



MEASUREMENT REPORT

FCC PART 25

FCC ID: 2AJNDGMPT401

APPLICANT: HONEYWELL GLOBAL TRACKING LTD

Application Type: Certification

Product: Personal Tracker

Model No.: GMPT-401, GMPT-401-C1D2

Brand Name: Honeywell

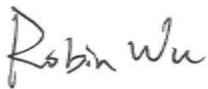
FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)

FCC Rule Part(s): FCC CFR47 Part 25

Test Procedure(s): ANSI C63.4-2014, ANSI/TIA-603-D 2010,
KDB 971168 D01v02r02

Test Date: June 02 ~ August 25, 2016

Reviewed By
Manager

: 

(Robin Wu)

Approved By
CEO

: 

(Marlin Chen)



The test results relate only to the samples tested.

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI/TIA-603-D 2010. Test results reported herein relate only to the item(s) tested.

The test report shall not be reproduced except in full without the written approval of MRT Technology (Suzhou) Co., Ltd.

Revision History

Report No.	Version	Description	Issue Date	Note
1606RSU01507	Rev. 01	Initial report	08-26-2016	Invalid
1606RSU01507	Rev. 02	Revised some test data and test description	10-07-2016	Invalid
1606RSU01507	Rev. 03	Revised the OBW test procedure	10-08-2016	Invalid
1606RSU01507	Rev. 04	Revised the output power calculation	10-09-2016	Valid

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§2.1033 General Information

Applicant:	HONEYWELL GLOBAL TRACKING LTD
Applicant Address:	Unit 17 Miller Court, Severn Drive Tewkesbury, Gloucestershire GL20 8DN UK
Manufacturer:	HONEYWELL GLOBAL TRACKING LTD
Manufacturer Address:	Unit 17 Miller Court, Severn Drive Tewkesbury, Gloucestershire GL20 8DN UK
Test Site:	MRT Technology (Suzhou) Co., Ltd
Test Site Address:	D8 Building, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China
MRT Registration No.:	809388
FCC Rule Part(s):	Part CFR47 Part25
FCC ID:	2AJNDGMPT401
Test Device Serial No.:	N/A <input type="checkbox"/> Production <input checked="" type="checkbox"/> Pre-Production <input type="checkbox"/> Engineering
FCC Classification:	Licensed Non-Broadcast Station Transmitter

Test Facility / Accreditations

Measurements were performed at MRT Laboratory located in Tian'edang Rd., Suzhou, China.

- MRT facility is a FCC registered (MRT Reg. No. 809388) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules.
- MRT facility is an IC registered (MRT Reg. No. 11384A-1) test laboratory with the site description on file at Industry Canada.
- MRT facility is a VCCI registered (R-4179, G-814, C-4664, T-2206) test laboratory with the site description on file at VCCI Council.
- MRT Lab is accredited to ISO 17025 by the American Association for Laboratory Accreditation (A2LA) under the American Association for Laboratory Accreditation Program (A2LA Cert. No. 3628.01) in EMC, Telecommunications and Radio testing for FCC, Industry Canada, EU and TELEC Rules.



1. INTRODUCTION

1.1. Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Industry Canada Certification and Engineering Bureau.

1.2. MRT Test Location

The map below shows the location of the MRT LABORATORY, its proximity to the Taihu Lake. These measurement tests were conducted at the MRT Technology (Suzhou) Co., Ltd. Facility located at D8 Building, Youxin Industrial Park, No.2 Tian'edang Rd., Wuzhong Economic Development Zone, Suzhou, China. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4-2009 on September 30, 2013.



2. PRODUCT INFORMATION

2.1. Equipment Description

Product Name	Personal Tracker
Model No.	GMPT-401, GMPT-401-C1D2
Brand Name	Honeywell
Bluetooth Specification	v4.1
GPS	1575.42MHz
Satellite Specification	1624MHz
Components	
AC Adapter	Model No.: ADS-12B-06 05010E Input Power: 100 - 240V ~ 50/60Hz, 0.3A Output Power: 5VDC/2A
Car Adapter	Model No.: C15E-0520CAZ-S0 Input Power: 12/24VDC, 1300mA Max Output Power: 5VDC, 2A

2.2. Product Specification Subjective to this Report

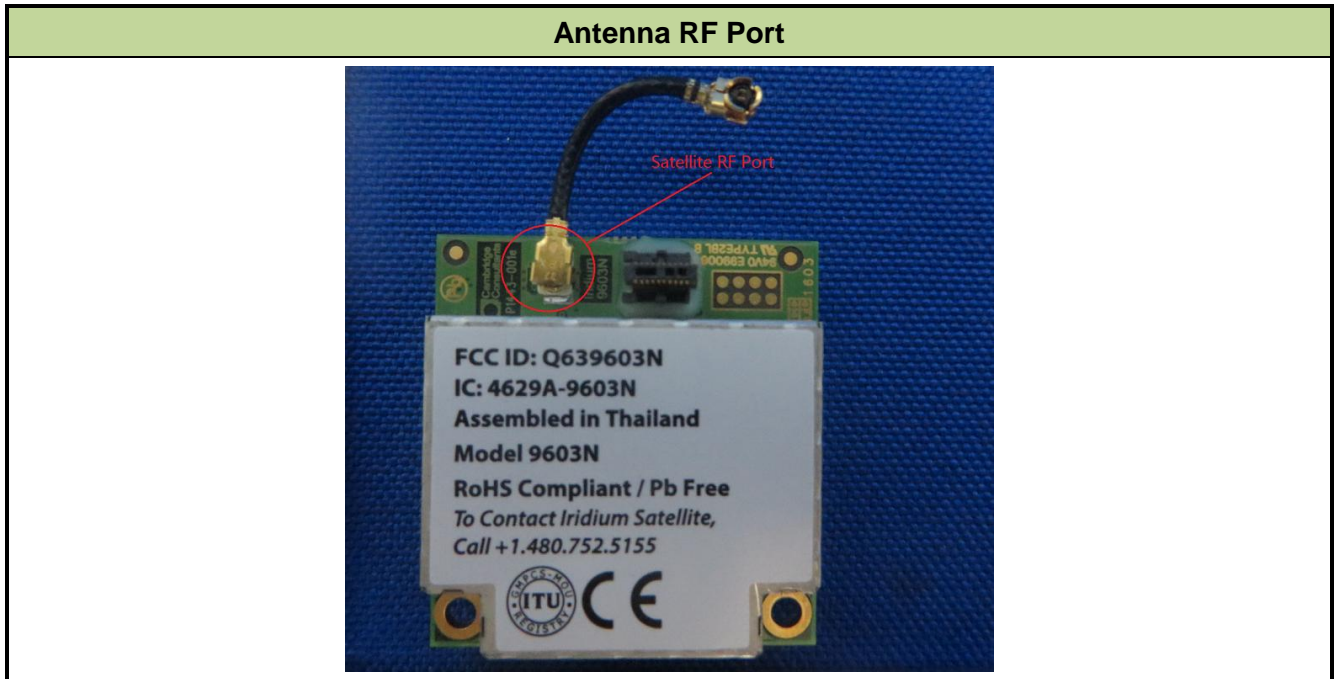
Declared Frequency	1624MHz
Channel Number	1
Type of Modulation	TDD (Time Domain Duplex)
Data Rate	33.6 - 604.8 kbps

Note: For other features of this EUT, test report will be issued separately.

2.3. Description of Available Antennas

Antenna Type	Manufacturer	Model No.	Max Peak Gain (dBi)
Dipole Antenna 1#	Maxtena Inc.	M1600HCT-P-SMA	2.8 for 1616~1626MHz -3dBi for 1575.42MHz
Dipole Antenna 2#	Maxtena Inc.	M1600HCT-P-SMA	2.8 for 1616~1626MHz -3dBi for 1575.42MHz

2.4. Description of Antenna RF Port



2.5. Device Capabilities

This device contains the following capabilities:

1.6GHz Mobile/Satellite device, BLE (v4.1, single mode), GPS

2.6. Test Configuration

The **Personal Tracker** was tested per the guidance of ANSI/TIA-603-D. ANSI C63.4-2014 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

2.7. Test Mode

Test Mode	Mode 1: Transmit
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2.8. Test Software

The test utility software used during testing was “nRF Toolbox” provided by applicant.

2.9. EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and/or no modifications were made during testing.

3. TEST EQUIPMENT CALIBRATION DATE

Radiated Spurious Emission - AC1

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
MXE EMI Receiver	Agilent	N9038A	MRTSUE06125	1 year	2016/08/03
EMI Test Receiver	R&S	ESR7	MRTSUE06001	1 year	2016/11/03
Preamplifier	Agilent	83017A	MRTSUE06076	1 year	2017/03/28
Loop Antenna	Schwarzbeck	FMZB1519	MRTSUE06025	1 year	2016/12/14
TRILOG Antenna	Schwarzbeck	VULB9168	MRTSUE06172	1 year	2016/12/11
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	MRTSUE06023	1 year	2016/11/07
Broadband Horn Antenna	Schwarzbeck	BBHA9170	MRTSUE06024	1 year	2017/01/04
Digital Thermometer & Hygrometer	Yuhuaze	HTC-2	MRTSUE06183	1 year	2016/12/20
Anechoic Chamber	TDK	Chamber-AC1	MRTSUE06212	1 year	2017/05/10

Conducted Test Equipment - TR3

Instrument	Manufacturer	Type No.	Serial No.	Cali. Interval	Cali. Due Date
Spectrum Analyzer	Agilent	N9020A	MRTSUE06106	1 year	2017/05/08
USB Wideband Power Sensor	Boonton	55006	MRTSUE06109	1 year	2017/05/08
Programmable Temperature & Humidity Chamber	BAOYT	BYH-1500L	MRTSUE06051	1 year	2016/12/08
DC Power Supply	APECC	DPS-336030D	MRTSUE06014	1 year	2016/09/13
Temperature/Humidity Meter	Yuhuaze	HTC-2	MRTSUE06180	1 year	2016/12/20

Software	Version	Function
e3	V8.3.5	EMI Test Software

4. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Radiated Emission Measurement - AC1
Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$):
9kHz ~ 1GHz: 4.18dB
1GHz ~ 25GHz: 4.76dB

5. TEST RESULT

5.1. Summary

Company Name: HONEYWELL GLOBAL TRACKING LTD
FCC ID: 2AJNDGMPT401
FCC Classification: Licensed Non-Broadcast Station Transmitter

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference										
2.1049	Occupied Bandwidth	N/A	Conducted	Pass	Section 7.2										
2.1046(a), 25.204	RF Output Power	$\leq +40\text{dBW}$		Pass	Section 7.3										
2.1051, 25.202(f)	Unwanted Emission at Antenna Terminal	<table border="1"> <thead> <tr> <th>Frequency removed from channel center by:</th> <th>Minimum signal reduction</th> </tr> </thead> <tbody> <tr> <td>0 to 50%</td> <td>In channel</td> </tr> <tr> <td>50 to 100%</td> <td>-25 dBc</td> </tr> <tr> <td>100 to 250%</td> <td>-35 dBc</td> </tr> <tr> <td>More than 250%</td> <td>-13 dBm</td> </tr> </tbody> </table>		Frequency removed from channel center by:	Minimum signal reduction	0 to 50%	In channel	50 to 100%	-25 dBc	100 to 250%	-35 dBc	More than 250%	-13 dBm	Pass	Section 7.4
Frequency removed from channel center by:	Minimum signal reduction														
0 to 50%	In channel														
50 to 100%	-25 dBc														
100 to 250%	-35 dBc														
More than 250%	-13 dBm														
2.1055, 25.202(d)	Frequency Stability	$\pm 10\text{ppm}$	Pass	Section 7.5											
2.1053, 25.202(f)	Radiated Spurious Emission	$\leq -13\text{dBm}$	Radiated	Pass	Section 7.6										
25.216	Protection of Aeronautical Radio Navigation Satellite Service	$\geq 20\text{dBc(Peak)}$	Conducted	Pass	Section 7.7										

Notes:

- All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

5.2. Occupied Bandwidth Measurement

5.2.1. Test Limit

Not Required.

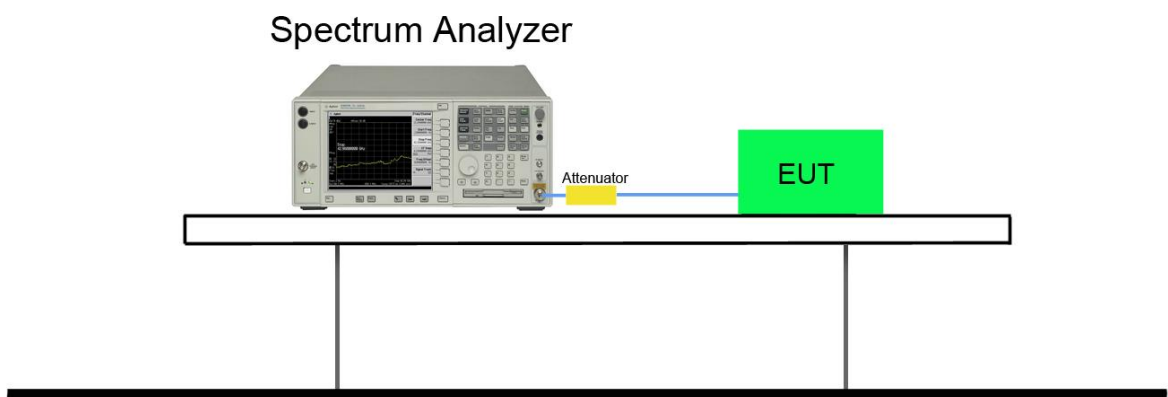
5.2.2. Test Procedure used

FCC Part2.1049 & ANSI/TIA-603-D-2010

5.2.3. Test Setting

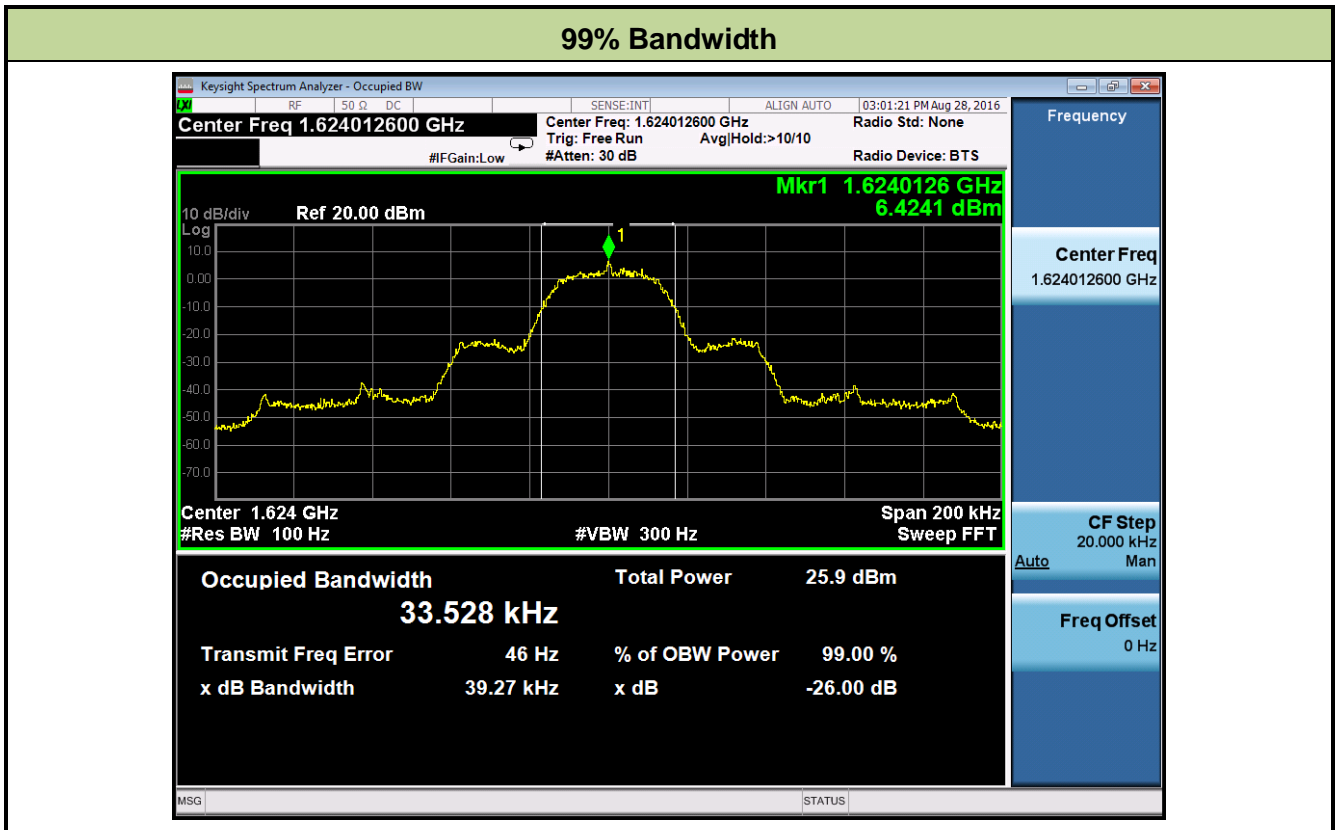
1. The Spectrum's automatic bandwidth measurement capability was used to perform the 99% bandwidth measurement. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. Set RBW = 100 kHz
3. VBW $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. Allow the trace was allowed to stabilize

5.2.4. Test Setup



5.2.5. Test Result

Modulation Mode	Frequency (MHz)	99% Bandwidth (MHz)
TDD	1624	33.53



5.3. RF Output Power Measurement

5.3.1. Test Limit

In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

+ 40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+ 40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

Where θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

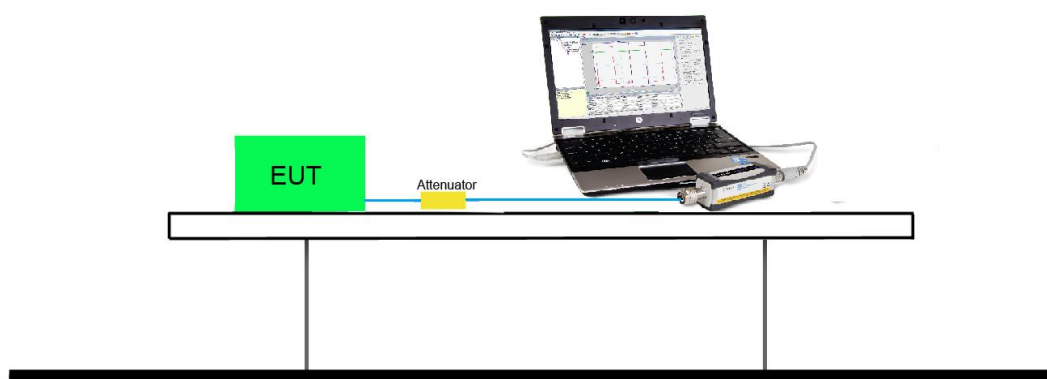
5.3.2. Test Procedure Used

ANSI/TIA-603-D-2010 Clause 2.2.1

5.3.3. Test Setting

Output power measurements were performed only when the EUT was transmitting at its maximum power control level using a power meter with a pulse sensor per TIA-603-D. As device could not be set to continuously transmit, a Duty Cycle correction was added to compensate for carrier off intervals.

5.3.4. Test Setup



5.3.5. Test Result of Output Power

Modulation Mode	Power Meter Level Average Power (dBm)	Antenna Gain (dBi)	E.I.R.P (dBm)	E.I.R.P Limit (dBm)	Result
TDD	19.58	3.0	22.58	70	Pass

Note: E.I.R.P (dBm) = Average Power (dBm) + Antenna Gain (dBi).

FCC 47 CFR Part25, Limit Clause 25.204

+40 dBW in any 4 kHz band for $\theta \leq 0^\circ$

+40 + 3 θ dBW in any 4 kHz band for $0^\circ < \theta \leq 5^\circ$

For angles of elevation of the horizon greater than 5° there shall be no restriction as to the equivalent isotropically radiated power transmitted by an earth station towards the horizon.

5.4. Unwanted Emission at Antenna Terminal Measurement

5.4.1. Test Limit

FCC Part 25.202(f) Emissions Limitations

The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth: 25 decibels;
- (2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth: 35 decibels;
- (3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250% of the authorized bandwidth: an amount equal to 43 decibels plus 10 times Logarithm (to the base 10) of the transmitter power in watts

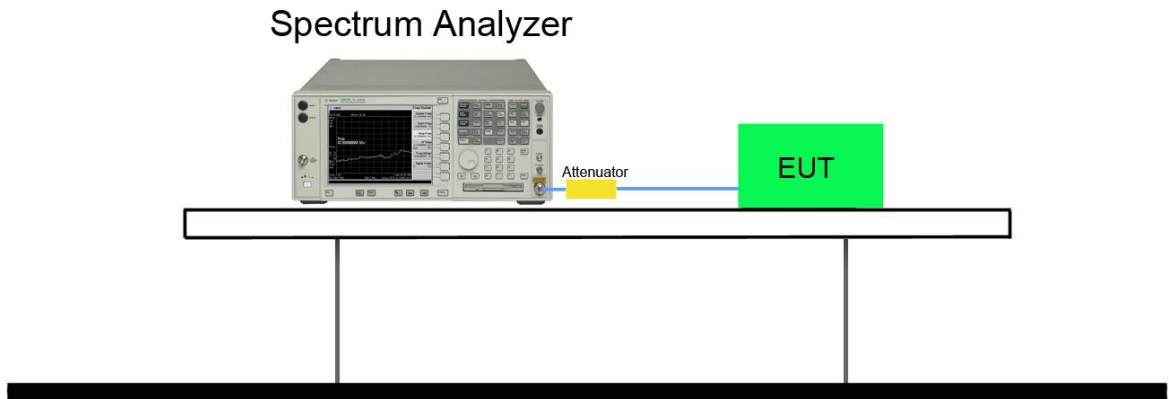
5.4.2. Test Procedure Used

ANSI/TIA-603-D-2010 Clause 2.2.13

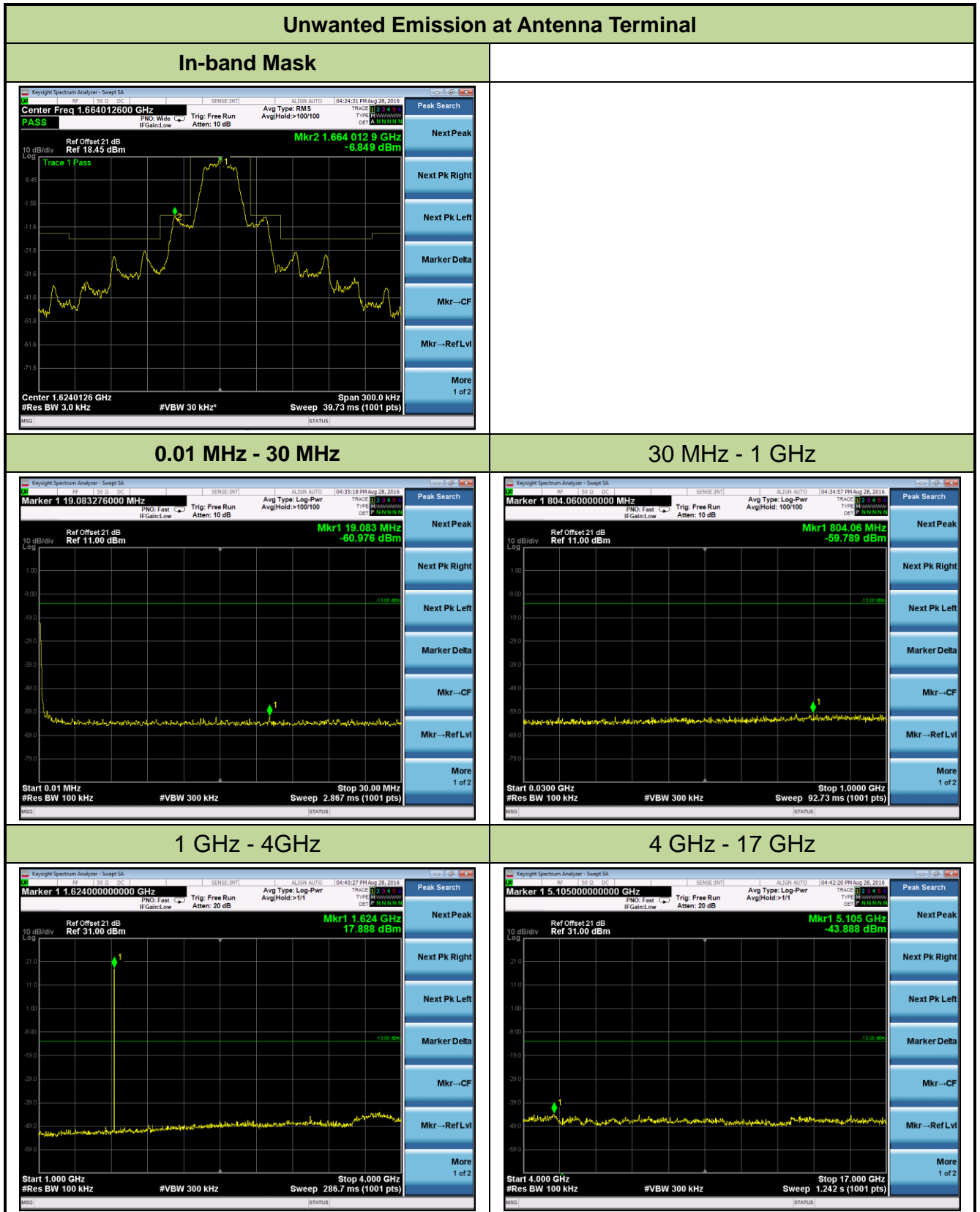
5.4.3. Test Setting

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 3kHz
4. VBW = 10kHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

5.4.4. Test Setup



5.4.5. Test Result



Note 1: The Resolution Bandwidth (RBW) was corrected from 4 kHz by $10\log_{10} [(used\ RBW) / 4kHz]$
 $= 10\log_{10} (3kHz / 4kHz) = -1.25$;

Note 2: Emission limits are computed based on following:

1. Emissions Limits (dBm) (50% -100% of Bandwidth) = $P - 25 + CF = -6.67dBm$;
2. Emissions Limits (dBm) (100% - 250% of Bandwidth) = $P - 35 + CF = -16.67dBm$;
3. Emissions Limits (dBm) (> 250% of Bandwidth) = $P - [43 + 10 \log_{10} PW] + 30 + CF = -14.25dBm$;

Where P = Measured mean power in dBm = 19.58 dBm

PW = Measured mean power in W

CF = RBW correction factor = -1.25

5.5. Frequency Stability Under Temperature & Voltage Variations

5.5.1. Test Limit

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Limit	$< \pm 10\text{ppm}$
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5.5.2. Test Procedure

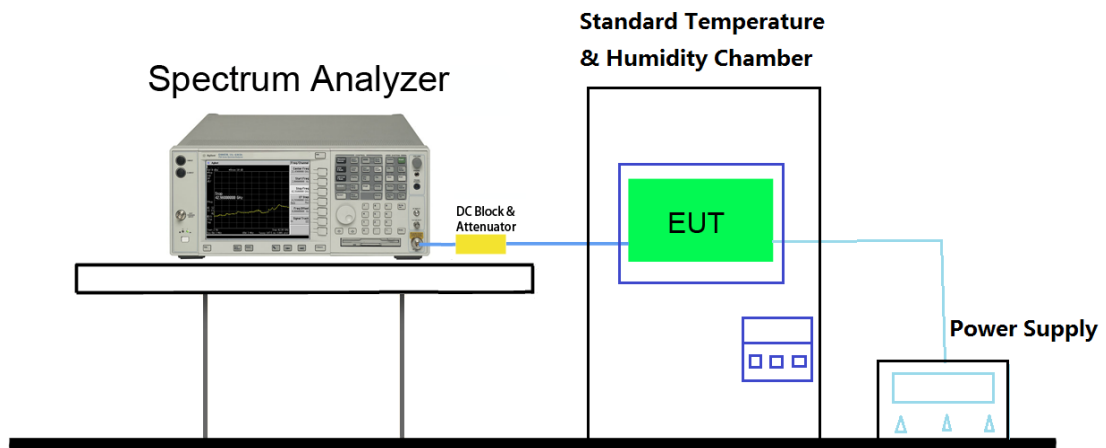
ANSI/TIA-603-D-2010 Clause 2.2.2

The EUT was connected to a spectrum analyzer via a cable and attenuator. The EUT was set to transmit at maximum power with an un-modulated carrier.

For measurements of frequency variation with respect to temperature, the procedure as described in FCC 47 CFR Part 2, clause 2.1055 (b) was followed.

Variations in voltage were performed at the extreme voltage conditions as specified the manufacturer as these voltages exceeded the conditions specified in FCC 47 CFR Part 2, clause 2.1055(d).

5.5.3. Test Setup



5.5.4. Test Result

Operating Frequency	1624.0126MHz
Reference Voltage	3.7 VDC
Deviation Limit	±10ppm

Voltage (%)	Power (VDC)	TEMP (%)	Frequency (MHz)	Freq. Dev. (Hz)	Deviation (ppm)
100%	3.7	+20(Ref)	1624.012552	-48	-0.02956
100%		-30	1624.012494	-106	-0.06527
100%		-20	1624.012482	-118	-0.07266
100%		-10	1624.012582	-18	-0.01108
100%		0	1624.012562	-38	-0.02340
100%		+10	1624.012572	-28	-0.01724
100%		+20	1624.012552	-48	-0.02956
100%		+30	1624.012622	22	0.01355
100%		+40	1624.012634	34	0.02094
100%		+50	1624.012653	53	0.03264
115%		4.2	+20	1624.012593	-7
BAT.ENDPOINT	3.6	+20	1624.012622	22	0.01355

Note: Deviation (ppm) = Frequency Deviation / Operating Frequency *10⁶.

5.6. Radiated Spurious Emission Measurement

5.6.1. Test Limit

FCC Part 25.202(f) Emissions Limitations

The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

- (1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth: 25 decibels;
- (2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth: 35 decibels;
- (3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250% of the authorized bandwidth: an amount equal to 43 decibels plus 10 times Logarithm (to the base 10) of the transmitter power in watts

According to FCC Part 25.216.

Frequency (MHz)	Carrier-on		
	EIRP (dBm)	Measured Bandwidth	Measured Method
0.1 to 30	-13	10kHz	Peak-hold
30 to 1000	-13	100kHz	Peak-hold
1000 to 1559	-13	100kHz	Peak-hold
1559 to 1605	-40	100kHz	Average
1605 to 1610	-40 to +10	100kHz	Average
1610 to 1628.5	Not applicable	Not applicable	Not applicable
1628.5 to 17000	-13	100kHz	Peak-hold

5.6.2. Test Procedure Used

ANSI/TIA-603-D-2010 Clause 2.1.1

5.6.3. Test Setting

The EUT is placed on a non-conducting table above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurement below 1GHz, the resolution bandwidth is set to 100kHz for peak detection measurement or 120kHz for quasi-peak detection measurement. Peak detection is used unless

otherwise notes as quasi-peak.

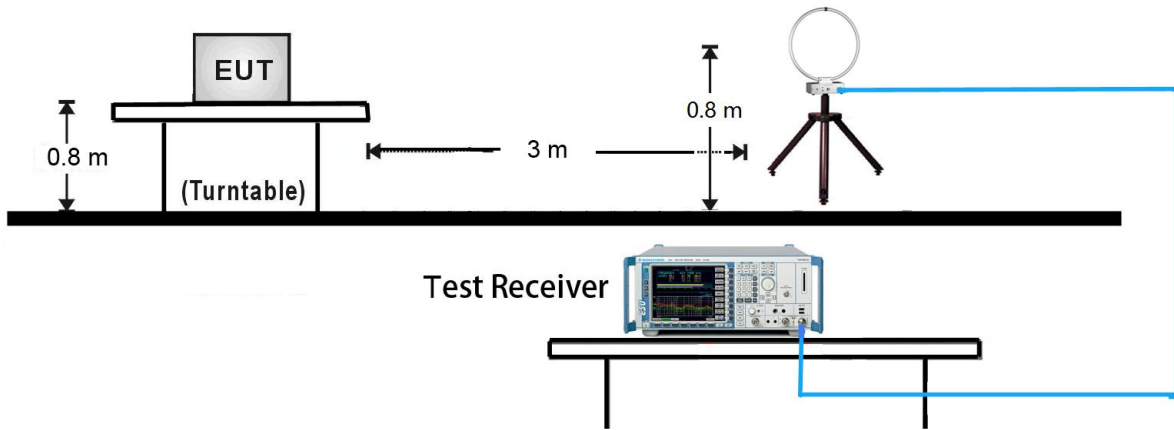
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz for peak measurements.

Bandwidth is reduced to the specified bandwidth, if applicable, for final measurements.

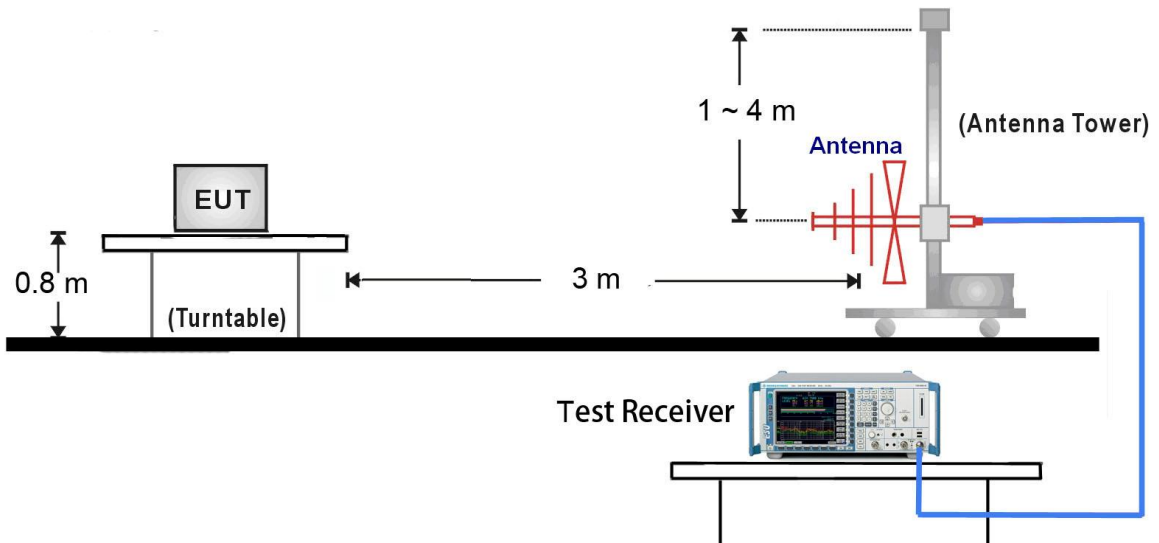
The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

5.6.4. Test Setup

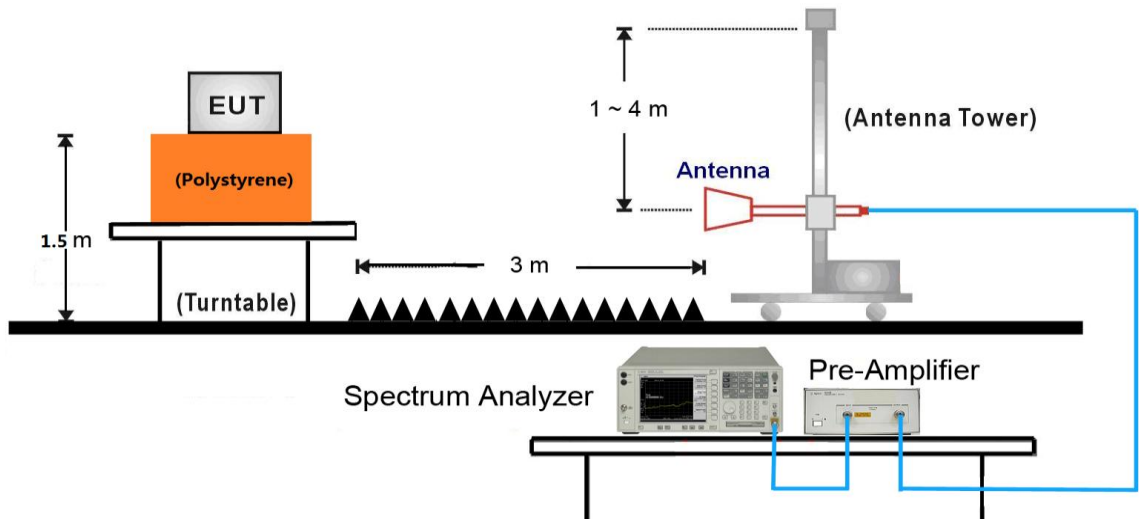
9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



1GHz ~ 18GHz Test Setup:



5.6.5. Test Result

Frequency (MHz)	Ant. Pol. (H/V)	SG Reading (dBm)	Cable Loss (dB)	Substitute Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
0.15 – 30 MHz							
26.0	Face On	-60.2	0.2	-11.0	-71.4	-13.0	-58.4
30 – 1000 MHz							
235.2	H	-67.9	0.5	6.3	-62.1	-13.0	-49.1
638.2	H	-64.4	0.7	7.4	-57.8	-13.0	-44.8
954.9	H	-59.3	0.8	7.7	-52.4	-13.0	-39.4
112.9	V	-63.3	0.3	-0.2	-63.8	-13.0	-50.8
261.8	V	-72.4	0.5	6.8	-66.1	-13.0	-53.1
802.6	V	-61.0	0.8	7.6	-54.2	-13.0	-41.2
1000 – 1559 MHz							
1323.1	H	-52.6	1.0	7.6	-46.0	-13.0	-33.0
1384.6	V	-52.0	1.0	7.9	-45.1	-13.0	-32.1
1559 – 1605 MHz							
1598.8	H	-63.7	1.1	9.4	-55.4	-40.0	-15.4
1598.8	V	-63.9	1.1	9.4	-55.6	-40.0	-15.6
1605 – 1610 MHz							
1607.2	H	-63.7	1.2	9.5	-55.3	-17.8	-37.5
1607.2	V	-62.4	1.2	9.5	-54.1	-17.9	-36.2
1628.5 – 17000 MHz							
3250.2	H	-60.9	1.5	12.5	-49.9	-13.0	-36.9
4871.9	H	-61.9	1.6	12.6	-50.9	-13.0	-37.9
3250.2	V	-64.6	1.5	12.5	-53.6	-13.0	-40.6
4871.9	V	-65.7	1.6	12.6	-54.8	-13.0	-41.8

5.1. Protection of Aeronautical Radio Navigation Satellite Service

5.1.1. Test Limit

FCC Part 25.216(h)(i)(f)

(h) Mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies in the 1626.5-1660.5 MHz band shall suppress the power density of emissions in the 1605-1610 MHz band-segment to an extent determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -46 dBW/MHz at 1610 MHz, averaged over any 2 millisecond active transmission interval. The e.i.r.p of discrete emissions of less than 700 Hz bandwidth from such stations shall not exceed a level determined by linear interpolation from -80 dBW at 1605 MHz to -56 dBW at 1610 MHz, averaged over any 2 millisecond active transmission interval.

(i) The e.i.r.p density of carrier-off state emissions from mobile earth stations manufactured more than six months after Federal Register publication of the rule changes adopted in FCC 03-283 with assigned uplink frequencies between 1 and 3 GHz shall not exceed -80 dBW/MHz in the 1559-1610 MHz band averaged over any two millisecond interval.

(j) A Root-Mean-Square detector shall be used for all power density measurements.

FCC Part 25.254(b)(4)

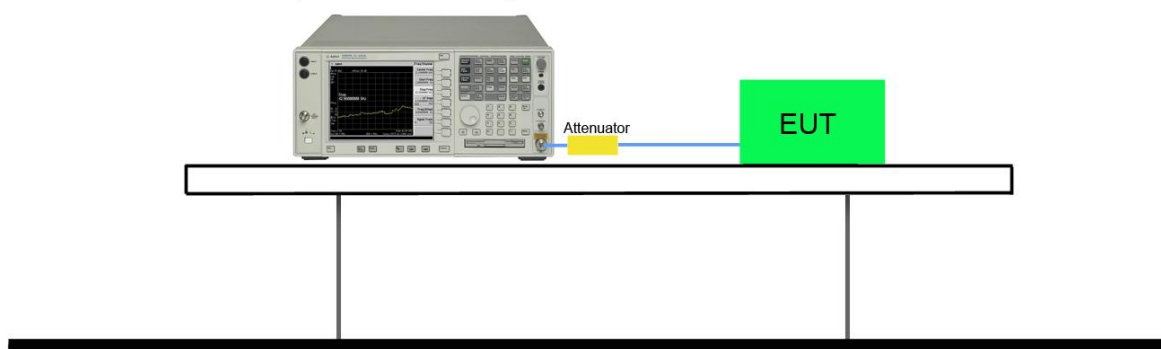
Special requirements for ancillary terrestrial components operating in the 1610-1626.5 MHz / 2483.5-2500 MHz bands

(b) An applicant for an ancillary terrestrial component in these bands must demonstrate that mobile terminals shall:

(4) ATC mobile terminals operating in assigned frequencies in the 1610-1626.5 MHz band shall not generate EIRP density, averaged over any two-millisecond active transmission interval, greater than -70 dBW/MHz in the 1559-1605 MHz band or greater than a level determined by linear interpolation in the 1605-1610 MHz band, from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz. The EIRP, averaged over any two-millisecond active transmission interval, of discrete out-of-band emissions of less than 700 Hz bandwidth from such mobile terminals shall not exceed -80 dBW in the 1559-1605 MHz band or exceed a level determined by linear interpolation in the 1605-1610 MHz band, from -80 dBW at 1605 MHz to -20 dBW at 1610 MHz. The EIRP density of carrier-off-state emissions from such mobile terminals shall not exceed -80 dBW/MHz in the 1559-1610 MHz band, averaged over a two-millisecond interval. A root-mean-square detector function with a resolution bandwidth of one megahertz or equivalent and no less video bandwidth shall be used to measure wideband EIRP density for purposes of this rule, and narrowband EIRP shall be measured with a root-mean-square detector function with a resolution bandwidth of one kilohertz or equivalent.

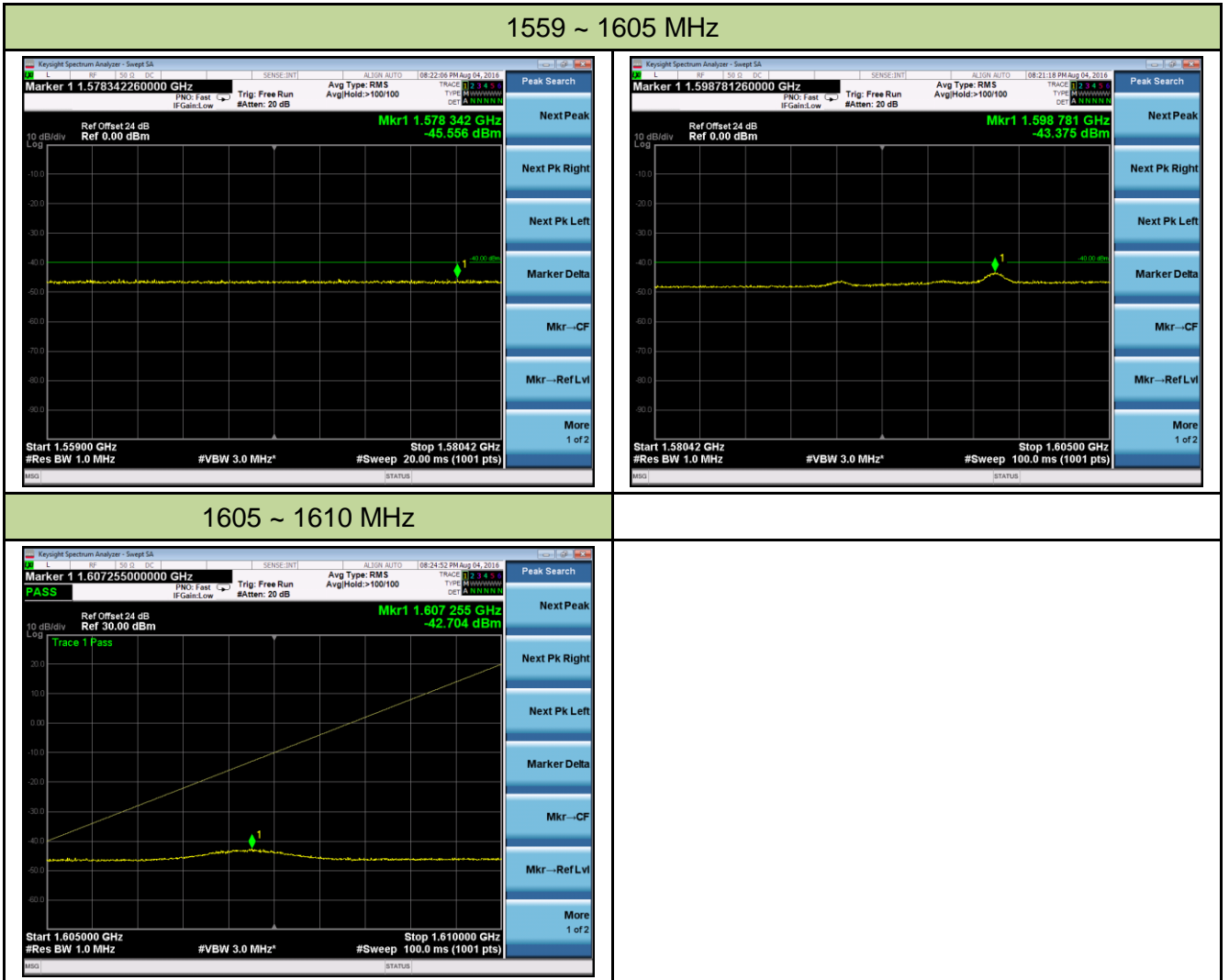
5.1.2. Test Setup

Spectrum Analyzer



5.1.3. Test Result

All spurious signals found were below the specified limit.



6. CONCLUSION

The data collected relate only the item(s) tested and show that the **Personal Tracker FCC ID: 2AJNDGMPT401** is in compliance with Part 25 of the FCC Rules.

————— The End —————