EMC
TEST REPORT

Report No. : TS10030080-EME
Model No. : M01084-T
Issued Date : Apr. 19, 2010

Applicant: **ACCO Brands, Inc.**
333 Twin Dolphin Drive, 6th Floor, Redwood Shores, CA 94065

Test Method/ Standard: **47 CFR FCC Part 15.249 & ANSI C63.4 2003**

Test By: **Intertek Testing Services Taiwan Ltd.**
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Title Engineer

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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
Calculation of Average Factor	15.35	Pass

1. General information

1.1 Identification of the EUT

Product:	Wireless Presenter with Laser Pointer and Memory
Model No.:	M01084-T (Pressenter)
FCC ID.:	GV3M01084-T
Frequency Range:	2412 MHz ~ 2472 MHz
Channel Number:	5 channels
Frequency of Each Channel:	2412 MHz, 2427 MHz, 2450 MHz, 2467 MHz, 2472 MHz
Type of Modulation:	GFSK
Rated Power:	DC 3 V from Battery
Power Cord:	N/A
Data Cable:	N/A
Sample Received:	Mar. 12, 2010
Test Date(s):	Mar. 13, 2010 ~ Mar. 23, 2010
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 Wireless Presenter with Laser Pointer and Memory, 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 Type	: PCB printed 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 continuously transmitted during the test.

For the signal from base unit, we found the maximum electromagnetic field was occurred with stand after verification of the maximum output power. The final test was executed under this condition and recorded in this report individually.

For the signal from handset 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.
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30
Horn Antenna	EMCO	1GHz~18GHz	3115
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170
Bilog Antenna	SCHWARZBECK	25MHz~1.7GHz	VULB 9160
Turn Table	HDGmbH	N/A	DS 420S
Antenna Tower	HDGmbH	N/A	MA 240
Pre-Amplifier	MITER	100MHz~26.5GHz	919981
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5

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

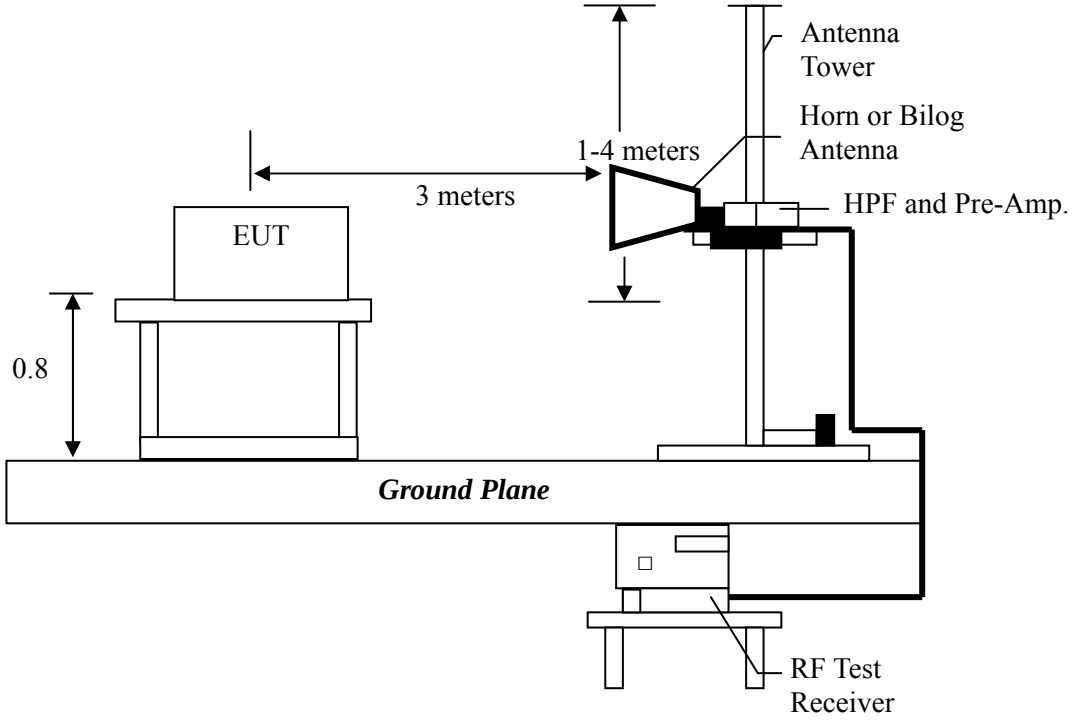
3. Radiated emission test

3.1 Operating environment

Temperature:	22	℃
Relative Humidity:	56	%
Atmospheric Pressure	1023	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

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 low channel.

EUT : M01084-T
Worst Case : Tx at low channel in X axis

Polarization (circle)	Frequency (MHz)	Detector	Corr. Factor (dB/m)	Reading (dBuV)	Calculated dBuV/m	Limit (dBuV/m)	Margin (dB)
Vertical	660.50	QP	21.50	9.62	31.12	46.00	-14.88
Vertical	686.69	QP	22.33	9.67	31.99	46.00	-14.01
Vertical	763.32	QP	22.81	9.74	32.55	46.00	-13.45
Vertical	816.67	QP	23.29	9.47	32.76	46.00	-13.24
Vertical	858.38	QP	23.70	9.75	33.45	46.00	-12.55
Vertical	886.51	QP	24.35	10.39	34.73	46.00	-11.27
Horizontal	474.26	QP	18.16	9.60	27.76	46.00	-18.24
Horizontal	510.15	QP	18.77	9.55	28.32	46.00	-17.68
Horizontal	557.68	QP	19.72	9.19	28.91	46.00	-17.09
Horizontal	641.10	QP	21.55	9.20	30.74	46.00	-15.26
Horizontal	680.87	QP	22.48	8.53	31.01	46.00	-14.99
Horizontal	761.38	QP	23.02	9.00	32.02	46.00	-13.98

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

3.4.2 Measurement results: frequency above 1GHz

EUT : M01084-T
Test Condition : Tx at low channel in X axis

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)
4824.00	PK	V	35.1	38.54	48.21	-	51.65	74	-22.35
4824.00	AV	V	35.1	38.54	48.21	-12.16	39.49	54	-14.51
4824.00	PK	H	35.1	38.54	50.26	-	53.70	74	-20.30
4824.00	AV	H	35.1	38.54	50.26	-12.16	41.54	54	-12.46
7236.00	PK	H	33	44.6	38.94	-	50.54	74	-23.46
7236.00	AV	H	33	44.6	38.94	-12.16	38.38	54	-15.62

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. The data value listed above which is higher than the system noise floor.

EUT : M01084-T
Test Condition : Tx at middle channel in X axis

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	46.43	-	49.87	74	-24.13
4900.00	AV	V	35.1	38.54	46.43	-12.16	37.71	54	-16.29
4900.00	PK	H	35.1	38.54	46.16	-	49.60	74	-24.40
4900.00	AV	H	35.1	38.54	46.16	-12.16	37.44	54	-16.56

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. The data value listed above which is higher than the system noise floor.

EUT : M01084-T
Test Condition : Tx at high channel in X axis

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)
4944.00	PK	V	35.1	38.54	44.83	-	48.27	74	-25.73
4944.00	AV	V	35.1	38.54	44.83	-12.16	36.11	54	-17.89
7416.00	PK	V	33	44.6	38.1	-	49.70	74	-24.30
7416.00	AV	V	33	44.6	38.1	-12.16	37.54	54	-16.46
4942.00	PK	H	35.1	38.54	46.51	-	49.95	74	-24.05
4942.00	AV	H	35.1	38.54	46.51	-12.16	37.79	54	-16.21
7416.00	PK	H	33	44.6	38.2	-	49.80	74	-24.20
7416.00	AV	H	33	44.6	38.2	-12.16	37.64	54	-16.36

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. The data value listed above which is higher than the system noise floor.

3.4.3 Measurement results: Fundamental emission

EUT : M01084-T
Test Condition : Tx at low channel in X axis

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)
2412.00	PK	H	32.86	62.87	-	95.73	113.9794	-18.25
2412.00	AV	H	32.86	62.87	-12.16	83.57	93.9794	-10.41

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

EUT : M01084-T
Test Condition : Tx at middle channel in X axis

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	32.95	62.55	-	95.50	113.9794	-18.48
2450.00	AV	H	32.95	62.55	-12.16	83.34	93.9794	-10.64

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

EUT : M01084-T
Test Condition : Tx at high channel in X axis

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)
2472.00	PK	H	33.06	61.33	-	94.39	113.9794	-19.59
2472.00	AV	H	33.06	61.33	-12.16	82.23	93.9794	-11.75

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

4. Radiated emission on the band edge FCC 15.209

Method of Measurement:

Reference FCC document: KDB558074, ANSI C63.4

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

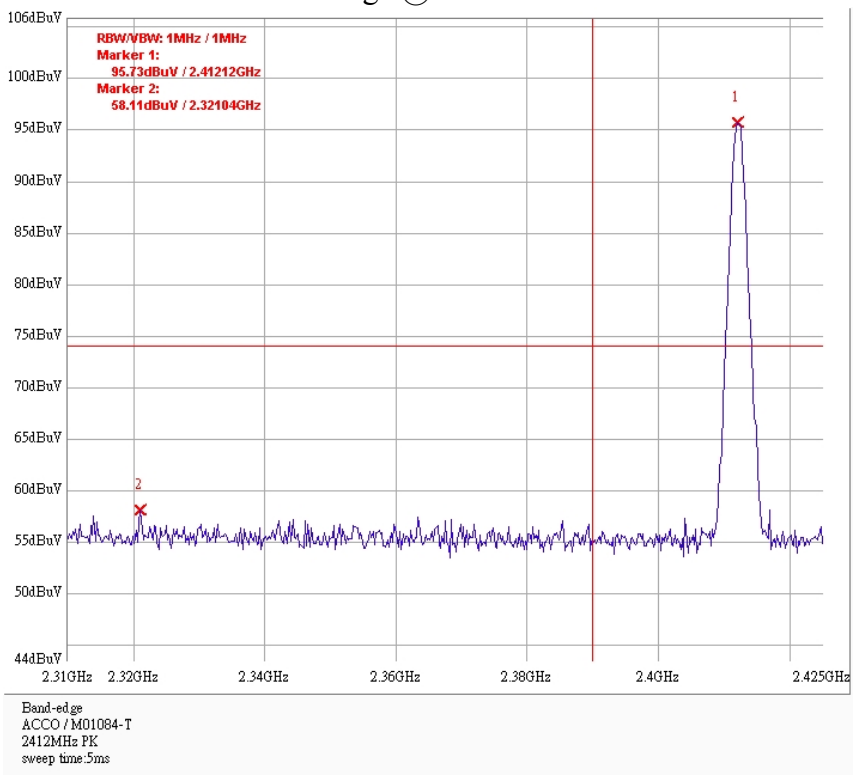
§ 15.35 Measurement detector functions and bandwidths

(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

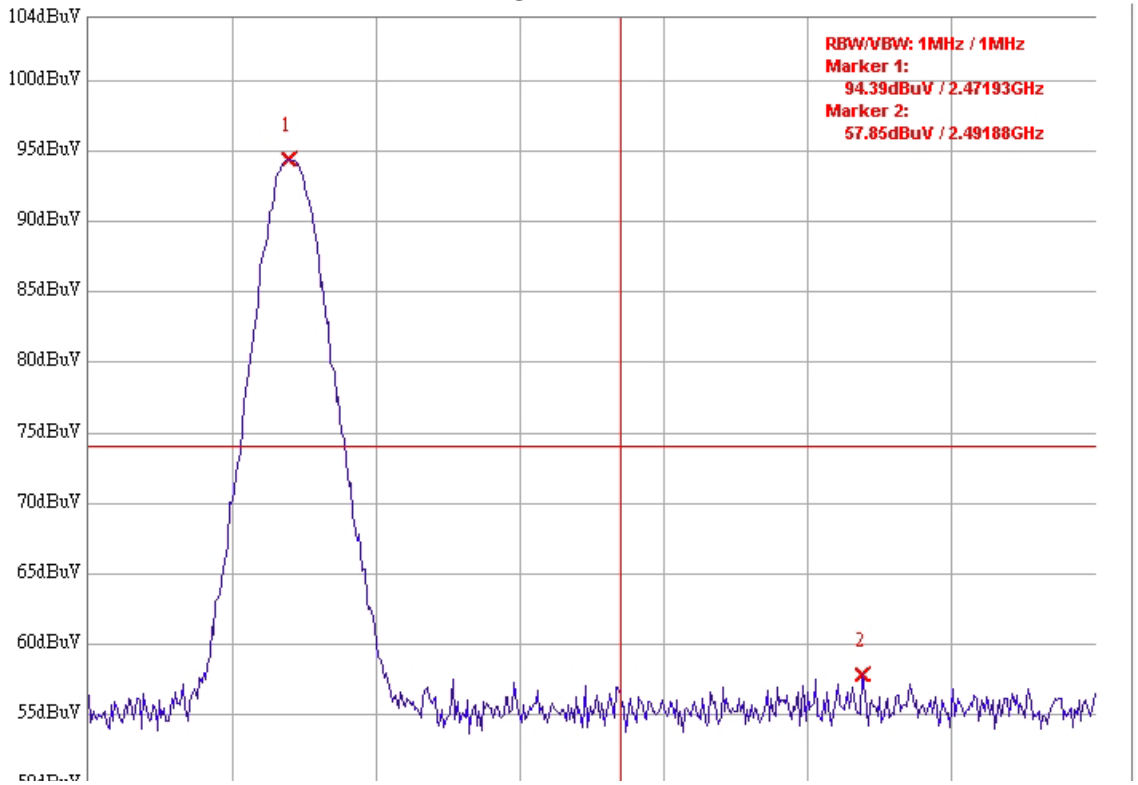
Frequency	Measurement Freq.Band (MHz)	Detector	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
2412 MHz	2310-2390	PK	58.11	74	-15.89
2412 MHz	2310-2390	AV	45.95	54	-8.05
2472 MHz	2483.5-2500	PK	57.85	74	-16.15
2472 MHz	2483.5-2500	AV	45.69	54	-8.31

Note: Duty cycle correction factor = -12.16 dB

Band Edge @ Low channel



Band Edge @ High channel (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 at 100 resolution bandwidth.

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

Duty cycle correction factor in dB = 20log (duty cycle)

The duty cycle is simply the on-time divided by the period:

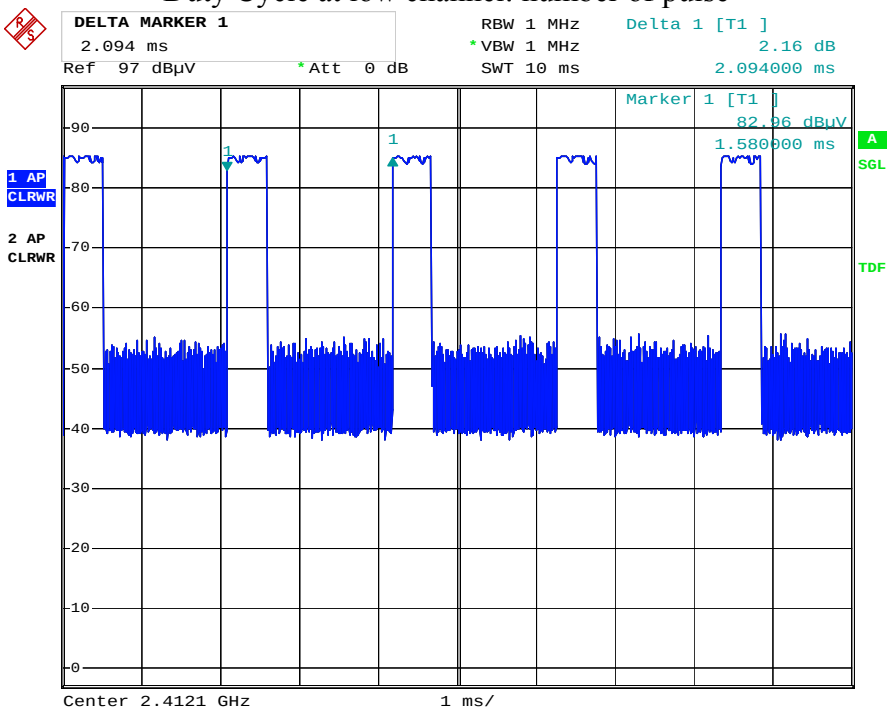
The number of pulses in each period (1 multiplied by the duration of each pulses 0.516ms

Duty Cycle = 0.516ms / 2.094ms = 0.24641

Therefore, the duty cycle correction factor will be 20 log10 (0.24641) = -12.16 dB

Please see the plot below.

Duty Cycle at low channel: number of pulse



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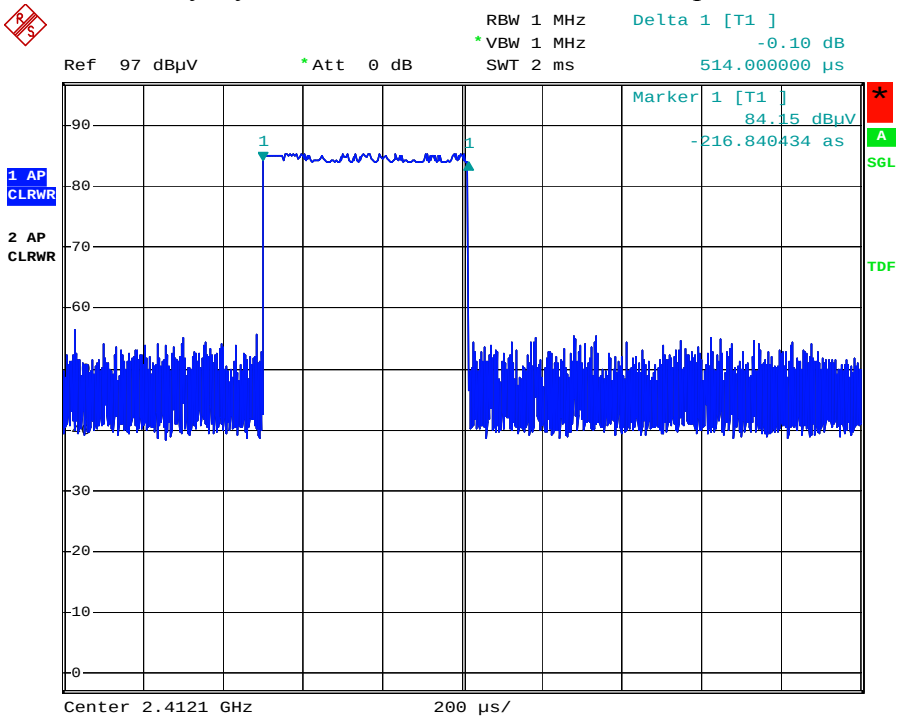
Duty Cycle at low channel: on time of one pulse



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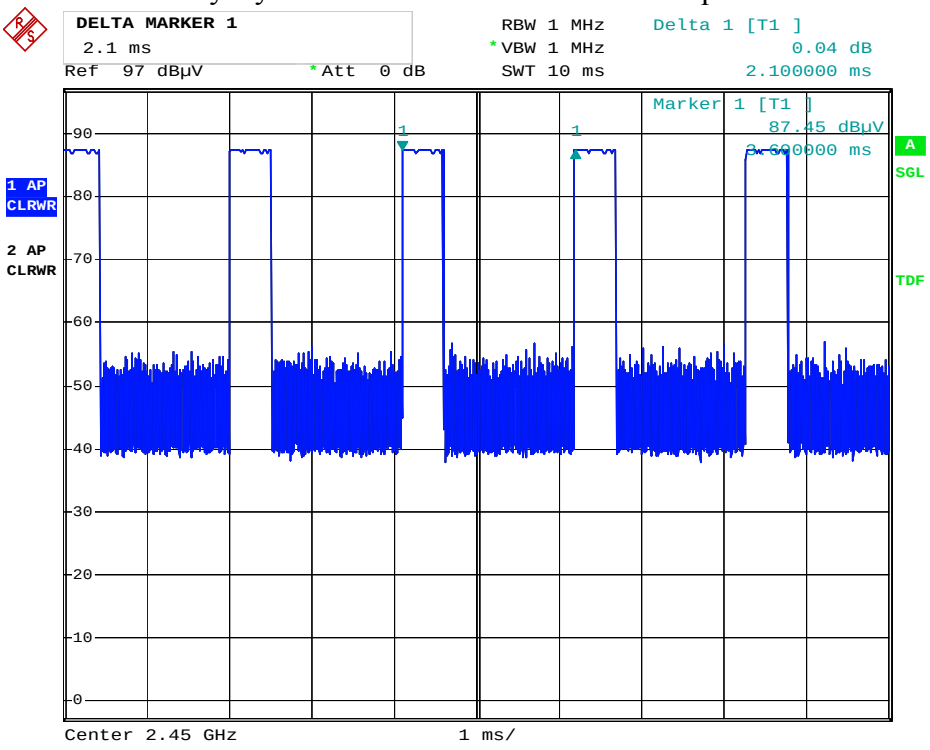
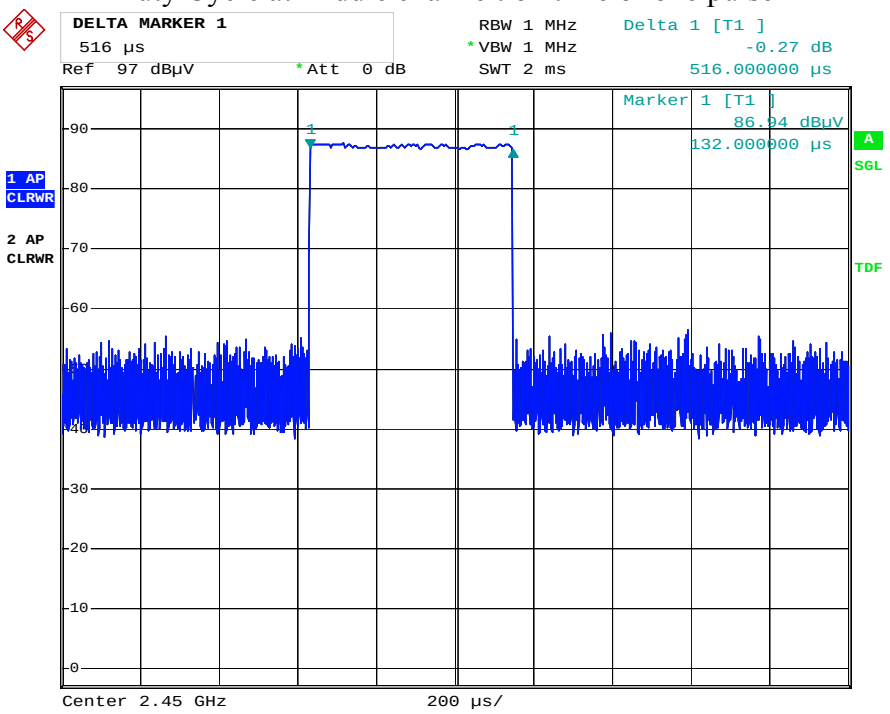
Duty Cycle at middle channel: number of pulse



Duty Cycle at middle channel: on time of one pulse



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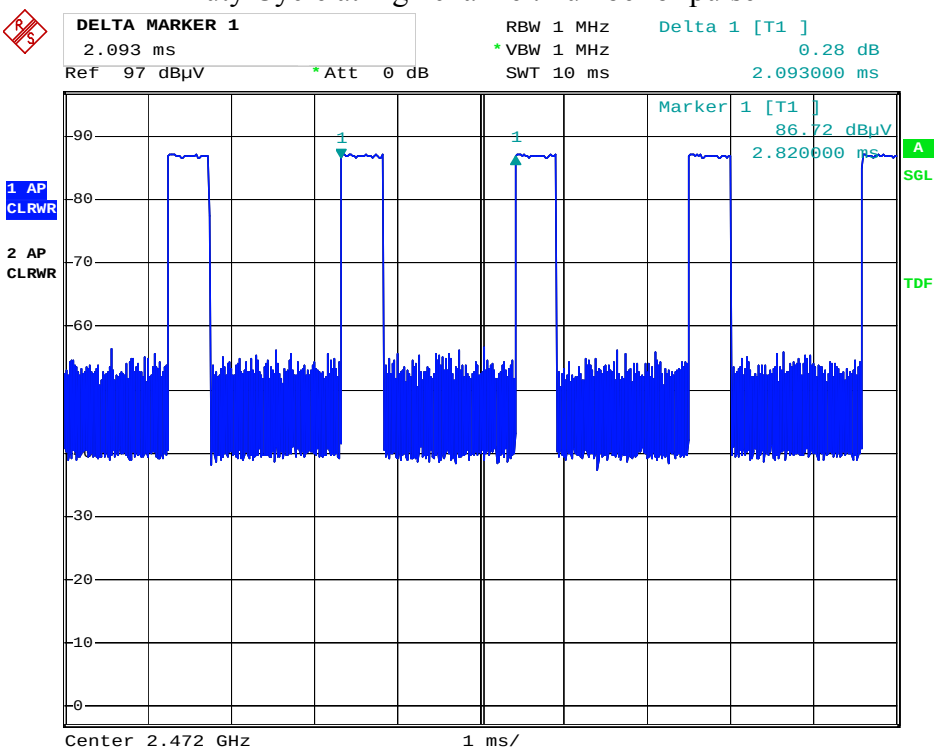
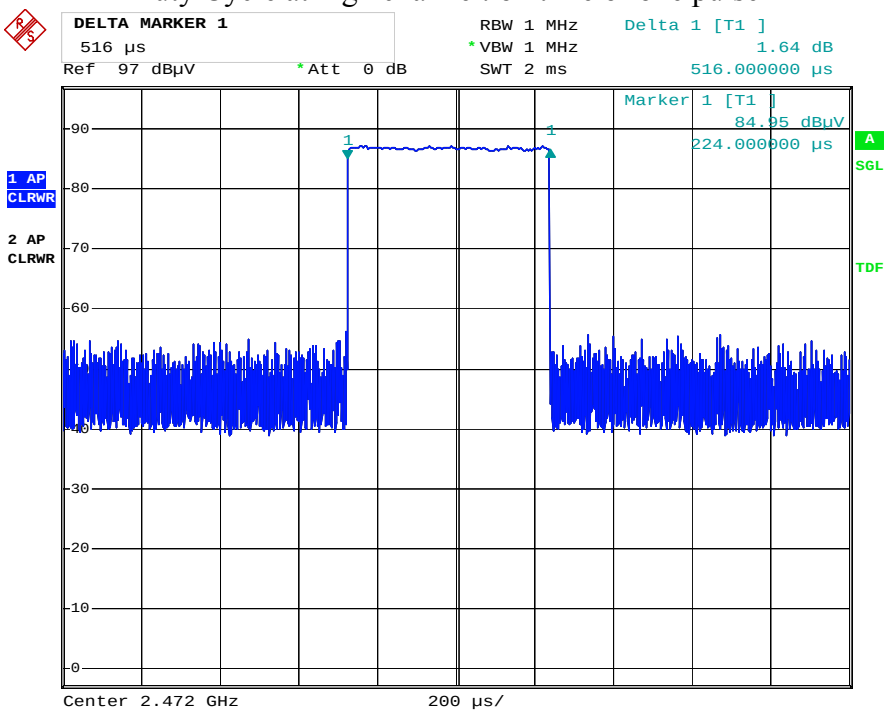
Duty Cycle at high channel: number of pulse



Duty Cycle at high channel: on time of one pulse



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