

Radio Test Report: 99416130

Applicant: Matsushita Electric Industrial Co., Ltd.
4-3-1, Tsunashima-higashi, Kohoku-ku
223-8639, Yokohama
Japan

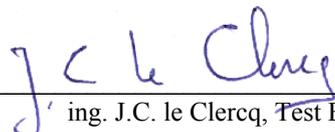
Equipment Under Test: JT-H200PR-**

FCC ID: ACJJT-H200PR

In Accordance With: **FCC Part 15, Subpart C, 15.247 (10-1-02 edition)**
Frequency Hopping Transmitters

Tested By: Telefication bv
Edisonstraat 12a
6902 PK Zevenaar
The Netherlands

Test Engineer:



ing. J.C. le Clercq, Test Engineer

Reviewed by:



ing. P.A. Suringa, Senior Engineer Radio/EMC

Authorized by:



J.P. van de Poll, Co-ordinator Test Group

Date: 5 October 2003

Total Number of Pages: 47

Table of Contents

Section 1.	Summary of Test Results	3
Section 2.	Equipment Under Test (E.U.T.).....	5
Section 3.	Channel Separation	9
Section 4.	Pseudorandom Hopping Algorithm	11
Section 5.	Time of Occupancy	12
Section 6.	Occupied Bandwidth.....	13
Section 7.	Peak Power Output	16
Section 8.	Spurious Emissions (Exploratory Radiated).....	17
Section 9.	Spurious Emissions (Radiated).....	24
Section 10.	Spurious Emissions (Restricted bands Radiated)	25
Section 11.	Test Equipment List.....	26
ANNEX A	TEST DETAILS	27
ANNEX B	PHOTOGRAPHS	34

EQUIPMENT: JT-H200PR-**

FCC ID: ACJJT-H200PR

PROJECT NO.: 99416130

Section 1. Summary of Test Results

Manufacturer: Matsuhita Electric Industrial Co., Ltd.
 Model No.: JT-H200PR-**
 Serial No.: 2092009101
 Date Received In Laboratory: 7 April 2003

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15, Subpart C, Paragraph 15.247 for Frequency Hopping Spread Spectrum devices. Radiated tests were conducted in accordance with ANSI C63.4-2001.

- | | | | |
|-------------------------------------|----------------------------|-------------------------------------|---------------------|
| <input checked="" type="checkbox"/> | New Submission | <input checked="" type="checkbox"/> | Production Unit |
| <input type="checkbox"/> | Class II Permissive Change | <input type="checkbox"/> | Pre-Production Unit |
| <input type="checkbox"/> | Family Listing | | |

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

See " Summary of Test Data".



QUALIFIED
BY STERLAB
Reg.nr. L021

Telefication complies with the accreditation criteria for test laboratories as laid down in ISO/IEC 17025:1999. The accreditation covers the quality system of the laboratory as well as the specific activities as described in the authorized annex bearing the accreditation number L021 and is granted on 30 November 1990 by the Dutch Council For Accreditation (RvA: Raad voor Accreditatie).

Telefication bv authorizes the above named company to reproduce this report provided it is reproduced in its entirety and for use by the company's employees only.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Telefication bv accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This report applies only to the items tested.

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dB μ V	N.A.	N.A.
Channel Separation	15.247(a)(1)	Greater than 25 kHz or 20 dB bandwidth	1 MHz	PASS
Pseudorandom Hopping Algorithm	15.247(a)(1)		Bluetooth	PASS
Time of Occupancy	15.247(a)(1)(ii)	\leq 0.4 sec in 30 sec	0.120 sec	PASS
20 dB Occupied Bandwidth	15.247(a)(1)	\leq 1 MHz	0.542 MHz	PASS
Peak Power Output	15.247(b)	1 Watt	1.2 mW	PASS
Spurious Emissions (Antenna Conducted)	15.247(c)	-20 dBc	N.A.	N.A.
Spurious Emissions (Radiated)	15.247(c)	Table 15.209(a)	See Note 1	PASS

Test Conditions:

Indoor Temperature: 26 °C
 Humidity: 52 %

Note 1:

See test report by TNO Electronic Products & Services (EPS), project number 03081901.r03, dated September 4, 2003

Section 2. Equipment Under Test (E.U.T.)

General Equipment Information

Frequency Band: 902 – 928 MHz
 2400 – 2483.5 MHz

Number of Channels: 79

Channel Spacing: 1 MHz

Emissions Designator: 1M00G1D

User Frequency Adjustment: Software controlled



Telefication

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSCEIVER

EQUIPMENT: JT-H200PR-**

FCC ID: ACJIT-H200PR

PROJECT NO.: 99416130

Description of Modification for Modification Filing

Not applicable

Family List Rational

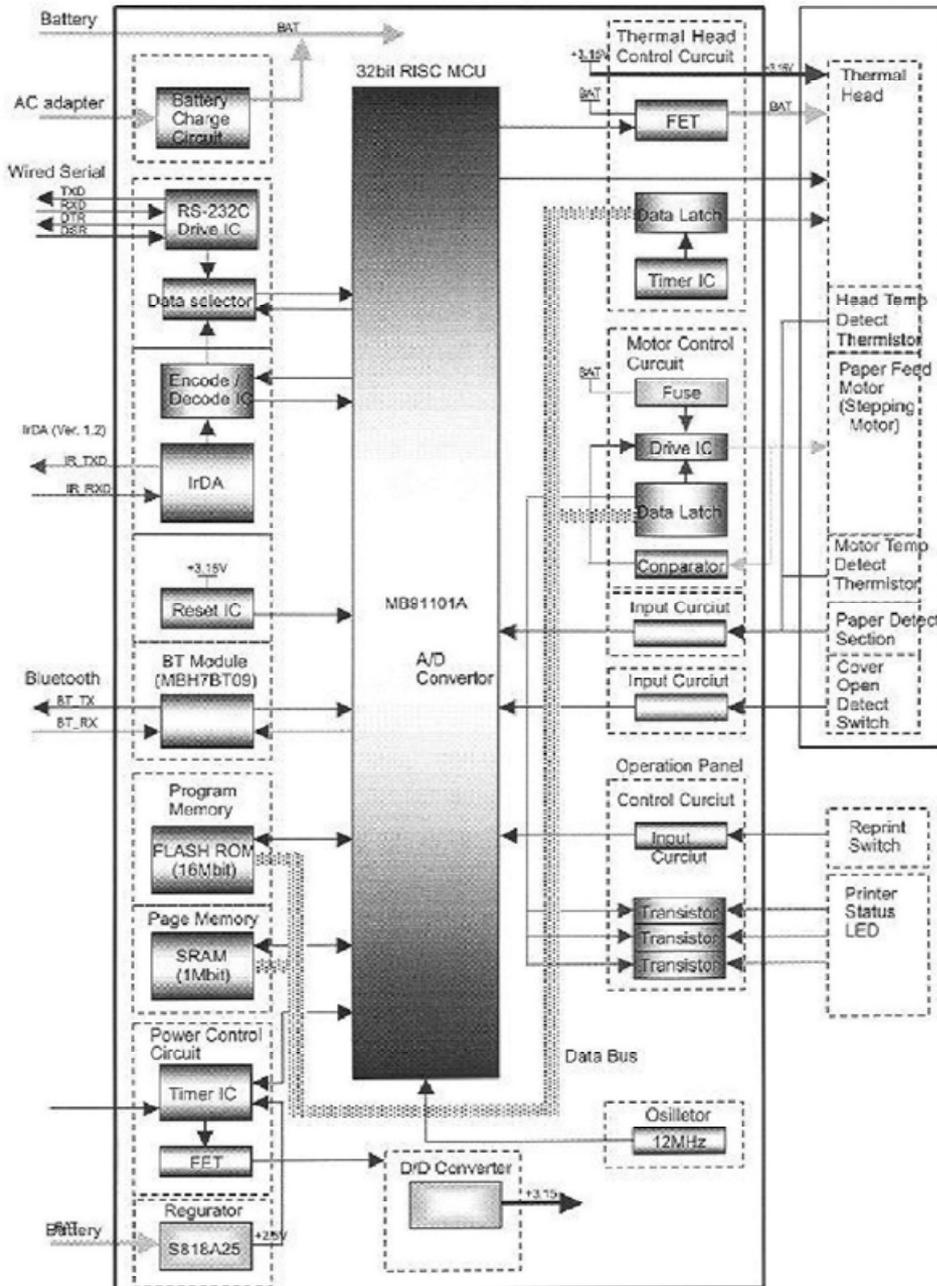
Not applicable

Theory of Operation

The JT-H200PR-** contains a spread spectrum frequency hopping transceiver and is designated for operation in the frequency band of 2400-2483.5 MHz. The equipment is a small printer intended to be connected to a PC via a Bluetooth radio link. The equipment is provided with an integral antenna.

System Diagram

PRINTER (JT-H200PR-50) CIRCUIT BLOCK DIAGRAM

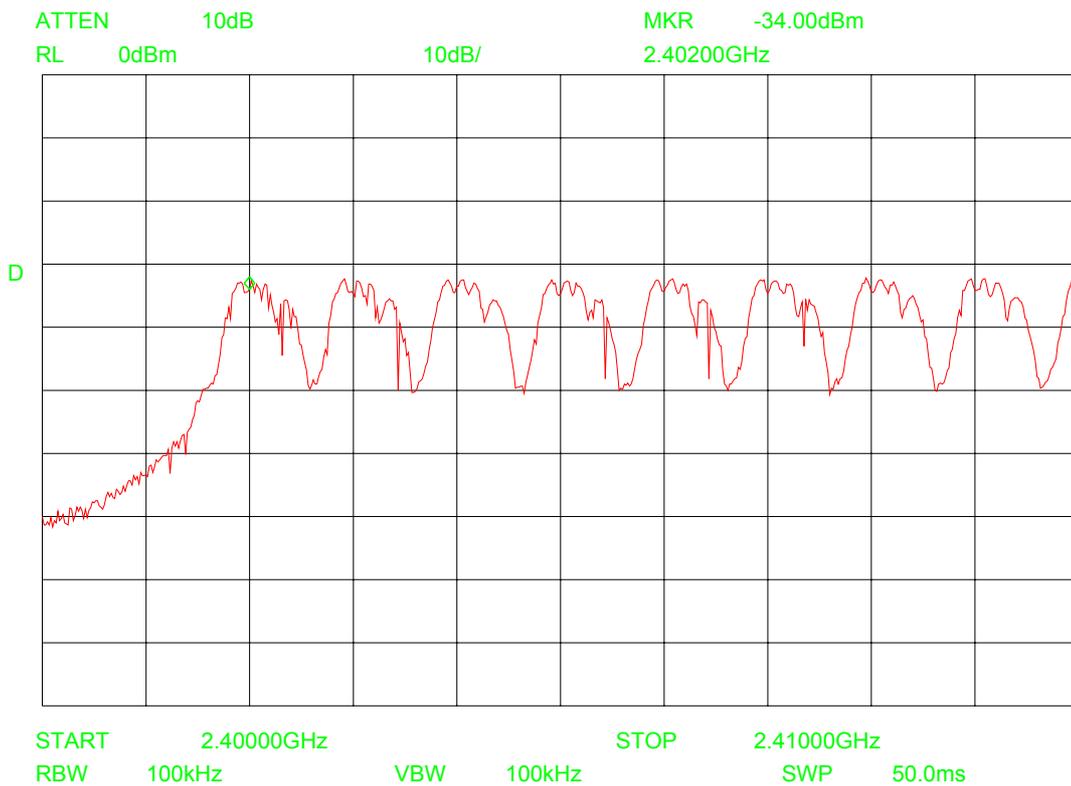


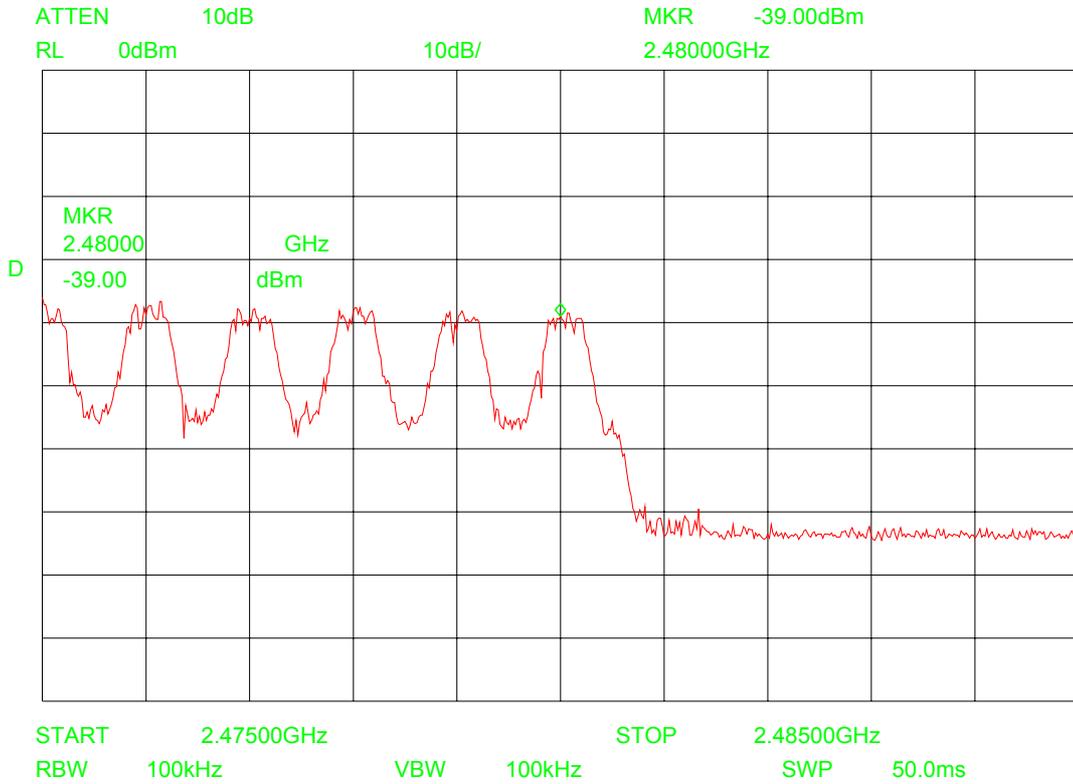
Section 3. Channel Separation

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
----------------------------------	-------------------------

Test Results: Complies.

Measurement Data: See attached plots
 See also 20 dB BW plot
 Measured 20 dB bandwidth: 0.542 MHz
 Channel separation: 1 MHz





Section 4. Pseudorandom Hopping Algorithm

NAME OF TEST: Pseudorandom Hopping Algorithm

PARA. NO.: 15.247(a)(1)

Test Results: Complies.**Measurement Data:** Hopping sequence: according to Bluetooth protocol
Number of Hopping Frequencies: 79
Number of Hopping Patterns: according to Bluetooth protocol

Section 5. Time of Occupancy

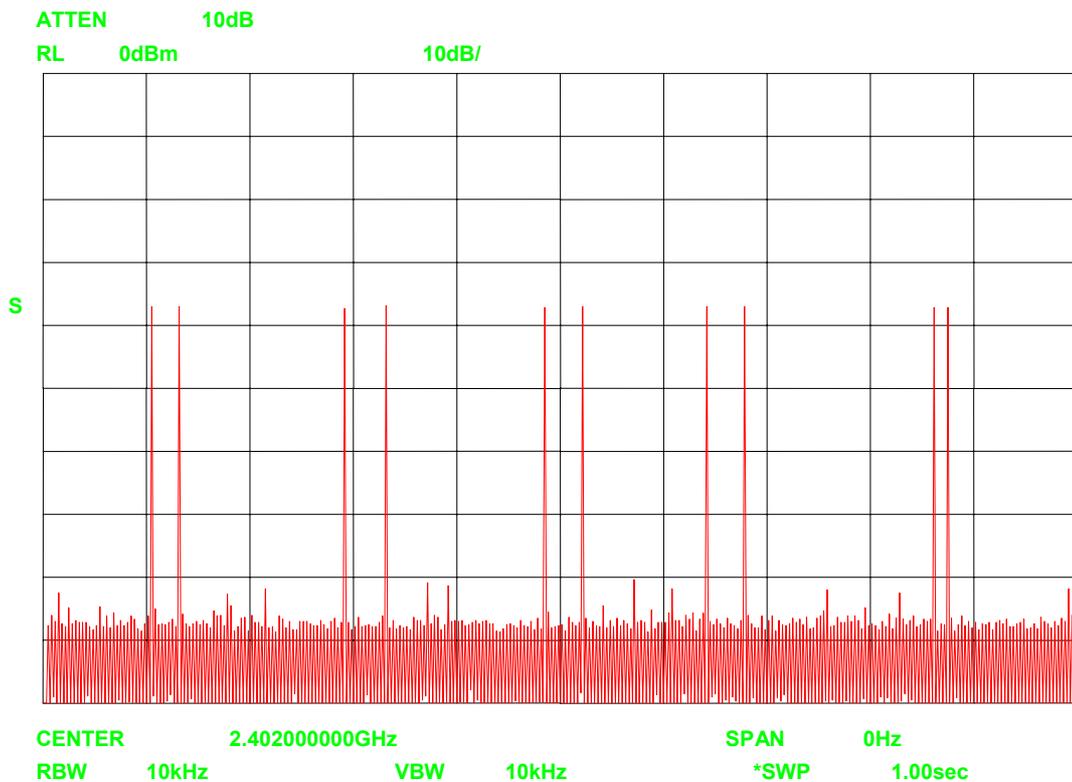
NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)
---------------------------------	-------------------------

Test Results: Complies.

Measurement Data:

Maximum dwell time on any channel: 0.4 ms
 Number of transmissions per second / per channel: 10
 Occupance time in one measurement period: 30 x 10 x 0.4

Limit: Average time of occupancy: ≤ 0.4 sec in 30 sec.

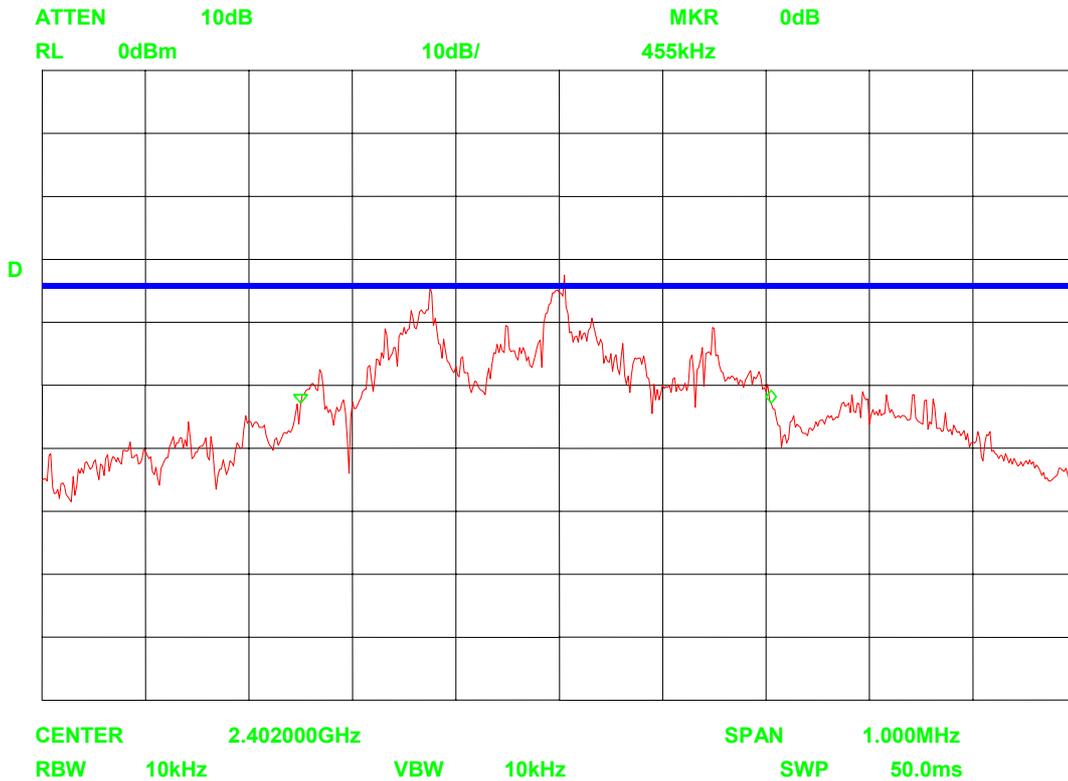


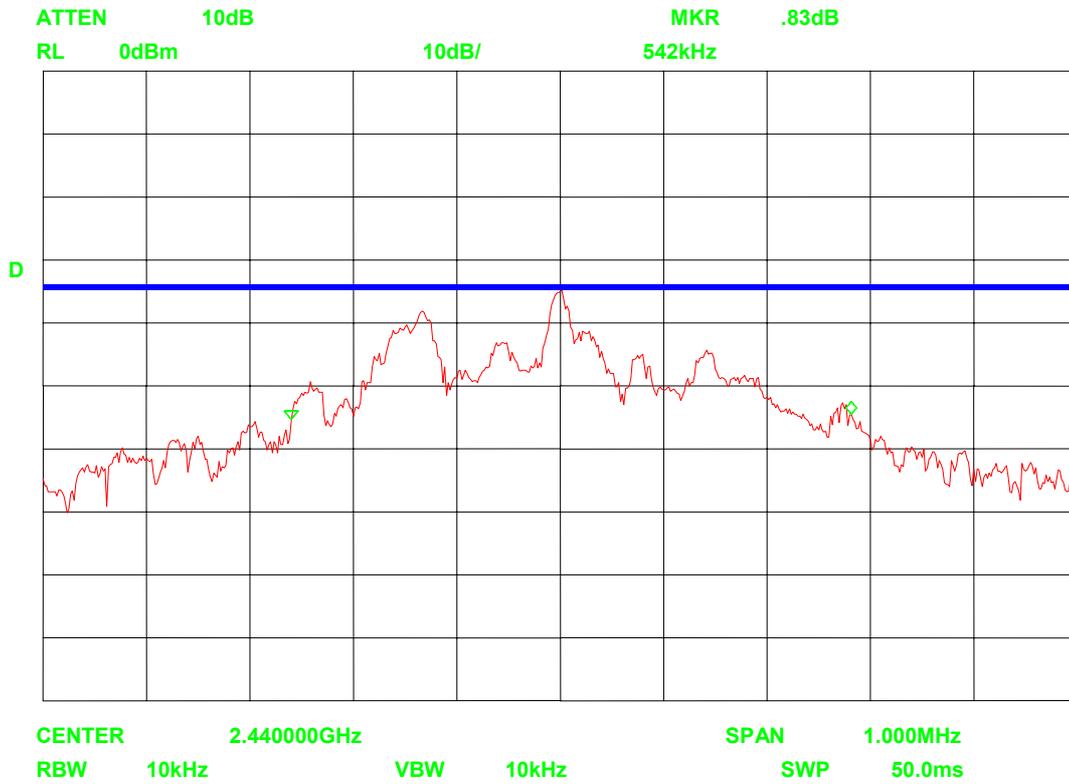
Section 6. Occupied Bandwidth

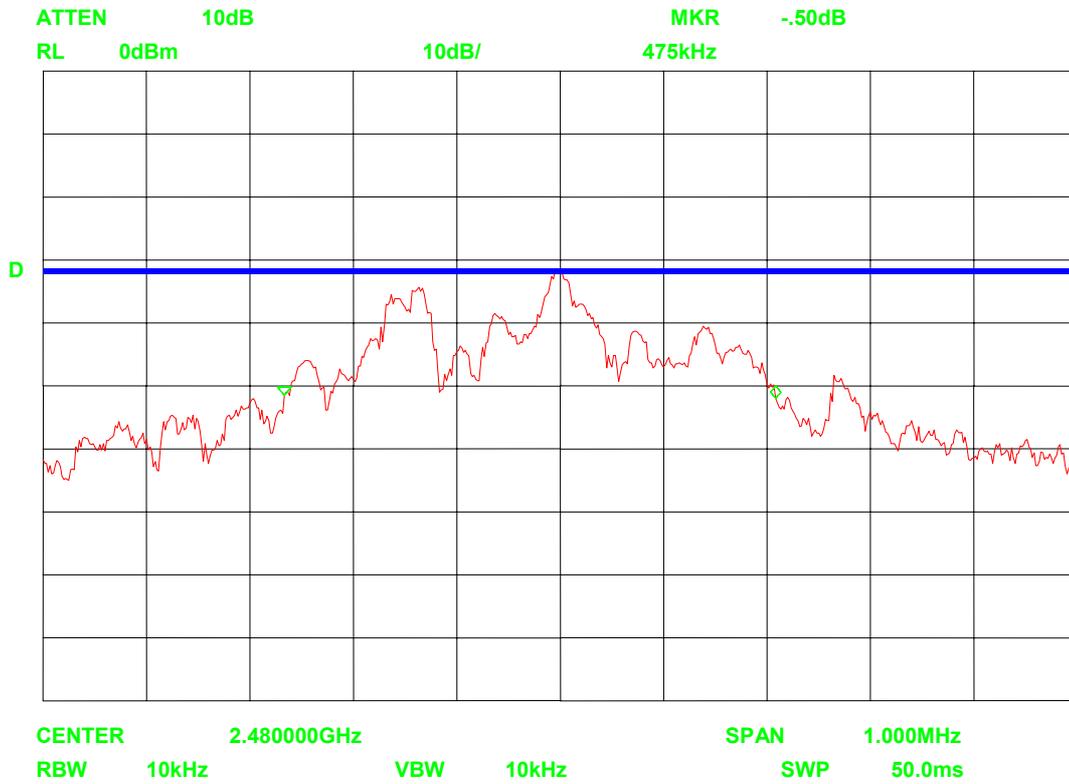
NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(1)(i)
----------------------------------	----------------------------

Test Results: Complies

Measurement Data: See attached plots.
Measured 20 dB BW: 0,542 MHz (max)









Telefication

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSCEIVER

EQUIPMENT: JT-H200PR-**

FCC ID: ACJJT-H200PR

PROJECT NO.: 99416130

Section 7. Peak Power Output

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247 (b)
---------------------------------	-----------------------

Test Results: Complies.

Measurement Data: See attached table
 Detachable antenna? Yes No
 If yes, state the type of non-standard connector used:

Antennas:

Model	Type	Manufacturer	Gain (dBi)	E.I.R.P. (dBm)
integral	NA	NA	0	1.1
Peak power output at antenna port(dBm): not applicable				

Field Strength: 98 dBµV/m @ 3m or 79 mV/m @ 3m.

Section 8. Spurious Emissions (Exploratory Radiated)

NAME OF TEST: Spurious Emissions (Radiated)

PARA. NO.: 15.247(c)

Test Results: Inconclusive

The preliminary test in an anechoic room did reveal that the only spurious signal present is on 4.8 GHz. The spurious signal on 4.8 GHz is approximately 40 dB weaker than the desired signal on 2.4 GHz. The level of the spurious signal on 4.8 GHz is $-48 \text{ dBm}_{\text{erp}}$.

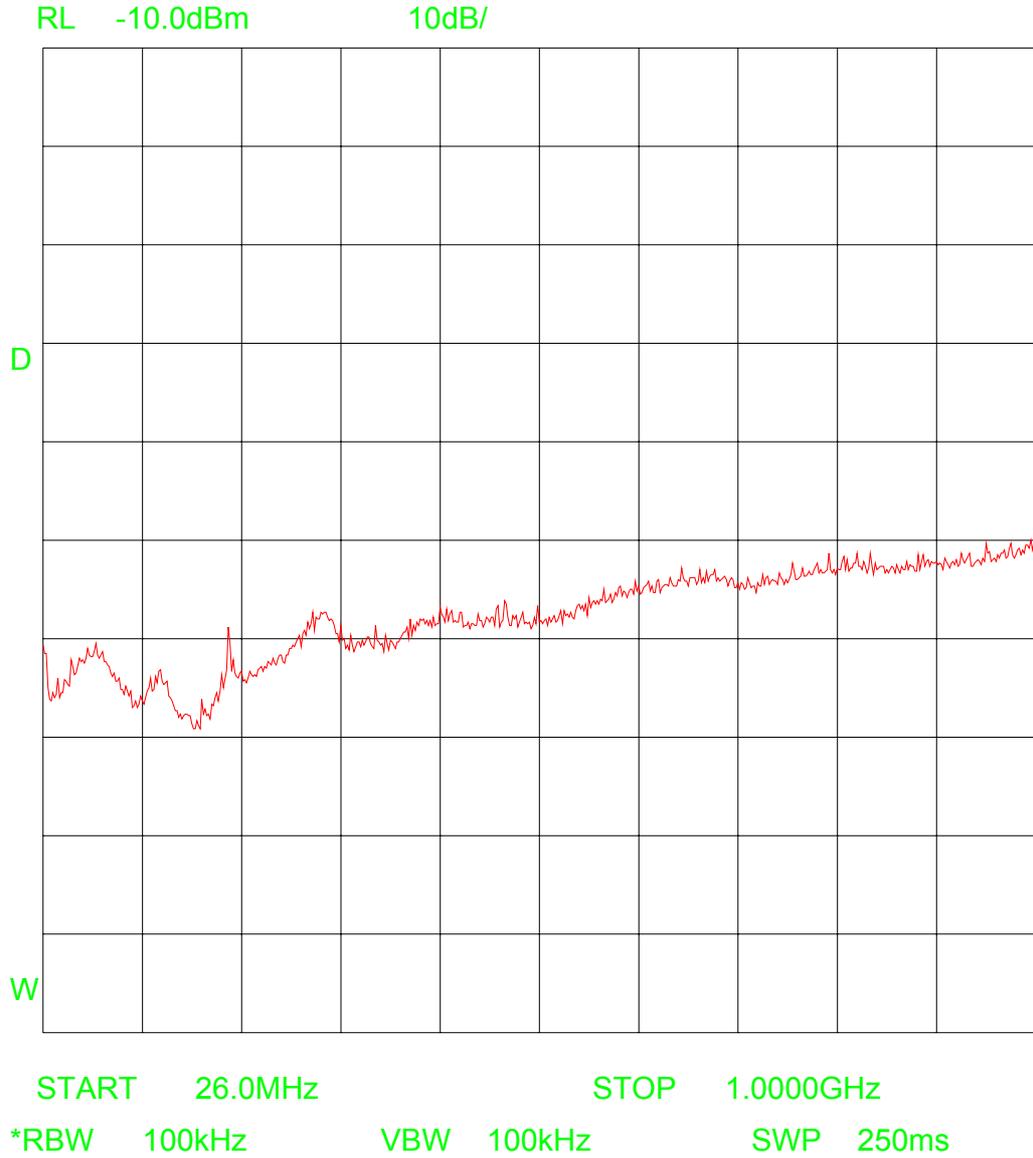
Requirement: Spurious signals in the restricted bands shall comply with §15.205.
In addition spurious signals shall be at least 20 dB weaker than the desired signal.

Measurement Data: See attached graphs.

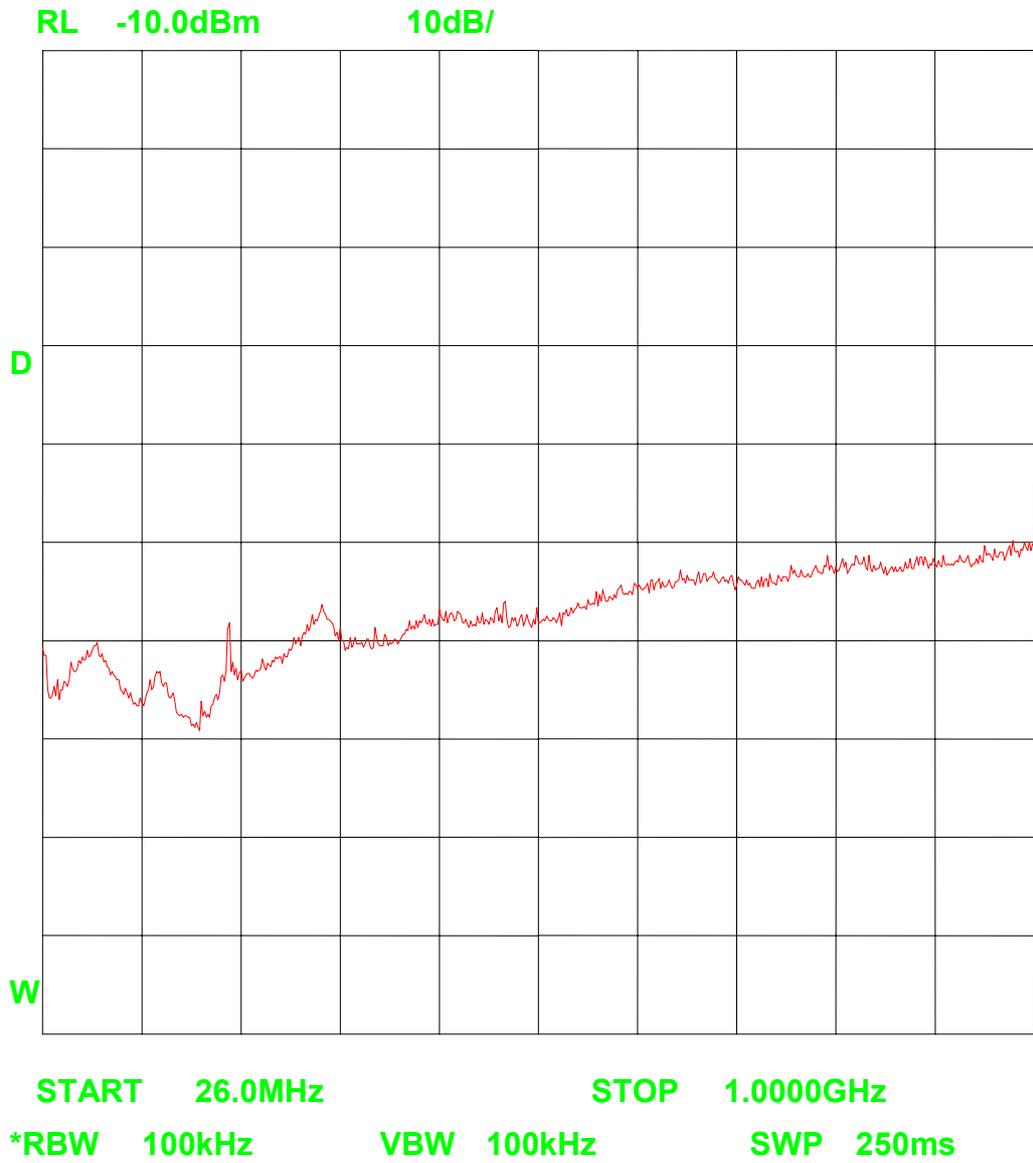
Note: The graphs represent values calibrated in effective radiated power (erp).
The displayed limit is converted by using the relationship: $\text{ERP}_{\text{dBm}} = \text{E}_{\text{dB}\mu\text{V}/\text{m}} - 97_{\text{dB}}$

Test Data - Radiated Emissions (Peak)

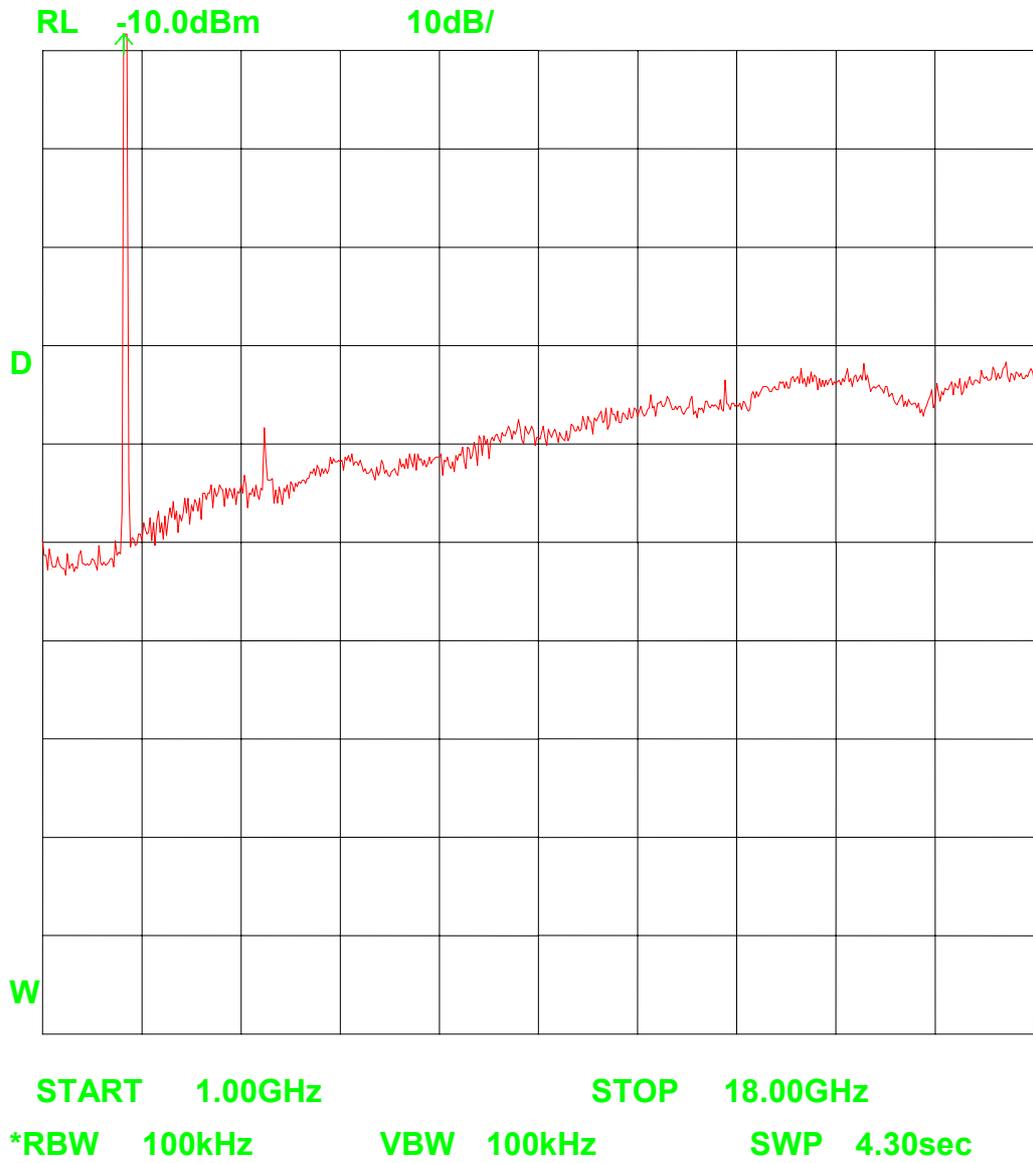
Vertical polarization



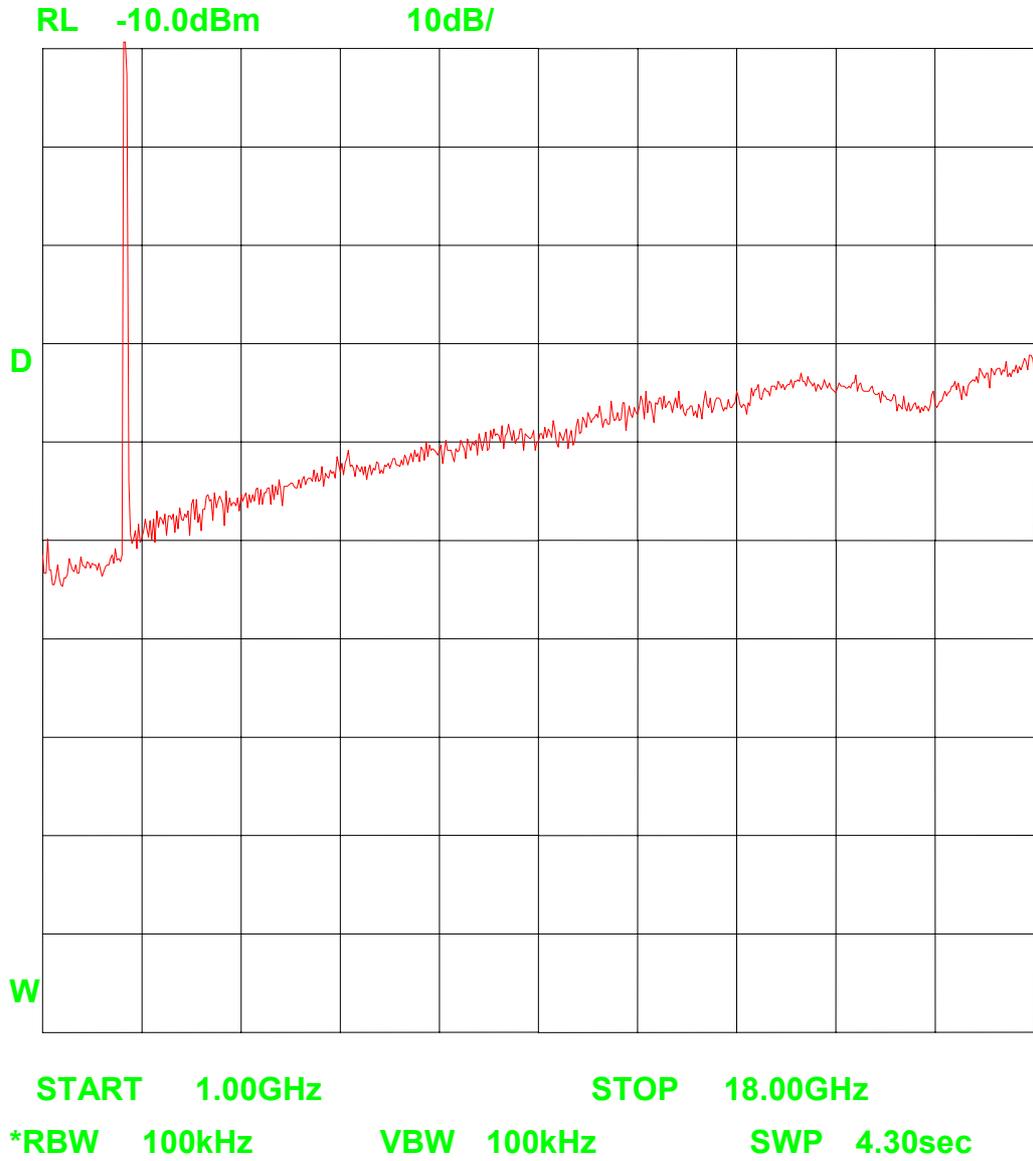
Horizontal polarization



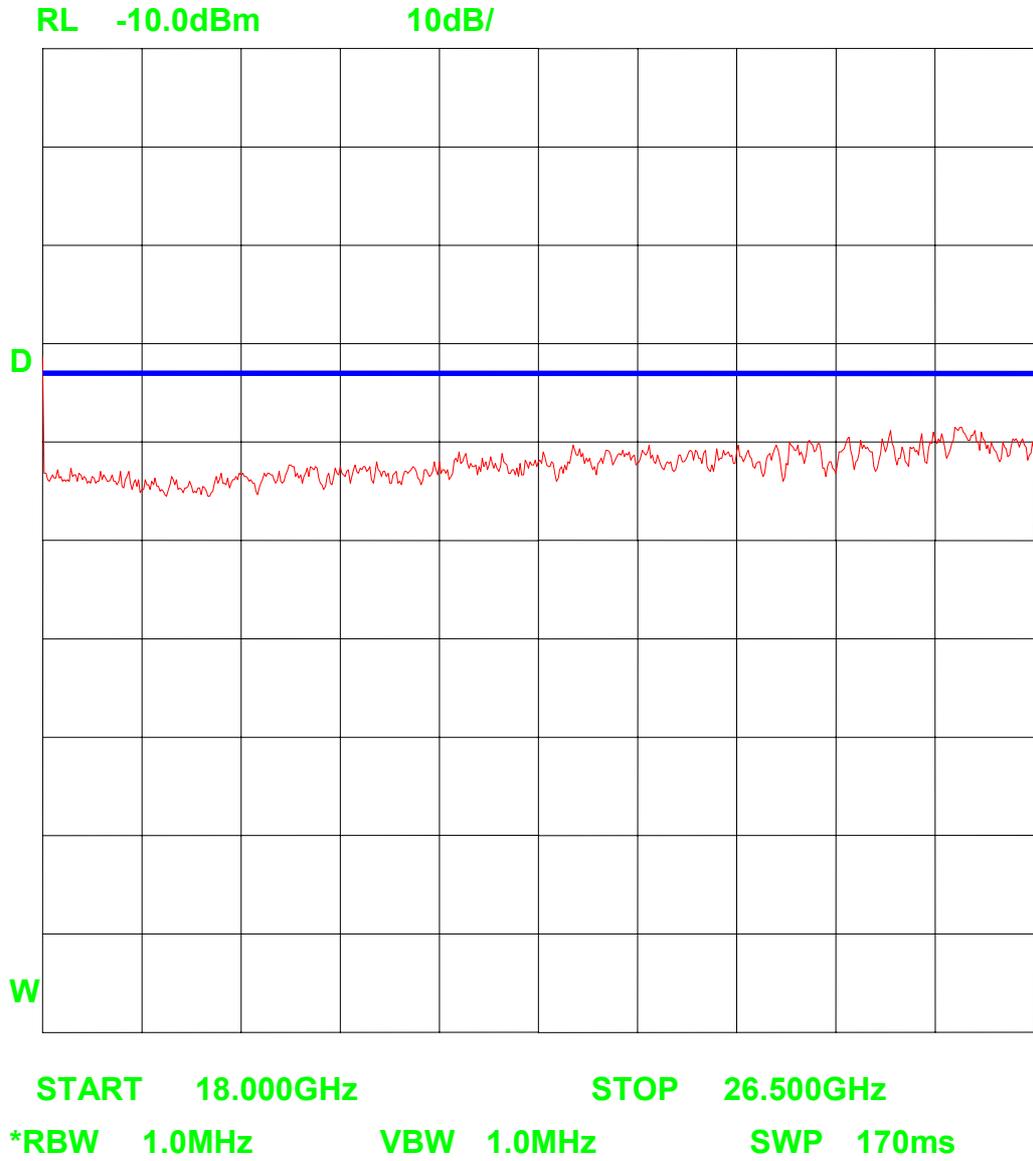
Vertical polarization



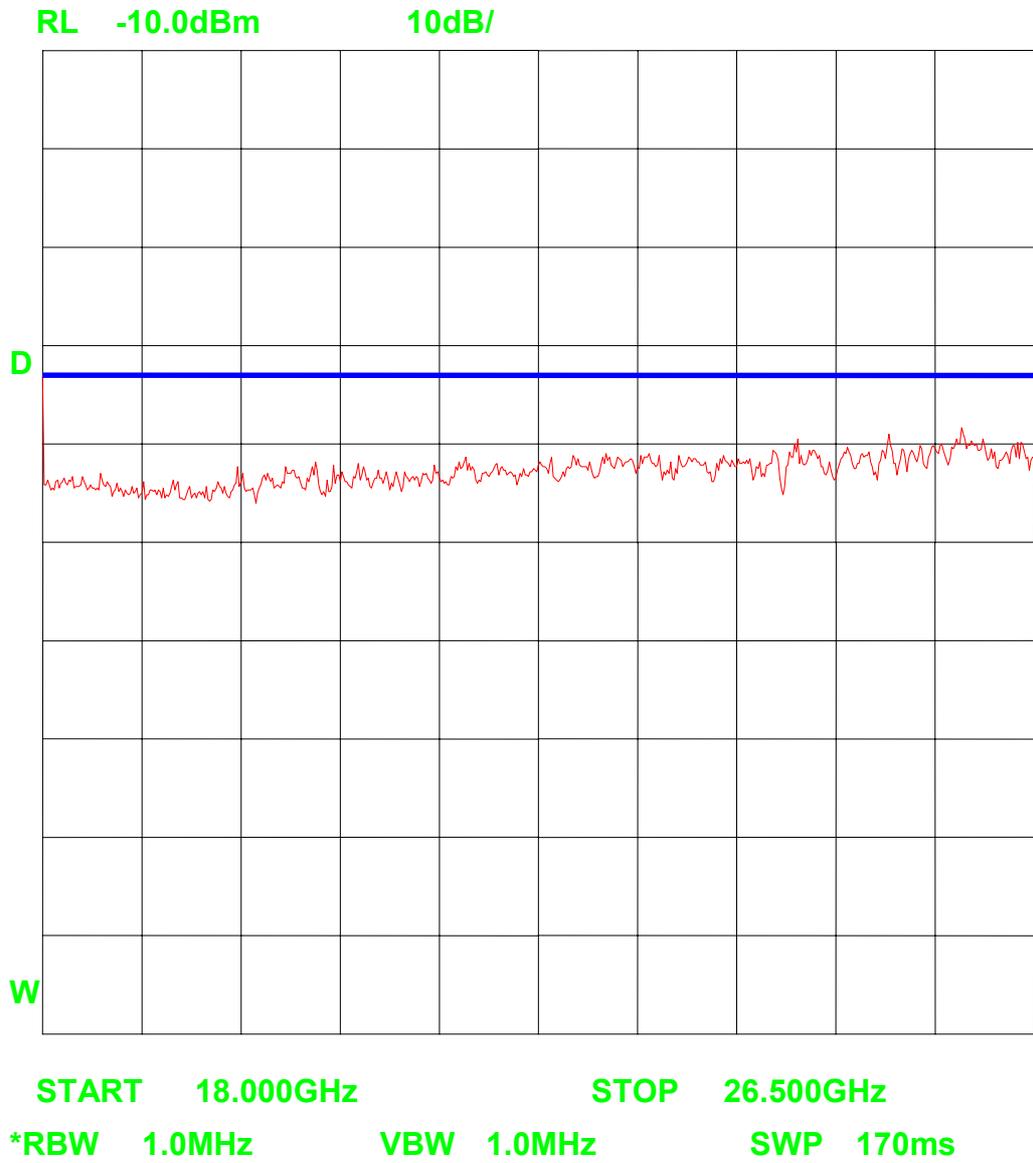
Horizontal polarization



Vertical polarization



Horizontal polarization



Section 9. Spurious Emissions (Radiated)

NAME OF TEST: Spurious Emissions (Radiated)	PARA. NO.: 15.247(c)
---	----------------------

Test Results:

Complies.

Radiated emission tests have been performed by TNO Electronic Products & Services (E.P.S.) B.V. See measurement/technical report 03081901.r03, dated September 4, 2003. The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.109 and 15.209.

Section 10. Spurious Emissions (Restricted bands Radiated)

NAME OF TEST: Spurious Emissions (Radiated)

PARA. NO.: 15.247(c)

Test Results:

Complies

Radiated emission tests have been performed by TNO Electronic Products & Services (E.P.S.) B.V. See measurement/technical report 03081901.r03, dated September 4, 2003. The test methodology used is based on the requirements of 47 CFR Part 15, sections 15.109 and 15.209.

Section 11. Test Equipment List

Description	Manufacturer	Model	Identification	Used at
Anechoic chamber	Euroshield	RFD-F-100	--	15.207(a);15.247(a)(2); (c); (d)
Spectrum analyzer	Hewlett Packard	8563E	TE 00481	15.207(a);15.247(a)(2); (c); (d)
Standard gain horn	Scientific Atlanta	12A-18	TE 00608	15.247(c)
Double ridged guide horn antenna	EMCO	3115	TE 00531	15.247(c)
Biconilog antenna	EMCO	3143	TE 00744	15.247(c)
Pre-amplifier	Hewlett Packard	8449B	TE 00092	15.247(c)
Pre-amplifier	Rohde & Schwarz	ESV-Z3	TE 00098	15.247(c)
Power meter	Hewlett Packard	435 B	TE 00249	15.247(b)(3)
Power sensor	Hewlett Packard	8484 A	TE 00245	15.247(b)(3)



Telefication

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSCEIVER

EQUIPMENT: JT-H200PR-**

FCC ID: ACJIT-H200PR

PROJECT NO.: 99416130

ANNEX A TEST DETAILS

NAME OF TEST: Channel Separation	PARA. NO.: 15.247(a)(1)
----------------------------------	-------------------------

Minimum Standard:

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.



Telefication

FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSCEIVER

EQUIPMENT: JT-H200PR-**

FCC ID: ACJJT-H200PR

PROJECT NO.: 99416130

NAME OF TEST: Pseudorandom Hopping Algorithm

PARA. NO.: 15.247(a)(1)

Minimum Standard:
from

The system shall hop to channel frequencies that are selected from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

NAME OF TEST: Time of Occupancy	PARA. NO.: 15.247(a)(1)(ii)
---------------------------------	-----------------------------

Minimum Standard:

Frequency Band (MHz)	20 dB Bandwidth	No. of Hopping Channels	Average Time of Occupancy
902 - 928	<250 kHz	50	=<0.4 sec. in 20 sec.
902 - 928	=>250 kHz	25	=<0.4 sec. in 10 sec.
2400 - 2483.5	-----	75	=<0.4 sec. in 30 sec.
5725 - 5850	-----	75	=<0.4 sec. in 30 sec.

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: 1 MHz

VBW: = RBW

Span: 0 Hz

LOG dB/div.: 10 dB

Sweep: Sufficient to see one hop time sequence.

Trigger: Video

The occupancy time of one hop is measured as above. The average time of occupancy is calculated over the appropriate period of time from above table (10, 20, or 30 seconds).

Avg. time of occupancy = (period from table/duration of one hop)/no. of channels multiplied by the duration of one hop.

For instance:

If a 2.4 GHz system has a measured hop duration time of 1 msec. and uses 75 channels, then the average time of occupancy would be:

$$(30 \text{ sec.}/.001 \text{ sec.})/75 \text{ chan.} = 400 \times 1 \text{ msec.} = 400 \text{ msec. or } 0.4 \text{ sec. in } 30 \text{ sec.}$$

NAME OF TEST: Occupied Bandwidth	PARA. NO.: 15.247(a)(2)
----------------------------------	-------------------------

Minimum Standard:

Frequency Band (MHz)	Maximum 20 dB Bandwidth
902 - 928	500 kHz
2400 – 2483.5	1 MHz
5725 – 5850	1 MHz

Method Of Measurement:

The spectrum analyzer is set as follows:

RBW: At least 1% of span/div.

VBW: >RBW

Span: Sufficient to display 20 dB bandwidth

LOG dB/div.: 10 dB

Sweep: Auto

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Peak Power Output	PARA. NO.: 15.247(b)
---------------------------------	----------------------

Minimum Standard:

Frequency Band (MHz)	No. of Hopping Channels	Maximum Peak Power Output at Antenna Port
902 - 928	at least 50	1 Watt
902 – 928	25 - 49	0.25 Watts
2400 – 2483.5	75	1 Watt
5725 – 5850	75	1 Watt

If transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point to point operation may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceed 6 dBi.

Systems operating in the 5725 – 5850 MHz band that are used exclusively for fixed, point-to-point operation may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter peak output power.

Direct Measurement Method For Detachable Antennas:

If the antenna is detachable, a peak power meter is used to measure the power output with the transmitter operating into a 50 ohm load. The dBi gain of the antenna(s) employed shall be reported.

Calculation Of EIRP For Integral Antenna:

If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the relationship for 3 m distance as follows:

EIRP = E – 97

where,

EIRP = the equivalent isotropic radiated power in dBm

E = the maximum measured field strength in dBμV/m

The RBW of the spectrum analyzer shall be set to a value greater than the measured 20 dB occupied bandwidth of the E.U.T.

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

NAME OF TEST: Radiated Spurious Emissions

PARA. NO.: 15.247(c)

Minimum Standard: In any 100 kHz bandwidth outside the frequency band in which the transmitter is operating, emissions shall be at least 20 dB below the fundamental emission and shall not exceed the following field strength limits when falling in the restricted bands.

Emissions falling in the restricted bands of 15.205 shall not exceed the following field strength limits:

Frequency (MHz)	Field Strength (µV/m @ 3m)	Field Strength (dB @ 3m)
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

THE SPECTRUM WAS SEARCHED TO THE 10th HARMONIC

15.205 Restricted Bands

MHz	MHz	MHz	GHz
0.09-0.11	16.42-16.423	399.9-410	4.5-5.25
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.125-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2655-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41	1718		

Number of channels tested:

Tuning range	Number of channels tested	Channel location in band
1 MHz or less	1	middle
1 to 10 MHz	2	top and bottom
more than 10 MHz	3	top, middle, bottom

Telefication



FCC PART 15, SUBPART C

FREQUENCY HOPPING SPREAD SPECTRUM TRANSCEIVER

EQUIPMENT: JT-H200PR-**

FCC ID: ACJIT-H200PR

PROJECT NO.: 99416130

ANNEX B PHOTOGRAPHS

Test sample, overview



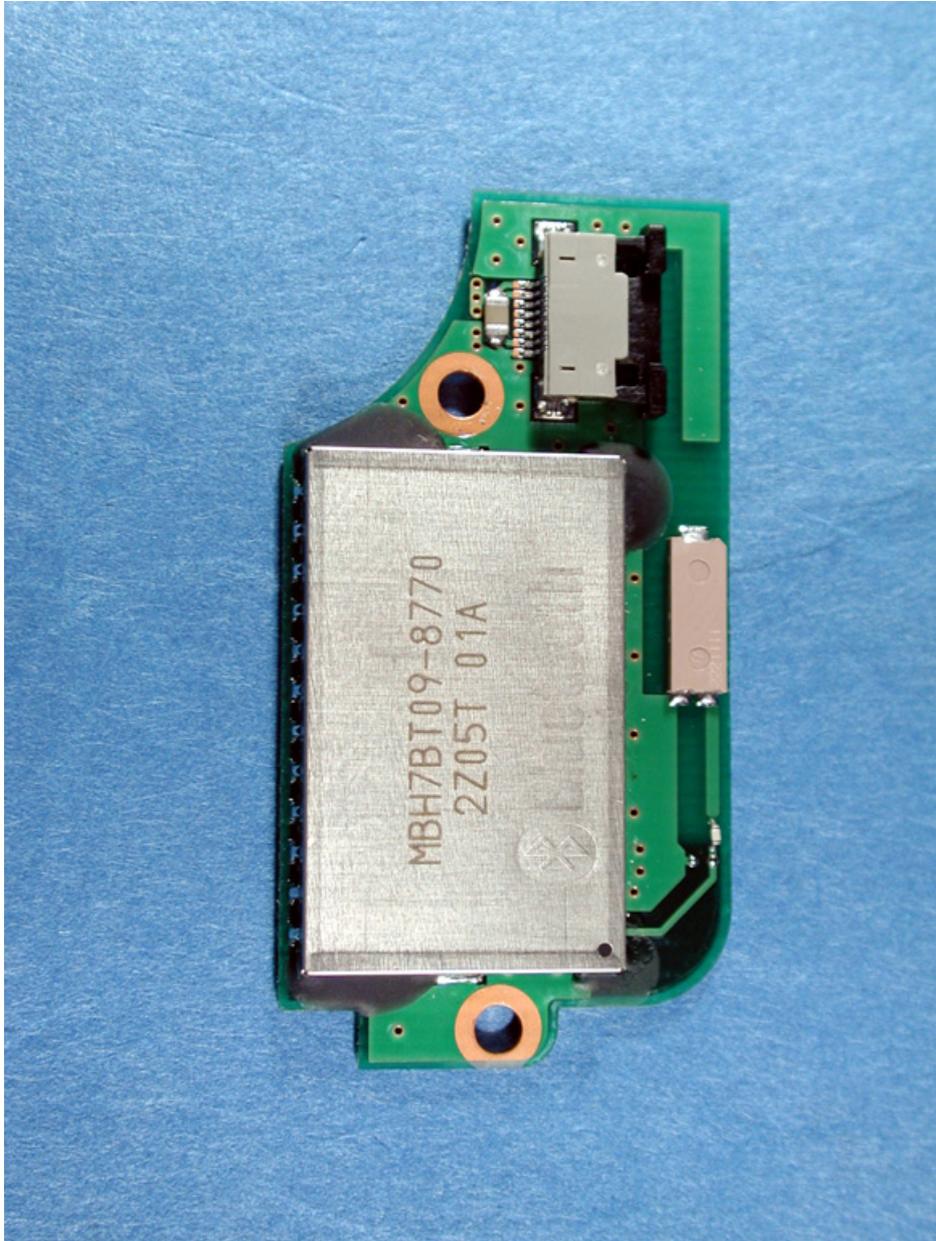
Test sample, interior, right side



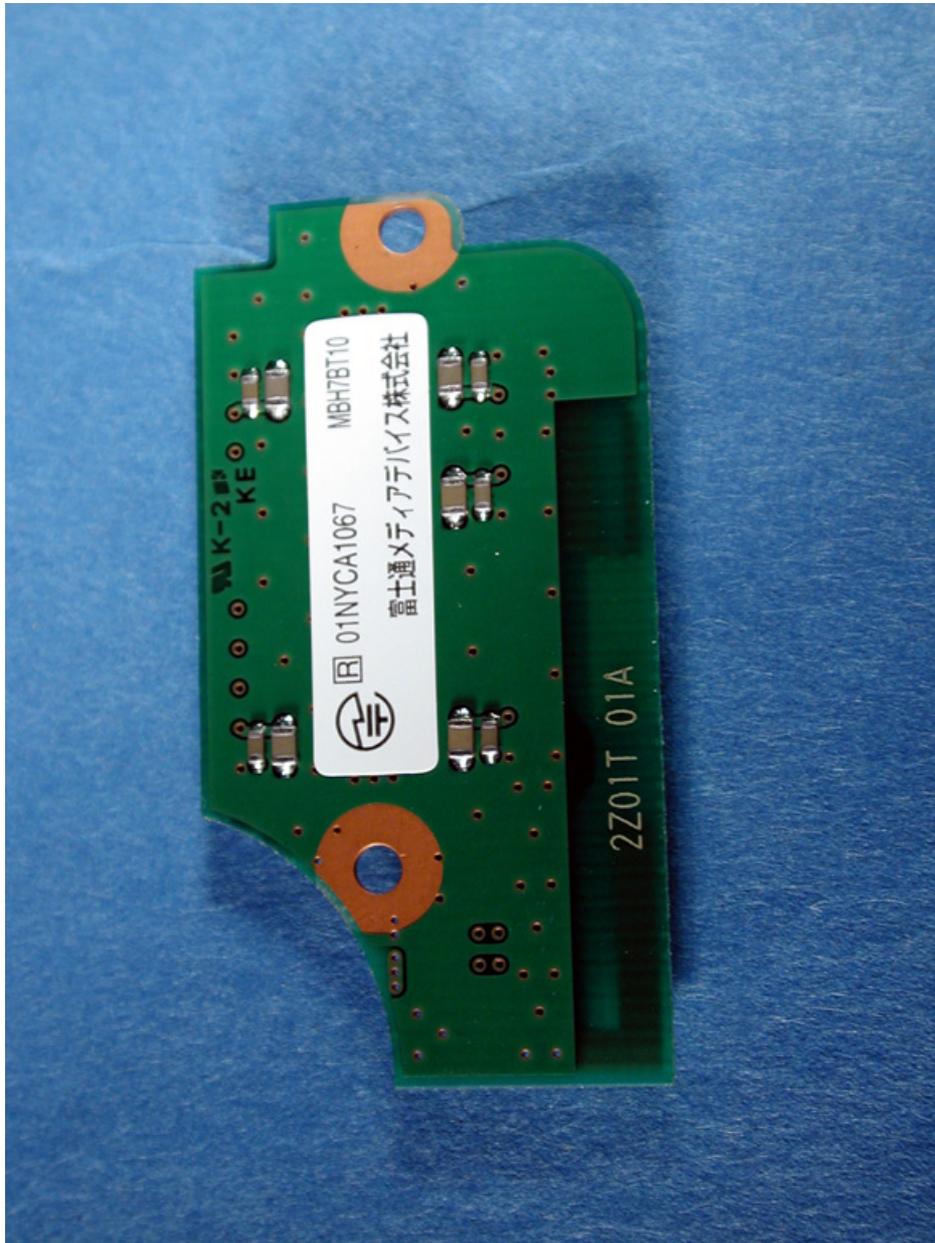
Test sample, interior, left side



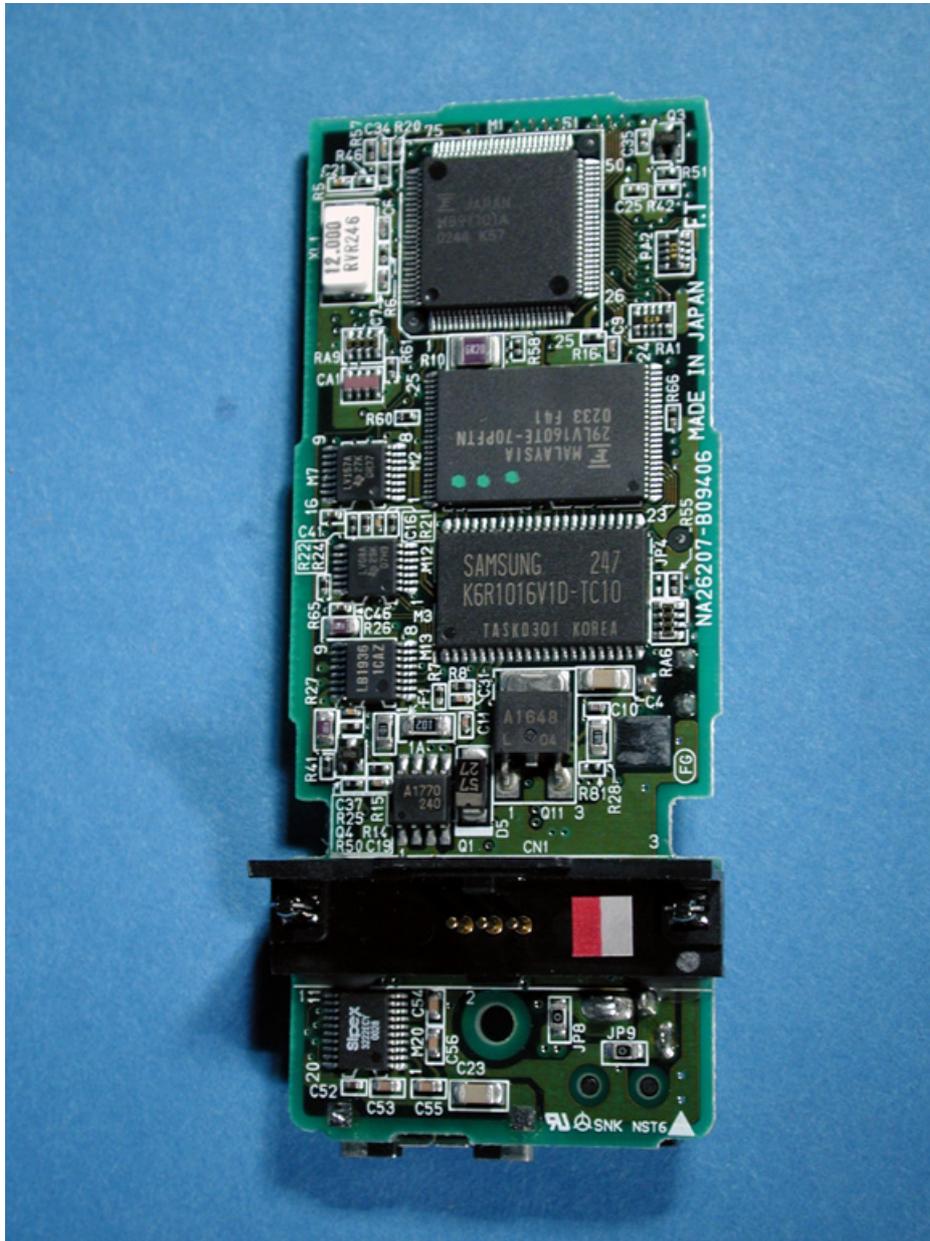
Test sample, bluetooth module, top side



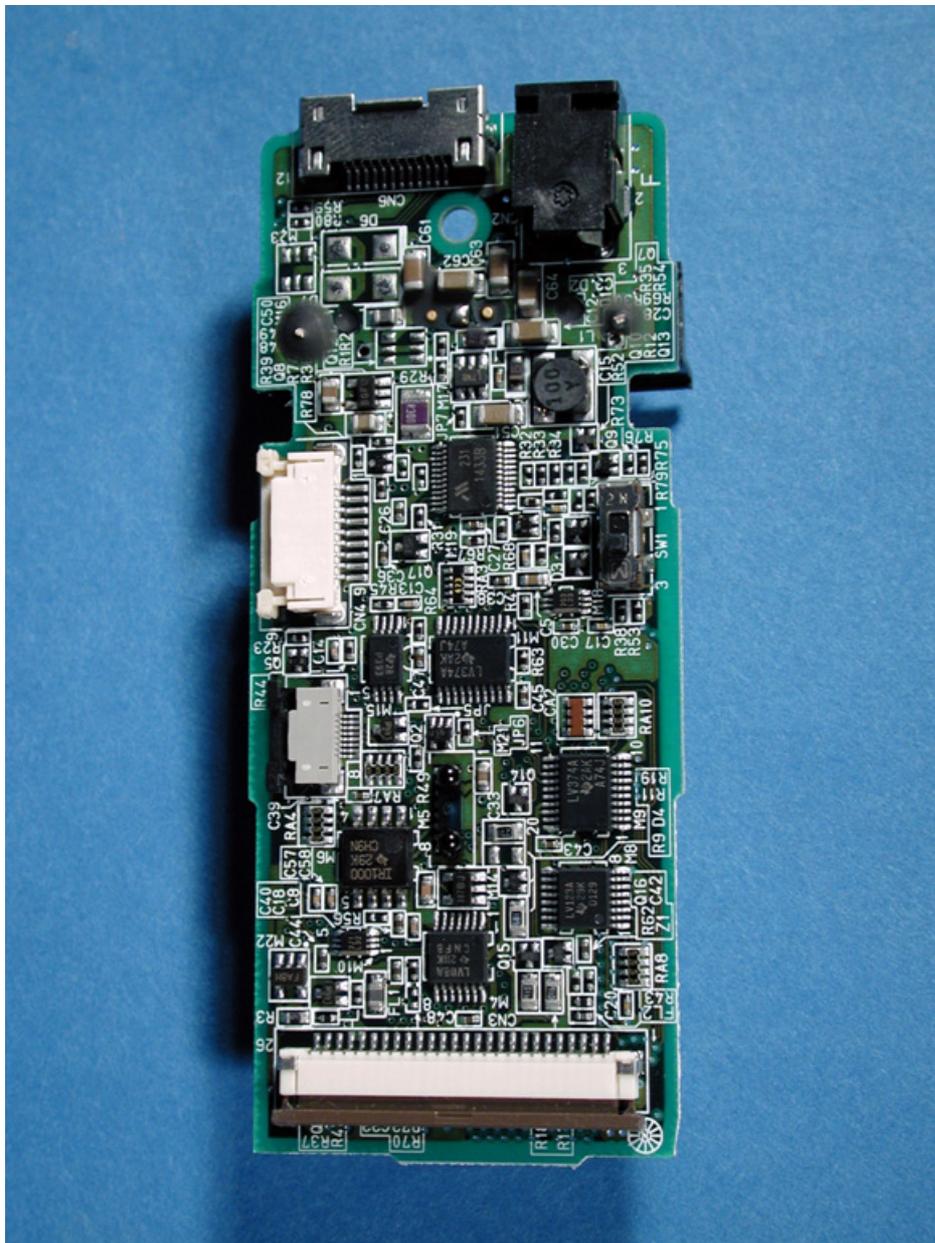
Test sample, bluetooth module, bottom side



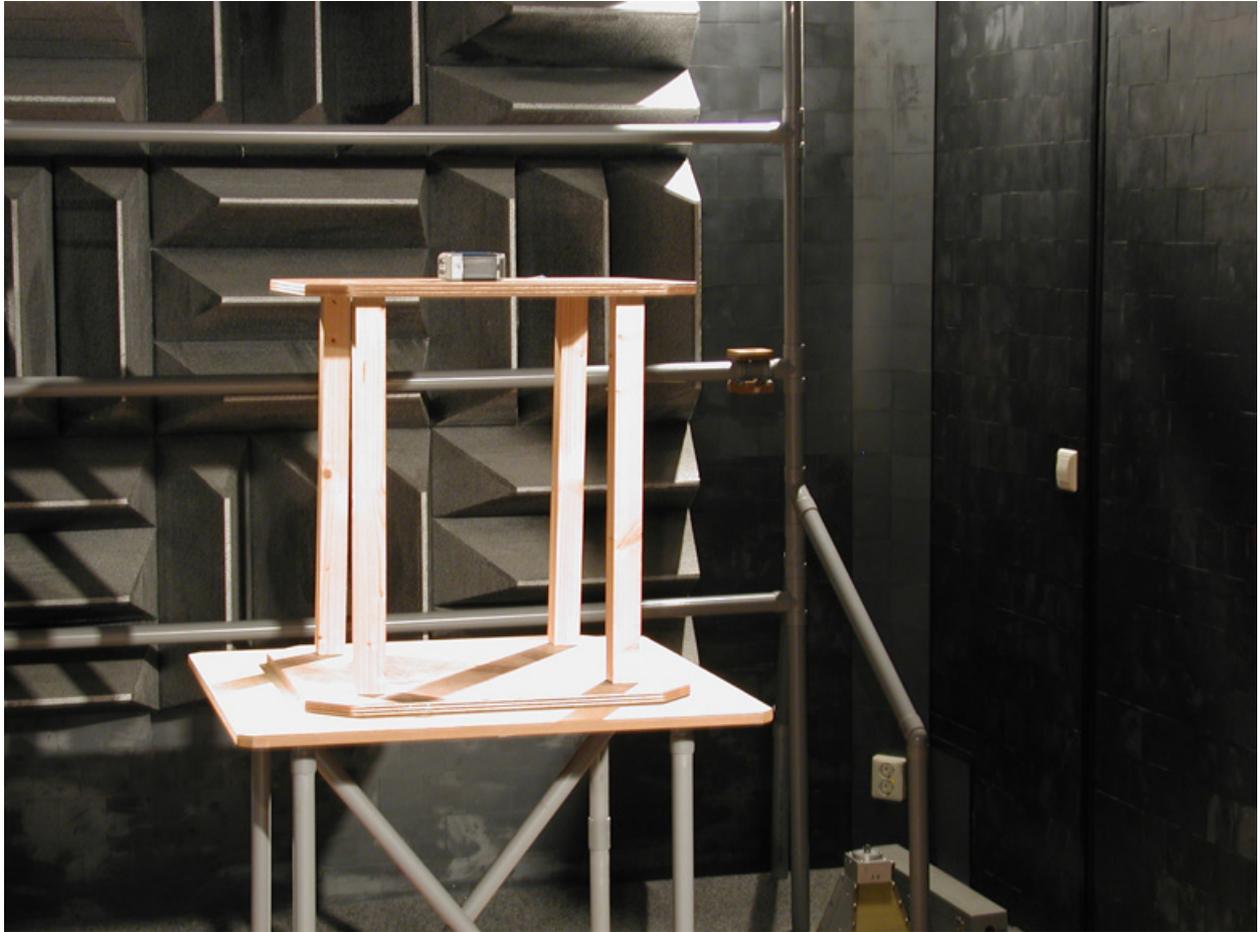
Test sample, PCB, top side



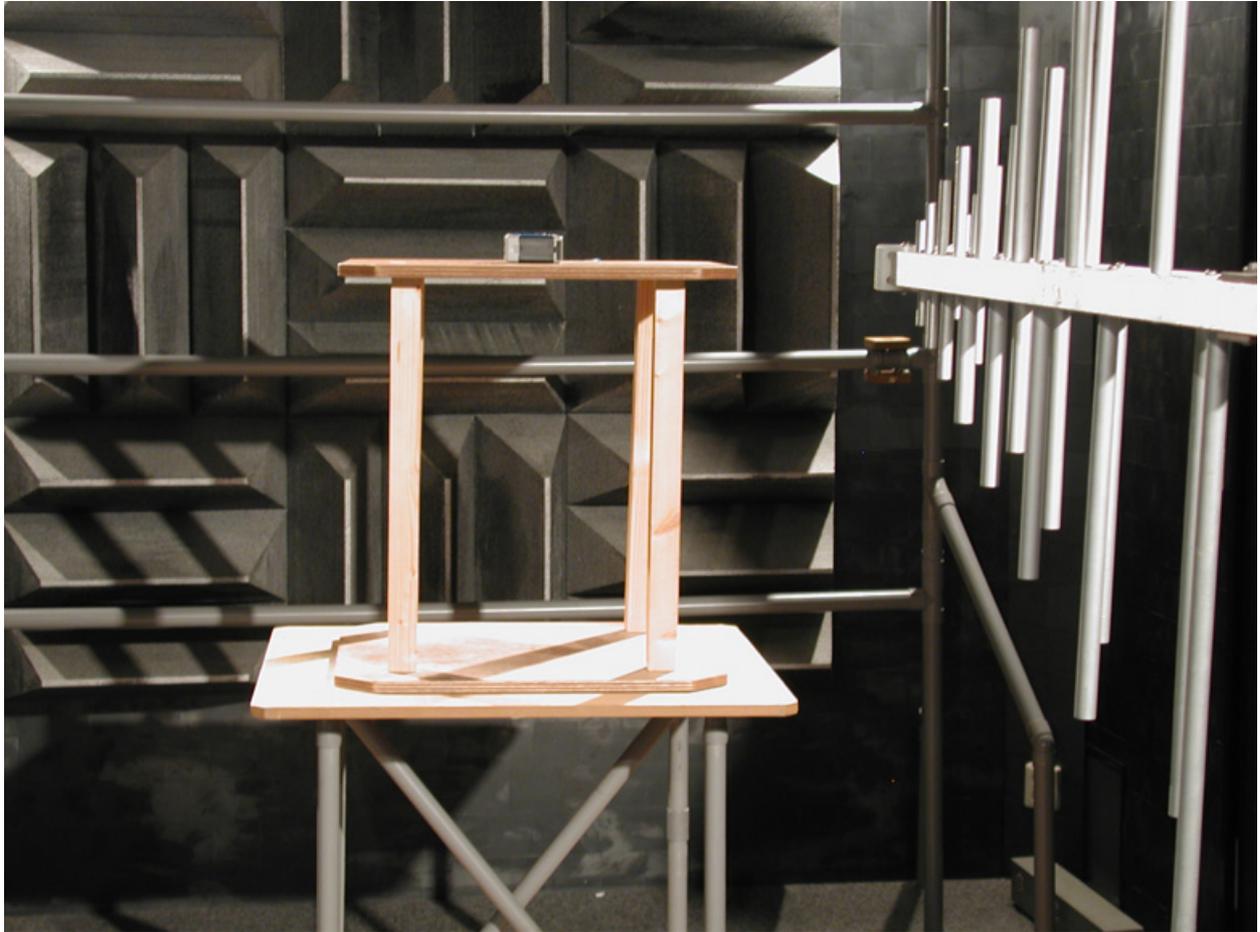
Test sample, PCB, bottom side



Set up test sample and turntable



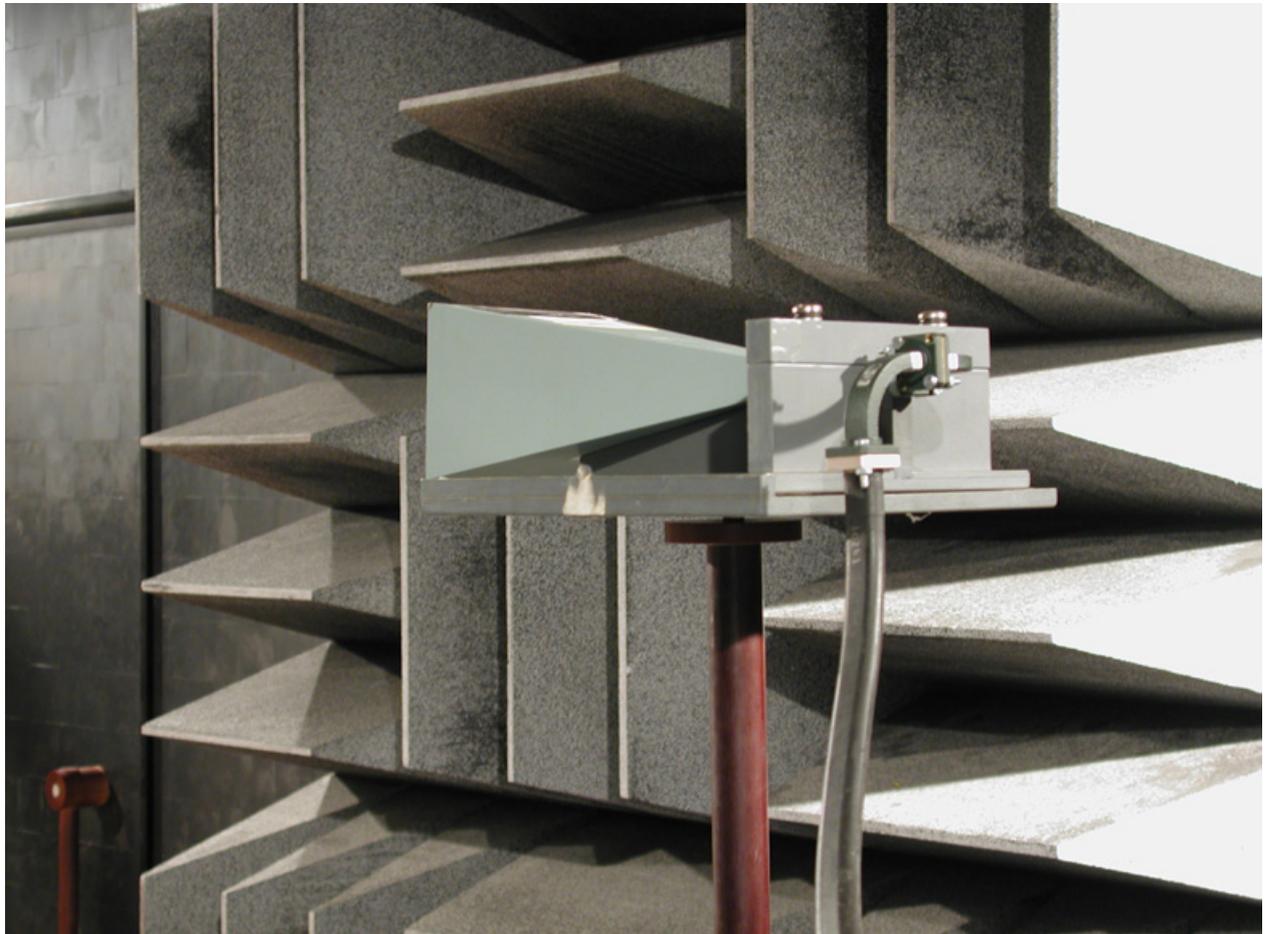
Set up 0.03 - 1 GHz



Set up 1 – 18 GHz



Set up 18 - 26 GHz



Set up 18 – 26 GHz



Set up 18 – 26 GHz

