



MPE/RF EXPOSURE EVALUATION REPORT

FCC CFR 47 Part 1.1310

TUVR116_FCC_MPE Rev B

Company: Sonos Inc.

Model Name: S23



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To: FCC CFR 47 Part 1.1310

Test Report Serial No.: TUVR116_FCC_MPE Rev B

This report supersedes: NONE

Applicant: Sonos Inc
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This Test Report is Issued Under the Authority of:

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1.1. MAXIMUM PERMISSABLE EXPOSURE

Calculations for Maximum Permissible Exposure Levels

$$\text{Power Density} = P_d \text{ (mW/cm}^2) = \text{EIRP}/(4\pi d^2)$$

$$\text{EIRP} = P * G$$

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

$$\text{Numeric Gain} = 10 ^ (G \text{ (dBi)}/10)$$

The calculations in the table below use the highest conducted power value together with the highest antenna gain specified for the EUT. These calculations represent worst case in terms of the exposure levels.

Freq. Band (MHz)	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Power Density (mW/cm ²) @ 20cm	Power Density Limit (mW/cm ²)	Min Calculated safe distance for Limit (cm)
2400.0 - 2483.5 (BLE)	3.3	2.14	-6.62	0.22	0.000093	1.00	0.192
2400.0 - 2483.5 (WiFi 5.5 Mbit/s)	3.6	2.29	23.87	243.78	0.111	1.00	6.666
5725.0 - 5850.0	2.9	1.95	23.99	250.61	0.097	1.00	6.236

The following assessments are worst case exposure conditions where the Sonos Inc S23 contains 2 radio modules:- 2.4GHz/5GHz 802.11 and 2.4GHz BLE with both radios transmitting simultaneously;-

The following table is an assessment of worst case exposure conditions for the two radios in question

Freq. Band (MHz)	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance for Summation (cm)	Power Density Limit (mW/cm ²) E _{ref}	Power Density (mW/cm ²) @20cm	Summation E _i /E _{ref} @ 20 cm
2400.0 - 2483.5 (BLE)	3.3	2.14	-6.62	0.22				
2400.0 - 2483.5 (WiFi 5.5 Mbit/s)	3.6	2.29	23.87	243.78				
EIRP TOTAL (mW/EIRP) :					20 cm distance Total Evaluation:		0.112 mW/cm²	

Note: for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Worst Case Simultaneous Operation

Assessment for simultaneous operation: 2.4GHz, BLE

Freq. Band (MHz)	Ant Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Power Density (mW/cm ²) @ 20cm	Power Density Limit (mW/cm ²)
2400.0 - 2483.5 (BLE)	3.3	2.14	-6.62	0.22	0.000093	1.00
2400.0 - 2483.5 (WiFi 5.5 Mbit/s)	3.6	2.29	23.87	243.78	0.111	1.00
Evaluation for compliance of simultaneous transmission is determined by summation of the ratios of Pd Calc/Pd Limit < 1.						
Ratio = S BLEi + S Wi-Fi = 0.00009/1 + 0.111/1 = 0.112						

Specification

Maximum Permissible Exposure Limits

FCC §1.1310 Table 1
 300 to 1500MHz = $f/1500$ (mW/cm²)
 1500 to 100,000MHz = 1 mW/cm²



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