

Appendix H: TAS Validation for HAC Pmax

This device operates different Pmax for HAC mode.

Please refer to the Main Operational description for detailed power control concept and description.

This appendix is to validate that the average Plimit level is maintained using Pmax for HAC operation.

Time-varying Tx power measurement in LTE Band 41 PC3 (Ant.F) was used for validation Pmax for HAC.

Test was performed with both Pmax and Pmax(HAC), and the result shows that average plimit level is maintained.

Table 1 : P_{limit} for LTE/NR TDD bands (P_{limit} in EFS file)

Exposure condition			Head (RCV)	Bodyworn & Hotspot	Phablet 10-g SAR	Pmax (Maximum tune-up Power) (dBm)	Pmax (HAC) (Maximum tune-up Power for HAC) (dBm)
Spatial-average			1g	1g	10g		
Test distance (mm)			0	10	0		
DSI :			1	0	0		
RF Air Interface	Antenna	Antenna Group	Plimit corresponding to 1.0 W/kg (SAR _{design_target}) (1g) / 2.5 W/kg (SAR _{design_target}) (10g)				
LTE Band 41(38) PC3	B	AG 0	20.4	21.0	21.0	22.0	22.0
LTE Band 41(38) PC3	F	AG 1	17.0	19.5	19.5	22.0	20.0
LTE Band 41(38) PC2	B	AG 0	20.4	21.0	21.0	22.1	20.4
LTE Band 41(38) PC2	F	AG 1	17.0	19.5	19.5	22.1	18.4
LTE Band 48	F	AG 1	16.0	20.8	20.0	20.0	17.0
NR Band n41(38) PC2 -Main- (Switching SRS1)	F	AG 1	17.0	19.5	19.5	26.0	21.0
NR Band n41 PC2 -SRS2- (Switching SRS3)	E	AG 1	15.0	15.0	15.0	23.0	21.0
NR Band n41(38) swithcing PC2 -Main- (non switching SRS1)	B	AG 0	21.0	21.0	21.0	26.0	22.0
NR Band n41 swithcing PC2-SRS2- (non switching SRS3)	D	AG 0	17.0	17.0	17.0	22.5	21.0
NR Band n48 -Main-	F	AG 1	15.5	19.5	19.5	22.0	20.0
NR Band n48 -SRS1-	C	AG 0	18.0	18.0	18.0	20.5	20.0
NR Band n48 -SRS2-	I	AG 1	11.5	18.0	18.0	20.5	20.0
NR Band n48 -SRS3-	D	AG 0	17.0	17.0	17.0	19.5	19.5
NR Band n77(78) PC2 -Main-	F	AG 1	16.0	18.5	18.5	26.0	20.0
NR Band n77(78) PC2 -SRS1-	C	AG 0	18.0	18.0	18.0	23.0	20.0
NR Band n77(78) PC2 -SRS2-	I	AG 1	11.5	19.0	19.0	25.0	20.0
NR Band n77(78) PC2 -SRS3-	D	AG 0	16.5	16.5	16.5	23.0	20.0

Table 2 : Configuration selected for Part 2 test

Test Case	Test Scenario	Tech	Band	Antenna	DSI	Channel	Freq. (MHz)	RB/RB Offset /Bandwidth (MHz)	Mode	SAR Exposure Scenario	Worst configurations	Part 1 Worst Case Measured SAR at Plimit (W/kg)
1	Test Sequence 1	LTE	B41	F	1	41490	2680.0	1/50/20 MHz	QPSK	Head	Right tilt - 0mm	0.924

1. Time-varying Tx power transmission scenario

Following descriptions are referred to 4790976523-S1 FCC Report RF exposure_Part2 report including sections and tables.

This test is performed with the two pre-defined test sequences described in Section 3.1 for all the technologies and bands selected in Section 3.2.1. The purpose of the test is to demonstrate the effectiveness of power limiting enforcement and that the time-averaged SAR (corresponding time averaged Tx power) does not exceed the FCC limit at all times (see Eq. (1a) and (1b)).

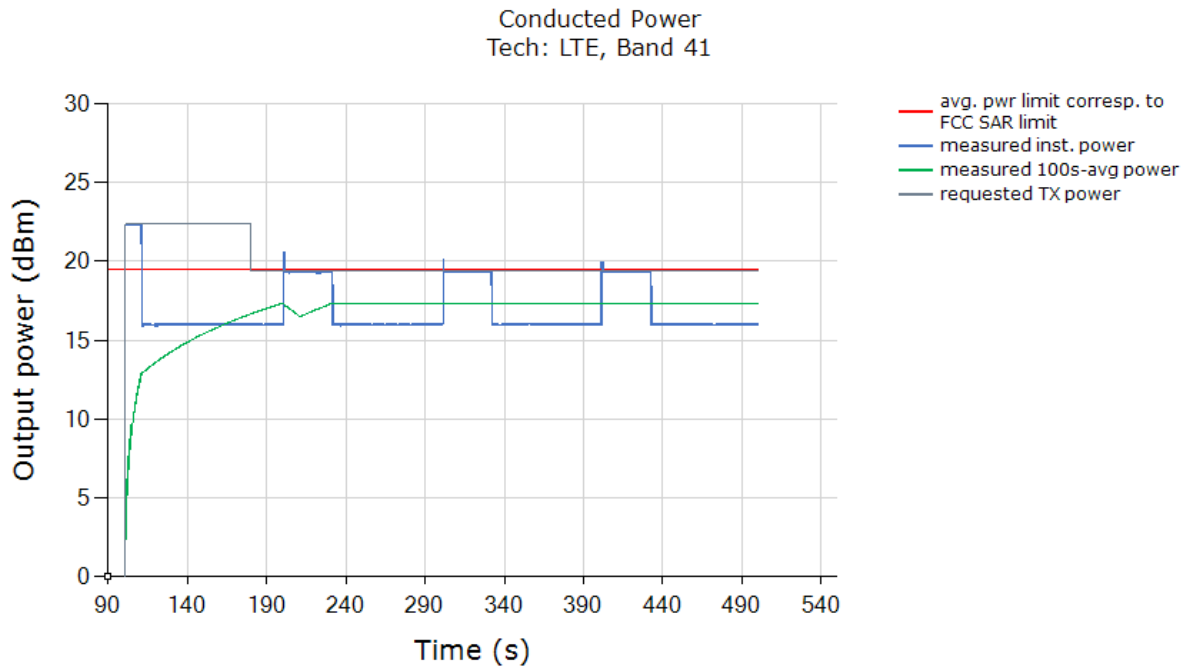
Test procedure:

1. Measure P_{max} , measure P_{limit} and calculate Preserve (= measured P_{limit} in dBm – $Reserve_power_margin$ in dB) and follow Section 3.1 to generate the test sequences for all the technologies and bands selected in Section 3.2.1. Both test sequence 1 and test sequence 2 are created based on measured P_{max} and measured P_{limit} of the EUT. Test condition to measure P_{max} and P_{limit} is:
 - Measure P_{max} with Smart Transmit disable and callbox set to request maximum power.
 - Measure P_{limit} with Smart Transmit enable and $Reserve_power_margin$ set to 0 dB (Peak exposure mode); callbox set to request maximum power.
2. Set $Reserve_power_margin$ to actual (intended) value (3dB for this EUT based on Part 1 report) and reset power on EUT to enable Smart Transmit, establish radio link in desired radio configuration, with callbox requesting the EUT's Tx power to be at pre-defined test sequence 1, measure and record Tx power versus time, and then convert the conducted Tx power into 1gSAR or 10gSAR value (see Eq. (1a)) using measured P_{limit} from above Step 1. Perform running time average to determine time-averaged power and 1gSAR or 10gSAR versus time as illustrated in Figure A-1 where using 100-second time window as an example.
3. Make one plot containing:
 - a. Computed time-averaged 1gSAR or 10gSAR versus time determined in Step 2
 - b. Corresponding regulatory $1g$ or $10gSAR_{limit}$ limit.

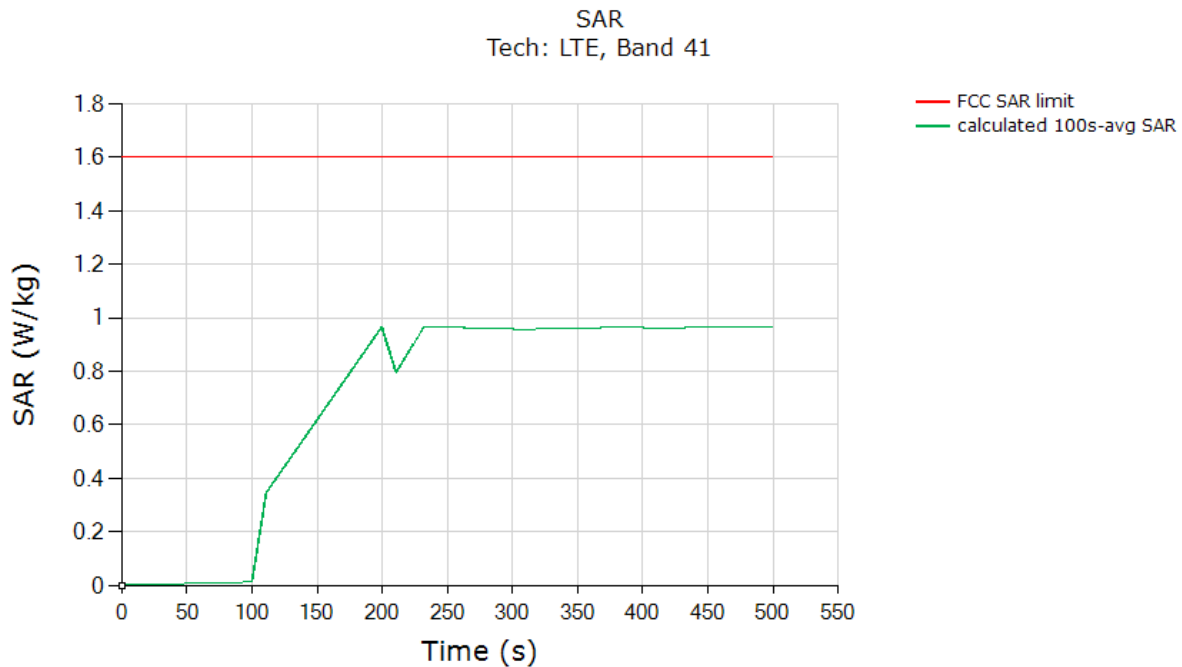
The validation criteria is, at all times, the time-averaged 1gSAR or 10gSAR versus time shown in Step 2 shall not exceed regulatory $1g$ or $10gSAR_{limit}$ limit.

2. LTE Band 41 PC3 (Ant.F)

Test result for test sequence 1 : with Pmax

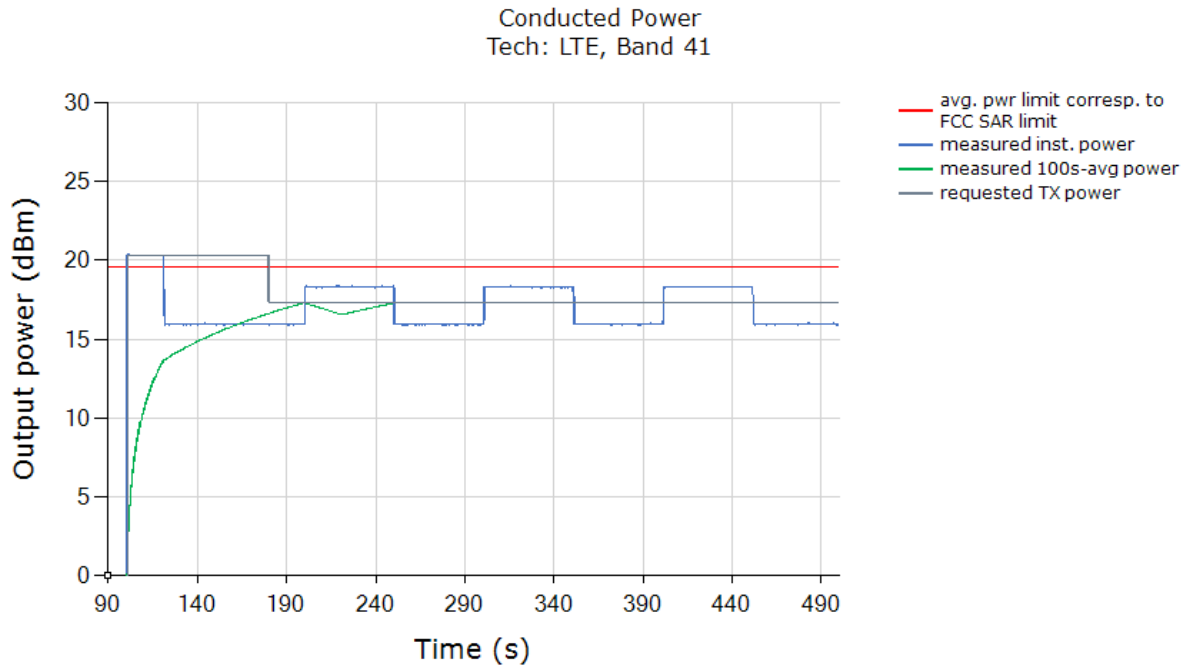


Above Time-averaged conducted Tx power is converted/calculated into time-averaged SAR using Equation (1a) and plotted below to demonstrate that the time-averaged SAR versus time does not exceed the FCC limit for SAR (1.6W/kg for 1g SAR or 4.0W/kg for 10g SAR):

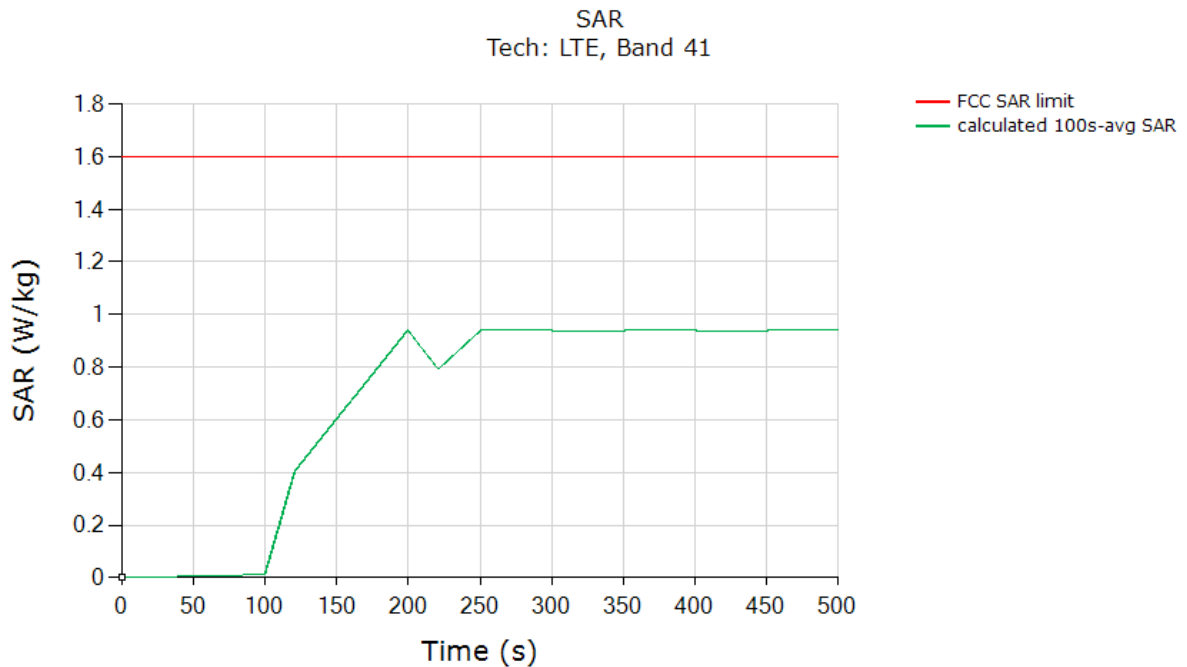


	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (green curve)	0.966
Validated : Max time averaged SAR (green curve) is within 1 dB device uncertainty of measured SAR at P_{limit} (Table 2).	

Test result for test sequence 1 : with Pmax(HAC)



Above Time-averaged conducted Tx power is converted/calculated into time-averaged SAR using Equation (1a) and plotted below to demonstrate that the time-averaged SAR versus time does not exceed the FCC limit for SAR (1.6W/kg for 1g SAR or 4.0W/kg for 10g SAR):



	(W/kg)
FCC 1gSAR limit	1.6
Max 100s-time averaged 1gSAR (green curve)	0.941
Validated : Max time averaged SAR (green curve) is within 1 dB device uncertainty of measured SAR at P_{limit} (Table 2).	