DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29 507 456

Test report No:
NIE: 59573RAN.001

Assessment report
RF EXPOSURE REPORT ACCORDING TO
FCC 47 CFR Part 2.1091
ISED RSS-102 Issue 5:2015

Identification of item tested	Wi-Fi bgn wireless radio module with embedded full stack
Trademark	Silicon Labs
Model and /or type reference	WGM160P22A (ordering code WGM160PX22KGA2) WGM160P22N (ordering code WGM160PX22KGN2)
Other identification of the product	FCC ID: QOQWGM160P IC: 5123A-WGM160P
Features	802.11bgn @ 2.4GHz, single spatial stream
Applicant	SILICON LABORATORIES FINALD OY Alberga Business Park, Bertel Junginaukio 3, 02600 Espoo, Finland
Test method requested, standard	FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices. ISED RSS-102 Issue 5 (2015-03) – Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Miguel Lacave Antennas Lab Manager  MIGUEL LACAVE GARCÍA 2019.03.08 14:28:58 +01'00'
Date of issue	2019-03-08
Report template No	FAN36_00

Index

Competences and guarantees

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated on the report and, it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Assessment Report apply only to the particular item under test established in this document.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA.

General conditions

1. This report is only referred to the item that has undergone the assessment.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This assessment report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA and the Accreditation Bodies.

Identification of the client

SILICON LABORATORIES FINALD OY

Alberga Business Park, Bertel Junginaukio 3, 02600 Espoo, Finland

Document history

Report number	Date	Description
59573RAN.001	2019-03-08	First release

Data provided by the client

The sample consists of a Wi-Fi bgn wireless radio module with embedded full stack. As reference, the manufacturer declares the different WGM160P variants:

SILICON LABS

Description of WGM160P Variants and of Low Freq Crystal Oscillator Functionality

In the WGM160P family of Wi-Fi modules, four variants exist, and the manufacturing differences are described in the following table:

- Integral chip antenna assembled and connected to primary RF port - 32kHz crystal assembled - Orderable part number: WGM160PX22KGA2 - Known as "A" variant with generic model name: WGM160P22A	- Integral chip antenna not assembled: external antenna(s) required for normal operations - 32kHz crystal assembled - Orderable part number: WGM160PX22KGN2 - Known as "N" variant with generic model name: WGM160P22N
- Integral chip antenna assembled and connected to primary RF port - 32kHz crystal not assembled - Orderable part number: WGM160P022KGA2 - Known as "A" variant with generic model name: WGM160P22A	- Integral chip antenna not assembled: external antenna(s) required for normal operations - 32kHz crystal not assembled - Orderable part number: WGM160P022KGN2 - Known as "N" variant with generic model name: WGM160P22N

A 32.768kHz crystal is connected to the microcontroller inside the module, which contains a low-frequency crystal oscillator being used as the sleep clock for the power saving modes of the module. The microcontroller feeds the buffered 32kHz clock signal to the radio chip which uses it to schedule its sleep periods between RF operation periods.

A variant with the 32.768kHz crystal not assembled in production is provided to reduce the module cost, for customers for whom the power consumption is not as important as the cost. In the variants where the crystal has not been assembled, the software will detect its absence and will configure the microcontroller first, and consequently the radio chipset, to use internal RC clocks for sleep timing. The radio listen periods will be widened too, due to the lower timing precision, with the only side effect of increasing the average current consumption.

All RF operation is correlated to a separate, high precision, thermally compensated, crystal which is connected to the radio chipset, and which is used among others for all precision timings required by the radio communication. Nothing that affects radio operation depends on the low frequency crystal.

The printed circuit board with all the variants is identical, as is the software and all settings.

Silicon Laboratories Finland Oy
Alberga Business Park, Bertel Jungin aukio 3
FI-02600 Espoo, Finland
Phone: +358 9 435 5060
www.silabs.com

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results

General description of the device under evaluation

The device under evaluation consists of a Wi-Fi bgn wireless radio module with embedded full stack.

Two devices are evaluated in this report: WGM160P22A and WGM160P22N models.

WGM160P22A model has a variant WGM160PX22KGA2. Both of them support two 802.11bgn RF interfaces, RF1 and RF2. RF1 uses an integrated internal antenna while RF2 uses an external antenna which is not commercialized with the device and therefore it is not part of the evaluation.

WGM160P22N model has a variant WGM160PX22KGN2. Both of them support two 802.11bgn RF interfaces too, RF1 and RF2. Both RF interfaces use external antennas which are not commercialized with the device and therefore they are not part of the evaluation.

The RF Exposure assessment for each pair of device-variant is equivalent. For the rest of the document only the WGM160P22A and WGM160P22N models will be indexed.

The equipment specifications declared by the manufacturer for the 802.11bgn feature are:

Device model	RF Interface	Mode	Band (MHz)	Max. declared output power (dBm)	Max. antenna gain (dBi)	Max. E.I.R.P (dBm)	Max. E.I.R.P (mW)
WGM160P22A	RF 1	802.11bgn	2450	18.82	+1.86	20.68	116.94
	RF 2	802.11bgn	2450	18.46	N/A	18.46	70.14
WGM160P22N	RF 1	802.11bgn	2450	18.82	N/A	18.82	76.20
	RF 2	802.11bgn	2450	18.46	N/A	18.46	70.14

Table 1: Equipment specifications

Assessment summary

Radiofrequency radiation exposure limits						
FCC 47 CFR § 2.1091 & ISED RSS-102 Issue 5 (2015-03)						
Assessment	**Device model**	**RF Interface**	**Band (MHz)**	**Technology**	**Band**	**VERDICT (Pass/Fail)**
1	WGM160P22A	RF1	2450	802.11bgn	ISM	Pass
2		RF2	2450	802.11bgn	ISM	Pass
3	WGM160P22N	RF1	2450	802.11bgn	ISM	Pass
4		RF2	2450	802.11bgn	ISM	Pass

Table 2: Assessment summary

Appendix A: FCC RF Exposure

FCC RF Exposure evaluation for mobile devices

Devices operating in standalone mobile device exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be at least 20 cm and fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile device exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When a device qualifies for the categorical exclusion provision of § 2.1091(c), the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

According to §1.1310 Radiofrequency radiation exposure limits, paragraph (e), the limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields are:

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*100	6
3.0–30	1842/f	4.89/f	*900/f²	6
30–300	61.4	0.163	1.0	6
300–1,500			f/300	6
1,500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*100	30
1.34–30	824/f	2.19/f	*180/f²	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

FCC Conducted Output Limits

Maximum FCC conducted output limits are stated into FCC 47 CFR §15.247 (b) (4) standard. The limit depends on the antenna value as follows:

For antenna gains lower than 6dBi:

Standard	Band (MHz)	Conducted output limit (W)
FCC 47 CFR §15.247 (b)	2450	1.0

For antenna gains exceeding 6dBi, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC MPE Evaluation Results

Each supported transmission technology will be evaluated to determine if it is in compliance with limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

1. Evaluation for WGM160P22A device, RF1 interface (internal defined antenna):

Power density: $S[mW/cm^2] = \frac{P_{E.I.R.P.}[mW]}{4\Pi R[cm]^2}$; Minimum compliance distance: $R_{\min}[cm] = \sqrt{\frac{P_{E.I.R.P.}[mW]}{4\Pi S[mW/cm^2]}}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

2. Evaluation for WGM160P22A and WGM160P22N devices, RF interfaces without defined antennas:

Power density: $S[mW/cm^2] = \frac{P_{\max}[mW]}{4\Pi R[cm]^2}$; Minimum compliance distance: $R_{\min}[cm] = \sqrt{\frac{P_{\max}[mW]}{4\Pi S[mW/cm^2]}}$

Maximum gain to meet the MPE limit: $G_{\max}[dBi] = (10 * \log[S[mW/cm^2] * 4\Pi R[cm]^2) - P_{\max}[dBm]$

S = power density

$P_{\max}$ = power input to the antenna

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

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

Assessment 1 - WGM160P22A device – RF1 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.82
Maximum antenna Gain (dBi):	1.86
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2412
Maximum EIRP (dBm):	20.68
Maximum EIRP (mW):	116.94
General population - Power density limit (mW/cm^2):	1.0

Power density at minimum use distance:

Power density (mW/cm^2):	0.023
General population - Power density limit (mW/cm^2):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	3.05
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Assessment 2 - WGM160P22A device – RF2 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.46
Maximum output power (mW):	70.15
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2412
General population - Power density limit (mW/cm^2):	1.0

Power density at minimum use distance:

Power density (mW/cm^2):	0.014
General population - Power density limit (mW/cm^2):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	2.36
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	18.5
Power density using max antenna gain (mW/cm^2):	0.988

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Maximum gain to meet the FCC 47 CFR §15.247 (b) (4) conducted output power limit

As declared in the 15.247 (b) (4), the conducted output power is reduced by the amount in dB that the directional gain of the antenna exceeds 6dB. The applicable output power limit shall be calculated as follows:

$$P_{Out} = P_{Limit} - (G - 6)$$

Therefore, the maximum antenna gain value to meet the limit will be:

$$G = P_{Limit} - P_{Out} + 6$$

Maximum output power (dBm):	Maximum conducted output power limit (dBm)	Maximum antenna gain to meet the limit (dBi)
18.46	30.0	17.54

Maximun antenna gain to meet power density reference limit / conducted output power limit

Maximum antenna gain (dBi):	17.54

Assessment 3 - WGM160P22N device – RF1 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.82
Maximum output power (mW):	76.21
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2412
General population - Power density limit (mW/cm^2):	1.0

Power density at minimum use distance:

Power density (mW/cm^2):	0.015
General population - Power density limit (mW/cm^2):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	2.46
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	18.1
Power density using max antenna gain (mW/cm^2):	0.979

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Maximum gain to meet the FCC 47 CFR §15.247 (b) (4) conducted output power limit

As declared in the 15.247 (b) (4), the conducted output power is reduced by the amount in dB that the directional gain of the antenna exceeds 6dB. The applicable output power limit shall be calculated as follows:

$$P_{Out} = P_{Limit} - (G - 6)$$

Therefore, the maximum antenna gain value to meet the limit will be:

$$G = P_{Limit} - P_{Out} + 6$$

Maximum output power (dBm):	Maximum conducted output power limit (dBm)	Maximum antenna gain to meet the limit (dBi)
18.82	30.0	17.18

Maximun antenna gain to meet power density reference limit / conducted output power limit

Maximum antenna gain (dBi):	17.18

Assessment 4 - WGM160P22N device – RF2 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.46
Maximum output power (mW):	70.15
Minimum use distance (cm):	20.0
Worst Case Frequency (MHz):	2412
General population - Power density limit (mW/cm^2):	1.0

Power density at minimum use distance:

Power density (mW/cm^2):	0.015
General population - Power density limit (mW/cm^2):	1.0
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	2.36
Minimum use distance (cm):	20.0
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the §1.1310 Radiofrequency radiation exposure limits:

Maximum antenna gain to meet reference level (dBi):	18.1
Power density using max antenna gain (mW/cm^2):	0.979

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Maximum gain to meet the FCC 47 CFR §15.247 (b) (4) conducted output power limit

As declared in the 15.247 (b) (4), the conducted output power is reduced by the amount in dB that the directional gain of the antenna exceeds 6dB. The applicable output power limit shall be calculated as follows:

$$P_{Out} = P_{Limit} - (G - 6)$$

Therefore, the maximum antenna gain value to meet the limit will be:

$$G = P_{Limit} - P_{Out} + 6$$

Maximum output power (dBm):	Maximum conducted output power limit (dBm)	Maximum antenna gain to meet the limit (dBi)
18.82	30.0	17.18

Maximun antenna gain to meet power density reference limit / conducted output power limit

Maximum antenna gain (dBi):	17.18

Appendix B: ISED RF Exposure

ISED RF Exposure evaluation for mobile devices

According to RSS-102 Issue 5, Paragraph "4. Exposure Limits", Industry of Canada has adopted the RF field strength limits established in Health Canada's RF exposure guideline, Safety code 6:

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10[21]	83	90	-	Instantaneous*
0.1-10	-	$0.73/f$	-	6**
1.1-10	$87/f^{0.5}$	-	-	6**
10-20	27.46	0.0728	2	6
20-48	$58.07/f^{0.25}$	$0.1540/f^{0.25}$	$8.944/f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000/f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000/f^{1.2}$

Note: f is frequency in MHz.
*Based on nerve stimulation (NS).
** Based on specific absorption rate (SAR).

ISED EIRP Limits

Maximum ISED EIRP limits are stated into RSS-247 Issue 2 standard:

Standard	Band (MHz)	EIRP limit (dBm)	EIRP limit (W)
RSS-247 Issue 2, section 5.4	2450	36.0	4.0

ISED MPE Evaluation Results

Each supported transmission technology will be evaluated to determine if it is in compliance with RSS-102 Issue 5, RF Field Strength Limits for devices used by the General Public.

In order to perform the assessment, the following equations have been used for the calculations; these equations are accurate in the far-field of an antenna and will over-predict power density in the near field, where they could be used for making a "worst case" or conservative prediction:

1. Evaluation for WGM160P22A device, RF1 interface (internal defined antenna):

Power density: $S[W/m^2] = \frac{P_{E.I.R.P.}[W]}{4\Pi R[m]^2}$

Minimum compliance distance: $R_{\min}[m] = \sqrt{\frac{P_{E.I.R.P.}[W]}{4\Pi S[W/m^2]}}$

Where:

S = power density

$P_{E.I.R.P.}$ = Equivalent isotropically radiated power

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

2. Evaluation for WGM160P22A and WGM160P22N devices, RF interfaces without defined antennas:

Power density: $S[W/m^2] = \frac{P_{\max}[W]}{4\Pi R[m]^2}$

Minimum compliance distance: $R_{\min}[m] = \sqrt{\frac{P_{\max}[W]}{4\Pi S[W/m^2]}}$

Maximum gain to meet the RSS -102 limit: $G_{\max}[dBi] = (10 * \log[S[W/m^2] * 4\Pi R[m]^2) + 30 - P_{\max}[dBm]$

S = power density

$P_{\max}$ = power input to the antenna

R = distance to the center of radiation of the antenna (evaluation distance)

$R_{\min}$ = distance to the center of radiation of the antenna

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

Assessment 1 - WGM160P22A device – RF1 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.82
Maximum antenna gain (dBi):	1.86
Minimum use distance (m):	0.2
Worst Case Frequency (MHz):	2412
Maximum EIRP (dBm):	20.68
Maximum EIRP (W):	0.12
General public - Power density limit (W/m^2):	5.36

Power density at minimum use distance:

Power density (W/m^2):	0.233
General public - Power density limit (W/m^2):	5.36
Verdict for general public:	PASS

The power density level for this transmission mode is below general public power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general public (m):	0.042
Minimum use distance (m):	0.2
Verdict for general public:	PASS

The minimum use distance is greater than general public minimum compliance distance.

Assessment 2 - WGM160P22A device – RF2 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.46
Maximum output power (mW):	0.07
Minimum use distance (cm):	0.2
Worst Case Frequency (MHz):	2412
General population - Power density limit (mW/cm^2):	5.36

Power density at minimum use distance:

Power density (mW/cm^2):	0.14
General population - Power density limit (mW/cm^2):	5.36
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	0.032
Minimum use distance (cm):	0.20
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the RSS-102 limits:

Maximum antenna gain to meet reference level (dBi):	15.8
Power density using max antenna gain (W/m^2):	5.31

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Maximum gain to meet the RSS-247 EIRP limit

Maximum output power (dBm):	EIRP limit (dBm)	Maximum antenna gain to meet EIRP level (dBi)
18.46	36.0	17.54

Maximun antenna gain to meet power density reference limit / EIRP limit

Maximum antenna gain (dBi):	15.8

Assessment 3 - WGM160P22N device – RF1 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.82
Maximum output power (mW):	0.08
Minimum use distance (cm):	0.2
Worst Case Frequency (MHz):	2412
General population - Power density limit (mW/cm^2):	5.36

Power density at minimum use distance:

Power density (mW/cm^2):	0.152
General population - Power density limit (mW/cm^2):	5.36
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	0.034
Minimum use distance (cm):	0.20
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the RSS-102 limits:

Maximum antenna gain to meet reference level (dBi):	15.4
Power density using max antenna gain (W/m^2):	5.26

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Maximum gain to meet the RSS-247 EIRP limit

Maximum output power (dBm):	EIRP limit (dBm)	Maximum antenna gain to meet EIRP level (dBi)
18.82	36.0	17.18

Maximun antenna gain to meet power density reference limit / EIRP limit

Maximum antenna gain (dBi):	15.4

Assessment 4 - WGM160P22N device – RF2 Interface - 802.11bgn 2.4 GHz Band

MPE Evaluation

Maximum output power (dBm):	18.46
Maximum output power (mW):	0.07
Minimum use distance (cm):	0.2
Worst Case Frequency (MHz):	2412
General population - Power density limit (mW/cm^2):	5.36

Power density at minimum use distance:

Power density (mW/cm^2):	0.14
General population - Power density limit (mW/cm^2):	5.36
Verdict for general population:	PASS

The power density level for this transmission mode is below general population exposure power density limit.

Minimum compliance distance for this technology:

Minimum compliance distance for general population (cm):	0.032
Minimum use distance (cm):	0.20
Verdict for general population:	PASS

The minimum use distance is greater than general population exposure minimum compliance distance.

Maximum gain to meet the RSS-102 limits:

Maximum antenna gain to meet reference level (dBi):	15.8
Power density using max antenna gain (W/m^2):	5.31

The power density level using the maximum antenna gain for this transmission mode will be below power density reference level.

Maximum gain to meet the RSS-247 EIRP limit

Maximum output power (dBm):	EIRP limit (dBm)	Maximum antenna gain to meet EIRP level (dBi)
18.46	36.0	17.54

Maximun antenna gain to meet power density reference limit / EIRP limit

Maximum antenna gain (dBi):	15.8