RF Exposure Exemption Report

Kinéis
Model: KIM2-HW1-FW1

In accordance with FCC CFR 47 Pt 1.1307

Prepared for: 11 Rue Hermes
Parc Technologique Du Canal
Ramonville Saint-Agne
31520
France

Add value.
Inspire trust.

COMMERCIAL-IN-CONFIDENCE

FCC ID: 2A96E-KIM2-HW1FW1

Document 75958442-02 Issue: 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Matthew Russell	Chief Engineer	Authorised Signatory	17 July 2023

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

The wireless devices described within this report are compliant with the exemption criteria related to human exposure to electromagnetic fields laid out in FCC CFR Title 47 Part 1.1307.

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuvsud.com/en

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire PO15 5RL
United Kingdom

Contents

1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	17-July-2023

Table 1

1.2 Introduction

Applicant	Kinéis
Manufacturer	Kinéis
Model Number(s)	KIM2-HW1-FW1
Hardware Version(s)	HW1.x
Software Version(s)	FW1.x
Specification/Issue/Date	FCC 47 CFR Part 1.1307: 2021
Order Number	PO-23-01028
Date	26 April 2023
Related Document(s)	• KDB 447498 D04 v01 • FCC 47 CFR Part 2.1091: 2021

1.3 Brief Summary of Results

The wireless devices described within this report are compliant with the exemption criteria related to human exposure to electromagnetic fields laid out in FCC CFR Title 47 Part 1.1307.

The calculations shown in this report were made in accordance with the procedures specified in the applied test specification(s).

1.4 Product Information

1.4.1 Technical Description

A telecommunication module, dedicated to Kinéis protocol. Uplink and downlink able (ground <-> satellites).

1.4.2 Transmitter Description

The following radio access technologies and frequency bands are supported by the equipment under test.

Radio Access Technology	Frequency Band (MHz)	Minimum Frequency (MHz)	Output Power (dBm)	Duty Cycle (%)
Kinéis satellite uplink	399.90 – 403.00	399.91	27	0.7

Table 2 – Transmitter Description- FCC

Note: Transmitter power includes upper bounds of uncertainty therefore maximum values are used.

1.4.3 Antenna Description

The following antennas are supported by the equipment under test.

Radio Access Technology	Antenna Model	Gain (dBi)	Antenna length (cm)	Minimum Separation Distance (cm)
Kinéis satellite uplink	Whip dipole	2.2	70	>20
Kinéis satellite uplink	PCB coil	0	5	>20

Table 3 – Antenna description

In the case of more than one type of antenna being supported by the equipment, the calculation is based on the maximum of the antenna gains. If other antennas can be used that have greater gains, the minimum separation distances will need to be recalculated.

Note: Antenna gain includes upper bounds of uncertainty therefore maximum values are used.

1.4.4 Equipment Configuration

Simultaneous transmission is not supported.

2 Assessment Details

2.1 Single RF Source options for determination of exemption.

<table>
<tr><th>Option</th><th>Reference</th><th>RF Exposure Test Exemptions for Single Source</th></tr>
<tr><td>A
(1-mW Test Exemption)</td><td>FCC
1.1307(b)(3)(i)(A)</td><td>The available maximum time averaged power is no more than 1 mW, regardless of separation distance.</td></tr>
<tr><td>B
(SAR-Based Exemption)</td><td>FCC
1.1307(b)(3)(i)(B)</td><td>The available maximum timeaveraged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold Pth (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by:
$$P_{th}\ (\text{mW}) = \begin{cases} ERP_{20\ cm}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ cm} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases}$$
Where
$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right)$$ and f is in GHz;
and
$$ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases}$$
d = the separation distance (cm);</td></tr>
<tr><td>C
(MPE-Based Exemption)</td><td>FCC
1.1307(b)(3)(i)(C)</td><td>Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least λ/2π, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).
TABLE 1 TO § 1.1307(b)(3)(i)(C)—SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION
<table>
<tr><th>RF Source frequency (MHz)</th><th>Threshold ERP (watts)</th></tr>
<tr><td>0.3–1.34</td><td>1,920 R².</td></tr>
<tr><td>1.34–30</td><td>3,450 R²/f².</td></tr>
<tr><td>30–300</td><td>3.83 R².</td></tr>
<tr><td>300–1,500</td><td>0.0128 R²f.</td></tr>
<tr><td>1,500–100,000</td><td>19.2R².</td></tr>
</table>
</td></tr>
</table>

2.2 Multiple RF Sources options for determination of exemption.

Option	Reference	
A 1-mW Test Exemption for Multiple Sources	FCC 1.1307(b)(3)(ii)(A)	The available maximum time averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required). This exemption may not be used in conjunction with other exemption criteria other than those is paragraph (b)(3)(i)(A) of this section. Medical implant devices may only use this exemption and that in paragraph (b)(3)(i)(A).
B Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions	FCC 1.1307(b)(3)(ii)(B)	in the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation. $\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$

2.3 Individual Antenna Port Exposure Results

2.3.1 Single Source Calculation of Exposure at Specified Separation Distance FCC 1.1307(b)(3)(i)(C) 'Option C' (MPE Based Exemption)

RAT	Antenna	Frequency (MHz)	Conducted Power Output (mW)	Duty Cycle %	Time Average Conducted Power Output (mW)	Antenna Gain Ratio	Maximum Power (EIRP) mW	Maximum Power (ERP) mW	Minimum separation distance for MPE evaluation λ/2 π mm	Actual Distance (mm)	Threshold ERP (mW)	1.1307(b)(3)(i)(C) Exemption (Yes/No) (300 kHz to 100 GHz)
Kinéis satellite (uplink)	Whip dipole	399.91	501.187	0.7	3.508	1.660	5.822	3.55	119.4	200	204.8	Yes
Kinéis satellite (uplink)	PCB coil	399.91	501.187	0.7	3.508	1	3.508	2.14	119.4	200	204.8	Yes

Table 4 –Transmitter Result

The calculations show that the individual transmitters comply with FCC 1.1307(b)(3)(i)(C) MPE-based exception at a minimum distance of 20 cm.