



Model: **AMN41012**

FCC ID: **VQSAMN41012**

RF Exposure

Introduction

The module **VQSAMN41012** is intended to be used at a distance of 20cm or more to the end-user.

Amimon requested from the FCC to perform MPE calculation for the UNII5 application based on the fact that the application is under FCC 2.1091 (Radiofrequency radiation exposure evaluation: mobile devices).

FCC reply was that it is permissible to use mobile exposure evaluation for the product.

MPE worst case results is **0.07958 mW/cm²**.

Background

15.407(f) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a “general population/uncontrolled” environment. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request. Pursuant to KDB publication “388624 D02 Pre-Approval Guidance List v16r10”, section II A 2 and 3, “Devices subject to special conditions where the authorization procedures to be used must be approved by the FCC prior to approval by a TCB: A 2. When Section 2.1091(d)(4) of the FCC rules applies and SAR or MPE (above 6 GHz) evaluation is required and A 3. RF exposure evaluations using numerical simulations or computational modeling techniques.” we herewith request the guidance of the FCC relating to the attached RF exposure application by means of MPE calculation.

Also, pursuant KDB 987594 D01 section IV: RF Exposure: For U-NII 6-7 GHz band portable devices (subject to MPE power density limits, not SAR limits), until specific additional exposure evaluation guidance is published by FCC, applicants and test labs must submit a KDB inquiry for review of the RF exposure evaluation plan before completing testing and submitting to a TCB, consistent with KDB Pub. 388624 PAG requirements.

Amimon requested in KDB314844 to perform MPE by calculations in the UNII5 band for VQSAMN41012 under the category of low power indoor access point applications (**6ID**) as the device is intended to be used at 20cm separation distance between the device and the

MPE for UNII5 is calculated based on the same equation used to calculate the MPE for UNII1,2,3 and is shown below (this calculation is a worst-case prediction of power



density at or near a surface, 100% reflection of incoming radiation is assumed, ref: OET Bulletin 65, equation 6):

$$S = MPE = \frac{P_{\text{conducted}} \cdot G_{\text{Antenna}}}{\pi \cdot r^2}$$

Where,

S = MPE = power density (in appropriate units, e.g. mW/cm²)

P_{conducted} = power input to the antenna (in appropriate units, e.g.mW)

G_{Antenna} = power gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the center of radiation of the antenna (appropriate units, e.g. cm)

FCC answered by referring KDB314844 to KDB549411 with the following guidance:

It is permissible to use mobile exposure evaluation for your module. Please keep in mind that requirements for maintaining RF Exposure will have to be clearly explained in the integration instructions as required by KDB 996369 D03:

2.6 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

FCC Requirement

FCC 15.407 (f) Radio frequency devices operating under the provisions of this part are subject to the radio frequency radiation exposure requirements specified in §§1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a “general population/uncontrolled” environment. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements. Technical information showing the basis for this statement must be submitted to the Commission upon request.

FCC 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons

(d) The limits to be used for evaluation are specified in §1.1310 of this chapter. All unlicensed personal communications service (PCS) devices



and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

FCC 1.307 Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared

(b)(2)(ii) Unlicensed PCS, unlicensed NII, and millimeter-wave devices are also subject to routine environmental evaluation for RF exposure prior to equipment authorization or use, as specified in §§15.255(f), 15.257(g), 15.319(i), and 15.407(f) of this chapter.

FCC 1.310 Radiofrequency radiation exposure limits

(d)(3) At operating frequencies above 6 GHz, the MPE limits listed in Table 1 in paragraph (e)(1) of this section shall be used in all cases to evaluate the environmental impact of human exposure to RF radiation as specified in §1.1307(b) of this part.

(d)(4) Both the MPE limits listed in Table 1 in paragraph (e)(1) of this section and the SAR limits as set forth in paragraphs (a) through (c) of this section are for continuous exposure, that is, for indefinite time periods. Exposure levels higher than the limits are permitted for shorter exposure times, as long as the average exposure over a period not more than the specified averaging time in Table 1 in paragraph (e)(1) is less than (or equal to) the exposure limits.).

(e)(1) Table 1 to §1.1310(e)(1) sets forth limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

Table 1 to §1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(ii) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	<30
1.34-30	824/f	2.19/f	*(180/f ²)	<30
30-300	27.5	0.073	0.2	<30
300-1,500			f/1500	<30
1,500-100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

(e)(3) General population/uncontrolled exposure limits apply in situations in which the general public may be exposed, or in which persons who are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure. For example, RF sources intended for consumer use shall be subject to the limits for general population/uncontrolled exposure in this section.



MPE Calculation Results

The table below summarizes the MPE results for the VQSAMN41012 according to the truly worst case scenario of the OET Bulletin 65 equation (6) and the maximum allowed power during tune up of the device:

- BW: 20MHz and 40MHz
- RF ports: 2 ports configuration and 4 ports configuration

Configuration	BW	Measured output power	Total Output power incl +0.1dB tolerance		Antenna Gain	Distance	MPE	Limit	margin
	[MHz]	In dBm	In dBm	In mW	[dBi]	[cm]	[mW/cm ²]	[mW/cm ²]	
2 ports	20	14.7	14.8	30.20	2	20	0.03809	1	0.96191
	40	17.9	18.0	63.10	2	20	0.07958	1	0.92042
4 ports	20	14.5	14.6	28.84	2	20	0.03637	1	0.96363
	40	17.8	17.9	61.66	2	20	0.07777	1	0.92223