

47 CFR §2.1093 - Maximum Permissible Exposure Evaluation

FCC ID:	PY7-46195Y	Sony Corporation 1-7-1 Konan Minato-ku Tokyo, 108-0075, Japan Certification
Device Type:	Portable Device	
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Exposure Scenario	% of MPE Limit
Standalone	15.7 %
Simultaneous	28.8 %

The measurement evaluations presented in this report is based on the maximum performance of the assessed device(s) which has been shown to be capable of compliance for maximum permissible MPE for uncontrolled environment/ general population exposure federal limits in 47CFR § 1.1310 and has been assessed in accordance with the measurement procedures specified within this report.

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This document has been revised and replaces all previously issued versions of this document with the same Test Report S/N.



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1. DUT Specifics

1.1. Device Under Test

This portable device operates with a power control mechanism such that the device can operate at maximum power only when it is operating more than 20 cm from the body. Therefore, the maximum permissible exposure (MPE) was additionally assessed at 20cm for WWAN Sub 6GHz Operations and associated simultaneous transmission scenarios.

The power control mechanism does not impact the NR FR2 Operations, therefore, these bands were assessed entirely in the near-field power density report.

1.2. Maximum Power

This device follows the below target output power specifications and tolerances when operating off-body.

Table 1-1 LTE Target RF Output Power

LTE			LTE during EN-DC conditions		
Band/Mode	Antenna	Modulated Average Nominal Power [dBm]	Band/Mode	Antenna	Modulated Average Nominal Power [dBm]
		Pmax (Off-Body)			Pmax (Off-Body)
LTE Band 71	Main1	24.0	LTE Band 12	Main1	23.0
LTE Band 12/17	Main 1	24.0	LTE Band 13	Main1	23.0
LTE Band 12/17	Sub	24.0	LTE Band 5	Main1	23.0
LTE Band 13	Main1	24.0	LTE Band 66	Main2	23.0
LTE Band 13	Sub	23.7	LTE Band 66	Sub	23.0
LTE Band 5	Main1	24.0	LTE Band 2	Main2	23.0
LTE Band 5	Sub	24.0	LTE Band 2	Sub	23.0
LTE Band 66/4	Main2	24.0	LTE Band 30	Main2	22.0*
LTE Band 25/2	Main2	24.0	LTE Band 30	Sub	22.0
LTE Band 30	Main2	22.0*	LTE Band 41	Main2	23.0
LTE Band 41	Main2	24.0	LTE Band 48	Main1	21.0**
LTE Band 48	Main1	21.0**	LTE Band 48	Sub-UHB	21.0
LTE Band 48	Sub-UHB	21.0	Upper Tolerance: +1.0 dB		
Upper Tolerance: +1.0 dB			*Upper Tolerance: +0.4 dB		
*Upper Tolerance: +0.4 dB			**Upper Tolerance: +0.5 dB		
**Upper Tolerance: +0.5 dB			Lower Tolerance: -1.5 dB		
Lower Tolerance: -1.5 dB					



Table 1-2 NR Target RF Output Power

NR		
Band/Mode	Antenna	Modulated Average Nominal Power [dBm]
		Pmax (Off-Body)
NR Band n71	Main1	24.0
NR Band n5	Main1	24.3*
NR Band n5	Sub	23.8
NR Band n66	Main2	24.0
NR Band n25/n2	Main2	24.0
NR Band n30	Main2	21.5**
NR Band n41 PC2	Main2	26.0
NR Band n41 PC3	Main2	24.0
NR Band n41 (PC3, UL-MIMO)	Main2	19.5
NR Band n41 PC2 SRS 1T4R	Sub	24.4
NR Band n41 PC3 SRS 1T4R	Sub	22.4
NR Band n41 (PC3, UL-MIMO / SRS 2T4R)	Sub	19.5
NR Band n41 PC2 SRS 1T4R	3rd-LMH	25.2
NR Band n41 PC3 SRS 1T4R	3rd-LMH	23.2
NR Band n41 PC3 SRS 2T4R	3rd-LMH	18.7
NR Band n41 PC2 SRS 1T4R	4th-MBHB	25.3
NR Band n41 PC3 SRS 1T4R	4th-MBHB	23.3
NR Band n41 PC3 SRS 2T4R	4th-MBHB	17.7
NR Band n48 SA	Main1	21.0***
NR Band n48 UL-MIMO	Main1	18.0***
NR Band n48 (UL-MIMO / SRS 2T4R)	Sub-UHB	18.0
NR Band n48 SRS 2T4R	3rd-LMH	16.8
NR Band n48 SRS 2T4R	4th-MBHB	16.2
NR Band n77 PC2	Main1	26.5
NR Band n77 PC3	Main1	24.3*
NR Band n77 (PC3, UL-MIMO / SRS 2T4R)	Main1	19.8
NR Band n77 PC2 AS-Div	Sub-UHB	25.0
NR Band n77 PC3 AS-Div	Sub-UHB	22.8
NR Band n77 PC2 SRS 1T4R	Sub-UHB	25.0
NR Band n77 PC3 SRS 1T4R	Sub-UHB	22.8
NR Band n77 (PC3, UL-MIMO / SRS 2T4R)	Sub-UHB	19.8
NR Band n77 PC2 SRS 1T4R	3rd-LMH	24.2
NR Band n77 PC3 SRS 1T4R	3rd-LMH	22.0
NR Band n77 PC3 SRS 2T4R	3rd-LMH	17.5
NR Band n77 PC2 SRS 1T4R	4th-MBHB	24.4
NR Band n77 PC3 SRS 1T4R	4th-MBHB	22.2
NR Band n77 PC3 SRS 2T4R	4th-MBHB	16.9
Upper Tolerance: +1.0 dB *Upper Tolerance: +0.7 dB **Upper Tolerance: +0.4 dB ***Upper Tolerance: +0.5 dB		
Lower Tolerance: -1.5 dB		



Table 1-3 2.4 GHz WLAN Maximum RF Output Power (including tolerance)

2.4 GHz WLAN									
Mode / Band	Power Level	Chain0 in MIMO				Chain1 in MIMO			
		802.11b (CDD + STBC)	802.11g (CDD + STBC)	802.11n (CDD + STBC, SDM)	802.11ax (SU) (CDD + STBC, SDM)	802.11b (CDD + STBC)	802.11g (CDD + STBC)	802.11n (CDD + STBC, SDM)	802.11ax (SU) (CDD + STBC, SDM)
		Maximum Allowed Power [dBm]							
2.45 GHz WLAN	Normal State	13	13	13	13	12.5	13	13	13
	Simultaneous 2 GHz and 5 GHz / 6 GHz State	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5

Table 1-4 5 GHz WLAN Maximum RF Output Power (including tolerance)

5 GHz WLAN						
Mode	Band	Power Level	Chain0 / Chain1 in MIMO			
			802.11a (CDD + STBC)	802.11n (CDD + STBC, SDM)	802.11ac (CDD + STBC, SDM)	802.11ax (SU) (CDD + STBC, SDM)
			Maximum Allowed Power [dBm]			
5 GHz WLAN (20 MHz BW)	UNII-1/2A/2C/3	Normal State	7.5	7.5	7.5	7.5
		Simultaneous 2 GHz and 5 GHz State	7.5	7.5	7.5	7.5
5 GHz WLAN (40 MHz BW)	UNII-1/2A/2C/3	Normal State		7.5	7.5	7.5
		Simultaneous 2 GHz and 5 GHz State		7.5	7.5	7.5
5 GHz WLAN (80 MHz BW)	UNII-1/2A/2C/3	Normal State			7.5	7.5
		Simultaneous 2 GHz and 5 GHz State			7.5	7.5
5 GHz WLAN (160 MHz BW)	UNII-1/2A/2C	Normal State			7.5	7.5
		Simultaneous 2 GHz and 5 GHz State			7.5	7.5

Table 1-5 6 GHz WLAN Maximum RF Output Power (including tolerance)

6 GHz WLAN - LPI				
Mode	Band	Power Level	Chain0 / Chain1 in MIMO	
			802.11a (CDD + STBC)	802.11ax (SU) (CDD + STBC, SDM)
			Maximum Allowed Power [dBm]	
6 GHz WLAN (20 MHz BW)	UNII-5/6/7	Normal State	5.0	5.0
		Simultaneous 2 GHz and 6 GHz State	5.0	5.0
	UNII-8	Normal State	5.5	6.5
6 GHz WLAN (40 MHz BW)	UNII-5/6/7/8	Normal State		7.5
		Simultaneous 2 GHz and 6 GHz State		7.5
6 GHz WLAN (80 MHz BW)	UNII-5/6/7/8	Normal State		7.5
		Simultaneous 2 GHz and 6 GHz State		7.5
6 GHz WLAN (160 MHz BW)	UNII-5/6/7/8	Normal State		7.5
		Simultaneous 2 GHz and 6 GHz State		7.5

Table 1-6 2.4 GHz Bluetooth Maximum RF Output Power (including tolerance)

2.4 GHz Bluetooth	
Chain0 / Chain1	
Mode	Maximum Allowed Power [dBm]
BR	11.0
EDR	11.0
BLE 1 Mbps	10.79
BLE 2 Mbps	10.79
BLE LR s2	10.79
BLE LR s8	10.79



2. MPE Results (Standalone)

Table 2-1 MPE Results

Band Mode	Antenna	AG	Max Allowed Power [dBm]	Max Allowed Power [mW]	MPE [mW/cm ²]	Limit [mW/cm ²]	MPE % of Limit
LTE Band 71	Main1	AG0	25	316.2	0.04986	0.465	10.71%
LTE Band 12	Main1	AG0	25	316.2	0.05090	0.477	10.66%
LTE Band 17	Main1	AG0	25	316.2	0.05090	0.477	10.66%
LTE Band 12	Sub	AG1	25	316.2	0.03103	0.477	6.50%
LTE Band 17	Sub	AG1	25	316.2	0.03103	0.477	6.50%
LTE Band 13	Main1	AG0	25	316.2	0.05020	0.525	9.57%
LTE Band 13	Sub	AG1	24.7	295.1	0.03160	0.525	6.02%
LTE Band 5	Main1	AG0	25	316.2	0.05032	0.566	8.89%
LTE Band 5	Sub	AG1	25	316.2	0.05417	0.566	9.57%
LTE Band 4	Main2	AG0	25	316.2	0.08785	1.000	8.78%
LTE Band 66	Main2	AG0	25	316.2	0.08785	1.000	8.78%
LTE Band 66	Sub	AG1	24	251.2	0.04537	1.000	4.54%
LTE Band 2	Main2	AG0	25	316.2	0.08585	1.000	8.58%
LTE Band 2	Sub	AG1	24	251.2	0.04034	1.000	4.03%
LTE Band 25	Main2	AG0	25	316.2	0.08585	1.000	8.58%
LTE Band 30	Main2	AG0	22.4	173.8	0.04963	1.000	4.96%
LTE Band 30	Sub	AG1	23	199.5	0.04342	1.000	4.34%
LTE Band 41	Main2	AG0	25	316.2	0.08585	1.000	8.58%
LTE Band 48	Main1	AG0	21.5	141.3	0.03481	1.000	3.48%
LTE Band 48	Sub-UHB	AG1	22	158.5	0.02539	1.000	2.54%
NR Band n71	Main1	AG0	25	316.2	0.04986	0.465	10.71%
NR Band n5	Main1	AG0	25	316.2	0.05032	0.566	8.89%
NR Band n5	Sub	AG1	24.8	302.0	0.05173	0.566	9.14%
NR Band n66	Main2	AG0	25	316.2	0.08785	1.000	8.78%
NR Band n2	Main2	AG0	25	316.2	0.08585	1.000	8.58%
NR Band n25	Main2	AG0	25	316.2	0.08585	1.000	8.58%
NR band n30	Main2	AG0	21.9	154.9	0.04423	1.000	4.42%
NR Band n41	Sub	AG1	25.4	346.7	0.08255	1.000	8.26%
NR band n41	3rd-LMH	AG1	26.2	416.9	0.09655	1.000	9.65%
NR band n41	4th-MBHB	AG1	26.3	426.6	0.11213	1.000	11.21%
NR Band n41	Main2	AG0	27	501.2	0.13606	1.000	13.61%
NR Band n48	Sub-UHB	AG1	20	100.0	0.01602	1.000	1.60%
NR Band n48	3rd-LMH	AG1	17.8	60.3	0.02186	1.000	2.19%
NR Band n48	4th-MBHB	AG1	17.2	52.5	0.00772	1.000	0.77%
NR Band n48	Main1	AG0	21.5	141.3	0.03481	1.000	3.48%
NR Band n77	Sub-UHB	AG1	26	398.1	0.10040	1.000	10.04%
NR Band n77	3rd-LMH	AG1	25.2	331.1	0.12015	1.000	12.02%
NR Band n77	4th-MBHB	AG1	25.4	346.7	0.09789	1.000	9.79%
NR Band n77	Main1	AG0	27.5	562.3	0.15658	1.000	15.66%
2.4 GHz WIFI	Chain0	-	13	20.0	0.00276	1.000	0.28%
2.4 GHz WIFI	Chain1	-	13	20.0	0.00185	1.000	0.18%
2.4 GHz Bluetooth	Chain0	-	11	12.6	0.00174	1.000	0.17%
2.4 GHz Bluetooth	Chain1	-	11	12.6	0.00117	1.000	0.12%
5GHz WIFI	Chain0	-	7.5	5.6	0.00099	1.000	0.10%
5GHz WIFI	Chain1	-	7.5	5.6	0.00098	1.000	0.10%
6 GHz WIFI	Chain0	-	7.5	5.6	0.00079	1.000	0.08%
6 GHz WIFI	Chain1	-	7.5	5.6	0.00074	1.000	0.07%

3. MPE Results (Simultaneous Transmission)

This device is enabled with Qualcomm® Smart Transmit Gen2 with pre-defined sub6 antenna groups (AG0 and AG1). Simultaneous transmission analysis is performed per antenna groups. The sum of the MPE from each AGs and the RF exposure from radios outside Smart Transmit (ie: Bluetooth, WIFI) must be less than regulatory limits. As a conservative estimate, the assessment was performed as if all radios outside of Smart Transmit could transmit simultaneously at maximum power.

Transmitter	% of Limit
Antenna Group 0 (AG0)	15.66%
Antenna Group 1 (AG1)	12.02%
2.4 GHz WIFI (MIMO)	0.46%
2.4 GHz Bluetooth (Chain 0)	0.17%
2.4 GHz Bluetooth (Chain 1)	0.12%
5 GHz WIFI (MIMO)	0.20%
6 GHz WIFI (MIMO)	0.15%
Simultaneous	28.77%

4. General Introduction

Title 47 of the Code of Federal Regulations (CFR) pertains to United States Federal regulation for Telecommunications. The Federal Communications Commission (FCC) is the agency responsible for implementing and enforcing these regulations. The rules define a radiofrequency device as any device which in its operation is capable of emitting radiofrequency energy by radiation, conduction, or other means.

47CFR §2.1091(b) states, “A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the RF source's radiating structure(s) and the body of the user or nearby persons.”

Also, 47CFR §1.1310(e)(3) states, that General population/uncontrolled exposure limits defined in §1.1310 “General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.”

5. Background on Radiofrequency (RF) Exposure Limits

5.1. Controlled Environment

Controlled environments are defined as locations where the RF field intensities have been adequately characterized by means of measurement or calculation and exposure is incurred by persons who are: aware of the potential for RF field exposure, cognizant of the intensity of the RF fields in their environment, aware of the potential health risks associated with RF field exposure and able to control their risk using mitigation strategies. In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

5.2. Uncontrolled Environment

Uncontrolled environments are defined as locations where either insufficient assessment of RF fields have been conducted or where persons who are allowed access to these areas have not received proper RF field awareness/safety training and have no means to assess or, if required, to mitigate their exposure to RF fields. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed, or in which persons who may not be made fully aware of the potential for exposure, or cannot exercise control over their exposure. Members of the general public would fall under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.3. Mobile RF Exposure Limits

Per FCC 47 CFR §1.1310, the power density limits are applied for frequencies between 300 MHz and 100 GHz as shown below.

Table 5-1
Human Exposure to RF Radiation Limits in 47 CFR §1.1310

Environment	Frequency (MHz)	Power Density (mW/cm ²)	Average Time (minutes)
Uncontrolled / General Population	300 - 1500	f/1500	30
	1500 - 100000	1	30
Controlled	300 - 1500	f/300	6
	1500 - 100000	5	6

6. MPE Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements.

The power generated by each transmitter used in this product was initially measured by a power meter or spectrum analyzer and the powers were recorded. Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at a distance of 20cm.

Friis Transmission Formula

$$P_d = \frac{P_{out} * G}{(4\pi r^2)}$$

Where,

P_d = Power Density (mW/cm²)

P_{out} = output power to antenna (mW)

r = distance between observation point and center of the radiator (cm)

G = gain of antenna in linear scale

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios to the limit for all simultaneous transmitting antennas incorporated in a device is ≤ 1 .

7. Conclusion

The device meets the mobile RF Exposure limit at 20cm separation distance as specified in §2.1091 of the FCC rules.