TEST REPORT

Application No.:	SHCR2208001706AT
FCC ID:	FI5-EX1-02
Applicant:	Michelin North America (US) Inc.
Address of Applicant:	One Parkway South, Greenville, SC 29615, United States
Manufacturer:	MFP Michelin
Address of Manufacturer:	23 Place des Carmes-Déchaux, 63000 Clermont-Ferrand, France
Factory:	EMI
Address of Factory:	ZAC Puy Bayard, 63570 BRASSAC-LES-MINES, FRANCE
Equipment Under Test (EUT):	
EUT Name:	MEMS EVOLUTION ACTIVE ANTENNA
Model No.:	AA-V3.2
Trade Mark:	MICHELIN
Standard(s) :	47 CFR Part 15, Subpart B
Date of Receipt:	2022-08-16
Date of Test:	2022-08-17 to 2022-08-18
Date of Issue:	2022-09-16
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan
Laboratory Manager

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2022-09-16	/

Authorized for issue by:				
		Bill Wu **Bill Wu/Project Engineer**		
		Parlam Zhan **Parlam Zhan/Reviewer**		

2 Test Summary

Emission Part				
Item	**Standard**	**Method**	**Requirement**	**Result**
Radiated Emissions (30MHz-1GHz)	47 CFR Part 15, Subpart B	ANSI C63.4:2014	15.109(a);Class B	Pass
Radiated Emissions (Above 1GHz)		ANSI C63.4:2014	15.109(g);Class B	Pass

3 Contents

4 General Information

4.1 Details of E.U.T.

Power supply:	DC 12V

4.2 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
Laptop	HuaWei	NbB-WAH9P	-

4.3 Measurement Uncertainty & Decision Rule

Measurement Uncertainty:

No.	Item	Measurement Uncertainty (U_{Lab})	U_{CISPR}
1	Conducted Emission at mains port using AMN	2.6dB (9kHz to 150kHz)	3.8dB (9kHz to 150kHz)
		2.4dB (150kHz to 30MHz)	3.4dB (150kHz to 30MHz)
2	Conducted Emission at mains port using VP	1.8dB (9kHz to 30MHz)	2.9dB (9kHz to 30MHz)
3	Conducted Emission at telecommunication port using AAN	4.2dB (150kHz to 30MHz)	5.0dB (150kHz to 30MHz)
4	Radiated Power	3.2dB (30MHz to 300MHz)	4.5dB (30MHz to 300MHz)
5	Radiated emission	4.5dB (30MHz-1GHz)	6.3dB (30MHz-1GHz)
		5.1dB (1GHz-6GHz)	5.2dB (1GHz-6GHz)
		5.4dB (6GHz-18GHz)	5.5dB (6GHz-18GHz)
6	Radiated disturbance (disturbance current in a LLAS)	2.4dB (9kHz to 30MHz)	3.3dB (9kHz to 30MHz)

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

Decision Rule:

• CISPR 16-4-2 for emission measurements is as below described.

Pass means the test result passed the test standard requirement, please find the detailed decision rule in the report relative section.

U_{LAB} less than U_{CISPR}, therefore:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non-compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

4.4 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. E&E Lab
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China
Tel: +86 21 6191 5666 Fax: +86 21 6191 5678
No tests were sub-contracted.
Note:
1. SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc) is provided by the applicant. (if applicable).
2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).

4.5 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• CNAS (No. CNAS L0599)

CNAS has accredited SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

• A2LA (Certificate No. 6332.01)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

• FCC (Designation Number: CN1301)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

• ISED (CAB Identifier: CN0020)

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory.
Company Number: 8617A

• VCCI (Member No.: 3061)

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4.6 Deviation from Standards

None

4.7 Abnormalities from Standard Conditions

None

5 Equipment List

Radiated Emissions (30MHz-1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI test receiver	Rohde & Schwarz	ESU40	SHEM051-1	2021/12/20	2022/12/19
EMI test receiver	Rohde & Schwarz	ESR7	SHEM201-1	2022/8/02	2023/8/01
CONTROLLER	INNCO	CO2000	SHEM047-1	N/A	N/A
ANTENNA MAST	INNCO	MA400-EP	SHEM047-2	N/A	N/A
TURN DEVICE	INNCO	DE 3600-RH	SHEM047-3	N/A	N/A
Broadband UHF-VHF ANTENNA	SCHWARZBECK	VULB9168	SHEM048-1	2021/9/21	2023/9/20
Broadband UHF-VHF ANTENNA	SCHWARZBECK	VULB9168	SHEM202-1	2021/5/7	2023/5/6
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020/5/25	2023/5/24
Pre-amplifier	HP	8447D	SHEM236-1	2022/8/02	2023/8/01
Pre-amplifier	HP	8447D	SHEM143-1	2021/12/20	2022/12/19
RE test Cable	/	/	SHEM173-1&SHEM174-1	2022/1/7	2023/1/6
Test Software	ESE	e3	Version: 6.111221a	N/A	N/A

Radiated Emissions (Above 1GHz)					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
EMI test receiver	Rohde & Schwarz	ESU40	SHEM051-1	2021/12/20	2022/12/19
EMI test receiver	Rohde & Schwarz	ESR7	SHEM201-1	2022/8/02	2023/8/01
CONTROLLER	INNCO	CO2000	SHEM047-1	N/A	N/A
ANTENNA MAST	INNCO	MA400-EP	SHEM047-2	N/A	N/A
TURN DEVICE	INNCO	DE 3600-RH	SHEM047-3	N/A	N/A
Broadband UHF-VHF ANTENNA	SCHWARZBECK	VULB9168	SHEM048-1	2021/9/21	2023/9/20
Broadband UHF-VHF ANTENNA	SCHWARZBECK	VULB9168	SHEM202-1	2021/5/7	2023/5/6
Horn Antenna (1-18GHz)	Schwarzbeck	BBHA9120D	SHEM050-1	2021/9/18	2023/9/17
Pre-amplifier (1-18GHz)	Schwarzbeck	SCU-F0118-G40-BZ4-CSS(F)	SHEM050-2	2021/12/20	2022/12/19
Horn Antenna (1-18GHz)	Schwarzbeck	HF906	SHEM009-1	2022/8/11	2024/8/10
Semi/Fully Anechoic	ST	11*6*6M	SHEM078-2	2020/5/25	2023/5/24
RE test Cable	/	/	SHEM173-1&SHEM174-1	2022/1/7	2023/1/6

Test Software	ESE	e3	Version: 6.111221a	N/A	N/A

General used equipment					
Equipment	**Manufacturer**	**Model No**	**Inventory No**	**Cal Date**	**Cal Due Date**
Digital pressure meter	YONGZHI	DYM3-01	SHEM082-1	2021-01-22	2024-01-21
Temperature&humidity recorder	ShangHai weather meter work	ZJ 1-2B	SHEM042-9~10	2021-12-29	2022-12-28
Temperature&humidity recorder	ShangHai weather meter work	ZJ 1-2B	SHEM042-5	2022-08-01	2023-07-31
Digital Temperature& humidity recorder	Jianda Renke	RS-WS-N01-6J	SHEM247-1~8	2022-01-20	2023-01-19
Digital Multimeter	FLUKE	17B+	SHEM271-1	2021-08-26	2022-08-25
Autoformer regulator	Guangzhou bao de	TDGC2-5KVA	SHEM150-1	N/A	N/A
Multi-purpose tong tester	FLUKE	316	SHEM001-1	2021-12-20	2022-12-19

6 Emission Test Results

6.1 Radiated Emissions (30MHz-1GHz)

Test Requirement: 47 CFR Part 15, Subpart B

Test Method: ANSI C63.4:2014

Limit:

	Class B
Test Distance:	3m
30MHz -88MHz	40.0(dBμV/m) quasi-peak
88MHz-216MHz	43.5(dBμV/m) quasi-peak
216MHz-960MHz	46.0(dBμV/m) quasi-peak
960MHz-1000MHz	54.0(dBμV/m) quasi-peak
Detector:	Peak for pre-scan (120kHz resolution bandwidth) 30MHz to1000MHz

	Class B
Test Distance:	10m
30MHz -88MHz	29.5(dBμV/m) quasi-peak
88MHz-216MHz	33.1(dBμV/m) quasi-peak
216MHz-960MHz	35.6(dBμV/m) quasi-peak
960MHz-1000MHz	43.5(dBμV/m) quasi-peak
Detector:	Peak for pre-scan (120kHz resolution bandwidth) 30MHz to1000MHz

6.1.1 E.U.T. Operation

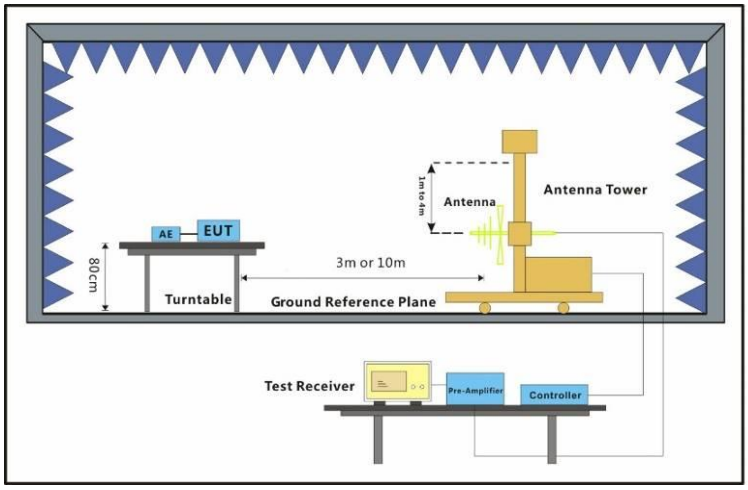
Operating Environment:

Temperature: 22.9 °C Humidity: 53.6 % RH Atmospheric Pressure: 1010 mbar

6.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Operation Wireless_Keep the EUT working continuously via wireless function（RX frequency: 433.92MHz ISM band）.

6.1.3 Test Setup Diagram

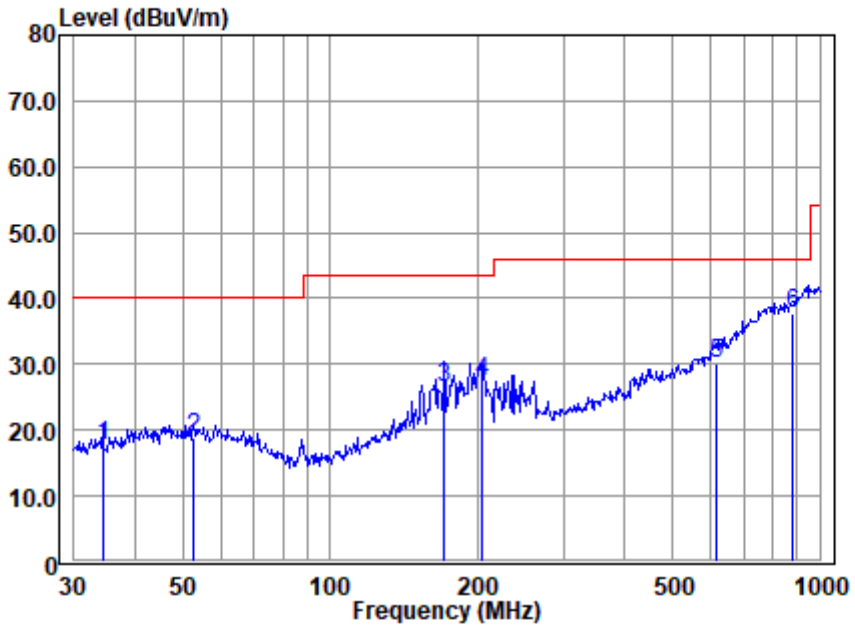


6.1.4 Measurement Procedure and Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by BiConiLog antenna with 2 orthogonal polarities.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test Mode: 00; Polarity: Horizontal

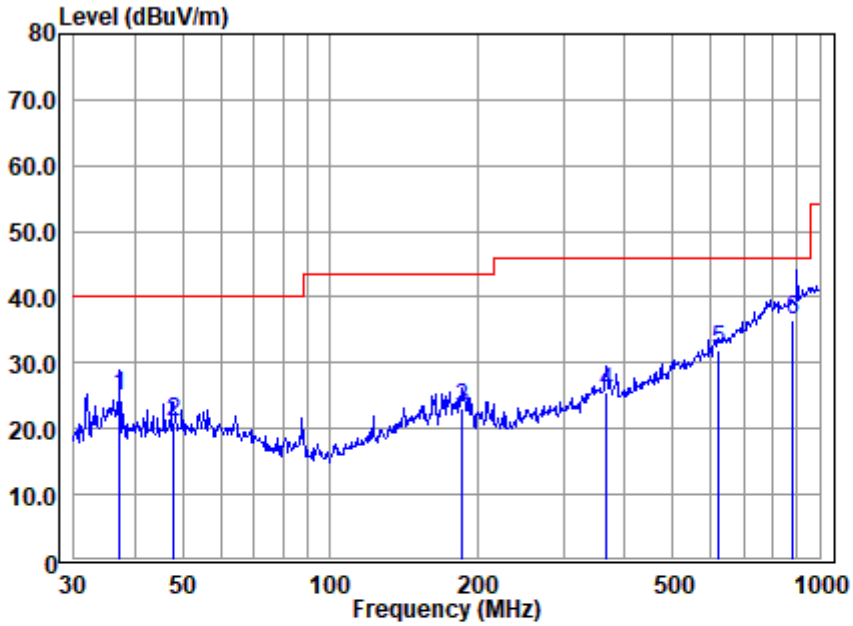


Antenna Polarity :Horizontal
EUT/Project :01706AT
Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	34.33	35.43	12.39	1.51	31.70	17.63	40.00	-22.37	QP
2	52.62	35.31	13.69	1.74	32.00	18.74	40.00	-21.26	QP
3	171.27	42.85	12.57	3.23	32.23	26.42	43.50	-17.08	QP
4	203.86	46.31	9.79	3.43	32.28	27.25	43.50	-16.25	QP
5	613.30	36.22	20.15	6.32	32.47	30.22	46.00	-15.78	QP
6	883.71	36.89	23.35	7.47	30.07	37.64	46.00	-8.36	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical



Antenna Polarity :Vertical
EUT/Project :01706AT
Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuv	dB/m	dB	dB	dBuv/m	dBuv/m	dB	
1	37.14	42.48	12.68	1.56	31.74	24.98	40.00	-15.02	QP
2	47.83	37.33	14.01	1.64	31.96	21.02	40.00	-18.98	QP
3	185.29	40.85	10.98	3.28	32.10	23.01	43.50	-20.49	QP
4	367.78	39.15	14.87	4.88	33.28	25.62	46.00	-20.38	QP
5	620.24	37.57	20.33	6.31	32.32	31.89	46.00	-14.11	QP
6	878.76	35.94	23.28	7.46	30.11	36.57	46.00	-9.43	QP

Note: Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

6.2 Radiated Emissions (Above 1GHz)

Test Requirement: 47 CFR Part 15, Subpart B

Test Method: ANSI C63.4:2014

Limit:

	Class B
Above 1GHz	74(dBμV/m) peak, 54(dBμV/m) average
Detector:	Peak for pre-scan (1000kHz resolution bandwidth) 1000M to18000MHz

6.2.1 E.U.T. Operation

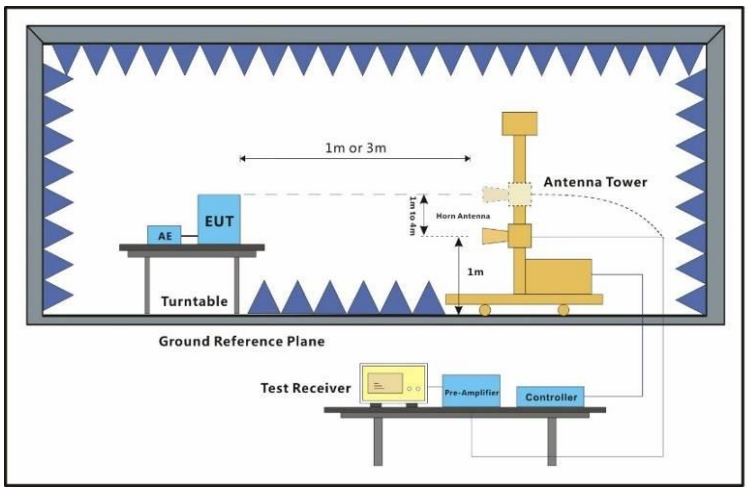
Operating Environment:

Temperature: 22 °C Humidity: 50 % RH Atmospheric Pressure: 1010 mbar

6.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	Operation Wireless_Keep the EUT working continuously via wireless function（RX frequency: 433.92MHz ISM band）.

6.2.3 Test Setup Diagram



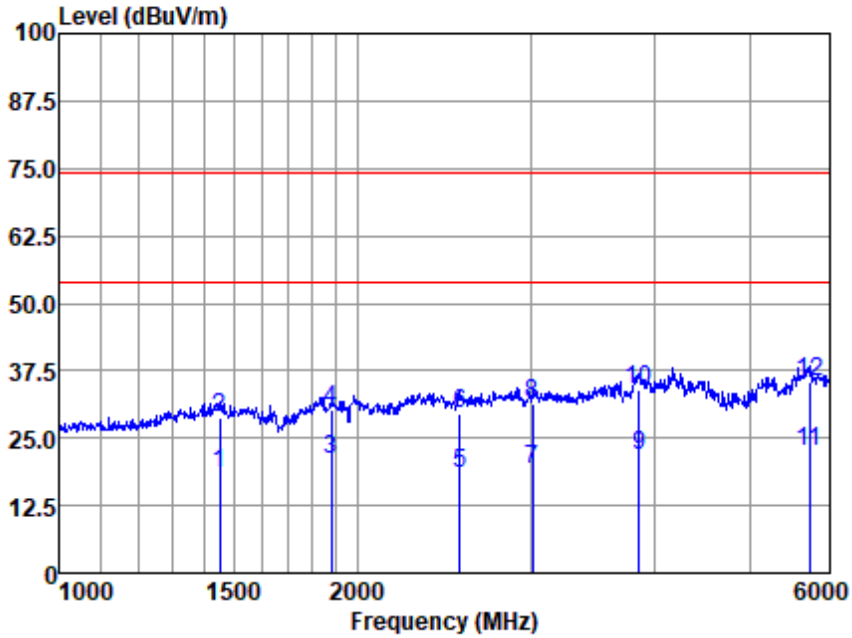
6.2.4 Measurement Procedure and Data

An initial pre-scan was performed in the chamber using the spectrum analyser in peak detection mode. Average measurements were conducted based on the peak sweep graph. The EUT was measured by Horn antenna with 2 orthogonal polarities.

The red line show in graphic is the limit in standard used in this section.

Remark: Level= Read Level+ Cable Loss+ Antenna Factor- Preamp Factor

Test Mode: 00; Polarity: Horizontal

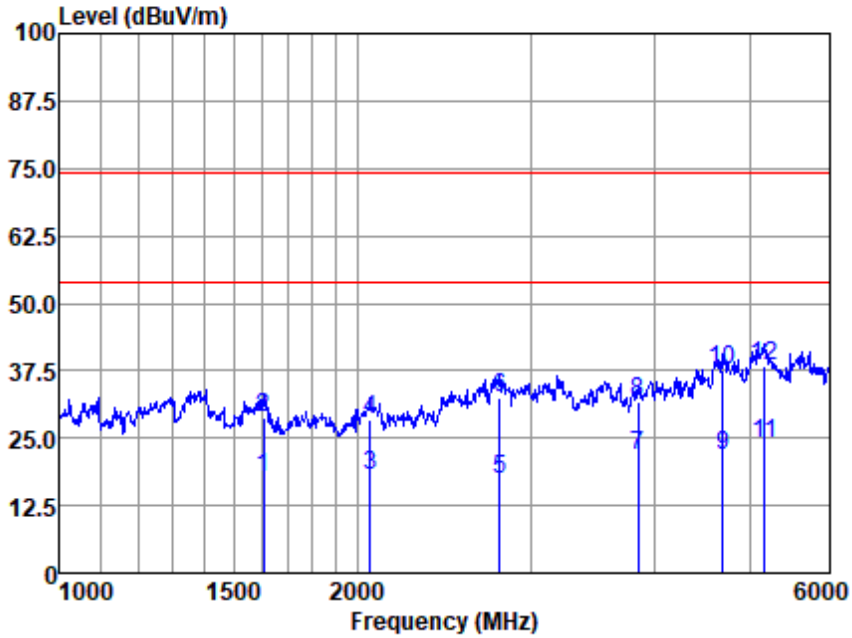


Antenna Polarity :HORIZONTAL
EUT/Project :1706AT
Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1451.628	29.30	23.50	6.89	41.19	18.50	54.00	-35.50	Average
2	1451.628	39.55	23.50	6.89	41.19	28.75	74.00	-45.25	Peak
3	1882.294	30.69	23.95	7.82	41.30	21.16	54.00	-32.84	Average
4	1882.294	39.81	23.95	7.82	41.30	30.28	74.00	-43.72	Peak
5	2538.859	24.94	26.48	9.58	42.40	18.60	54.00	-35.40	Average
6	2538.859	35.80	26.48	9.58	42.40	29.46	74.00	-44.54	Peak
7	3009.976	23.34	27.56	10.58	42.40	19.08	54.00	-34.92	Average
8	3009.976	35.59	27.56	10.58	42.40	31.33	74.00	-42.67	Peak
9	3854.321	22.45	28.94	12.61	42.40	21.60	54.00	-32.40	Average
10	3854.321	34.72	28.94	12.61	42.40	33.87	74.00	-40.13	Peak
11	5726.896	18.24	32.12	14.74	42.50	22.60	54.00	-31.40	Average
12	5726.896	30.93	32.12	14.74	42.50	35.29	74.00	-38.71	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

Test Mode: 00; Polarity: Vertical



Antenna Polarity :VERTICAL
EUT/Project :1706AT
Test mode :00

	Freq	Read Level	Antenna Factor	Cable Loss	Preamp Factor	Emission Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB	
1	1607.719	28.08	23.44	7.41	41.24	17.69	54.00	-36.31	Average
2	1607.719	39.09	23.44	7.41	41.24	28.70	74.00	-45.30	Peak
3	2058.709	26.17	25.06	8.38	41.47	18.14	54.00	-35.86	Average
4	2058.709	36.52	25.06	8.38	41.47	28.49	74.00	-45.51	Peak
5	2786.779	22.45	26.99	10.29	42.40	17.33	54.00	-36.67	Average
6	2786.779	37.55	26.99	10.29	42.40	32.43	74.00	-41.57	Peak
7	3847.421	22.52	28.92	12.61	42.40	21.65	54.00	-32.35	Average
8	3847.421	32.74	28.92	12.61	42.40	31.87	74.00	-42.13	Peak
9	4685.613	19.96	30.63	13.46	42.40	21.65	54.00	-32.35	Average
10	4685.613	35.77	30.63	13.46	42.40	37.46	74.00	-36.54	Peak
11	5161.626	21.13	31.47	13.68	42.43	23.85	54.00	-30.15	Average
12	5161.626	35.77	31.47	13.68	42.43	38.49	74.00	-35.51	Peak

Note:Emission Level=Read Level+Antenna Factor+Cable loss-Preamp Factor

7 Test Setup Photo

Refer to the < Test Setup photos-FCC>.

8 EUT Constructional Details (EUT Photos)

Refer to the < External Photos > & < Internal Photos >.

-- End of the Report --