QPE6105A

ETSI Certification Guide – Bluetooth® Low Energy Mode

Introduction

This document provides a guideline for the execution of the ETSI radio certification tests of Zigbee / Matter™ / Bluetooth® Low Energy modules using QPG6105 chips. This document focusses on Bluetooth Low Energy mode certification for the ETSI regulatory domain.

At start of the radio certification test the applicable PHY (BLE) can be selected in the Radio Control Console software [1].

This document is based on and compliant with the technical requirements given in ETSI EN 300 328 v2.2.2, see [3].

! **Obtaining regulatory certifications is the responsibility of the end customer.**

Table of Contents

1 Device under Test (DUT)

This certification guide has been customized for the following product:

Type:	QPE6105A
Model:	19644_QPE6105a_Module
H/W Revision:	0.60 onwards
S/W Revision:	PTC_QPG6105_10DBM_CFG_B_v1.9.0.0.dll

2 Block Diagrams and Functional Description

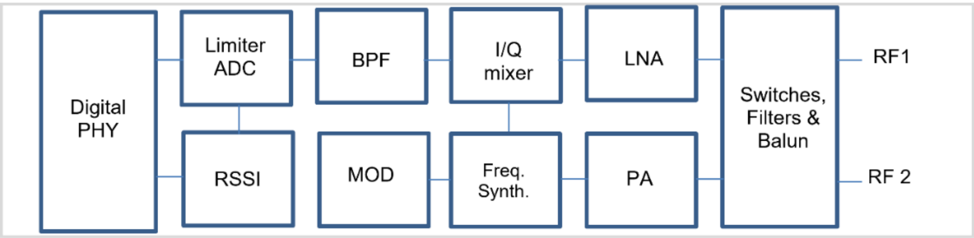

Figure 1: Block Diagram of QPG6105 Chip

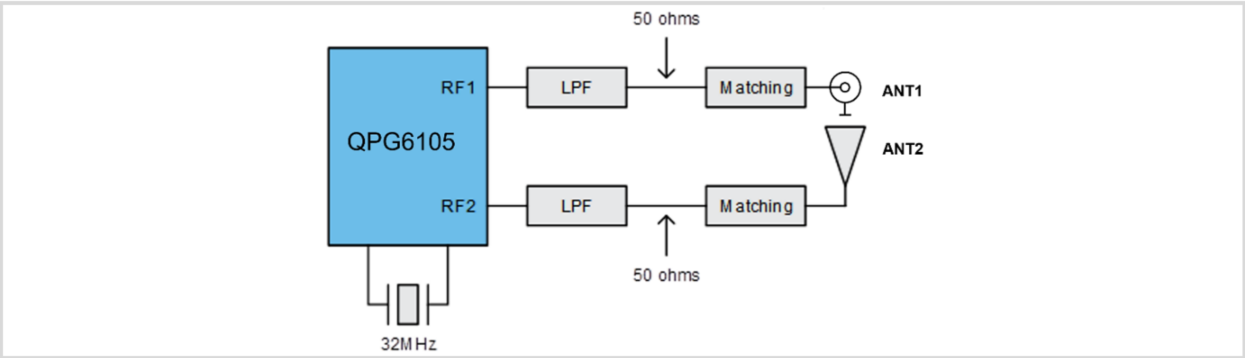

Figure 2: RF Block Diagram of the QPE6105A Module with one Embedded Antenna and one Antenna pin

2.1 General Description

The QPG6105 chip is an **IEEE 802.15.4 / Bluetooth® Low Energy** Multi-Protocol Multi-Channel Communications Controller for ultra-low power wireless communications for remote controls. It is compliant with the IEEE Standard 802.15.4 for RF4CE Zigbee, and the Bluetooth Core Specification v 5.3 for Bluetooth Low Energy. In IEEE 802.15.4 communications, antenna diversity offers additional robustness in a crowded wireless 2.4 GHz environment.

2.2 Power Regulation

The QPG6105 chip has an integrated power management system using a Global Low Dropout Regulator (GLDO). This generates an internal 1.8 V power supply. The internal 1.8 V power rail is used to supply separate local LDO regulators feeding RF/analog and digital blocks. The local LDOs used to supply RF/analog blocks are specially designed to have high power supply rejection ratio (PSRR) to suppress the supply ripples.

In case the external supply voltage is too low to deliver the 1.8V internal supply voltage, the QPG6105 chip will reset and consequently stop all RF communication. This means that RF frequency and RF modulation will be independent from the supply voltage.

2.3 Frequency Synthesis and Modulation

The QPG6105 chip uses a FLL circuit with a VCO operating at 2 times the transmit frequency. The VCO is directly modulated by digital signal processor (DSP). The modulation is fully compatible with the offset quadrature phase- shift keying (O-QPSK) as required by the IEEE802.15.4 standard and with different settings it also supports MSK modulation as used by BLE.

The receiver uses a low intermediate frequency (IF) scheme, where the IF frequency is 2 MHz. The formula to calculate the VCO frequency in RX mode can be found in section 3.5.2.

2.4 RF Interface

The QPG6105 chip has two RF outputs: RF1 and RF2. Both RF ports are bidirectional and will be used for both transmit (TX) and receive (RX) mode. The antenna ports outputs are 50 Ω single ended. Only one (1) antenna is used for RX or TX at the time (i.e., not supporting MIMO).

3 Radio Information

3.1 Applicable Standard

ETSI EN 300 328 V2.2.2 as mentioned in [3].

Verify with the test house which version of the standard to use.

The modulation can be considered as non-FHSS, see paragraph "4.21 Wideband Data Transmission equipment types" in reference [3].

3.2 Receiver category

See these paragraphs in reference [3]:

4.2.3.2.1	**Receiver category 1:** adaptive equipment with a maximum RF output power greater than 10 dBm e.i.r.p. NOTE: Non-adaptive equipment is categorized as receiver category 2 or receiver category 3.
4.2.3.2.2	**Receiver category 2:** • non-adaptive equipment with a Medium Utilization (MU) factor greater than 1 % and less than or equal to 10 % (irrespective of the maximum RF output power); or • equipment (adaptive or non-adaptive) with a maximum RF output power greater than 0 dBm e.i.r.p. and less than or equal to 10 dBm e.i.r.p.
4.2.3.2.3	**Receiver category 3:** • non-adaptive equipment with a maximum Medium Utilization (MU) factor of 1 % (irrespective of the maximum RF output power); or • equipment (adaptive or non-adaptive) with a maximum RF output power of 0 dBm e.i.r.p.

The receiver class is Category 2.

The max TX output power of the QPG6105 chip is 10 dBm. The max gain of the embedded antenna is -3 dBi, so the device will stay withing the 10 mW/MHz spectral density requirement. An external antenna can be connected to the module antenna pin. The gain of this antenna should stay below 0 dBi at 10 dBm TX power level to stay within the 10 mW/MHz spectral density requirement. It is possible to use an antenna with higher gain if power is backed off. Only one of the two antennas will be used in BLE mode.

3.3 Medium Utilization

See in ref. [3] paragraph 4.3.2.5

The Medium Utilization (MU) factor is a measure to quantify the number of resources (Power and Time) used by non-adaptive equipment. The Medium Utilization factor is defined by the formula:

$$MU = (Pout / 100\ mW) \times DC$$

where:
MU is Medium Utilization.
Pout is the RF output power as expressed in mW.
DC is the Duty Cycle expressed in %.

For non-adaptive non-frequency hopper spread spectrum modulation the limit is defined in paragraph 4.3.2.5.3 of reference [3].

The maximum Medium Utilization factor for non-adaptive non-FHSS equipment shall be 10 %.

With a maximum TX power of 10 dBm EiRP which complies with 10 mW even with 100% DC, the MU will never exceed 10%. This implies that it is not needed to measure the MU, medium utilization, or to measure adaptivity.

3.4 Bluetooth LE Frequency Range

The BLE PHY supports 40 channels, these channels are following the BLE standard channel numbering.

These RF channels have center frequencies 2402 + k * 2 MHz, where k = 0, ..., 39.
“k” is the channel number.

The lowest frequency with k= 0 is 2402 MHz, the highest frequency with k = 39 is 2480 MHz.

3.5 Frequency Generation Scheme

3.5.1 TX mode

The local oscillator operates on 2 times the TX frequency. The local oscillator is directly modulated.

3.5.2 RX mode

The local oscillator operates on (Fo + 2) * 2, where Fo is frequency of RF channel in [MHz].

4 Operating Manual

4.1 System Setup

Test software allowing to control the radio is distributed via Radio Control Software packages ref [1] and [2]. These packages consist of a Radio Control Console (RCC) PC application and Product Test Component (PTC) firmware binaries. Below figure shows the high-level overview of the system.

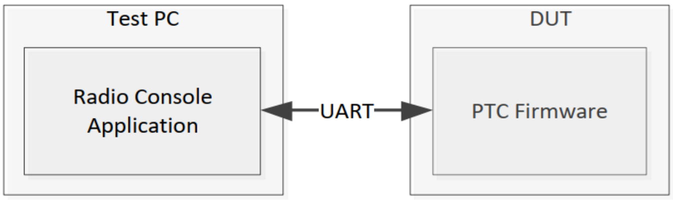

Figure 3: System Setup

The physical interface in-between the RCC application and the PTC firmware is a UART link. The UART pin mapping options are described in the PTC release notes.

The PTC firmware [2] should be flashed to the processor of the DUT. The RCC application can be started by means of the RadioConsoleControl.exe executable.

Figure 4: QPE6105A Module on Radio Adaptor Board

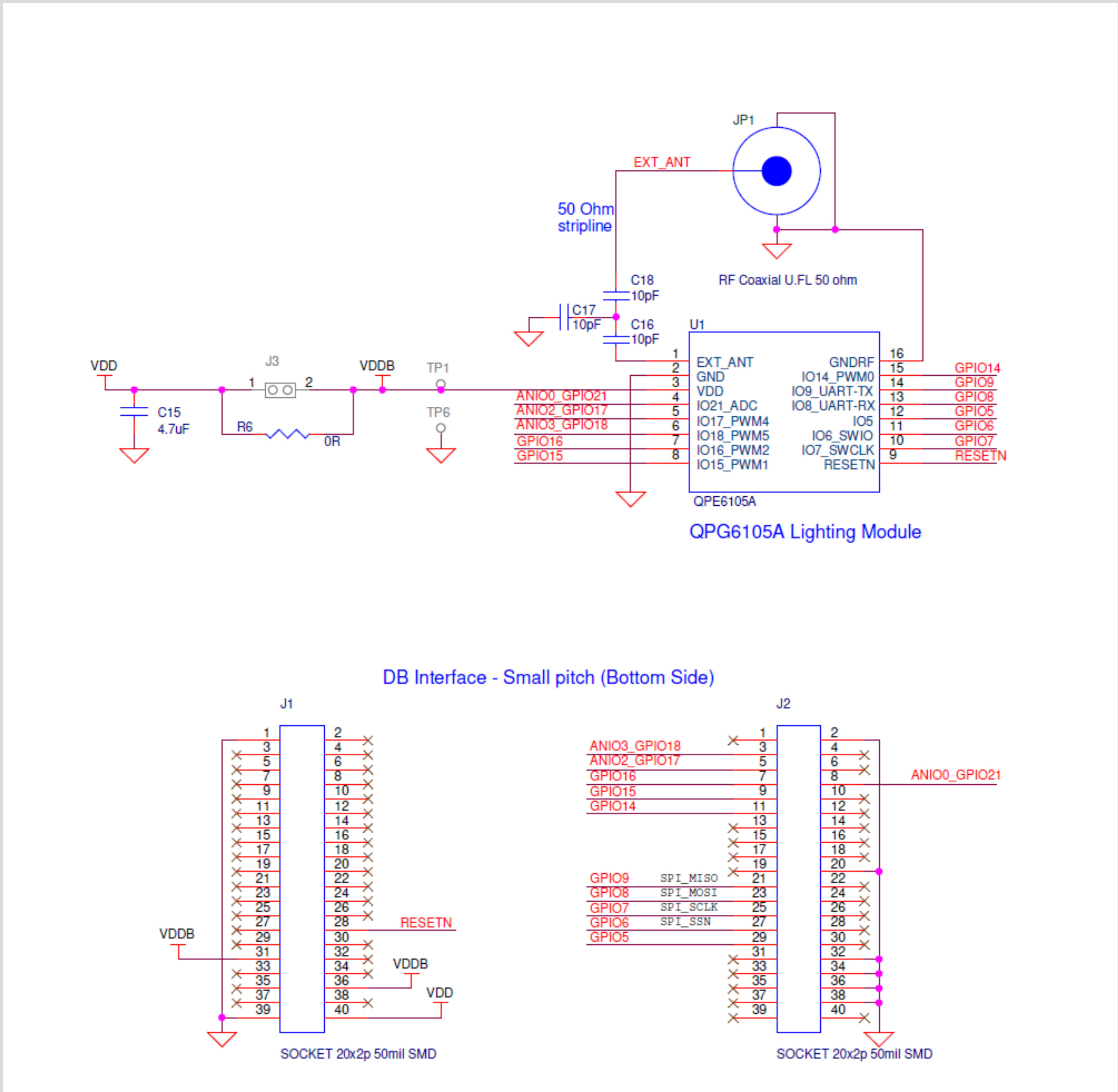

Figure 5: Pin Mapping QPE6105A Radio Adaptor Board

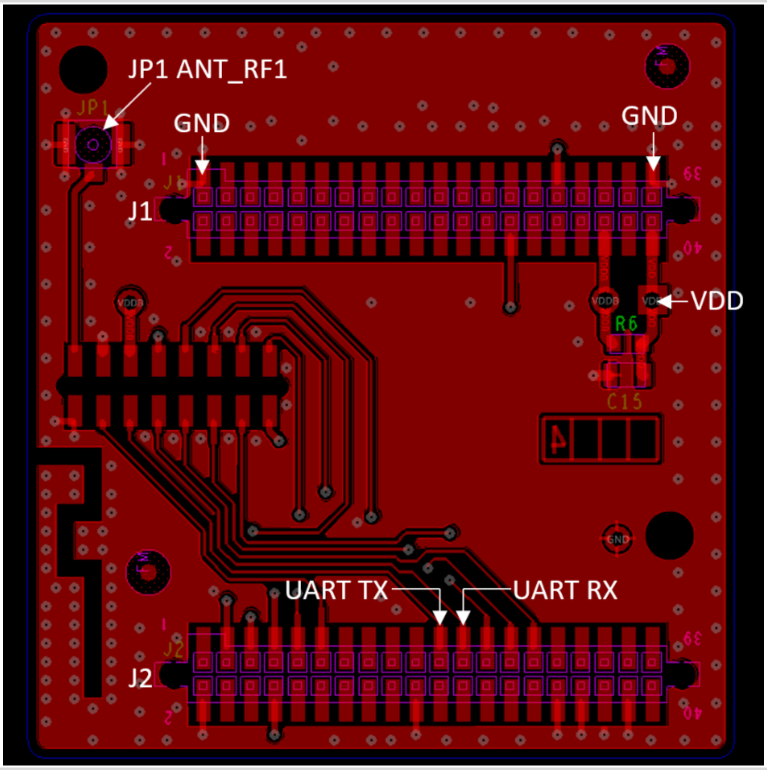

Figure 6: Connecting the Power Supply and UART Interface on Radio Adaptor Board

Connecting power supply and UART interface on adaptor board:

- JP1 — UFL connector for ANT_RF1
- J1 pin 1, 39 — GND
- J2 pin 2, 20, 32, 34, 36, 38 — GND
- J2 pin 21 — J2 GPIO9 UART TX, Data from target to the tester
- J2 pin 23 — J2 GPIO8 UART RX, Data from tester to the target
- J1 pin 40 — VDD 1.8 ~ 3.6 V; nominal voltage is 3.0V

4.2 Quick Start Guide at Terminal Emulator

The commands required to perform the Certification Test are listed in Table 1 below. Information on the full command set of this application, see [1].

At start of the test the intended PHY needs to be selected. Please use the "PHY" command to do this.

In case of issues (e.g., non-responsive device) please repeat the power up cycle.

Table 1: Radio Control Console Command Set

Commands	Description
H	Show Help on all possible commands
PHY BLE/RF4CE	Select the BLE or RF4CE (Zigbee) PHY
I	Print the current settings/state of the chip
AN 0	Select antenna port
CH 20	Set channel to channel 20 "CH [space] 20", channel 0 to 39 can be selected
W 10	Set TX power to 10 dBm. Supported W inputs: 10 to -24 in steps of 1 dB
CW U	Configure DUT to send Continuous Unmodulated wave
CW M	Configure DUT to send Continuous Modulated wave
SETCW ON/OFF	Start/stop Continuous Wave (CW) transmission
RX ON/OFF	Switch on/off receiver
P	Show packet statistics
R	Reset packet statistics
TX <number> <interval> <length> ON/OFF	Transmit packets with payload
PACKETLENGTH *<number>*	Set packet length in bytes In BLE mode the maximum packet payload is 241 bytes.
BLETESTPACKET <number>	Defines the BLE TestPacket Type to be used in Direct Test Mode Transmit
BLEDATARATE <number>	Select the PHY BLE datarate (1 Mbit/s / 2 Mbit/s).

5 RF Testing

Devices for certification tests are loaded with PTC software. With this software, it is possible to perform all radio tests. Detailed instructions on how to use this software can be found in ref [1].

5.1 Select the PHY mode

Make sure that BLE is selected:

- **PHY BLE** Select BLE

5.2 Select RF Port/Antenna

Select antenna port:

- **AN 0** Select RF1 port, this port is connected to the external antenna pin
- **AN 1** Select RF2 port, this port is connected to the embedded antenna

5.3 Set-Up Procedure for TX Modes

5.3.1 Select Output Power Level

NOTE: The default setting for output power is +10 dBm which is also the default setting for ETSI certification. To set the module to the 10 dBm power, at console enter:

- **W 10**

5.3.2 Select RF Channel

At the console enter:

- **CH 0** (low)
- **CH 20** (mid)
- **CH 39** (high)

Enter "**I**" at the console to verify if DUT has changed channels.

5.3.3 Select BLE data rate

- **BLEDATARATE 1M** selects 1 Mbit/s
- **BLEDATARATE 2M** selects 2 Mbit/s

NOTE: on the primary BLE advertisement channels the BLE standard limits PHY data rate to 1 Mbit/s. The advertisement channels are: 2402, 2426 and 2480 MHz. Please take in consideration when doing ETSI band-edge testing (do not select a 2 Mbit/s data rate on especially 2402 and 2480 MHz).

5.3.4 Turn TX on, (Un-)modulated CW

- **CW U** select unmodulated CW
- **CW M** select modulated CW
- **SETCW ON** set continuous wave to "on"
- **SETCW OFF** turn off continuous wave

5.4 Transmit Packets

For selecting the BLE data rate see section 5.3.3.

5.4.1 BLETESTPACKET

- **BLETESTPACKET 0** select packet type 0, other options stated in table below

Type	Description
0	PRBS9 sequence '1111111100000111101…' (in transmission order)
1	Repeated '11110000' (in transmission order)
2	Repeated '10101010' (in transmission order)
3	PRBS15 sequence
4	Repeated '11111111' (in transmission order) sequence
5	Repeated '00000000' (in transmission order) sequence
6	Repeated '00001111' (in transmission order) sequence
7	Repeated '01010101' (in transmission order) sequence

5.4.2 BLE packet length

- **PACKETLENGTH 10** select packet length in bytes, max 241

5.4.3 Transmit packets

- **TX 100 0 ON** transmit 100 packets.

It is not possible to select the interval time between packets in BLE mode, so it is defaulted to 0. Therefore, it is not obvious how to control the TX duty cycle for average spurious emission measurements. Typical duty cycles can be found in table below.

Packet length (bytes)	TX duty cycle @ 1 Mbit/s	TX duty cycle @ 2 Mbit/s
10	+/- 32%	+/- 16%
20	+/- 42%	+/- 30%
30	+/- 54%	+/- 29%
40	+/- 32%	+/- 35%

The PTC SW does not provide a mode in which it is possible to transmit at a 13 % duty cycle with 20 bytes packets as used in 64 kbit/s voice mode.

5.4.4 Set-up Procedure for RX Mode

Before the RX test, please RESET the DUT by power cycling and restarting the Radio Control Console application (see also section 5.1).

5.4.5 Select RF Channel

See 5.3.2 to select an RF channel.

5.4.6 Turn RX On

At the console enter:

- **RX ON**

5.4.7 Print Packets Sent/Received in BLE Mode

- **RX OFF**
- **P** (print number of received packets)
- **R** (reset the number of sent/received counter)

In BLE mode, the values returned by the Show Packet Statistics are only valid after the RX/TX/TXR mode has been stopped explicitly by issuing the RX OFF or TX OFF command, depending on which mode was activated.

6 ETSI EN 300 328 - Annex E - Information

(copied from reference [3])

The information below is provided as an example only.

NOTE: comments are stated in red.

Annex E (informative): Application form for testing

E.1 Introduction

Notwithstanding the provisions of the copyright clause related to the text of the present document, ETSI grants that users of the present document may freely reproduce the application form pro forma in this annex so that it can be used for its intended purposes and may further publish the completed application form.

The form contained in this annex may be used by the manufacturer to comply with the requirement contained in clause 5.4.1 to provide the necessary information about the equipment to the test laboratory prior to the testing. It contains product information as well as other information which might be required to define which configurations are to be tested, which tests are to be performed as well the test conditions.
This application form should form an integral part of the test report.

E.2 Information as required by ETSI EN 300 328 V2.2.2, clause 5.4.1

In accordance with ETSI EN 300 328, clause 5.4.1, the following information is provided by the manufacturer.

a) The type of wideband data transmission equipment:

- □ FHSS
- ■ non-FHSS (select non-FHSS)

b) In case of FHSS: (not applicable)

- In case of non-Adaptive FHSS equipment:
  The number of Hopping Frequencies: …………..
- In case of Adaptive FHSS equipment:
  The maximum number of Hopping Frequencies: …………..
  The minimum number of Hopping Frequencies: …………..
- The (average) dwell time: …………..

c) Adaptive/non-adaptive equipment:

- ■ non-adaptive Equipment
- □ adaptive Equipment without the possibility to switch to a non-adaptive mode
- □ adaptive Equipment which can also operate in a non-adaptive mode

(Select non-adaptive equipment, as EiRP power stays below 10 dBm, there is no need to prove adaptivity, so this simplifies testing.)

d) In case of adaptive equipment:

The maximum Channel Occupancy Time implemented by the equipment: .... ms

- □ The equipment has implemented an LBT mechanism
  - In case of non-FHSS equipment:
  - ■ The equipment is Frame Based equipment
  - □ The equipment is Load Based equipment
- □ The equipment can switch dynamically between Frame Based and Load Based equipment
  The CCA time implemented by the equipment: .... µs
- □ The equipment has implemented a DAA mechanism
- □ The equipment can operate in more than one adaptive mode

e) In case of non-adaptive Equipment:

The maximum RF Output Power (e.i.r.p.): …10……. dBm (see paragraph 3.2)
The maximum (corresponding) Duty Cycle: …54……. %

Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):

………

………

f) The worst case operational mode for each of the following tests:

- RF Output Power
  Default TX power of 10 dBm and -3 dBi antenna gain (when using embedded antenna, in case of external antenna adjust Power Spectral Density statement below)

- Power Spectral Density
  10 + -3 = 7 dBm EiRP (PSD in 1 MHz BW)

- Duty cycle, Tx-Sequence, Tx-gap
  see section 5.4.3 of this Certification Guide

.

- Accumulated Transmit time, Frequency Occupation & Hopping Sequence (only for FHSS equipment)

……………………………………………………………………………

- Hopping Frequency Separation (only for FHSS equipment)

……………………………………………………………………………

- Medium Utilization
  10 mW /100 mW * 54% = 5.4%

……………………………………………………………………………

- Adaptivity & Receiver Blocking
  Receiver class 2

……………………………………………………………………………

- Nominal Channel Bandwidth
  2 MHz per Bluetooth Low Energy specification

……………………………………………………………………………

- Transmitter unwanted emissions in the OOB domain
  < -30 dBm/MHz

……………………………………………………………………………

- Transmitter unwanted emissions in the spurious domain
  << -30 dBm/MHz

……………………………………………………………………………

- Receiver spurious emissions
  << -47 dBm

……………………………………………………………………………

g) The different transmit operating modes (tick all that apply):

- ■ Operating mode 1: Single Antenna Equipment
  - ■ Equipment with only one antenna
  - □ Equipment with two diversity antennas but only one antenna active at any moment in time
  - □ Smart Antenna Systems with two or more antennas, but operating in a (legacy) mode where only one antenna is used (e.g. IEEE 802.11™ legacy mode in smart antenna systems)

(The Qorvo QPG6105a reference design in BLE mode uses 1 antenna)

- □ Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming
  - □ Single spatial stream/Standard throughput/(e.g. IEEE 802.11™ legacy mode)
  - □ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
  - □ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE 1: Add more lines if more channel bandwidths are supported.

- □ Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming
  - □ Single spatial stream/Standard throughput (e.g. IEEE 802.11™ legacy mode)
  - □ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 1
  - □ High Throughput (> 1 spatial stream) using Nominal Channel Bandwidth 2

NOTE 2: Add more lines if more channel bandwidths are supported.

h) In case of Smart Antenna Systems:

- The number of Receive chains: ....
- The number of Transmit chains: ....
  - □ symmetrical power distribution
  - □ asymmetrical power distribution

In case of beam forming, the maximum (additional) beam forming gain: .... dB

NOTE: The additional beam forming gain does not include the basic gain of a single antenna.

i) Operating Frequency Range(s) of the equipment:

- Operating Frequency Range 1: ..2402......... MHz to .....2480...... MHz
- Operating Frequency Range 2: .... MHz to .... MHz

NOTE: Add more lines if more Frequency Ranges are supported.

j) Nominal Channel Bandwidth(s):

- Nominal Channel Bandwidth 1: ..2......... MHz (per Bluetooth Low Energy specification)
- Nominal Channel Bandwidth 2: .... MHz

NOTE: Add more lines if more channel bandwidths are supported.

k) Type of Equipment (stand-alone, combined, plug-in radio device, etc.):

- ■ Stand-alone
- □ Combined Equipment
- □ Plug-in radio device
- □ Other ....

l) The normal and the extreme operating conditions that apply to the equipment:

Normal operating conditions (if applicable):

Operating temperature: …20… °C (room temperature 0 ~ 50 degrees)

Other (please specify if applicable): ……

Extreme operating conditions:
Operating temperature range: Minimum: -40 °C Maximum …125…°C
Other (please specify if applicable): …… Minimum: …… Maximum ……

Details provided are for the:
□ stand-alone equipment
□ combined equipment
□ test jig

m) The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p. levels:

- Antenna Type:
  ■ Integral Antenna (information to be provided in case of conducted measurements)
  Antenna Gain: .....-3........ dBi (option to use external antenna on module pin)

If applicable, additional beamforming gain (excluding basic antenna gain): .... dB
□ Temporary RF connector provided (optional by using rigid coax)
□ No temporary RF connector provided

□ Dedicated Antennas (equipment with antenna connector)
□ Single power level with corresponding antenna(s)
□ Multiple power settings and corresponding antenna(s)
Number of different Power Levels: ....

Power Level 1: .... dBm
Power Level 2: .... dBm
Power Level 3: .... dBm

NOTE 1: Add more lines in case the equipment has more power levels.
NOTE 2: These power levels are conducted power levels (at antenna connector).

(The antennas used un the Qorvo remote control reference design(s) are embedded antennas with gain ≤ 3 dBi)

- For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable

Power Level 1: .... dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 3: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 2: .... dBm

Number of antenna assemblies provided for this power level: ....

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

NOTE 4: Add more rows in case more antenna assemblies are supported for this power level.

Power Level 3: .... dBm

Assembly #	Gain (dBi)	e.i.r.p. (dBm)	Part number or model name
1			
2			
3			
4			

Number of antenna assemblies provided for this power level: ....

NOTE 5: Add more rows in case more antenna assemblies are supported for this power level.

n) The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined equipment or test jig in case of plug-in devices:

Details provided are for the: □ stand-alone equipment
□ combined equipment
□ test jig

Supply Voltage □ AC mains State □ AC voltage ……….. V
□ DC State □ DC voltage ……….. V

In case of DC, indicate the type of power source

□ Internal Power Supply
□ External Power Supply or AC/DC adapter
□ Battery
□ Other: ....

o) Describe the test modes available which can facilitate testing:

....
....
....

p) The equipment type (e.g. Bluetooth®, IEEE 802.11™, IEEE 802.15.4™, proprietary, etc.):

.....Bluetooth Low Energy 5.3...

q) If applicable, the statistical analysis referred to in clause 5.4.1 q)
(to be provided as separate attachment)

r) If applicable, the statistical analysis referred to in clause 5.4.1 r)
(to be provided as separate attachment)

s) Geo-location capability supported by the equipment:

□ Yes
□ The geographical location determined by the equipment as defined in clause 4.3.1.13.2 or clause 4.3.2.12.2 is not accessible to the user
□ No

E.3 Configuration for testing (see clause 5.3.2.3 of ETSI EN 300 328 V2.2.2)

From all combinations of conducted power settings and intended antenna assembly(ies) specified in clause 5.4.1 m), specify the combination resulting in the highest e.i.r.p. for the radio equipment.

Unless otherwise specified in ETSI EN 300 328, this power setting is to be used for testing against the requirements of ETSI EN 300 328. In case there is more than one such conducted power setting resulting in the same (highest) e.i.r.p. level, the highest power setting is to be used for testing. See also ETSI EN 300 328, clause 5.3.2.3.

Highest overall e.i.r.p. value: ...10...... dBm	
Corresponding Antenna assembly gain: ....-3..... dBi	Antenna Assembly #: .....embedded....
Corresponding conducted power setting: ....10..... dBm (also the power level to be used for testing)	Listed as Power Setting # W 10

(The antenna used in the Qorvo module reference design is an embedded antenna with gain of – 3 dBi.)

E.4 Additional information provided by the manufacturer

E.4.1 Modulation

ITU Class(es) of emission: ...2.3 M F1D BT ....
Can the transmitter operate unmodulated? ■ yes □ no

E.4.2 Duty Cycle

The transmitter is intended for:
- □ Continuous duty
- ■ Intermittent duty
- ■ Continuous operation possible for testing purposes

E.4.3 About the UUT

- □ The equipment submitted are representative production models
- □ If not, the equipment submitted are pre-production models?
- □ If pre-production equipment are submitted, the final production equipment will be identical in all respects with the equipment tested.
- □ If not, supply full details

....
....

E.4.4 Additional items and/or supporting equipment provided

- □ Spare batteries (e.g. for portable equipment)
- □ Battery charging device
- □ External Power Supply or AC/DC adapter
- □ Test jig or interface box
- □ RF test fixture (for equipment with integrated antennas)
- □ Combined equipment Manufacturer: ....
- □ Model #: ....
- □ Model name: ....
- □ User Manual
- □ Technical documentation (Handbook and circuit diagrams)

(This Certification guide maybe part of the technical documentation)

References

[1] User Manual for Radio Control Console; Qorvo document GP_P864_UM_16380_PTC_Overview

[2] Radio Control SW Package; Qorvo document GP_P864_SW_16383

[3] ETSI EN 300 328 v2.2.2.
Wideband transmission systems; Data transmission equipment operating in the 2,4 GHz band; Harmonised Standard for access to radio spectrum

[4] Product Test Component Release note; Qorvo document GP_P864_RN_12462_ProductTestComponentReleaseNotes

[5] Antenna Pattern report
GP_P1246_TR_20019_RD_Lighting_QPG6105_Antenna_Pattern_Measurements.xlsx

[6] Bill of Material QPE6105a
GP_P1246_BOM_19644_RD_Lighting_QPG6105

[7] Schematic QPE6105a
GP_P1246_HW_19642_RD_Lighting_QPG6105_SCH

[8] PCB design files QPE6105a
GP_P1246_HW_19643_RD_Lighting_QPG6105_PCB

[9] Bill of Material QPE6105a Radio Adaptor Board
GP_P345_BOM_19687_QPE6105A_Radio_Board

[10] Schematic QPE6105a Radio Adaptor Board
GP_P345_HW_19685_QPE6105A_Radio_Board_SCH

[11] PCB design files QPE6105a Radio Adaptor Board
GP_P345_HW_19686_QPE6105A_Radio_Board_PC

[12] FCC Certification guide Zigbee / Matter™ mode
GP_P335_UM_20020_FCC_Certification_Guide_QPE6105a__IoT_Controller_Zigbee_Mode.pdf

[13] FCC Certification guide Bluetooth Low Energy mode
GP_P335_UM_20021_FCC_Certification_Guide_QPE6105a__IoT_Controller_BLE_Mode.pdf

[14] ETSI Certification guide Zigbee / Matter™ mode
GP_P335_UM_20255_ETSI_Certification_Guide_QPE6105a__IoT_Controller_Zigbee_Mode.pdf

Abbreviations

ADC Analog-to-Digital Converter
BPF Band-Pass filter
BLE Bluetooth Low Energy
CW Continuous Wave
DUT Device Under Test
GLDO Global Low Dropout Regulator
LDO Low Dropout Regulator
LNA Low-Noise Amplifier
LPF Low-Pass Filter
PTC Product Test Component
RCC Radio Control Console
RCU Remote Control Unit
VCO Voltage Controlled Oscillator

Important Notice

Document History

Version	Date	Section	Changes
1.0	10 Aug 2023		Released version.