RF Exposure Measured (Part 25), Calculated Part 15

Maximum Permissible Exposure at 100cm

1. Declaration of RF exposure compliance

Transmitter(s) Installed	WiFi (w MIMO) 2.4 and 5GHz, and Satellite transmitter
Model number:	AP-TH1118
Manufacturer:	Carnegie Technologies
Judgement of Compliance	Compliant
Compliance Distance	1 m
Radiated Transmitter Power (V/m) Conducted Transmitter Power (dBm)	Satellite Transmitter power – 29.7V/m Measured 2.4GHz transmitter power – 14.4 5GHz transmitter power – 15.79
Antenna Gain (dBi)	Satellite Antenna – N/A 2.4GHz gain – 2 5GHz gain - 3
4.3.1. Maximum Permissible Exposure considerations are:	During normal operation, user and user extremities must be at least 1 m removed from any transmitting antenna. The Requirements for MPE are set by Operation: Simultaneous transmission Satellite Earth Stations and Systems (SES) 2.4GHz MIMO transmitter or Satellite Earth Stations and Systems (SES) 5GHz MIMO transmitter
Verdict	Compliant with 1m zone

2. Attestation

ATTESTATION: I attest that the calculations were performed or supervised by me; that the calculations were based on the worst-case power output at the worst-case frequency of the transmitting device. All possible configurations have been considered when calculating the worst case Maximum Permissible Exposure requirements as detailed below.

Signature:	*FR Fleury*
Date:	December 10, 2019
Name:	Chip Fleury

Both the MPE limits listed in Table 1 of paragraph (e) of this section and the SAR limits as set forth in paragraph (a) through (c) of this section and in §2.1093 of this chapter are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over the specified averaging time in Table 1 is less than the limits. Detailed information on our policies regarding procedures for evaluating compliance with all of these exposure limits can be found in the FCC's *OET Bulletin 65,* "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields," and in supplements to *Bulletin 65,* all available at the FCC's Internet Web site: *http://www.fcc.gov/oet/rfsafety.*

Table 1 below sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f^2	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f^2	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

Part 25 Measured result

Test process.
1. Carnegie Technologies EUT model AP-TH1118 was set up in the RFI room. (see Test set below)
2. The EUT satellite transmitter was set to operate at maximum output power
3. An RFI probe was set up 1 meter away and measurements were collected (see Test results)
   a. ETS Lindgren HI-6100 Monitor – asset 1724
   b. ETS Lindgren Hi-6005 Field prove – asset 1793 – calibration due date 03/28/2020
4. Worst case value was in front of the transmitter antenna, as shown below
5. The Power density (mW/cm^2) is determined as shown below
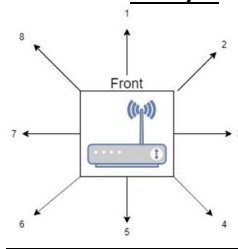 P_D (mW/cm^2) = E^2 /3770.
   P_D = (29.5 (V/m))^2/3770 = .23 mW/

TEST SET UP

Test Results
1. **29.5 V/m**
2. **2.1 V/m**
3. **2.6 V/m**
4. **2.7 V/m**
5. **2.9 V/m**
6. **1.7 V/m**
7. **3.2 V/m**
8. **2.4 V/m**

Measurements made a 100cm distance from EUT

Measured and Calculated Result

Nemko

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Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

	15C WiFi MiMo	15E NII MIMO	Part 25	
Maximum peak output power at device output terminal:	23.6	22.05	37.67	dBm
Cable and Jumper loss:	0	0	0	dB
Maximum peak output power at antenna input terminal:	23.6	22.05	37.67	dBm
	229.086765	160.3245391	5847.900841	mW
Single Antenna gain (typical):	2	3	11.3	dBi
Number of Antennae:	2	2	1	
Total Antenna gain (typical):	5.01029996	6.010299957	11.3	dBi
	3.16978638	3.99052463	13.48962883	(numeric)
Prediction distance:	100	100	100	cm
Prediction frequency:	2442	5240	1660.5	MHz
E limit for uncontrolled exposure at prediction frequency:	1	1	1	mW/cm^2
Power density at prediction frequency:	0.00577857	0.0050912	0.627754936	mW/cm^2
	0.05778567	0.050911997	6.277549356	W/m^2
Tx On time:	1	1	1	ms
Tx period time:	1	1	1	ms
Average Factor:	100	100	100	%
Average Power density at prediction frequency:	0.05778567	0.050911997	6.277549356	W/m^2
Maximum allowable antenna gain:	27.3920986	28.94209864	13.32209864	dBi
Margin of Compliance:	22.3817987	22.93179868	2.02209864	dB

	Part 15 C		Part 15E		Part 25		Total		
15C + Part 25	0.006	+	0.000	+	0.628	=	0.634	<1.0	
									Calculated
15E + Part 25	0.000	+	0.005	+	0.628	=	0.633	<1.0	

	Part 15 C		Part 15E		Part 25		Total		
15C + Part 25	0.006	+	0.000	+	0.231	=	0.237	<1.0	
									Measured
15E + Part 25	0.000	+	0.005	+	0.231	=	0.236	<1.0	