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TEST REPORT

Report Number: 102254548LEX-001
Project Number: G102254548

Report Issue Date: 1/10/2016

Product Name: 3M Tracker – CDMA Variant

Standards: Title 47 CFR Parts 22 and 24

Tested by:
Intertek Testing Services NA, Inc.
731 Enterprise Drive
Lexington, KY 40510

Client:
3M Traffic Safety and Security Division
1838 Gunn Highway
Odessa, FL 55144

Report prepared by

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1 Introduction and Conclusion

The tests indicated in section 2 were performed on the product constructed as described in section 3. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test method, a list of the actual test equipment used, documentation photos, results and raw data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested complied with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested.

The INTERTEK-Lexington is located at 731 Enterprise Drive, Lexington Kentucky, 40510. The radiated emission test site is a 10-meter semi-anechoic chamber. The chamber meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters. The test site is listed with the FCC under registration number 485103. The test site is listed with Industry Canada under site number IC 2042M-1.

2 Test Summary

Page	Test full name	FCC Reference	IC Reference	Result
-	Output Power	§ 22.913(a) and § 24.232(c)	RSS-132 (5.4) RSS-133 (6.4)	Note ¹
6	Radiated Spurious Emissions (Transmitter)	§2.1053, §22.917(a)(b), and §24.238(a)(b)	RSS-132 (5.5), RSS-133 (6.5)	Pass
-	Conducted Output Power	§2.1046 §24.232(d)	RSS-132 (5.4) RSS-133 (6.4)	Note ¹
-	Occupied Bandwidth	§2.1049, §22.917(b)(d), and §24.238(a)	RSS-GEN (4.6.1) RSS-133 (2.3)	Note ¹
-	Conducted Spurious Emissions at Antenna Terminals	§2.1049, §2.1051, §22.917(a)(b), and § 24.238(a)(b)	RSS-132 (5.5), RSS-133 (6.5)	Note ¹
-	Frequency Stability	§2.1055, §22.355, and §24.235	RSS-132 (5.3), RSS-133 (6.3)	Note ¹
-	Receiver Spurious Emissions	§ 15.109	RSS-Gen (7.2.3.2)	Note ¹
-	AC Powerline Conducted Emissions	§ 15.107	RSS-Gen (7.2.2)	Note ¹

¹ See module test report exhibit.

3 Description of Equipment Under Test

Equipment Under Test	
Manufacturer	3M Traffic Safety and Security Division
Model Number	CDMA Tracker
Serial Number	MEID868D
Receive Date	9/2/2015
Test Start Date	9/2/2015
Test End Date	10/1/2015
Device Received Condition	Good
Test Sample Type	Production
Frequency Band	824MHz - 849MHz (CDMA Cell Band) 1850MHz - 1910MHz (CDMA PCS Band)
Modulation Type	1xrtt
Transmission Control	Base Station Simulator
Maximum Output Power (Conducted)	24.5dBm (Cell Band) 24.5dBm (PCS Band)
Test Channels	1013, 384, and 777 (CDMA Cell Band) 25, 600, and 1075 (CDMA PCS Band)
Antenna Type	Internal

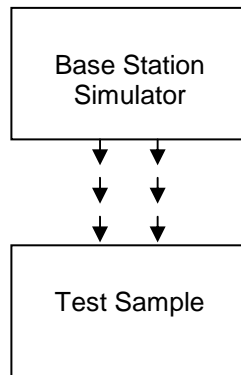
Description of Equipment Under Test
The product under test was an ankle worn tracking device

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Powered on and transmitting a CDMA signal.
2	

3.1 System setup including cable interconnection details, support equipment and simplified block diagram

3.2 EUT Block Diagram:



Block Diagram for Radiated Tests

3.3 Cables:

Cables					
Description	Length	Shielding	Ferrites	Connection	
				From	To
Power	1m	No	No	Charging Port	DC Power Supply

4 Radiated Spurious Emissions (Transmitter)

4.1 Test Limits

§ 2.1053

- (a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

§ 22.917

- (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.
- (b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 100 kHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

§ 24.238

- (a) Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB.
- (b) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

4.2 Test Procedure

The EUT was placed on a non-conductive turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. The EUT was forced to transmit at its maximum output power setting. During the tests, the antenna height and EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic was investigated in order to identify the spurious emission. Once the spurious emissions were identified, the power of the emission was determined using the substitution method described in TIA-603-C. The spurious emissions attenuation was calculated as the difference between radiated power at the fundamental frequency and at the spurious emissions frequency.

4.3 Test Equipment Used:

Description	Serial Number	Manufacturer	Model	Cal. Date	Cal. Due
EMI Test Receiver	1302.6005.40	Rohde&Schwarz	ESU40	9/19/2015	9/19/2016
Preamplifier	122005	Rohde&Schwarz	TS-PR18	11/26/2014	11/26/2015
Horn Antenna	00156319	ETS	3117	5/15/2015	5/15/2016
Horn Antenna	00154521	ETS	3117	10/21/2014	10/21/2015
Bilog Antenna	2362	ETS	3142B	1/16/2015	1/16/2016
Bilog Antenna	00051864	ETS	3142C	1/20/2015	1/20/2016
System Controller	121701-1	Sunol Sciences	SC99V	Time of Use	Time of Use
High Pass Filter	1	Wainwright	WHKX12-2533.85-2710-18000-40SS	Time of Use	Time of Use
High Pass Filter	25	Wainwright	WHKX12-1028.5-1100-1500-40SS	Time of Use	Time of Use
Base Station Simulator	2522	Rohde&Schwarz	CMU200	9/19/2014	9/19/2015
Base Station Simulator	3982	Rohde&Schwarz	CMW500	9/24/2015	9/24/2016
Signal Generator	3915	Rohde&Schwarz	SMB100A	9/18/2015	9/18/2016

4.4 Results:

All radiated spurious emissions were attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB which is equivalent to -13dBm. Testing was performed with the product configured with a normal ankle strap as well as with a reinforced strap.

Worst Case Spurious Measurements

Radiated Spurious Emissions Measurement								
Test Engineer:	Brian Daffin		Start Date:	9/2/2015		End Date:	9/2/2015	
Temperature:	21.2C		Humidity:	68.80%		Pressure:	979.4mBar	
RBW:	1MHz		VBW:	3MHz				
Notes:	Results represent the worst case from 3 orthogonal axis positions.							
			A	B	C	D	E	F
Band/Channel	Spurious Frequency (MHz)	Polarity	Device Reading (dBm)	Signal Generator Level (dBm)	Cable Loss (dB)	Tx Antenna Gain (dBd)	Limit (dBm)	Radiated Spurious Emission Level (dBm)
CDMA Cell Band; Low Channel (1013)	1649.4	H	-38.884	-31.354	3.26	5.64	-13	-28.97
	1649.4	V	-38.724	-30.294	3.26	5.64	-13	-27.91
	2474.1	H	-36.657	-25.227	4.17	5.87	-13	-23.53
	2474.1	V	-36.917	-24.037	4.17	5.87	-13	-22.34
	3298.8	H	-54.41	-41.985	4.58	7.32	-13	-39.25
	3298.8	V	-53.09	-40.275	4.58	7.32	-13	-37.54
	4123.5	H	-65.80	-52.129	5.33	8.91	-13	-48.55
	4123.5	V	-64.68	-50.999	5.33	8.91	-13	-47.42
	4948.2	H	-81.28	-65.512	5.82	9.90	-13	-61.43
4948.2	V	-79.56	-63.812	5.82	9.90	-13	-59.73	
CDMA Cell Band; Mid Channel (384)	1673.04	H	-39.83	-31.484	3.30	5.64	-13	-29.14
	1673.04	V	-45.67	-36.564	3.30	5.64	-13	-34.22
	2509.56	H	-38.24	-26.267	3.97	5.65	-13	-24.59
	2509.56	V	-40.68	-27.107	3.97	5.65	-13	-25.43
	3346.08	H	-60.23	-47.623	4.63	7.67	-13	-44.58
	3346.08	V	-58.38	-45.363	4.63	7.67	-13	-42.32
	4182.6	H	-75.49	-61.699	5.19	8.91	-13	-57.98
	4182.6	V	-75.46	-61.579	5.19	8.91	-13	-57.86
	5019.12	H	-77.51	-62.158	6.19	9.99	-13	-58.36
5019.12	V	40.25	55.642	6.19	9.99	-13	59.44	
CDMA Cell Band; High Channel (777)	1696.62	H	-41.09	-32.314	3.48	5.64	-13	-30.15
	1696.62	V	-41.06	-31.124	3.48	5.64	-13	-28.96
	2544.93	H	-44.50	-32.607	4.09	5.65	-13	-31.05
	2544.93	V	-44.51	-31.347	4.09	5.65	-13	-29.79
	3393.24	H	-64.35	-51.503	4.84	7.67	-13	-48.67
	3393.24	V	-63.44	-50.063	4.84	7.67	-13	-47.23
	4241.55	H	-80.19	-66.05	5.00	9.01	-13	-62.04
	4241.55	V	-84.01	-69.8	5.00	9.01	-13	-65.79
	5089.86	H	-79.69	-64.228	6.25	9.99	-13	-60.49
5089.86	V	-78.91	-63.068	6.25	9.99	-13	-59.33	
								F=B-C+D

CDMA Cell, Normal Strap

Worst Case Spurious Measurements

Radiated Spurious Emissions Measurement									
Test Engineer:	Brian Daffin		Start Date:	9/29/2015		End Date:	9/29/2015		
Temperature:	21.2C		Humidity:	68.80%		Pressure:	979.4mBar		
RBW:	1MHz		VBW:	3MHz					
Notes:	Results represent the worst case from 3 orthogonal axis positions. Sample with Reinforced								
			A	B	C	D	E	F	
Band/Channel	Spurious Frequency (MHz)	Polarity	Device Reading (dBm)	Signal Generator Level (dBm)	Cable Loss (dB)	Tx Antenna Gain (dBd)	Limit (dBm)	Radiated Spurious Emission Level (dBm)	
CDMA Cell Band; Low Channel (1013)	1649.4	H	-34.124	-26.594	3.26	5.64	-13	-24.21	
	1649.4	V	-33.704	-25.274	3.26	5.64	-13	-22.89	
	2474.1	H	-37.957	-26.527	4.17	5.87	-13	-24.83	
	2474.1	V	-35.317	-22.437	4.17	5.87	-13	-20.74	
	3298.8	H	-55.60	-43.175	4.58	7.32	-13	-40.44	
	3298.8	V	-54.92	-42.105	4.58	7.32	-13	-39.37	
	4123.5	H	-69.10	-55.429	5.33	8.91	-13	-51.85	
	4123.5	V	-67.81	-54.129	5.33	8.91	-13	-50.55	
CDMA Cell Band; Mid Channel (384)	4948.2	H	-78.48	-62.712	5.82	9.90	-13	-58.63	
	4948.2	V	-78.62	-62.872	5.82	9.90	-13	-58.79	
	1673.04	H	-39.80	-31.454	3.30	5.64	-13	-29.11	
	1673.04	V	-39.80	-30.694	3.30	5.64	-13	-28.35	
	2509.56	H	-43.86	-31.887	3.97	5.65	-13	-30.21	
	2509.56	V	-41.57	-27.997	3.97	5.65	-13	-26.32	
	3346.08	H	-61.32	-48.713	4.63	7.67	-13	-45.67	
	3346.08	V	-60.25	-47.233	4.63	7.67	-13	-44.19	
CDMA Cell Band; High Channel (777)	4182.6	H	-73.47	-59.679	5.19	8.91	-13	-55.96	
	4182.6	V	-68.70	-54.819	5.19	8.91	-13	-51.10	
	5019.12	H	-74.96	-59.608	6.19	9.99	-13	-55.81	
	5019.12	V	-73.87	-58.478	6.19	9.99	-13	-54.68	
	1696.62	H	-36.21	-27.434	3.48	5.64	-13	-25.27	
	1696.62	V	-36.96	-27.024	3.48	5.64	-13	-24.86	
	2544.93	H	-44.08	-32.187	4.09	5.65	-13	-30.63	
	2544.93	V	-44.47	-31.307	4.09	5.65	-13	-29.75	
CDMA Cell Band; High Channel (777)	3393.24	H	-61.53	-48.683	4.84	7.67	-13	-45.85	
	3393.24	V	-59.75	-46.373	4.84	7.67	-13	-43.54	
	4241.55	H	-75.70	-61.56	5.00	9.01	-13	-57.55	
	4241.55	V	-73.80	-59.59	5.00	9.01	-13	-55.58	
	5089.86	H	-73.83	-58.368	6.25	9.99	-13	-54.63	
	5089.86	V	-75.30	-59.458	6.25	9.99	-13	-55.72	
									F=B-C+D

CDMA Cell, Reinforced Strap

Worst Case Spurious Measurements

Radiated Spurious Emissions Measurement								
Test Engineer:	Brian Daffin		Start Date:	9/3/2015		End Date:	9/3/2015	
Temperature:	21.2C		Humidity:	68.80%		Pressure:	979.4mBar	
RBW:	1MHz		VBW:	3MHz				
Notes:	Results represent the worst case from 3 orthogonal axis positions.							
			A	B	C	D	E	F
Band/Channel	Spurious Frequency (MHz)	Polarity	Device Reading (dBm)	Signal Generator Level (dBm)	Cable Loss (dB)	Tx Antenna Gain (dBd)	Limit (dBm)	Radiated Spurious Emission Level (dBm)
CDMA PCS Band; Low Channel (25)	3702.5	H	-59.894	-45.744	4.85	8.26	-13	-42.33
	3702.5	V	-59.124	-45.274	4.85	8.26	-13	-41.86
	5553.75	H	-59.255	-43.395	6.91	10.40	-13	-39.91
	5553.75	V	-59.415	-43.505	6.91	10.40	-13	-40.02
	7405	H	-71.689	-53.359	7.75	11.84	-13	-49.27
	7405	V	-71.629	-53.649	7.75	11.84	-13	-49.56
	9256.25	H	-77.147	-57.567	9.21	13.19	-13	-53.59
	9256.25	V	-77.757	-58.097	9.21	13.19	-13	-54.12
CDMA PCS Band; Mid Channel (600)	11107.5	H	-80.458	-56.868	10.47	13.23	-13	-54.11
	11107.5	V	-79.298	-55.908	10.47	13.23	-13	-53.15
	3760	H	-68.244	-53.194	5.20	8.26	-13	-50.13
	3760	V	-67.484	-52.684	5.20	8.26	-13	-49.62
	5640	H	-52	-36.78	7.09	10.56	-13	-33.31
	5640	V	-53.35	-38.03	7.09	10.56	-13	-34.56
	7520	H	-69.705	-51.095	8.01	11.93	-13	-47.18
	7520	V	-71.035	-52.685	8.01	11.93	-13	-48.77
CDMA PCS Band; High Channel (1175)	9400	H	-81.405	-60.875	9.15	13.12	-13	-56.91
	9400	V	-82.555	-61.955	9.15	13.12	-13	-57.99
	11280	H	-77.843	-53.513	10.16	13.26	-13	-50.41
	11280	V	-77.143	-53.063	10.16	13.26	-13	-49.96
	3817.5	H	-61.8	-47.09	5.00	8.25	-13	-43.84
	3817.5	V	-61.73	-47.38	5.00	8.25	-13	-44.13
	5726.25	H	-59.641	-42.511	7.06	10.66	-13	-38.91
	5726.25	V	-60.201	-43.141	7.06	10.66	-13	-39.54
CDMA PCS Band; High Channel (1175)	7635	H	-69.856	-51.866	8.15	11.98	-13	-48.04
	7635	V	-71.016	-53.046	8.15	11.98	-13	-49.22
	9543.75	H	-80.915	-60.105	8.41	13.09	-13	-55.43
	9543.75	V	-78.265	-57.235	8.41	13.09	-13	-52.56
	11452.5	H	-82.137	-57.047	9.51	13.25	-13	-53.31
	11452.5	V	-83.147	-58.407	9.51	13.25	-13	-54.67
								F=B-C+D

CDMA PCS, Normal Strap

Worst Case Spurious Measurements

Radiated Spurious Emissions Measurement								
Test Engineer:	Brian Daffin		Start Date:	10/1/2015	End Date:	10/1/2015		
Temperature:	21.2C		Humidity:	68.80%	Pressure:	979.4mBar		
RBW:	1MHz		VBW:	3MHz				
Notes:	Results represent the worst case from 3 orthogonal axis positions. Sample with Reinforced Strap							
			A	B	C	D	E	F
Band/Channel	Spurious Frequency (MHz)	Polarity	Device Reading (dBm)	Signal Generator Level (dBm)	Cable Loss (dB)	Tx Antenna Gain (dBd)	Limit (dBm)	Radiated Spurious Emission Level (dBm)
CDMA PCS Band; Low Channel (25)	3702.5	H	-63.174	-49.024	4.85	8.26	-13	-45.61
	3702.5	V	-61.464	-47.614	4.85	8.26	-13	-44.20
	5553.75	H	-58.575	-42.715	6.91	10.40	-13	-39.23
	5553.75	V	-49.975	-34.065	6.91	10.40	-13	-30.58
	7405	H	-70.989	-52.659	7.75	11.84	-13	-48.57
	7405	V	-69.669	-51.689	7.75	11.84	-13	-47.60
	9256.25	H	-76.147	-56.567	9.21	13.19	-13	-52.59
	9256.25	V	-77.397	-57.737	9.21	13.19	-13	-53.76
	11107.5	H	-79.258	-55.668	10.47	13.23	-13	-52.91
11107.5	V	-82.438	-59.048	10.47	13.23	-13	-56.29	
CDMA PCS Band; Mid Channel (600)	3760	H	-62.674	-47.624	5.20	8.26	-13	-44.56
	3760	V	-63.184	-48.384	5.20	8.26	-13	-45.32
	5640	H	-53.25	-38.03	7.09	10.56	-13	-34.56
	5640	V	-52.52	-37.2	7.09	10.56	-13	-33.73
	7520	H	-67.065	-48.455	8.01	11.93	-13	-44.54
	7520	V	-66.255	-47.905	8.01	11.93	-13	-43.99
	9400	H	-77.335	-56.805	9.15	13.12	-13	-52.84
	9400	V	-77.845	-57.245	9.15	13.12	-13	-53.28
	11280	H	-74.823	-50.493	10.16	13.26	-13	-47.39
11280	V	-75.793	-51.713	10.16	13.26	-13	-48.61	
CDMA PCS Band; High Channel (1175)	3817.5	H	-58.88	-44.17	5.00	8.25	-13	-40.92
	3817.5	V	-59.51	-45.16	5.00	8.25	-13	-41.91
	5726.25	H	-60.701	-43.571	7.06	10.66	-13	-39.97
	5726.25	V	-60.881	-43.821	7.06	10.66	-13	-40.22
	7635	H	-65.386	-47.396	8.15	11.98	-13	-43.57
	7635	V	-64.686	-46.716	8.15	11.98	-13	-42.89
	9543.75	H	-77.825	-57.015	8.41	13.09	-13	-52.34
	9543.75	V	-77.145	-56.115	8.41	13.09	-13	-51.44
	11452.5	H	-77.367	-52.277	9.51	13.25	-13	-48.54
11452.5	V	-76.087	-51.347	9.51	13.25	-13	-47.61	
								F=B-C+D

CDMA PCS, Reinforced Strap

5 Measurement Uncertainty

The measured value related to the corresponding limit will be used to decide whether the equipment meets the requirements.

The measurement uncertainty figures were calculated and correspond to a coverage factor of $k = 2$, providing a confidence level of respectively 95.45 % in the case where the distributions characterizing the actual measurement uncertainties are normal (Gaussian).

Measurement uncertainty Table

Parameter	Uncertainty	Notes
Radiated emissions, 30 to 1000 MHz	+3.9dB	
Radiated emissions, 1 to 18 GHz	+4.2dB	
Radiated emissions, 18 to 40 GHz	+4.3dB	
Power Port Conducted emissions, 150kHz to 30 MHz	+2.8dB	

6 Revision History

Revision Level	Date	Report Number	Notes
0	1/10/2016	102254548LEX-001	Original Issue