SK TECH CO., LTD.

TEST REPORT

Test Report No.:	**SKTTRT-090624-007**		
Applicant:	**VISIONEMS Co.,Ltd**		
Applicant Address:	#1104-1, 11F, Ace Techno Tower 5th, 197-22, Guro-Dong, Guro-Gu, Seoul, Korea		
Manufacturer:	**VISIONEMS Co.,Ltd**		
Manufacturer Address:	#1104-1, 11F, Ace Techno Tower 5th, 197-22, Guro-Dong, Guro-Gu, Seoul, Korea		
Device Under Test:	**Electronic Anti-lost alarm**		
FCC ID:	**XH9-URING**	**Model Name:**	**URING+**
Brand/Trade Name:	**-**		
Receipt No.:	SKTEU09-0441	**Date of receipt:**	May 14, 2009
Date of Issue:	June 24, 2009		
Location of Testing:	**SK TECH CO., LTD.** #820-2, Wolmoon-ri, Wabu-up, Namyangju-si, Kyunggi-do, 472-905 South Korea		
Test Procedure:	**ANSI C63.4:2003**		
Test Specification:	**47CFR, Part 15 Rules**		
FCC Equipment Class:	**DXX - Part 15 Low Power Communication Device Transmitter**		
Test Result:	**The above-mentioned device has been tested and passed.**		

Tested & Reported by: *Jungtae, Kim*

2009-06-24

Signature *Date*

Approved by: *Jongsoo, Yoon*

2009-06-24

Signature *Date*

Other Aspects:	**-**
Abbreviations:	**· OK, Pass = passed · Fail = failed · N/A = not applicable**

☞
- **This test report is not permitted to copy partly and entirely without our permission.**
- **This test result is dependent on only equipment to be used.**
- **This test result is based on a single evaluation of submitted samples of the above mentioned.**

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1. GENERAL

These tests were performed using the test procedure outlined in ANSI C63.4, 2003 for intentional radiators, and in accordance with the limits set forth in FCC Part 15.249 for Part 15 Low Power Communication Device Transmitter. The EUT (Equipment Under Test) has been shown to be capable of compliance with the applicable technical standards.

We attest to the accuracy of data. All measurements reported herein were performed by SK TECH CO., LTD. and were made under Chief Engineer's supervision.
We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

2. TEST SITE

SK TECH CO., LTD.

2.1 Location

#820-2, Wolmoon-ri, Wabu-up, Namyangju-si, Kyunggi-do, 472-905 South Korea
(FCC Registered Test Site Number: 90752)
(OPEN AREA TEST SITE INDUSTRY CANADA NUMBER: IC 5429)

This test site is in compliance with ISO/IEC 17025 for general requirements for the competence of testing and calibration laboratories.
This laboratory is recognized as a Conformity Assessment Body (CAB) for CAB's Designation Number: KR0007 by FCC, is accredited by NVLAP for NVLAP Lab. Code: 200220-0.

2.2 List of Test and Measurement Instruments

No.	Description	Manufacturer	Model No.	Serial No.	Calibrated until	Used
1	Spectrum Analyzer	Agilent	E4405B	US40520856	2009.07	
2	EMC Spectrum Analyzer	Agilent	E7405A	US40240203	2010.03	
3	EMI Test Receiver	Rohde&Schwarz	ESIB40	100277	2010.02	☒
4	EMI Test Receiver	Rohde&Schwarz	ESVS10	825120/008	2009.07	
5	EMI Test Receiver	Rohde&Schwarz	ESHS10	862970/019	2009.07	
6	Artificial Mains Network	Rohde&Schwarz	ESH3-Z5	836679/018	2009.07	
7	Pre-amplifier	HP	8447F	3113A05153	2009.07	☒
8	Pre-amplifier	MITEQ	AFS44	1116321	2009.10	☒
9	Pre-amplifier	MITEQ	AFS44	1116322	2009.07	
10	Power Meter	Agilent	E4417A	MY45100426	2009.07	
11	Power Meter	Agilent	E4418B	US39402176	2009.10	
12	Power Sensor	Agilent	E9327A	MY44420696	2009.07	
13	Power Sensor	Agilent	8482A	MY41094094	2009.07	
14	Attenuator (10dB)	HP	8491B	38067	2009.07	
15	High Pass Filter	Wainwright	WHKX3.0/18G	8	2009.07	☒
16	VHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	VHAP	1014 / 1015	2009.12	
17	UHF Precision Dipole Antenna (TX/RX)	Schwarzbeck	UHAP	989 / 990	2009.12	
18	Loop Antenna	Schwarzbeck	HFH2-Z2	863048/019	2009.11	
19	TRILOG Broadband Antenna	Schwarzbeck	VULB9168	9168-230	2009.07	☒
20	Horn Antenna	AH Systems	SAS-200/571	304	N/A	
21	Horn Antenna	EMCO	3115	00040723	2010.03	☒
22	Horn Antenna	EMCO	3115	00056768	2009.06	
23	Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170318	2010.08	☒
24	Vector Signal Generator	Agilent	E4438C	MY42080359	2009.07	
25	PSG analog signal generator	Agilent	E8257D-520	MY45141255	2009.07	
26	DC Power Supply	HP	6622A	3448A032223	2009.11	
27	DC Power Supply	HP	6268B	2542A-07856	2009.07	
28	PCS Interface	HP	83236B	3711J00881	2010.03	
29	CDMA Mobile Test Set	HP	8924C	US35360253	2010.03	
30	Hygro/Thermo Graph	SATO	PC-5000TRH-II	-	2009.07	☒
31	Temperature/Humidity Chamber	All Three	ATM-50M	20030425	2010.03	
32	Temperature/Humidity Chamber	DAEJIN	DJ-THC02	06071	2010.03	

2.3 Test Date

Date of Test: June 9, 2009 ~ June 16, 2009

2.4 Test Environment

See each test item's description.

3. DESCRIPTION OF THE EQUIPMENT UNDER TEST

The product specification described herein was obtained from the product data sheet or user's manual.

3.1 Rating and Physical Characteristics

Power source	DC 3.0V Lithium battery
Transmit Frequency	2412 MHz ~ 2461.8 MHz (200 kHz step)
Number of Channels	250 Channels
RF Output power	Under 1mW
Type of Modulation	GFSK
X-tal or Oscillator	X-tal: 26 MHz
Antenna Type	Integrated Chip antenna
External Ports	None

3.2 Equipment Modifications

The firmware was modified to perform the measurements. The normal product transmits RF signals every one second, but the modified product transmits RF signals about every 100 ms.

The operating frequency was set to the lowest(2412 MHz), Middle(2437 MHz), and highest(2461.8 MHz) frequency.

3.3 Submitted Documents

Block diagram

Schematic diagram

Antenna Specification

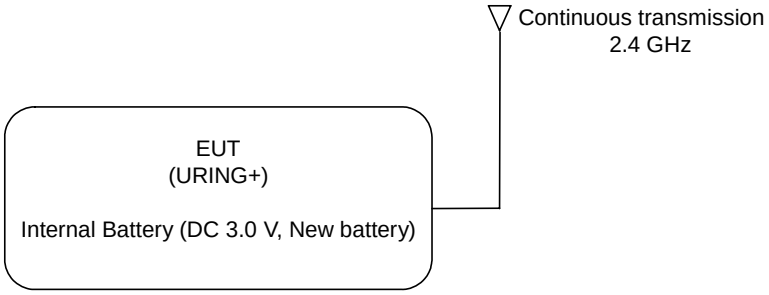
Part List

User manual

4. MEASUREMENT CONDITIONS

4.1 Description of test configuration

The EUT was tested as a stand-alone device.



[System Block Diagram of Test Configuration]

The Period of RF signals was approximately 100 ms and transmission duration was about 421 μs.

4.2 List of Peripherals

Equipment Type	Manufacturer	Model	S/N
-	-	-	-

** The EUT was tested as a stand-alone device.

4.3 Type of Used Cables

#	START		END		CABLE	
	NAME	I/O PORT	NAME	I/O PORT	LENGTH(m)	SHIELDED
-	-	-	-	-	-	-

4.4 Uncertainty

Measurement Item	Combined Standard Uncertainty *Uc*	Expanded Uncertainty *U* = *kUc* (*k* = 2)
Radiated disturbance	± 2.30 dB	± 4.60 dB
Conducted disturbance	± 1.96 dB	± 3.92 dB

5. TEST AND MEASUREMENTS

Summary of Test Results

Requirement	CFR 47 Section	Report Section	Test Result
Antenna Requirement	15.203	5.1	PASS
Radiated emissions	15.249(a)&(d), 15.209(a)	5.2	PASS
AC power line Conducted emissions	15.207(a)	-	N/A**

** The EUT is powered from DC 3.0V Lithium battery

5.1 ANTENNA REQUIREMENT

5.1.1 Regulation

According to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

5.1.2 Result: PASS

The transmitter has an integral Chip antenna, and meets the requirements.

5.2 RADIATED EMISSIONS

5.2.1 Regulation

According to §15.249(a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency (MHz)	Field strength of Fundamental (mV/m @ 3m)	Field strength of Fundamental (dBμV/m @ 3m)	Field strength of Harmonics (μV/m @ 3m)	Field strength of Harmonics (dBμV/m @ 3m)
902 – 928	50	94	500	54
2400 – 2483.5	50	94	500	54
5725 – 5875	50	94	500	54
24000 – 24250	250	108	2500	68

According to §15.249(d), emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

According to §15.209(a), for an intentional device, the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Field strength (μV/m @ 3m)	Field strength (dBμV/m @ 3m)
30–88	100	40.0
88–216	150	43.5
216–960	200	46.0
Above 960	500	54.0

** The emission limits shown in the above tables are based on measurement instrumentation employing a CISPR quasi-peak detector below 1000 MHz and an average detector above 1000 MHz. However, the peak field strength of any emission shall not exceed the average limit by more than 20 dB.

According to §15.215(c), intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

5.2.2 Test Procedure

1. The preliminary radiated measurements were performed to determine the frequency producing the maximum emissions in an anechoic chamber at a distance of 3 or 1 meter.
2. The EUT was placed on the top of the 0.8-meter height, 1 × 1.5 meter non-metallic table. To find the maximum emission levels, the height of a measuring antenna was changed and the turntable was rotated 360˚.
3. The antenna polarization was also changed from vertical to horizontal. The spectrum was scanned from 30 to 1000 MHz using the TRILOG broadband antenna, and using the horn antenna from 1000 MHz to 18000 MHz or to tenth harmonic of the highest fundamental frequency, whichever is higher.
4. To obtain the final measurement data, the EUT was arranged on a turntable situated on a 4 × 4 meter at the Open Area Test Site. The EUT was tested at a distance 3 meters.
5. Each frequency found during preliminary measurements was re-examined and investigated. The test-receiver system was set up to average, peak, and quasi-peak detector function with specified bandwidth.
6. The EUT is situated in three orthogonal planes (if appropriate)
7. The presence of ambient signals was verified by turning the EUT off. In case an ambient signal was detected, the measurement bandwidth was reduced temporarily and verification was made that an additional adjacent peak did not exist. This ensures that the ambient signal does not hide any emissions from the EUT.
8. If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

Marker-Delta Method at the edge of the authorized band of operation:

1. Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function as the above Spurious Radiated Emissions test procedure.
2. Choose a spectrum analyzer span that encompasses both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span (but never less than 30 kHz) with a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission (i.e., run several sweeps in peak hold mode). Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement; it is only a relative measurement to determine the amount by which the emission drops at the band-edge relative to the highest fundamental emission level.
3. Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance as required by Section 15.205.
4. The above "delta" measurement technique may be used for measuring emissions that are up to two "standard" bandwidths away from the band-edge, where a "standard" bandwidth is the bandwidth specified by C63.4 for the frequency being measured. For example, for band-edge measurements in the restricted band that begins at 2483.5 MHz, C63.4 specifies a measurement bandwidth of at least 1 MHz. Therefore you may use the "delta" technique for measuring emissions up to 2 MHz removed from the band-edge. Radiated emissions that are removed by more than two “standard” bandwidths must be measured as the above Spurious Radiated Emissions test procedure.

5.2.3 Test Results: PASS

Table 1: Measured values of the Field strength

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Antenna Height [m]	Turn Table [degree]	Reading [dB(μV)]	Amp Gain [dB]	ATT [dB]	AF dB(1/m)	CL [dB]	Actual [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Emissions in 15.249 (a) – Fundamental												
AVERAGE												
2412.0	1000	V	1.08	168	48.94	42.76	-	27.93	4.96	39.07	94.00	67.67
2412.0	1000	H	1.31	202	46.07	42.76	-	27.93	4.96	36.20	94.00	64.80
2437.0	1000	V	1.00	173	43.90	42.76	-	27.93	4.96	34.03	94.00	72.19
2437.0	1000	H	1.03	201	41.55	42.76	-	27.93	4.96	31.68	94.00	69.84
2461.8	1000	V	1.00	186	43.72	42.80	-	28.26	5.79	34.40	94.00	71.26
2461.8	1000	H	1.03	200	41.38	42.80	-	28.26	5.79	32.06	94.00	68.92
PEAK												
2412.0	1000	V	1.08	168	91.29	42.76	-	27.93	4.96	81.42	114.00	45.64
2412.0	1000	H	1.31	202	88.10	42.76	-	27.93	4.96	78.23	114.00	42.45
2437.0	1000	V	1.00	173	87.10	42.76	-	27.93	4.96	77.23	114.00	51.26
2437.0	1000	H	1.03	201	82.48	42.76	-	27.93	4.96	72.61	114.00	46.64
2461.8	1000	V	1.00	186	87.31	42.80	-	28.26	5.22	77.99	114.00	49.84
2461.8	1000	H	1.03	200	82.80	42.80	-	28.26	5.22	73.48	114.00	45.33
Emissions in 15.249 (a) – Harmonics												
AVEAGE												
4824.0	1000	V	1.48	126	41.17	43.90	0.69	33.20	7.04	37.51	54.00	20.10
4824.0	1000	H	1.62	82	41.22	43.90	0.69	33.20	7.04	37.56	54.00	20.15
4874.0	1000	V	1.25	119	40.63	43.95	0.69	33.31	7.16	37.15	54.00	20.25
4874.0	1000	H	1.60	83	40.71	43.95	0.69	33.31	7.16	37.23	54.00	20.33
4923.6	1000	V	1.52	131	40.92	43.95	0.69	33.31	7.16	37.44	54.00	20.13
4923.6	1000	H	1.46	96	40.83	43.95	0.69	33.31	7.16	37.35	54.00	20.04
PEAK												
4824.0	1000	V	1.48	126	64.94	43.90	0.69	33.20	7.04	61.28	74.00	16.04
4824.0	1000	H	1.62	82	65.28	43.90	0.69	33.20	7.04	61.62	74.00	16.38
4874.0	1000	V	1.25	119	64.05	43.95	0.69	33.31	7.16	60.57	74.00	16.13
4874.0	1000	H	1.60	83	64.83	43.95	0.69	33.31	7.16	61.35	74.00	16.91
4923.6	1000	V	1.52	131	65.39	43.95	0.69	33.31	7.16	61.91	74.00	16.49
4923.6	1000	H	1.46	96	64.47	43.95	0.69	33.31	7.16	60.99	74.00	15.57
Emissions in 15.249 (d) and 15.209 (a) – Spurious												
QAUSI-PEAK												
260.1	120	V	1.03	169	39.74	26.48	-	11.64	1.88	32.29	46.00	19.22
260.1	120	H	1.07	251	45.25	26.48	-	11.64	1.88	26.78	46.00	13.71

Table 1: Measured values of the Field strength (Continued)

Frequency [MHz]	Receiver Bandwidth [kHz]	Pol. [V/H]	Antenna Height [m]	Turn Table [degree]	Reading [dB(μV)]	Amp Gain [dB]	ATT [dB]	AF dB(1/m)	CL [dB]	Actual [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
Emissions in 15.249 (d) and 15.209 (a) – Spurious												
AVERAGE												
2399.4	1000	V	1.08	168	36.66	42.76	-	27.93	4.96	26.79	54.00	27.21
2399.8	1000	H	1.31	202	36.59	42.76	-	27.93	4.96	26.72	54.00	27.28
2489.4	1000	V	1.08	168	36.56	42.80	-	28.26	5.22	27.24	54.00	26.76
2489.4	1000	H	1.31	202	36.56	42.80	-	28.26	5.22	27.24	54.00	26.76
2397.0	1000	V	1.00	173	36.51	42.76	-	27.93	4.96	26.64	54.00	27.36
2388.2	1000	H	1.03	201	36.47	42.76	-	27.93	4.96	26.60	54.00	27.40
2492.2	1000	V	1.00	173	36.36	42.80	-	28.26	5.22	27.04	54.00	26.96
2489.0	1000	H	1.03	201	36.49	42.80	-	28.26	5.22	27.17	54.00	26.83
2399.0	1000	V	1.00	186	36.52	42.76	-	27.93	4.96	26.65	54.00	27.35
2397.8	1000	H	1.03	200	36.52	42.76	-	27.93	4.96	26.65	54.00	27.35
2495.4	1000	V	1.00	186	36.38	42.80	-	28.26	5.22	27.06	54.00	26.94
2486.6	1000	H	1.03	200	36.20	42.80	-	28.26	5.22	26.88	54.00	27.12
PEAK												
2399.4	1000	V	1.08	168	54.26	42.76	-	27.93	4.96	44.39	74.00	29.61
2399.8	1000	H	1.31	202	52.23	42.76	-	27.93	4.96	42.36	74.00	31.64
2489.4	1000	V	1.08	168	49.61	42.80	-	28.26	5.22	40.29	74.00	33.71
2489.4	1000	H	1.31	202	49.98	42.80	-	28.26	5.22	40.66	74.00	33.34
2397.0	1000	V	1.00	173	49.89	42.76	-	27.93	4.96	40.02	74.00	33.98
2388.2	1000	H	1.03	201	51.19	42.76	-	27.93	4.96	41.32	74.00	32.68
2492.2	1000	V	1.00	173	50.23	42.80	-	28.26	5.22	40.91	74.00	33.09
2489.0	1000	H	1.03	201	50.09	42.80	-	28.26	5.22	40.77	74.00	33.23
2399.0	1000	V	1.00	186	50.62	42.76	-	27.93	4.96	40.75	74.00	33.25
2397.8	1000	H	1.03	200	50.51	42.76	-	27.93	4.96	40.64	74.00	33.36
2495.4	1000	V	1.00	186	50.48	42.80	-	28.26	5.22	41.16	74.00	32.84
2486.6	1000	H	1.03	200	50.57	42.80	-	28.26	5.22	41.25	74.00	32.75

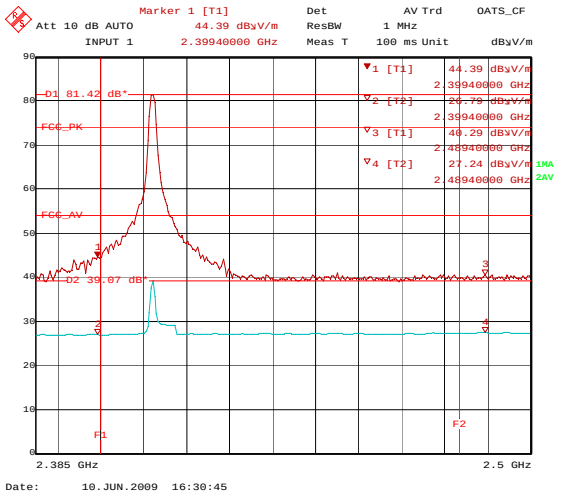
Margin (dB) = Limit – Actual

[Actual = Reading – Amp Gain + ATT + AF + CL]

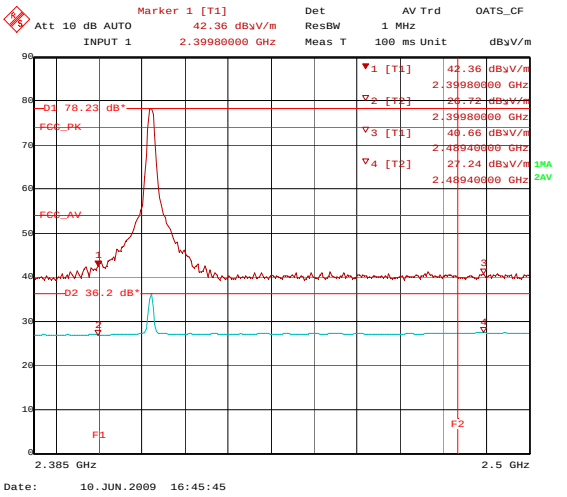
1. H = Horizontal, V = Vertical Polarization
2. ATT = Attenuation (10dB pad and/or Insertion Loss of HPF)
3. AF = Antenna Factor, CL = Cable Loss

Figure 1. Plot of the Band Edge(corrected to the field strength)

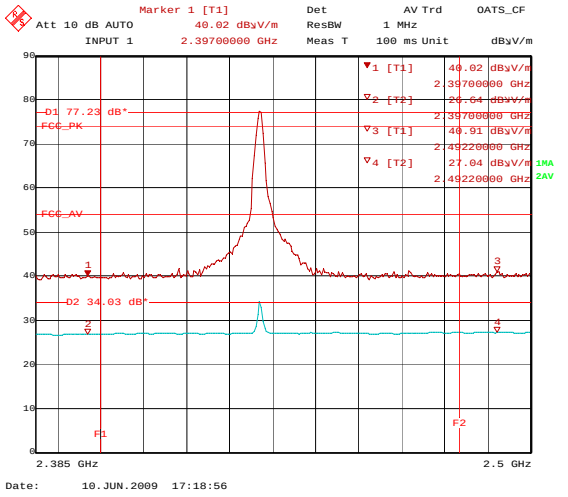
Lowest Channel (operating at 2412 MHz): Vertical
PEAK, AVERAGE



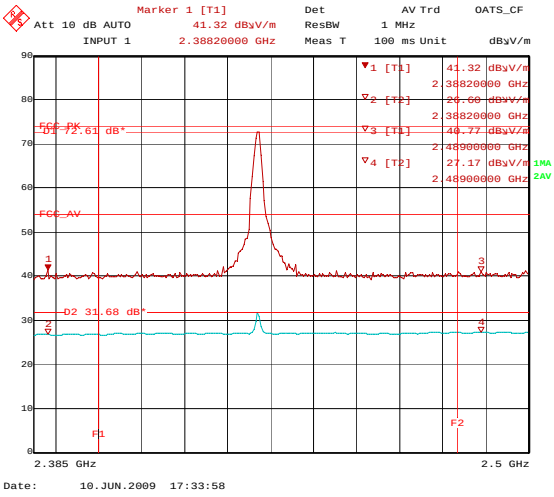
Lowest Channel (operating at 2412 MHz): Horizontal
PEAK, AVERAGE



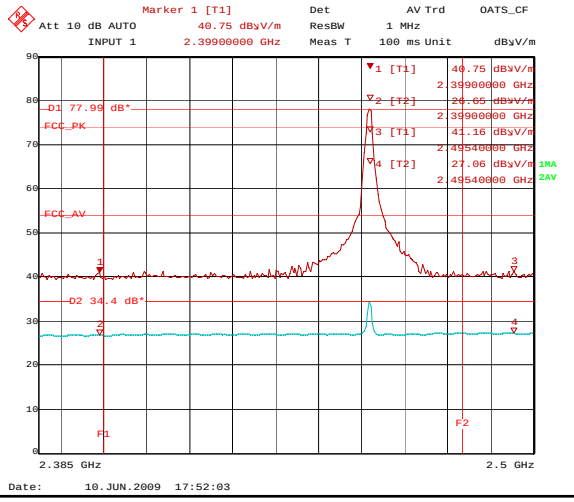
Middle Channel (operating at 2437 MHz): Vertical
PEAK, AVERAGE



Middle Channel (operating at 2437 MHz): Horizontal
PEAK, AVERAGE



Highest Channel (operating at 2461.8 MHz): Vertical
PEAK, AVERAGE



Highest Channel (operating at 2461.8 MHz): Horizontal
PEAK, AVERAGE

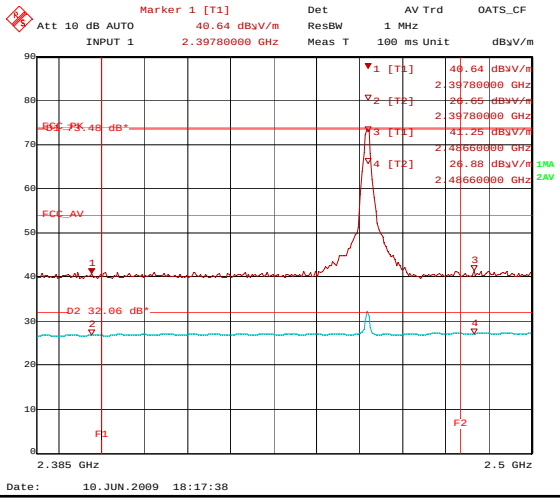
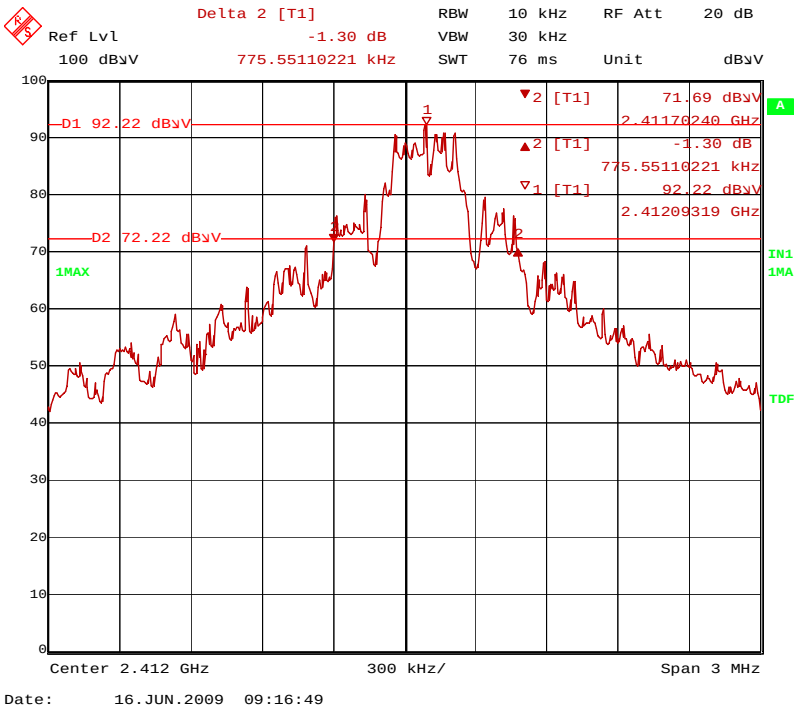


Figure 2. Plot of the 20dB bandwidth(Conducted measurement method)

Lowest Channel (operating at 2412 MHz)



Highest Channel (operating at 2461.8 MHz)

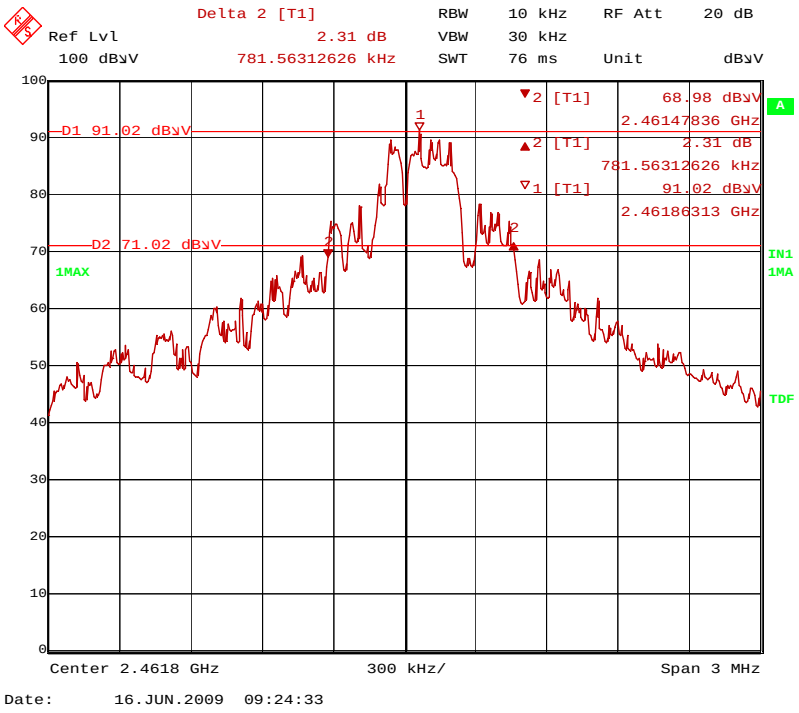
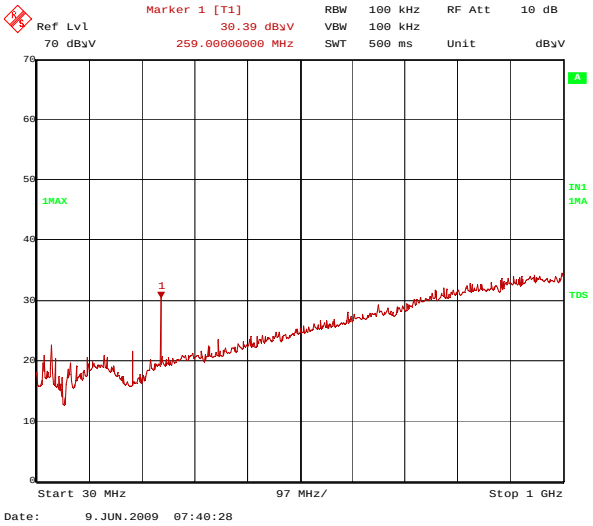
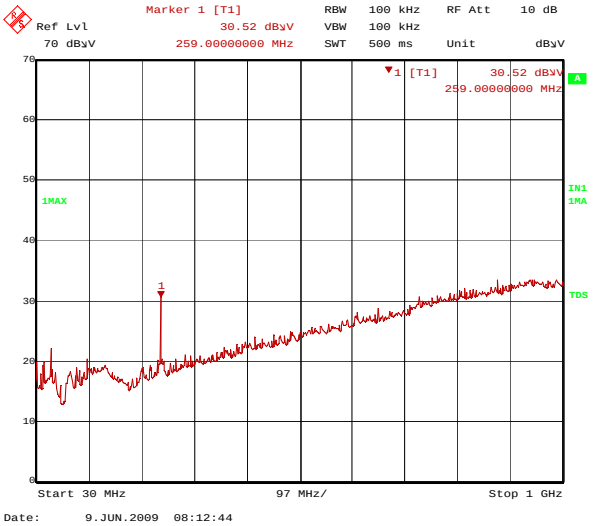


Figure 3. Emission plot for the preliminary radiated measurements

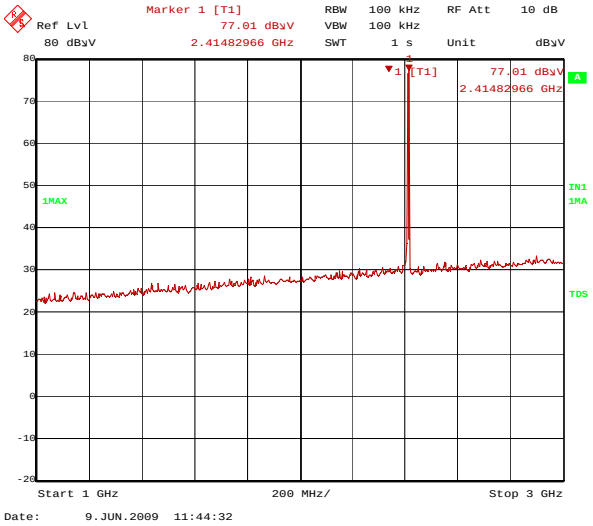
Operating at 2412 MHz: 30 MHz ~ 1 GHz (@ 3-m distance)



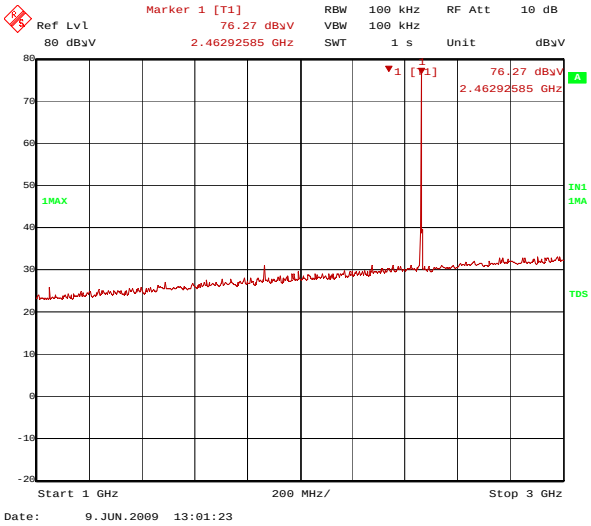
Operating at 2461.8 MHz: 30 MHz ~ 1 GHz (@ 3-m distance)



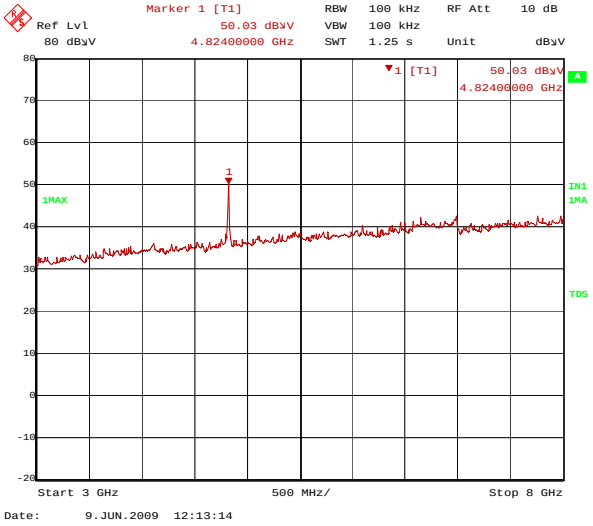
Operating at 2412 MHz: 1 GHz ~ 3 GHz (@ 3-m distance)



Operating at 2461.8 MHz: 1 GHz ~ 3 GHz (@ 3-m distance)



Operating at 2412 MHz: 3 GHz ~ 8 GHz (@ 3-m distance)



Operating at 2461.8 MHz: 3 GHz ~ 8 GHz (@ 3-m distance)

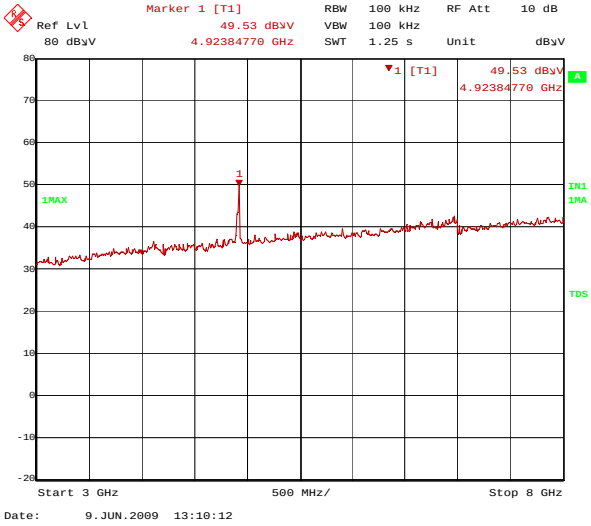
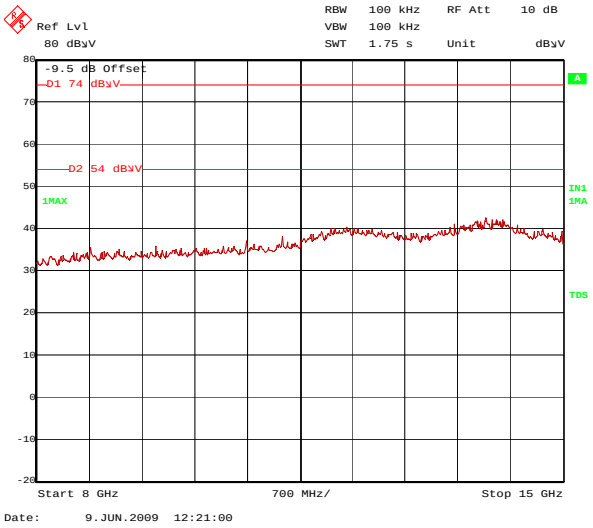
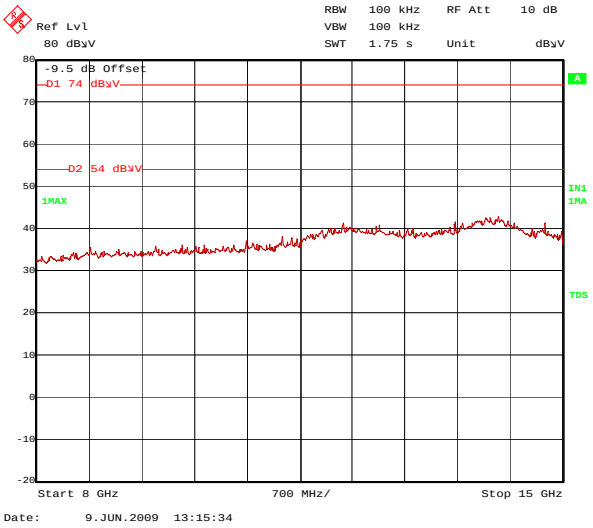


Figure 3. Emission plot for the preliminary radiated measurements (continued)

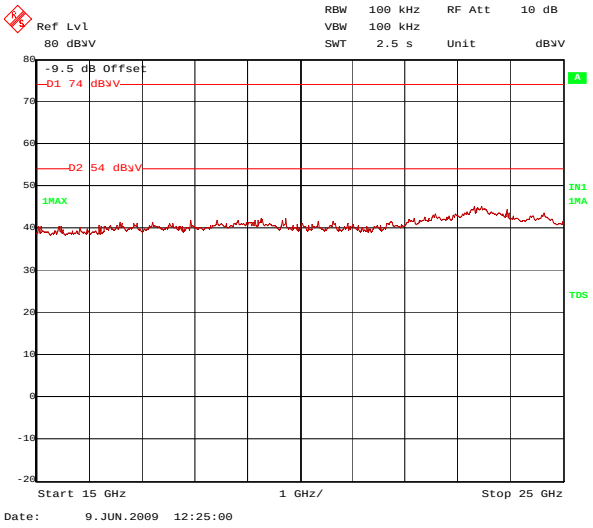
Operating at 2412 MHz: 8 GHz ~ 15 GHz (@ 1-m distance)



Operating at 2461.8 MHz: 8 GHz ~ 15 GHz (@ 1-m distance)



Operating at 2412 MHz: 15 GHz ~ 25 GHz (@ 1-m distance)



Operating at 2461.8 MHz: 15 GHz ~ 25 GHz (@ 1-m distance)

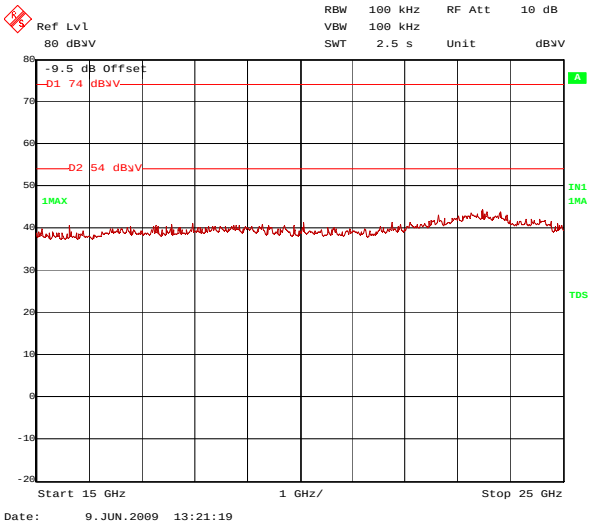
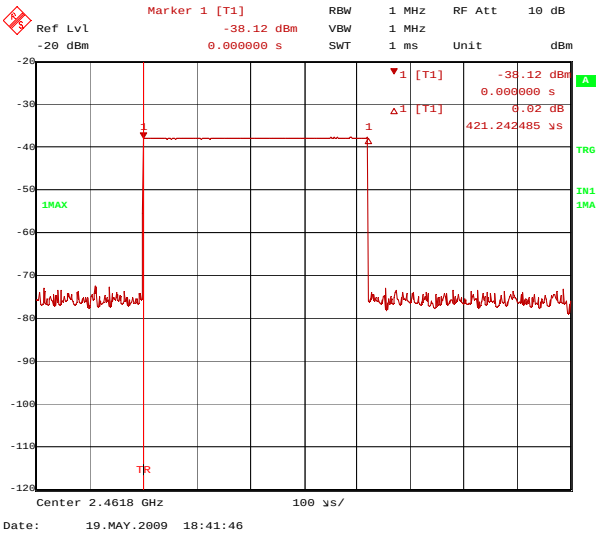
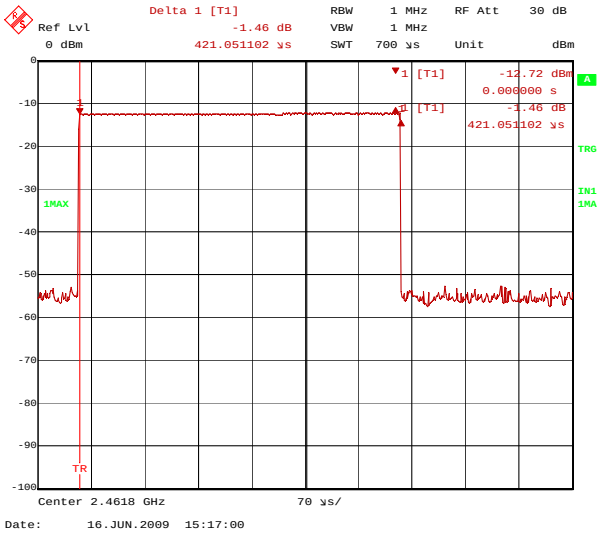


Figure 4. Duty Cycle

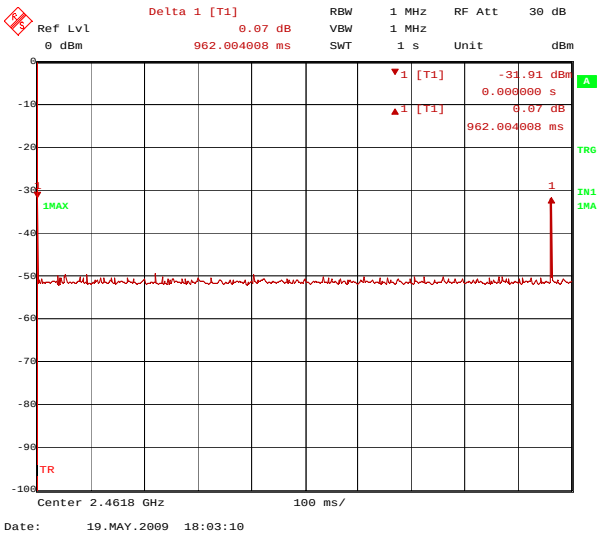
Duration of the normal signals



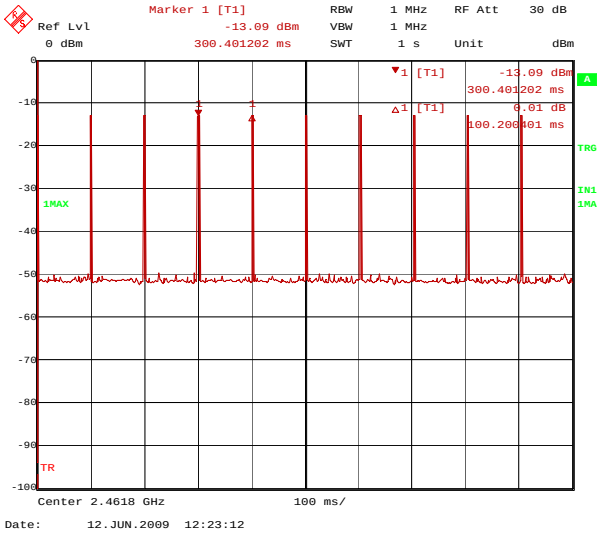
Test mode Operating(modified firmware)



Period of the normal signals



Test mode Operating(modified firmware)



Note : the power output levels were not corrected for the measurements of Duty cycle.