We help ideas meet the real world

DELTA Test Report

TEST REPORT issued by an Accredited Testing Laboratory

Test of Interspiro DualWay Radio

Performed for Interspiro

REC-E702544 Rev A
Project no.: E702544

08 September 2010

DELTA Development Technology AB
Finnslätten
Elektronikgatan 47
721 36 Västerås
Sweden

Tel. 021-31 44 80
Fax 021-31 44 81
info@delta-dt.se
www.delta-dt.se

Bankgiro 5534-7728
Postgiro 161 65 92-0
VAT SE 556556207001

DELTA Development Technology AB
is a subsidiary company of DELTA

Title	Radio parameter test of DualWay.
Test object	DualWay.
Report no.	REC-702544 Rev A.
Project no.	E702544
Test period	08 Mar. 2010 - 22 Apr. 2010
Client	Interspiro AB Box 10060 181 10 Lidingö Sweden Tel.: +46(0)8-636 51 00
Contact person	Jonas Strandell WSI AB E-mail: jonas.strandell@wsi.nu
Manufacturer	Interspiro AB
Specifications	FCC Part 15, Subpart C, Section 15.247
Results	The test object was found to be in compliance with the specifications, as listed in Section 1
Test personnel	Fredrik Thorsell, Lars Johnsson
Date	08 September 2010

Project Manager

Lars Johnsson
DELTA

Responsible

Ulf Bjerke, Technical manager
DELTA

Table of contents

1. Summary of tests

FCC reference	Tests SRD	Test methods	Results
15.247 (a)	Carrier frequency separation	DA-00-705A1	Passed
15.247 (a)	Number of hopping frequencies	DA-00-705A1	Passed
15.247 a)	Time of occupancy (dwell time)	DA-00-705A1	Passed
15.247 (a)	20 dB Bandwidth	DA-00-705A1	Passed
15.247 (b)	Peak output power	DA-00-705A1	Passed
15.247	Band-edge compliance of RF conducted emissions	DA-00-705A1	Passed
15.247 (d)	Spurious RF conducted emissions	DA-00-705A1	Passed
15.247 (d)	Spurious Radiated emissions	DA-00-705A1	Passed
15.247 (a)	Average time of occupancy	-	Passed

Conclusion

The test object mentioned in this report meet the requirements of the standard stated below.

- FCC 47 CFR Part 15 (2008) Subpart C: Intentional Radiators Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

The test results relate only to the object tested.

2. Test object and auxiliary equipment

2.1 Test object

Test object 2.1.1

Name of test object	DualWay
Model / type	DualWay
Part no.	
Serial no.	1007-002
FCC ID	
Manufacturer	Interspiro
Supply voltage	6 VDC, Battery powered
Software version	
Cycle time	1 sec
Comments	

3. General test conditions

3.1 Test setup during test

See the following photos illustrating the test setup and the tested equipment:

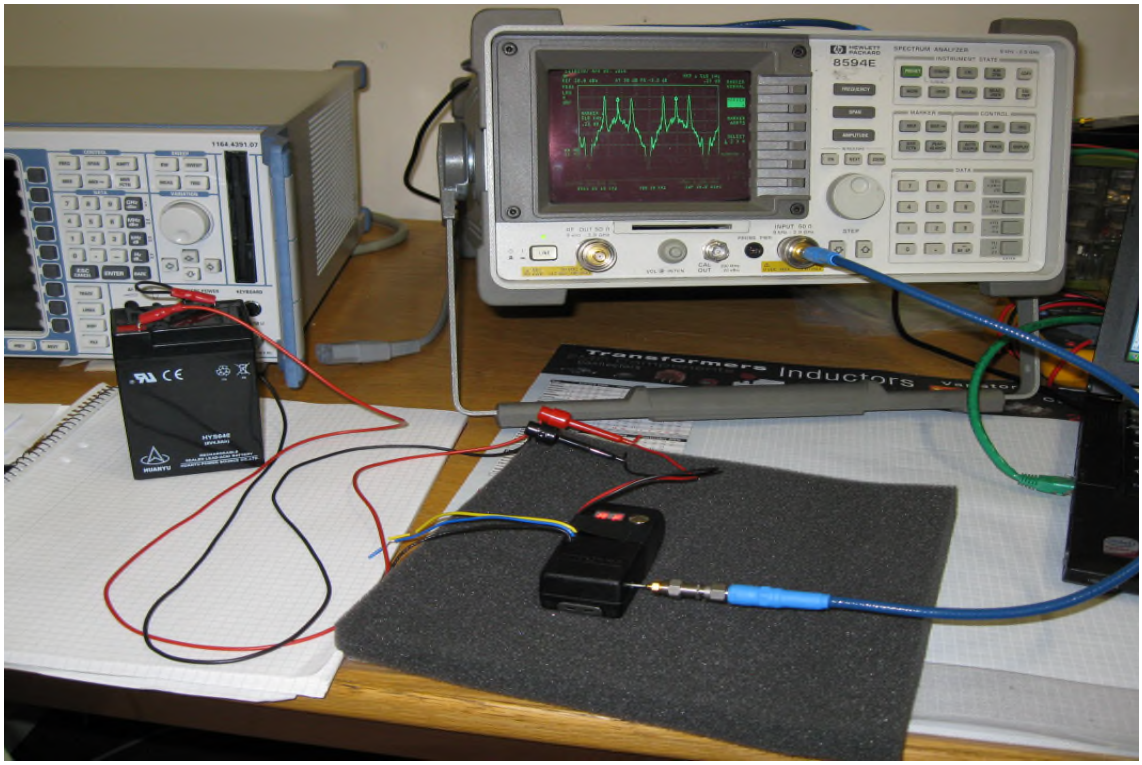


Photo 3.1.1 Test setup of all conducted tests. The EUT is connected, via a soldered SMA coaxial connector, to the spectrum analyzer via a 3 dB attenuator and a coaxial cable. The EUT is battery powered by the 6.2 VDC lead battery

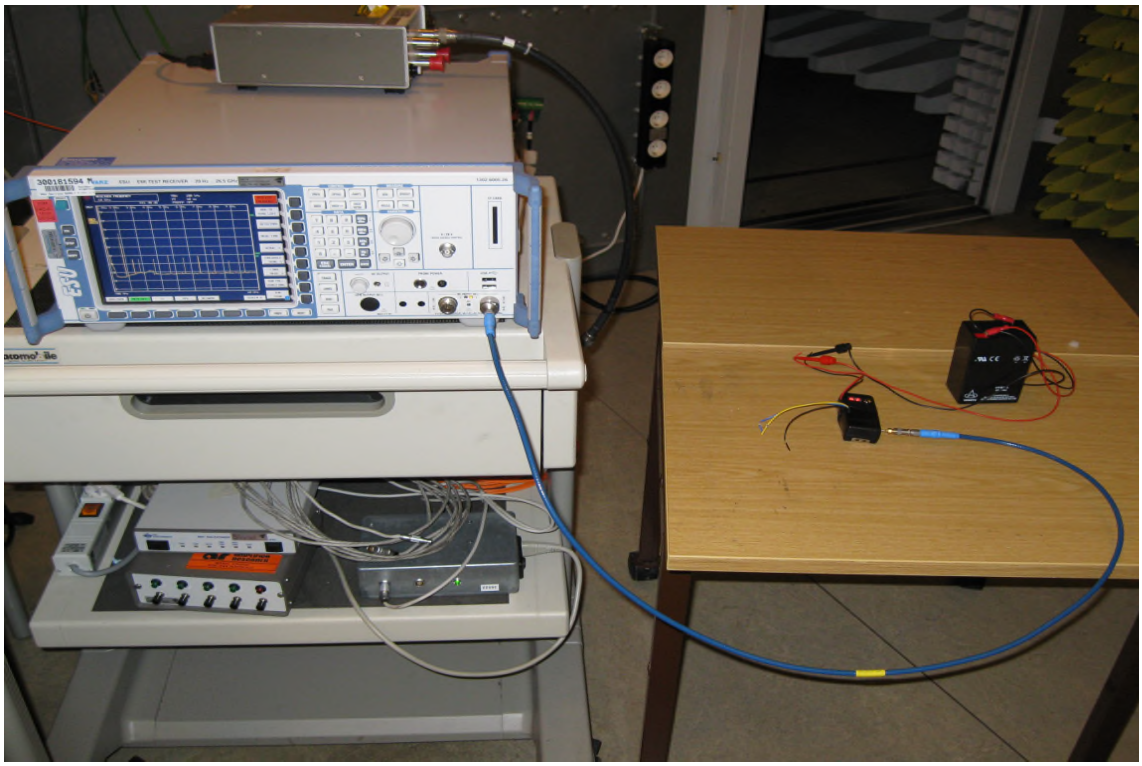


Photo 3.1.2 Photo of the setup during conducted spurious emissions measurement

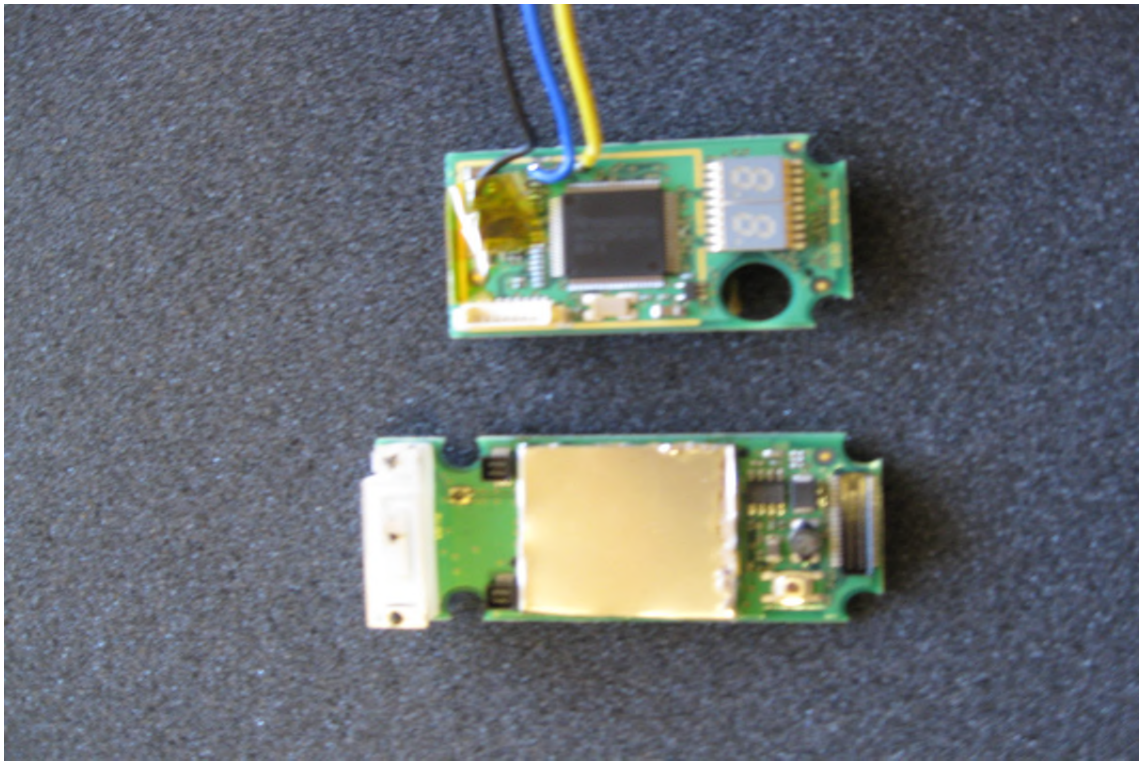


Photo 3.1.3 Photo of the tested object.

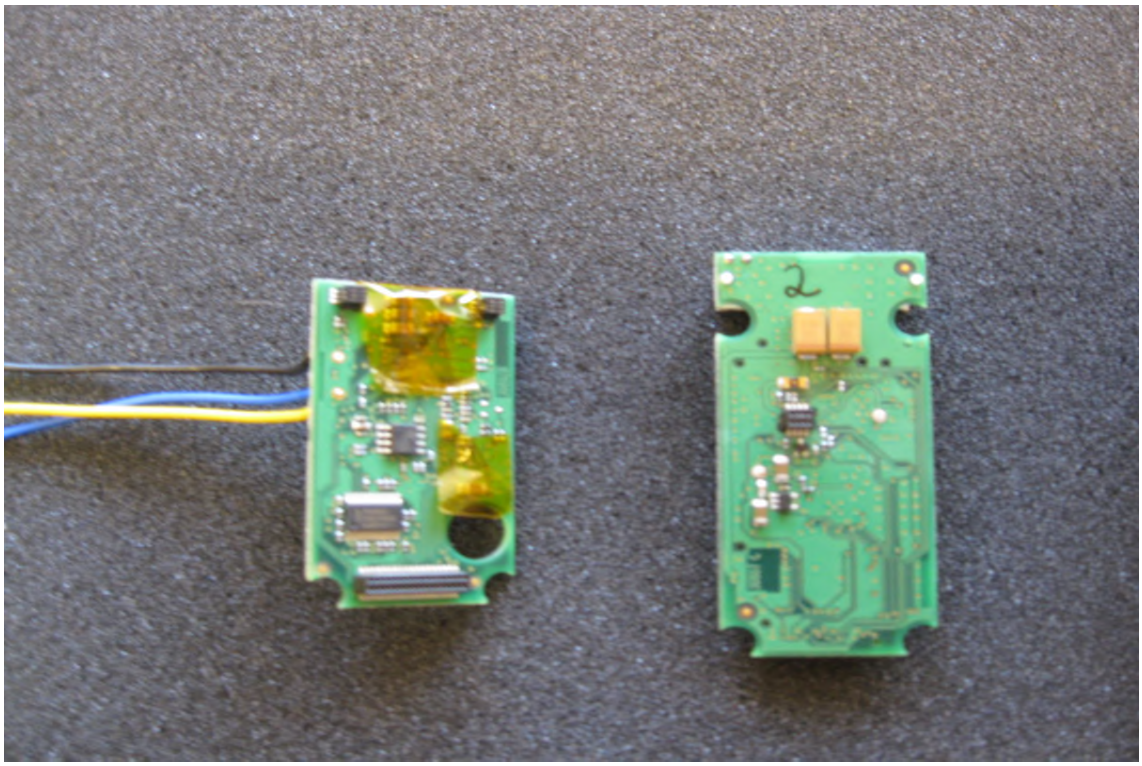


Photo 3.1.4 Photo of the tested object..

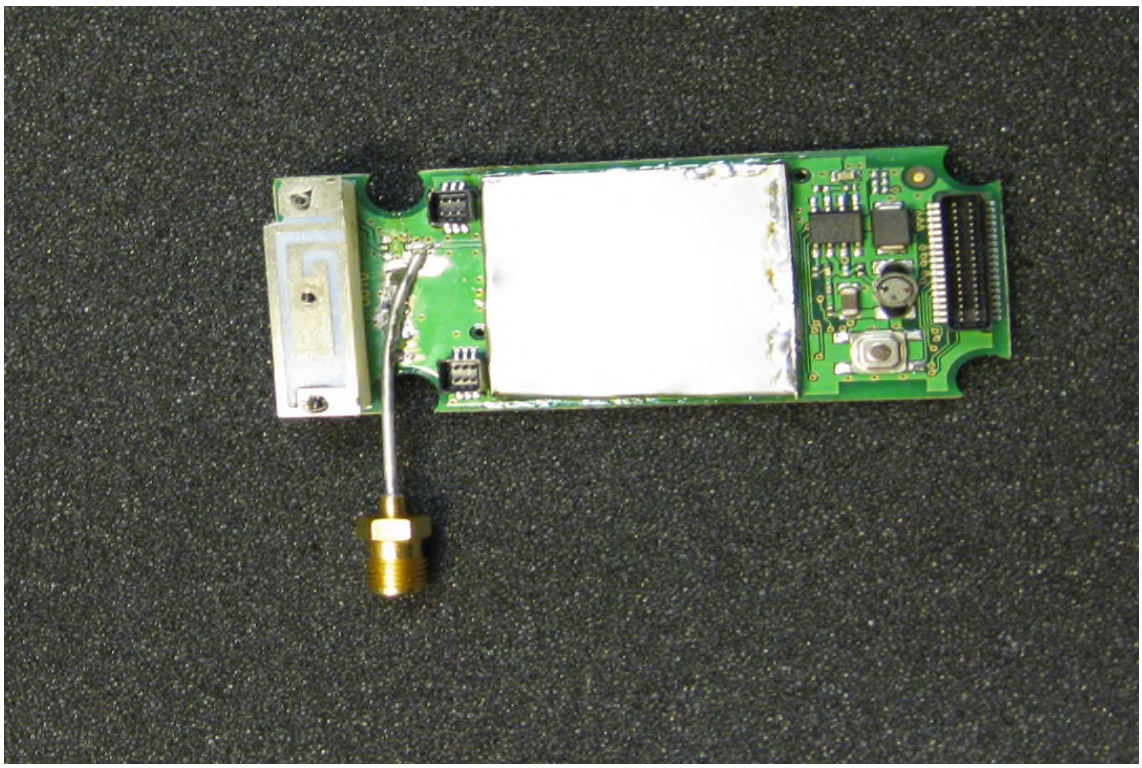


Photo 3.1.5 The SMA semirigid coax has been soldered to the 50 Ohm RF microstrip. The antenna connection has been severed

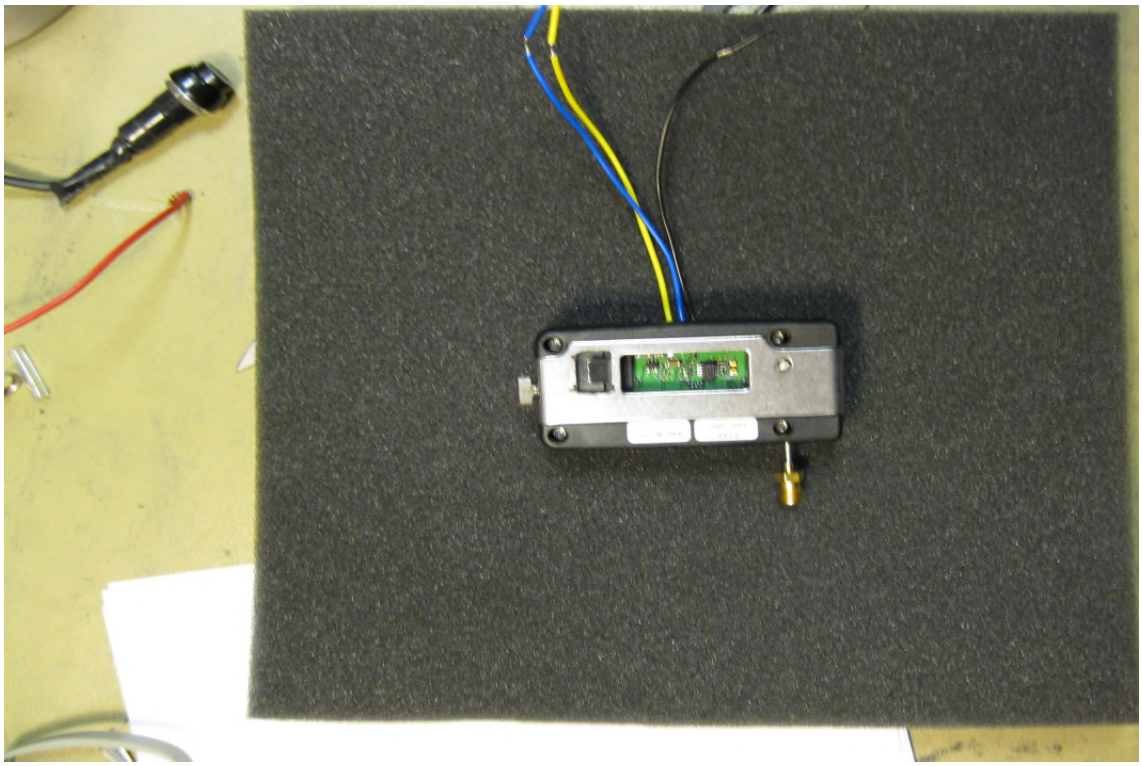


Photo 3.1.6 Photo of the tested object with SMA semirigid coax soldered and with cover.

4. Test results

4.1 Carrier frequency separation

Test object	DualWay	Sheet	ADJ_PWR-1
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	9 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method	DA 00-705	Temperature	22 °C
Characteristics	Test voltage: 6.2 VDC	Humidity	27 % RH

Test equipm.

SA Settings RBW: 10 kHz VBW: 30 kHz SPAN: 1 MHz DET: Peak Trace: Max hold

Center Frequency	Measured	Limit	Comments
902.8 MHz	508 kHz	20 dB bandwidth	
915.0 MHz	510 kHz	20 dB bandwidth	
927.2 MHz	510 kHz	20 dB bandwidth	

Note 1:

Test result The measured channel separation was within the limits.

Test modulation GFSK

Compliant Yes

Comments The 20 dB bandwidth of the product is greater than 25 kHz, this is why the limit was set to the 20 dB bandwidth, see subsection 4.5

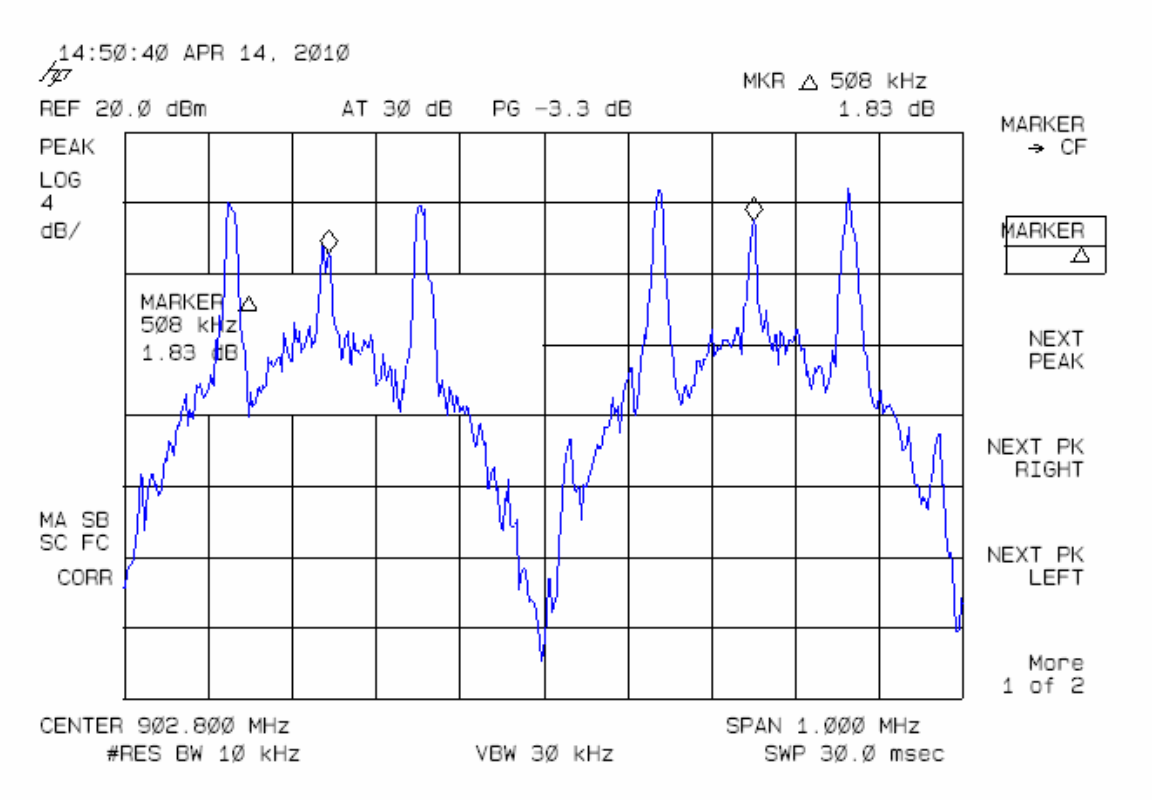


Figure 1 Carrier frequency separation low channel.

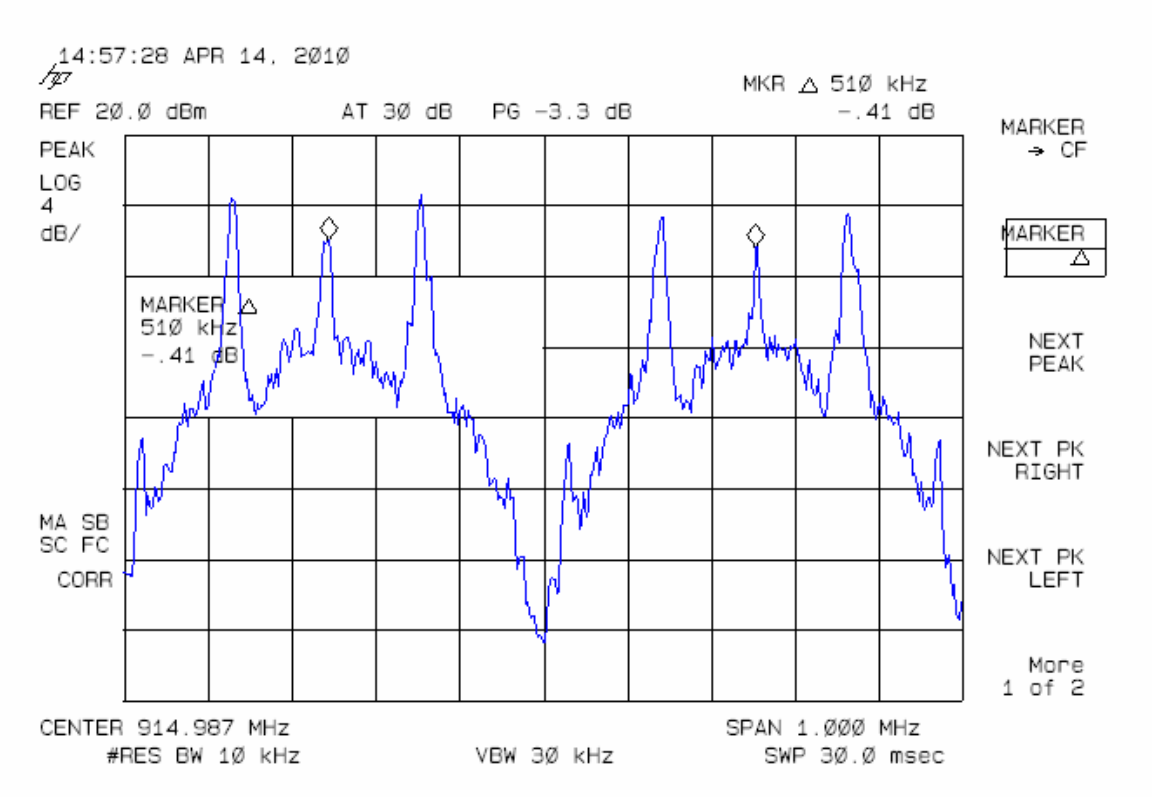


Figure 2 Carrier frequency sepparation mid channel.

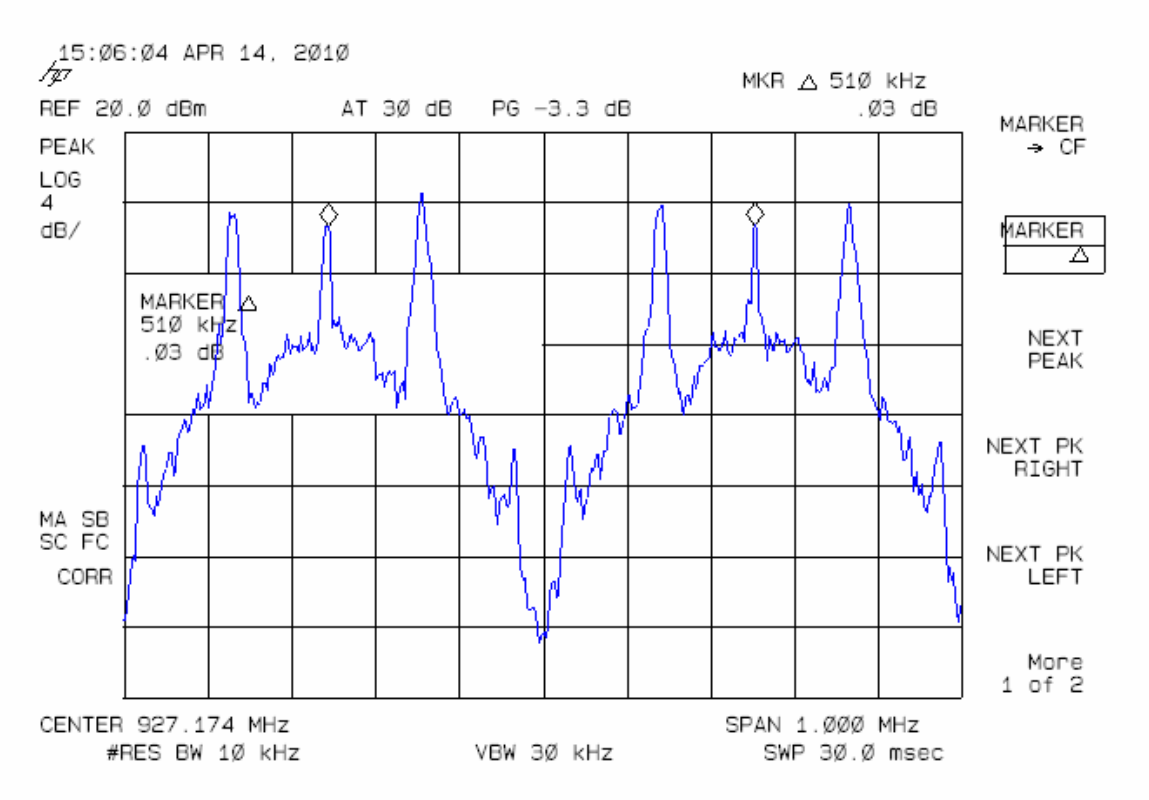


Figure 3 Carrier frequency sepparation high channel.

4.2 Measurement of number of hopping channels

Test object	DualWay	Sheet	ADJ_PWR-2
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	8 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method Characteristics	DA 00-705 Test voltage: 6.2 VDC	Temperature Humidity	23 °C 27 % RH
Test equipm.	HP		
SA Settings	RBW: 300 kHz VBW: 1 MHz SPAN: 26 MHz DET: Peak CF: 915 Trace: Max hold		

Measured Number of frequencies	Limit	Comments
50	≥ 50	
Note 1:		

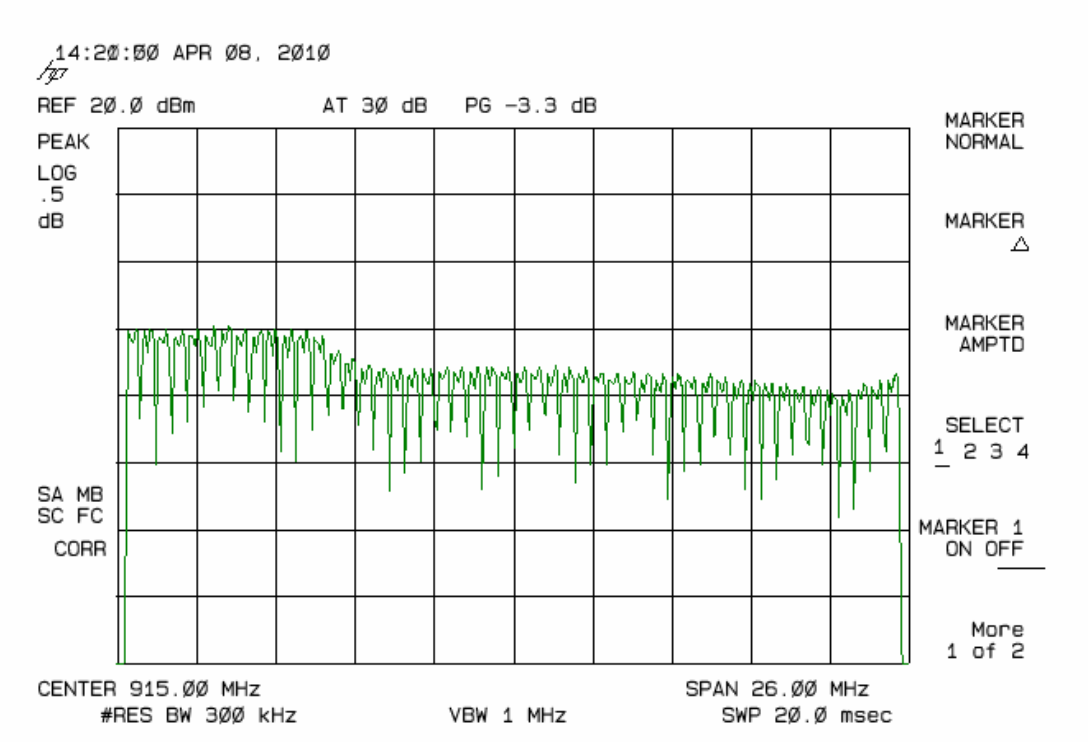


Figure 4 Graph showing all hopping frequencies used by the system.

Test result	The measured number of hopping frequencies was within the limits
Test modulation	
Compliant	Yes
Comments	The output power of the transmitter is more than 0.25 Watts therefore the limit is set to, at least 50 channels.

4.3 Measurement of peak output power

Test object	DualWay	Sheet	ADJ_PWR-3
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	8 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method Characteristics	DA 00-705 Test voltage: 6.2 VDC normal condition or extreme condition	Temperature Humidity	22 °C 27 % RH
Test equipm.			
SA Settings	RBW: 1 MHz VBW: 3 MHz SPAN: 2.5 MHz DET: Peak Trace: Max hold		

Frequency	Measured	Limit	Comments
902.55 MHz	18.6 dBm	30 dBm	
914.73 MHz	18.5 dBm	30 dBm	
927.43 MHz	18.2 dBm	30 dBm	
Note 1:			

Test result	The measured range of operating frequencies was within the limits
Test modulation	GFSK, Hopping disabled
Compliant	Yes
Comments	None

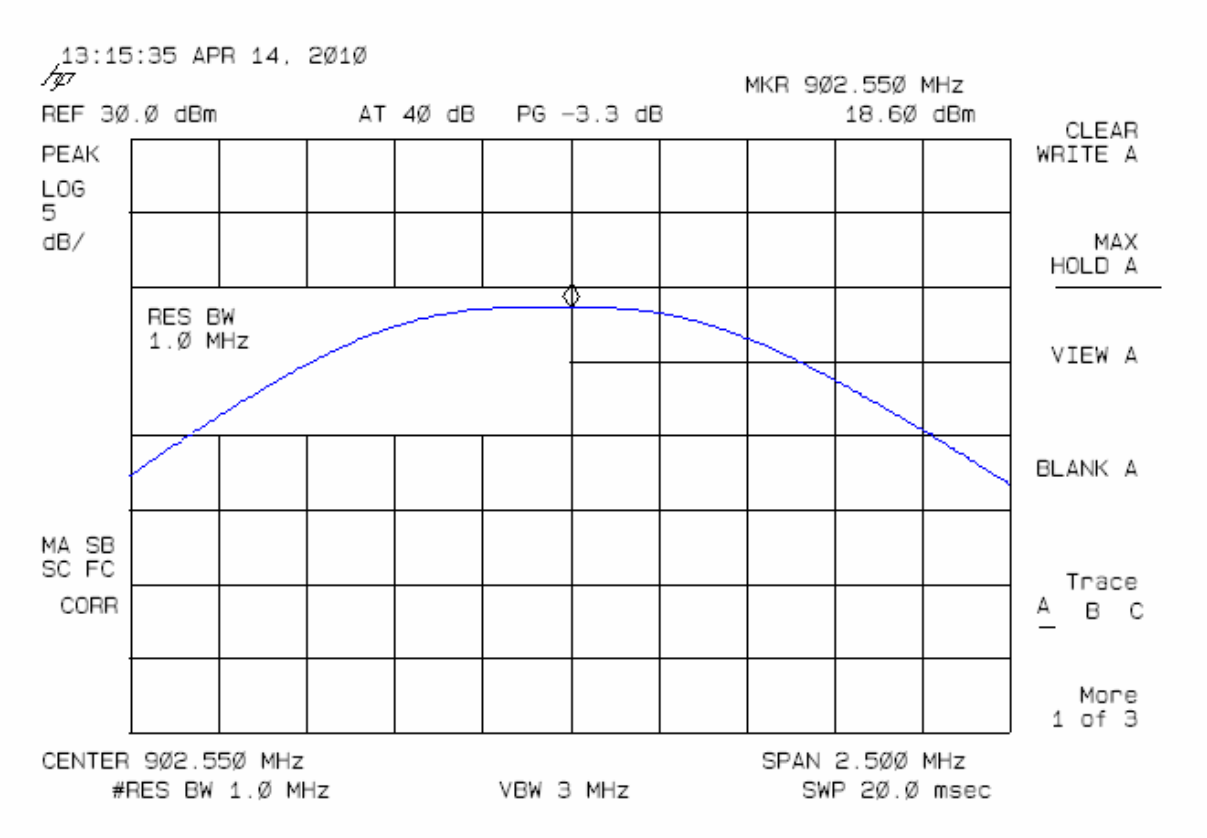


Figure 5 Peak output power low channel.

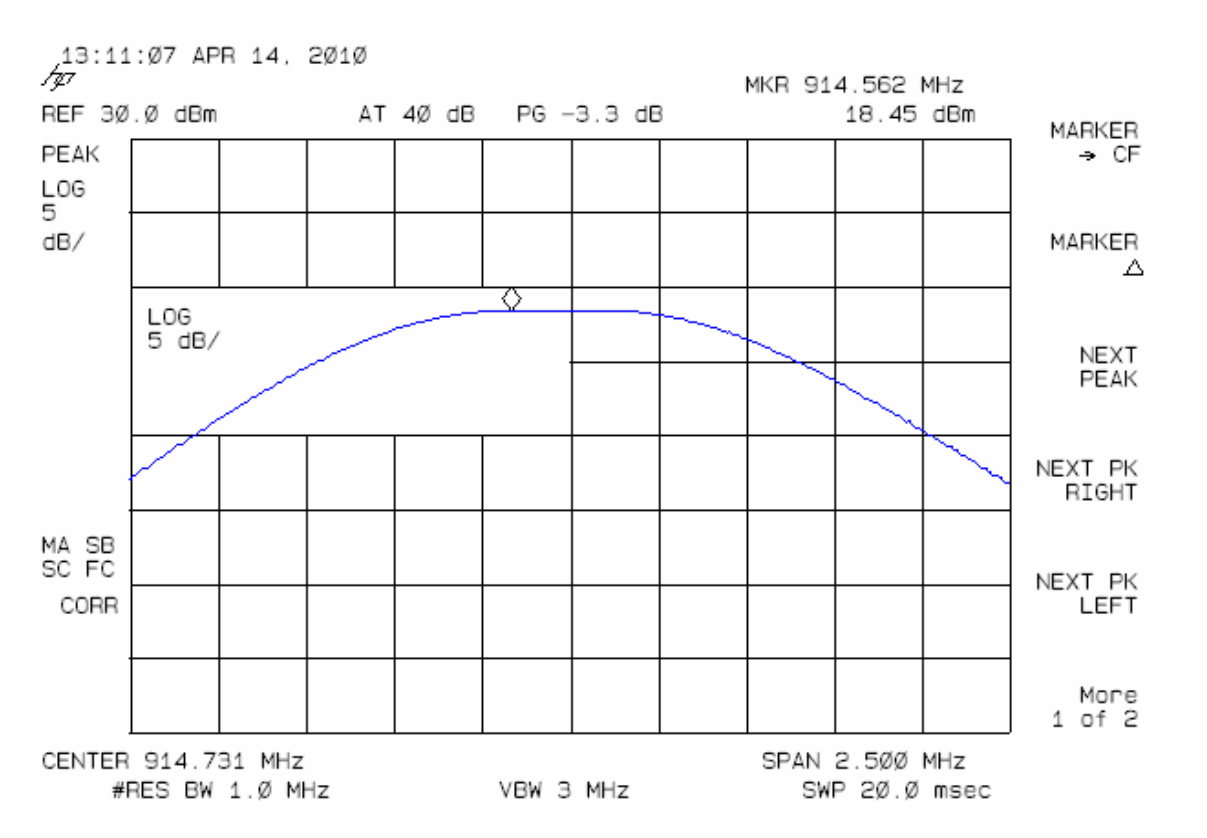


Figure 6 Peak output power mid channel

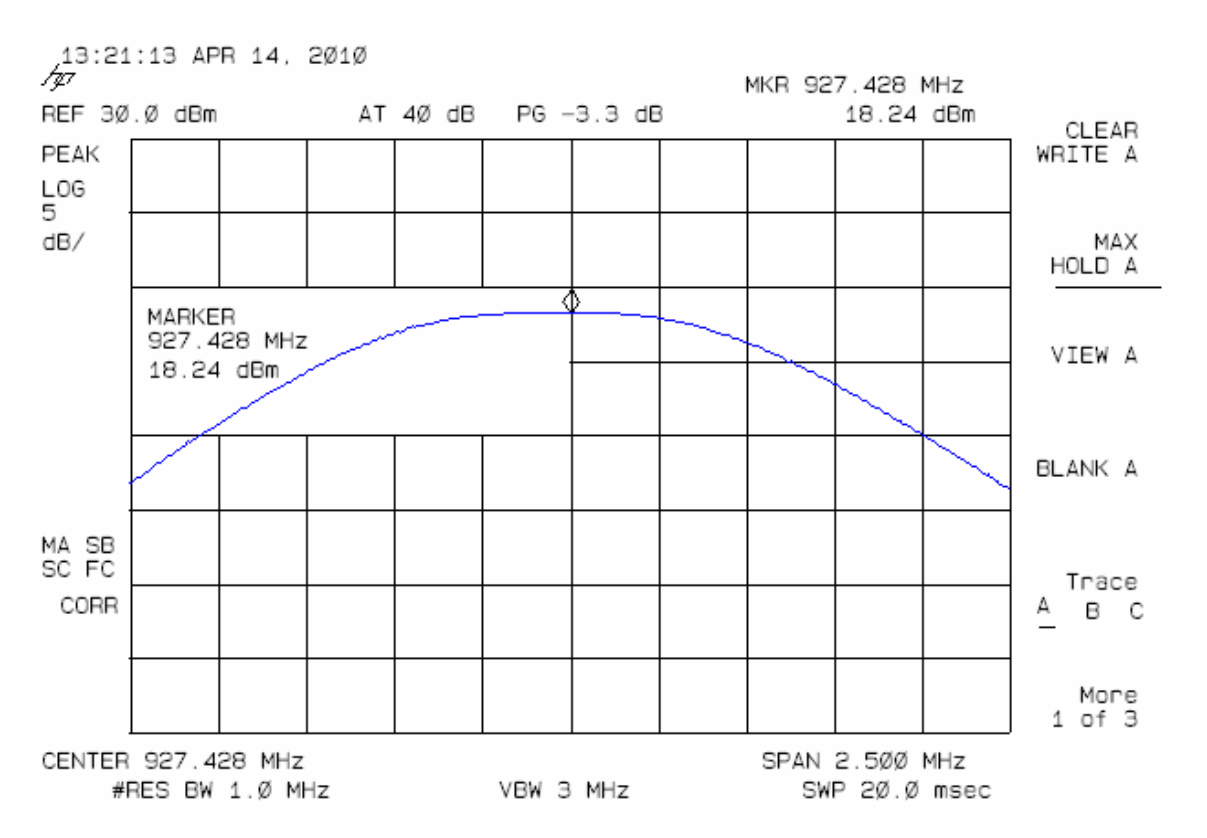


Figure 7 Peak output power high channel

4.4 Measurement dwell time

Test object	DualWay	Sheet	ADJ_PWR-4
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	8 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method Characteristics	DA 00-705 Test voltage: normal condition or extreme condition	Temperature Humidity	22 °C 27 % RH
Test equipm.	HP Uncertainty: 1•10-7		
SA Settings	RBW: 1 MHz VBW: 3 MHz SPAN: ZERO DET: Peak CF:	Trace: Max hold	

Frequency	Measured	Limit	Comments
902.54 MHz	384 ms	400 ms	
915.24 MHz	384 ms	400 ms	
927.25 MHz	384 ms	400 ms	

Note 1: The sweeps were trigged using the measured burst. The trigger in the spectrum analyzer introduces a 1 ms delay. Hence a more accurate dwell time is 385 ms for all the measurements above. The analyzer trigger delay was verified using manually triggered single sweeps.

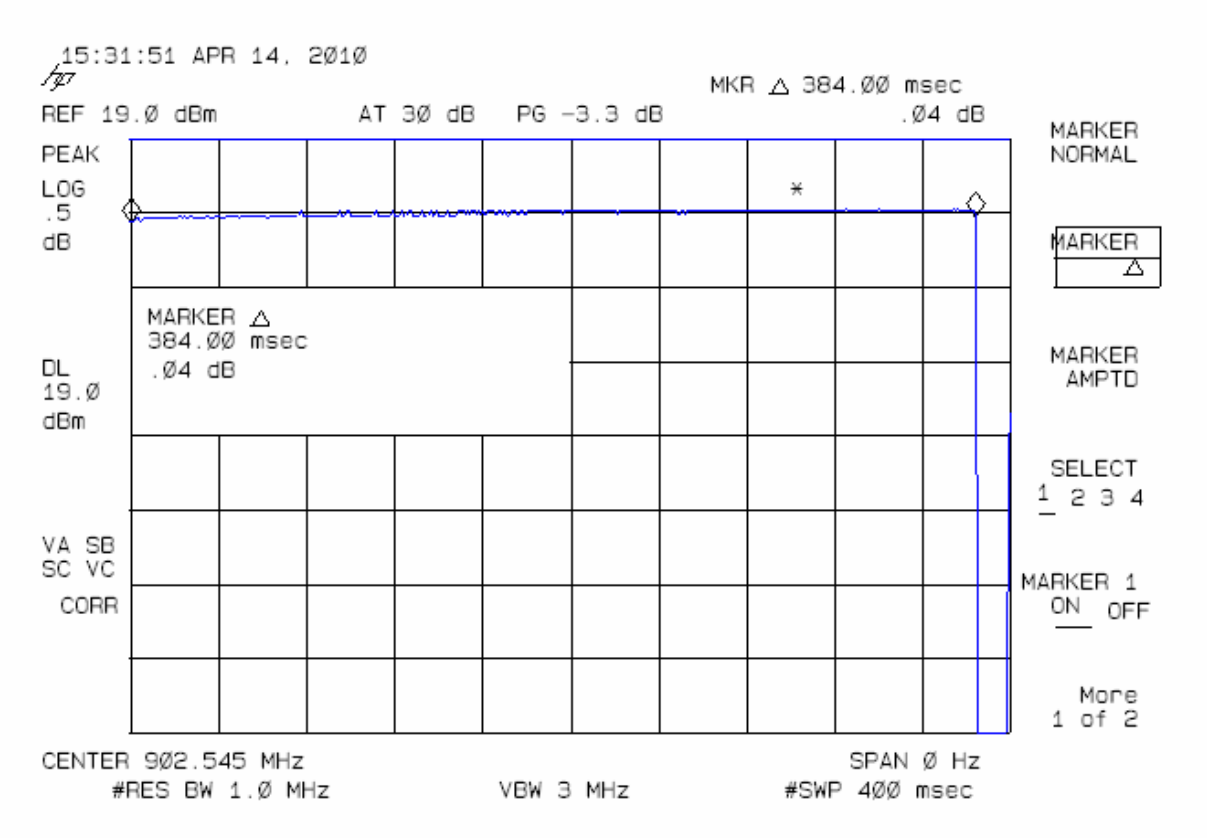


Figure 8 Time of occupancy low channel.

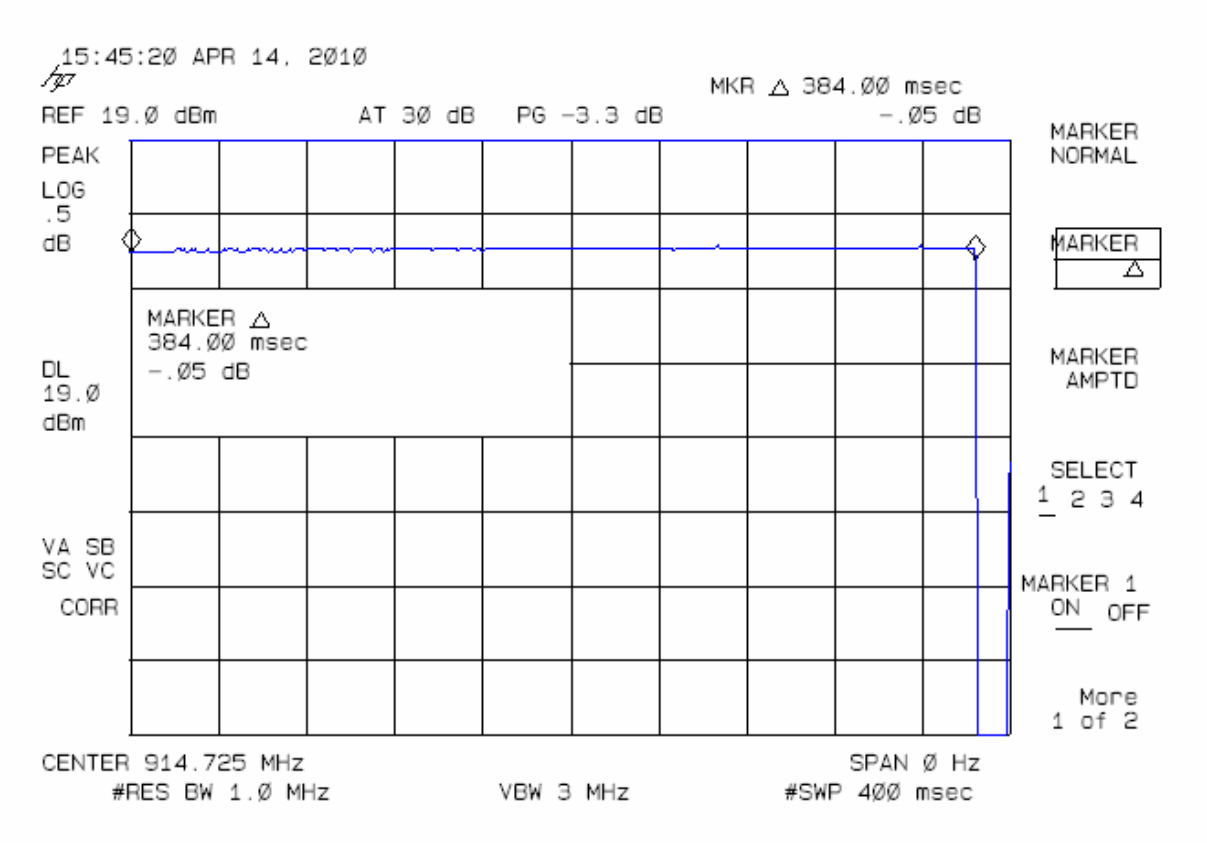


Figure 9 Time of occupancy mid channel.

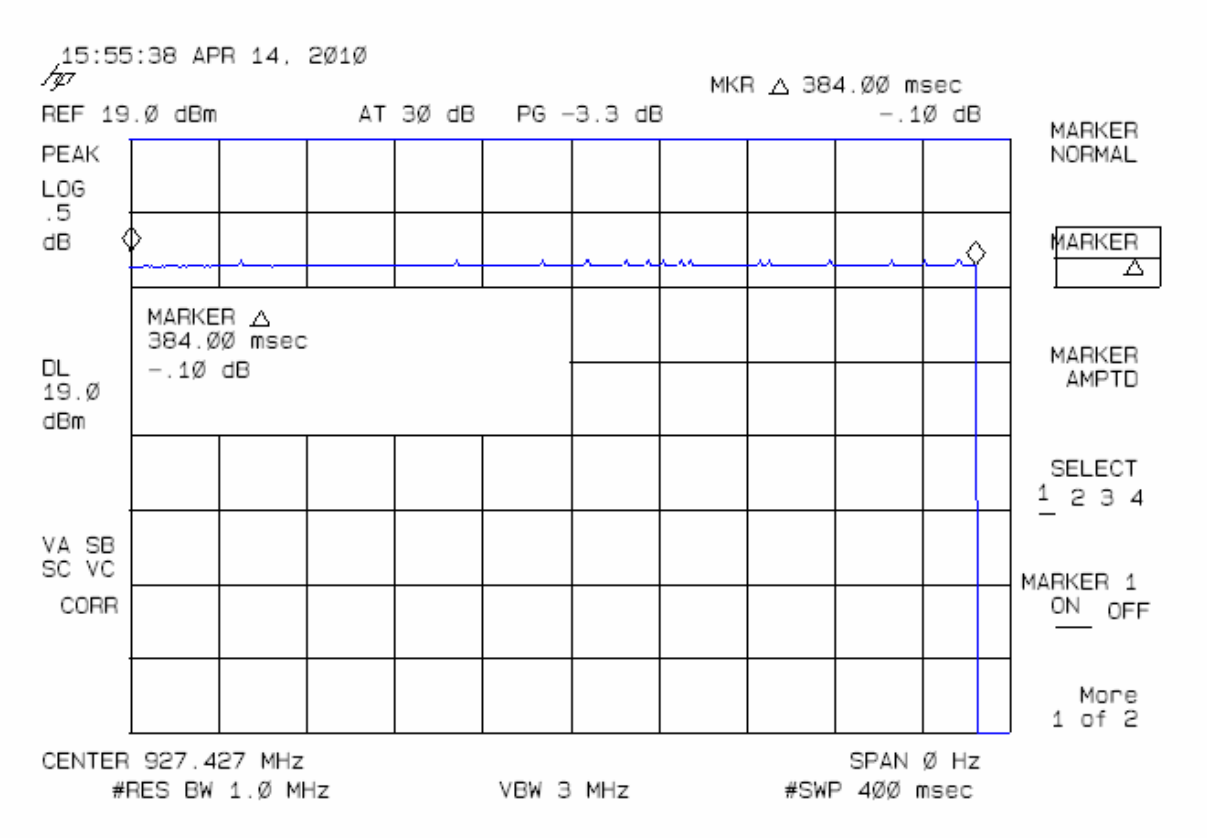


Figure 10 Time of occupancy high channel

Test result	The measured time of occupancy, or dwell time, at low, mid, and high channel was within the limits.
Test modulation	GFSK, frequency hopping.
Compliant	Yes
Comments	In the measurements on the mid frequency channel the burst that can be seen at the left edge of the plot is actually occurring after the burst measured on the mid frequency. Because the plot is triggered on the burst preceding the burst at the chosen channel, which is done in order to get the entire burst in the plot, the plot retriggers immediately after the first sweep is finished.

4.5 Measurement of 20 dB bandwidth

Test object	DualWay	Sheet	ADJ_PWR-5
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	8 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method Characteristics	FCC part 15, subpart 247 Test voltage: 6 VDC	Temperature Humidity	23 °C 27 % RH
Test equipm.			
SA Settings	RBW: 10 kHz VBW: 30 kHz SPAN: 1 MHz DET: Peak CF:	Trace: Max hold	

Frequency	Measured	Limit	Comments
902.545 MHz	465 kHz	500 kHz	
914.727MHz	465 kHz	500 kHz	
927.427 MHz	463 kHz	500 kHz	

Note 1:

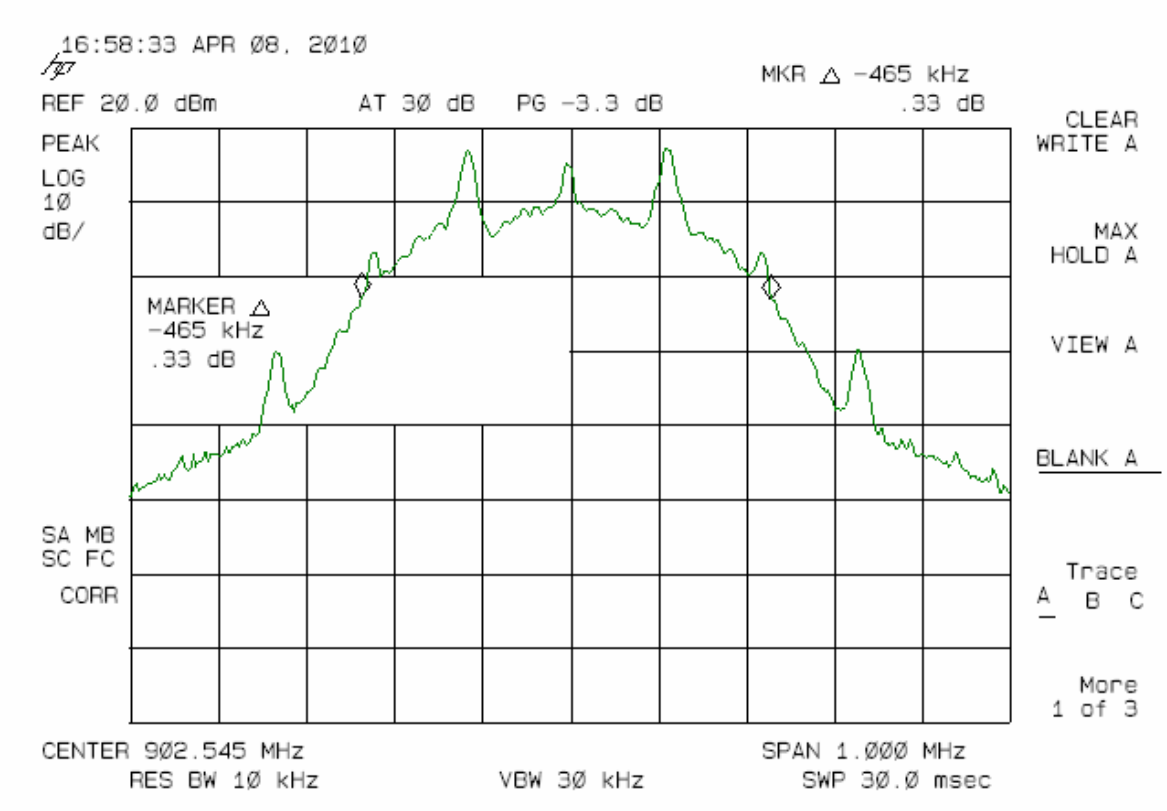


Figure 11 20 dB Bandwidth of the modulated carrier at low channel.

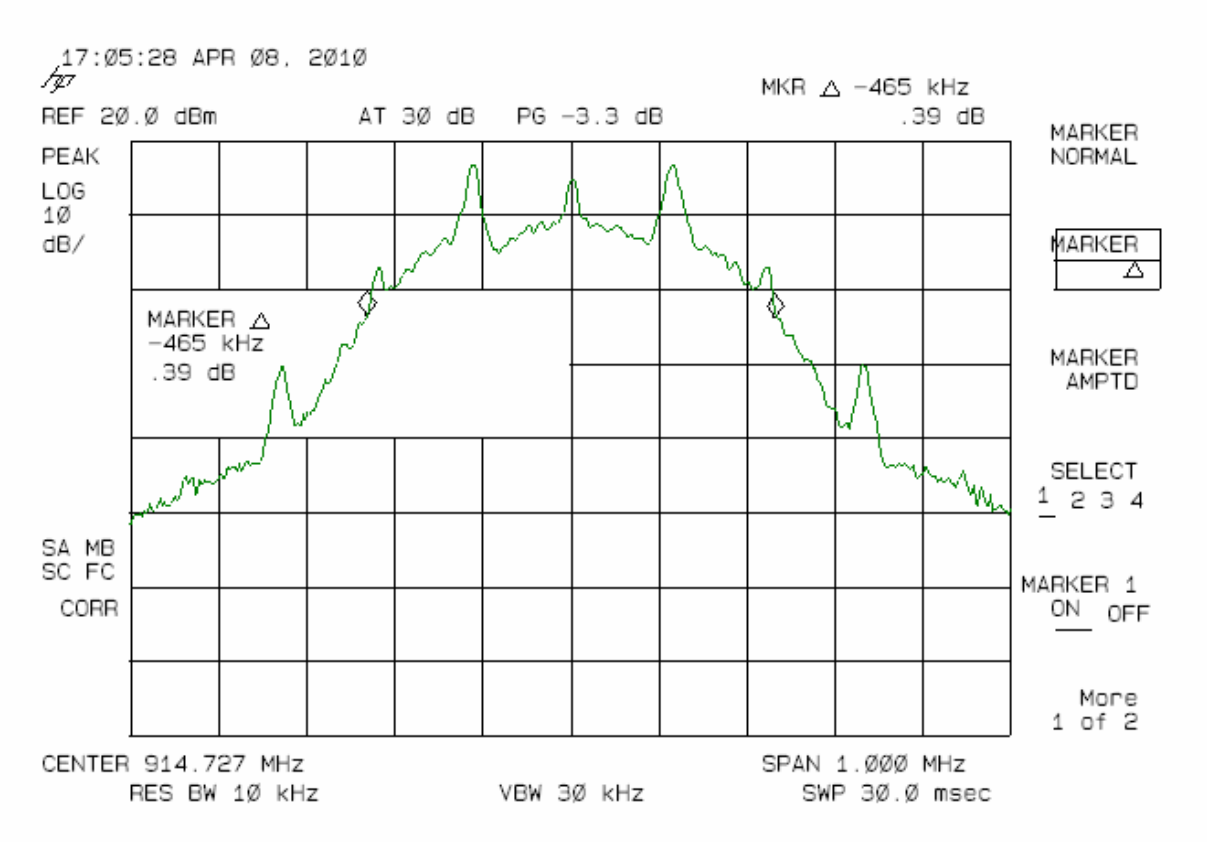


Figure 12 20 dB Bandwidth of the modulated carrier at mid channel

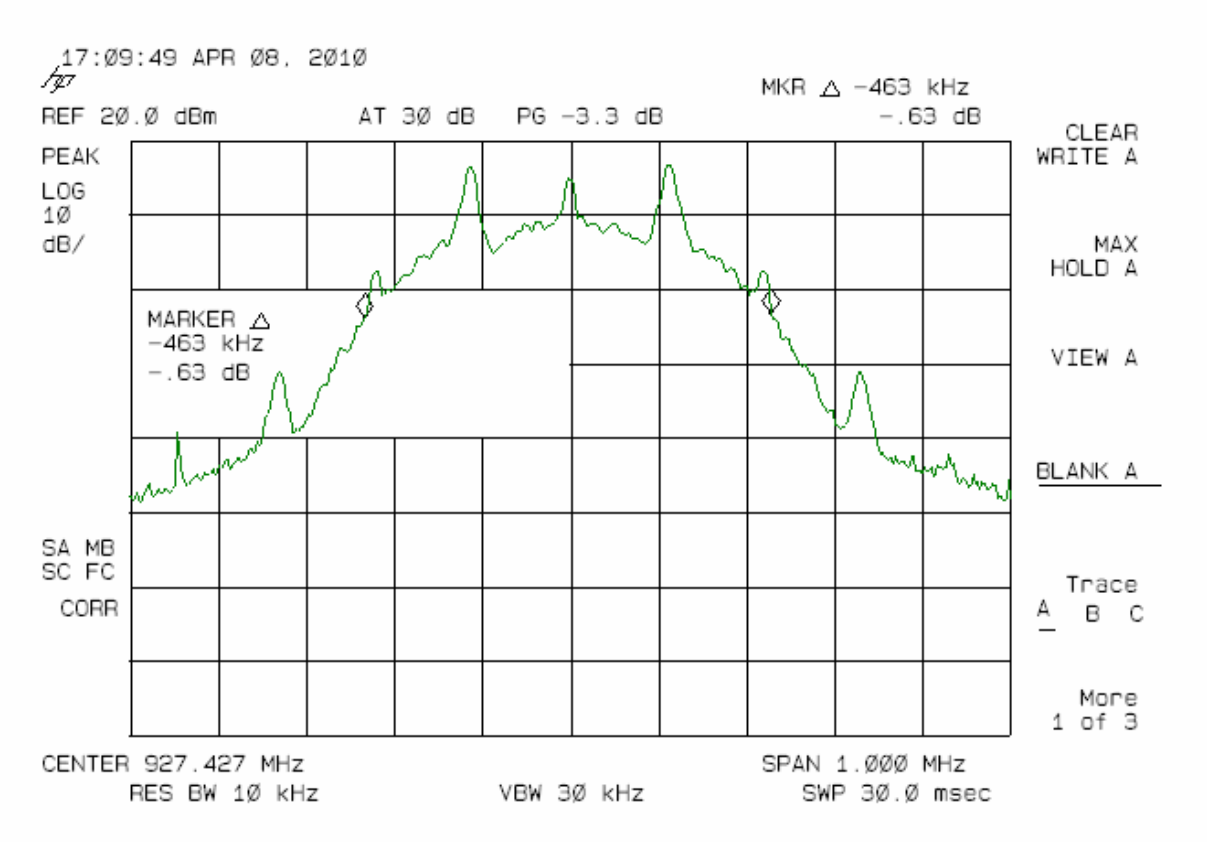


Figure 13 20 dB Bandwidth of the modulated carrier at high channel

Test result	The measured 20 dB bandwidths at low, mid and high channel was within the limits
Test modulation	GFSK
Compliant	Yes
Comments	None

4.6 Measurement of band edge compliance

Test object	DualWay	Sheet	ADJ_PWR-6
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	8-14 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method Characteristics	DA 00-705 Test voltage: 6.2 VDC normal condition or extreme condition	Temperature Humidity	22 °C 28 % RH
Test equipm.			
SA Settings	RBW: 100 kHz VBW: 300 kHz SPAN: 2 MHz DET: Peak CF:	Trace: Max hold	

Center Frequency	Delta Marker	Limit	Comments
902 MHz	-35.84 dB	-20 dB @ 902 MHz	Hopping disabled
902 MHz	- 24.95 dB	-20 dB @ 902 MHz	Hopping enabled
928 MHz	-33.85 dB	-20 dB @ 928 MHz	Hopping disabled
928 MHz	-26.49 dB	-20 dB @ 928 MHz	Hopping enabled

Note 1:

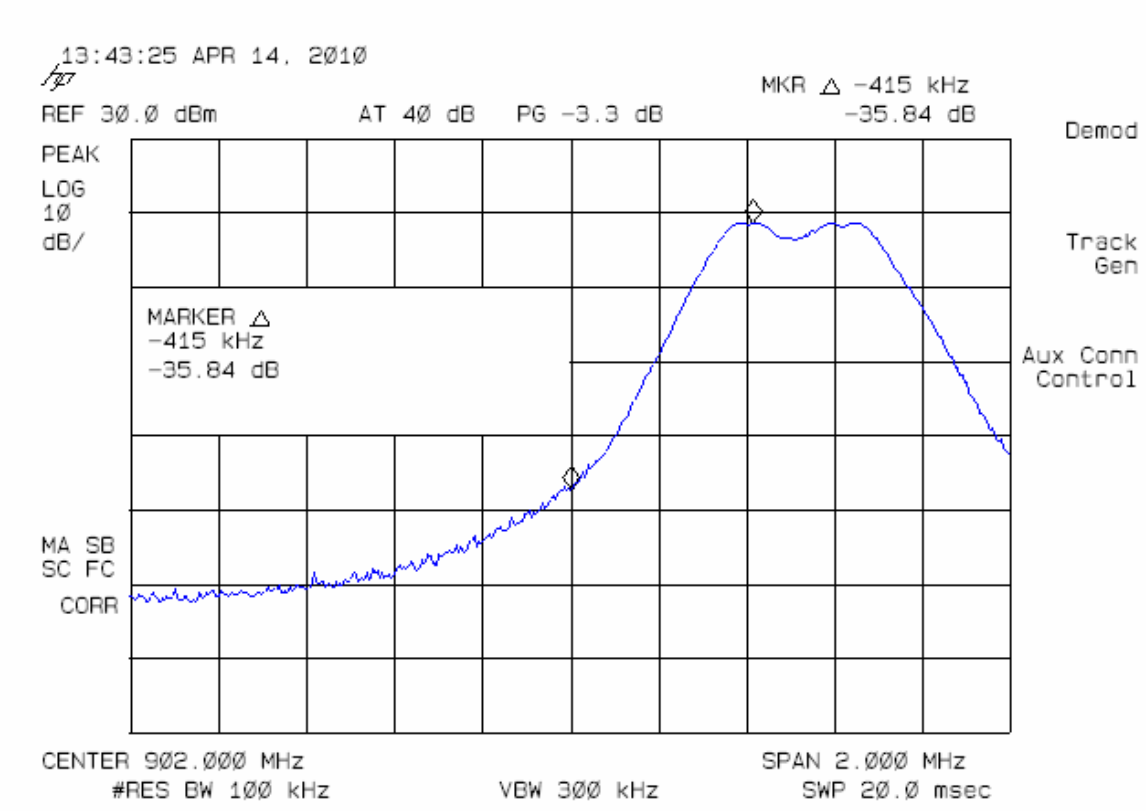


Figure 14 Band-edge compliance low channel with frequency hopping disabled.

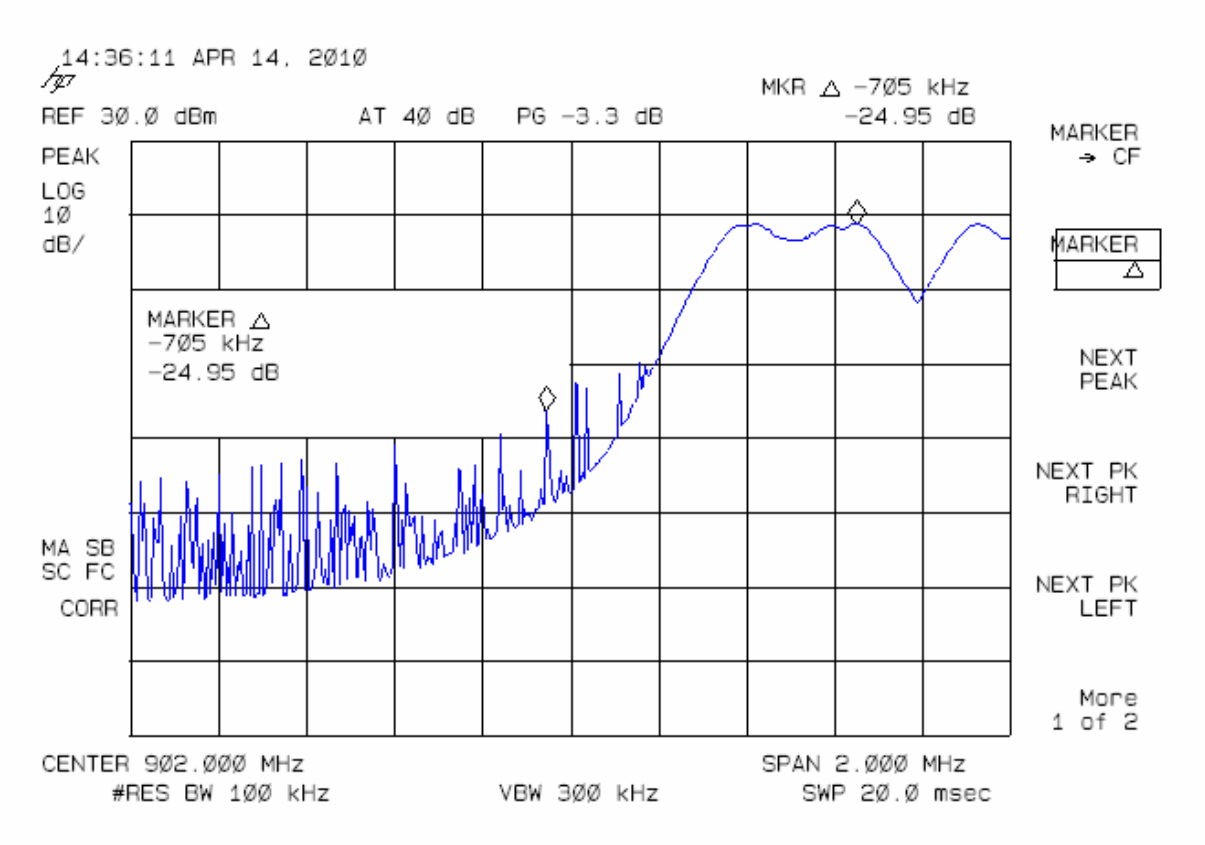


Figure 15 Band-edge compliance low channel with frequency hopping enabled.

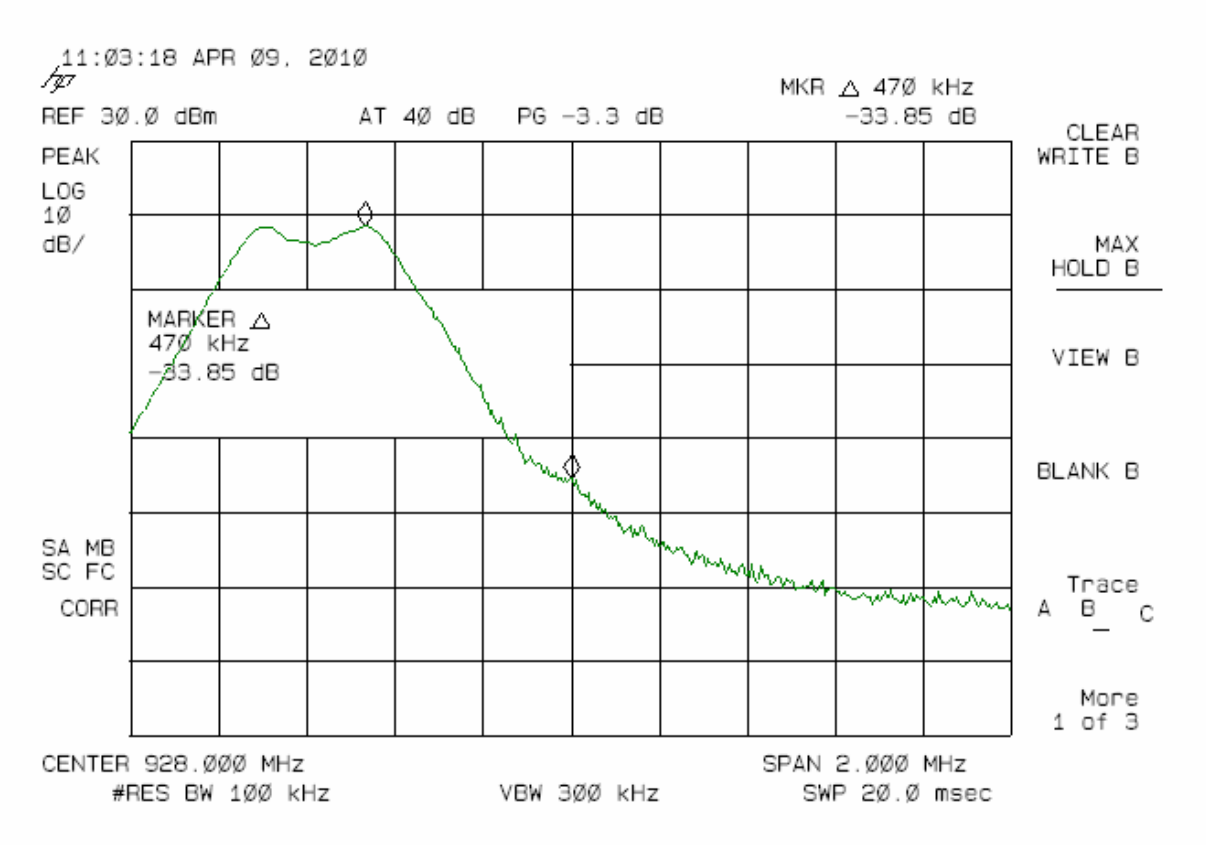


Figure 16 Band-edge compliance high channel with frequency hopping disabled.

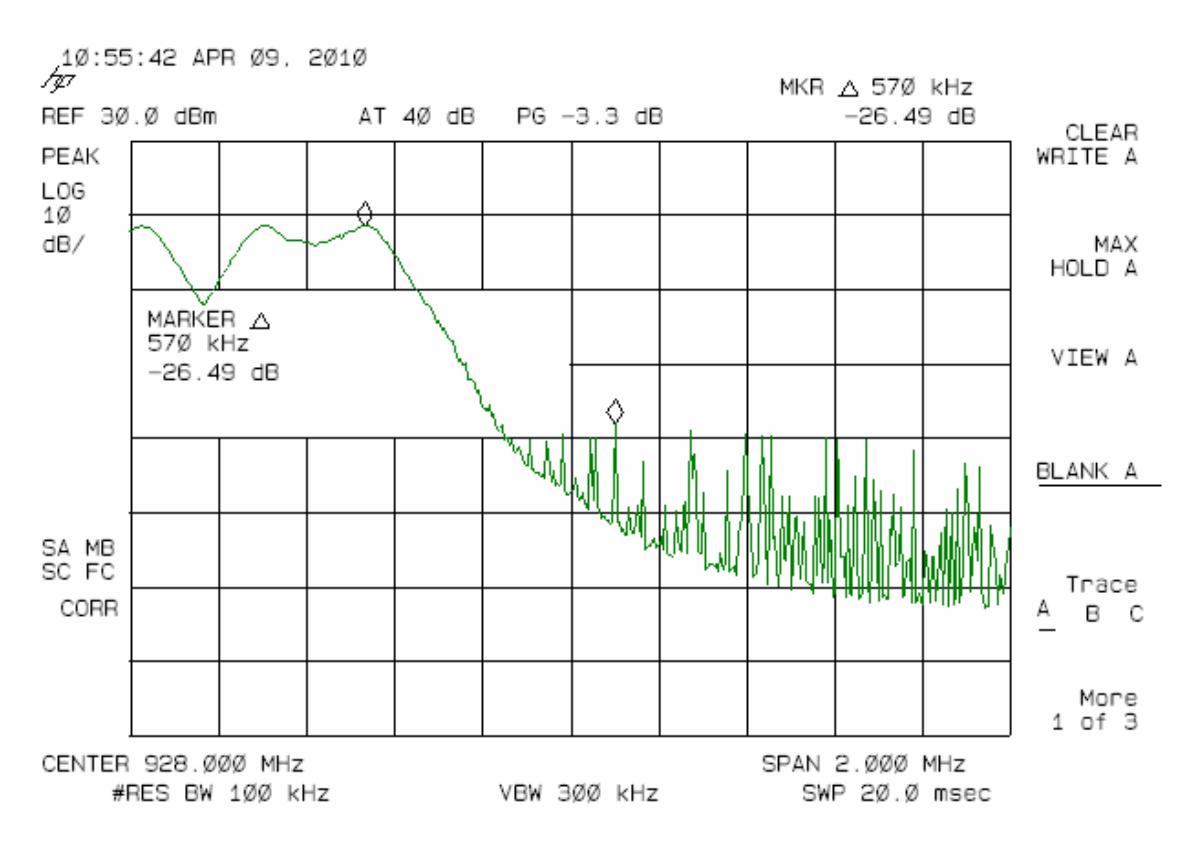


Figure 17 Band-edge compliance high channel with frequency hopping enabled.

Test result	The measured range of operating frequencies was within the limits
Test modulation	GFSK
Compliant	Yes
Comments	Guiding measurements with wider span was conducted initially to verify that no stronger switching transients or modulation products were present outside the span reported above.

4.7 Measurement of radiated spurious emissions

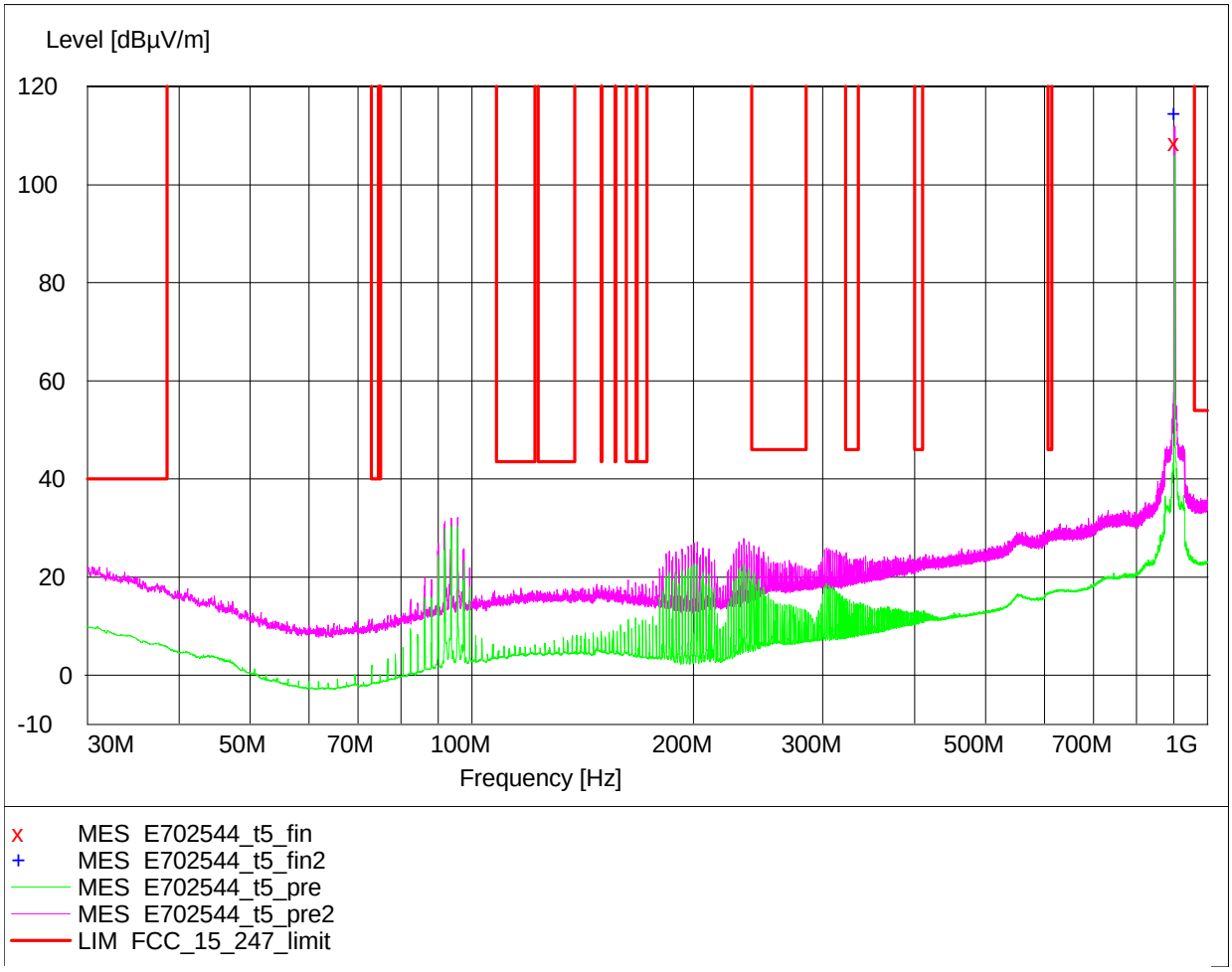
Test object	DualWay	Sheet	RE-1
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	8 Apr. 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247	Frequency	1-10 GHz

Test method Characteristics	ANSI C63.4:2003 Complete search, Antenna distance 3 m	Temperature Humidity	23 °C 31 % RH
Detector	Peak and average.	Bandwidth	f < 1 GHz 100 kHz, f > 1GHz 1 MHz
Test equipm.	Semi-anechoic chamber. See section 6 List of instruments	Uncertainty: 4.9 dB	

Radiated emission 2010-04-07

Complete measurement 30-1000 MHz

```
EUT:                 Spirocom DualWay
Manufacturer:        WSI
Operating Condition: 6 VDC Batt
Test Site:           DELTA Development Technology AB
Operator:            Fredrik Thorsell
Test Specification:  FCC 15.247 (15.209)
Comment:             Carrier "low"
Start of Test:       2010-04-07 / 17:13:10
```



MEASUREMENT RESULT: "E702544_t5_fin"

```
2010-04-07  18:00
   Frequency     Level  Transd  Det.  Height  Azimuth  Polarization
         MHz    dBµV/m      dB          cm      deg

  902.650000    108.60    27.5  AV     115.0   243.00  VERTICAL
```

MEASUREMENT RESULT: "E702544_t5_fin2"

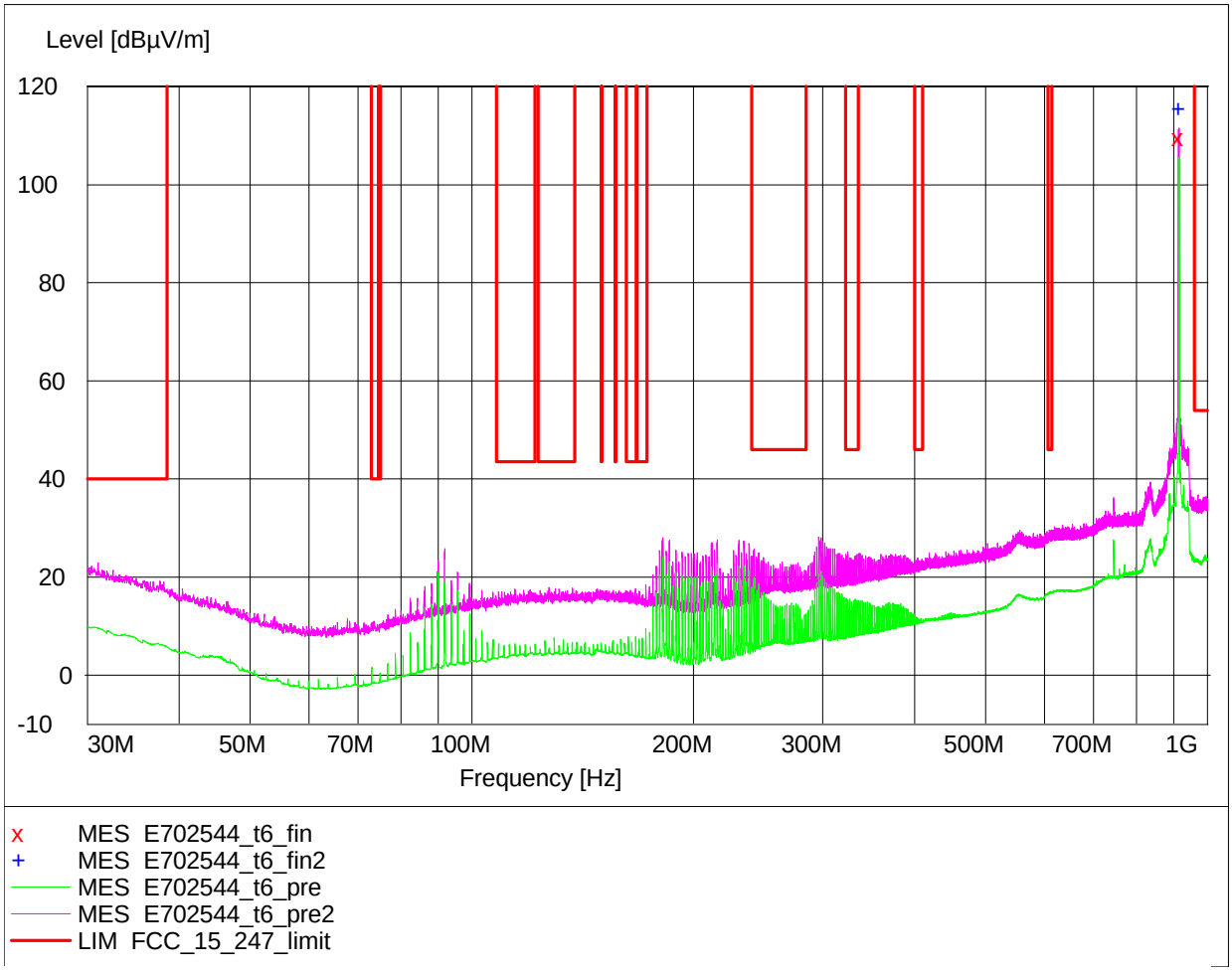
```
2010-04-26  15:05
   Frequency     Level  Transd   Det.  Height  Azimuth  Polarization
         MHz    dBµV/m      dB          cm      deg

  902.425000    114.30    27.5   PK     113.0   242.00  VERTICAL
```

Carrier Power 2010-04-07

Complete measurement 30-1000 MHz

```
EUT:                 Spirocom DualWay
Manufacturer:        WSI
Operating Condition: 6 VDC Batt
Test Site:           DELTA Development Technology AB
Operator:            Fredrik Thorsell
Test Specification:  FCC 15.247 (15.209)
Comment:             Carrier; midd channel
Start of Test:       2010-04-07 / 18:16:09
```



MEASUREMENT RESULT: "E702544_t6_fin"

```
2010-04-07  18:44
   Frequency     Level  Transd   Det.  Height  Azimuth  Polarization
         MHz    dBµV/m      dB           cm      deg

  914.850000    109.40    27.8     AV     113.0   248.00  VERTICAL
```

MEASUREMENT RESULT: "E702544_t6_fin2"

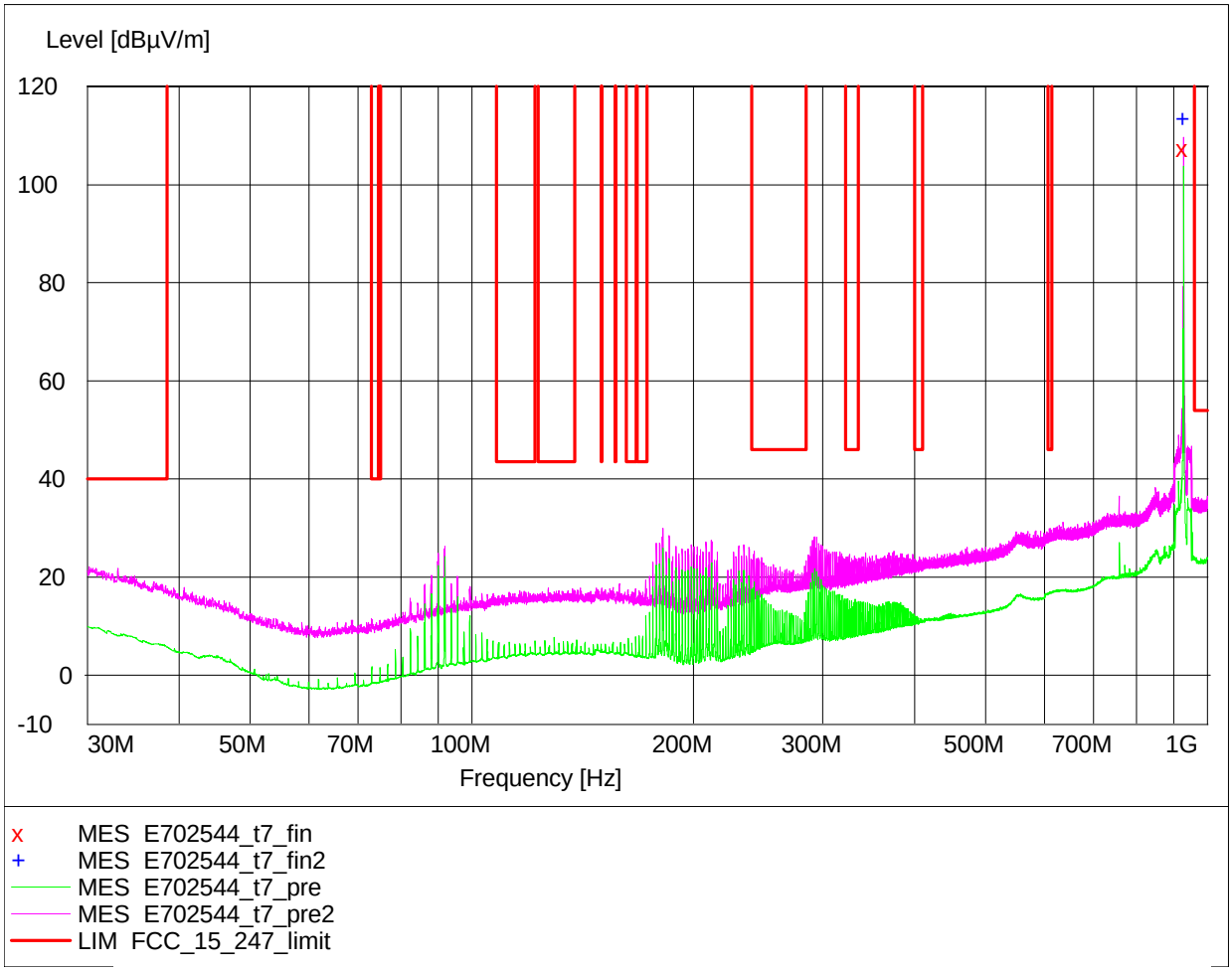
```
2010-04-07  18:44
   Frequency     Level  Transd  Det.  Height  Azimuth  Polarization
         MHz    dBµV/m      dB         cm      deg

  914.850000    115.40    27.8  PK     114.0   250.00  VERTICAL
```

Carrier Power 2010-04-07

Complete measurement 30-1000 MHz

```
EUT:                 Spirocom DualWay
Manufacturer:        WSI
Operating Condition: 6 VDC Batt
Test Site:           DELTA Development Technology AB
Operator:            Fredrik Thorsell
Test Specification:  FCC 15.247 (15.209)
Comment:             Carrier; high channel
Start of Test:       2010-04-07 / 18:55:13
```



MEASUREMENT RESULT: "E702544_t7_fin"

```
2010-04-07  19:23
   Frequency     Level  Transd  Det.  Height  Azimuth  Polarization
         MHz    dBµV/m      dB          cm      deg

  927.325000   107.30    28.5   AV     113.0   246.00  VERTICAL
```

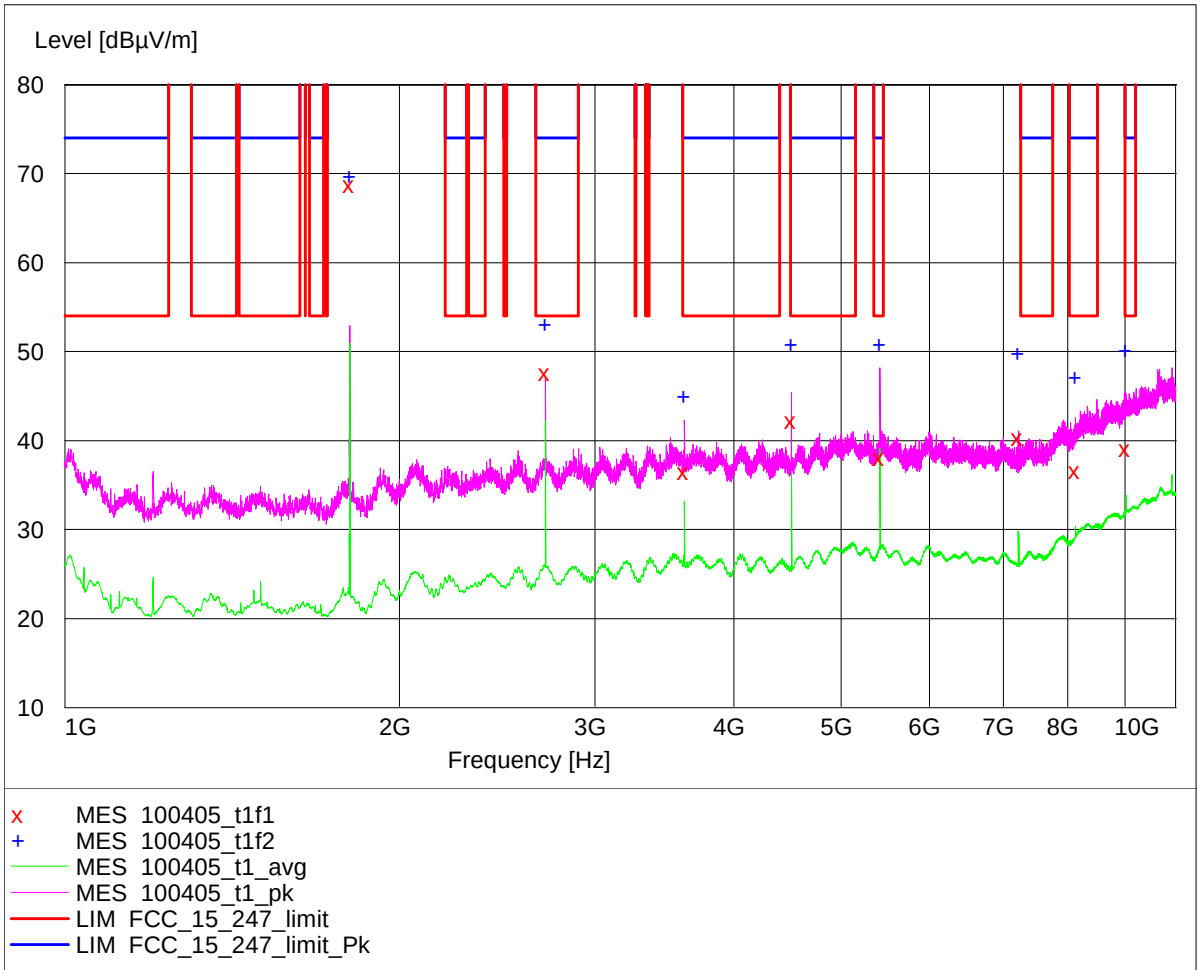
MEASUREMENT RESULT: "E702544_t7_fin2"

```
2010-04-07  19:23
   Frequency     Level  Transd  Det.  Height  Azimuth  Polarization
         MHz    dBµV/m      dB          cm      deg
  927.550000   113.20    28.5   PK     113.0   247.00  VERTICAL
```

Spurious Radiated Emission 2010-04-05

Final measurement 1-10 GHz

```
EUT:                 Dual-Way
Manufacturer:        WSI
Operating Condition: 6 VDC
Test Site:           DELTA Development Technology AB
Operator:            Fredrik Thorsell
Test Specification:  FCC Part 15.247
Comment:             Low channel (902 MHz)
Start of Test:       2010-04-05 / 10:14:29
```



MEASUREMENT RESULT: "100405_t1f1"

2010-04-05 14:00

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1805.000000	68.80	-14.4	-	-	AV	206.0	241.00	VERTICAL
3610.000000	36.50	-8.2	54.0	17.5	AV	164.0	88.00	HORIZONTAL
2708.000000	47.60	-10.7	54.0	6.4	AV	200.0	97.00	HORIZONTAL
4512.000000	42.30	-7.7	54.0	11.7	AV	157.0	182.00	HORIZONTAL
5414.000000	38.10	-4.9	54.0	15.9	AV	122.0	236.00	VERTICAL
7219.500000	40.30	-0.8	54.0	13.7	AV	150.0	109.00	HORIZONTAL
8124.000000	36.60	0.0	54.0	17.4	AV	135.0	138.00	HORIZONTAL
9026.500000	39.10	0.9	54.0	14.9	AV	149.0	121.00	HORIZONTAL

MEASUREMENT RESULT: "100405_t1f2"

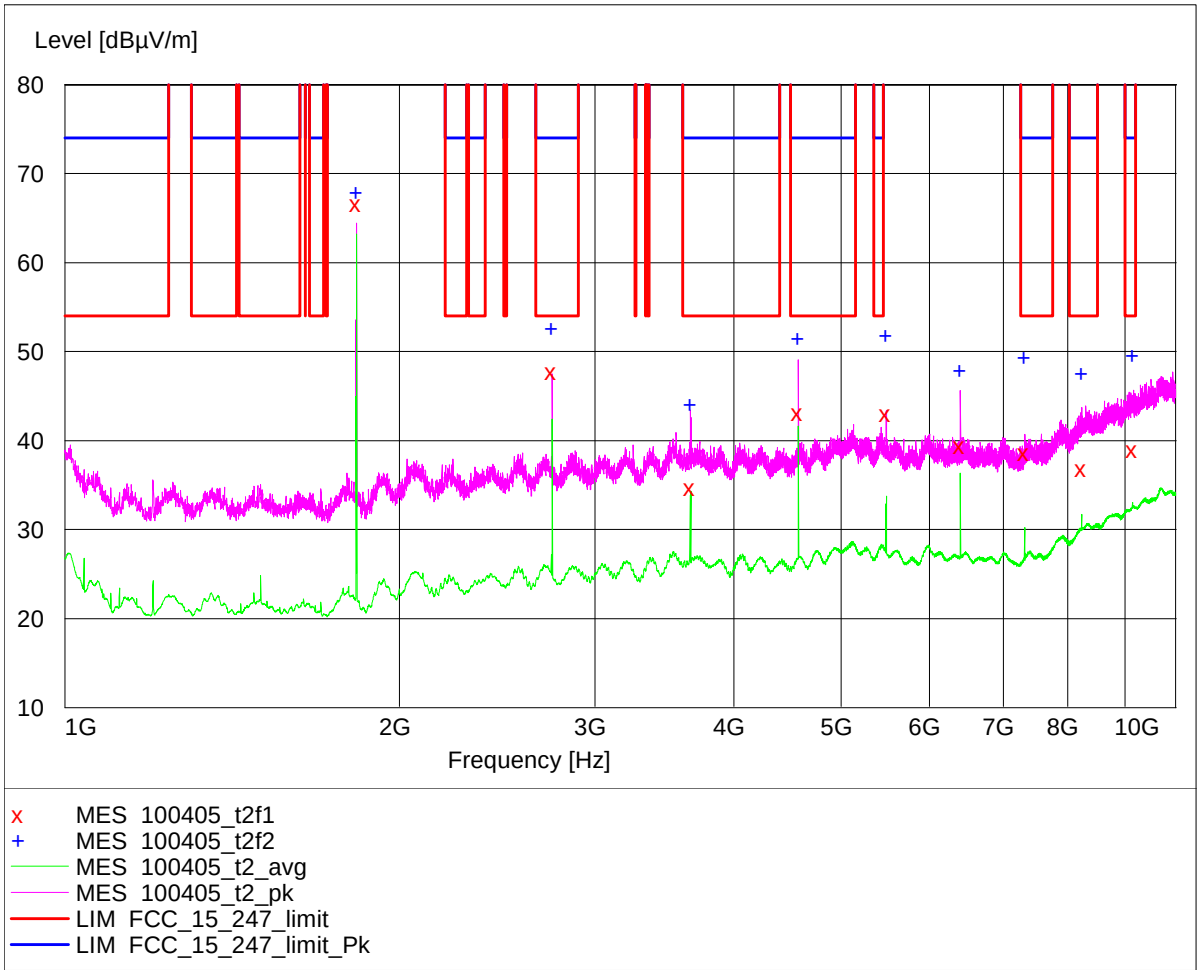
2010-04-05 14:02

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1805.000000	69.70	-14.4	-	-	PK	206.0	237.00	VERTICAL
3610.000000	44.98	-8.2	74.0	29.0	PK	164.0	88.00	HORIZONTAL
2708.000000	53.00	-10.7	74.0	21.0	PK	200.0	98.00	HORIZONTAL
4512.000000	50.80	-7.7	74.0	23.2	PK	157.0	180.00	HORIZONTAL
5414.000000	50.80	-4.9	74.0	23.2	PK	122.0	235.00	VERTICAL
7219.500000	49.70	-0.8	74.0	24.3	PK	142.0	74.00	HORIZONTAL
8124.000000	47.10	0.0	74.0	26.9	PK	124.0	139.00	HORIZONTAL
9026.500000	50.10	0.9	74.0	23.9	PK	126.0	138.00	HORIZONTAL

Spurious Radiated Emission 2010-04-05

Final measurement 1-10 GHz

```
EUT:                 Dual-Way
Manufacturer:        WSI
Operating Condition: 6 VDC
Test Site:           DELTA Development Technology AB
Operator:            Fredrik Thorsell
Test Specification:  FCC Part 15.247
Comment:             Mid channel (915 MHz)
Start of Test:       2010-04-05 / 11:41:13
```



MEASUREMENT RESULT: "100405_t2f1"

2010-04-05 12:24

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1829.500000	66.70	-14.2	-	-	AV	148.0	297.00	VERTICAL
2744.500000	47.80	-10.7	54.0	6.2	AV	197.0	119.00	HORIZONTAL
3658.500000	34.70	-8.1	54.0	19.3	AV	100.0	291.00	VERTICAL
4573.000000	43.20	-7.3	54.0	10.8	AV	150.0	154.00	HORIZONTAL
5488.500000	43.00	-4.9	54.0	11.0	AV	136.0	314.00	HORIZONTAL
6404.000000	39.40	-3.3	54.0	14.6	AV	111.0	238.00	VERTICAL
7317.000000	38.70	-0.5	54.0	15.3	AV	141.0	89.00	HORIZONTAL
8233.500000	36.90	0.1	54.0	17.1	AV	125.0	237.00	HORIZONTAL
9148.500000	39.00	1.1	54.0	15.0	AV	141.0	120.00	HORIZONTAL

MEASUREMENT RESULT: "100405_t2f2"

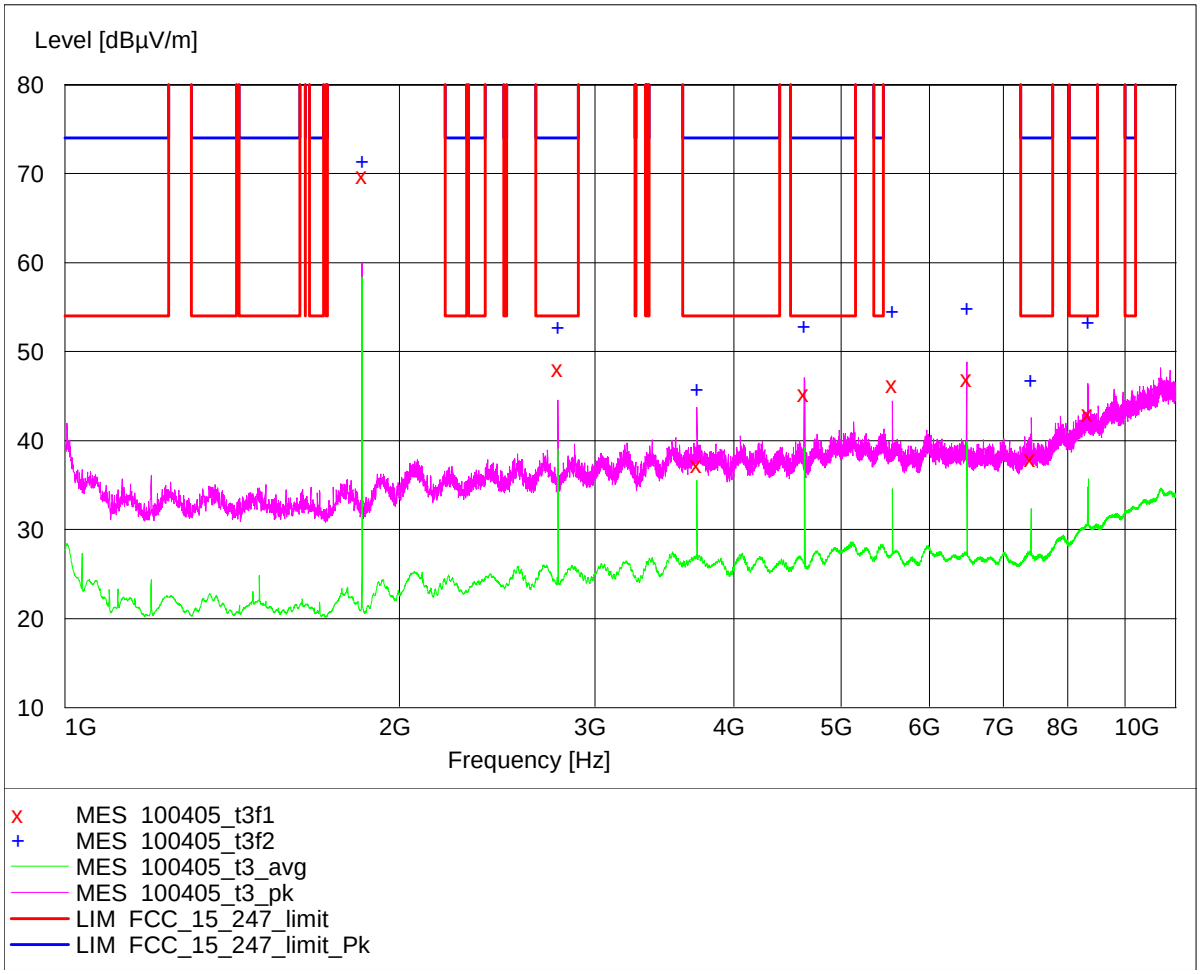
2010-04-05 12:24

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1829.500000	67.90	-14.2	-	-	PK	151.0	296.00	VERTICAL
2744.500000	52.60	-10.7	74.0	21.4	PK	200.0	120.00	HORIZONTAL
3658.500000	44.10	-8.1	74.0	29.9	PK	151.0	100.00	HORIZONTAL
4573.000000	51.40	-7.3	74.0	22.6	PK	150.0	154.00	HORIZONTAL
5488.500000	51.80	-4.9	74.0	22.2	PK	154.0	300.00	HORIZONTAL
6404.000000	47.90	-3.3	74.0	26.1	PK	109.0	268.00	VERTICAL
7317.000000	49.30	-0.5	74.0	24.7	PK	142.0	89.00	HORIZONTAL
8233.500000	47.50	0.1	74.0	26.5	PK	123.0	236.00	HORIZONTAL
9148.500000	49.60	1.1	74.0	24.4	PK	136.0	120.00	HORIZONTAL

Spurious Radiated Emission 2010-04-05

Final measurement 1-10 GHz

```
EUT:                 Dual-Way
Manufacturer:        WSI
Operating Condition: 6 VDC
Test Site:           DELTA Development Technology AB
Operator:            Fredrik Thorsell
Test Specification:  FCC Part 15.247
Comment:             High channel (927 MHz)
Start of Test:       2010-04-05 / 13:01:01
```



MEASUREMENT RESULT: "100405_t3f1"

2010-04-05 13:41

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1855.000000	69.80	-14.0	-	-	AV	146.0	294.00	VERTICAL
2782.500000	48.10	-10.6	54.0	5.9	AV	199.0	137.00	HORIZONTAL
3709.500000	37.30	-8.0	54.0	16.7	AV	147.0	107.00	HORIZONTAL
4637.500000	45.30	-7.0	54.0	8.7	AV	147.0	150.00	HORIZONTAL
5565.000000	46.30	-4.9	-	-	AV	100.0	121.00	VERTICAL
6492.500000	47.00	-3.1	-	-	AV	147.0	60.00	HORIZONTAL
7418.500000	38.00	-0.2	54.0	16.0	AV	153.0	208.00	HORIZONTAL
8348.000000	43.00	-0.1	54.0	11.0	AV	124.0	239.00	HORIZONTAL

MEASUREMENT RESULT: "100405_t3f2"

2010-04-05 13:41

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
1855.000000	71.30	-14.0	-	-	PK	146.0	294.00	VERTICAL
2782.500000	52.70	-10.6	74.0	21.3	PK	193.0	100.00	HORIZONTAL
3709.500000	45.80	-8.0	74.0	28.2	PK	159.0	45.00	HORIZONTAL
4637.500000	52.80	-7.0	74.0	21.2	PK	148.0	153.00	HORIZONTAL
5565.000000	54.50	-4.9	-	-	PK	100.0	115.00	VERTICAL
6492.500000	54.80	-3.1	-	-	PK	147.0	62.00	HORIZONTAL
7418.500000	46.80	-0.2	74.0	27.2	PK	166.0	210.00	HORIZONTAL
8348.000000	53.30	-0.1	74.0	20.7	PK	125.0	245.00	HORIZONTAL

Test result	The measured field strengths are within the limits
Compliant	Yes
Comments	Final maximal measurements by variation of turntable azimuth, antenna height, and antenna polarisation

Photo 4.7.1 Test setup regarding measurement of radio frequency electromagnetic field in the measurement in the frequency span 30-1000 MHz.

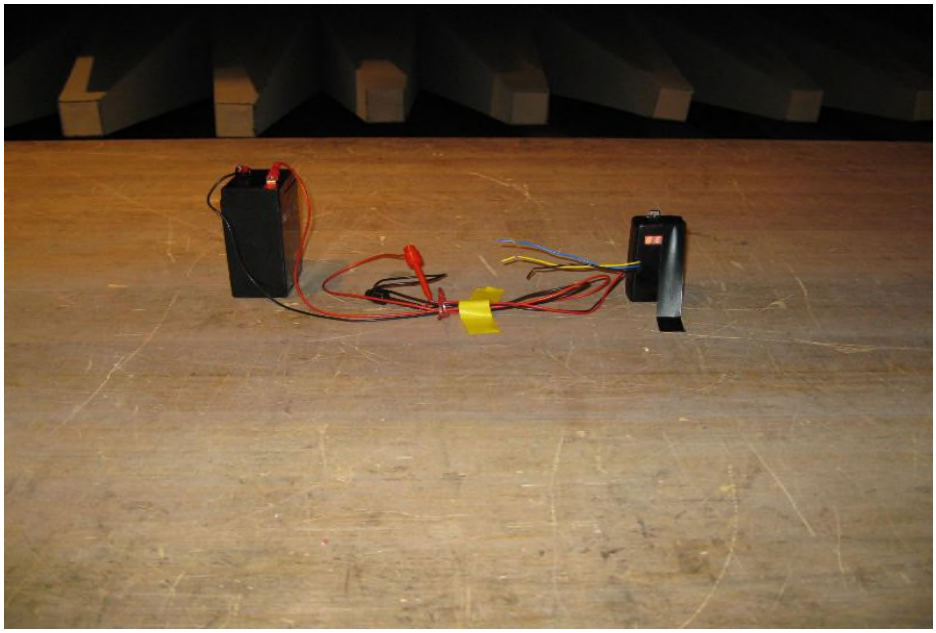


Photo 4.7.2 Test setup regarding measurement of radio frequency electromagnetic field in the measurement in the frequency span 30-1000 MHz and the frequency span 1-2 GHz.

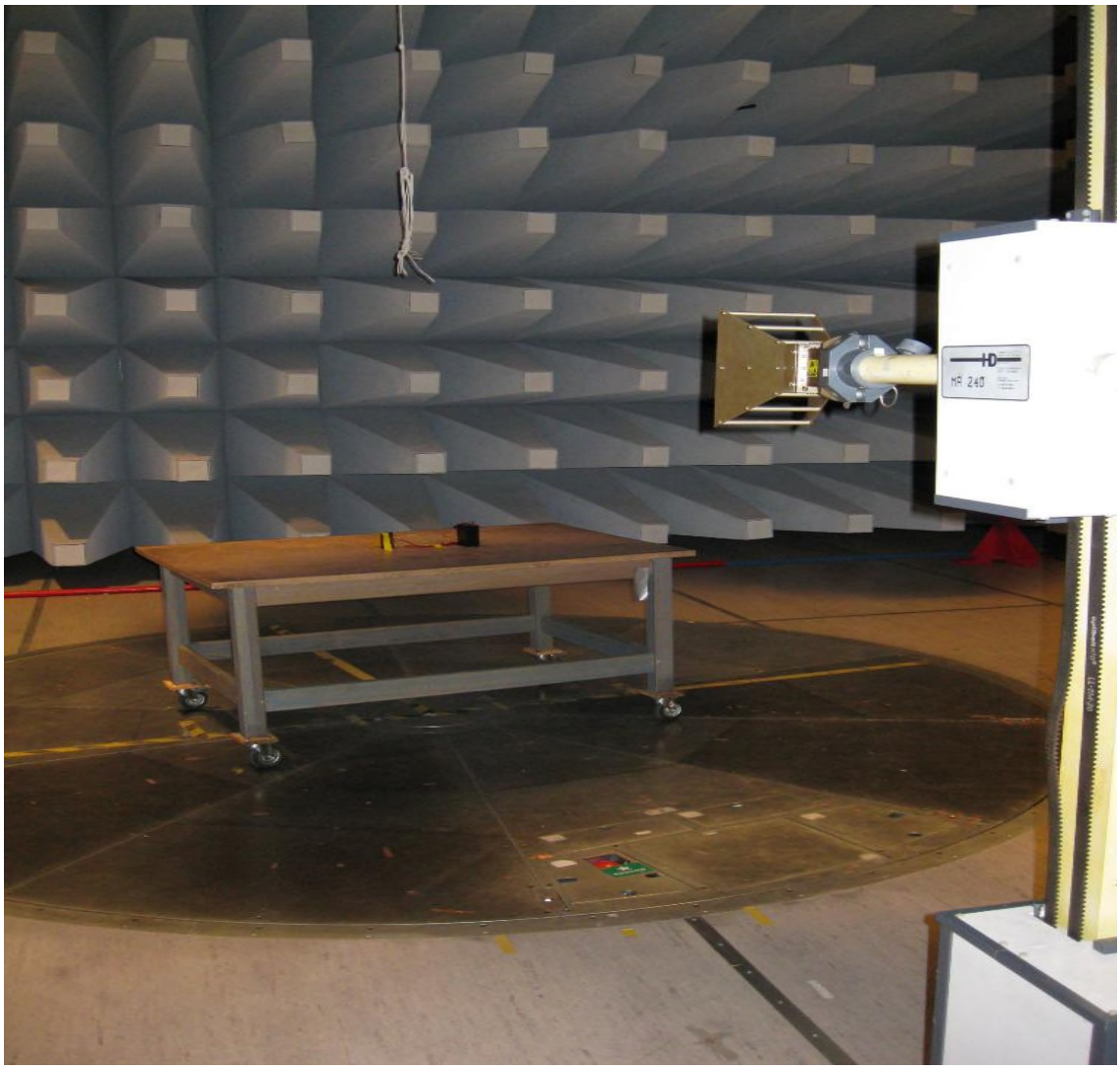


Photo 4.7.3 Test setup regarding measurement of radio frequency electromagnetic field in the measurement in the frequency span 1-10 GHz.

4.8 Measurement of Conducted spurious emissions

Test object	DualWay	Sheet	
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	23 April 2010
Client	Interspiro	Initials	fth
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method	DA 00-705	Temperature	22 °C
Characteristics	Test voltage: 6VDC	Humidity	27 % RH
Test equipm.	Uncertainty: 1•10-7		
SA Settings	RBW: 100 kHz SPAN: 1.1 GHz DET: Peak Trace: Max hold		

Frequency	Measured	Limit	Comments
1804.85 MHz	-59.1 dBc	-20 dBc	
1929.90 MHz	-57.45 dBc	-20 dBc	
1855.10MHz	-63.00 dBc	-20 dBc	

Note 1:

Test result	The measured range of operating frequencies was within the limits
Test modulation	GFSK
Compliant	Yes
Comments	Measured values and given limits are specified in dBc meaning power relative to maximum peak power of the carrier frequency.

SCAN TABLE: "FCC_cond_spurious"

Start Frequency	Stop Frequency	Step Width	Detector	IF Bandw.	Transducer
900.0 MHz	10.0 GHz	50.0 kHz	MaxPeak	100 kHz	None

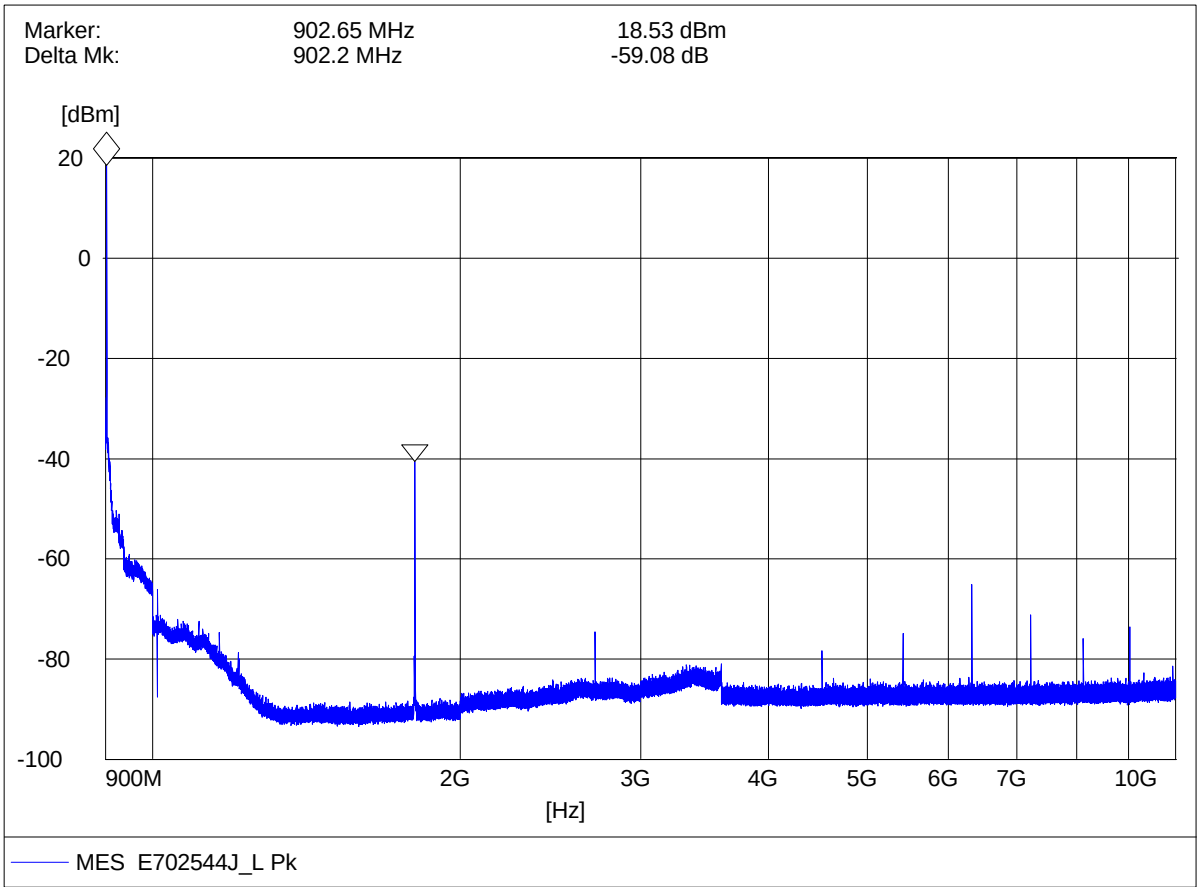


Figure 18 Conducted spurious emissions, low channel.

SCAN TABLE: "FCC_cond_spurious"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
900.0 MHz	10.0 GHz	50.0 kHz	MaxPeak	10.0 ms	100 kHz	None

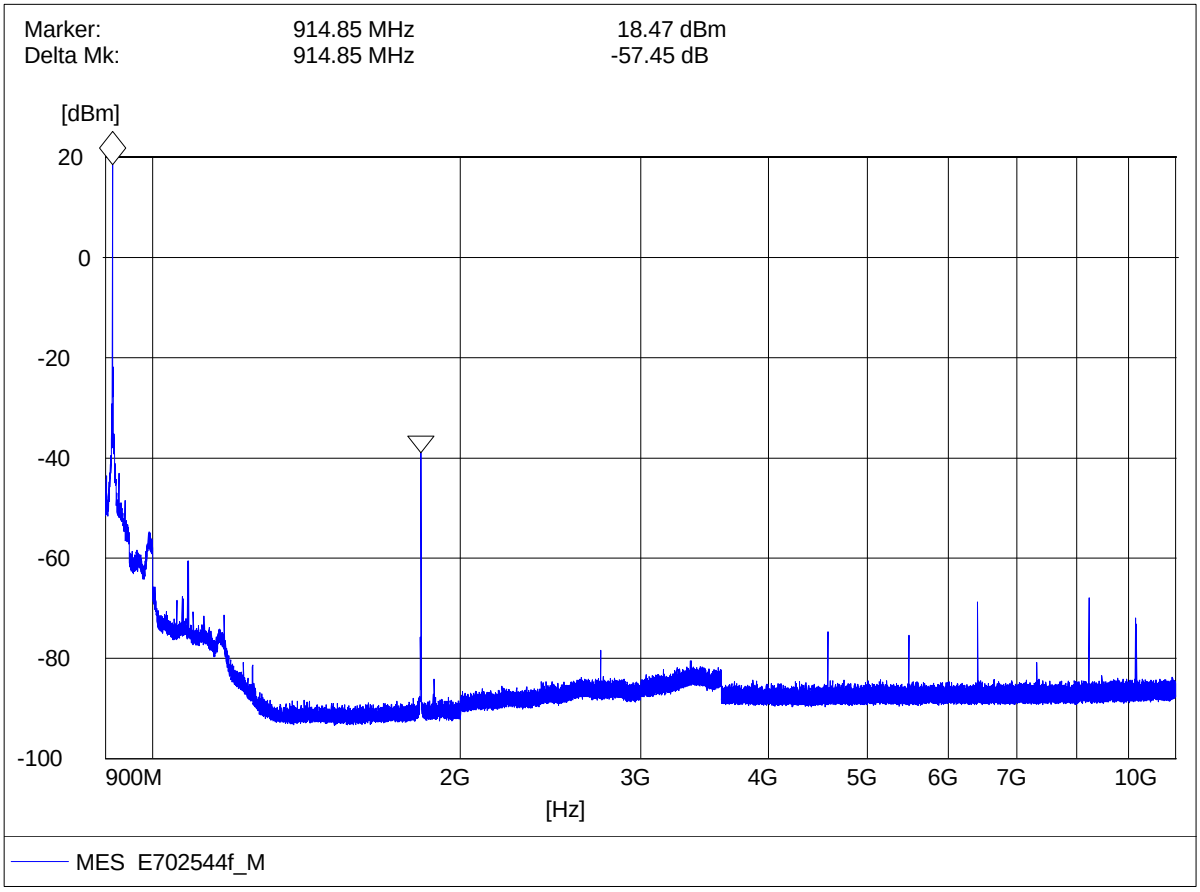


Figure 19 Conducted spurious emissions, mid channel.

SCAN TABLE: "FCC_cond_spurious"

Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
900.0 MHz	10.0 GHz	50.0 kHz	MaxPeak	10.0 ms	100 kHz	None

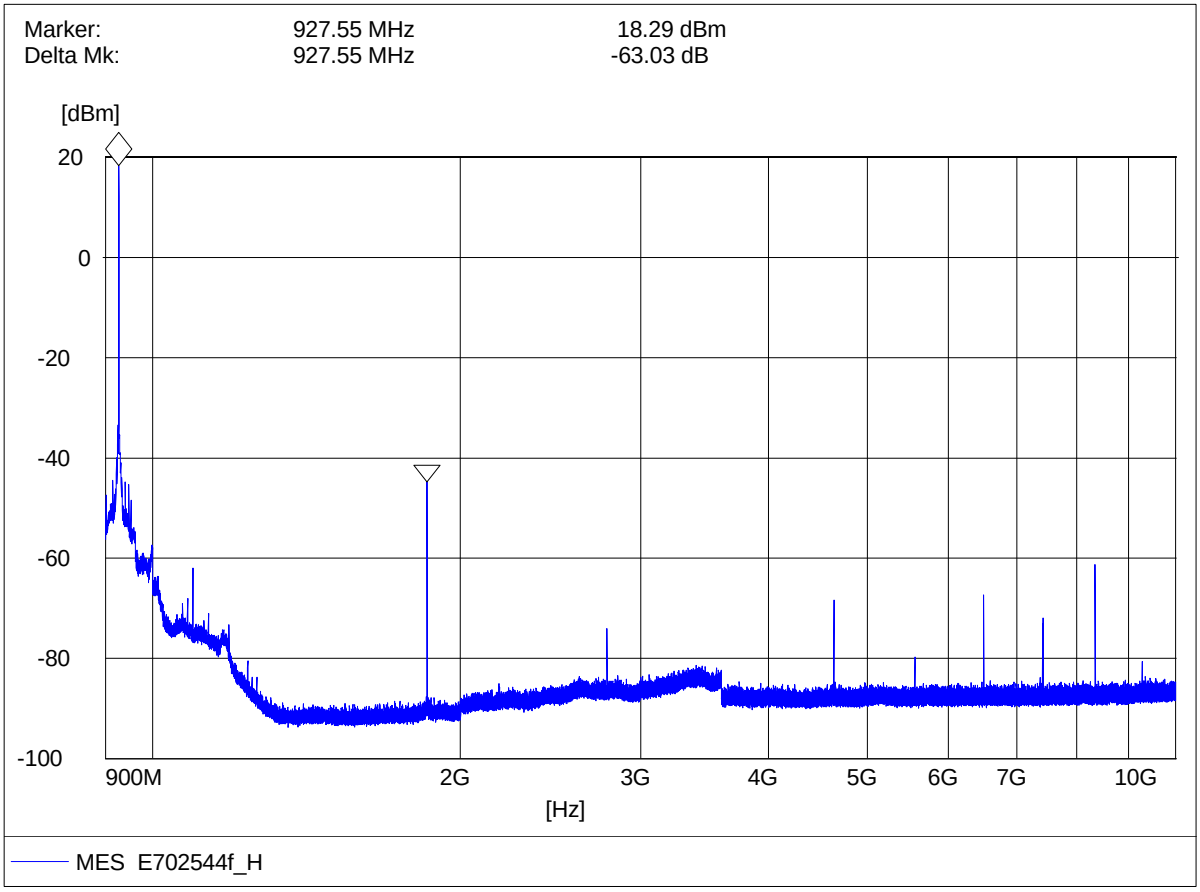


Figure 20 Conducted spurious emissions, high channel.

4.9 Measurement of average time of occupancy

Test object	DualWay	Sheet	ADJ_PWR-7
Type	DualWay	Project no.	E702544
Serial no.	1007-002	Date	08 Sep. 10
Client	Interspiro	Initials	laj
Specification	FCC Part 15, Subpart C, Section 15.247		

Test method	-	Temperature	22 °C
Characteristics	Test voltage: 6 VDC Normal condition.	Humidity	27 % RH
Test equipm.	HP Uncertainty: 1•10-7		
SA Settings	RBW: 10 kHz VBW: 30 kHz SPAN: ZERO DET: Peak CF: See below Trace: ClearWrite		

Frequency	Number of transmission/ 15 min	Dwell time/ transmission [ms]	Average time of occupancy/ 10 s [ms]	Limit [ms]	Passed	
902.54 MHz	52	385	221	400	Yes	
915.24 MHz	45	385	193	400	Yes	
927.25 MHz	43	385	183	400	Yes	

Test result	The measured average time of occupancy was within the limits
Hopping sequence	Standard hopping sequence
Compliant	Yes
Comments	Three sweeps of 300 s each was performed for low, middle and high channel. The number of transmissions on each sweep was counted. The dwell time for each channel is 385 ms and from that the average time of occupancy for a 10 s period was calculated.

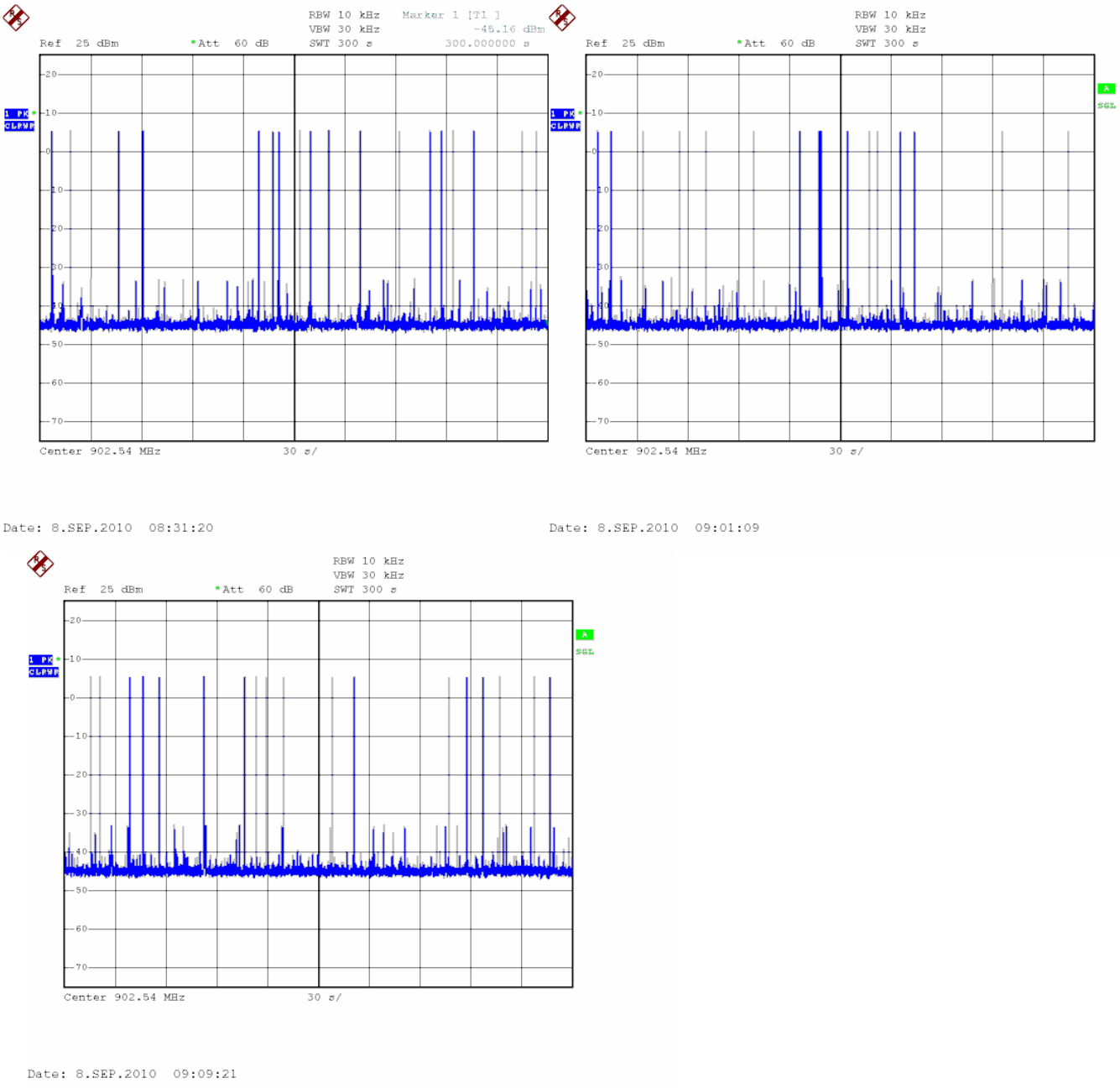


Figure 21 Average time of occupancy. The figure shows three 300 s sweeps for low channel. Here 52 transmissions occurred.

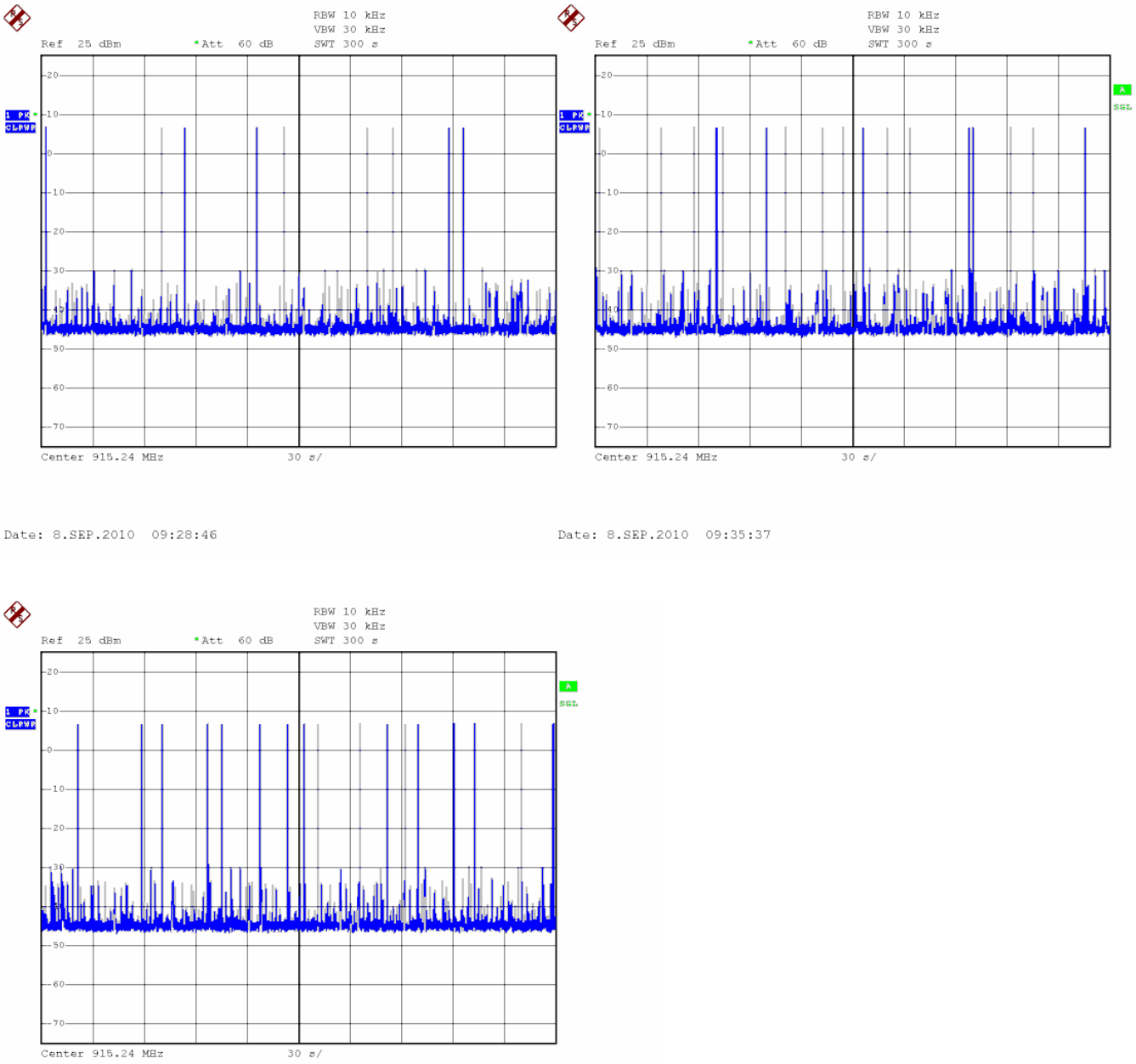


Figure 22. Average time of occupancy. The figure shows three 300 s sweeps for middle channel. Here 45 transmissions occurred.

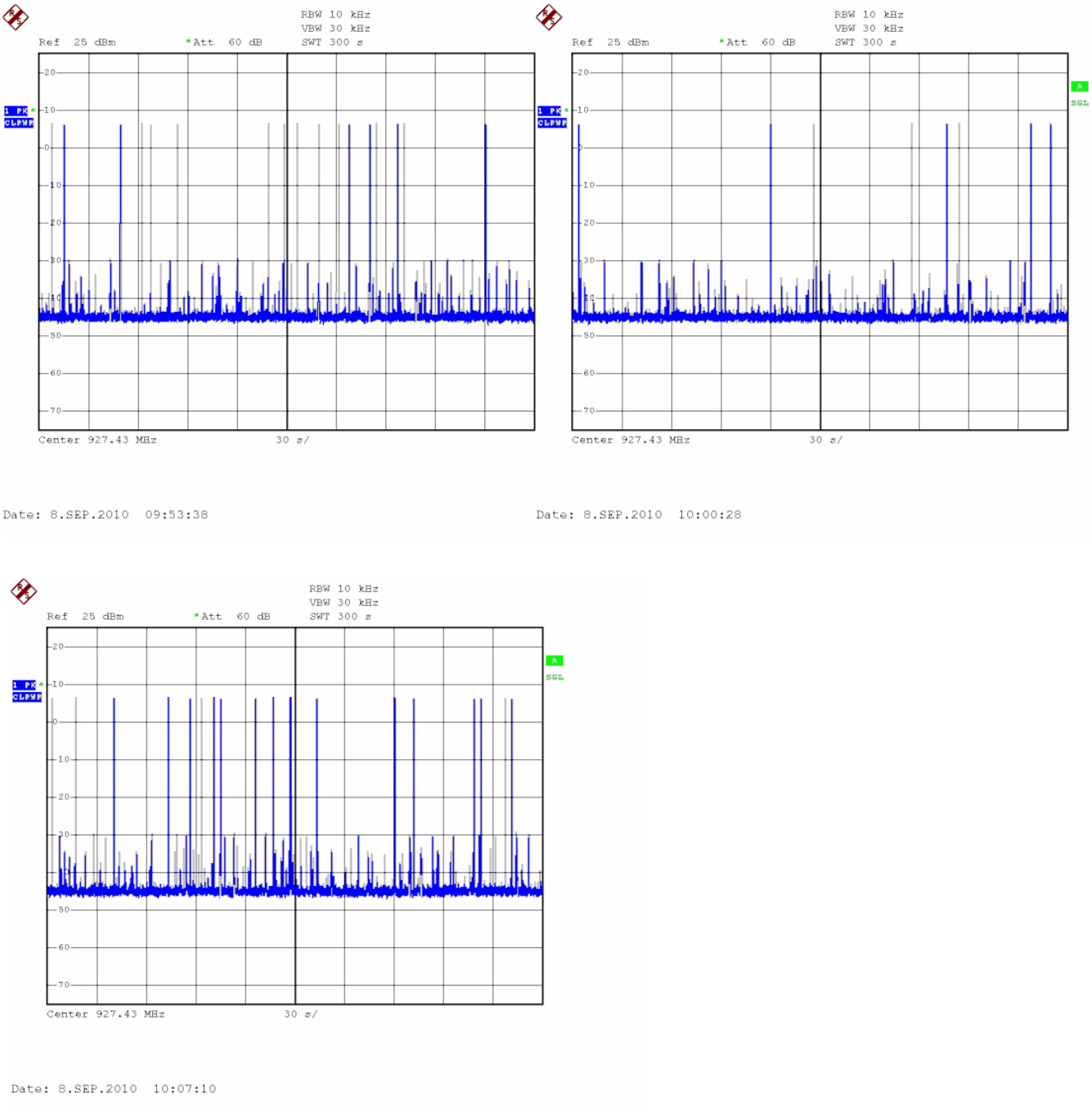


Figure 23. Average time of occupancy. The figure shows three 300 s sweeps for high channel. Here 43 transmissions occurred.

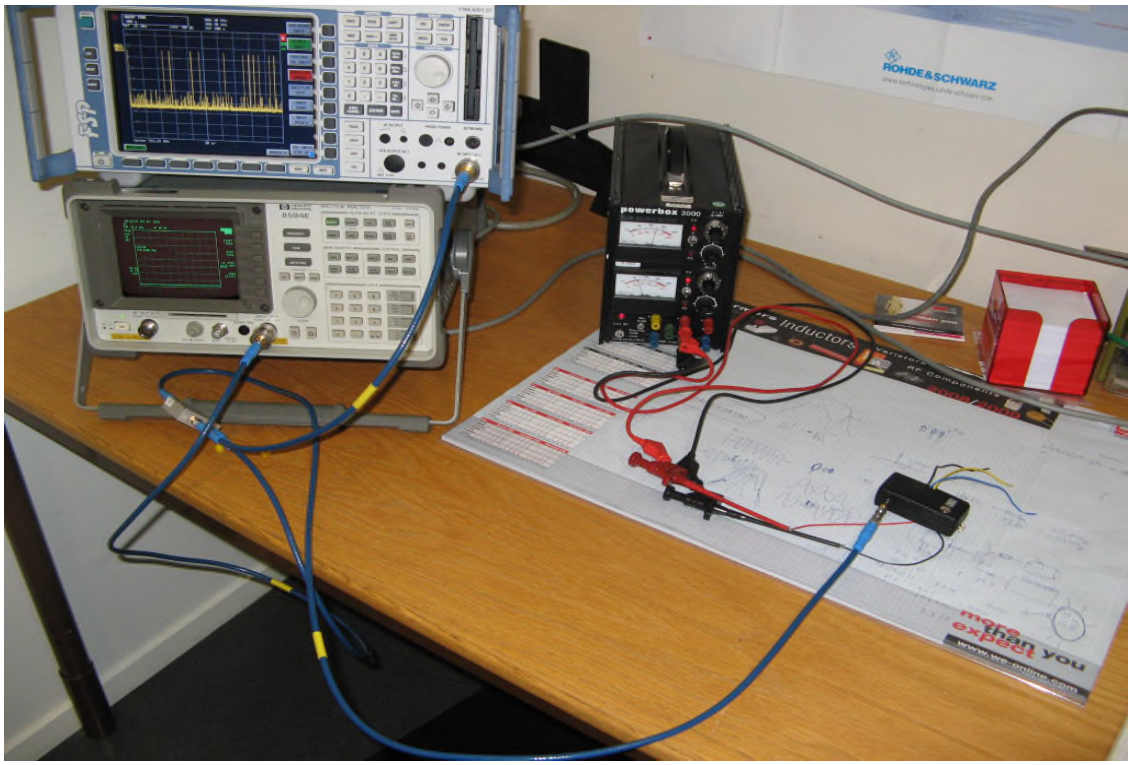


Photo 4.9.1 Test setup regarding average time of occupancy. The signal is divided to both spectrum analyzers. The bottom analyzer is set to a short sweep time to verify that each transmission is received correctly by the “counting” analyzer”

5. National registrations and accreditations

5.1 FCC Registrations

Organization: Federal Communications Commission, USA

Registration Number: 516880

Facilities: EMC chamber A 3 and 10 m

5.2 SWEDAC Accreditation

Organization: Swedish Board for Accreditation and Conformity Assessment - SWEDAC, see www.swedac.se and www.ilac.org

Registration Number: 1688

SWEDAC is part of ILAC (International Laboratory Accreditation Cooperation) including its MRA (Mutual Recognition Arrangement).

6. List of instruments

INSTRUMENT EMI SYSTEM	MANUFACTURER	TYPE	IDENT NO.
Software	Rohde & Schwarz	ES-K1 ver 1.71 SP2	36032
EMI Test receiver 20 Hz - 26.5 GHz	Rohde & Schwarz	ESU26	36020
Antenna Bilog 30-1000MHz	Chase	CBL6111A	IE-B928
Antenna Horn 1-18 GHz	ARA	DRG-118/A	E-I839
Attenuator 3 dB, up to 18 GHz	Aeroflex-INMET	18AH-3 dB	36043
Preamplifier 1 - 12.75 GHz	DELTA	UVB	36021
Power supply for preamplifiers	DELTA	UVB	36022
Spectrum analyzer 9 kHz - 2.9 GHz	Hewlett-Packard	8594E	IE-D018
GPIB Bus extender (A)	ICS	4897-B	36024
GPIB Bus extender (ESU)	ICS	4897-B	36037
GPIB Interface	Amplifier Research	CP3000	36025

7. Revision

Rev. index	Description	Date/ Init
-	New document	04 May 2010/ fth
A	Measurement of average time of occupancy added	08 Sep. 2010/LAJ