



SAR Exclusion Justification

Test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm

Guidance document reference: 447498 D01 General RF Exposure Guidance v05r01, page 11, paragraph 4.3.1(1).

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$\left[\frac{\text{max. power of channel, including tune-up tolerance, mW}}{\text{min. test separation distance, mm}} \right]^* \cdot \sqrt{f(\text{GHz})} \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$

- $f(\text{GHz})$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

SAR test exclusion analysis:

Assumptions: Since the exact separation distance may vary, the minimum separation distance of 5 mm is assumed per the guidance document.

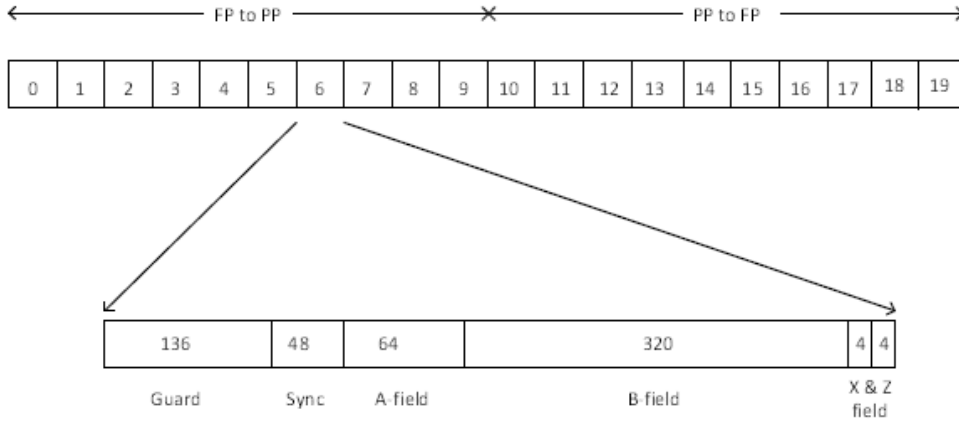
Scaling of rf power output:

Maximum peak rf output power from page 15 of test report 2014_272452_FCC_15247 is 87.1 mW

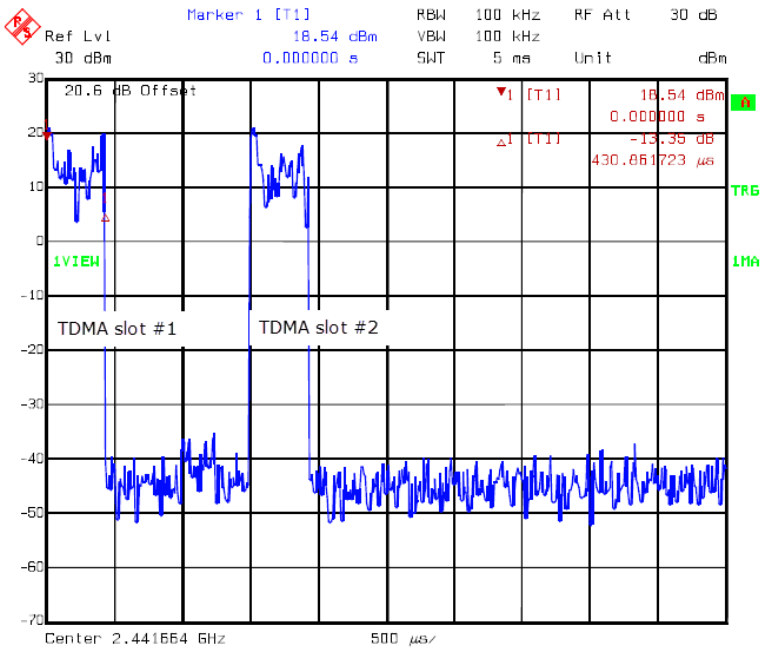
The system uses a source –based duty cycle. The system is TDMA based using 2 of 20 evenly spaced time slots (see page 12 of test report). This makes the source-based duty cycle a ratio of 1:10. The power is therefore scaled by a factor of 10 for the purpose of this analysis making the peak power of 87 mW a value of 8.7 mW average.



Frame and slot structure for the MARS 47 system – 2.4GHz band



1 frame = 20 slot Crystal freq = 10.368 Mhz
 1 slot = 576 bit Bitrate = 1.152 Mbit/s
 1 frame = 11520 bit Bit-period= 869 ns
 Frame period = 10 ms/frame RF Channels = 47



Measured peak power: 87 mW
 Source-based average power = 87 mW/10 = 8.7 mW



Max. power of channel: 8.7 mW
Min. separation distance: 5 mm
Max. frequency: 2.48 GHz

[(Pwr/Dist)*√Freq.] = 2.7

The result of the above SAR threshold calculation demonstrates that the result is less than the 1-g numeric threshold of 3 and the 10-g numeric threshold of 7.5.

Conclusion: The above analysis shows that the evaluated device qualifies for exemption from SAR testing for both 1-g and 10-g SAR.

Signed:  David Light 3/2/2015
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