



July 9, 2001

Mr. Andy Leimer, FCC Engineering Examiner
Authorization & Evaluation Division
Federal Communications Commission Laboratory
7435 Oakland Mills Road
Columbia, MD 21046

Copy to: Mr. Kwok Chan

Re: Form 731 Confirmation Number: EA 101043 with FCC ID: AZ489FT4845.

Gentlemen;

Motorola Inc., 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322, herein submits its response to the June 26, 2001 request for information on FCC ID: AZ489FT4845, EA101043 via correspondence number 19772.

The product in this application EA101043 is identical to the product in application EA100436. The only difference is operating frequency range, for contiguous and overlapping adjacent band spreads. The underlying foundation for design and representation of the two products is identical, and therefore it is reasonable to expect the equipment authorization criteria to be identical.

Q1. The differences in head and body dielectric parameters are about - 30% in dielectric constant and 8% in conductivity. The increase in conductivity may not cover the substantial decrease in dielectric constant. Please either re-test, or find ways to selectively re-test to show compliance for the head configurations.

A1. In the June 21, 2001 supplementary response to FCC Correspondence 19334 Motorola provided the results of numerical simulations and experimental results using a dipole antenna at 450 MHz which confirmed that the muscle tissue overestimates SAR as compared to the IEEE head tissue; this was in accordance with the requests made by Mr. Kwok Chan in the conference call of May 24, 2001. It is on this basis that Motorola shows compliance for the head configurations you have questioned.

The applicable portion of the June 21, 2001 supplementary response is duplicated below for convenience. Motorola certifies that this excerpt of the June 21, 2001 document is equally applicable to this portable radio (EA101043). Furthermore Motorola would like to clarify to the Commission that the EME Test Lab has completed conversion to the IEEE specified head tissue for all head and face SAR tests above 300 MHz effective June 12, 2001. The data contained within the SAR report dated May 11, 2001 and the additional data submitted herein in A2 thru A6 was obtained prior to this conversion date.

Excerpt from Motorola Supplementary Response to FCC Correspondence 19334

Numerical simulations and experimental measurements were also performed to support the claim that SAR measurements performed in the Muscle mixture are overestimated in comparison with IEEE Head mixture. The IEEE Head mixture has a conductivity 14% lower and permittivity 25% lower than the Muscle mixture. The measurements were made on a flat phantom exposed to a 450 MHz half-wavelength dipole source at 16 mm to the liquid. The following table summarizes the results. In both cases, the Muscle tissue overestimates the SARs in comparison to the IEEE Head tissue.

Muscle and IEEE Head SAR Comparison

Method	Tissue	Dielectric Constant	Conductivity (S/m)	SAR (W/kg)	Change
FDTD	Muscle	58.47	1.01	2.26	
	IEEE Head	44	0.87	2.11	-6.6%
Measurement	Muscle	58.47	1.01	2.61	
	IEEE Head	44.08	0.87	2.4	-8.0%
	Change	-24.7%	-13.9%		

The table found in the SPEAG Application Note and IEEE SCC34 draft P1528 Table E3, providing the change in sensitivity as a function of change in permittivity and conductivity is based on an approximate equation and assumes antenna current normalization, which is not appropriate for this comparison since devices are power rated. When the comparison is normalized to power, the effect from conductivity is much higher than from permittivity. The table is also only valid for “the estimation of the influence of small parameter errors on the measured SAR values,” as indicated in the Application Note.

$$\frac{\Delta SAR}{SAR_0} = S_{\sigma} \Big|_{\sigma_0} \frac{\Delta \sigma}{\sigma_0} + S_{\epsilon} \Big|_{\epsilon_0} \frac{\Delta \epsilon}{\epsilon_0}$$

$S_{\sigma, \epsilon} = \text{Sensitivity}$

Valid only for small $\frac{\Delta \sigma}{\sigma_0}, \frac{\Delta \epsilon}{\epsilon_0}$

Q2. You only provided 2 SAR numbers for this device with 5 antenna configurations, 2 body-worn accessories and 2 battery options. It operates in the 450 - 520 MHz band, which covers 70 MHz. Each configuration should be tested at high, middle and low frequency channels. Those 2 SAR numbers were obtained with 2 of the 3 available antennas, one for head and one for body. This is not sufficient for demonstrating SAR compliance. Please review the SAR reports for the EA 98411 and EA 98633 applications, re-test and fix the SAR report as we had discussed in these two previous filings (specifically Section 7).

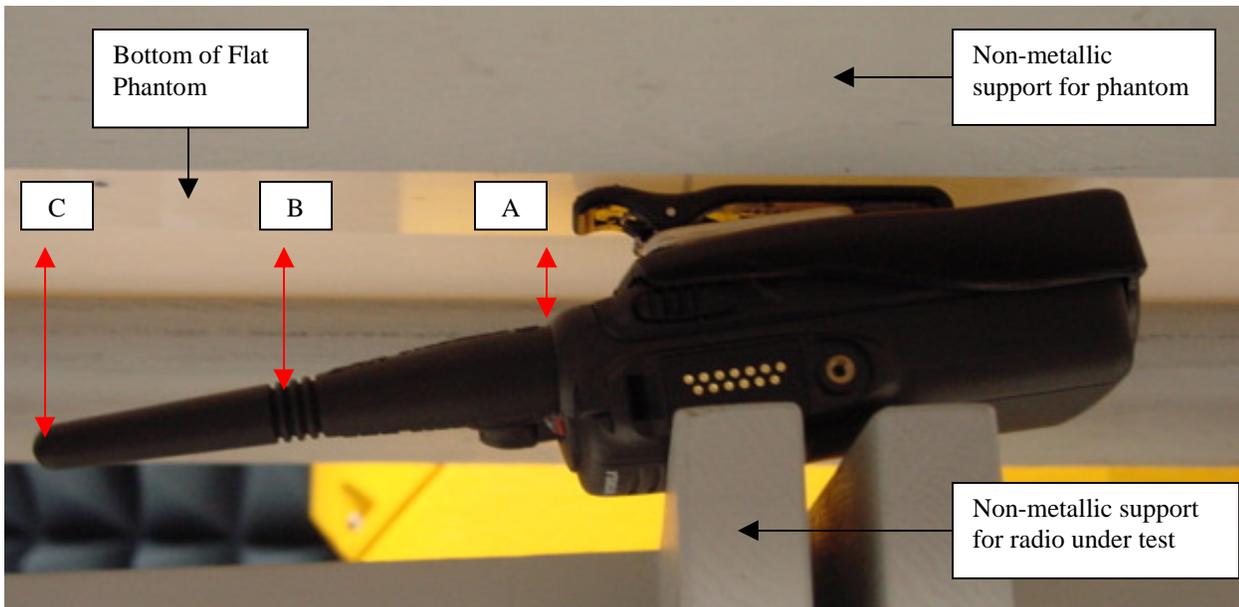
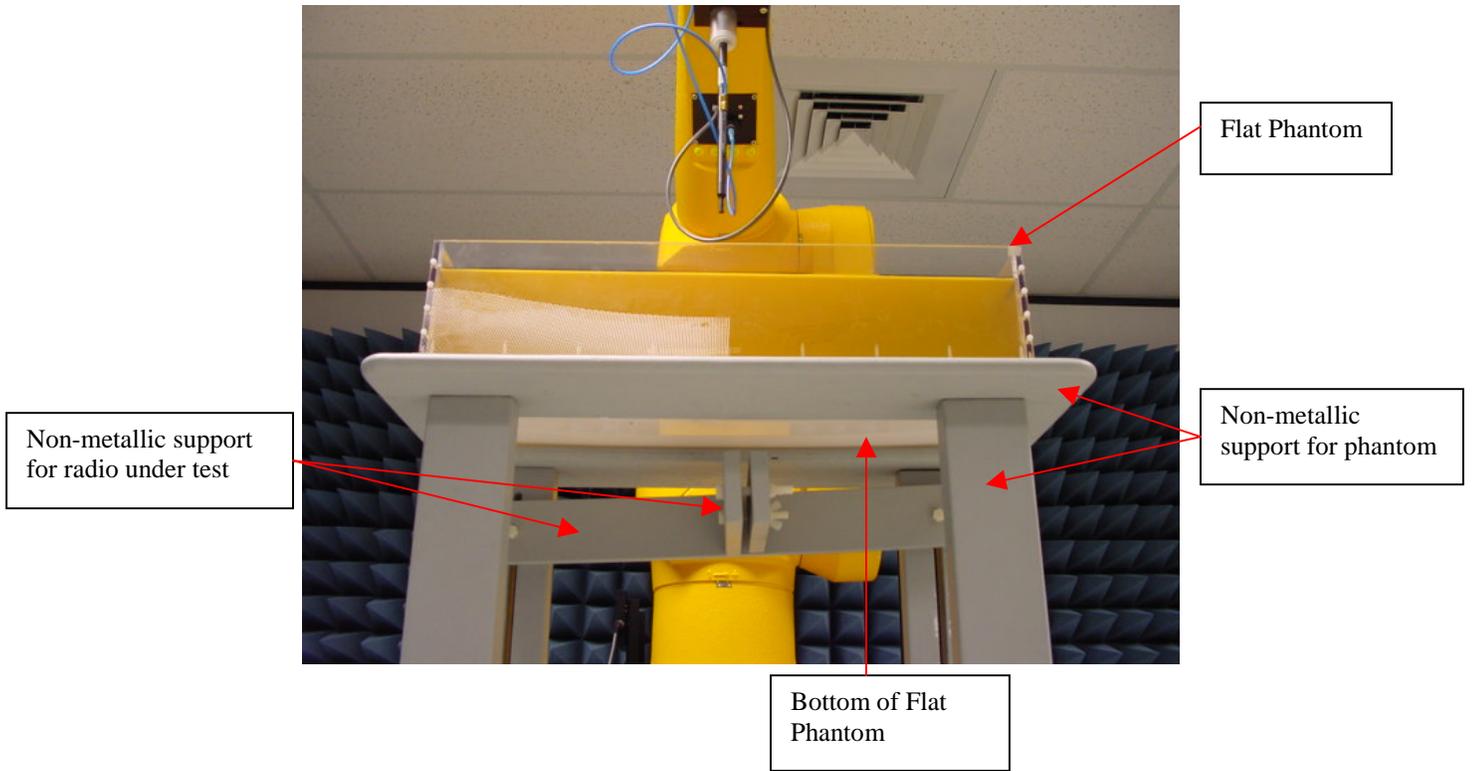
A2. To facilitate FCC review of the application, Motorola presented only the highest measured and calculated SAR by body position. The results of all scans are contained in the DASY output files and are available upon request. For this product the SAR report indicates in section 5.0, “All antennas, batteries, and accessories listed in section 3.0 were included in the SAR search pattern over transmit frequency band to determine the combination providing the highest SAR results.” A total of 18 SAR scans were performed in order to determine the highest SAR configuration by body position; the final results are summarized in section 7.0 of the SAR report with the corresponding DASY output plots contained in Appendix A.

For your further clarification, the Table below contains additional test results performed at that time: Note that the frequency range for the Radio is 450-527 MHz and the low (450 MHz), mid (488 MHz) and high (527 MHz) frequencies were tested. The optional antennas have specific frequency ranges that are typically not applicable to the entire range of the radio. Refer to section 3.0 of the SAR report for antenna specifications. The configuration and frequencies for the face were guided by the abdomen results.

Antenna	Antenna frequency range	Frequency tested (MHz)	Battery	Body-worn accessory	Body position	Measured SAR (mW/g)
PMAE4006A	465-495	488	JMNN4024	JMZN4023A Plastic	Abdomen	2.33
PMAE4006A	465-495	488	JMNN4023	JMZN4023A Plastic	Abdomen	2.97
PMAE4003A	430-470	450	JMNN4023	JMZN4023A Plastic	Abdomen	5.11
PMA4008A	470-530	488	JMNN4023	JMZN4023A Plastic	Abdomen	1.61
PMA4008A	470-530	525	JMNN4023	JMZN4023A Plastic	Abdomen	3.46
PMAE4007A	490-527	525	JMNN4023	JMZN4023A Plastic	Abdomen	4.05
NAE6483A	403-520	450	JMNN4023	JMZN4023A Plastic	Abdomen	4.33
NAE6483A	403-520	525	JMNN4023	JMZN4023A Plastic	Abdomen	0.81
PMAE4003A	430-470	450	JMNN4023	JMZN4019A Leather	Abdomen	4.8
PMAE4003A	430-470	450	JMNN4023	PMLN4421B Leather	Abdomen	4.68
PMAE4006A	465-495	488	JMNN4023	None	Face	1.46
PMAE4003A	430-470	450	JMNN4023	None	Face	2.65
PMA4008A	470-530	525	JMNN4023	None	Face	2.42
PMAE4007A	490-527	525	JMNN4023	None	Face	3.46
NAE6483A	403-520	450	JMNN4023	None	Face	3.65

Q3. Pages 10 of the SAR report shows test configuration for the belt-clip accessory. However, there is no photo showing the "holster with swivel clip" configuration. Please submit the photos for this configuration and identify the separation distances for all body-worn configurations (only one has been shown in the test setup figure).

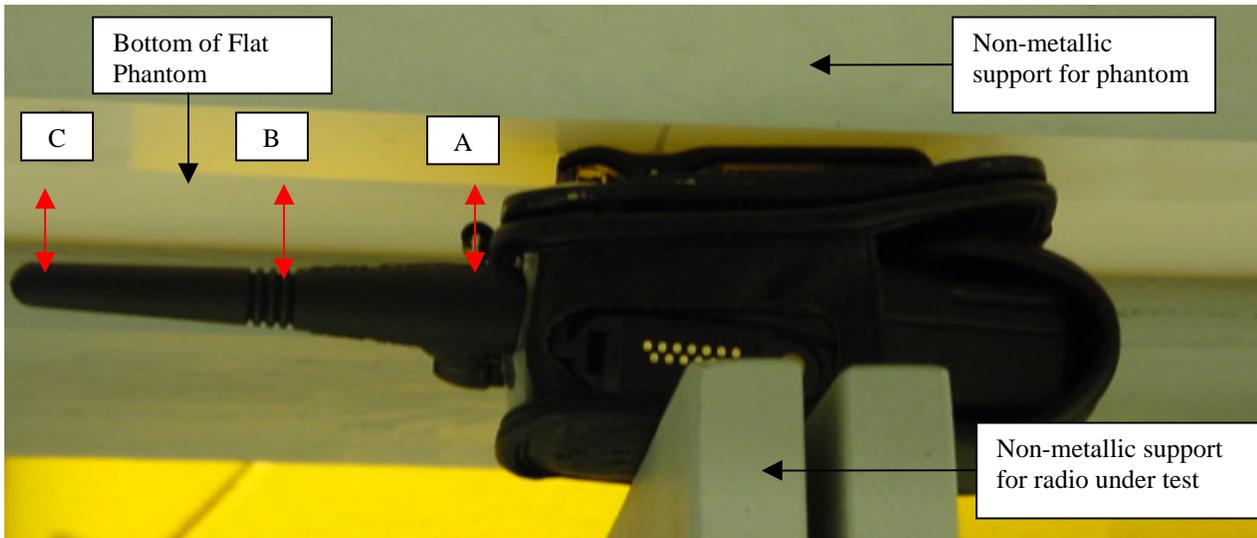
A3. Section 5.1 of the SAR report describes the test positions at the face (figure 1) and abdomen (figure 2). The photos in figures 1 and 2 are the actual "highest measured" configurations as described in section 7.0. See photos below for additional separation distances for all 3 body-worn carry cases. Please refer to section 3.0 and appendix D of the SAR report for a complete list of body-worn accessories.



JMZN4023A Plastic carry holder with swivel belt clip

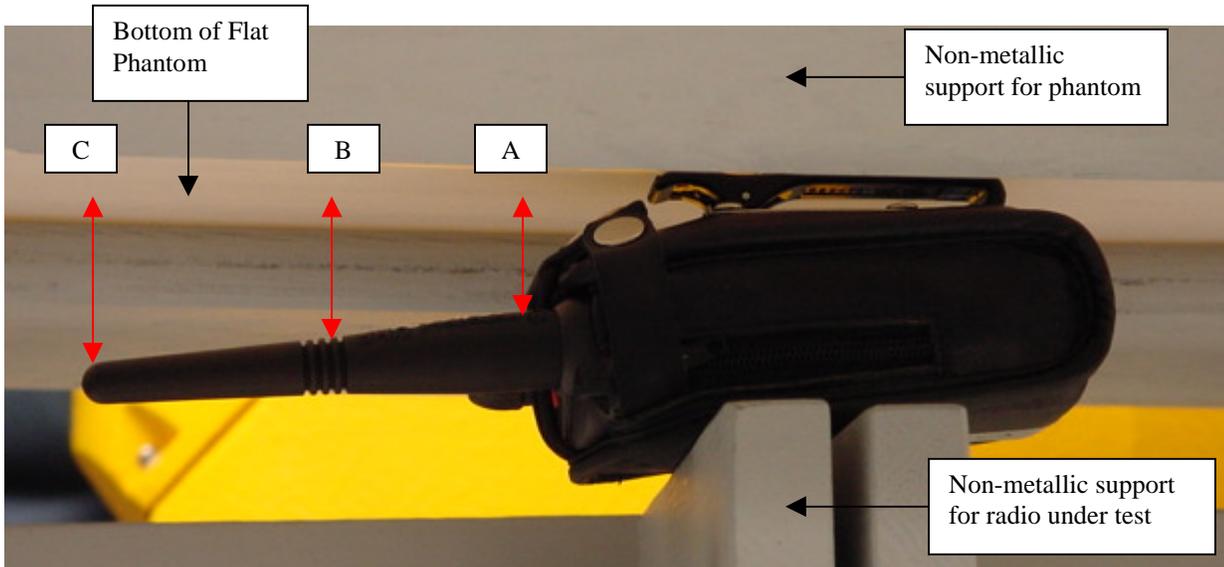
Distance A is from the surface of the antenna base to the phantom surface
Distance B is from the surface of the antenna center to the phantom surface
Distance C is from the surface of the antenna tip to the phantom surface

A=29mm
B=39mm
C=47mm



JMZN4019A Soft leather case with swivel belt clip

Distance A is from the surface of the antenna base to the phantom surface A=29mm
Distance B is from the surface of the antenna center to the phantom surface B=32mm
Distance C is from the surface of the antenna tip to the phantom surface C=34mm

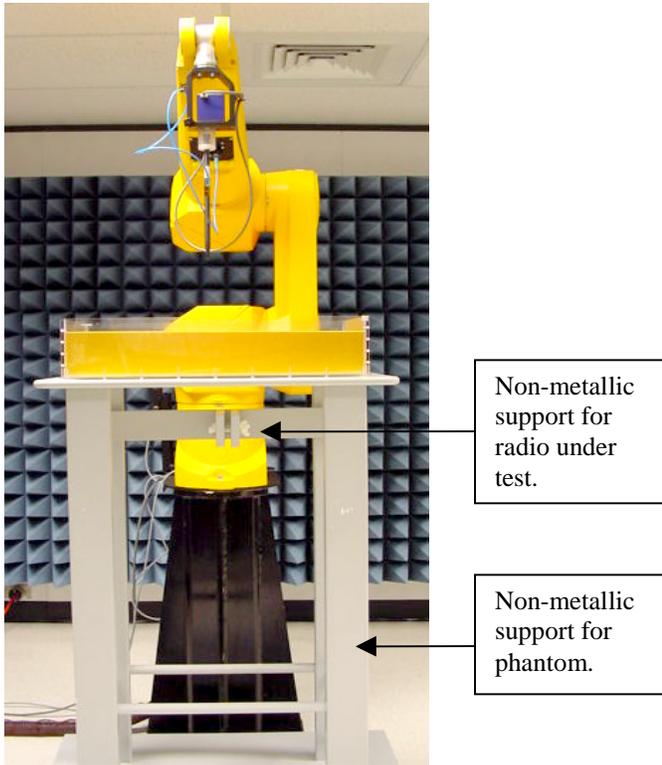


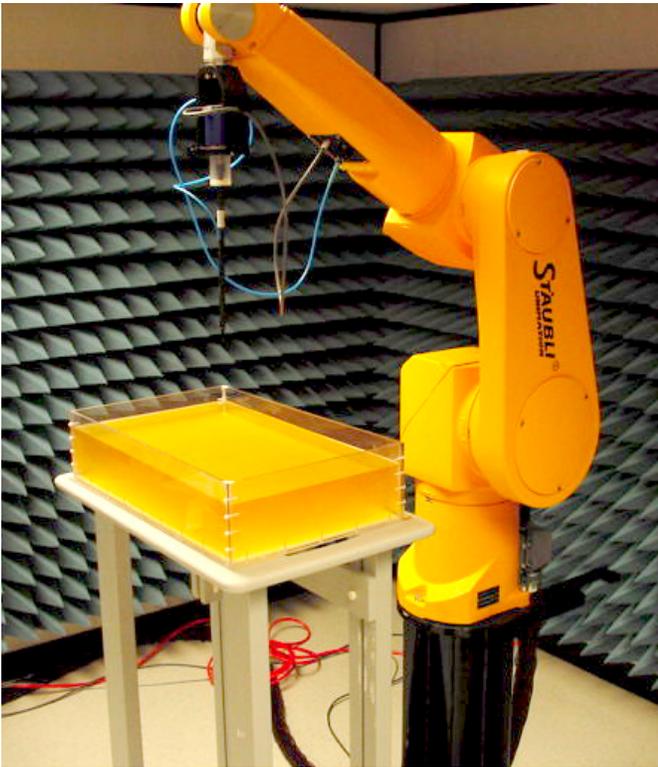
PMLN4421B Soft leather case with swivel belt clip

Distance A is from the surface of the antenna base to the phantom surface A=30mm
Distance B is from the surface of the antenna center to the phantom surface B=36mm
Distance C is from the surface of the antenna tip to the phantom surface C=41mm

Q4. It is not clear in Figure 2 of the SAR report where is the phantom. It looks like a couple pieces of (plastic) slabs. A better photo or description of the flat phantom is needed. It is not clear where the 2.5 cm in the "note" is referenced to compared to the other dimensions (A, B, C).

A4. The description of the flat phantom was provided in Section 4.2 of the SAR report; additional pictures of the flat phantom from different perspectives are included as part of this response. The 2.5 cm distance, as described in the note below figure 2 of the SAR report, is the distance from the microphone area of the radio to the phantom surface; the reference is the same phantom surface used for dimensions A, B and C.





Flat phantom filled with tissue supported by non-metallic stand.

Q5. There was no Question 5 in correspondence 19772. This note is for reference only.

Q6. All 5 antennas should be tested for both head and body configurations. If there are supporting info to demonstrate these configurations can be selectively tested to show compliance, it should be clearly explained in the SAR report. It will be up to us to review and determine if that would be acceptable. Please address how the battery options could affect either head or body SAR compliance.

A6. In regard to the antenna options, Motorola confirms all 5 antennas were tested for both abdominal and facial positions. Please refer to A2 for additional data.

In regard to battery options, since the battery is located on the back of the radio the predominant effect between the two battery options would be observed at the abdomen position, because batteries that vary in thickness will cause different separation distances between the user and the radio. The JMNN4023A battery is thinner than the JMNN4024A battery.

Battery Kit Number	Accessory	Separation distances		
JMNN4023A	Plastic carry holder with swivel belt clip	A=29mm	B=39mm	C=47mm
JMNN4024A	Plastic carry holder with swivel belt clip	A=34mm	B=44mm	C=53mm

Data from A2

Antenna	Battery	Position	Measured SAR
PMAE4006A	JMNN4024	Abdomen	2.33
PMAE4006A	JMNN4023	Abdomen	2.97

Q7. The SAR does not comply with the general population SAR limit. Please show how the users are going to be trained on RF exposure requirements to satisfy the occupational exposure limit.

A7. This device will be marketed to and used by employees solely for work-related operations, such as public safety agencies, e.g. police, fire and emergency medical. User training is the responsibility of these agencies, who can be expected to employ the usage instructions, safety information and operational cautions set forth in the user's manual, instructional sessions or other means. Motorola also makes available to its customers training classes on the proper use of two-way radios.

Motorola will accept grant conditions that would be identical to those set forth in FCC's June 4, 2001 Correspondence 19504 in reference to EA100397 FCC ID AZ489FT5803.

Q8. The radiated spurious emissions data in the Test Report exhibit says it is for "worst case. This is not defined. Upload radiated spurious emissions data for ALL 5 antenna configurations.

A8. The Transmitter Radiated Spurious Emissions data submitted in Section 7 of Exhibit 6 showed the worst case emissions. The "worst case" emission reported represents the highest absolute level at the specific harmonic for the low, mid and high channels (450.025 MHz, 488.025 MHz and 526.975 MHz) at the maximum power.

Per TIA/EIA-603, Section 2.2.12, Radiated Spurious Emissions are emissions from the equipment transmitting into a non-radiating load. Hence, none of the five antenna configurations are required for measuring Transmitter Radiated Spurious Emissions.

Please contact me at (954) 723-5793 if you require any additional information.

Regards,
/s/ Mike Ramnath
FCC Liaison
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