telefication bv
The Netherlands
Chamber of Commerce
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Radio Test Report: 99594831 Logitech AGY-735235-0000

Applicant:
Logitech Europe SA
Z.I. Moulin du Choc
CH-1122 Romanel
Morges, Switzerland

Equipment Under Test: V-UAN17

FCC ID: DZL221829

In Accordance With: **FCC Part 15, Subpart C, 15.247 (10-1-03 edition)**
Frequency Hopping Transmitters

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

Tested by:
ing. P.A. Suringa, Senior Engineer Radio/EMC

Reviewed by:
ing. J.C. le Clercq, Test Engineer

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

Date: 8 December 2004
Total Number of Pages: 42

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Section 1. Summary of Test Results

Manufacturer:	Logitech inc., 6505 Kaiser Drive, 94555 Fremont, CA USA
Model No.:	V-UAN17
Serial No.:	Not applicable
Date Received In Laboratory:	23 November 2004

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. Tests were conducted in accordance with Public Notice DA 00-705, issued in March 2000.

☒	New Submission	☒	Production Unit
☐	Class II Permissive Change	☐	Pre-Production Unit
☐	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".

TESTING RvA L 021

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).

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
Powerline Conducted Emissions	15.207(a)	48 dBµV	45.9 dBµV	PASS
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)	≤ 0.4 sec in 30 sec	18 msec	PASS
20 dB Occupied Bandwidth	15.247(a)(1)	N.A.	0.875 MHz	N.A.
Peak Power Output	15.247(b)	1 Watt	1.0 mW	PASS
Spurious Emissions (Antenna Conducted)	15.247(c)	≤ -20 dBc	≤ - 51.66 dBc	PASS
Spurious emissions (Radiated)	15.209	Table 15.209(a)	≤ 39.0 dBµV/m	PASS
Spurious Emissions in restricted bands as defined in 15.205(a) (Radiated)	15.247(c)	Table 15.209(a)	45.2 dBµV/m (Av) 63.9 dBµV/m (Pk)	PASS

Test Conditions:

Indoor Temperature: 22 °C
Humidity: 45 %

Outdoor Temperature: 4.3 °C
Humidity: --

Test locations:

Section 15.209 only:

- TNO Electronic Products & Services (EPS) B.V
  Smidshornerweg 18
  9822 TL Niekerk
  The Netherlands

  FCC listed : 90828
  Industry Canada : IC3501

Other applicable sections:

- Telefication bv, Zevenaar

Note:

During testing, use has been made of a test tool named Blue Test issued by CSR Ltd.
By means of this test tool, the power was set to its maximum (pwr int = 63).

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

General Equipment Information

Frequency Band:	2400 – 2483.5 MHz
Rated power:	4 dBm (conducted)
Number of Channels:	79
Channel Spacing:	1 MHz
Emissions Designator:	1M00F1D

Description of Modification for Modification Filing

Not applicable

Family List Rational

Not applicable

Description of EUT

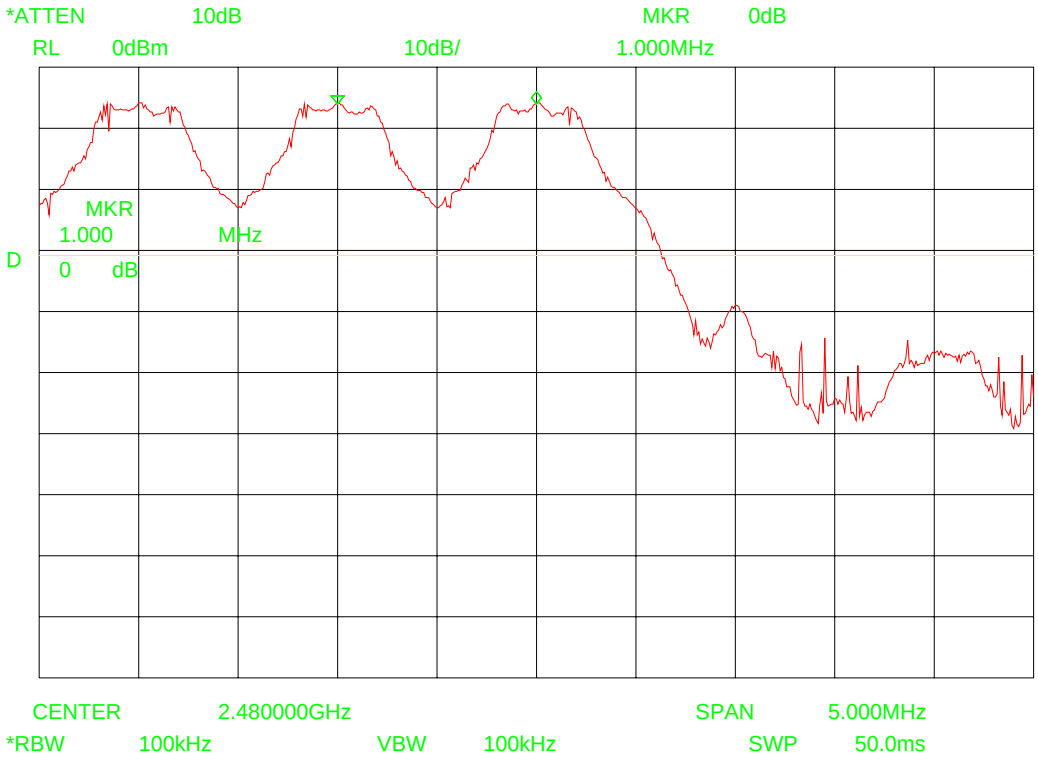
The V-UAN17 contains a spread spectrum frequency hopping transceiver and is designated for operation in the frequency band of 2400-2483.5 MHz. The equipment is a Bluetooth camera intended to be connected to the USB port of a PC. The equipment is provided with an integral antenna.
Based on the afore-mentioned the equipment may also be characterized as a computer peripheral.

Section 3. Channel Separation

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

Test Result: Complies.

Measurement Data: See attached plots
See also 20 dB BW plots
Measured 20 dB bandwidth: 0.875 MHz
Channel separation: 1 MHz



Section 4. Pseudorandom Hopping Algorithm

NAME OF TEST: Pseudorandom Hopping Algorithm	PARA. NO.: 15.247(a)(1)

Test Result: N.A.

Measurement Data:

Hopping sequence:	according to Bluetooth profile V1.1
Number of Hopping Frequencies:	79
Number of Hopping Patterns:	according to Bluetooth profile V1.1

Section 5. Time of Occupancy

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

Test Result: Complies.

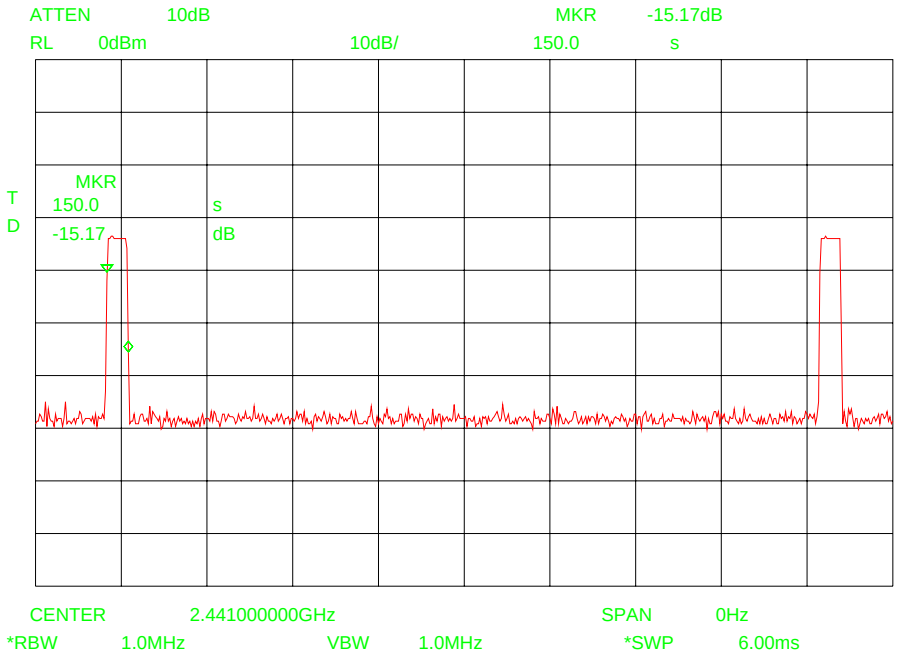
Data:

Hops per second (Bluetooth)	1600
Hops per second (DM5/DH5 packet size)	320 (5 time slots for Tx)

Measurement Data:

Time of occupancy on any channel:	150 µsec.
Number of transmissions per second / per channel:	4
Time of occupancy in one measurement period: 30 x 4 x 150 µsec	18 msec.

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



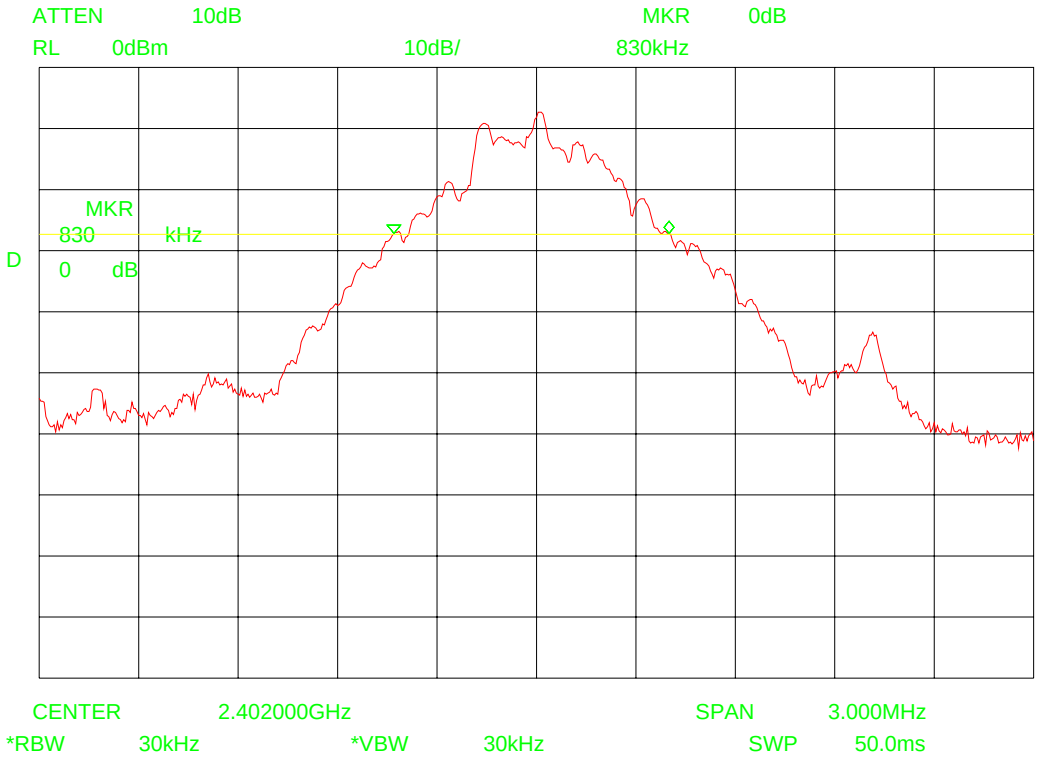
Section 6. Occupied Bandwidth

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

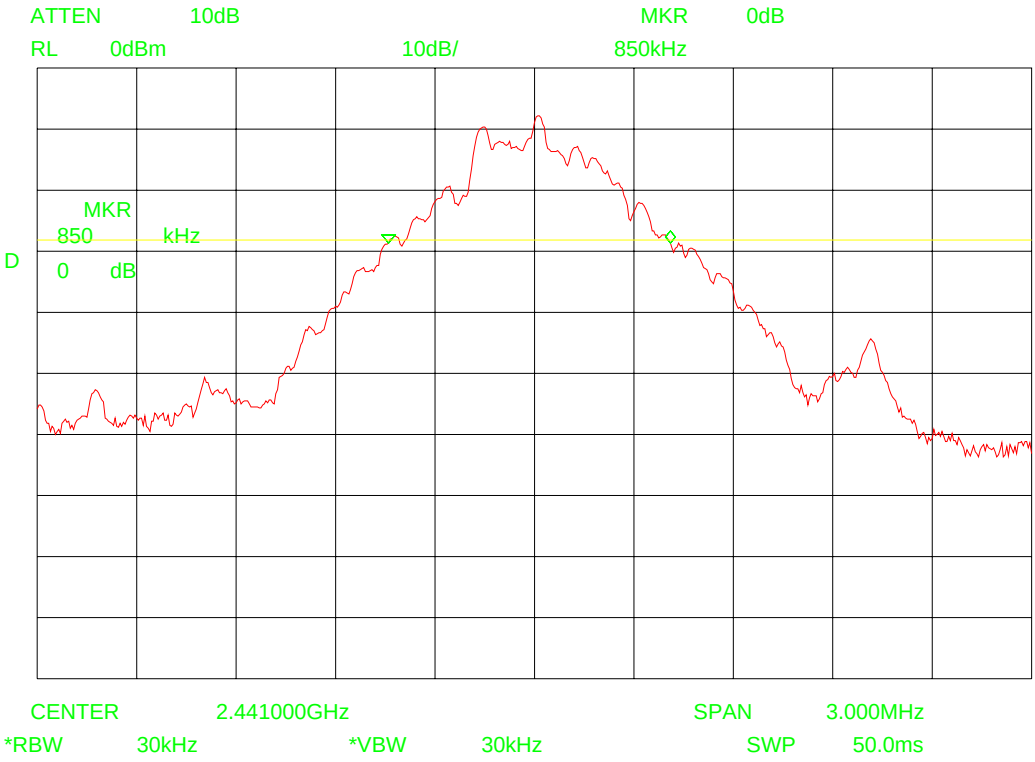
Test Result: Complies

Measurement Data: See attached plots.
Measured 20 dB BW: 0.875 MHz (max)

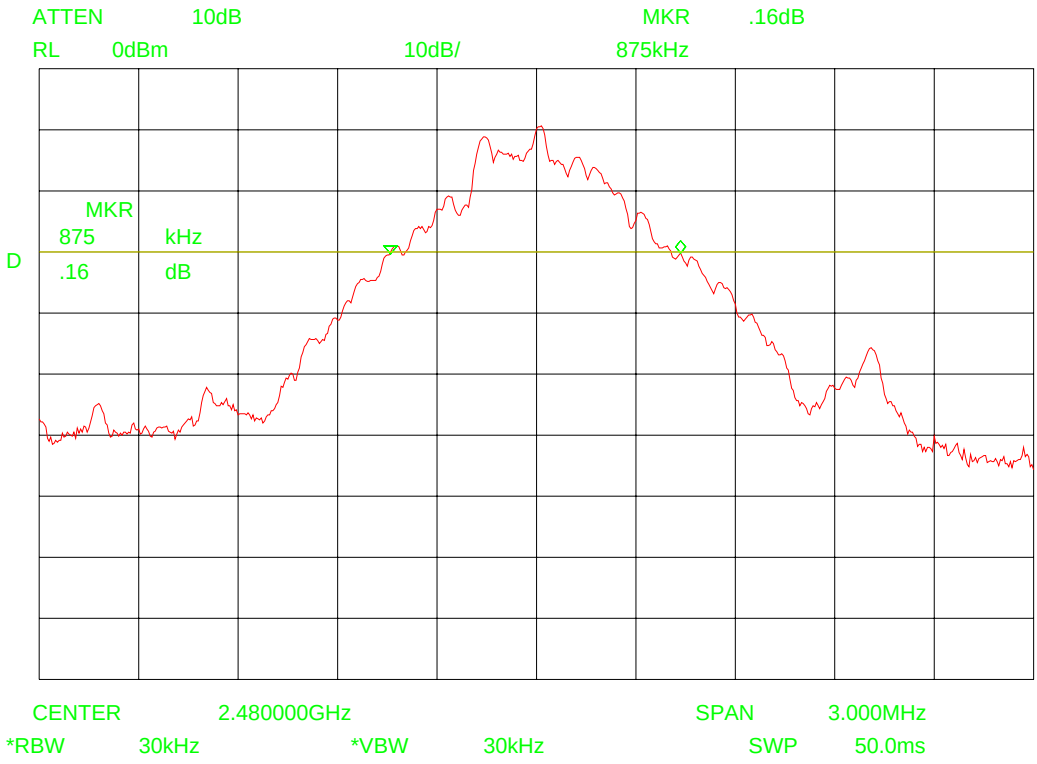
Channel 2



Channel 41


ATTEN 10dB
MKR 0dB
RL 0dBm
10dB/
850kHz
MKR
850 kHz
D
0 dB
CENTER 2.441000GHz
SPAN 3.000MHz
*RBW 30kHz
*VBW 30kHz
SWP 50.0ms

Channel 80


ATTEN 10dB
MKR .16dB
RL 0dBm
10dB/
875kHz
MKR
875 kHz
D
.16 dB
CENTER 2.480000GHz
SPAN 3.000MHz
*RBW 30kHz
*VBW 30kHz
SWP 50.0ms

Section 7. Peak Power Output

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

Test Result: Complies.

Measurement data:

Channel	EIRP (dBm)
2 (2402 MHz)	+1.0
41 (2441 MHz)	-0.1
80 (2480 MHz)	-1.1

Antenna:

Model	Type	Manufacturer	Gain (dBi)
integral	NA	Universal Scientific Industrial Co., Ltd.	1 (peak)

Field Strength: 96.2 dBµV/m @ 3m or 64.6 mV/m @ 3m.

Section 8. Spurious Emissions (Antenna conducted)

NAME OF TEST: Spurious Emissions (Antenna conducted)	PARA. NO.: 15.247(c)

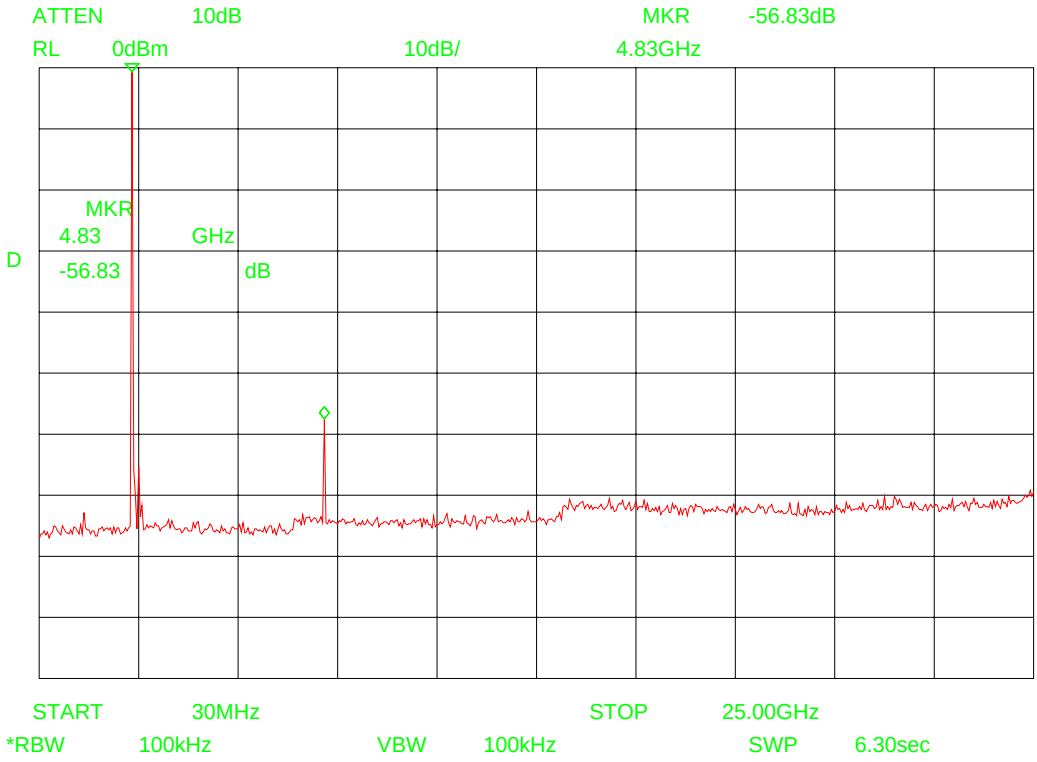
Test Result: Complies

Measurement Data: See attached graphs.

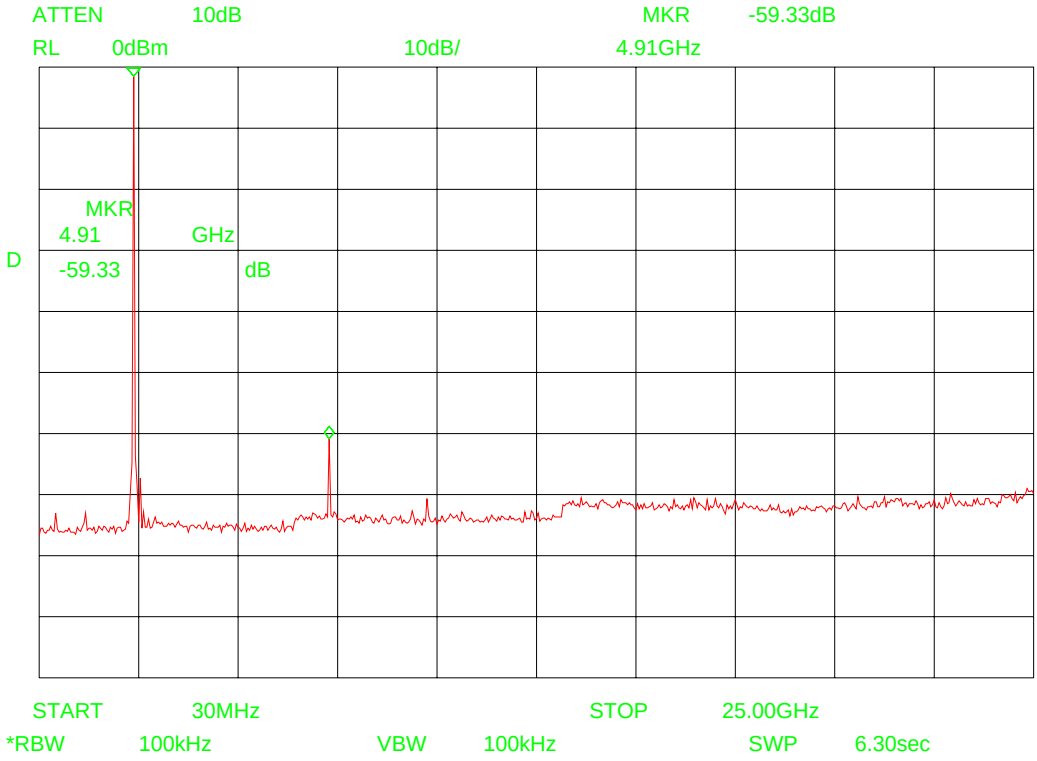
Requirement: In any 100 kHz bandwidth outside the operating frequency band, the RF power produced shall be at least 20 dB below that in the 100 kHz bandwidth that contains the highest level of intended RF power.
Spurious signals in the restricted bands shall comply with §15.205.

Test Data - Conducted Emissions (Peak)

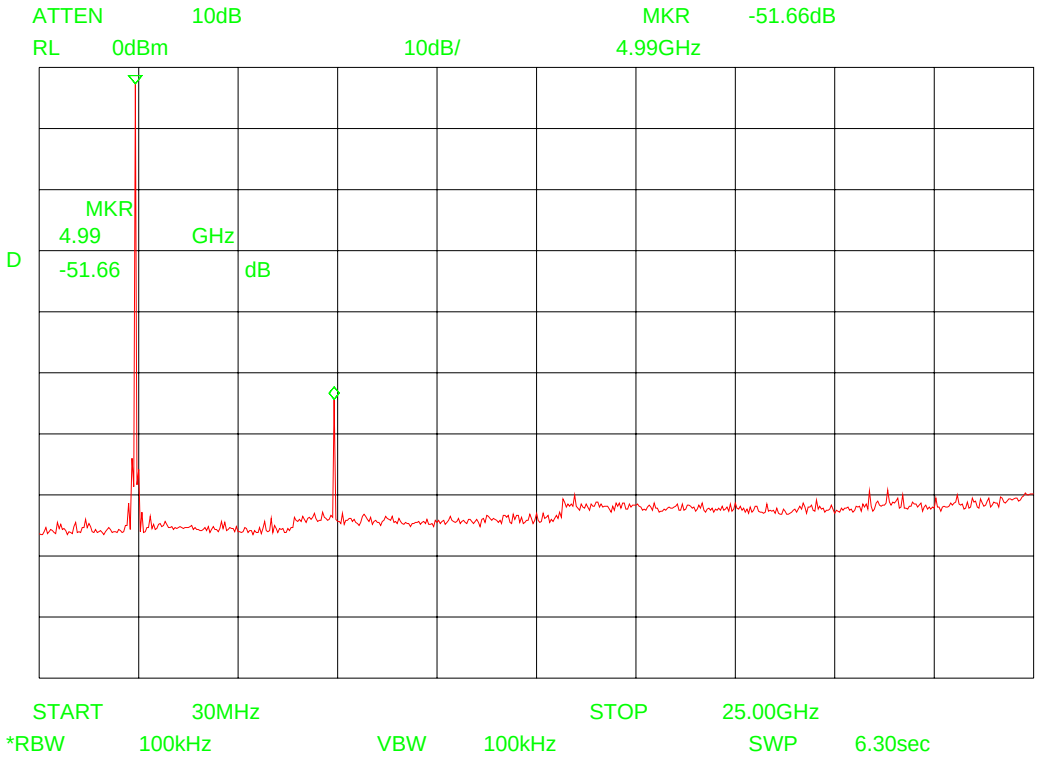
Channel 2



Channel 41


ATTEN 10dB
MKR -59.33dB
RL 0dBm
10dB/
4.91GHz
MKR
4.91 GHz
D
-59.33 dB
START 30MHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
SWP 6.30sec

Channel 80


ATTEN 10dB
MKR -51.66dB
RL 0dBm
10dB/
4.99GHz
MKR
4.99 GHz
D
-51.66 dB
START 30MHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
SWP 6.30sec

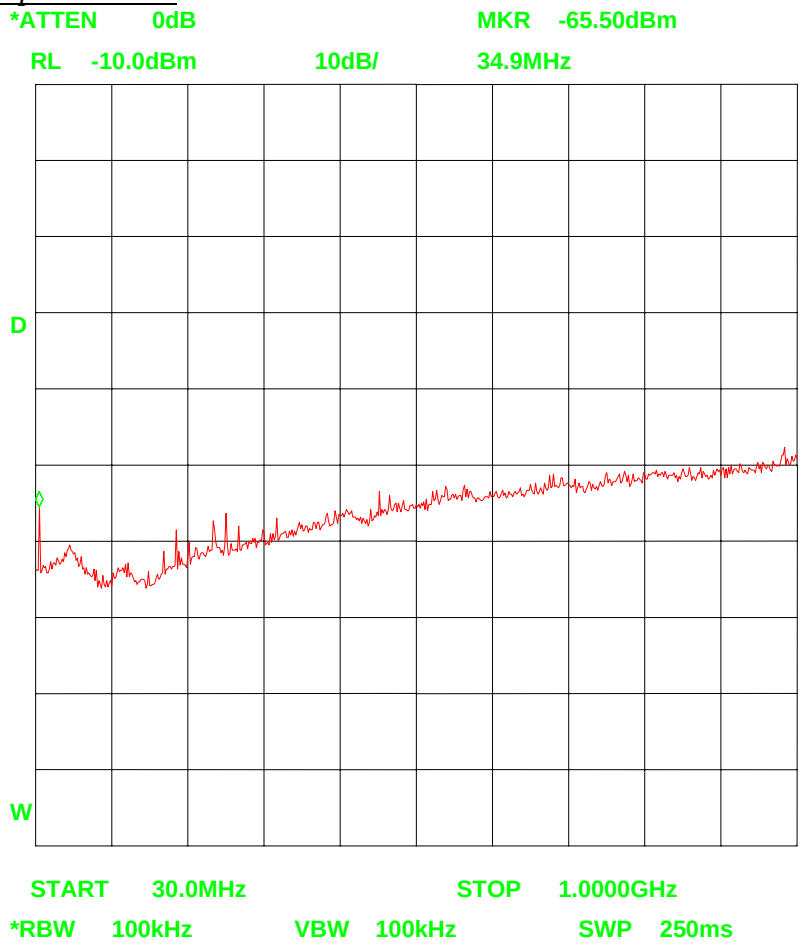
Section 9. Spurious Emissions (Radiated, exploratory)

NAME OF TEST: Spurious Emissions (Radiated, exploratory)	PARA. NO.: 15.209

Test Result: N.A.

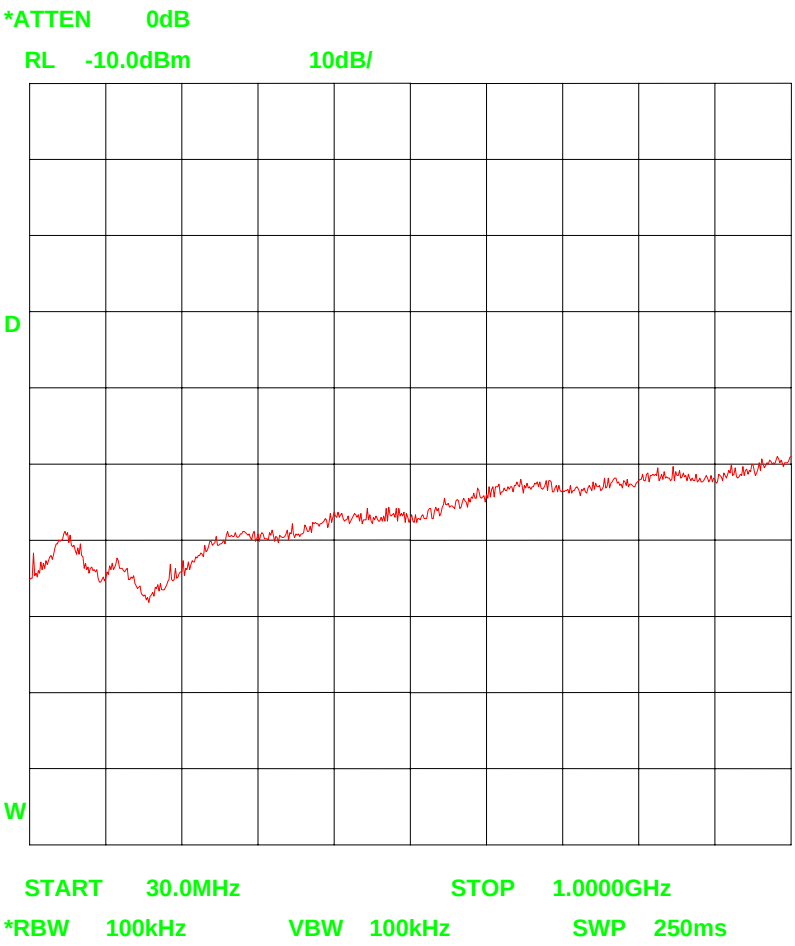
Measurement data: See plots

Horizontal polarization



Note: The plot is calibrated in units of dBm E.R.P.

Vertical polarization



Note: The plot is calibrated in units of dBm E.R.P.

Section 10. Spurious Emissions (Radiated, compliance)

NAME OF TEST: Spurious Emissions (Radiated, compliance)	PARA. NO.: 15.209

Test Result: Complies

Measurement data:

Frequency (MHz)	Polarization (H/V)	Fieldstrength in dBµV/m (QP)	Limit (dBµV/m)
44	H	≤ 15.5	40
208.9	V	21.3	43.5
258.1	V	22.8	46
270.3	H	21.5	46
272	H	20.4	46
273	V	≤ - 0.5	46
468	--	Ambient	46
492	V	37.5	46
528.1	H	39.0	46
530	V	≤ 30.0	46
576	V & H	37.6	46
936	--	Ambient	46
960	V & H	≤ 33.8	46

Section 11. Spurious Emissions (Restricted bands Radiated)

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

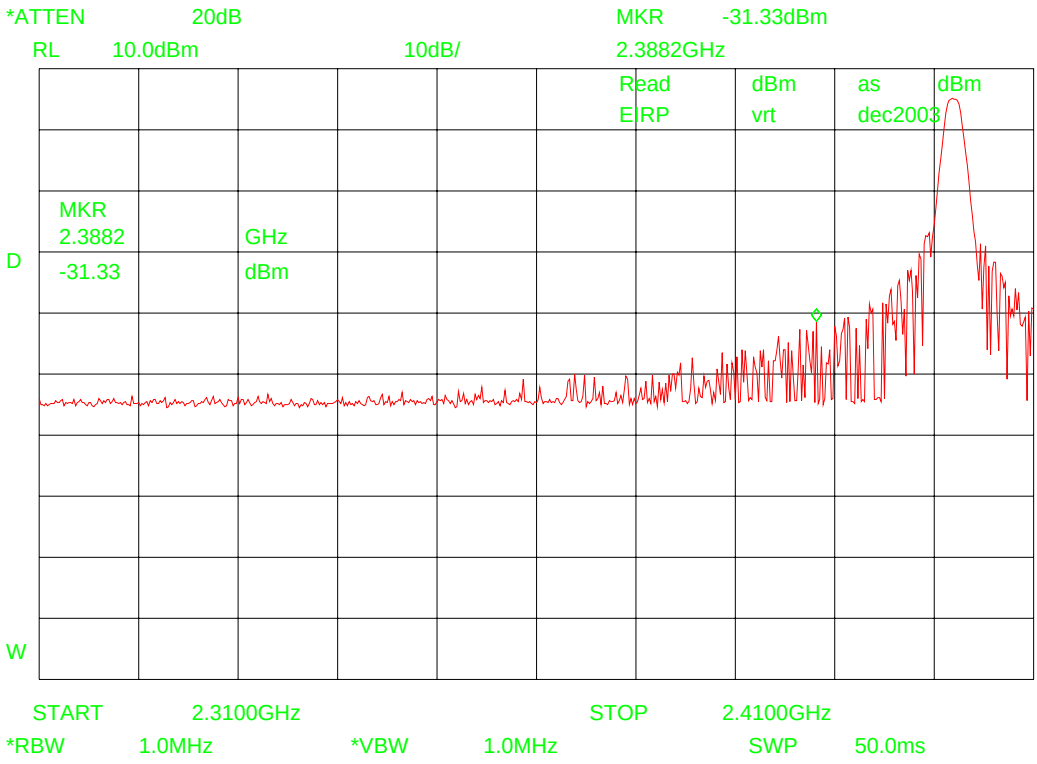
Test Result: Complies

Measurement data: See plots

Frequency (MHz)	E.I.R.P. (dBm)	Fieldstrength in dBµV/m = E.I.R.P. + 95.2	Peak/Average
2388.2	-31.3	63.9	peak
2388.2	-62.5	32.6	average
2484.76	-37.5	57.7	peak
2484.15	-52.0	43.2	average
4804.4	-32.7	62.5	peak
4804.1	-50.2	45.0	average
4882.4	-32.3	62.9	peak
4882.0	-50.0	45.2	average
4959.3	-35.5	59.7	peak
4960.0	-51.3	43.9	average

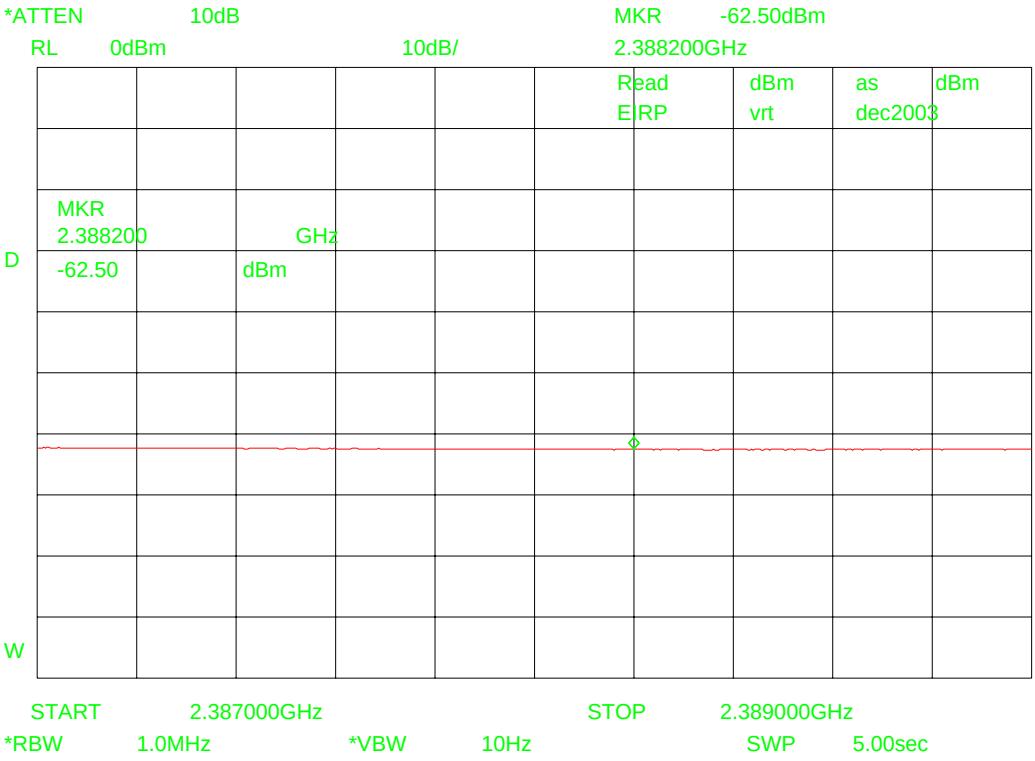
Limit: 54 dBµV/m (average)
74 dBµV/m (peak)

Lower adjacent restricted band (peak measurement)



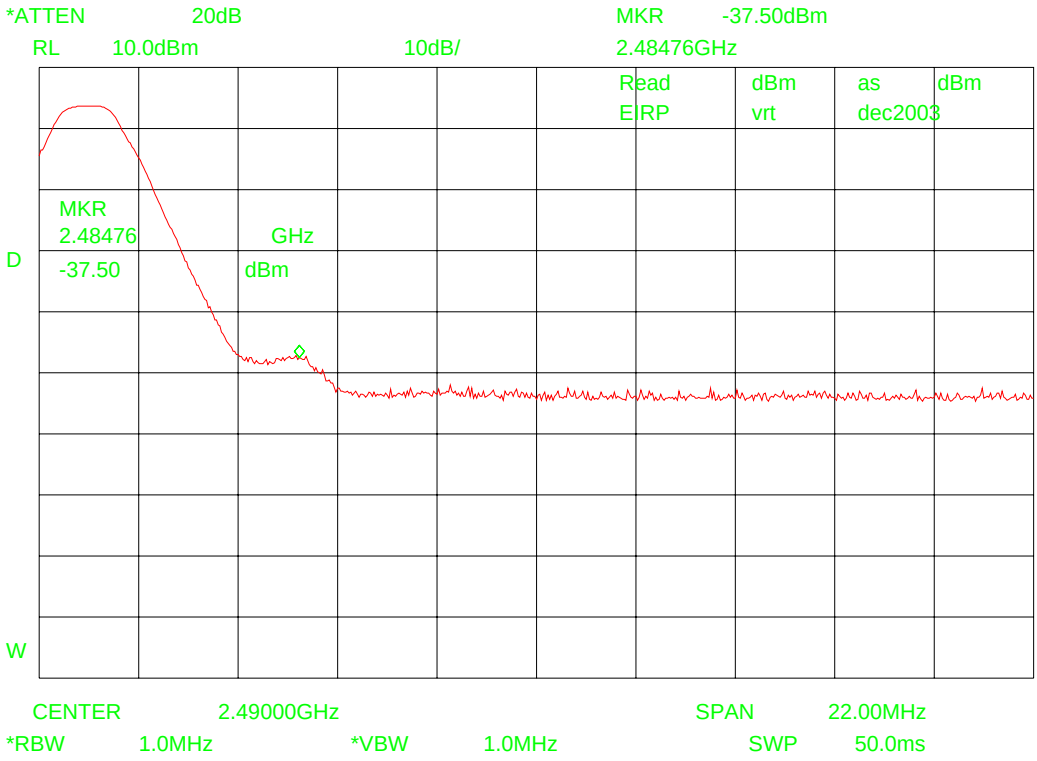
Note: The plot is calibrated in units of dBm E.I.R.P.

Lower adjacent restricted band (average measurement)



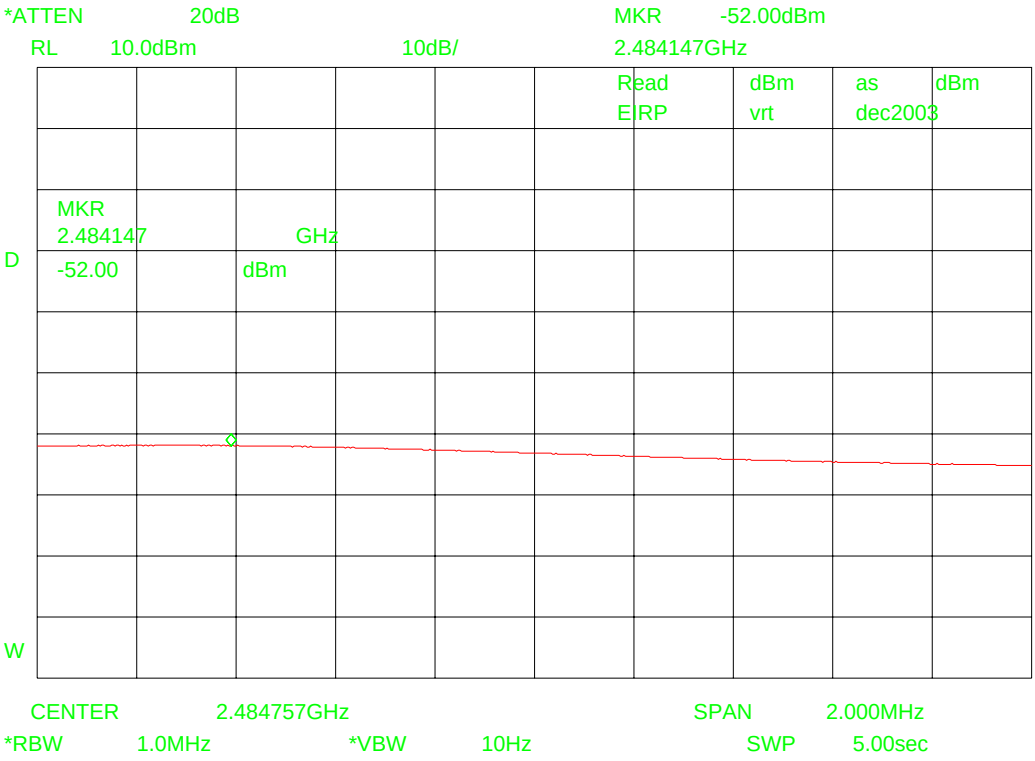
Note: The plot is calibrated in units of dBm E.I.R.P.

Upper adjacent restricted band (peak measurement)



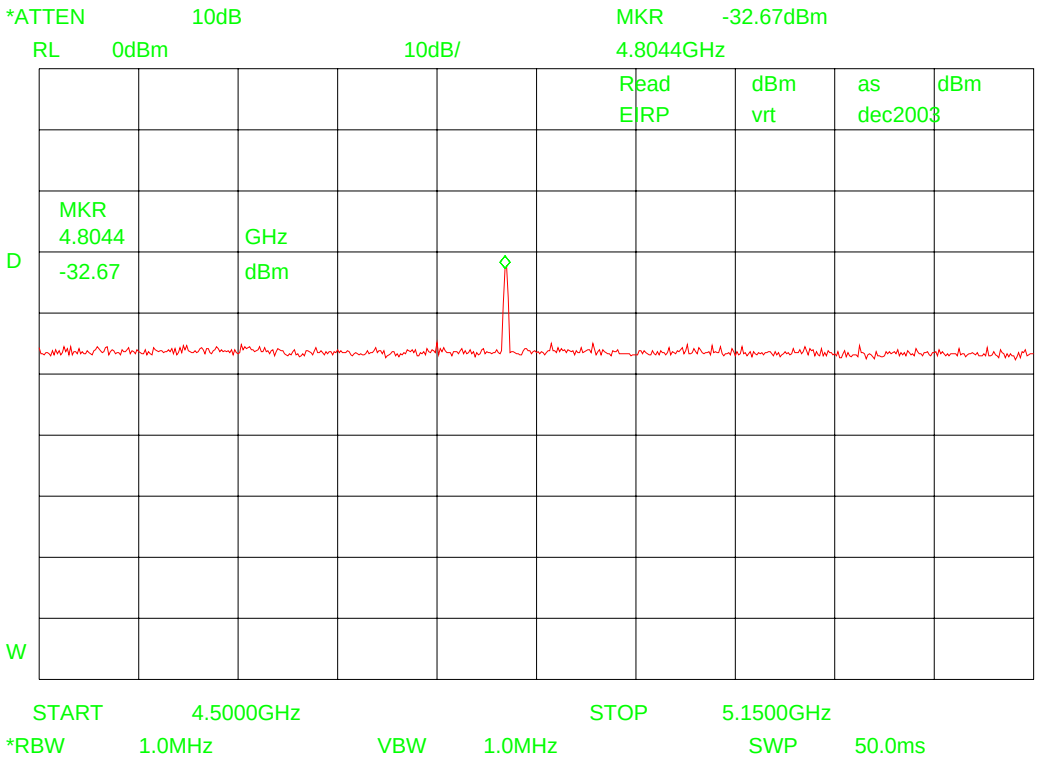
Note: The plot is calibrated in units of dBm E.I.R.P.

Upper adjacent restricted band (average measurement)



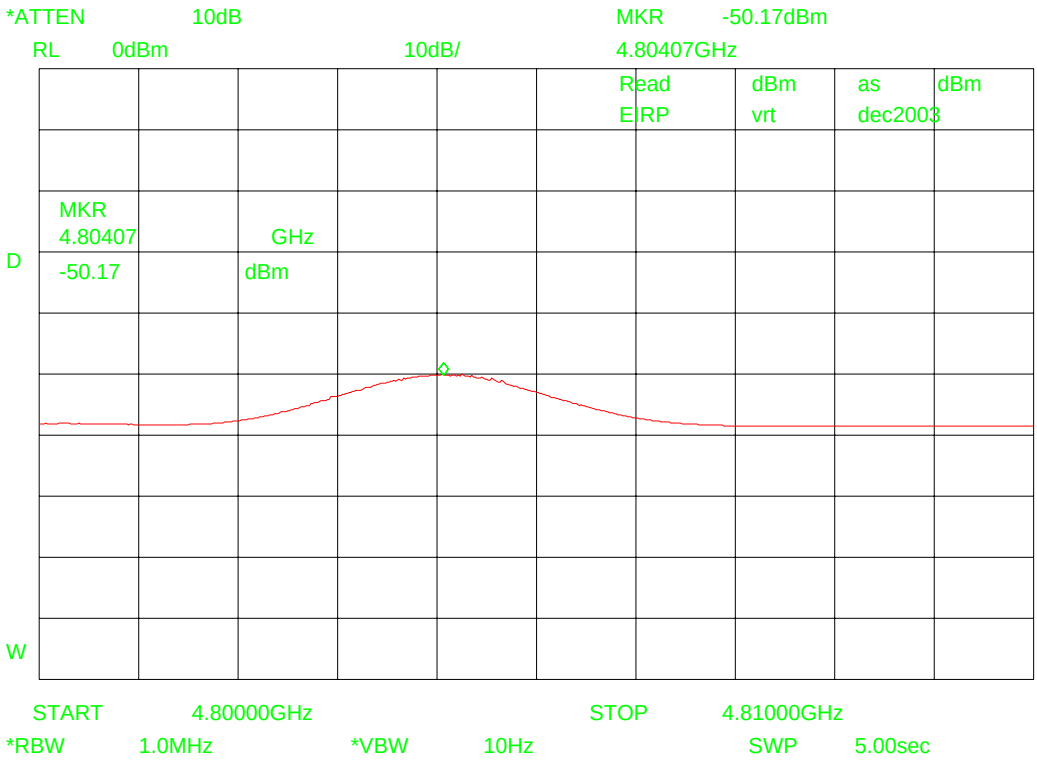
Note: The plot is calibrated in units of dBm E.I.R.P.

Ch 2 harmonic in restricted band (peak measurement)



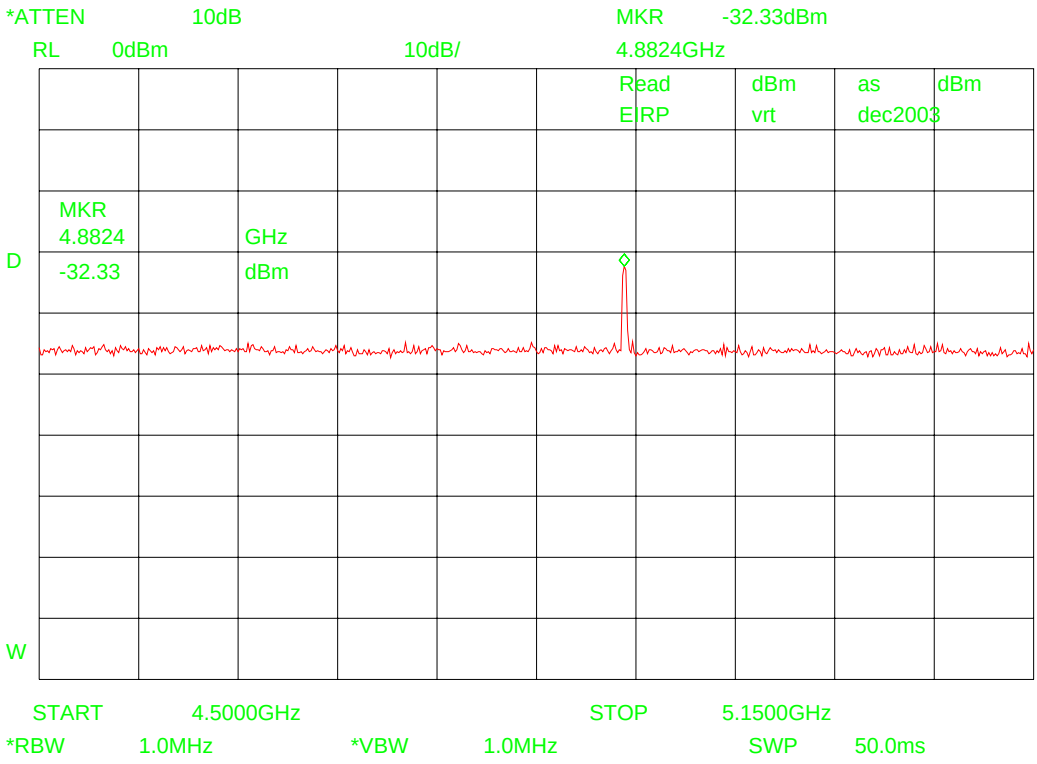
Note: The plot is calibrated in units of dBm E.I.R.P.

Ch 2 harmonic in restricted band (average measurement)



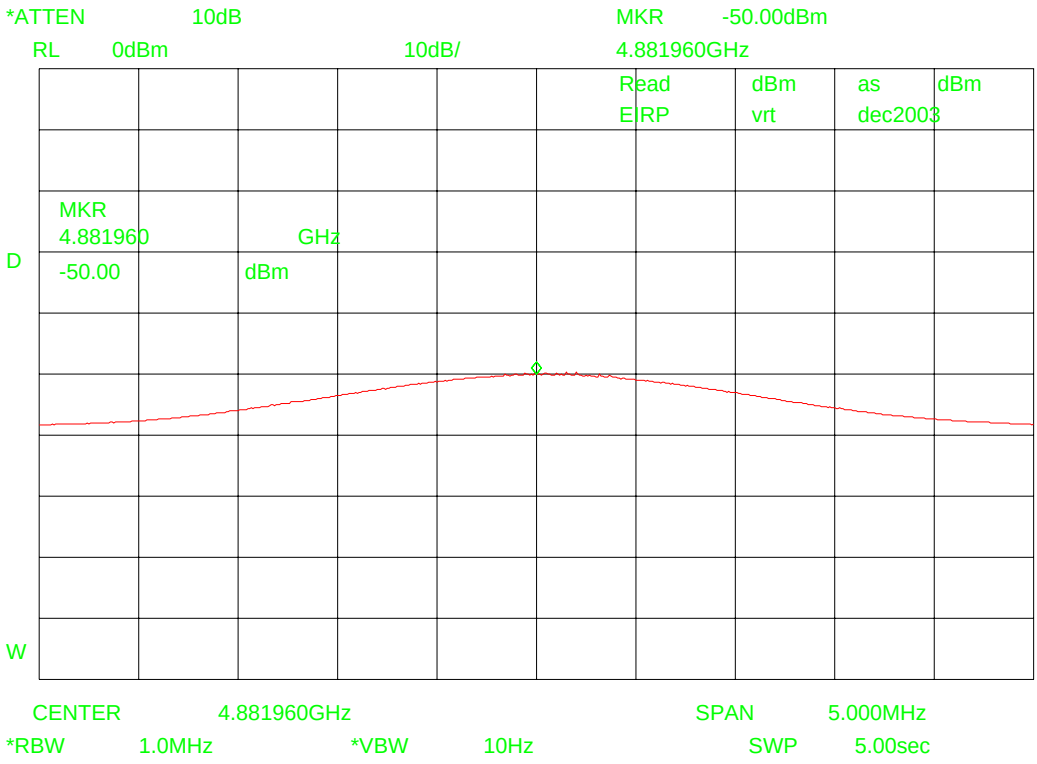
Note: The plot is calibrated in units of dBm E.I.R.P.

Ch 41 harmonic in restricted band (peak measurement)



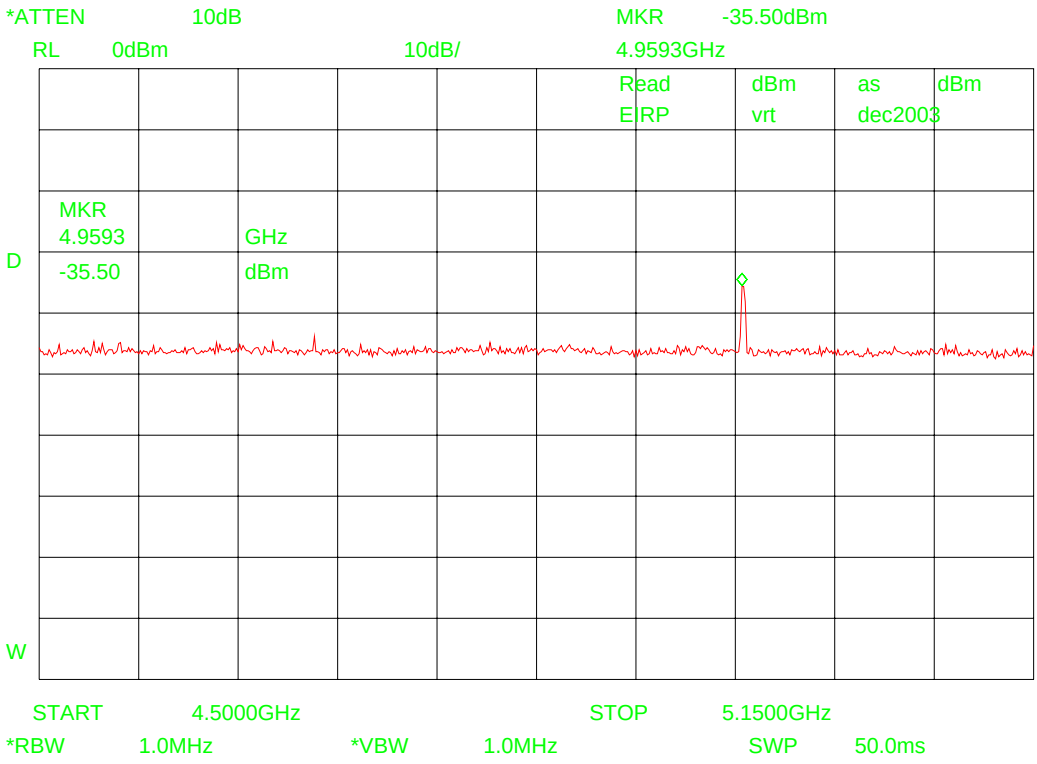
Note: The plot is calibrated in units of dBm E.I.R.P.

Ch 41 harmonic in restricted band (average measurement)



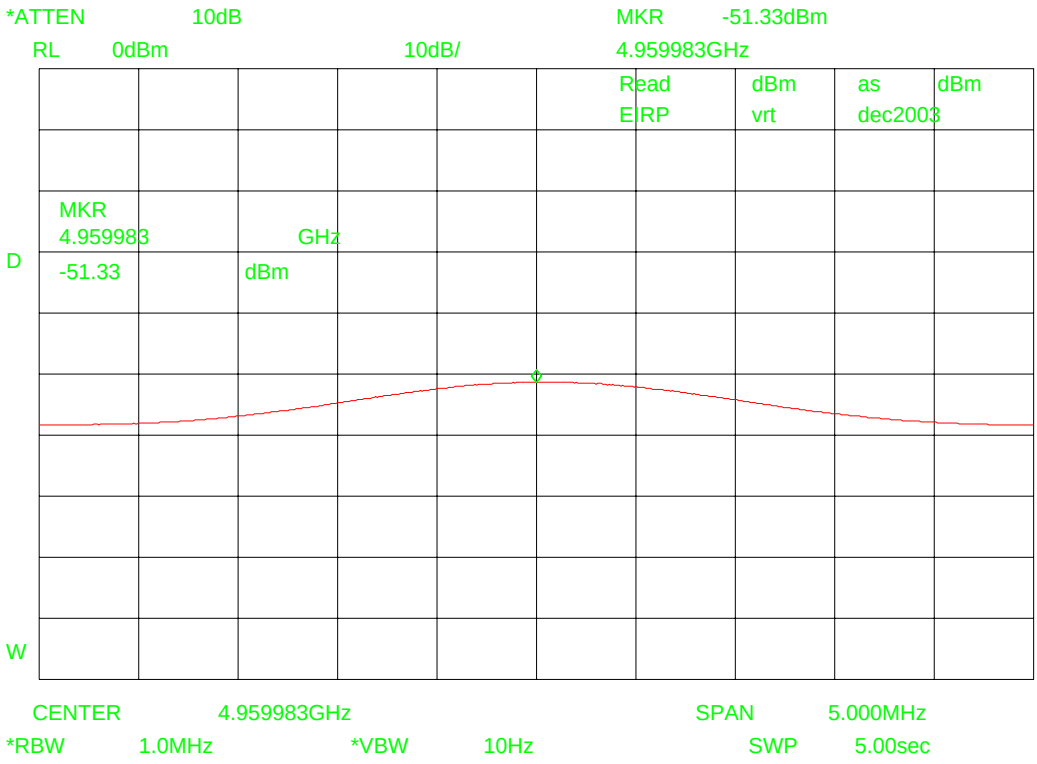
Note: The plot is calibrated in units of dBm E.I.R.P.

Ch 80 harmonic in restricted band (peak measurement)



Note: The plot is calibrated in units of dBm E.I.R.P.

Ch 80 harmonic in restricted band (average measurement)



Note: The plot is calibrated in units of dBm E.I.R.P.

Section 10. AC power conducted emissions

NAME OF TEST: Spurious Emissions (Conducted)	PARA. NO.: 15.207

Test result: Complies.

Measurement data: See tables

Time: 11:29:50 Date: 02-12-2004

Signal measured on "Neutral".

Measurement =>	QPeak			Av		
Range	Frequency (MHz)	Level dB (uV)	Limit dB (uV)	Frequency (MHz)	Level dB (uV)	Limit dB (uV)
01	0.17460	26.8	64.8	0.17460	10.7	54.8
02	0.19850	38.7	63.7	0.20170	26.6	53.6
03	0.31760	31.7	59.8	0.29680	23.6	50.4
04	0.39000	34.5	58.1	0.40160	26.6	47.9
05	0.54540	35.2	56	0.54540	27.9	46
06	0.63600	34.9	56	0.63600	25.5	46
07	0.91110	31.6	56	0.91110	21.0	46
08	0.99610	33.9	56	1.08870	24.2	46
09	1.62760	34.2	56	1.54360	23.3	46
10	1.63140	34.2	56	1.63140	23.3	46
11	2.43810	29.7	56	2.16070	20.1	46
12	2.90670	28.8	56	2.90670	19.6	46
13	3.82410	28.6	56	3.80150	18.8	46
14	5.62050	26.0	60	5.62050	15.3	50
15	6.99700	27.1	60	7.41080	16.4	50
16	10.2520	27.8	60	9.12340	18.1	50
17	12.0002	45.9	60	12.0006	34.4	50
18	16.6558	31.1	60	15.0504	22.3	50
19	18.0006	37.7	60	18.0006	21.7	50
20	23.9996	37.9	60	24.0000	28.2	50

This product is in compliance with FCC part 15, subpart C, section 15.207

* ==> exceeding the limit

The frequency range 0.15 - 30 MHz is divided into 20 subranges.
For every subrange the highest emission component is given in the table.

In ranges marked "Below" the maximum level of the components measured,
is below 30 dBuV. For this evaluation, peak detection is used.

Time: 11:59:13 Date: 02-12-2004

Signal measured on "Live".

Measurement =>	QPeak			Av		
Range	Frequency (MHz)	Level dB (uV)	Limit dB (uV)	Frequency (MHz)	Level dB (uV)	Limit dB (uV)
01	0.19430	37.1	63.9	0.19430	22.3	53.9
02	0.19490	37.0	63.9	0.20470	22.7	53.5
03	0.29480	28.7	60.4	0.29860	20.2	50.3
04	0.43400	28.7	57.2	0.41200	18.6	47.7
05	0.54240	35.7	56	0.54240	27.0	46
06	0.63280	34.9	56	0.63280	26.3	46
07	0.90570	33.3	56	0.90430	25.6	46
08	0.99610	33.9	56	0.99610	25.4	46
09	1.63060	33.2	56	1.62780	22.9	46
10	1.63200	33.1	56	1.63200	22.8	46
11	2.45110	28.7	56	2.43510	19.9	46
12	2.91070	27.3	56	3.35430	17.7	46
13	3.81690	27.5	56	3.79230	17.0	46
14	5.62670	24.4	60	5.62670	14.1	50
15	6.99280	25.4	60	6.99280	15.0	50
16	9.18980	25.7	60	9.18980	16.0	50
17	11.9994	43.0	60	11.9994	31.7	50
18	16.6602	27.7	60	14.9906	18.6	50
19	17.9970	33.1	60	17.9970	17.6	50
20	24.0000	32.1	60	24.0000	22.5	50

This product is in compliance with FCC part 15, subpart C, section 15.207

* ==> exceeding the limit

The frequency range 0.15 - 30 MHz is divided into 20 subranges.
For every subrange the highest emission component is given in the table.

In ranges marked "Below" the maximum level of the components measured,
is below 30 dBuV. For this evaluation, peak detection is used.

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)
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	437 B	TE 00489	15.247(b)(3)
Power sensor	Hewlett Packard	8481 A	TE 00355	15.247(b)(3)
EMI test receiver	Rohde & Schwarz	ESH 3	TE 00205	15.207
Artificial mains network	Rohde & Schwarz	ESH3-Z5	TE 00208	15.207
Variac	Philips	B870900	--	15.207

The following equipment was used at TNO Electronic Products & Services (EPS) B.V

Description	ID / SN	Manufacturer	Model	Used at
Plastic measurement room	12636	Polyforce	-	15.209
Open Area Test Site	13886	Comtest	-	15.209
Antenna mast 4m	14277	Heinrich Deisel	MA240	15.209
Controller OATS	14278	Heinrich Deisel	HD100	15.209
Loop Antenna	1107	Chase	HLA6120	15.209
Biconilog antenna 30MHz – 1000MHz	15633	Chase	CBL6111 B	15.209
EMI test receiver	15667	Rohde & Schwarz	ESCS 30	15.209
Turntable OATS	99108	Heinrich Deisel	HD050	15.209

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.

NAME OF TEST: Pseudorandom Hopping Algorithm	PARA. NO.: 15.247(a)(1)

Minimum Standard: The system shall hop to channel frequencies that are selected from a pseudorandom 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 sec./.001 sec.)/75 chan. = 400 x 1 msec. = 400 msec. or 0.4 sec. in 30 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 – 95.2

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

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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