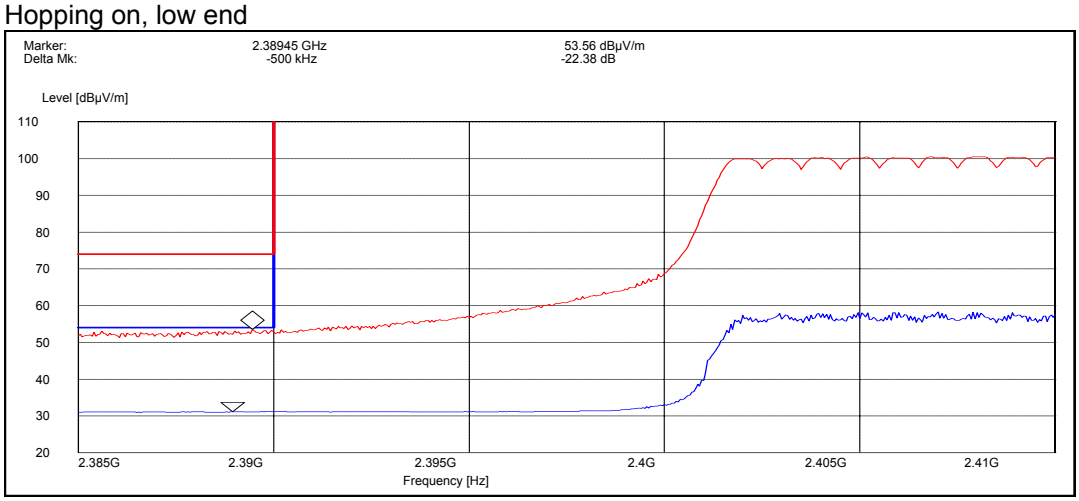
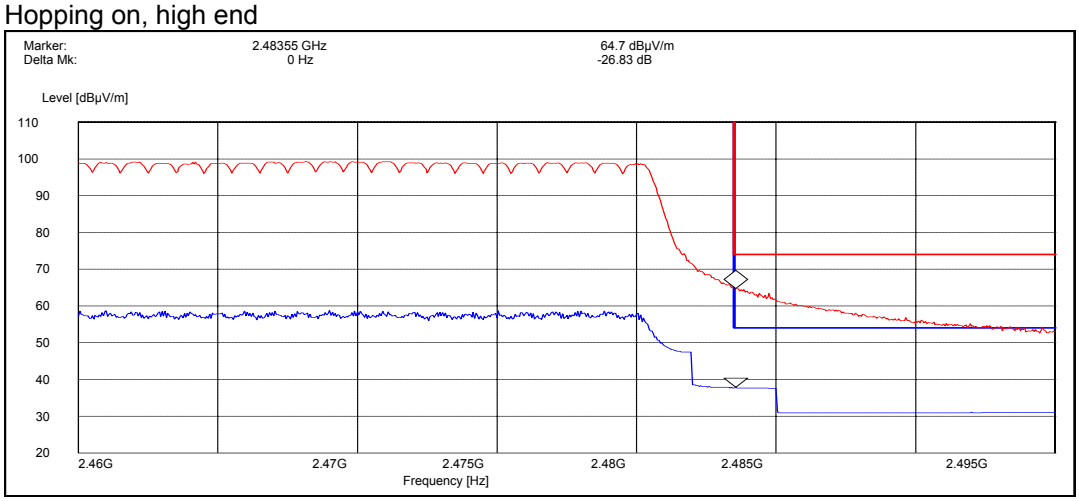
Hopping on, low end



Hopping on, high end



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5. Spurious RF conducted emissions

(FCC §15.247(c), RSS-210 6.2.2(o)(e1)

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.2
Date of measurements	29.8.2005
Measured by	Jari Jantunen

5.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for spurious RF conducted emissions measurements

Frequency range [MHz]	Limit [dBc]
1 – 25000	≤ -20

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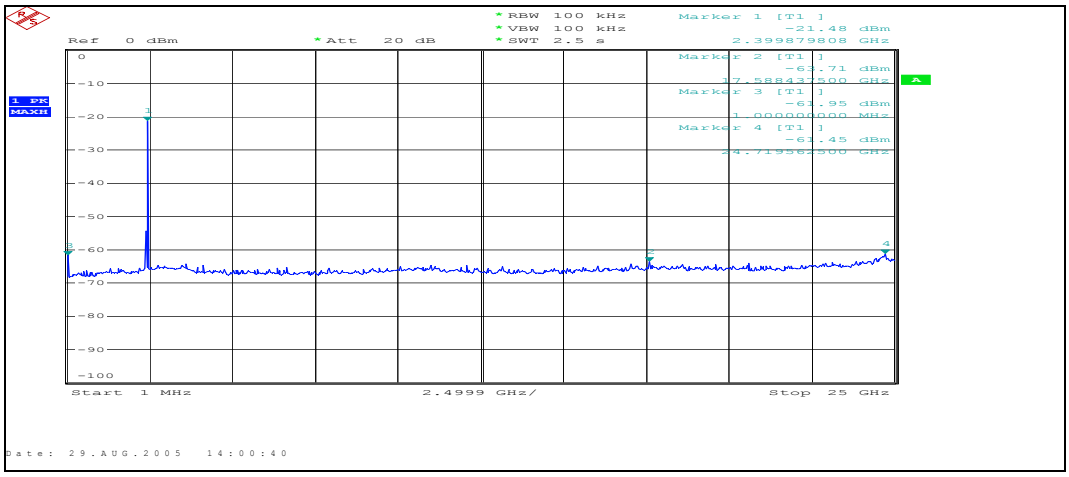
5.2. Bluetooth Test results

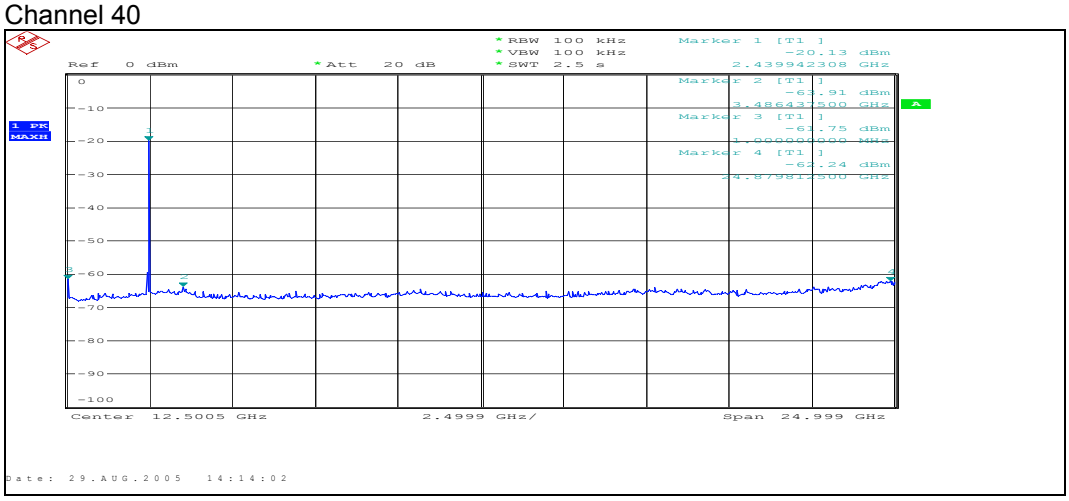
5.2.1 GFSK modulation, PRBS packet type

Channel 0



Frequency [MHz]	P [dBc]	Result
1.000	-40.47	PASSED
17588	-42.23	PASSED
24720	-39.97	PASSED

Channel 40



Frequency [MHz]	P [dBc]	Result
1.000	-41.62	PASSED
3.4864	-43.78	PASSED
24880	-42.11	PASSED

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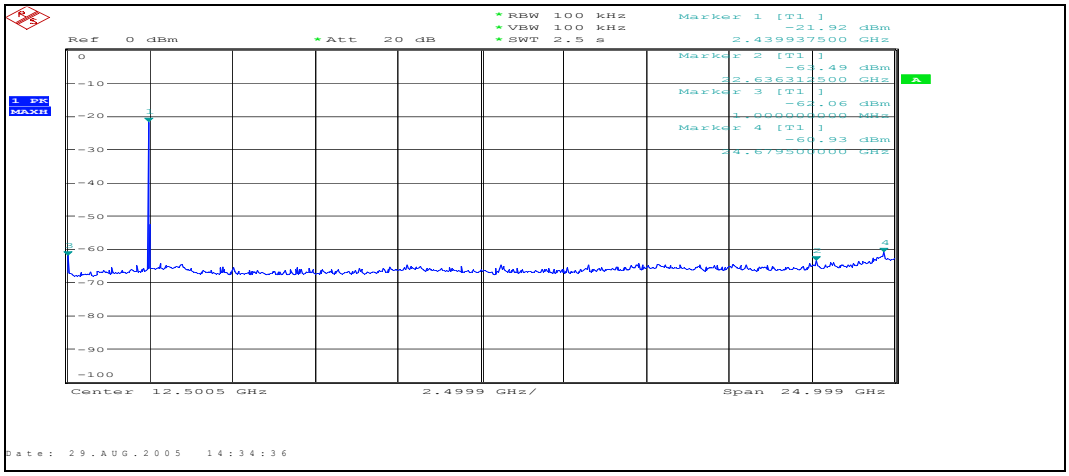
Channel 78



Frequency / MHz	Level / dBc	Result
1.000	-40.11	PASSED
22636	-41.57	PASSED
24680	-39.01	PASSED

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6. Spurious radiated emissions

(FCC §15.247(c), §15.209, RSS-210 6.2.2(o)(e1)

EUT with DUT number	RM-56 DUT 40319
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 43 / 100.9
Date of measurements	30.8.2005
Measured by	Jari Jantunen

6.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with absorbers on the floor and measuring antenna at fixed height using 2-axis EUT position system.

The Final Measurement is performed in the Semi-Anechoic Chamber with conducting metal floor, if the Preliminary Measurement results are closer than 20 dB to the permissible value.

The EUT is placed at nonconductive plate at the turntable center.

For each suspected frequency, the turntable is rotated 360 degrees and antenna is scanned from 1 to 4 m. This is repeated for both horizontal and vertical receive antenna polarizations.

The emissions less than 20 dB below the permissible value are reported.

The measurement results are obtained as described below:

$$E\ [\mu V/m] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable loss, antenna factor and preamplifier gain ($A_{TOT} = L_{CABLES} + AF - G_{PREAMP}$).

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Limits for spurious radiated emissions measurements (3 m measurement distance)

Frequency range [MHz[	Limit [µV/m]	Limit [dBµV/m]	Detector
30 – 88	100	40	Quasi peak
88 – 216	150	43.5	Quasi peak
216 – 960	200	46	Quasi peak
960 – 1000	500	54	Quasi peak
Above 1000	500	54	Average
Above 1000	5000	74	Peak

6.2. Bluetooth Test results

6.2.1 GFSK modulation, PRBS packet type

Channel 0

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4804.000000	40.70	108.39	41.00	-0.30	HORIZONTAL	PASSED
7206.000000	43.70	153.11	40.70	3.00	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4804.000000	28.30	26.00	28.60	-0.30	VERTICAL	PASSED
7206.000000	30.50	33.50	27.50	3.00	HORIZONTAL	PASSED

Channel 40

Quasi peak (RBW: 120 kHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
38.176353	13.90	4.95	43.00	-29.10	VERTICAL	PASSED
73.046092	20.90	11.09	59.20	-38.30	HORIZONTAL	PASSED
74.169940	25.40	18.62	63.70	-38.30	HORIZONTAL	PASSED

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4946.393788	44.20	162.18	44.50	-0.30	VERTICAL	PASSED
7344.195391	44.90	175.79	40.70	4.20	HORIZONTAL	PASSED
7418.341683	45.20	181.97	40.70	4.50	HORIZONTAL	PASSED
17993.483968	56.10	638.26	34.00	22.10	HORIZONTAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4945.893788	31.70	38.46	32.00	-0.30	VERTICAL	PASSED
7348.195391	32.00	39.81	27.60	4.40	HORIZONTAL	PASSED

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7416.841683	32.20	40.74	27.70	4.50	HORIZONTAL	PASSED
17995.483968	43.60	151.36	21.40	22.20	HORIZONTAL	PASSED

Channel 78

Peak (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4960.000000	42.00	125.89	42.10	-0.10	HORIZONTAL	PASSED
7440.000000	44.30	164.06	39.90	4.40	VERTICAL	PASSED

Average (RBW: 1 MHz)

Frequency [MHz]	E [dBµV/m]	E [µV/m]	U_{RX} [dBµV]	A_{TOT} [dB]	Polarisation	Result
4960.000000	29.00	28.18	29.10	-0.10	HORIZONTAL	PASSED
7440.000000	31.90	39.36	27.50	4.40	HORIZONTAL	PASSED

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7. AC powerline conducted emissions

(FCC §15.207, RSS-210 6.6)

EUT with DUT number	RM-56 DUT 40319
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324, CA-53 DUT 40281, Dell Latitude D600 DUT 40085, PA-12 DUT 40086, HP deskjet 1600C C3540A DUT 40077, Fuji DS-7 DUT 40076, Serial cable for camera DUT 40088, Parallel cable for printer DUT 40087
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	BT in TX mode channel 40
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	19 / 48 / 102.7
Date of measurements	1.9.2005
Measured by	Jari Jantunen

7.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The EUT is placed on a wooden table 80 cm above the reference groundplane.

The EUT is connected via LISN to a test power supply.

The measurement results are obtained as described below:

$$U\ [dB\mu V] = U_{RX} + A_{TOT}$$

Where U_{RX} is receiver reading and A_{TOT} is total correction factor including cable and pulse limiter attenuations.

CISPR 22 Class B limits

Frequency range [MHz]	Quasi peak limit [dBµV]	Average limit [dBµV]
0.15 - 0.5	66 - 56	56 - 46
0.5 - 5	56	46
5 - 30	60	50

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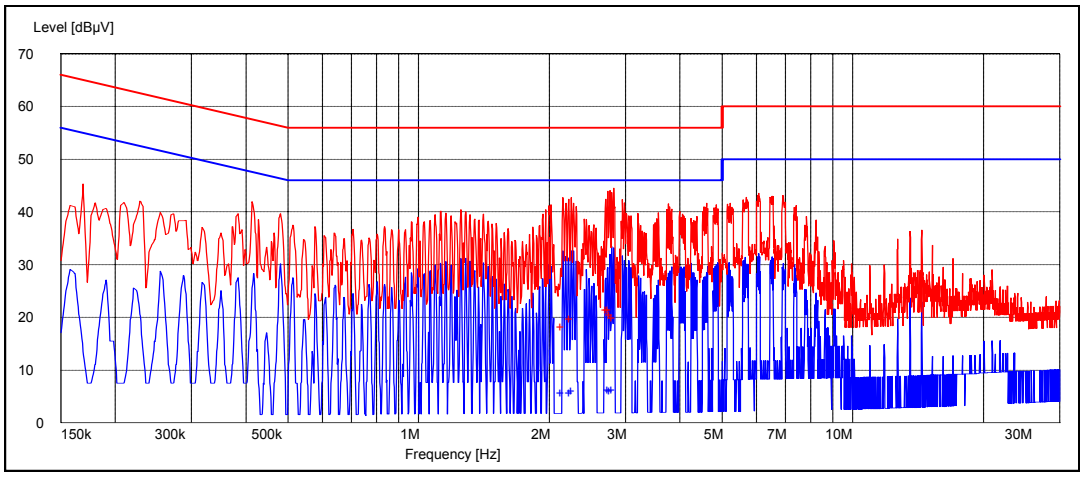
7.2. Bluetooth Test results

7.2.1 GFSK modulation, PRBS packet type

Channel 40



Quasi peak (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
2.150301	18.20	N	PASSED
2.246493	19.70	N	PASSED
2.727455	21.50	N	PASSED
2.757515	21.50	N	PASSED
2.787575	20.40	N	PASSED
2.817635	19.80	N	PASSED

Average (RBW: 9 kHz)

Frequency [MHz]	U [dBµV]	Line	Result
2.150301	5.70	N	PASSED
2.246493	5.60	N	PASSED
2.276553	5.90	N	PASSED
2.757515	6.20	N	PASSED
2.787575	6.10	N	PASSED
2.817635	6.20	N	PASSED

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8. 20 dB bandwidth

(FCC §15.247(a)(1), RSS-210 6.2.2(o)(a3))

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.2
Date of measurements	29.8.2005
Measured by	Jari Jantunen

8.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for 20 dB bandwidth measurements

Limit [MHz]
≤ 1

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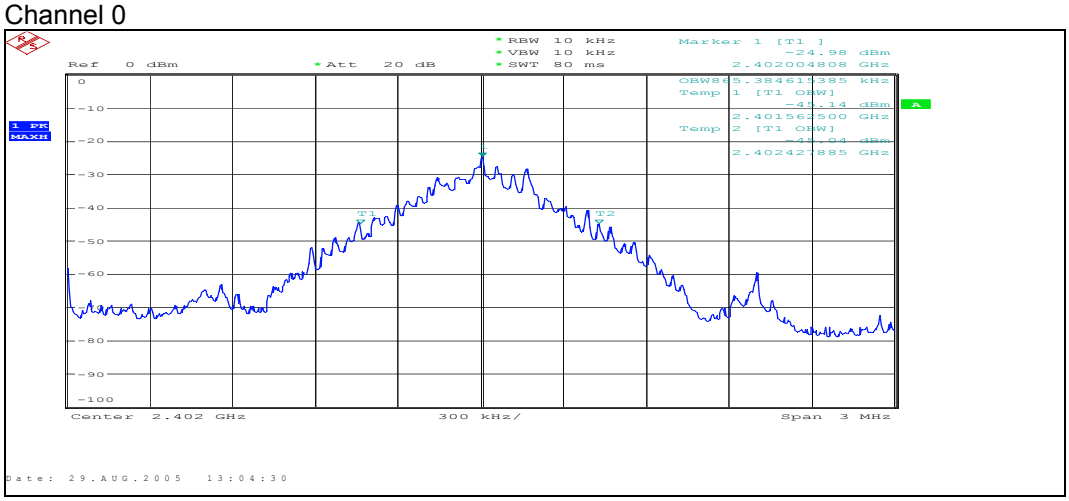
8.2. Bluetooth Test results

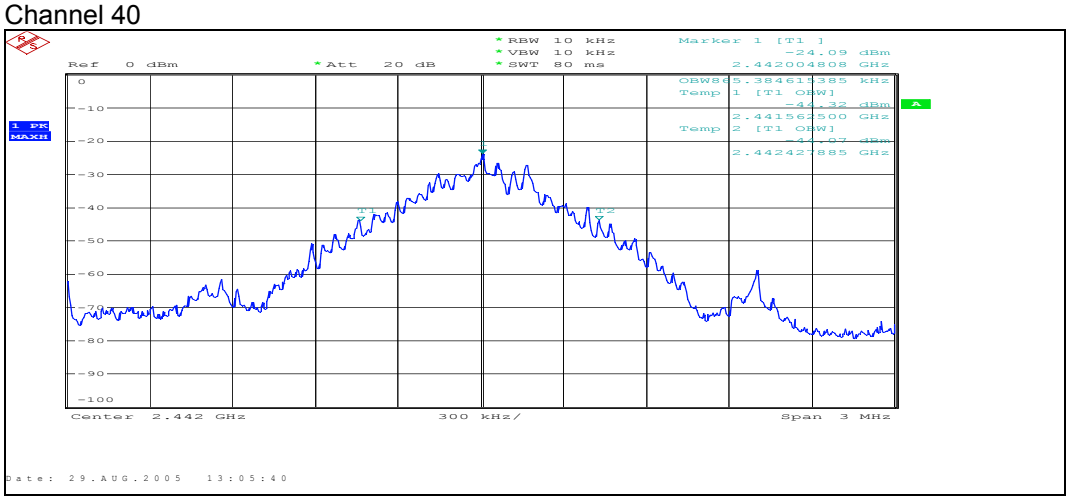
8.2.1 GFSK modulation, PRBS packet type

Channel	20 dB bandwidth [kHz]	Result
0	865.385	PASSED
40	865.385	PASSED
78	865.385	PASSED

Channel 0



Channel 40



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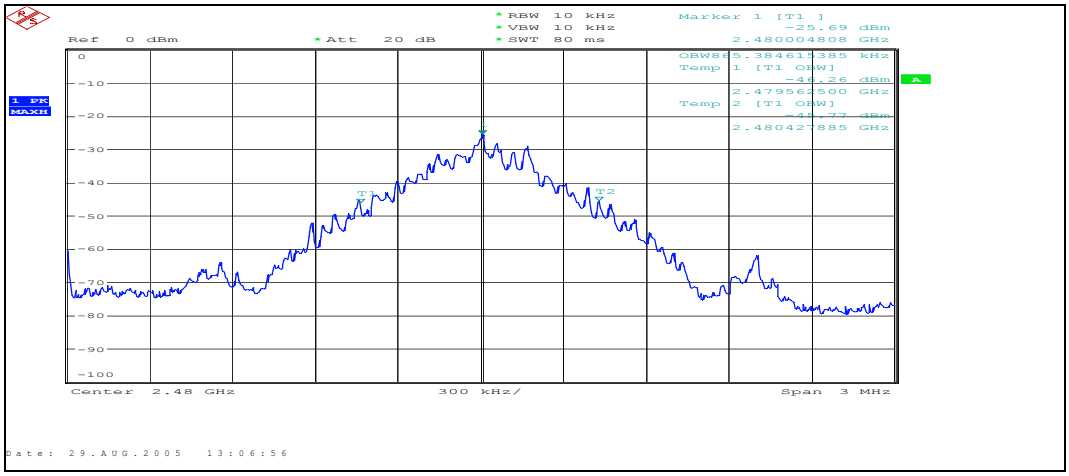
Channel 78



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9. Carrier frequency separation

(FCC §15.247(a)(1), RSS-210 6.2.2(o)(a1))

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.2
Date of measurements	29.8.2005
Measured by	Jari Jantunen

9.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for carrier frequency separation measurements

Limit [MHz]
≥ 0.025 or 20 dB bandwidth

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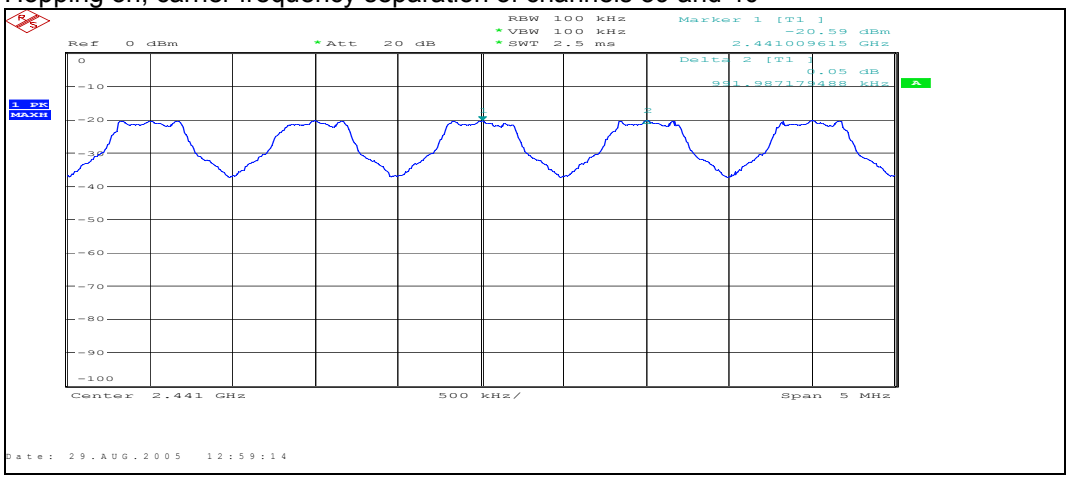
9.2. Bluetooth Test results

9.2.1 GFSK modulation, PRBS packet type

Carrier frequency separation [kHz]	Result
991.987	PASSED

Hopping on, carrier frequency separation of channels 39 and 40



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10. Number of hopping frequencies

(FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 /60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.2
Date of measurements	29.8.2005
Measured by	Jari Jantunen

10.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210.

Limits for number of hopping frequencies measurements

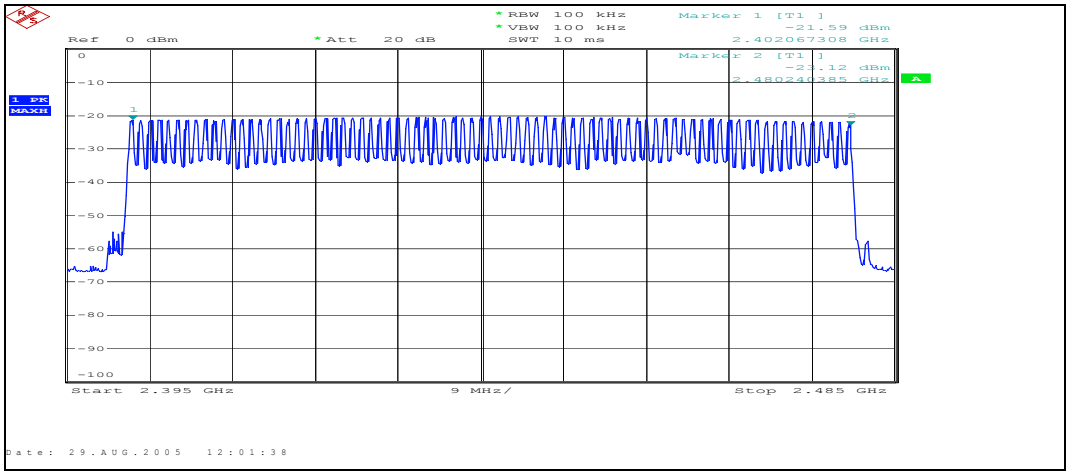
Limit [number]
≥ 75

10.2. Bluetooth Test results

10.2.1 GFSK modulation, PRBS packet type

Measured number of hopping frequencies	Result
79	PASSED

Hopping on, number of hopping frequencies



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11. Time of occupancy

(FCC §15.247(a)(1)(iii), RSS-210 Amend I(ii))

EUT with DUT number	RM-56 DUT 40320
Accessories with DUT numbers	AC-4E DUT 40321, MU-17 DUT 40322, BL-5C DUT 40323, HS-23 DUT 40324
Operation Voltage [V] / [Hz]	115 / 60
Result	PASSED
Remarks	-
Temp [°C] / Humidity [%RH] / Air Pressure [kPa]	22 / 44 / 101.2
Date of measurements	29.8.2005
Measured by	Jari Jantunen

11.1. Test method and limit

The measurement is made according to FCC rules part 15.247 and IC standard RSS-210 as follows:

The total time of occupancy is get by multiplying the measured number of transmissions occurred during 31.6 second period with the duration of one transmission.

Limits for time of occupancy measurements

Limit [s]
≤ 0.4

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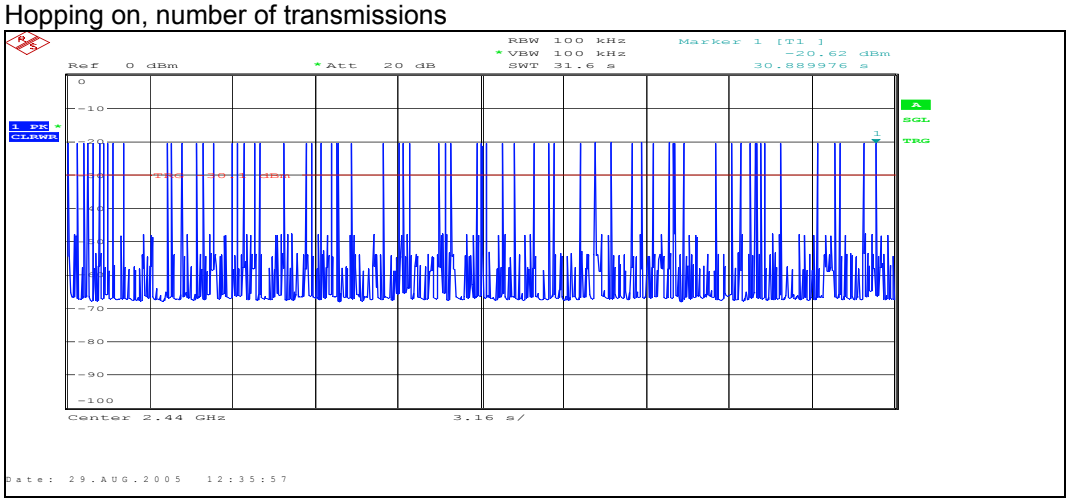
11.2. Bluetooth test results

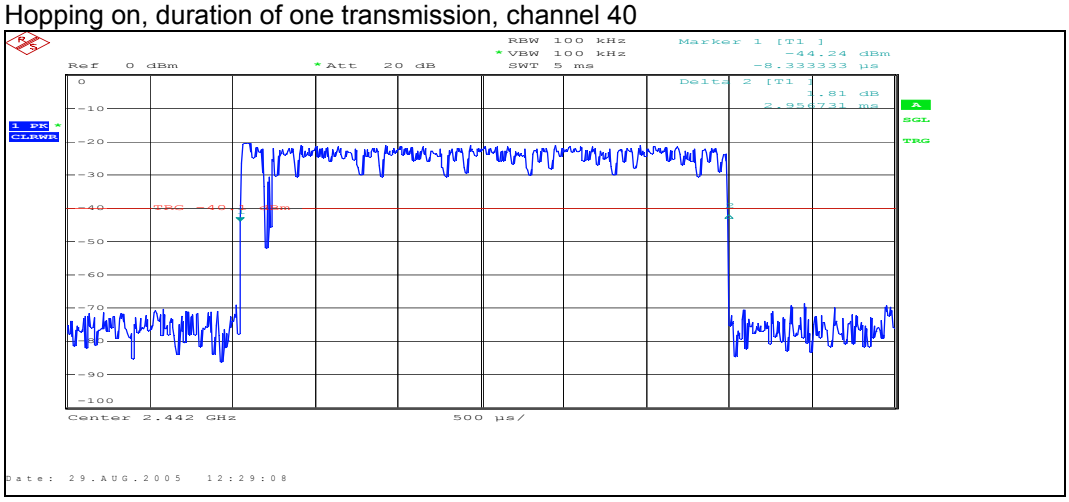
11.2.1 GFSK modulation, PRBS packet type

Measured number of transmissions	Duration of one transmission [µs]	Time of occupancy [s]	Result
65	2956.731	0.192	PASSED

Hopping on, number of transmissions



Hopping on, duration of one transmission, channel 40



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12. Test Equipment

12.1. Conducted measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM37610	Spectrum analyzer	FSU	R&S	15C,22/24
TM37678	Radio communication tester	CMU-200	R&S	15C,22/24
	Attenuator 10 dB	6251.17.A	Huber+Suhner AG	15C,22/24
TM22901	Step attenuator 110dB	8496A	Agilent	15C,22/24
TM37499	Power splitter	11667A	Agilent	15C,22/24
	Temperature chamber	VT4002	Vötsch	15C,22/24
TM38112	DC power supply	6632A	Agilent	15C,22/24
TM38111	Multimeter	34401A	Agilent	15C,22/24
TM38845	EMI receiver	ESI 40	R&S	15B,15C
TM37773	Radio communication tester	CMU-200	R&S	15B,15C
TM38631	Signal generator	83640L	Agilent	15B,15C
TM38114	DC power supply	6632A	Agilent	15B,15C
TM22835	Multimeter	87	Fluke	15B,15C
TM30600	Pulse Limiter	ESH3-Z2	R&S	15B,15C
TM26490	LISN 50 µH	ESH3-Z5/	R&S	15B,15C
TM30636	LISN 50 µH	L2-16/	PMM	15B,15C

12.2. Radiated measurements

Eq. No	Equipment	Type	Manufacturer	Used in
TM30599	3m semi-anechoic chamber		TDK	15B,15C, 22/24
TM38845	EMI receiver	ESI 40	R&S	15B,15C, 22/24
TM37498	Preamplifier	AMF-5D-020180-26-10P	MITEQ	15B,15C, 22/24
TM37523	Preamplifier	AMF-4D-10M-3G-25-20P	MITEQ	15B,15C, 22/24
TM37516	Biconilog antenna	HL562	R&S	15B,15C, 22/24
TM26496	Double ridged waveguide antenna	3115	EMCO	15B,15C, 22/24
TM39158	Horn antenna	3116	EMCO	15B,15C, 22/24
TM26492	Reference dipole set	UHAP/VHAP	Schwarzbeck	15B,15C, 22/24
TM37501	Dipole antenna	3125-870	EMCO	22/24
TM37502	Dipole antenna	3125-1880	EMCO	22/24
TM37773	Radio communication tester	CMU-200	R&S	15B,15C, 22/24
TM38631	Signal generator	83640L	Agilent	15B,15C, 22/24
TM38066	High pass filter	4HC3000/18000-3-KK	Trilithic	15B,15C, 22/24
	High pass filter	WHK2010-10SS	Trilithic	15B,15C, 22/24
	Low pass filter	WLK1750-10SS	Trilithic	15B,15C, 22/24
TM26511	Tunable notch filter	WRCA870	Wainwright	22/24
TM38215	Tunable notch filter	WRCD1850/1910-0.2/40	Wainwright	22/24
TM38214	Band reject filter	WRCT 2402/2480-2400/2483.5-30	Wainwright	15C
TM30642	Turntable controller	HD-100	Deisel	15B,15C, 22/24
TM26500	Turntable	DS412	Deisel	15B,15C, 22/24
TM38842	Antenna mast controller	2090	EMCO	15B,15C, 22/24
TM38843	Antenna mast	2075	EMCO	15B,15C, 22/24
TM38114	DC power supply	6632A	Agilent	15B,15C, 22/24
TM22835	Multimeter	87	Fluke	15B,15C, 22/24

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