

RF Exposure Calculation Report

For

Cinterion® ALAS6A-US GSM/UMTS/LTE Data Module

FCC ID QIPALAS6A-US
IC: 7830A-ALAS6AUS

Report Reference: MDE_GEMALTO_1605_MPEb_rev1

Test Laboratory:

7layers GmbH
Borsigstrasse 11
40880 Ratingen
Germany

Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

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0 Summary

0.1 Technical Report Summary

Type of Report

RF Exposure for a GSM/UMTS/LTE radio module.

Applicable FCC and IC Rules

For RF Exposure:

OET Bulletin 65 Edition 97-01 August 1997

FCC 47 CFR §1.1307

FCC 47 CFR §1.1310

RSS-102 Issue 5 – March 2015

| Report version control | | | |
|------------------------|--------------|---------------------------------------|------------------|
| Version | Release date | Changes | Version validity |
| 000 | 04.08.2016 | Initial version | Invalid |
| 001 | 26.09.2016 | Revised conclusion based on Bands now | Valid |

Reviewed by
Dirk Bratsch:



Responsible
for Report:



1 Administrative Data

1.1 Testing Laboratory

Company Name: 7Layers GmbH
Address: Borsigstr. 11
40880 Ratingen
Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

Report Template Version: 2014-05-15

1.2 Project Data

Responsible for calculation and report: Mr. Andreas Tübel
Date of Report: 2016-09-26

1.3 Applicant Data

Company Name: Gemalto M2M GmbH
Address: Siemensdamm 50
13629 Berlin
Germany
Contact Person: Leandro Wan-Dall

1.4 Manufacturer Data

Company Name: please see applicant data
Address:
Contact Person:

2 Test object Data

2.1 General EUT Description

| | |
|--------------------------------------|---------------------------------------|
| Equipment under Test | GSM/(E)GPRS/UMTS/HSPA/LTE Data Module |
| Type Designation: | ALAS6A-US |
| Kind of Device: GPRS/EDGE MSC | GSM/UMTS/LTE Data Module |
| GPRS Multi-slot class | 12 |
| FCC ID: | QIPALAS6A-US |
| IC Number: | 7830A-ALAS6AUS |

General product description:

The EUT is Cellular radio module supporting GSM/UMTS/LTE/GPRS/EGPRS/HSDPA/HSUPA

3 Evaluation Results

3.1 RF Exposure Evaluation for Module

| Standards |
|---|
| OET Bulletin 65 Edition 97-01 August 1997 |
| FCC 47 CFR §1.1307 |
| FCC 47 CFR §1.1310 |
| RSS-102 Issue 5 – March 2015 |

3.1.1 Test limits

As specified in Table 1B of 47 CFR 1.1310 – Limits for Maximum Permissible Exposure (MPE), Limits for General Population/Uncontrolled Exposure.

| Frequency range (MHz) | Power density (mW/cm ²) |
|-----------------------|-------------------------------------|
| 300 – 1,500 | f/1500 |
| 1,500 – 100,000 | 1.0 |

Limits specified per RSS-102, Issue 5.

| Frequency range (MHz) | Power density (W/m ²) | Power density (mW/cm ²) |
|-----------------------|-----------------------------------|---|
| 300 – 6000 | 0.02619 f ^{0.6834} | mW/cm ² = W/m ² * 0.1 |

Equation OET bulletin 65, page 18, edition 97-01:
$$S = \frac{PG}{4\pi R^2} = \frac{EIRP}{4\pi R^2}$$

Where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

3.1.2 Test Protocol

| Maximum antenna gain to comply with MPE limits for FCC | | | | | | | | | |
|--|------------|------------|-----------------|--------------------------------------|-------------------------------------|--|---------------------------------|--|--------------------------|
| Band | Mode | Duty Cycle | Frequency (MHZ) | Maximum Conducted output power (dBm) | Maximum Conducted output power (mW) | Equivalent conducted output power (mW) | MPE Limit (mW/cm ²) | Maximum antenna gain to meet MPE Limit (dBi) | Separation distance (cm) |
| 850 | GSM / GPRS | 50% | 836.2 | 33.5 | 2238.72 | 1119.44 | 0.5575 | 4.0 | 20 |
| 1900 | GSM / GPRS | 50% | 1850.2 | 30.5 | 1122.02 | 561.05 | 1.0000 | 9.5 | 20 |
| FDD 2 | UMTS | 100.0% | 1850.2 | 24.5 | 281.84 | 281.84 | 1.0000 | 12.5 | 20 |
| FDD 4 | UMTS | 100.0% | 1710.0 | 24.5 | 281.84 | 281.84 | 1.0000 | 12.5 | 20 |
| FDD 5 | UMTS | 100.0% | 824.0 | 24.5 | 281.84 | 281.84 | 0.5493 | 9.9 | 20 |
| eFDD 2 | LTE | 100.0% | 1850.2 | 23.5 | 223.87 | 223.87 | 1.0000 | 13.5 | 20 |
| eFDD 4 | LTE | 100.0% | 1710.0 | 23.5 | 223.87 | 223.87 | 1.0000 | 13.5 | 20 |
| eFDD 5 | LTE | 100.0% | 824.0 | 23.5 | 223.87 | 223.87 | 0.5493 | 10.9 | 20 |
| eFDD 12 | LTE | 100.0% | 699.0 | 23.5 | 223.87 | 223.87 | 0.4660 | 10.2 | 20 |

* Conducted output power values bases on "Tune-up" information provided by manufacturer.

| Maximum antenna gain to comply with MPE limits for Industry Canada | | | | | | | | | |
|--|------------|------------|-----------------|--------------------------------------|-------------------------------------|--|---------------------------------|--|--------------------------|
| Band | Mode | Duty Cycle | Frequency (MHZ) | Maximum Conducted output power (dBm) | Maximum Conducted output power (mW) | Equivalent conducted output power (mW) | MPE Limit (mW/cm ²) | Maximum antenna gain to meet MPE Limit (dBi) | Separation distance (cm) |
| 850 | GSM / GPRS | 50% | 836.2 | 33.5 | 2238.72 | 1119.44 | 0.2602 | 0.7 | 20 |
| 1900 | GSM / GPRS | 50% | 1850.2 | 30.5 | 1122.02 | 561.05 | 0.4477 | 6.0 | 20 |
| FDD 2 | UMTS | 100.0% | 1850.2 | 24.5 | 281.84 | 281.84 | 0.4477 | 9.0 | 20 |
| FDD 4 | UMTS | 100.0% | 1710.0 | 24.5 | 281.84 | 281.84 | 0.4242 | 8.8 | 20 |
| FDD 5 | UMTS | 100.0% | 824.0 | 24.5 | 281.84 | 281.84 | 0.2576 | 6.6 | 20 |
| eFDD 2 | LTE | 100.0% | 1850.2 | 23.5 | 223.87 | 223.87 | 0.4477 | 10.0 | 20 |
| eFDD 4 | LTE | 100.0% | 1710.0 | 23.5 | 223.87 | 223.87 | 0.4242 | 9.8 | 20 |
| eFDD 5 | LTE | 100.0% | 824.0 | 23.5 | 223.87 | 223.87 | 0.2576 | 7.6 | 20 |
| eFDD 12 | LTE | 100.0% | 699.0 | 23.5 | 223.87 | 223.87 | 0.2302 | 7.1 | 20 |

* Conducted output power values bases on "Tune-up" information provided by manufacturer.

3.1.3 Conclusion

| Band and operating mode | Max gain for FCC MPE Limits | Max gain for Industry Canada MPE Limits | Maximum gain to be compliant with all MPE limits |
|---------------------------------|-----------------------------|---|--|
| Band 12, 700 MHz (LTE) | 10.2 | 7.1 | 7.1 |
| Band 5, 850 MHz (GSM/UMTS/LTE) | 4.0 | 0.7 | 0.7 |
| Band 4, 1700 MHz (UMTS/LTE) | 12.5 | 8.8 | 8.8 |
| Band 2, 1900 MHz (GSM/UMTS/LTE) | 9.5 | 6.0 | 6.0 |

All gains in (dBi)