

SAR Exclusion Evaluation Report

Project Number: 4238300

Report Number: 4238300EMC03 **Revision Level:** 0

Client: Altair Semiconductor

Equipment Under Test: CAT-1 LTE Module

Model Name: ALT1210MOD-VZ-01

Applicable Standards: 47 C.F.R. §§ 2.1091 and 2.1093;

FCC KDB 447498

Report issued on: 11 December 2017

Conclusion: SAR testing is exempt in the following conditions

- Distance to extremity is 53 mm or greater
- Distance to body is 79 mm or greater

Remarks: This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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1 General Information

1.1 Client Information

Name: Altair Semiconductor
Address: 6 Ha'harash st. P.O. Box 7158
City, State, Zip, Country: Hod Hasharon 45240, Israel

1.2 Test Laboratory

Name: SGS North America, Inc.
Address: 620 Old Peachtree Road NW, Suite 100
City, State, Zip, Country: Suwanee, GA 30024, USA

1.3 General Information of EUT

Type of Product: CAT-1 LTE Module
Model Number: ALT1210MOD-VZ-01
Serial Number: ALT1710110007041
FCC ID: ALTMOD001R0

IMEI Number: 0000000000000000
IMSI Number: 001010123456063

Rated Voltage: 3.8 Vdc
Test Voltage: 3.8 Vdc
Tx Frequency Range: 1710 – 1755 MHz (LTE Band 4)
777 – 787MHz (LTE Band 13)

FCC Classification: PCS Licensed Transmitter PCB
Type: Pre-Production

Sample Received Date: 14 November 2017

1.4 Operating Modes and Conditions

For this assessment, the EUT's maximum power including the maximum tolerance was considered.

2 SAR Exclusion

2.1 Conclusion

SAR testing is not applicable.

2.2 Requirement

From KDB 447498 D01 General RF Exposure Guidance V06

4.3. General SAR test exclusion guidance

4.3.1. Standalone SAR test exclusion considerations

Unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition(s), listed below, is (are) satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum *test separation distance* required for the exposure conditions. The minimum *test separation distance* defined in 4.1 f) is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander. To qualify for SAR test exclusion, the *test separation distances* applied must be fully explained and justified, typically in the SAR measurement or SAR analysis report, by the operating configurations and exposure conditions of the transmitter and applicable host platform requirements, according to the required *published RF exposure KDB procedures*. When no other RF exposure testing or reporting are required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for SAR test exclusion. When required, the device specific conditions described in the other *published RF exposure KDB procedures* must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops and tablets, etc.

a) For 100 MHz to 6 GHz and *test separation distances* ≤ 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:

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

- $f_{(\text{GHz})}$ 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
- The values 3.0 and 7.5 are referred to as numeric thresholds in step b) 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 4.1 f) is applied to determine SAR test exclusion.

b) For 100 MHz to 6 GHz and *test separation distances* > 50 mm, the 1-g and 10-g *SAR test exclusion thresholds* are determined by the following:

$$1) \{[\text{Power allowed at numeric threshold for } 50 \text{ mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot (f_{(\text{MHz})}/150)]\} \text{ mW, for } 100 \text{ MHz to } 1500 \text{ MHz}$$

$$2) \{[\text{Power allowed at numeric threshold for } 50 \text{ mm in step a)}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\} \text{ mW, for } > 1500 \text{ MHz and } \leq 6 \text{ GHz}$$

c) For frequencies below 100 MHz, the following may be considered for SAR test:

- 1) For *test separation distances* > 50 mm and < 200 mm, the power threshold at the corresponding test separation distance at 100 MHz in step b) is multiplied by $[1 + \log(100/f(\text{MHz}))]$
- 2) For *test separation distances* \leq 50 mm, the power threshold determined by the equation in c) 1) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$
- 3) SAR measurement procedures are not established below 100 MHz.

When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any SAR test results below 100 MHz to be acceptable.

2.3 Product Information

The device is a module that may be incorporated into extremity and body worn applications. If the distances are below the threshold, SAR testing must be performed followed by a Class 2 Permissive Change.

2.4 Summary

Minimum Distance for SAR Exclusion (mm)			
Band	Frequency Range	Extremity Applications	Body Applications
4	1710-1755 MHz	53	71
13	777-787 MHz	38	79

2.5 Calculations – Band 4 (1710-1755 MHz)

2.5.1 Extremity

447498 D01 General RF Exposure Guidance v06

SAR test exclusion calculations

Section 4.3: General SAR test exclusion guidance

	Input	Select Units
Max Power:	25	dBm
Min separation distance:	53	mm
Frequency, f:	1710	MHz

Value reference Number	Values used for Calculation		Reference number definition
v1	316	mW	[max. power of channel, including tune-up tolerance, mW] Rounded to nearest mW
v2	53	mm	[min. test separation distance, mm] Rounded to nearest mm
v3	1.308		[$\sqrt{f/GHz}$]

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\} \text{ mW}$, for > 1500 MHz and $\leq 6 \text{ GHz}$

Value reference Number	Values used for Calculation		Reference number definition
v4 _{1g}	114.7	mW	[Power allowed at numeric threshold of 3.0 for 50 mm in step a)]
v4 _{10g}	286.8	mW	[Power allowed at numeric threshold of 7.5 for 50 mm in step a)]
v5	3	mm	[(test separation distance - 50 mm)]
v6	10		[10]

1g Exclusion Threshold:	145	mW	$\leq v4_{1g} + (v5 * v6)$
10g Exclusion Threshold:	317	mW	$\leq v4_{10g} + (v5 * v6)$

Conclusions: The EUT max power is BELOW the threshold. SAR Testing is NOT required for Extremity applications

2.5.2 Body

447498 D01 General RF Exposure Guidance v06

SAR test exclusion calculations

Section 4.3: General SAR test exclusion guidance

	Input	Select Units
Max Power:	25	dBm
Min separation distance:	71	mm
Frequency, f:	1710	MHz

Value reference Number	Values used for Calculation		Reference number definition
v1	316	mW	[max. power of channel, including tune-up tolerance, mW] Rounded to nearest mW
v2	71	mm	[min. test separation distance, mm] Rounded to nearest mm
v3	1.308		[$\sqrt{f/GHz}$]

b) For 100 MHz to 6 GHz and test separation distances > 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B 2) $\{[\text{Power allowed at numeric threshold for 50 mm in step a}] + [(\text{test separation distance} - 50 \text{ mm}) \cdot 10]\} \text{ mW}$, for > 1500 MHz and $\leq 6 \text{ GHz}$

Value reference Number	Values used for Calculation		Reference number definition
v4 _{1g}	114.7	mW	[Power allowed at numeric threshold of 3.0 for 50 mm in step a)]
v5	21	mm	[(test separation distance - 50 mm)]
v6	10		[10]

1g Exclusion Threshold:	325	mW	$\leq v4_{1g} + (v5 * v6)$
Conclusions:	The EUT max power is BELOW the threshold. SAR Testing is NOT required for Body applications		

2.6 Calculations – Band 13 (777-787 MHz)

2.6.1 Extremity

447498 D01 General RF Exposure Guidance v06

SAR test exclusion calculations

Section 4.3: General SAR test exclusion guidance

	Input	Select Units
Max Power:	25	dBm
Min separation distance:	38	mm
Frequency, f:	777	MHz

Value reference Number	Values used for Calculation		Reference number definition
v1	316	mW	[max. power of channel, including tune-up tolerance, mW] 'Rounded to nearest mW'
v2	38	mm	[min. test separation distance, mm] 'Rounded to nearest mm'
v3	0.881		[f(GHz)]

a) For 100 MHz to 6 GHz and test separation distances \leq 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following:

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

10g Exclusion Threshold: 323.3 mW $\leq 7.5 * v2 / v3$

Conclusions: The EUT max power is BELOW the threshold. SAR Testing is NOT required for Extremity applications

2.6.2 Body

447498 D01 General RF Exposure Guidance v06

SAR test exclusion calculations

Section 4.3: General SAR test exclusion guidance

	Input	Select Units
Max Power:	25	dBm
Min separation distance:	79	mm
Frequency, f:	777	MHz

Value reference Number	Values used for Calculation		Reference number definition
v1	316	mW	[max. power of channel, including tune-up tolerance, mW] 'Rounded to nearest mW'
v2	79	mm	[min. test separation distance, mm] 'Rounded to nearest mm'
v3	0.881		[f(MHz)]

b) For 100 MHz to 6 GHz and test separation distances $>$ 50 mm, the 1-g and 10-g SAR test exclusion thresholds are determined by the following (also illustrated in Appendix B)
1) $[(\text{Power allowed at numeric threshold for 50 mm in step a}) + ((\text{test separation distance} - 50 \text{ mm}) \cdot (f(\text{MHz})/150))] \text{ mW, for 100 MHz to 1500 MHz}$

Value reference Number	Values used for Calculation		Reference number definition
v4 _{1g}	170	mW	$\leq 3 * 50 / V3$ [Power allowed at numeric threshold of 3.0 for 50 mm in step a)]
v5	29	mm	[(test separation distance - 50 mm)]
v6	5		[f(MHz)/150)]

1g Exclusion Threshold: 320.4 mW $\leq v4_{1g} + (v5 * v6)$

Conclusions: The EUT max power is BELOW the threshold. SAR Testing is NOT required for Body applications

3 Revision History

Revision Level	Description of changes	Revision Date
0	Initial release	11 December 2017