EMC
TEST REPORT

Report No. : TS11090150-EME
Model No. : CS004
Issued Date : Oct. 19, 2011

Applicant:	**ALATECH Technology Limited Co.** **39F., No.758, Jungming S.RD. Taichung, Taiwan**
Test Method/ Standard:	**47 CFR FCC Part 15.249 & ANSI C63.4 2003**
Test By:	**Intertek Testing Services Taiwan Ltd.** **No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,** **Shiang-Shan District, Hsinchu City, Taiwan**

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Table of Contents

Summary of Tests

Test	Reference	Results
Radiated Emission test	15.249(a), (c), (d), 15.209	Pass
Emission on the Band Edge	15.209	Pass
Conducted Emission of AC Power	15.207	N/A (DC Source)
Calculation of Average Factor	15.35	Pass
20dB Bandwidth	15.215(c)	Pass

1. General information

1.1 Identification of the EUT

Product:	Heart rate monitor
Model No.:	CS004
FCC ID.:	YQOCS004
Frequency Range:	2401 MHz, 2450 MHz, 2480 MHz
Channel Number:	3 channels
Frequency of Each Channel:	2401 MHz, 2450 MHz, 2480 MHz
Type of Modulation:	GFSK
Rated Power:	DC 3 V from battery
Power Cord:	N/A
Data Cable:	N/A
Sample Received:	Sep. 28, 2011
Test Date(s):	Sep. 29, 2011 ~ Oct. 13, 2011
Note 1:	This report is for the exclusive use of Intertek's Client and is provided pursuant to the agreement between Intertek and its Client. Intertek's responsibility and liability are limited to the terms and conditions of the agreement. Intertek assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the Intertek name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by Intertek. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an Intertek certification program.
Note 2:	When determining the test conclusion, the Measurement Uncertainty of test has been considered.

1.2 Additional information about the EUT

The EUT is a Heart rate monitor, and was defined as information technology equipment.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Gain:	0 dBi max
Antenna Type:	PCB antenna
Connector Type:	N/A

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Paragraph 15.249 for non-spread spectrum devices.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band was all meet limit requirement, thus we evaluate the EUT pass the specified test.

2.2 Operation mode

The EUT was supplied with 3 Vdc from battery.

The EUT was operated under Tx and Rx mode during all the test.

For the signal from Heart rate monitor is maximized through rotation and placement in the three orthogonal axes.

X axis

Y axis

Z axis

After verifying three axes, we found the maximum electromagnetic field was occurred at X axis. The final test data was executed under this configuration.

The EUT configuration please refer to the “Spurious set-up photo.pdf”.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Last Cal.	Cal. interval
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	2010/9/3	1 year
EMI Test Receiver	Rohde & Schwarz	9kHz~3GHz	ESCI	2009/12/8	1 year
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	2010/8/16	1 year
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	2010/1/18	1 year
Horn Antenna	SCHWARZBECK	1GHz~18GHz	BBHA9120D	2010/8/31	2 years
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9168	2009/9/22	2 years
Turn Table	HDGmbH	N/A	DS 420S	N/A	N/A
Antenna Tower	HDGmbH	N/A	MA 240	N/A	N/A
Pre-Amplifier	MITER	100MHz~26.5GHz	AFS42-00102650	2009/10/27	2 years
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	2009/3/13	2 years
Power Meter	Anritsu	N/A	2495A	2010/10/20	1 year
Power Senor	Anritsu	N/A	2411B	2010/10/20	1 year

Note: The above equipments are within the valid calibration period.

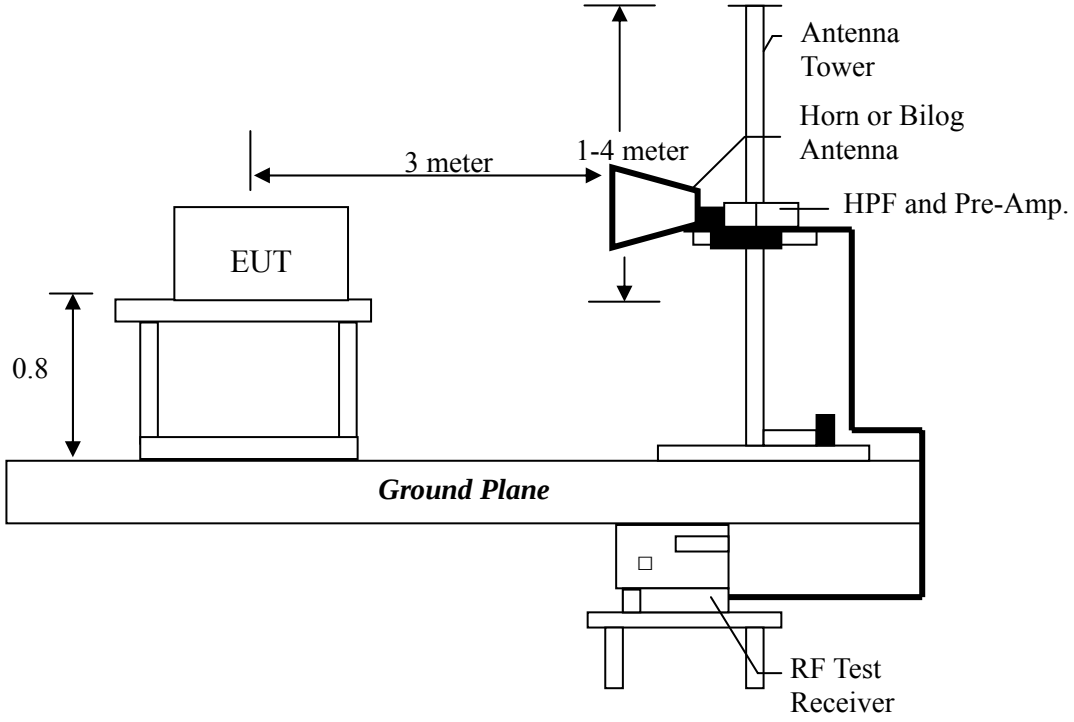
3. Radiated emission test

3.1 Operating environment

Temperature:	22	℃
Relative Humidity:	56	%
Atmospheric Pressure	1008	hPa

3.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



The signal is maximized through rotation and placement in the three orthogonal axes.

Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

The EUT configuration please refer to the "Spurious set-up photo.pdf".

3.3 Emission limit

3.3.1 Fundamental and harmonics emission limits

Frequency (MHz)	Field Strength of Fundamental		Field Strength of Harmonics	
	(mV/m@3m)	(dBuV/m@3m)	(uV/m@3m)	(dBuV/m@3m)
2400-2483.5	50	94	500	54

3.3.2 General radiated emission limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

Frequency MHz	15.209 Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Measurement uncertainty was calculated in accordance with TR 100 028-1.

Parameter	Uncertainty
Radiated Emission	± 5.10 dB
Conducted Emission	± 2.786 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level using a coverage factor of k=2.

3.4 Radiated spurious emission test data

3.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under continuously transmitting mode. Low, middle and high channels were verified. The worst case occurred Tx at high channel.

EUT : CS004
Worst Case : Tx at high channel

Polarization (circle)	Frequency (MHz)	Detector	Corr. Factor (dB/m)	Reading (dBuV)	Calculated dBuV/m	Limit (dBuV/m)	Margin (dB)
Vertical	47.46	QP	12.84	8.86	21.70	40.00	-18.30
Vertical	154.16	QP	15.83	5.29	21.12	43.50	-22.38
Vertical	437.40	QP	17.64	8.98	26.62	46.00	-19.38
Vertical	569.32	QP	19.53	10.50	30.03	46.00	-15.97
Vertical	756.53	QP	22.81	9.21	32.02	46.00	-13.98
Vertical	859.35	QP	23.70	10.12	33.82	46.00	-12.18
Horizontal	44.55	QP	14.20	8.62	22.82	40.00	-17.18
Horizontal	156.10	QP	13.60	7.67	21.27	43.50	-22.23
Horizontal	359.80	QP	15.48	8.90	24.37	46.00	-21.63
Horizontal	482.99	QP	18.64	9.40	28.04	46.00	-17.96
Horizontal	839.95	QP	24.04	9.27	33.30	46.00	-12.70
Horizontal	973.81	QP	25.54	11.16	36.70	54.00	-17.30

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

3.4.2 Measurement results: frequency above 1GHz

EUT : CS004
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4802.00	PK	V	35.1	38.54	41.02	-	44.46	74	-29.54
4802.00	AV	V	35.1	38.54	41.02	-58.998	-14.54	54	-68.54
7203.00	PK	V	33	44.6	44.51	-	56.11	74	-17.89
7203.00	AV	V	33	44.6	44.51	-58.998	-2.89	54	-56.89
4802.00	PK	H	35.1	38.54	39.51	-	42.95	74	-31.05
4802.00	AV	H	35.1	38.54	39.51	-58.998	-16.05	54	-70.05
7203.00	PK	H	33	44.6	42.48	-	54.08	74	-19.92
7203.00	AV	H	33	44.6	42.48	-58.998	-4.92	54	-58.92

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. According to 15.31 (o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported.
4. Average value = peak value + average factor

EUT : CS004
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4900.00	PK	V	35.1	38.54	40.9	-	44.34	74	-29.66
4900.00	AV	V	35.1	38.54	40.9	-58.998	-14.66	54	-68.66
7350.00	PK	V	33	44.6	46.18	-	57.78	74	-16.22
7350.00	AV	V	33	44.6	46.18	-58.998	-1.22	54	-55.22
4900.00	PK	H	35.1	38.54	39.56	-	43.00	74	-31.00
4900.00	AV	H	35.1	38.54	39.56	-58.998	-16.00	54	-70.00
7350.00	PK	H	33	44.6	42.26	-	53.86	74	-20.14
7350.00	AV	H	33	44.6	42.26	-58.998	-5.14	54	-59.14

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. According to 15.31 (o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported.
4. Average value = peak value + average factor

EUT : CS004
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Preamp. Gain (dB)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
4960.00	PK	V	35.1	38.54	46.87	-	50.31	74	-23.69
4960.00	AV	V	35.1	38.54	46.87	-58.998	-8.69	54	-62.69
7440.00	PK	V	33	44.6	45.08	-	56.68	74	-17.32
7440.00	AV	V	33	44.6	45.08	-58.998	-2.32	54	-56.32
4960.00	PK	H	35.1	38.54	39.81	-	43.25	74	-30.75
4960.00	AV	H	35.1	38.54	39.81	-58.998	-15.75	54	-69.75
7440.00	PK	H	33	44.6	39.66	-	51.26	74	-22.74
7440.00	AV	H	33	44.6	39.66	-58.998	-7.74	54	-61.74

Remark:

1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor – Preamp. Gain
3. The frequency measured ranges from 1 GHz to 25 GHz. According to 15.31 (o), the amplitude of spurious emissions from intentional radiators and emissions from unintentional radiators which are attenuated more than 20 dB below the permissible value need not be reported.
4. Average value = peak value + average factor

3.4.3 Measurement results: Fundamental emission

EUT : CS004
Test Condition : Tx at low channel

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2401.00	PK	H	32.81	64.78	-	97.59	113.9794	-16.39
2401.00	AV	H	32.81	64.78	-58.998	38.59	93.9794	-55.39

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. Average value = peak value + average factor

EUT : CS004
Test Condition : Tx at middle channel

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2450.00	PK	H	33	60.74	-	93.74	113.9794	-20.24
2450.00	AV	H	33	60.74	-58.998	34.74	93.9794	-59.24

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. Average value = peak value + average factor

EUT : CS004
Test Condition : Tx at high channel

Frequency (MHz)	Spectrum Analyzer Detector	Ant. Pol. (H/V)	Correction Factor (dB/m)	Reading (dBuV)	Average Factor (dB)	Corrected Reading (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2480.00	PK	H	33.12	59.89	-	93.01	113.9794	-20.97
2480.00	AV	H	33.12	59.89	-58.998	34.01	93.9794	-59.97

Remark:
1. Correction Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Correction Factor
3. Average value = peak value + average factor

4. Radiated emission on the band edge FCC 15.209

Method of Measurement:

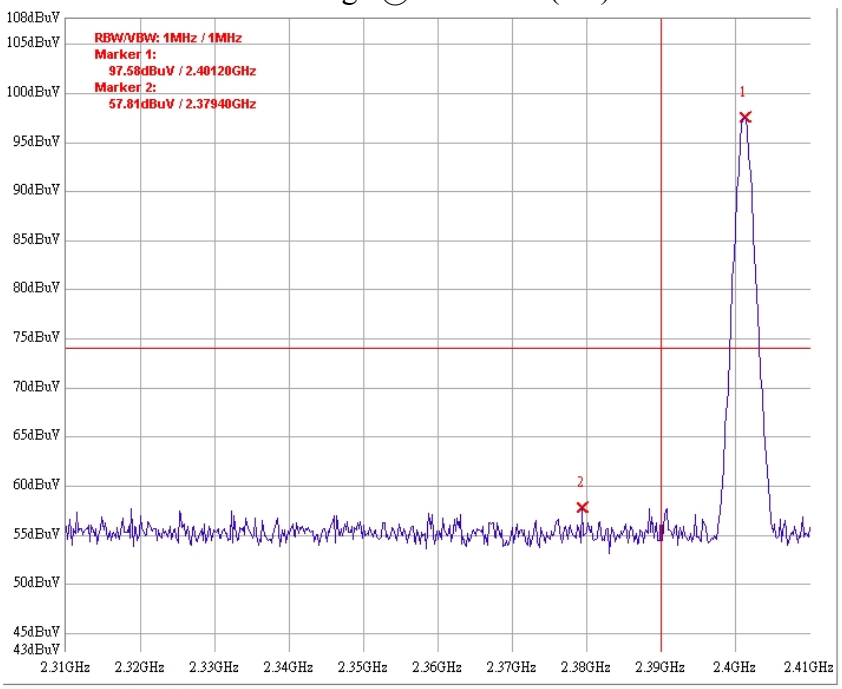
The frequency range from 30 MHz to 1000 MHz using Bilog Antenna.
The frequency range over 1 GHz using Horn Antenna.

Radiated emissions were invested cover the frequency range from 30 MHz to 1000 MHz using a receiver RBW of 120 kHz record QP reading, and the frequency over 1 GHz using a spectrum analyzer RBW of 1 MHz and 10 Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1 MHz RBW/VBW) recorded also on the report.

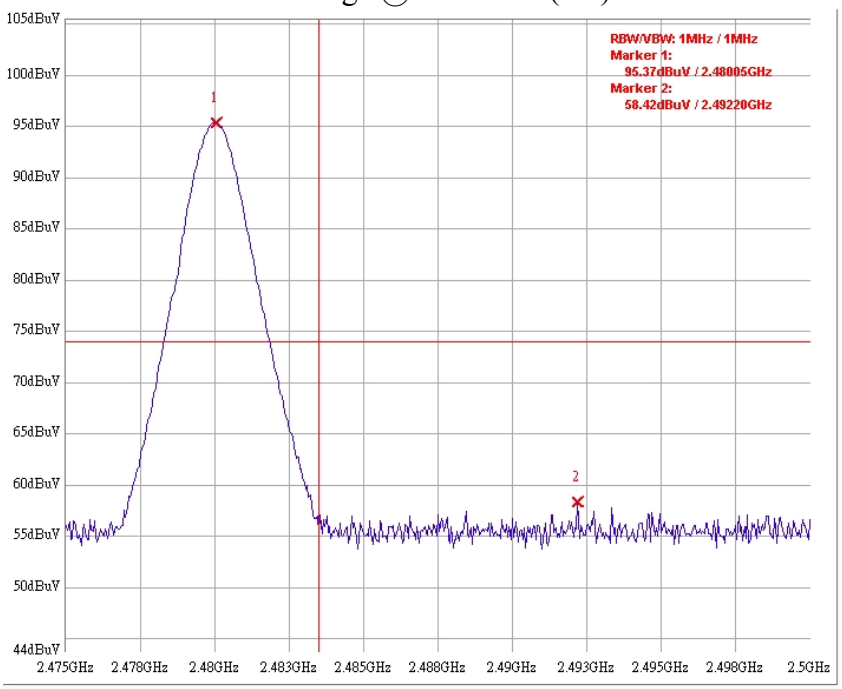
Channel	Measurement Freq.Band (MHz)	Detector	Average Factor (dB)	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
1 (lowest)	2310-2390	PK	-	57.81	74	-16.19
1 (lowest)	2310-2390	AV	-58.998	-1.188	54	-55.188
3 (highest)	2483.5-2500	PK	-	58.42	74	-15.58
3 (highest)	2483.5-2500	AV	-58.998	-0.578	54	-54.578

Please see the plots below.

Band Edge @ channel 1 (PK)



Band Edge @ channel 3 (PK)



5. Calculation of Average Factor

The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector. During testing, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The time period over which the duty cycle is measured in 100 ms or the repetition cycle, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer in zero span mode.

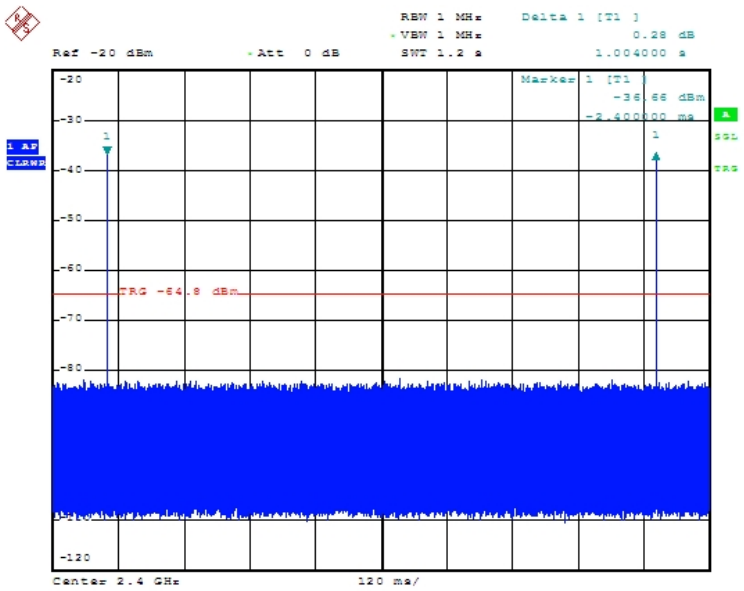
The duty cycles of handset and base unit are exactly the same.

Duty cycle correction factor in dB = 20 log (on-time/100ms) or 20 log (on-time/period) #If period is less than 100ms

Therefore, duty cycle correction factor = 20 log 10 (0.112/100) = -58.998 dB

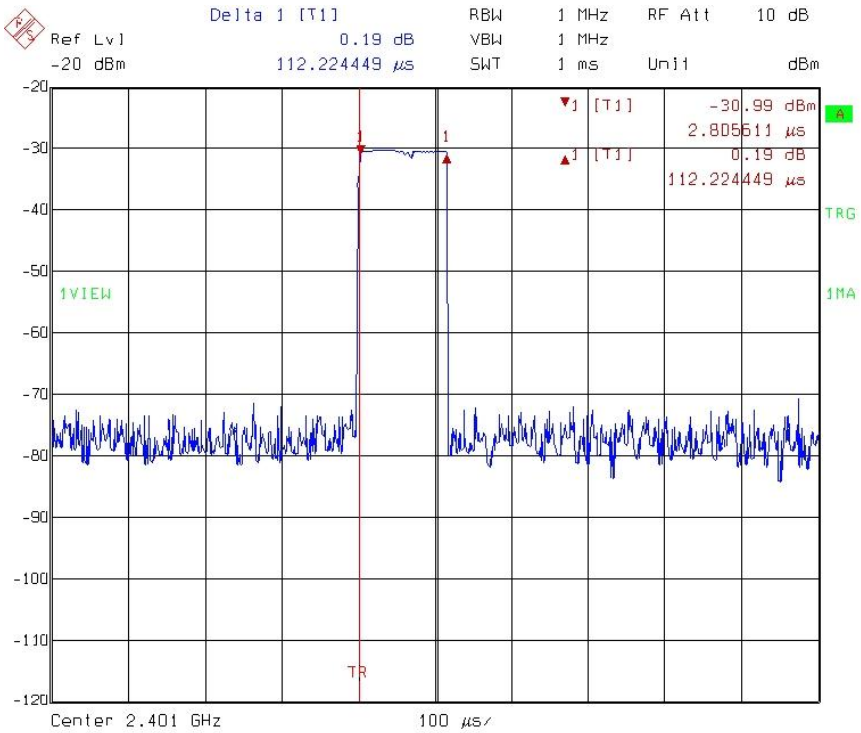
Please see the plot below.

Duty Cycle at low channel: the period

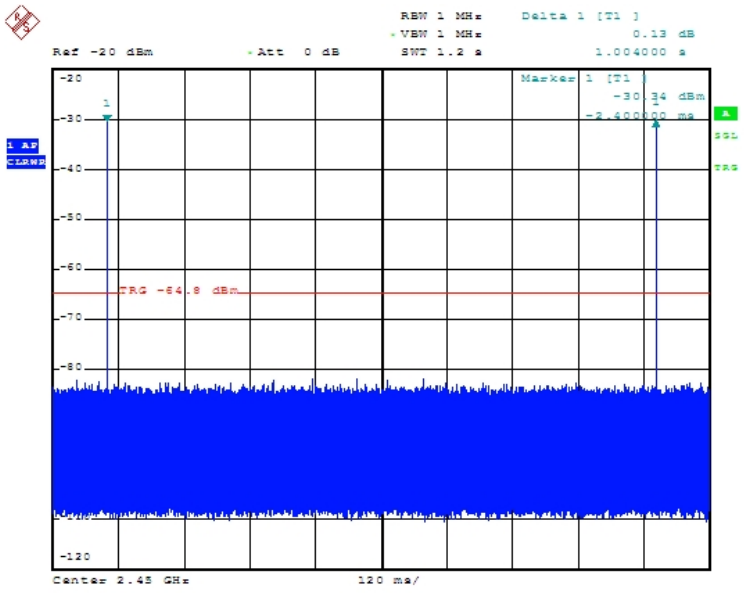


2nd comment ...

Duty Cycle at low channel: the pulse

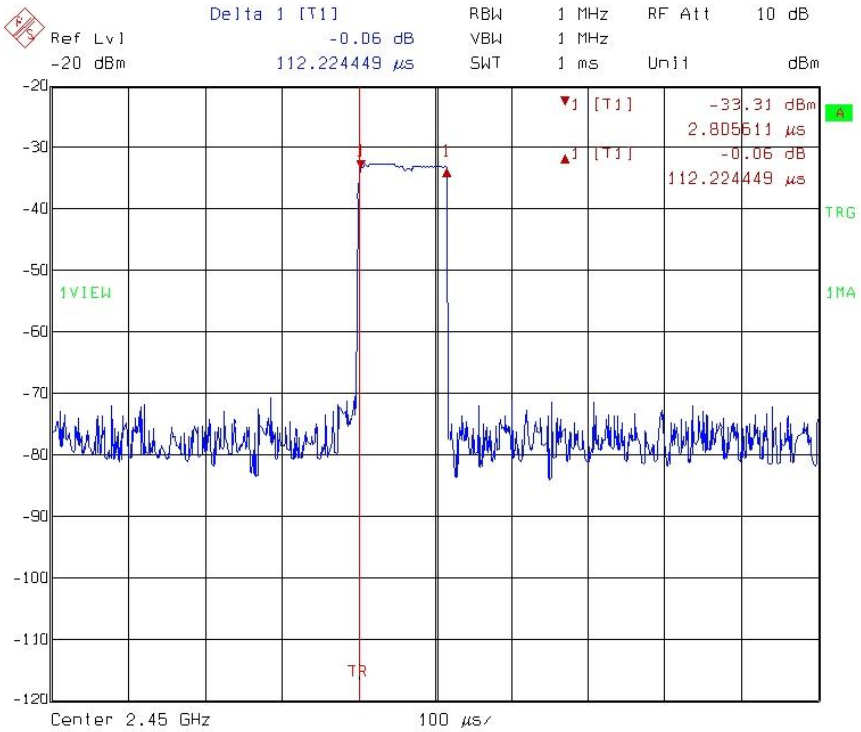


Duty Cycle at middle channel: the period

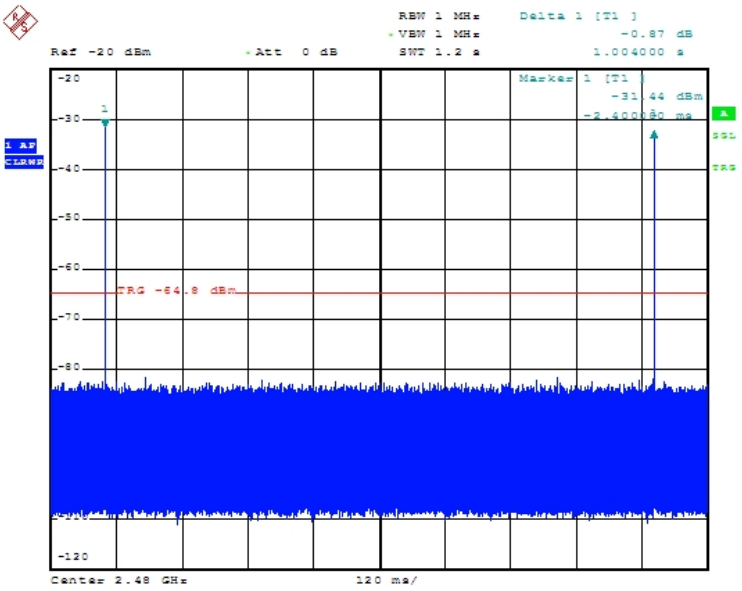


2nd comment ...

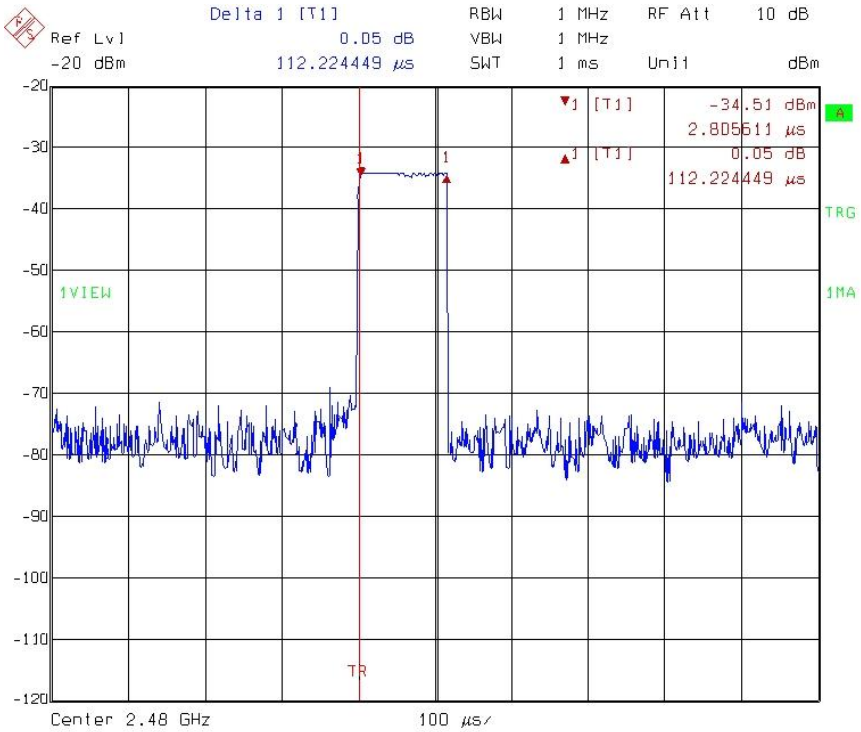
Duty Cycle at middle channel: the pulse



Duty Cycle at high channel: the period



Duty Cycle at high channel: the pulse



6. 20dB Bandwidth test

6.1 Operating environment

Temperature:	22	℃
Relative Humidity:	56	%
Atmospheric Pressure:	1008	hPa

6.2 Test setup & procedure

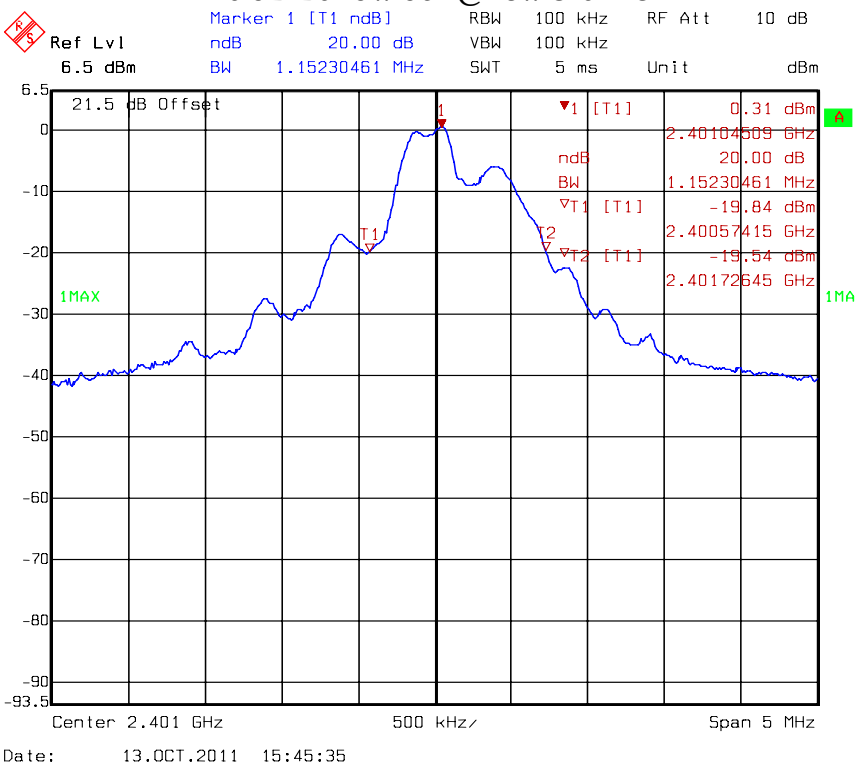
The 20dB bandwidth was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100 kHz, the video bandwidth≧RBW, and the SPAN may equal to approximately 2 to 3 times the 20dB bandwidth. The test was performed at 3 channels (lowest, middle and highest channel). The maximum 20dB modulation bandwidth is in the following Table.

6.3 Measured data of modulated bandwidth test results

Channel	Frequency (MHz)	Bandwidth (MHz)
low	2401	1.1523
middle	2450	1.1222
high	2480	1.0721

Please see the plot below.

20 dB Bandwidth @ low channel



20 dB Bandwidth @ middle channel

20 dB Bandwidth @ high channel