

# EMC TEST REPORT



NVLAP Lab Code 200033-0

**Standard(s):**

**47 CFR FCC Part 15.209  
RSS Gen, Issue 5, 2018**

**Product: 3M™ Peltor Tactical Earplug  
Model(s): TEP-300**

**Company Name:  
3M Company**

**Address:  
7911 Zionsville Road,  
Indianapolis, IN 46268**

**Report Number: RE1807011-1  
Report Issue Date: March 26, 2020**

**Report Prepared by:**

**Signature:**   
**Yuriy Litvinov  
Lead EMC Engineer**

**Tested by:  
3M EMC Laboratory  
410 E. Fillmore Avenue, Building 76-01-1  
St. Paul, Minnesota 55107-1000, USA**

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## 1.0 Test Summary

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

	Test Description	Requirement – Test	Result	Comments
4.1	Part 15.207	Conducted Emissions	N/A	
4.2	Part 15.209/RSS-Gen, 8.9	Radiated Emissions in restricted band	pass	
4.3	Part 15.209/RSS-Gen, 6.6	Occupied Bandwidth	pass	
4.4	Part 2.1093/RSS102	RF Exposure Evaluation	pass	
<b>Note:</b>		Device is battery operated.		

## 1.1 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).

Radiated emissions 30MHz to 1000MHz	4.9 dB
Radiated emissions 1GHz to 18GHz	4.6 dB
Conducted emissions 150KHz to 30MHz (AMN)	2.7 dB
Conducted emissions 150KHz to 30MHz (AAN)	1.92 dB



## 2.0 Equipment Description

2.1 Equipment Under Test	
<b>Description:</b>	3M™ Peltor earplug is in-ear Hearing Protector with built-in circuit to transmit/receive NFMI (near-field magnetic induction) communication signals, powered by a rechargeable 3.7VDC Lithium battery.
<b>Model(s):</b>	TEP-300
<b>Serial number:</b>	N/A
<b>Client Contact:</b>	Jessica Guilfoyle
<b>3M Division:</b>	Personal Safety
<b>Modifications:</b>	none
<b>Frequency Range:</b>	9.983MHz-11.771MHz
<b>Channel No.:</b>	4
<b>Modulation Type:</b>	D8PSK
<b>Maximum Output Power:</b>	42 dBuV/m @ 3meters
<b>Antenna Type and Gain:</b>	<input type="checkbox"/> External <input checked="" type="checkbox"/> Integral Coil Antenna <input checked="" type="checkbox"/> 0dBi <input type="checkbox"/> Beamforming Gain
<b>Test Deviations or Exclusions:</b>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
<b>Rated Power:</b>	<b>Voltage:</b> <input type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input checked="" type="checkbox"/> 3.7VDC
	<b>Phase:</b> <input type="checkbox"/> 1ph <input type="checkbox"/> 3ph <input checked="" type="checkbox"/> Battery
	<b>Frequency:</b> <input type="checkbox"/> 50Hz <input type="checkbox"/> 60Hz
	<b>Current:</b>
<b>Test Dates:</b>	12/10-03/23/2020
<b>Received Date:</b>	12/09/2019
<b>Received Conditions:</b>	<input type="checkbox"/> Poor <input checked="" type="checkbox"/> Good
	<input checked="" type="checkbox"/> Prototype <input type="checkbox"/> Production



### 3.0 EUT Configuration

#### 3.1 System Configuration

No.	Product Type	Manufacturer	Model	Comments
1	Earplug	3M	TEP-300	
2	System Control Unit	3M	SCU-300	Support Equipment
5				

#### 3.2 Input/Output Ports of EUT

No.	Description	Type	Comments
1			

#### 3.3 Cables

No.	Description	Type	Length	Shielding	Comments
1					

#### 3.4 Measurement Arrangements of EUT

	Intended Operational Arrangement(s)	Comments
<input checked="" type="checkbox"/>	Table-top only	
<input type="checkbox"/>	Floor-standing only	
<input type="checkbox"/>	Floor-standing or table-top	
<input type="checkbox"/>	Other	

#### 3.5 Exercising of EUT and Interfaces

No.	Mode of Operation
1	Earplug was paired with SCU-300 to provide continuous NFMI communications link
2	Transmitting at lowest and middle channels (modes) of operation with modulated carrier



## 4.0 Test Conditions and Results

<b>4.1</b>	<b>Conducted Emissions Data</b>			
<b>Method:</b>	The AMN was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane. This distance was between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment was at least 0.8 m from the AMN. All power was connected to the system through Artificial Mains Network (AMN). Conducted voltage measurements on mains lines were made at the output of the AMN.			
	All power was connected to the system through Artificial Mains Network (AMN). All tested telecommunications lines were connected to an Asymmetric Artificial Network (AAN) and conducted voltage measurements on telecommunications lines were made at the output of the ISN. Where an AAN was not appropriate or available measurements were made using a Capacitive Voltage Probe.			
<b>Test Verification:</b> <input type="checkbox"/>	Laboratory Ambient Temperature:			
	Relative Humidity:			
	Atmospheric Pressure:			
<b>Reference Standard(s):</b>	<input type="checkbox"/> FCC 15.207/RSS Gen <input type="checkbox"/> ANSI C63.4:2014 <input type="checkbox"/> ANSI C63.10:2013		<b>Measurement Point</b> <input checked="" type="checkbox"/> Mains <input type="checkbox"/> Telecommunication ports <input type="checkbox"/>	
	<b>Nominal Voltage:</b> <input type="checkbox"/> 120VAC <input type="checkbox"/> 230VAC <input type="checkbox"/>			
<b>Test Personnel:</b>		<b>Date:</b>		
<b>Limits - Class A – AC Mains</b>				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Average	Result	Comments
0.15 to 0.50	79	66	N/A	AMN
0.50 to 30	73	60	N/A	AMN
<b>Limits - Class B – AC Mains</b>				
0.15 to 0.50	66 to 56	56 to 46	N/A	AMN
0.50 to 5	56	46	N/A	AMN
5 to 30	60	50	N/A	AMN

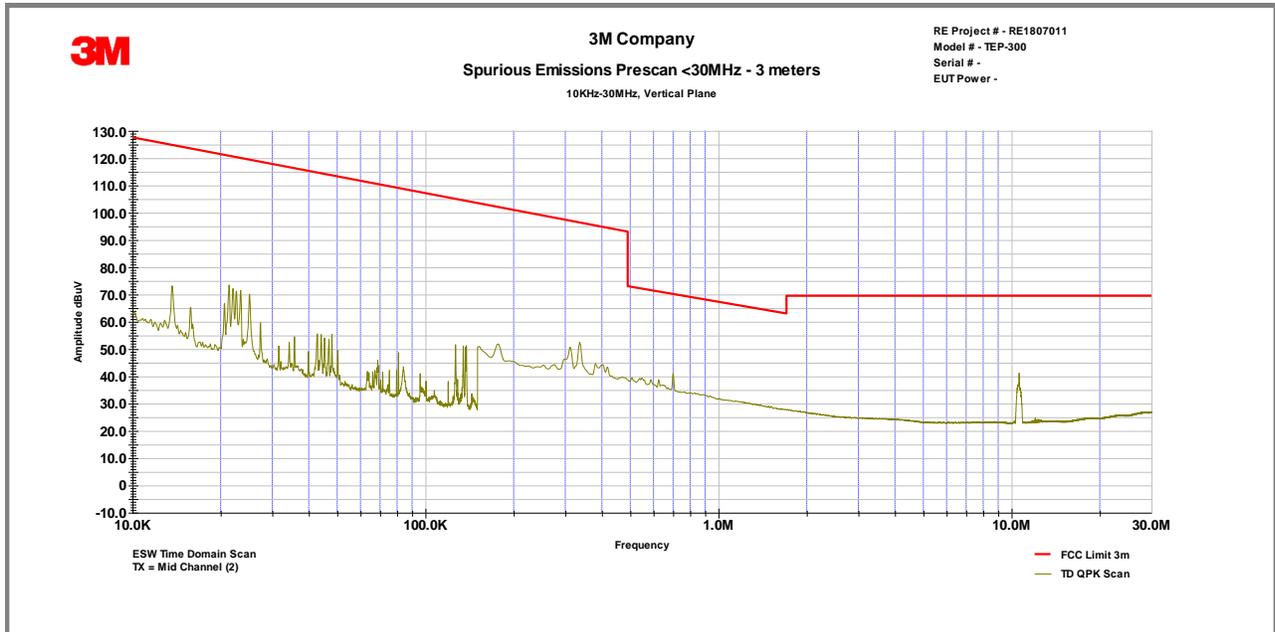
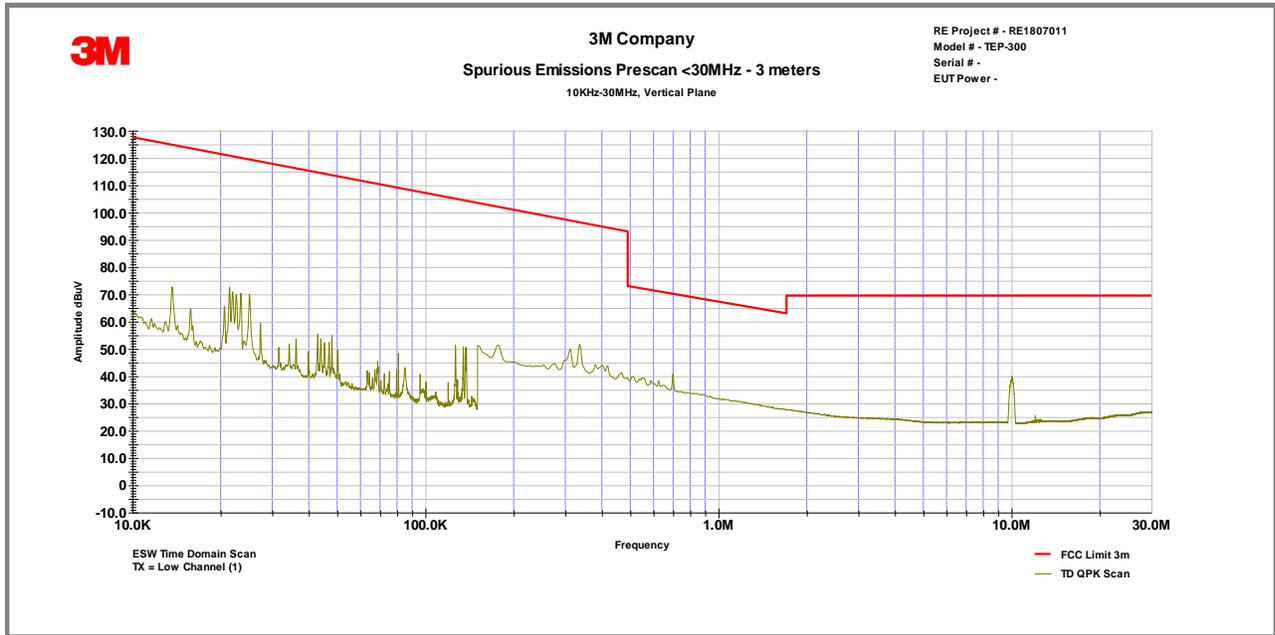
<b>Modifications:</b>	
<b>Note:</b>	



<b>4.2</b>	<b>Radiated Emissions in restricted band</b>			
<b>Method:</b>	<p>Measurements were made in a 3-meter semi-anechoic chamber that complies to CISPR 16/ANSI C63.4.  EUT was rotated through three orthogonal axes to determine which attitude (orientation) and arrangement produces the highest emission relative to the limit; the attitude and device arrangement that produces the highest emission relative to the limit was used in making final radiated emission measurements. Spurious Radiated emissions measurements were performed with external preamp and a high pass filter. Final measurements were then performed by rotating the EUT 360° and adjusting the receive antenna height from 1 to 4 m. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.</p>			
<b>Test Verification:</b> <input checked="" type="checkbox"/>	Laboratory Ambient Temperature:	23°C		
	Relative Humidity:	18%		
	Atmospheric Pressure:	1010 mbars		
<b>Reference Standard(s):</b>	<input type="checkbox"/> ANSI C63.4:2014	<b>Measurement Distance</b>		
	<input checked="" type="checkbox"/> ANSI C63.10 2013 <input type="checkbox"/>			<input checked="" type="checkbox"/> 3 Meters <input type="checkbox"/>
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 9KHz to 30 MHz <input checked="" type="checkbox"/> 30 MHz to 1000 MHz			
<b>Nominal Voltage:</b>	<input type="checkbox"/> 120VAC <input checked="" type="checkbox"/> 3.7VDC			
<b>Test Personnel:</b>	Keith Schwartz <i>KS</i>	<b>Date:</b> 12/11/2019		
<b>Limits – 15.209 and RSS-Gen</b>				
Frequency (MHz)	Limit dB (µV)			
	Quasi-Peak	Average	Distance	Result
0.009-0.490		2400/F(KHz)	300	<b>pass</b>
0.490-1.705	24000/F(KHz)		30	<b>pass</b>
1.705-30	30		30	<b>pass</b>
30 to 88	40		3	<b>pass</b>
88 to 216	43.5		3	<b>pass</b>
216 to 960	46		3	<b>pass</b>
Above 960		54	3	<b>N/A</b>
<b>Modifications:</b>				
<b>Note:</b>	<p>For emission in the restricted bands, the limit of 15.209 was used.  The lower limit applies at the transition frequency. An inverse proportionality factor of 40dB per decade has been used below 30MHz and 20dB above 30MHz to normalize the measured data to the specified distance for determining compliance.</p>			



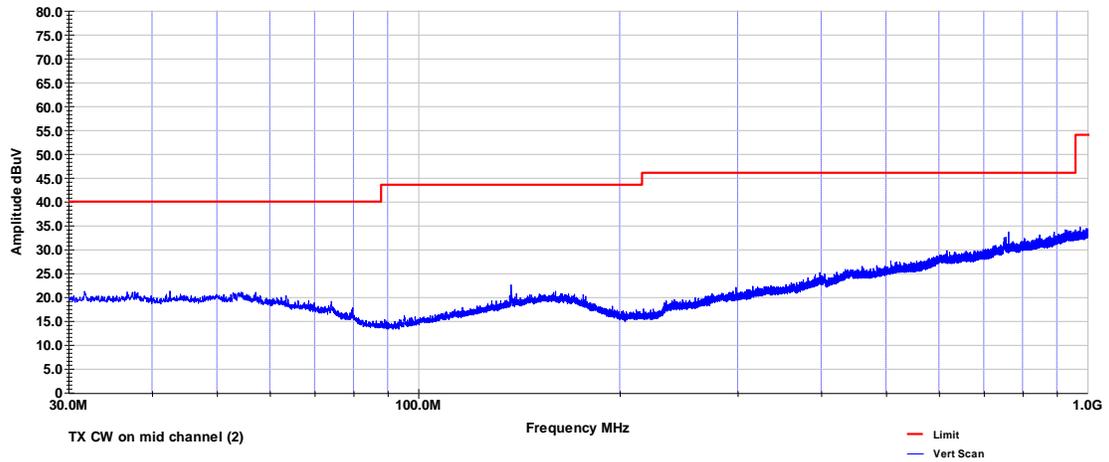
Frequency (MHz)	Pol.	QP Reading dB $\mu$ V/m	Total CF dB	Net at 3 m dB $\mu$ V/m	FCC Limit (dB $\mu$ V/m)	Margin dB
0.213	V			74.3	119	-44.7
9.996	V			40.3	69.5	-29.2
10.574	V			42.2	69.5	-27.2
138.29	H	3.9	17.3	21.2	43.5	-22.3
232.73	H	4.2	15.9	20	46	-26
507.98	H	5	23.4	28.3	46	-17.7
761.24	H	6.6	28	34.6	46	-11.4
<b>Notes:</b>	<b>Net Reading (dBuV) = Reading (dB<math>\mu</math>V)+Total CF(dB)</b>					





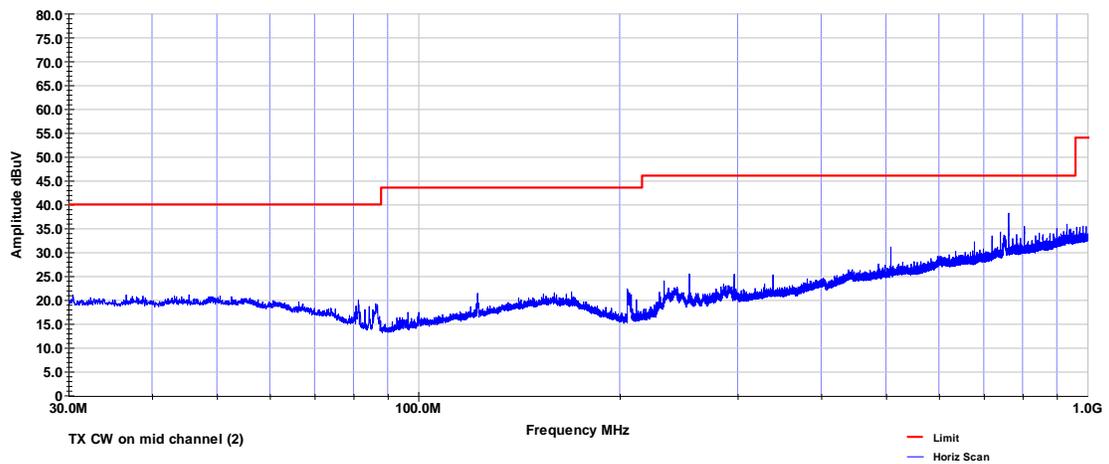
3M Company  
Radiated Emissions Prescan  
FCC Part 15, Class B, Vertical

Project # - RE1807011  
Model # - TEP-300  
Serial # - N/A  
EUT Power - 3.7VDC



3M Company  
Radiated Emissions Prescan  
FCC Part 15, Class B, Horizontal

Project # - RE1807011  
Model # - TEP-300  
Serial # - N/A  
EUT Power - 3.7VDC





4.3 Occupied bandwidth		
	Laboratory Ambient Temperature:	23°C
	Relative Humidity:	18%
	Atmospheric Pressure:	1010 mbars
Reference Standard(s):	<input checked="" type="checkbox"/> ANSI C63.10:2013 <input checked="" type="checkbox"/> RSS-Gen, Issue 5	<b>Measurement Point</b> <input checked="" type="checkbox"/> Conducted <input type="checkbox"/> Radiated
Frequency Range:	<input checked="" type="checkbox"/> 9.983MHz-11.771MHz	RBW = 10KHz, VBW ≥ 3 x RBW
OBW (99%):	<input checked="" type="checkbox"/> 784 KHz	
Nominal Voltage:	<input type="checkbox"/> 120VAC <input checked="" type="checkbox"/> 3.7VDC	
Test Personnel:	Yuriy Litvinov <i>Yuriy Litvinov</i>	Date: 12/11/2019





<b>4.4</b>		<b>RF Exposure Evaluation</b>	
<b>Reference Standard(s):</b>	<input checked="" type="checkbox"/> KDB 447498 <input checked="" type="checkbox"/> RSS 102, Issue 5 <input checked="" type="checkbox"/> SPR-002, Issue 1	<input type="checkbox"/> MPE <input checked="" type="checkbox"/> SAR Evaluation <input checked="" type="checkbox"/> SAR Test Exclusion	
<b>Frequency Range:</b>	<input checked="" type="checkbox"/> 9.983MHz-11.771MHz		
<b>Antenna Separation Distance:</b>	<5mm		
<b>Antenna Gain (maximum):</b>	0dBi (Coil Antenna)		
<b>NFMI Maximum Power:</b>	42.3dBuV/m @3m (0.0000029 mW ERP)		
<b>RF Exposure Conditions:</b>	Ear-worn		
<b>Power Density:</b>	N/A		
<b>SAR Test Exclusion Threshold</b>			
<b>FCC Part 2.1093</b>	474mW@ < 50mm @10MHz		
<b>RSS 102, Issue 5, 2015</b>	71mW@ <5mm @<300MHz		
<b>Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits</b>			
<b>Probe Position</b>	<b>Measuring Distance</b>		
<b>Front</b>	<input checked="" type="checkbox"/> 0cm <input type="checkbox"/> 15cm		
<b>Back</b>	<input checked="" type="checkbox"/> 0cm <input type="checkbox"/> 15cm		
<b>Left and Right</b>	<input checked="" type="checkbox"/> 0cm <input type="checkbox"/> 15cm		
	<b>Measured EMF</b>	<b>Table 4 - Limit 10-20MHz</b>	<b>Results</b>
<b>Maximum RF Exposure:</b>	<input checked="" type="checkbox"/> H-field (A/m) - 0.0078	0.073 (A/m)	<b>pass</b>
	<input checked="" type="checkbox"/> E-field (V/m) - 0.8	28 (V/m)	<b>pass</b>



5.0	Test Equipment				
Test Equipment Used					
Description	Manufacturer	Model	Identifier	Last Cal. Date	Check
Biconilog Antenna	Schwarzbeck	VULB 9168	9168-1070	10/20/2019	<input checked="" type="checkbox"/>
Horn Antenna	A.H. Systems	SAS 571	1010	10/20/2019	<input type="checkbox"/>
Loop Antenna	A.H. Systems	SAS 565H	1213E	10/20/2019	<input checked="" type="checkbox"/>
Power Sensor	ETS-Lindgren	7002-004	1136	10/20/2019	<input type="checkbox"/>
Signal Analyzer	Agilent	N9000A	MY53031040	10/20/2019	<input type="checkbox"/>
EMI Receiver	Agilent	E4448A	1530975	10/20/2019	<input type="checkbox"/>
EMI Receiver	Rohde & Schwarz	ESW26	101412	10/20/2019	<input checked="" type="checkbox"/>
LISN	TESEQ	NNB51	1130	10/20/2019	<input type="checkbox"/>
EMF Meter	NARDA	EMR-300	1140	10/20/2019	<input checked="" type="checkbox"/>
EMF Probe	NARDA	Type 33.0 100KHz-3GHz	K-0014	10/212019	<input checked="" type="checkbox"/>
EMF Probe	NARDA	Type 10.2 27M-1GHz	AP-0004	10/212019	<input checked="" type="checkbox"/>
EMC Software	ETS-Lindgren	TILE 7		N/A	<input checked="" type="checkbox"/>
<b>Equipment Calibration Interval:</b>		<input checked="" type="checkbox"/> 12 months		<input type="checkbox"/> 24 months	

6.0	Report revision history		
Revision Level	Date	Report Number	Notes
0	03/24/2020	RE1807011-1	Original Issue