Date: 2007-11-19
No.: 60.870.7.007.03F

TEST REPORT

Applicant:	Electronics Tomorrow Ltd. Unit 903-7, 9/F, Tower 1, Harbour Center, 1 Hok Cheung Street, Hung Hom, Kowloon, HK.
Description of Samples:	Model name: RF Thermo / Humidity with LCD Brand name: Nil Model no.: 9450, 260NU-1, 260NC-1, 260BC-1, 260BU-1, 262NU-1, 262NC-1, 262BC-1, 262BU-1 FCCID: PEQ945090807
Date Samples Received:	2007-09-24
Date Tested:	2007-09-24 to 2007-11-19
Investigation Requested:	FCC Part 15 Subpart C, Section 15.231
Conclusions:	The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.
Remarks:	----

Checked by:

Prudence Poon
Project Manager
Telecom department

Approved by:-

Victor Kwan
Manager
Telecom department

CONTENT:

	Cover	Page 1 of 25
	Content	Page 2-3 of 25
1.0	**General Details**	
1.1	Test Laboratory	Page 4 of 25
1.2	Applicant Details	Page 4 of 25
1.3	Equipment Under Test [EUT]	Page 5-6 of 25
1.4	Related Submittal(s) Grants	Page 6 of 25
2.0	**Technical Details**	
2.1	Investigations Requested	Page 7 of 25
2.2	Test Standards and Results Summary	Page 7 of 25
3.0	**Test Methodology**	
3.1	Radiated Emission	Page 8 of 25
3.2	Field Strength Calculation	Page 8 of 25
3.3	Conducted Emission	Page 8 of 25
4.0	**Test Results**	
4.1	Radiated Emission of Fundamental Frequency	Page 9-10 of 25
4.2	Spurious Radiated Emission	Page 11-17 of 25
4.3	Conducted Emission	Page 18 of 25
4.4	Bandwidth Measurement	Page 19-20 of 25
4.5	Average Factor	Page 21-24 of 25
5.0	**List of Measurement Equipments**	Page 25 of 25

Appendix A

Photos of Test Setup

Appendix B

External EUT Photos

Appendix C

Internal EUT Photos

1.0 General Details

1.1 Test Laboratory

Hong Kong Productivity Council
HKPC Building, 78 Tat Chee Avenue, Kowloon Tong,
Hong Kong

Registration Number: 90656

1.2 Applicant Details

Applicant

Electronics Tomorrow Ltd.
Unit 903-7, 9/F, Tower 1, Harbour Center,
1 Hok Cheung Street, Hung Hom, Kowloon, HK.

Manufacturer

Electronics Tomorrow Ltd.
Unit 903-7, 9/F, Tower 1, Harbour Center,
1 Hok Cheung Street, Hung Hom, Kowloon, HK.

1.3 Equipment Under Test [EUT]

Description of EUT

Model Name:	RF Thermo / Humidity with LCD
Brand Name:	Nil
Model Number:	9450
FCCID:	PEQ945090807
Rating:	3.0Vd.c. (2 x " AA" size batteries)
Antenna Type:	Integral
Operated Frequency:	434.048MHz
No. of Channel:	1
Accessories and Auxiliary Equipment:	None
EUT Exercising Software:	None

As per Client Declaration, circuit design, PCB Layout, shielding and interface of 9450, 260NU-1, 260NC-1, 260BC-1, 260BU-1, 262NU-1, 262NC-1, 262BC-1 and 262BU-1 are identical, only the cosmetic is different. So, 9450 is selected to be a representative model to perform all testing.

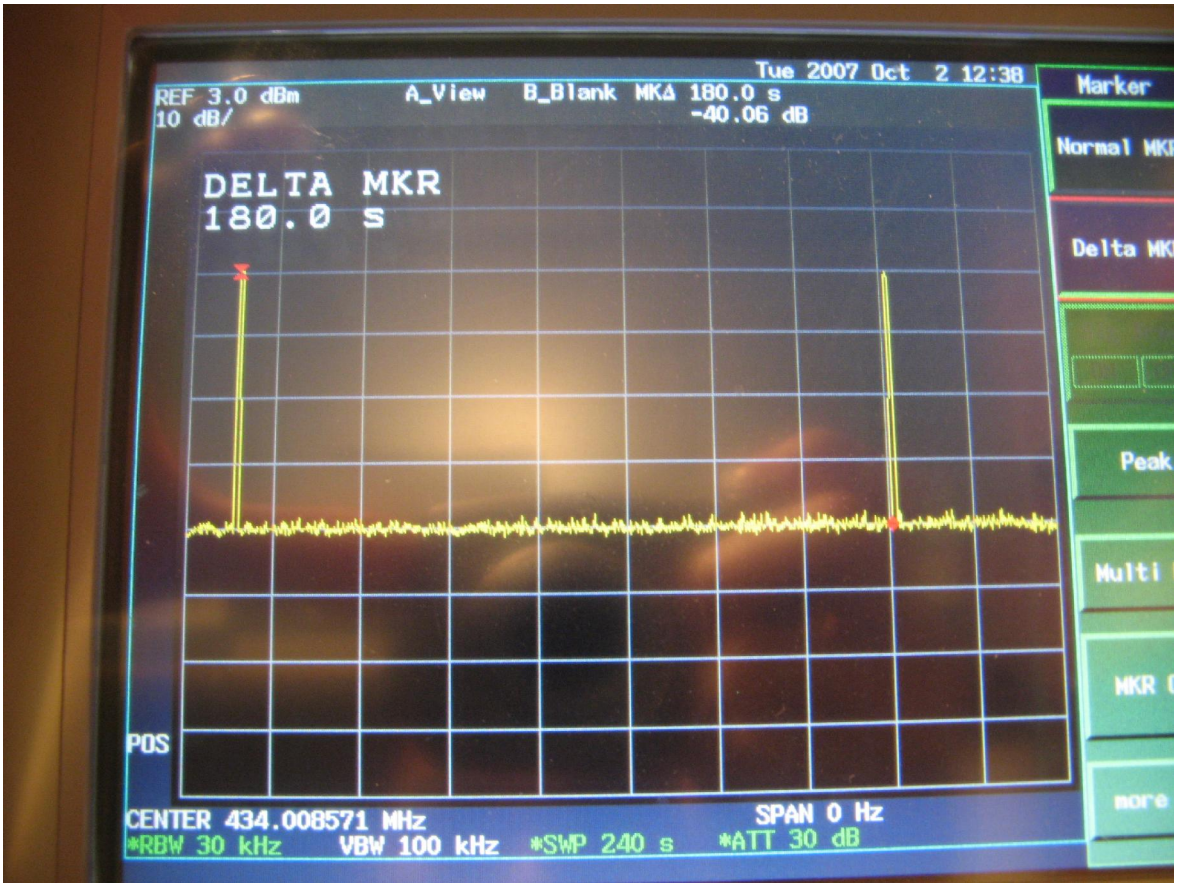
General Operation of EUT

The Equipment Under Test (EUT) is a transmitter operated at 434.048 MHz to detect the temperature and humidity of the surrounding and transmit this information to its associated weather station.

Periodic Operation of EUT

The transmitter transmits signal for every 180 seconds, that mean the silence period must not less than 180 seconds. Each data packet is continuously transmitting for approximate 990ms in one transmission, it activated automatically shall cease transmission within 1 seconds after activation.

So the EUT is deemed to fulfill FCC section 15.231(e).
According to section 15.231(e), the EUT shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.



1.4 Related Submittal(s) Grants

This is a single application for certification of the transmitter.

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2007 and ANSI C63.4: 2003 for FCC Verification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Radiated Emission of Carrier Frequency	FCC 47CFR 15.231	ANSI C63.4:2003	N/A	☒	☐	☐
Radiated Emission, 30MHz to 5GHz	FCC 47CFR 15.231	ANSI C63.4:2003	Class B	☒	☐	☐
Conducted Emission on AC, 0.15MHz to 30MHz	FCC 47CFR 15.207	ANSI C63.4:2003	Class B	☐	☐	☒
Bandwidth Measurement	FCC 47CFR 15.231	ANSI C63.4:2003	N/A	☒	☐	☐

Note: N/A - Not Applicable

3.0 Test Methodology

3.1 Radiated Emission

The sample was placed 0.8m above the ground plane on a standard emission test site *. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*On a standard emission test site with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 90656.

3.2 Field Strength Calculation

The field strength at 3 m was established by adding the meter reading of the spectrum analyzer to the factors associated with antenna correction factor, cable loss, preamplifiers and filter attenuation.

The equation is expressed as follow:

FS = R + System Factor
System Factor = AF + CF + FA – PA

Where FS = Net Field Strength in dBuV/m at 3 meters.
R = Reading of Spectrum Analyzer / Test Receiver in dBuV.
AF = Antenna Factor in dB.
CF = Cable Attenuation Factor in dB.
FA = Filter Attenuation Factor in dB.
PA = Preamplifier Factor in dB.

FA and PA are only be used for the measuring frequency above 1 GHz.

3.3 Conducted Emissions

The EUT was placed on a non-metallic table 0.8m above the horizontal metal reference place and 0.4m from a vertical ground plane which is connected to the horizontal metal ground plane. Meanwhile, the AC main of EUT was connected to the distance of 0.8m line impedance stabilization network (LISN) during measurement.

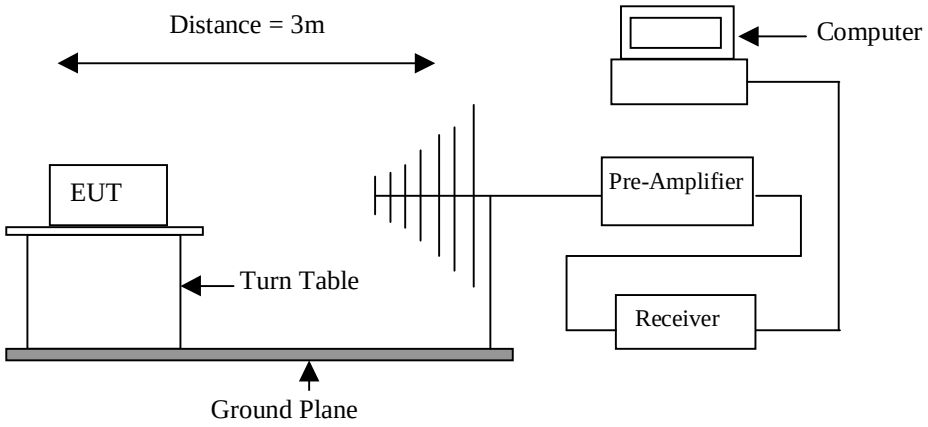
Initial measurements were performed in quasi-peak and average detection modes by the test receiver, any emissions recorded within 30dB of the relevant limit lines were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

4.0 Test Results

4.1 Radiated Emission of Fundamental Frequency

Test Requirement:	FCC part 15 section 15.231(e)
Test Method:	ANSI C63.4:2003
Test Date:	2007-11-16
Mode of Operation:	Transmitting mode.
Detector Function:	Peak
Measurement BW:	100 kHz

Test Setup:



Results: PASS

Radiated Emissions									
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading **dBµV/m**	System Factor **dB**	Field Strength at 3m **dBµV/m**	Average Factor **dB**	Net Field Strength at 3m **dBµV/m**	Limit **dBµV/m**	Delta to Limit **dBµV/m**
PK	434.048	V	58.16	18.24	76.40	0.00	76.40	92.87	-16.47
AV	434.048	V	58.16	18.24	76.40	-6.42	69.98	72.87	-2.89
PK	434.048	H	51.66	18.24	69.90	0.00	69.90	92.87	-22.97
AV	434.048	H	51.66	18.24	69.90	-6.42	63.48	72.87	-9.39

Remark:
-Calculated measurement uncertainty: ±5.0dB
-Refer to section 4.4 for average factor calculation.

Limits for Fundamental Frequency: [Section 15.231(e)]:

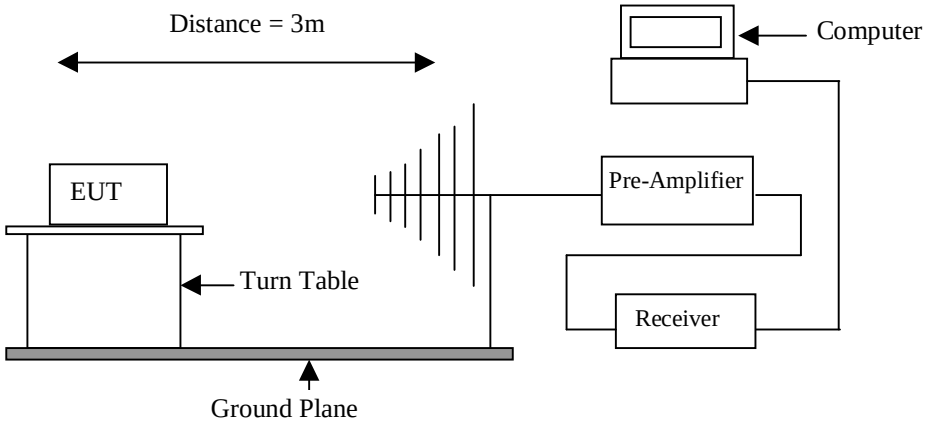
Fundamental Frequency [MHz]	Field Strength of Fundamental [µV/m]	Field Strength of Fundamental [dBµV/m]
434.048	4400.818	72.87

Compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR peak detector.

4.2 Spurious Radiated Emission

Test Requirement:	FCC part 15 section 15.231(e)
Test Method:	ANSI C63.4:2003
Test Date:	2007-11-16
Mode of Operation:	Transmitting mode.
Detector Function:	Peak
Measurement BW:	100 kHz

Test Setup:



Results: PASS

Radiated Emissions									
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading **dBµV/m**	System Factor **dB**	Field strength at 3m **dBµV/m**	Average Factor **dB**	Net Field Strength at 3m **dBµV/m**	Limit **dBµV/m**	Delta to Limit **dBµV/m**
AV	1736.25	V	44.23	-6.39	37.84	-6.42	31.42	52.87	-21.45
AV	2170.25	V	44.36	-4.29	40.07	-6.42	33.65	52.87	-19.22
AV	3038.25	V	43.20	-1.37	41.83	-6.42	35.41	52.87	-17.46
AV	*3906.43	V	46.99	1.38	48.37	-6.42	41.95	54.00	-12.05
AV	*1380.25	H	44.54	-8.41	36.13	-6.42	29.71	54.00	-24.29
AV	2170.25	H	45.00	-4.29	40.71	-6.42	34.29	52.87	-18.58
AV	3038.25	H	43.16	-1.37	41.79	-6.42	35.37	52.87	-17.50
AV	*3906.50	H	43.46	1.38	44.84	-6.42	38.42	54.00	-15.58

Note: No further spurious emissions found between 30 MHz and lowest internal used/generated frequency.

Remark (*) : Radiated emissions which fall in the restricted bands as defined in Section 15.205(a).

Remark:
-Calculated measurement uncertainty: ±5.0dB.
-Refer to section 4.4 for average factor calculation.

Limits for Radiated Emission [Section 15.231(e)]:

Fundamental Frequency [MHz]	Field Strength of Spurious Emission [μV/m]	Field Strength of Spurious Emission [dBμV/m]
434.048	440.0818	52.87

Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in section 15.209, whichever permits a higher field strength.

Limit for Radiated Emission Falling in Restricted Bands [Section 15.209]:

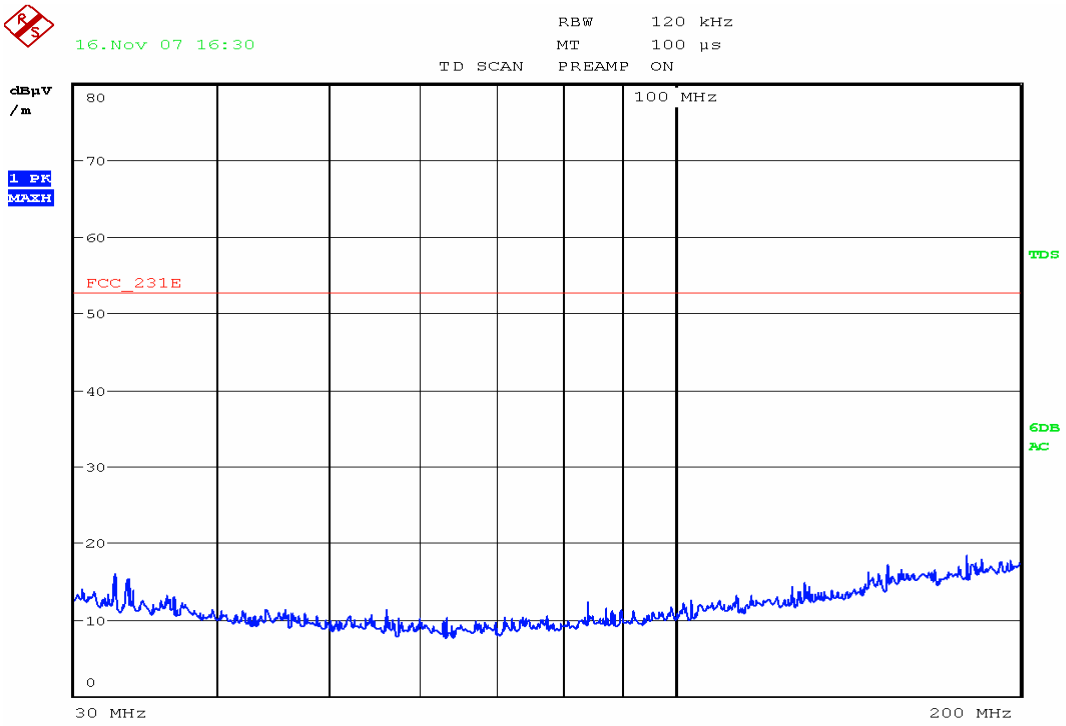
Frequency (MHz)	Field Strength [μV/m]	Field Strength [dBμV/m]
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-2500	500	54.0

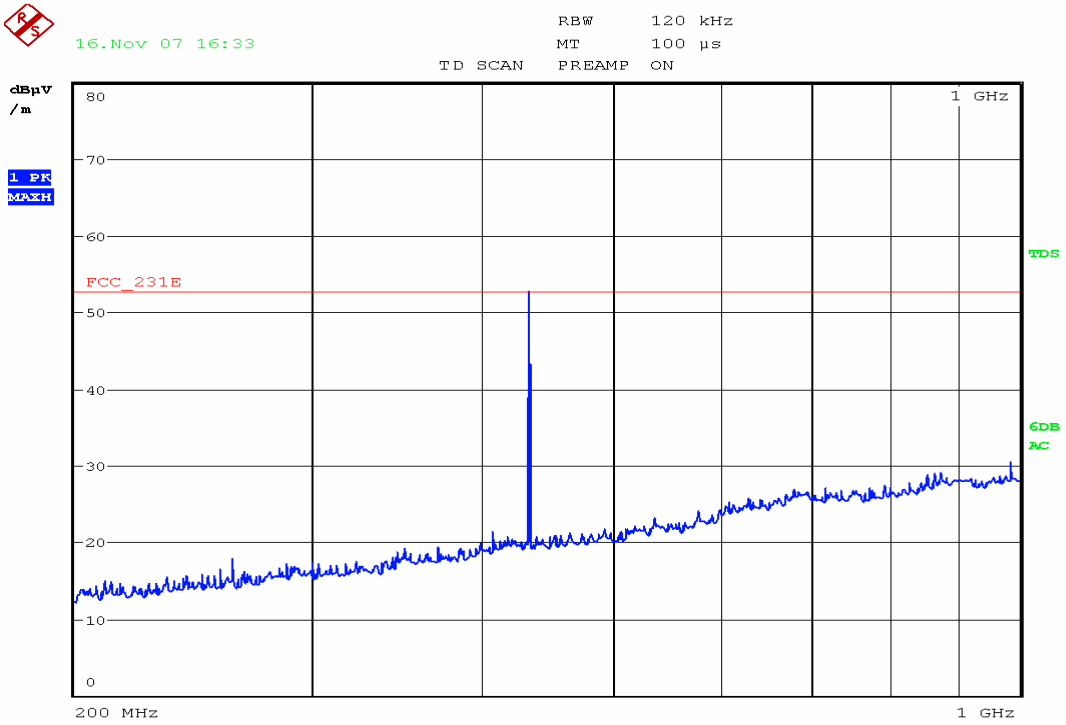
Radiated emissions, which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209.

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

- Result data graph is attached at the next pages for reference.

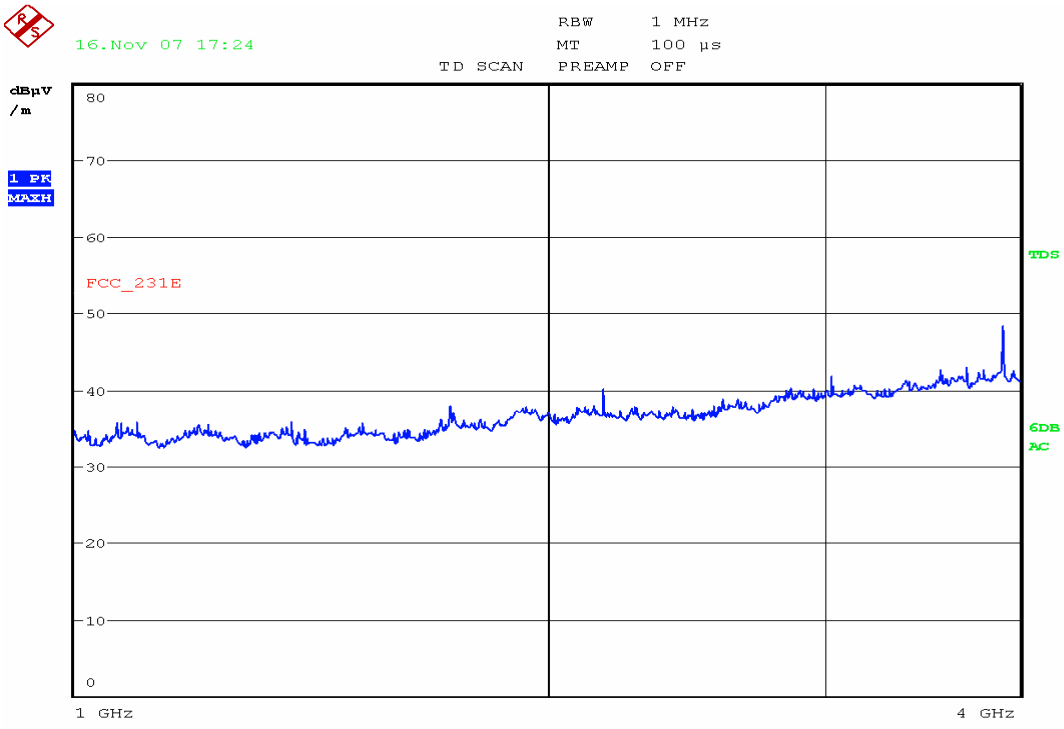
Vertical



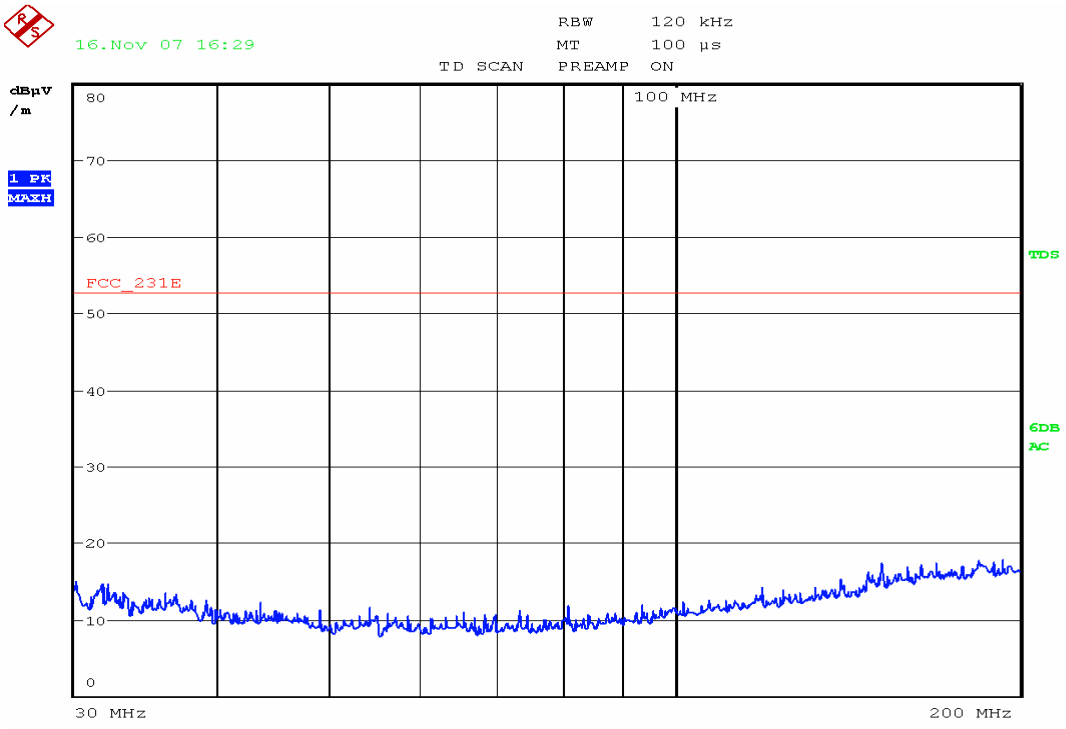


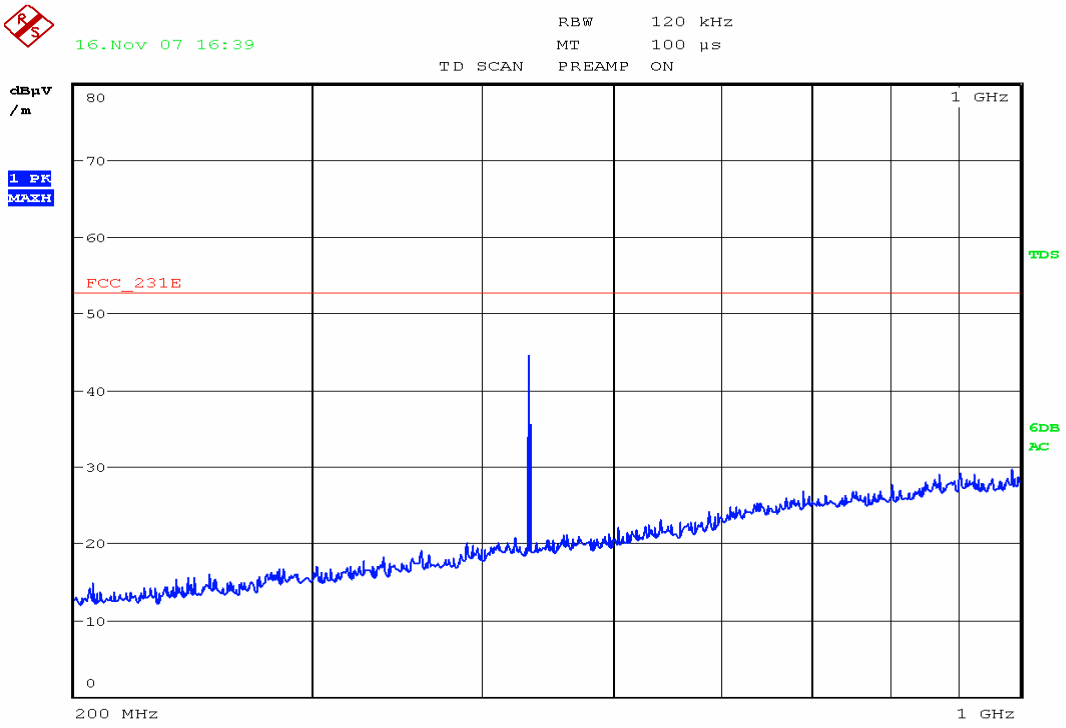
TÜV SÜD Hong Kong Ltd.
Unit 601, InnoCentre, 72 Tat Chee Avenue, Kowloon Tong, Hong Kong

Vertical

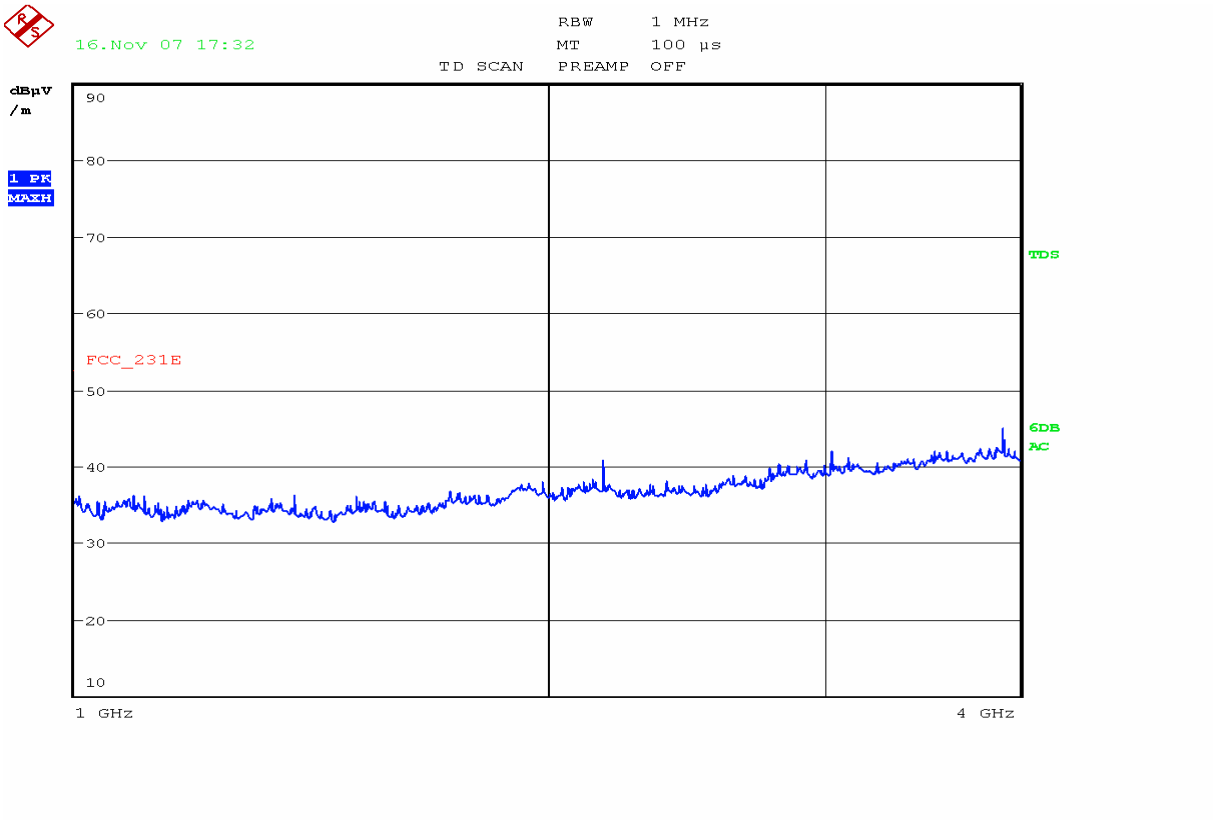

16.Nov 07 17:24
RBW 1 MHz
MT 100 µs
TD SCAN PREAMP OFF
dBµV /m
1 PK MAXH
80
70
60
FCC_231E
50
40
30
20
10
0
TDS
6DB AC
1 GHz
4 GHz

Horizontal


16.Nov 07 16:29
RBW 120 kHz
MT 100 µs
TD SCAN PREAMP ON
dBµV /m
1 PK MAXH
80
70
60
FCC_231E
50
40
30
20
10
0
100 MHz
TDS
6DB AC
30 MHz
200 MHz


16.Nov 07 16:39
RBW 120 kHz
MT 100 µs
TD SCAN PREAMP ON
dBµV /m
1 PK MAXH
80
70
60
FCC_231E
50
40
30
20
10
0
1 GHz
TDS
6DB AC
200 MHz
1 GHz

Horizontal


16.Nov 07 17:32
RBW 1 MHz
MT 100 µs
TD SCAN PREAMP OFF
dBµV /m
1 PK MAXH
90
80
70
60
FCC_231E
50
40
30
20
10
TDS
6DB AC
1 GHz
4 GHz

4.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement:	FCC part 15 Section 15.207 Class B
Test Method:	ANSI C63.4:2003
Test Date:	---
Mode of Operation:	---

Results: N/A

Note : This testing is not applicable for the battery operated EUT.

Limits for Conducted Emission [Section 15.207]:

Frequency Range [MHz]	Quasi-Peak Limit [dBµV]	Average Limit [dBµV]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

* Decreases with the logarithm of the frequency.

Remarks:
Calculated measurement uncertainty: ±2.8dB

4.4 Bandwidth Measurement

Test Requirement:	FCC part 15 section 15.231 (c)
Test Method:	ANSI C63.4:2003
Test Date:	2007-11-15
Mode of Operation:	Transmitting mode.
Detector Function:	Peak

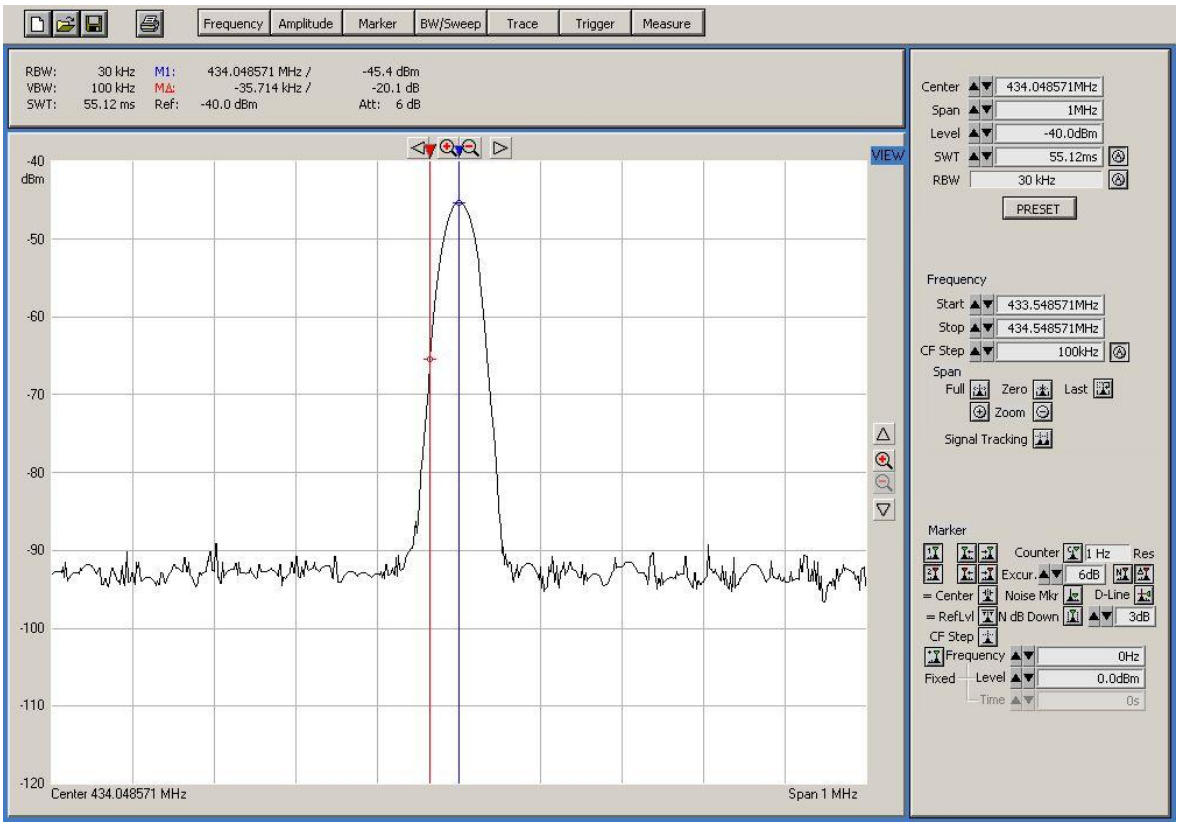
Results: PASS

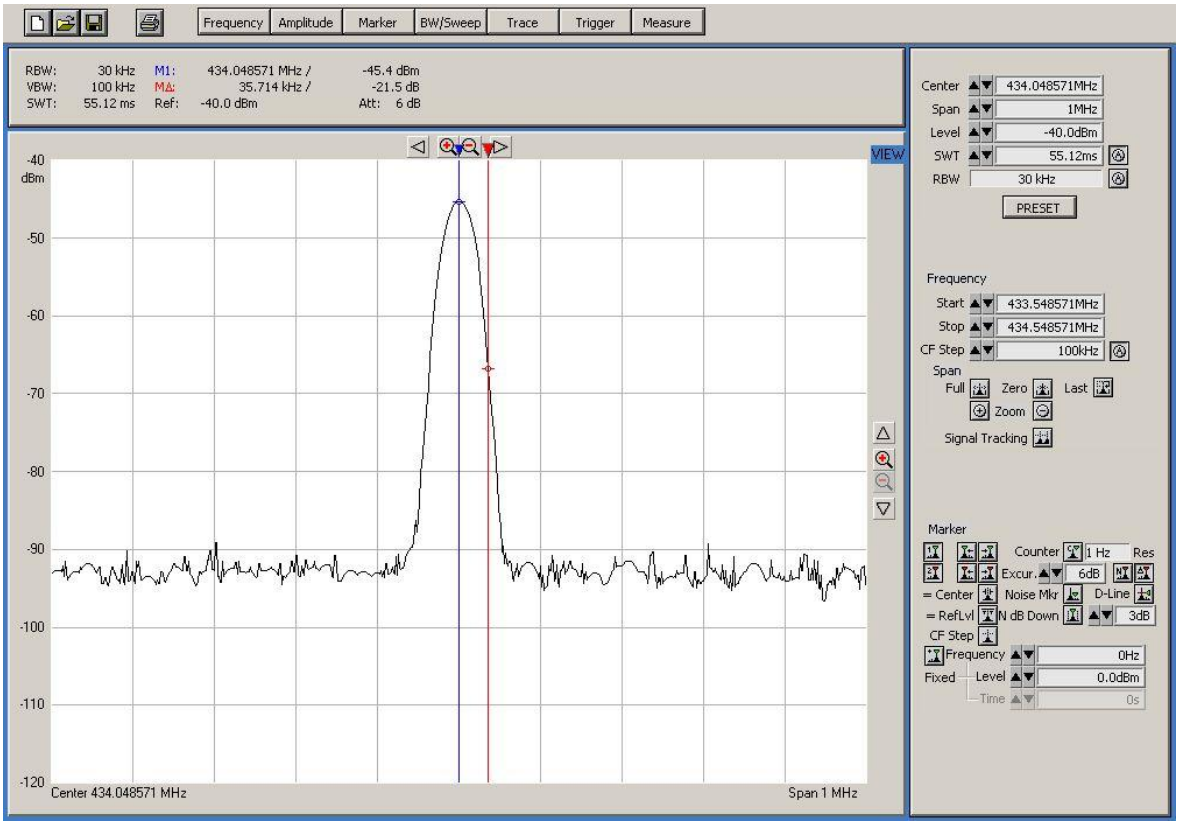
Refer to the data graph, the 20dB points at lower edge and at higher edge are 434.013MHz and 434.084MHz, so that is 35.714 kHz and 35.714 kHz respectively apart from the centre modulated carrier, the bandwidth of the emission is 0.016% of the centre frequency. Therefore, the EUT meets the requirement of section 15.231(c).

Limit for Bandwidth [Section 15.231 (c)]

The bandwidth of the emission shall be no wider than 0.25% if the center frequency for devices operating above 70MHz and below 900MHz.

Test Result: Result data graph is shown at the next pages for reference.


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 55.12 ms
M1: 434.048571 MHz / -45.4 dBm
M2: -35.714 kHz / -20.1 dB
Ref: -40.0 dBm
Att: 6 dB
VIEW
-40 dBm
-50
-60
-70
-80
-90
-100
-110
-120
Center 434.048571 MHz
Span 1 MHz
Center 434.048571MHz
Span 1MHz
Level -40.0dBm
SWT 55.12ms
RBW 30 kHz
PRESET
Frequency
Start 433.548571MHz
Stop 434.548571MHz
CF Step 100kHz
Span
Full
Zero
Last
Zoom
Signal Tracking
Marker
Counter
1 Hz
Res
Excur.
6dB
= Center
Noise Mkr
D-Line
= RefLvl
N dB Down
3dB
CF Step
Frequency
0Hz
Fixed
Level
0.0dBm
Time
0s


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 55.12 ms
M1: 434.048571 MHz / -45.4 dBm
M2: 35.714 kHz / -21.5 dB
Ref: -40.0 dBm
Att: 6 dB
VIEW
-40 dBm
-50
-60
-70
-80
-90
-100
-110
-120
Center 434.048571 MHz
Span 1 MHz
Center 434.048571MHz
Span 1MHz
Level -40.0dBm
SWT 55.12ms
RBW 30 kHz
PRESET
Frequency
Start 433.548571MHz
Stop 434.548571MHz
CF Step 100kHz
Span
Full
Zero
Last
Zoom
Signal Tracking
Marker
Counter
1 Hz
Res
Excur.
6dB
= Center
Noise Mkr
D-Line
= RefLvl
N dB Down
3dB
CF Step
Frequency
0Hz
Fixed
Level
0.0dBm
Time
0s

4.5 Average Factor

Average factor in dB = 20 log (duty cycle)

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 The specification for output field strengths in accordance with the FCC rules specify measurements with an average detector.

The duty cycle is the total signal on time per one transmission.

The duration of one cycle = 990ms

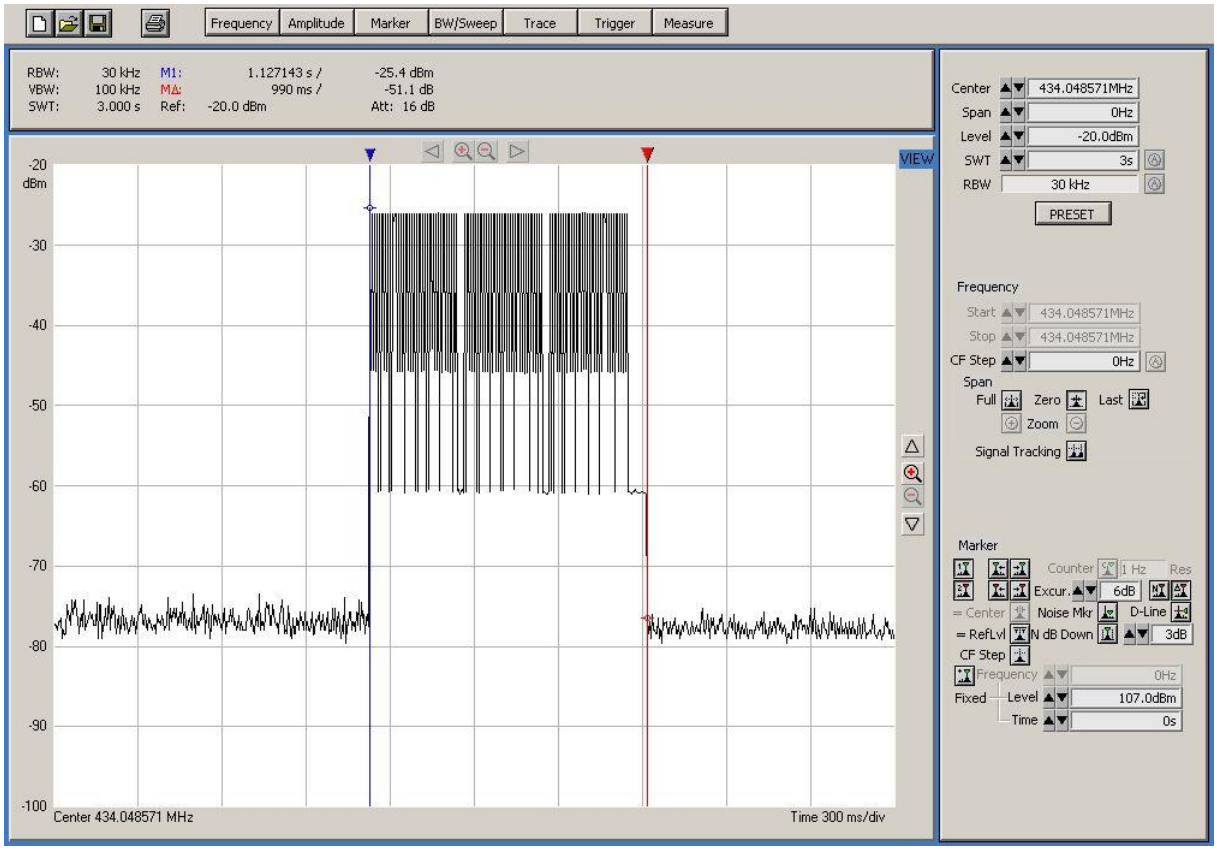
The duration of part of one cycle = 276.343ms

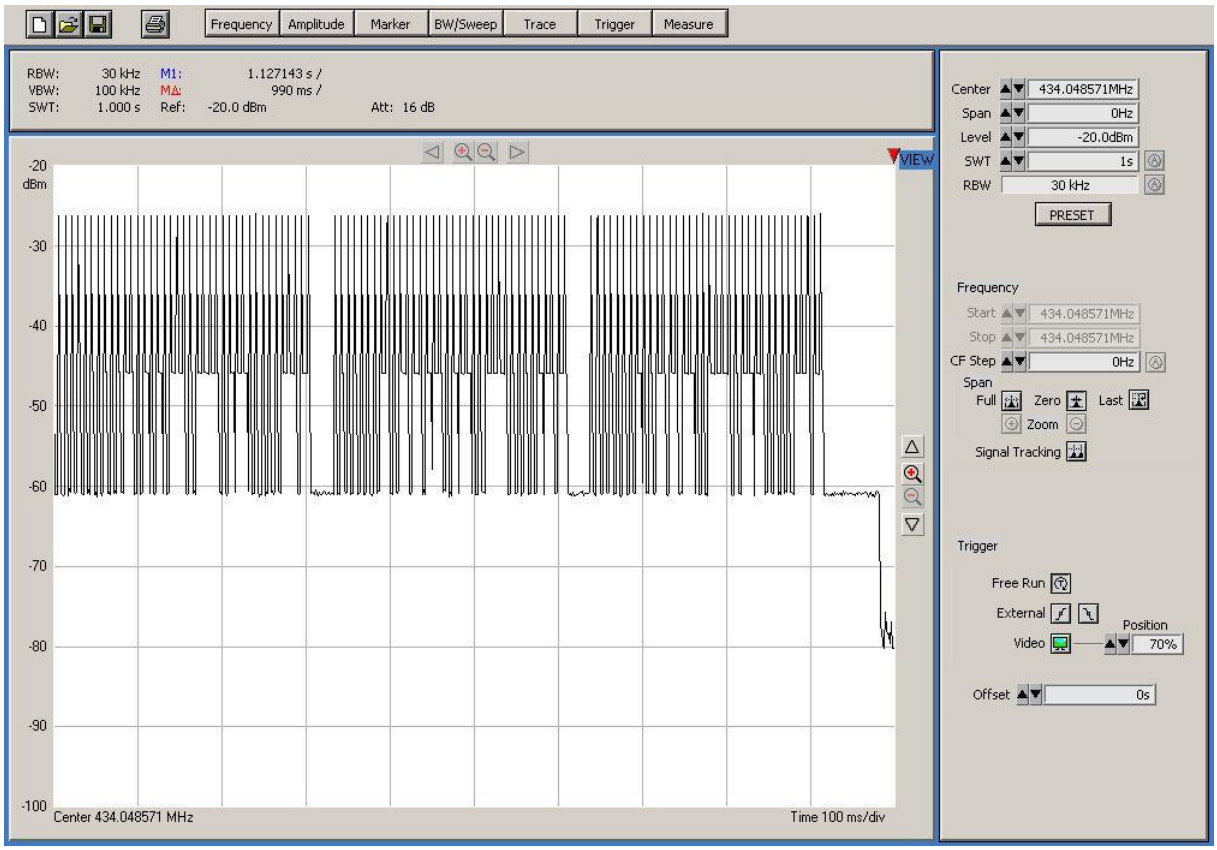
Effective period of part of the cycle = (15 x 6ms +21 x 2ms)

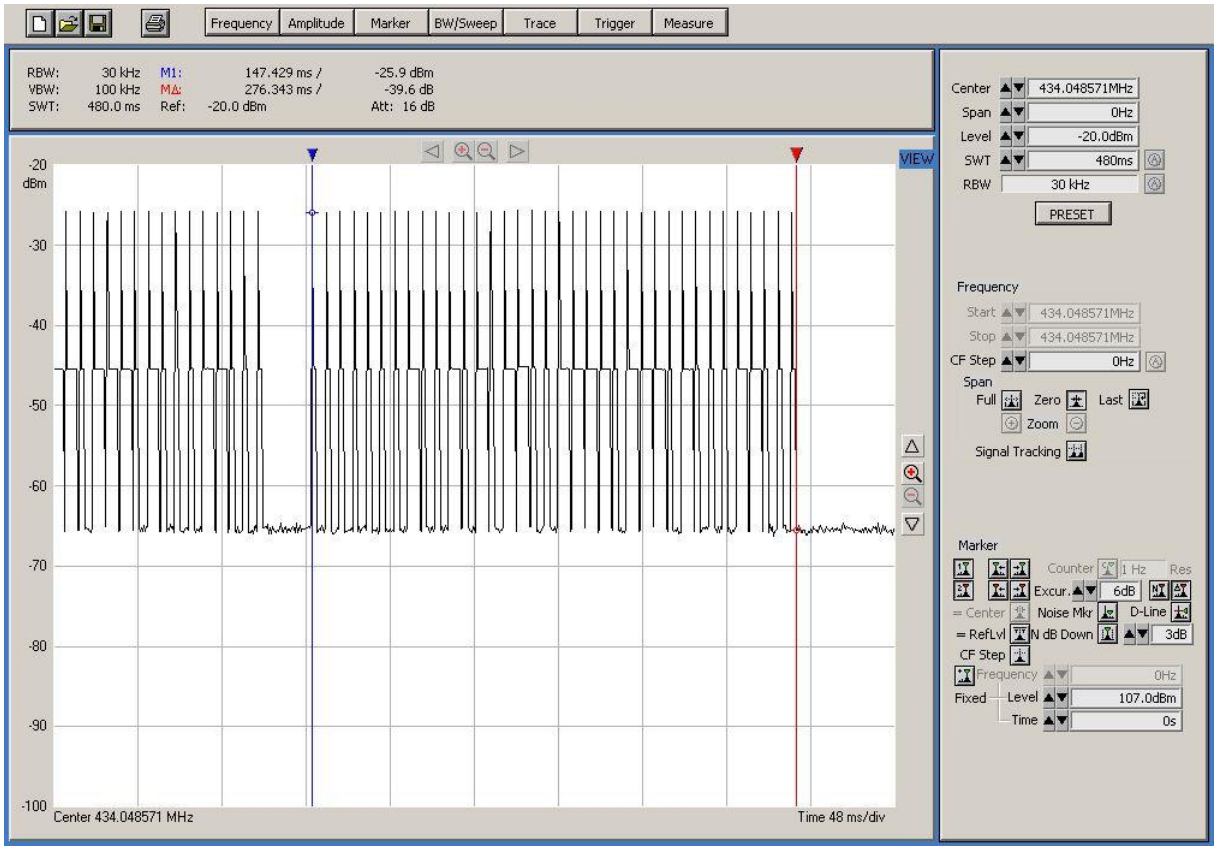
Duty cycle = 132ms / 276.343ms
= 0.4777

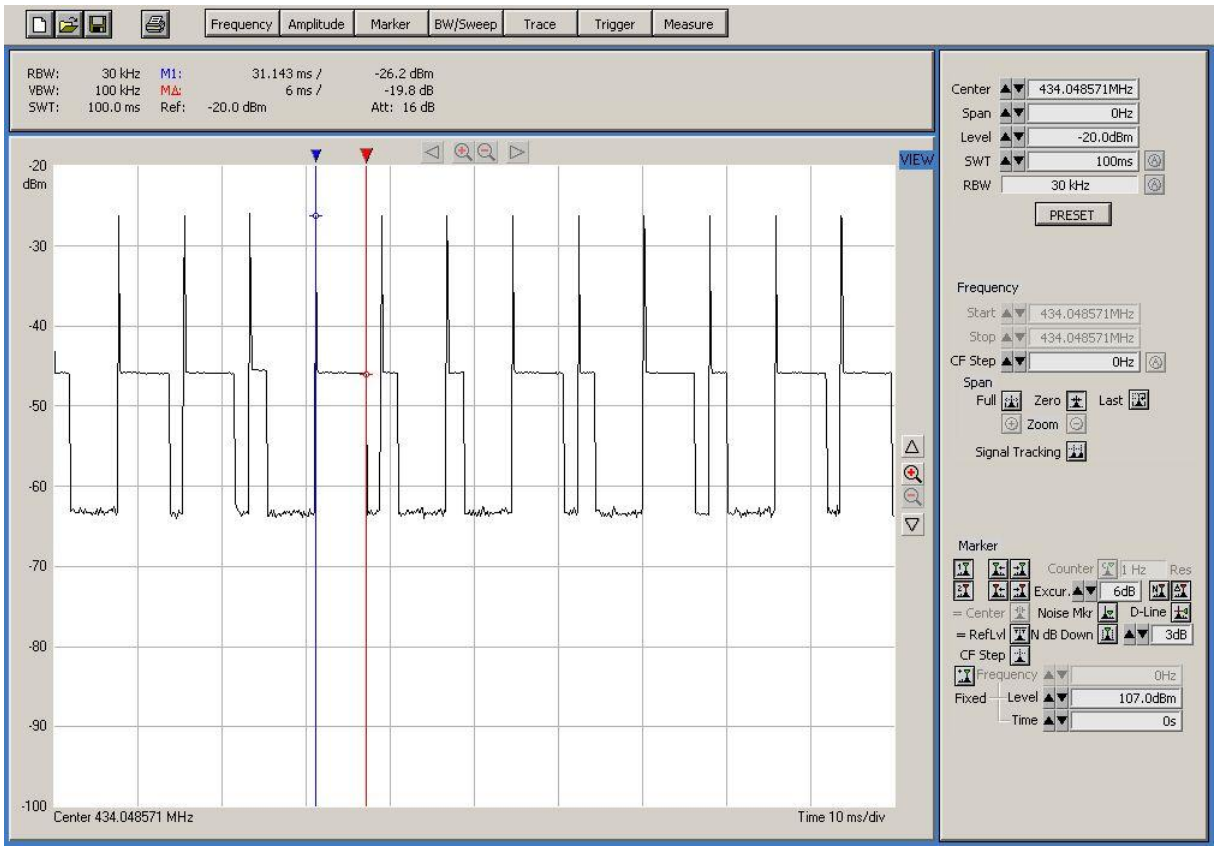
Therefore, the averaging factor is 20 log (0.4777)
= -6.42dB

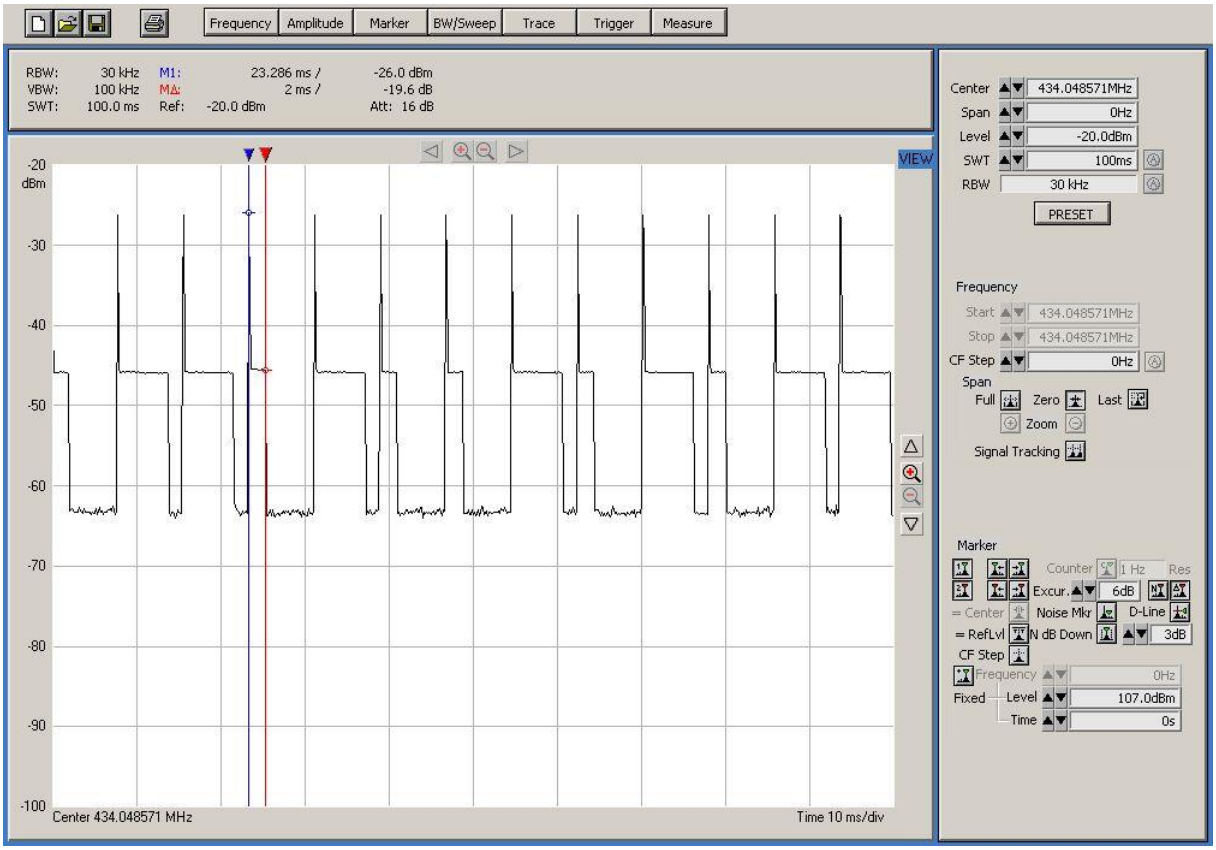
Refer to the following graph for the detail.


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 3.000 s
M1: 1.127143 s / -25.4 dBm
MΔ: 990 ms / -51.1 dB
Ref: -20.0 dBm
Att: 16 dB
VIEW
-20 dBm
-30
-40
-50
-60
-70
-80
-90
-100
Center 434.048571 MHz
Time 300 ms/div
Center 434.048571MHz
Span 0Hz
Level -20.0dBm
SWT 3s
RBW 30 kHz
PRESET
Frequency
Start 434.048571MHz
Stop 434.048571MHz
CF Step 0Hz
Span
Full
Zero
Last
Zoom
Signal Tracking
Marker
Counter 1 Hz Res
Excur. 6dB
= Center
Noise Mkr
D-Line
= RefLvl
N dB Down 3dB
CF Step
Frequency 0Hz
Fixed
Level 107.0dBm
Time 0s


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 1.000 s
M1: 1.127143 s /
MΔ: 990 ms /
Ref: -20.0 dBm
Att: 16 dB
VIEW
-20 dBm
-30
-40
-50
-60
-70
-80
-90
-100
Center 434.048571 MHz
Time 100 ms/div
Center 434.048571MHz
Span 0Hz
Level -20.0dBm
SWT 1s
RBW 30 kHz
PRESET
Frequency
Start 434.048571MHz
Stop 434.048571MHz
CF Step 0Hz
Span
Full
Zero
Last
Zoom
Signal Tracking
Trigger
Free Run
External
Video
Position 70%
Offset 0s


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 480.0 ms
M1: 147.429 ms / -25.9 dBm
M2: 276.343 ms / -39.6 dB
Ref: -20.0 dBm
Att: 16 dB
VIEW
-20 dBm
-30
-40
-50
-60
-70
-80
-90
-100
Center 434.048571 MHz
Time 48 ms/div
Center 434.048571MHz
Span 0Hz
Level -20.0dBm
SWT 480ms
RBW 30 kHz
PRESET
Frequency
Start 434.048571MHz
Stop 434.048571MHz
CF Step 0Hz
Span
Full
Zero
Last
Zoom
Signal Tracking
Marker
Counter
1 Hz
Res
Excur.
6dB
= Center
Noise Mkr
D-Line
= RefLvl
N dB Down
3dB
CF Step
Frequency
0Hz
Fixed
Level
107.0dBm
Time
0s


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 100.0 ms
M1: 31.143 ms / -26.2 dBm
M2: 6 ms / -19.8 dB
Ref: -20.0 dBm
Att: 16 dB
VIEW
-20 dBm
-30
-40
-50
-60
-70
-80
-90
-100
Center 434.048571 MHz
Time 10 ms/div
Center 434.048571MHz
Span 0Hz
Level -20.0dBm
SWT 100ms
RBW 30 kHz
PRESET
Frequency
Start 434.048571MHz
Stop 434.048571MHz
CF Step 0Hz
Span
Full
Zero
Last
Zoom
Signal Tracking
Marker
Counter
1 Hz
Res
Excur.
6dB
= Center
Noise Mkr
D-Line
= RefLvl
N dB Down
3dB
CF Step
Frequency
0Hz
Fixed
Level
107.0dBm
Time
0s


Frequency
Amplitude
Marker
BW/Sweep
Trace
Trigger
Measure
RBW: 30 kHz
VBW: 100 kHz
SWT: 100.0 ms
M1: 23.286 ms / -26.0 dBm
M2: 2 ms / -19.6 dB
Ref: -20.0 dBm
Att: 16 dB
VIEW
-20 dBm
-30
-40
-50
-60
-70
-80
-90
-100
Center 434.048571 MHz
Time 10 ms/div
Center 434.048571MHz
Span 0Hz
Level -20.0dBm
SWT 100ms
RBW 30 kHz
PRESET
Frequency
Start 434.048571MHz
Stop 434.048571MHz
CF Step 0Hz
Span
Full
Zero
Last
Zoom
Signal Tracking
Marker
Counter 1 Hz Res
Excur. 6dB
= Center
Noise Mkr
D-Line
= RefLvl
N dB Down 3dB
CF Step
Frequency 0Hz
Fixed
Level 107.0dBm
Time 0s

5.0 List of Measurement Equipment

Radiated Emission and Bandwidth Measurement

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	CAL DUE
EMC209	Semi-anechoic Chamber	Frankonia	N/A	N/A	28-Mar-07	28-Mar-08
EMC017	Test Receiver	R & S	ESVS30	842807/009	06-Aug-07	06-Aug-08
EMC040	Bi-conical Antenna	R & S	HK116	841489/016	08-Feb-06	08-Feb-08
EMC045	Log Periodic Antenna	R & S	HL223	841516/020	03-Feb-06	03-Feb-08
EMC184	Horn Antenna	EMCO	3115	9002-3347	02-Feb-06	02-Feb-08
EMC138	Loop Antenna	Chase	LLA6142	1019	07-Jun-07	07-Jun-08
EMC406	Coaxial Cable 50ohm	Rosenberger	RTK081-05S-10m	LA2-001-10M/002	15-May-07	15-May-08
EMC556	Spectrum Analyser	R & S	FSP 30	100416	08-Jun-07	08-Jun-08
60/2-74-05-042	Spectrum Analyser	R & S	FS 300	101335	04-Apr-07	04-Apr-09

Remarks:
CM Corrective Maintenance
N/A Not Applicable or Not Available
TBD To Be Determined