

***Wireless LAN 802.11ax
+ Bluetooth[®] Low Energy 5.4
Module***

WKI611AA1

Application Note

When designing equipment using this module, please check the latest specifications. For the latest specifications, please contact your nearest sales office.

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1. Revision History

Revision	Date	Change history
Version 1.0	08-Dec. 2025	Initial release

2. Summary

This document provides design guidelines to ensure stable characteristics of the wireless communication modules developed and sold by KAGA FEI Co., Ltd. (hereinafter referred to as "our company").

It contains technical data for designing equipment that adopts the module and for designing peripheral devices around the module.

When designing peripheral circuits or equipment with reference to this document, please thoroughly evaluate the characteristics of the module in your equipment.

For inquiries, please contact our staff.

3. Scope of Application

The contents of this document apply to wireless communication module products developed and sold by our company.

Applicable item: WKI611AA1

4. Overview of the Module

This module is a hybrid module adopting NXP's IW611. It is a multifunctional module compliant with IEEE802.11a/b/g/n/ac/ax and Bluetooth® 5.4, equipped with interfaces such as SDIO.

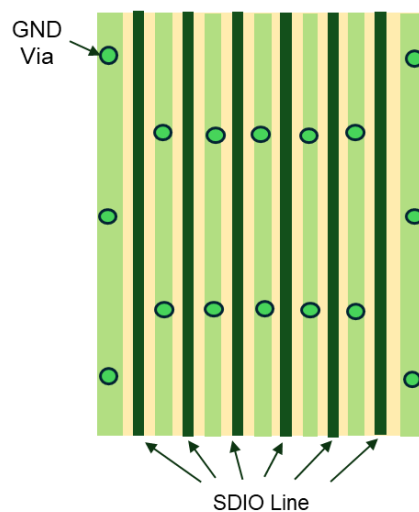
For details on functions and characteristics, please refer to the latest Data Sheet.

5. Design Guide

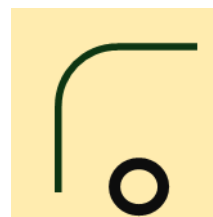
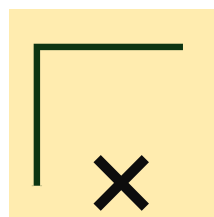
5.1. Digital Interface

When designing the PCB layout for SDIO signal lines, please pay attention to the following points:

- The characteristic impedance of SDIO signal lines is recommended to be 50Ω ($\pm 10\%$).
- Route SDIO signal lines as far as possible from RF signal lines and other digital signal lines, and avoid overlapping these signals between adjacent layers.
- Lay out all SDIO signal lines in parallel, keep their lengths equal, and make them as short as possible.
- When using long wiring between boards or connectors/FPCs, insert damping resistors in series with each line as necessary to eliminate the effects of reflection.
- To enhance isolation, place GND vias between SDIO signal lines as shown in the diagram below.



- Ensure that power lines do not overlap SDIO signal lines between adjacent layers.
- When bending SDIO signal lines, avoid right angles (90 degrees); route them smoothly with a large radius.



5.2. Unused Terminal Processing

Leave unused terminals open.

5.3. Recommended Land Pattern Dimensions

Refer to the recommended land pattern in the Data Sheet.

5.4. Module Mounting Position

The RF antenna is built into the WKI611AA1.

To achieve better antenna characteristics and RF performance, carefully consider the mounting position of the module on the main board.

For details on the mounting position, refer to the “WKI611AA1 Data Sheet”.

◦

5.5. Heat Dissipation Measures

In high-temperature environments, this product may not perform adequately.

Design the placement of this product to avoid the influence of circuits or devices that may become heat sources.

Also, use the GND layer (such as through-holes) on your product’s PCB to ensure heat dissipation for the module.

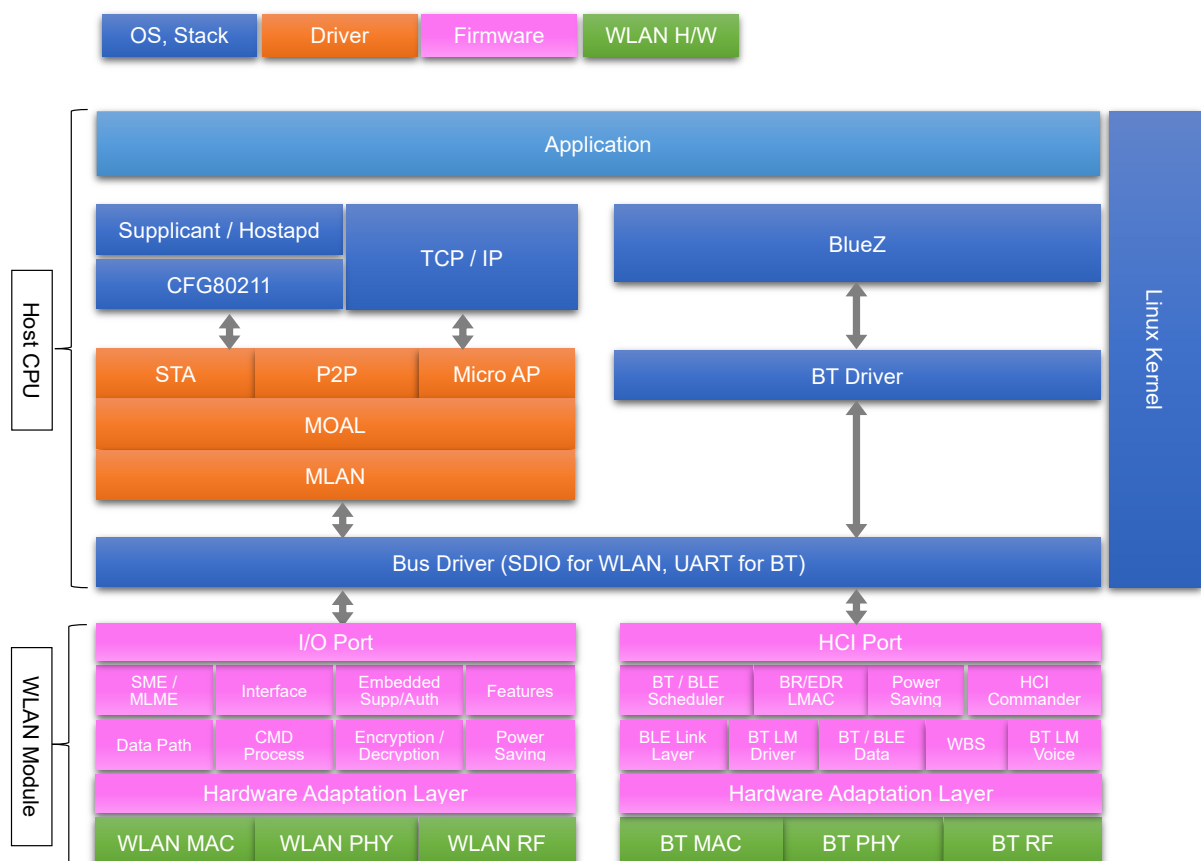
5.6. Antenna Routing Layout

This module supports both the internal antenna and an external antenna.

When using an external antenna, connect it via a U.FL connector, and ensure that the routing is designed and implemented to achieve a characteristic impedance of 50 Ω.

6. Software Description

6.1. Linux Driver Architecture



The software that constitutes the WKI611 consists of a wireless LAN driver and Bluetooth driver on the Linux architecture, as well as firmware running on the module.

The protocol stack, middleware, and Bluetooth driver use the standard Linux versions, while the wireless LAN driver and firmware are provided by the chip vendor.

The wireless LAN driver consists of the MOAL module and the MLAN module. MOAL is an OS-dependent module that includes the upper interface with the kernel and protocol stack and the bus driver.

MLAN includes the processing as a driver function and the interface to the module's firmware, but is OS-independent.

Through IEEE802.11 extensions (Wireless Extensions), interfaces to wireless extension functions provided by Linux (such as scan, authentication, 802.11d, 802.11h, WMM, etc.) are available.

For network interfaces, there are STA mode (client operation), AP mode (host operation), and P2P mode (connection between terminals), which can be used according to the device environment.

6.2. Types of Drivers

The drivers provided by the chip vendor are for the Linux architecture.

They are provided as source code, so they can be ported to your environment. We can also introduce partner companies to assist with various porting tasks.

A reference environment for the drivers provided by the chip vendor is available as a package for the i.MX8M Mini EVK board, allowing you to verify operation for evaluation and development.

[NXP Standard Driver]

MPU / OS	WLAN I/F	Bluetooth I/F
MCIMX8M-EVK / Linux v2.6.32 ~ v6.x.x	SDIO	UART

6.3. Software License

A pre-built Linux image for i.MX8M Mini EVK is available from the chip vendor, and the image includes the driver object, which can be used free of charge.

To obtain the latest driver source code, you need to sign a Software License Agreement (SLA) with KAGA FEI. For details, please contact our sales office.

6.4. Host Interface

■ UART

Default 115.2Kbps (max 3Mbps)

■ SDIO 3.0

Maximum operating frequency SDR104 (208 MHz) / bus width = 4 bits or 1 bit

*For throughput performance, an operating frequency of 150MHz or higher is recommended.

It is recommended that the SD controller specifications of the product meet the following:

- SDIO3.0, operating frequency 150MHz or higher, SDIO bus 4-bit mode
- Support for multi-block transfer by DMA in the data transfer system

7. Transmission Power Table

7.1. Notes on Wireless Regulations

When using this module, you must set the transmission power of WLAN, Bluetooth®, and Bluetooth® LE to the specified values in accordance with the radio laws of each country.

The WLAN Regulatory Table and Bluetooth Power Table in this document show the certified channel frequencies and maximum transmission power for each country.

Designers should refer to these tables and set the module output according to the target region.

Table data applicable items:

- Transmission power output
- Channel usage range
- Weather radar detection (5G band DFS)
- Passive scan (NO_IR)
- Energy Detection

For Linux application procedures regarding wireless regulations, please obtain them from the public site.

Document	WKI611_Setup_RgCert_R1.0.pdf
Linux Power Table	rgpower_CA.bin rgpower_DE.bin rgpower_JP.bin rgpower_US.bin rgpower_WW.bin

7.2. WLAN Configuration Table

7.2.1. Japan : rgpower_JP.bin

CH/Freq. 2.4GHz		11b 1-11 Mbps	11g 6-54 Mbps	11n HT20 MCS 0-7-	11n HT40 MCS 0-7	11ac VHT20 MCS 8-9	11ac VHT40 MCS 8-9	11ac VHT80 MCS 0-9	11ax HE20 MCS 8-9	11ax HE20 MCS 10-11	11ax HE40 MCS 10-11	11ax HE80 MCS 10-11	DFS / NO_ IR	ED _ MA C
1	2412	15 dBm	15 dBm	15 dBm	N/A	N/A	N/A	N/A	12 dBm	12 dBm	N/A	N/A	N/A	16
2	2417	15 dBm	15 dBm	15 dBm					12 dBm	12 dBm				
3	2422	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
4	2427	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
5	2432	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
6	2437	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
7	2442	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
8	2447	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
9	2452	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
10	2457	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
11	2462	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
12	2467	15 dBm	15 dBm	15 dBm	13 dBm				12 dBm	12 dBm	12 dBm			
13	2472	15 dBm	15 dBm	15 dBm	N/A				12 dBm	12 dBm	N/A			
14	2482	N/A	N/A	N/A					N/A	N/A				
5GHz W52														
36	5180	N/A	14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm	9 dBm	N/A	16
40	5200		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm				
44	5220		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm		12 dBm	9 dBm	9 dBm			
48	5240		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm				
5GHz W53														
52	5260	N/A	14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm	9 dBm	DFS NO_I R	16
56	5280		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm				
60	5300		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm		12 dBm	9 dBm	9 dBm			
64	5320		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm				
5GHz W56														
100	5500	N/A	14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm	9 dBm	DFS NO_I R	16
104	5520		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm				
108	5540		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm		12 dBm	9 dBm	9 dBm			
112	5560		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm				
116	5580		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm				
120	5600		14 dBm	14 dBm		12 dBm		12 dBm	9 dBm					
124	5620		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm				

128	5640		14 dBm	14 dBm		12 dBm			12 dBm	9 dBm		9 dBm		
132	5660		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm			
136	5680		14 dBm	14 dBm		12 dBm			9 dBm					
140	5700		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm		12 dBm	9 dBm	9 dBm			
144	5720		14 dBm	14 dBm		12 dBm			9 dBm					
5GHz W58														
149	5745	N/A	14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm	9 dBm	N/A	16
153	5765		14 dBm	14 dBm		12 dBm			9 dBm					
157	5785		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm		12 dBm	9 dBm	9 dBm			
161	5805		14 dBm	14 dBm		12 dBm			9 dBm					
165	5825		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm	12 dBm	12 dBm	9 dBm	9 dBm	9 dBm		
169	5845		14 dBm	14 dBm		12 dBm			9 dBm					
173	5865		14 dBm	14 dBm	13 dBm	12 dBm	12 dBm		12 dBm	9 dBm	9 dBm			
177	5885		14 dBm	14 dBm		12 dBm			9 dBm					

7.2.2. ETSI : rgpower_DE.bin

CH/Freq. 2.4GHz		11b 1-11 Mbps	11g 6-54 Mbps	11n HT20 MCS 0-7	11n HT40 MCS 0-7	11ac VHT20 MCS 8-9	11ac VHT40 MCS 8-9	11ac VHT80 MCS 0-9	11ax HE20 MCS 8-9	11ax HE20 MCS 10-11	11ax HE40 MCS 10-11	11ax HE80 MCS 10-11	DFS / NO_ IR	ED - MA C
1	2412	14 dBm	12 dBm	11 dBm	N/A	N/A	N/A	N/A	11 dBm	11 dBm	N/A	N/A	N/A	16
2	2417	14 dBm	12 dBm	11 dBm					11 dBm	11 dBm				
3	2422	14 dBm	12 dBm	11 dBm					9 dBm	11 dBm				
4	2427	14 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
5	2432	14 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
6	2437	14 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
7	2442	14 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
8	2447	14 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
9	2452	14 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
10	2457	14 dBm	12 dBm	11 dBm	N/A				11 dBm	11 dBm	N/A			
11	2462	14 dBm	12 dBm	11 dBm					11 dBm	11 dBm				
12	2467	14 dBm	12 dBm	11 dBm					11 dBm	11 dBm				
13	2472	N/A	N/A	N/A					N/A	N/A				
14	2482	N/A	N/A	N/A					N/A	N/A				
5GHz W52														
36	5180	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	8 dBm	7 dBm	6 dBm	N/A	16
40	5200		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
44	5220		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	8 dBm	7 dBm			
48	5240		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
5GHz W53														
52	5260	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	8 dBm	7 dBm	6 dBm	DFS NO_I R	16
56	5280		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
60	5300		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	8 dBm	7 dBm			
64	5320		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
5GHz W56														
100	5500	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	8 dBm	7 dBm	6 dBm	DFS NO_I R	16
104	5520		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
108	5540		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	8 dBm	7 dBm			
112	5560		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
116	5580		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	8 dBm	7 dBm	6 dBm		
120	5600		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
124	5620		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	8 dBm	7 dBm			
128	5640		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
132	5660		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	N/A	11 dBm	8 dBm	7 dBm	N/A		

136	5680		13 dBm	11 dBm		11 dBm			11 dBm	8 dBm				
140	5700		13 dBm	11 dBm	N/A	11 dBm	N/A		11 dBm	8 dBm	N/A			
144	5720		N/A	N/A		N/A			N/A	N/A				
5GHz W58														
149	5745	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
153	5765		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
157	5785		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
161	5805		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
165	5825		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
169	5845		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
173	5865		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
177	5885		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			

7.2.3. US : rgpower_US.bin

CH/Freq. 2.4GHz		11b 1-11 Mbps	11g 6-54 Mbps	11n HT20 MCS 0-7	11n HT40 MCS 0-7	11ac VHT20 MCS 8-9	11ac VHT40 MCS 8-9	11ac VHT80 MCS 0-9	11ax HE20 MCS 8-9	11ax HE20 MCS 10-11	11ax HE40 MCS 10-11	11ax HE80 MCS 10-11	DFS / NO_ IR	ED _ MA C
1	2412	17 dBm	12 dBm	11 dBm	N/A	N/A	N/A	N/A	11 dBm	11 dBm	N/A	N/A	N/A	16
2	2417	17 dBm	12 dBm	11 dBm					11 dBm	11 dBm				
3	2422	17 dBm	12 dBm	11 dBm					9 dBm	11 dBm				
4	2427	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
5	2432	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
6	2437	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
7	2442	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
8	2447	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
9	2452	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm			
10	2457	17 dBm	12 dBm	11 dBm	N/A				11 dBm	11 dBm	N/A			
11	2462	17 dBm	12 dBm	11 dBm					11 dBm	11 dBm				
12	2467	N/A	N/A	N/A					N/A	N/A				
13	2472	N/A	N/A	N/A					N/A	N/A				
14	2482	N/A	N/A	N/A					N/A	N/A				
5GHz W52														
36	5180	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	N/A	16
40	5200		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
44	5220		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
48	5240		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
5GHz W53														
52	5260	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	DFS NO_ I R	16
56	5280		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
60	5300		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
64	5320		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
5GHz W56														
100	5500	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	DFS NO_ I R	16
104	5520		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
108	5540		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
112	5560		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
116	5580		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm		
120	5600		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
124	5620		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
128	5640		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			
132	5660		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm		
136	5680		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm			

140	5700		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm				
144	5720		13 dBm	11 dBm		11 dBm			11 dBm	11 dBm					
5GHz W58															
149	5745	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	N/A	16	
153	5765		13 dBm	11 dBm		11 dBm			11 dBm	11 dBm					
157	5785		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm				
161	5805		13 dBm	11 dBm		11 dBm		11 dBm	11 dBm						
165	5825		13 dBm	11 dBm	N/A	11 dBm	N/A	9 dBm	11 dBm	11 dBm	N/A	9 dBm			
169	5845		N/A	N/A		N/A			N/A	N/A					
173	5865		N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A				
177	5885	N/A	N/A	N/A		N/A									

7.2.4. Canada : rgpower_CA.bin

CH/Freq. 2.4GHz		11b 1-11 Mbps	11g 6-54 Mbps	11n HT20 MCS 0-7	11n HT40 MCS 0-7	11ac VHT20 MCS 8-9	11ac VHT40 MCS 8-9	11ac VHT80 MCS 0-9	11ax HE20 MCS 8-9	11ax HE20 MCS 10-11	11ax HE40 MCS 10-11	11ax HE80 MCS 10-11	DFS / NO_ IR	ED - MA C		
1	2412	17 dBm	12 dBm	11 dBm	N/A	N/A	N/A	N/A	11 dBm	11 dBm	N/A	N/A	N/A	16		
2	2417	17 dBm	12 dBm	11 dBm					11 dBm	11 dBm						
3	2422	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
4	2427	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
5	2432	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
6	2437	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
7	2442	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
8	2447	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
9	2452	17 dBm	12 dBm	11 dBm	9 dBm				11 dBm	11 dBm	9 dBm					
10	2457	17 dBm	12 dBm	11 dBm	N/A				11 dBm	11 dBm	N/A					
11	2462	17 dBm	12 dBm	11 dBm					11 dBm	11 dBm						
12	2467	N/A	N/A	N/A					N/A	N/A						
13	2472															
14	2482															
5GHz W52																
36	5180	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	N/A	16		
40	5200		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
44	5220		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
48	5240		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
5GHz W53																
52	5260	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	DFS NO_I R	16		
56	5280		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
60	5300		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
64	5320		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
5GHz W56																
100	5500	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	DFS NO_I R	16		
104	5520		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
108	5540		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
112	5560		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
116	5580		13 dBm	11 dBm	N/A	11 dBm	N/A	N/A	11 dBm	11 dBm	N/A	N/A				
120	5600		N/A	N/A		N/A			N/A	N/A					N/A	N/A
124	5620															
128	5640															
132	5660		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm				
136	5680		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
140	5700		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					

144	5720		13 dBm	11 dBm		11 dBm			11 dBm	11 dBm						
5GHz W58																
149	5745	N/A	13 dBm	11 dBm	10 dBm	11 dBm	10 dBm	9 dBm	11 dBm	11 dBm	10 dBm	9 dBm	N/A	16		
153	5765		13 dBm	11 dBm		11 dBm			11 dBm							
157	5785		13 dBm	11 dBm	10 dBm	11 dBm	10 dBm		11 dBm	11 dBm	10 dBm					
161	5805		13 dBm	11 dBm		11 dBm			11 dBm	11 dBm						
165	5825		13 dBm	11 dBm	N/A	11 dBm	N/A	N/A	11 dBm	11 dBm	N/A	N/A				
169	5845		N/A	N/A		N/A			N/A	N/A					N/A	N/A
173	5865															
177	5885															

7.2.5. W/W Safe : rgpower_WW.bin

CH/Freq. 2.4GHz		11b 1-11 Mbps	11g 6-54 Mbps	11n HT20 MCS 0-7	11n HT40 MCS 0-7	11ac VHT20 MCS 8-9	11ac VHT40 MCS 8-9	11ac VHT80 MCS 0-9	11ax HE20 MCS 8-9	11ax HE20 MCS 10-11	11ax HE40 MCS 10-11	11ax HE80 MCS 10-11	DFS / NO_ IR	ED _ MA C			
1	2412	9 dBm	9 dBm	9 dBm	N/A	N/A	N/A	9 dBm	9 dBm	N/A	N/A	N/A	N/A	10			
2	2417	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
3	2422	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
4	2427	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
5	2432	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
6	2437	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
7	2442	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
8	2447	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
9	2452	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
10	2457	9 dBm	9 dBm	9 dBm				9 dBm	9 dBm								
11	2462	9 dBm	9 dBm	9 dBm	N/A	N/A	N/A	9 dBm	9 dBm	N/A	N/A	N/A	10				
12	2467							9 dBm	9 dBm								
13	2472	N/A	N/A	N/A													
14	2482																
5GHz W52																	
36	5180	N/A	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	N/A	10			
40	5200		6 dBm	6 dBm		6 dBm		6 dBm	6 dBm								
44	5220		6 dBm	6 dBm	6 dBm	6 dBm		6 dBm	6 dBm	6 dBm							
48	5240		6 dBm	6 dBm		6 dBm		6 dBm	6 dBm	6 dBm							
5GHz W53																	
52	5260	N/A	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	DFS NO_ I R	10			
56	5280		6 dBm	6 dBm	6 dBm	6 dBm		6 dBm	6 dBm	6 dBm							
60	5300		6 dBm	6 dBm		6 dBm		6 dBm	6 dBm	6 dBm							
64	5320		6 dBm	6 dBm		6 dBm		6 dBm	6 dBm	6 dBm							
5GHz W56																	
100	5500	N/A	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	6 dBm	DFS NO_ I R	10			
104	5520		6 dBm	6 dBm		6 dBm		6 dBm	6 dBm								
108	5540		6 dBm	6 dBm	6 dBm	6 dBm		6 dBm	6 dBm								
112	5560		6 dBm	6 dBm		6 dBm		6 dBm	6 dBm								
116	5580		6 dBm	6 dBm	N/A	6 dBm	N/A	N/A	6 dBm	6 dBm	N/A	N/A					
120	5600																
124	5620																
128	5640																
132	5660		N/A	N/A		N/A			N/A	N/A					N/A	N/A	N/A
136	5680																
140	5700																
144	5720																
5GHz W58																	
149	5745	N/A															
153	5765																
157	5785																
161	5805																
165	5825																
169	5845																
173	5865																
177	5885																

7.3. Bluetooth®/Bluetooth® LE Power Table

Country	Max Transmit power		
	Bluetooth BR	Bluetooth EDR	Bluetooth LE
JAPAN	6 dBm		
ETSI	4 dBm		
United States of America	17 dBm	8 dBm	17 dBm
Canada	17 dBm	8 dBm	17 dBm

8. Compliance Obligations

Japan Regulatory Information

- a) This module is approved with the specific antenna on this module. Please ensure that your product can also bear a label with the following information. If the product is so small that it is not practicable to place the label, you can also place it in the instruction manual and package. The mark diameter shall be easily legible without using a device such as light microscopes.



- b) It is recommended to include the following sentence in the user manual of your product:
This product installs a radio system which has been approved as a radio station in a low power data communication system based on the Radio Law.
WKI611 : 005-103569

Canada Regulatory Information

- a) This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:
1. This device may not cause interference.
 2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

- b) Please use the specified supply voltage in "Recommendation operating range" when installing this product.

Veuillez utiliser la tension d'alimentation précisée dans "Recommandation gamme opératoire" lorsque vous installez ce produit.

- c) This product for operation in the band 5150-5250MHz and 5250-5350MHz are intended for indoor use only to reduce the potential for harmful interference to co-channel mobile satellite systems.

Ce produit dont la fréquence de fonctionnement se situe entre 5150-5250MHz et 5250-5350MHz est conçu uniquement pour une utilisation en intérieur afin de réduire les risques d'interférences nuisibles avec les systèmes mobiles par satellite co-canal.

- d) Please inform your users that high power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350MHz and 5650-5850MHz and that these radars could cause interference and/or damage to the product.

Veuillez informer vos utilisateurs que les radars à haute puissance sont désignés comme utilisateurs principaux (c-à-d des utilisateurs prioritaires) des fréquences 5250-5350MHz et 5650-5850MHz et que ces radars pourraient provoquer des interférences et/ou endommager les appareils.

- e) This product shall not be capable of transmitting in the band 5600-5650MHz.

Ce produit ne doit pas être capable de transmettre entre les fréquences 5600-5650MHz.

- f) Data transmission is always initiated by software, which is then passed down through the MAC, through the digital and analog baseband, and finally to the RF chip. Several special packets are initiated by the MAC. These are the only ways the digital baseband portion will turn on the RF transmitter, which it then turns off at the end of the packet. Therefore, the transmitter will be on only while one of the aforementioned packets is being transmitted. In other words, this device automatically discontinues transmission in case of either absence of information to transmit or operational failure.

La transmission des données est toujours initiée par le logiciel, puis les données sont transmises par l'intermédiaire du MAC, par la bande de base numérique et analogique et, enfin, à la puce RF. Plusieurs paquets spéciaux sont initiés par le MAC. Ce sont les seuls moyens pour qu'une partie de la bande de base numérique active l'émetteur RF, puis désactive celui-ci à la fin du paquet. En conséquence l'émetteur reste uniquement activé lors de la transmission d'un des paquets susmentionnés. En d'autres termes, ce dispositif interrompt automatiquement toute transmission en cas d'absence d'information à transmettre ou de défaillance.

- g) This radio transmitter (28568-WKI611) has been approved by Innovation, Science and

Economic Development Canada to operate with the antenna model listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Model No.	Antenna Type	Frequency	Antenna Gain (Max.)		Impedance
AW-002	Monopole	2400-2500 MHz 5150-5850 MHz	1.0dBi 1.4dBi		50 Ω 50 Ω
1461870100 1461870150 1461870200 1461870300	Dipole	2400-2500 MHz 5150-5850 MHz	3.2dBi 4.5dBi		50 Ω 50 Ω
2344657-1 2344657-2 2344657-3 2344657-4 2344657-9	Dipole	2400-2500 MHz 5150-5875 MHz	1.1dBi 4.9dBi		50 Ω 50 Ω

Le présent émetteur radio (28568-WKI611) a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les modèle d'antenne énumérés ci-dessous et ayant un gain admissible maximal. Les mod è le d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout modèle figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

De réduire les interférences potentielles avec les autres utilisateurs, il est nécessaire de choisir le type d'antenne et le gain ne dépassant pas.) accepté pour une communication normale.

Modèle Non	Type d'antenne	Fréquenc es	Gain de l'antenne (Max.)	l'impédance
AW-002	Monopole	2400-2500 MHz 5150-5850 MHz	1.0dBi 1.4dBi	50 Ω 50 Ω
1461807100 1461870150 1461870200 1461870300	Dipole	2400-2500 MHz 5150-5850 MHz	3.2dBi 4.5dBi	50 Ω 50 Ω
2344657-1 2344657-2 2344657-3 2344657-4 2344657-9	Dipole	2400-2500 MHz 5150-5875 MHz	1.1dBi 4.9dBi	50 Ω 50 Ω

h) This equipment complies with ISED radiation exposure limits set forth for an uncontrolled

environment and meets RSS-102 of the ISED radio frequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) RSS-102 de l'ISED. Cet équipement doit être installé et utilisé en gardant une distance de 20cm ou plus entre le radiateur et le corps humain.

- i) Please label ISED certification number and Host Marketing Name (HMN) at any location on the exterior of your product. Please indicate ISED certification number by either one of the following method:

Veuillez étiqueter le numéro de certification ISED et le nom commercial de l'hôte à tout emplacement sur l'extérieur de votre produit. Veuillez indiquer le numéro de certification ISED par l'une des méthodes suivantes.

- Contains Transmitter module IC: 28568-WKI611
- Contains IC: 28568-WKI611

Host Marketing Name (HMN)

- The HMN is the name or model number of a final product, which contains a certified radio module.
- The Host Marketing Name (HMN) shall be displayed according to the e-labelling requirements of RSS-Gen, section 4.4 or indicated on the exterior of the host product or on the product packaging, or in the product literature, which shall be supplied with the host product or readily available online.

- j) Please include the following statements in the user manual of the host device of this module both in English and French:

- (i) The device for operation in the bands 5150-5250 MHz and 5250-5350MHz are only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

Ce produit dont la fréquence de fonctionnement se situe entre 5150-5250MHz et 5250-5350MHz est conçue uniquement pour une utilisation en intérieur afin de réduire les risques d'interférences nuisibles avec les systèmes mobiles par satellite co-canal.

U.S. Regulatory Information

- a) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
 - (1) This device may not cause harmful interference, and
 - (2) this device must accept any interference received, including interference that may cause undesired operation.
- b) Please use the specified supply voltage in "Recommendation operating range" when installing this product. Please use the specified supply voltage in "Recommendation operating range" when installing this product.
- c) Data transmission is inevitably initiated by software of host devices with the exception that several special packets are transmitted by the MAC. However, data transmission is terminated by end of packets in any cases. Therefore, it is RF transmitted only while packets are being transmitted. This modular transmitter automatically discontinues transmission in case of either absence of information to transmit or operational failure because RF parts will not be ON in neither case.
- d) Frequency Tolerance: 2.4GHz Band ± 20 ppm, 5GHz Band ± 20 ppm
- e) The device is designed to use the antennas listed below. Do not modify the antenna or any other part of the module. Any modifications will invalidate the modular certifications and require new approvals for the host system.

Model No.	Antenna Type	Frequency	Antenna Gain (Max.)	Impedance
AW-002	Monopole	2400-2500 MHz 5150-5850 MHz	1.0dBi 1.4dBi	50 Ω 50 Ω
1461870100 1461870150 1461870200 1461870300	Dipole	2400-2500 MHz 5150-5850 MHz	3.2dBi 4.5dBi	50 Ω 50 Ω
2344657-1 2344657-2 2344657-3 2344657-4 2344657-9	Dipole	2400-2500 MHz 4900-5875 MHz	1.1dBi 4.9dBi	50 Ω 50 Ω

- f) CAUTION:
 - Changes or modifications not expressly approved by the party responsible for compliance could void the use's authority to operate the equipment.
 - To maintain compliance with FCC's RF exposure guidelines, this equipment should be

installed and operated with minimum distance 20cm between the radiator and your body.

- g) Please label the FCC ID at any location on the exterior of your product. Please indicate the FCC ID by either one of the following methods:
- Contains Transmitter Module FCC ID: 2A6NFWKI611
 - Contains FCC ID: 2A6NFWKI611
- h) This device complies with the following FCC Rules:
- Part 15 Subpart C
 - Part 15 Subpart E
- i) This modular transmitter is only FCC authorized for the specific rule parts listed on our grant, host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

Host manufacturer in any case shall ensure host product which is installed and operating with the module is in compliant with Part 15B requirements. Please note that for a Class B or A digital devices or peripheral, the instructions furnished the user manual of the end-user product shall include statement set out in § 15.105 Information to the user or such similar statement and place it in a prominent location in the text of host product manual. Original texts as following:

<For Class B>

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/ TV technician for help.

<For Class A>

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- j) Co-location of this module with other transmitters that operate simultaneously are required to be evaluated using the FCC multi-transmitter procedures. When installing this module to your final devices, please make sure to carry out all the necessary evaluations according to the applicable guidelines like follows:
- for RF exposure: KDB 447498, KDB 996369 and any other relevant guidelines
 - for EMC: KDB 996369 D04 and any other relevant guidelines

CE Regulatory Information

- a) If a product containing this module is to be distributed in EU member countries, separate certification procedures are required.
- b) Wireless testing is required as part of the certification process for your product. KAGA FEI can provide a conducted test report for the wireless section as part of the documentation needed for product certification.

9. Bluetooth Certification

The Bluetooth certification for this product should be obtained using the Design Number and Product Type.

Product Type	DN
Core-Controller Configuration	Q347382