RF Exposure Exemption Report

Kinéis
Model: KIM1
Part number KIM152211xxxxx

In accordance with FCC CFR 47 Pt 1.1307

Prepared for: 11 Rue Hermès
Parc Technologique du Canal
31520 - RAMONVILLE SAINT-AGNE
FRANCE

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FCC ID: 2A96E-KIM1-HW1-5

Document 75957047-02 Issue: 01

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Matthew Russell	Chief Engineer (RF)	Authorised Signatory	23 March 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.

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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

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	23-March-2023

Table 1

1.2 Introduction

Applicant	Kinéis
Manufacturer	Kinéis
Model Number(s)	KIM1
Hardware Version(s)	1.5
Software Version(s)	3.0
Specification/Issue/Date	FCC 47 CFR Part 1.1307: 2021
Order Number Date	PO-22-00438 10th Nov 2022
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 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment)*	This is a telecommunication module, dedicated to Kinéis protocol. Uplink only (ground to satellites).
Manufacturer:	Kinéis
Model:	KIM1
Part Number:	KIM152211xxxxx

If more than one frequency band is supported, please confirm which combinations of bands are capable of Simultaneous Transmit.	

Frequency Band 1: Please detail (one entry for each band), e,g GSM 900 / WCDMA FDD I etc .

Antenna Model:	Whip dipole	
Antenna length:	70	cm
Bottom frequency:	399.91	MHz
Middle frequency:	401	MHz
Top frequency:	402.99	MHz

Maximum power (input to the antenna including a tolerance):	30	dBm
Antenna gain (or maximum gain allowed):	2.2	dBi

Or

Field Strength Measurement:		dBµA/M
Measurement Distance:		cm

Separation distance from antenna to the user/bystander	> 20	cm
Transmitter Duty Cycle:	0.7	%

Frequency Band 2: Please detail (one entry for each band), e,g GSM 900 / WCDMA FDD I etc

Antenna Model:	PCB coil	
Antenna length:	5	cm
Bottom frequency:	399.91	MHz
Middle frequency:	401	MHz
Top frequency:	402.99	MHz

Maximum power (input to the antenna including a tolerance):	30	dBm
Antenna gain (or maximum gain allowed):	0	dBi

Or

Field Strength Measurement:		dBµA/M
Measurement Distance:		cm

Separation distance from antenna to the user/bystander	> 20	cm
Transmitter Duty Cycle:	0.7	%

Frequency Band 3: Please detail (one entry for each band), e,g GSM 900 / WCDMA FDD I etc .

Antenna Model:	PCB	
Antenna length:	5	cm
Bottom frequency:	399.91	MHz
Middle frequency:	401	MHz
Top frequency:	402.99	MHz

Maximum power (input to the antenna including a tolerance):	30	dBm
Antenna gain (or maximum gain allowed):	-3	dBi

Or

Field Strength Measurement:		dBµA/M
Measurement Distance:		cm

Separation distance from antenna to the user/bystander	> 20	cm
Transmitter Duty Cycle:	0.7	%

I hereby declare that the information supplied is correct and complete.

Name: Vincent Gamonal
Position held: Test & validation engineer
Date: 22 November 2022

1.5 Product Information

1.5.1 Technical Description

This is a telecommunication module, dedicated to Kinéis protocol. Uplink only (ground to satellites).

1.5.2 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 (%)
Argos-2 satellite	400 MHz	399.91 MHz	30	0.7

Table 2 – Transmitter Description- FCC

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

1.5.3 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)
Argos-2 satellite	Whip dipole	2.2	70	20
Argos-2 satellite	PCB coil	0	5	20
Argos-2 satellite	PCB	-3	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 which in this case is the whip dipole. 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.

1.5.4 Equipment Configuration

Single 400 MHz transmitter

2 Assessment Details

2.1 Single RF Source options for determination of exemption.

Option	Reference	RF Exposure Test Exemptions for Single Source
A (1-mW Test Exemption)	FCC 1.1307(b)(3)(i)(A)	The available maximum time averaged power is no more than 1 mW, regardless of separation distance.
B (SAR-Based Exemption)	FCC 1.1307(b)(3)(i)(B)	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);
C (MPE-Based Exemption)	FCC 1.1307(b)(3)(i)(C)	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 RF Source frequency (MHz) / Threshold ERP (watts) 0.3–1.34 ..... 1,920 R^2. 1.34–30 ..... 3,450 R^2/f^2. 30–300 ..... 3.83 R^2. 300–1,500 ..... 0.0128 R^2f. 1,500–100,000 ..... 19.2R^2.

2.2 Individual Antenna Port Exposure Results

2.2.1 Single Source Calculation of Exposure at Specified Separation Distance FCC 1.1307(b)(3)(i)(B) 'Option B' (SAR Based Exemption)

RAT	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 Antenna to User Separation Distance (mm)	Pth (mW) 1.1307 (b)(3)(i)(B)	Greater of Max time averaged conducted power or ERP?	1.1307(b)(3)(i)(B) Exemption (Yes/No) (300 MHz to 6 GHz, 0.5 cm to 20 cm)
Argos-2 satellite	399.91	1000	0.7	7	1.66	11.62	7.085	200	815.8	7.085	Yes

Table 4 –Transmitter Result

The calculations show that the individual transmitters comply with FCC 1.1307(b)(3)(i)(B) SAR-based exemption at a minimum distance of 0.2 m.