

Application Note

How to Certify Your Bluetooth Product



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ABSTRACT

This application note is provided to guide system designers with an overview of the qualification and listing process needed to bring an end product incorporating a TI SimpleLink™ Bluetooth® Low Energy wireless MCU to the market. The content in this document must be considered informative with the actual standards body (for example, Bluetooth SIG, FCC, and so forth) providing the normative requirements.

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1 Introduction

All Bluetooth Low Energy products must go through the Bluetooth SIG qualification and declaration process to demonstrate and declare that the products satisfy the requirements of the Bluetooth license agreements and specifications.

This document presents the fundamentals of going through the process of releasing an end product incorporating a TI Bluetooth Low Energy wireless MCU.

In addition to the Bluetooth qualification process, all products must comply with regulatory compliance standards applicable to the regions the products operate in, such as FCC and CE/RED. This document briefly covers some of the more common regulatory compliance standards applicable to Bluetooth Low Energy products.

To understand the distinction between a wireless MCU and an end product is important, especially one that incorporates the wireless MCU along with external circuitry such as an PCB, matching network, antenna, and so forth, which together comprise the *end product*. Unless otherwise noted, the referenced regulatory and standards body referenced in this guide apply to the end product.

2 Bluetooth Qualification

To release a Bluetooth end product to market, the design needs to be qualified. Texas Instruments provides Qualified Design Listings (QDL) [2] with corresponding Qualified Design Identification (QDID) or Design Number (DN) for all Bluetooth Low Energy wireless MCUs and associated Bluetooth Low Energy software stacks. This means that no Bluetooth Low Energy software stack testing is required by system integrators.

In addition to the BLE-Stack compliance, RF-PHY testing must be performed to make sure the physical performance of the radio and antenna interface meet the minimum Bluetooth RF-PHY performance requirements. This is directly connected to the complete hardware (end product) design. Texas Instruments typically performs Core-Complete Configuration; previously called End Product Listing (EPL); and RF-PHY qualification on selected development kits that implement a TI reference design and the associated DN/QDIDs are provided when available. TI RF-PHY can be referenced for end product qualification if the RF-PHY design is close enough and follows the design guidelines from the associated TI reference design. A Bluetooth Qualification Consultant [7] (BQC) can assess if further RF-PHY testing is required with the product. End product designers are responsible for complying with the Bluetooth SIG requirements.

RF-PHY testing has to be done by a Bluetooth Qualified Test Facility (BQTF), (such as 7Layers [3], Dekra [4], TUV Rheinland [5] and Wipro [6]). Typically, the test houses also have a BQC, which can be used for further guidance through the qualification process.

The guidelines in this document follow the *Bluetooth Qualification and Declaration Processes* [9] on the Bluetooth SIG website and can be used to complete the Qualification and Declaration Process.

2.1 General Guidelines

2.1.1 Product Listing Creation

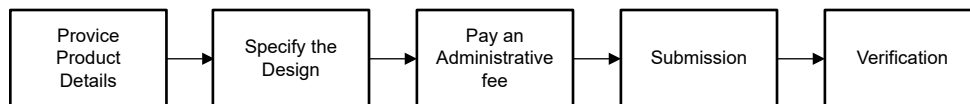


Figure 2-1. Bluetooth Certification Process

2.1.1.1 Provide Product Details

1. Open the Bluetooth Qualification Workspace (<https://qualification.bluetooth.com/>) [13] – logging into your Bluetooth account is a prerequisite.
2. Click on *Start the Bluetooth Qualification Process*.
3. Fill out product details.
4. Answer the questions displayed by the tool based on your situation. In general (especially if this is the first time you are going through the Bluetooth Qualification process) you want to answer *No, I do not* to both. Once done, click *Save and go to Specify the Design* button.

5. To the question *Do you include any existing Designs in your Product?*, answer *Yes, I do*. A field to enter the applicable DNs or QDIDs is then displayed.
6. Review the tables further down in this document to identify the proper DNs and QDIDs.
7. Enter the applicable DNs or QDIDs on the website. Click *I'm finished entering DNs* once done.

The system then offers two options. Either *Use this design without modifications* or *Modify or add to this Design*. The latter option needs to be selected if users want to certify additional GATT profiles, otherwise the first option is recommended.

- If users select *Use this design without modifications*, then users can click on *Save and go to Product Qualification Fee* and skip the steps in the section *Specify the Design*.
- If users select *Modify or add to this Design*, give a name to the design, confirm the TCRL to use, unroll and review the *Advanced Design Settings*, then click on *Save and go to Layer Selection*.

2.1.1.2 Specify the Design

In general, you are not expected to modify the Core Layers supported by the design. Such modification triggers requirements for testing that cannot be achieved with the software publicly provided by TI.

Systems integrators usually want to modify the list of GATT Profiles and Services supported by the design – this is what is described in the steps below:

1. Click on *GATT Profiles and Services*.
2. Select in the list the GATT Profiles and Services to certify the product for. Click on *Save and go to ICS Selection* once done.

The *Consistency Check* tool indicates if capabilities checkboxes are inconsistent with other capabilities checked, or missing mandatory capabilities. In case the TCRL referenced for the design is different from the TCRL referenced when TI obtained the DN, some inconsistencies within the core layers (GATT, LL, and so forth) can be reported. These inconsistencies are expected. The Test Coverage Waiver (TCW) [28]. ES-25636 must be applied to waive the inconsistencies and proceed with the qualification process for the product.

1. Once the ICS selection is completed and all the applicable TCW entered, click on *Save and go to Test Plan and Documentation*.
2. The test plan of the product can then be downloaded. Once testing is completed, the test declaration and test reports can be uploaded.
3. Click on *Save and go to Product Qualification Fee*.

Similarly, the ICS selection for the *Core Specifications* is expected to be left untouched. Only the added ICS selection for the added *GATT Profiles and Services* must be reviewed and modified if needed.

2.1.1.3 Pay an Administrative Fee

Product Qualification Fee must be paid to the Bluetooth SIG; see <https://www.bluetooth.com/fee-schedule/>.

Available prepaid product qualification fees for your company appear on this page, select one and click *Save and go to Submission*.

2.1.1.4 Submission

Carefully review all information. The submission can be completed with warning symbols in the status field if you have reviewed the submission requirements and determined the information is complete and accurate.

You can then complete the submission!

2.1.1.5 Verification

The Bluetooth SIG reviews the submitted materials.

2.1.2 Applicable TCRL

The Test Case Reference List (TCRL) is a living document introducing new test cases, removing test cases and categorizing test cases. The TCRL is provided by the Bluetooth SIG [26] and is the only reference for Bluetooth qualification.

All TCRLs have an Available Date and an Active Date. The Available Date represents when the TCRL is first published by the Bluetooth SIG. The Active Date represents the date that the TCRL is mandatory for qualification. A previous TCRL release becomes inactive after the newer TCRL release reaches the Active Date.

Qualified Components QDIDs or DN have an unlimited validity period. A new TCRL release does NOT modify the validity of a QDID or DN. In other words, a QDID or DN can be referenced even if the TCRL has become inactive. As a result of TCRL changes over time, there can be new test cases introduced for which there is no previously existing test evidence. Assuming the Component is still within the three-year window, members are not responsible for testing new test cases that are introduced and associated with an existing ICS selection or re-executing any test cases impacted by a Test Specification Errata (TSE) introduced in TCRL releases since the assessment date of the original component. Members are always required to make sure the designs are compliant with (and when necessary provide test evidence for new test cases associated with) any Expedited Erratum introduced in TCRL releases since the original Component qualification [27]. Additional test reports and test evidences corresponding to the mandatory errata added between the TCRL used by the QDID and the active TCRL are provided on E2E [24].

Note

The Bluetooth SIG Qualification Workspace enforces Inter-Layer Dependencies (ILDs) of designs used in the Qualification Process. Certain inconsistencies can be addressed by providing a Test Coverage Waiver (TCW) that addresses the inconsistencies. If one or more inconsistencies require the support of an ICS that does not exist in a locked layer, you can use TCW ES-25636.

More details on TCW and additional TCWs that can be applicable are provided by the Bluetooth SIG [28].

2.2 CC23xx and CC27xx Guidelines

For the CC23xx and CC27xx wireless MCUs, pre-qualified, tested, *Component* QDIDs/DNs are used. This means that there are QDIDs or DNs available for the complete software stack, excluding only the RF-PHY part and selected adopted services and profiles. Available Qualified RF-PHY component QDIDs provided by TI can be referenced. BQC assesses if additional testing is required.

For some devices, TI provides *End Product Listing* QDIDs or DNs. These QDIDs or DNs allow users to adopt the RF-PHY test results as well as host and controller test results. The BQC assesses the appropriate level of retest necessary.

2.2.1 CC2340Rx and CC27xx Qualified Designs

The following tables list the QDIDs or DNs that are valid for use with TI products. The complete list of the products supported by each QDID or DN is available on the Bluetooth SIG website. This list can be easily accessed by clicking on the Declaration IDs in the following tables.

Table 2-1. QDIDs or DNs for CC2340Rx (including CC2340R21, CC2340R22, CC2340R52, CC2340R52-Q1, CC2340R53 and All the Package Variants)

Applicable To	Design configuration type (QDID Type if applicable)	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID / DN	Includes	Core Spec Features
All BLE-Stack versions	LE Core-Controller Configuration (RF-PHY)	v5.4	D063667 , TCRL-2022-2, 2023-05-02	196592	RF-PHY for TI LaunchPad™ development kits	LE 1M PHY, LE 2M PHY, LE Coded PHYs
BLE-Stack 5-3.2.x (SDK 7.10 and later) - TI recommends to reference the subset Q312647 to avoid inconsistencies	LE Core-Complete Configuration (Component)	v5.3	D063694 , TCRL-2022-1, 2023-04-04	201833	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Privacy 1.2.1, CSA#2
BLE-Stack 5-3.2.x (SDK 7.10 and later) - subset of D063694 created to avoid inconsistencies	LE Core-Complete Configuration	v5.3	Q312647 , TCRL-2022-1, 2024-10-10	Q312647	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Privacy 1.2.1, CSA#2
BLE-Stack 5-3.3.x (SDK 8.20 and later)	LE Core-Complete Configuration	v5.4	Q301991 , TCRL-2024-1, 2024-10-25	Q301991	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Privacy 1.2.1, CSA#2, Advertisement Extension, Periodic Advertisement, Power Class 1
BLE-Stack 5-3.3.x (SDK 8.20 and later)	LE Core-Complete Configuration	v5.4	Q339124 , TCRL-2024-1, 2024-12-18	Q339124	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Privacy 1.2.1, CSA#2, Advertisement Extension, Periodic Advertisement, No Power Class 1
BLE-Stack 5-3.3.x (SDK 8.20 and later)	LE Core-Complete Configuration	v5.4	Q344718 , TCRL-2024-1, 2025-01-23	Q344718	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 1M PHY, Privacy 1.2.1, CSA#2, Advertisement Extension, Periodic Advertisement, No Power Class 1

Table 2-2. DNs for CC27xx (including CC2744R7-Q1, CC2745P10-Q1, CC2745R10-Q1, CC2745R7-Q1, CC2755P10, CC2745R10 and All the Package Variants)

Applicable To	Design configuration type (DN Type if applicable)	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	DN	Includes	Core Spec Features
All BLE-Stack versions	LE Core-Controller Configuration (RF-PHY)	v6.0	Q334701 , TCRL-2024-2, 2024-12-10	Q334701	RF-PHY for TI LaunchPad™ development kits	LE 1M PHY, LE 2M PHY, LE Coded PHYs
SDK 8.40 and later	LE Core-Complete Configuration	v5.4	Q310649 , TCRL-2024-1, 2024-11-19	Q310649	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Privacy 1.2.1, CSA#2, Advertisement Extension, Periodic Advertisement, Power Class 1
SDK 8.40 and later	LE Core-Complete Configuration	v5.4	Q339148 , TCRL-2024-1, 2024-12-18	Q339148	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Privacy 1.2.1, CSA#2, Advertisement Extension, Periodic Advertisement, No Power Class 1

2.3 CC13xx and CC26xx Guidelines

For the CC13xx and CC26xx wireless MCUs, pre-qualified, tested, *Component* QDIDs or DNs are used. This means that there are QDIDs or DNs available for the complete SW stack, excluding only the RF-PHY part and selected adopted services and profiles. Available Qualified RF-PHY component QDIDs or DNs provided by TI can be referenced. BQC assesses if additional testing is required.

The process for Bluetooth Mesh qualification is the same as the one for the other Bluetooth specifications. Texas Instruments provides qualified profiles for Bluetooth Mesh [25]. To identify the QDL and associated QDID or DN to use for the project, see the [Table 2-3](#).

For some devices, TI provides *End Product Listing* QDIDs/DNs. These QDIDs or DNs allow users to adopt the RF-PHY test results as well as host and controller test results. The BQC assesses the appropriate level of retest necessary.

2.3.1 CC13xx and CC26xx Qualified Designs

The following table lists the QDIDs or DNs that are valid for use with TI products. In version 5.30, the formerly called SIMPLELINK-CC13X2-26X2-SDK was renamed to SIMPLELINK-CC13XX-CC26XX-SDK. In version 7.10, the now formerly called SIMPLELINK-CC13XX-26XX-SDK has been renamed again to SIMPLELINK-LOW-POWER-F2-SDK. This SDK is backwards compatible for qualification purposes with previous SDK versions. The complete list of the products supported by each QDID or DN is available on the Bluetooth SIG website. This list can be easily accessed by clicking on the Declaration IDs in the following tables.

The CC2650 Module from TI (CC2650MODA) has an RF-PHY component in addition to regulatory modular radio pre-certification. For more information, see details in [Table 2-7](#). This means that users do not have to repeat RF-PHY testing when using CC2650MODA in accordance with the module's data sheet placement requirements [1]. If users are using another pre-certified module, then check with the module vendor to see if users can reuse the RF-PHY QDID listing of the module.

Table 2-3. QDIDs or DNs for CC13x4 and CC26x4 (including CC1354P10, CC1354R10, CC2674P10, and CC2674R10)

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID/DN	Includes	Core Spec Features
All BLE-Stack versions	RF-PHY	v5.3	D061813 , TCRL 2021-2, 2022-09-27	194334	RF-PHY for TI LaunchPad™ development kits	LE 1M PHY, LE 2M PHY, LE Coded PHYs
BLE-Stack 5-2.2.x (SDK 7.10 and later) - TI recommends to reference Q321357 the subset to avoid inconsistencies	Component	v5.3	D063565 , TCRL-2022-1, 2023-03-31	196584	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Adv. Extensions, Privacy 1.2.1, CSA#2
BLE-Stack 5-2.2.x (SDK 7.10 and later) - subset of D063565 created to avoid inconsistencies	Component	v5.3	Q321357 , TCRL-2022-1, 2024-10-20	Q321357	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Adv. Extensions, Privacy 1.2.1, CSA#2, No Power Class 1
BLE-Stack 5-2.2.x (SDK 7.10 and later)	Component	v5.3	Q327871 , TCRL-2022-1, 2024-12-03	Q327871	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE 2M PHY, LE Coded PHYs, Adv. Extensions, Privacy 1.2.1, CSA#2, Power Class 1

Table 2-4. QDIDs for CC13x2, CC13x2x7, CC26x1, CC26x2 and CC26x2x7 (including CC1352P, CC1352P7, CC1352R, CC1352R7, CC2651P3, CC2651R3, CC2651R3SIPA, CC2642R, CC2642R-Q1, CC2652P, CC2652P7, CC2652PSIP, CC2652R, CC2652R7, CC2652RB, CC2652RSIP)

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID	Includes	Core Spec Features
All BLE-Stack versions	RF-PHY	v5.3	D061813 , TCRL 2021-2, 2022-09-27	194334	RF-PHY for TI LaunchPad™ development kits	LE 1M PHY, LE 2M PHY, LE Coded PHYs
All BLE-Stack versions	RF-PHY	v5.2	D054799 , TCRL 2020-1, 2021-04-13	166660	RF-PHY for AoA/CTE transmission and reception (CC13x2, CC26x2).	LE 1M PHY, AoA/CTE (connection and connectionless-CTE)
BLE-Stack 5-2.2.x (SDK 4.40 and later)	Profile Subsystem	N/A	D052535 , TCRL-2019-2, 2021-01-25	162204	Bluetooth mesh profile specification v1.0.1	<i>This design is for Mesh profiles only. When referencing this QDID, users need to reference the appropriate QDID for the BLE-Stack version.</i>

Table 2-4. QDIDs for CC13x2, CC13x2x7, CC26x1, CC26x2 and CC26x2x7 (including CC1352P, CC1352P7, CC1352R, CC1352R7, CC2651P3, CC2651R3, CC2651R3SIPA, CC2642R, CC2642R-Q1, CC2652P, CC2652P7, CC2652PSIP, CC2652R, CC2652R7, CC2652RB, CC2652RSIP) (continued)

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID	Includes	Core Spec Features
BLE-Stack 5-2.2.x (SDK 4.40 and later)	Component	v5.2	D052819 , TCRL-2020-1, 2021-01-11	156080	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP	LE Coded PHYs, Adv. Extensions, Periodic Adv., LE 2M PHY, CSA#2, AoA/CTE (connection and connectionless-CTE)
BLE-Stack 5-2.2.x (SDK 4.40 and later)	End Product Listing	v5.2	D065853 , TCRL-2023-1, 2023-10-20	225762	Protocol: Link Layer, GAP, GATT, ATT, SMP, L2CAP, RF PHY	LE Coded PHYs, Adv. Extensions, Periodic Adv., LE 2M PHY, CSA#2, AoA/CTE (connection and connectionless-CTE)

Table 2-5. QDIDs for CC2640R2 (including C2640R2F, CC2640R2F-Q1, CC2640R2L, FRE014)

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID	Includes	Core Spec Features
All BLE-Stack versions	RF-PHY	v5.1	D057186 , TCRL 2021-1, 2021-10-08	176642	RF-PHY component listing	Coded PHYs, LE 1M PHY, LE 2M PHY
Central + Peripheral roles - BLE5-Stack 1.1.x (SDK 5.10 and later)	End Product Listing	v5.0	D057187 , TCRL 2021-1, 2021-10-08	176679	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	Coded PHYs, Adv. Extensions, LE 2M PHY
Peripheral role only - BLE5-Stack 1.1.x (SDK 5.10 and later)	End Product Listing	v5.0	D057188 , TCRL 2021-1, 2021-10-08	176850	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	Coded PHYs, Adv. Extensions, LE 2M PHY
Central, Peripheral, Multirole - BLE-Stack 3.3.x (SDK 5.10 and later)	End Product Listing	v5.1	D058218 , TCRL 2021-1, 2021-12-15	180401	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	v4.2: Privacy 1.2, Secure Connections, DLE

Table 2-6. QDIDs for CC13x0

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID	Includes	Core Spec Features
All BLE-Stack versions	RF-PHY	v5.1	D057186 , TCRL 2021-1, 2021-10-08	176642	RF-PHY component listing	Coded PHYs, LE 1M PHY, LE 2M PHY

Table 2-6. QDIDs for CC13x0 (continued)

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID	Includes	Core Spec Features
Central + Peripheral roles - All BLE-Stack versions	End Product Listing	v5.0	D057187 , TCRL 2021-1, 2021-10-08	176679	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	Coded PHYs, Adv. Extensions, LE 2M PHY
Peripheral role only - All BLE-Stack versions	End Product Listing	v5.0	D057188 , TCRL 2021-1, 2021-10-08	176850	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	Coded PHYs, Adv. Extensions, LE 2M PHY
Central, Peripheral - BLE-Stack 2.3.x (SIMPLELINK-CC13X0-SDK 4.10 and later)	End Product Listing	v5.1	D058218 , TCRL 2021-1, 2021-12-15	180401	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	v4.2: Privacy 1.2, Secure Connections, DLE

Table 2-7. QDIDs for CC26x0 (including CC2650MODA - not applicable to CC2640R2F)

Applicable To	QDID Type	BT Core Spec	Declaration ID, TCRL Version, Qualification Assessment Date	QDID	Includes	Core Spec Features
All BLE-Stack versions	RF-PHY	v5.1	D057186 , TCRL 2021-1, 2021-10-08	176642	RF-PHY component listing	Coded PHYs, LE 1M PHY, LE 2M PHY
Central + Peripheral roles - All BLE-Stack versions	End Product Listing	v5.0	D057187 , TCRL 2021-1, 2021-10-08	176679	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	Coded PHYs, Adv. Extensions, LE 2M PHY
Peripheral role only - All BLE-Stack versions	End Product Listing	v5.0	D057188 , TCRL 2021-1, 2021-10-08	176850	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	Coded PHYs, Adv. Extensions, LE 2M PHY
Central, Peripheral - BLE-Stack 2.2.x (BLE-STACK-2-X version 2.2.6 and later)	End Product Listing	v5.1	D058218 , TCRL 2021-1, 2021-12-15	180401	Attribute Protocol, Device Information Service, GAP, GATT, Interoperability Test Specification, L2CAP, LL, RF PHY, SMP	v4.2: Privacy 1.2, Secure Connections, DLE

Note

As specified by section 3.1.7.1, *Testing Requirements for Qualification of Combinations of Bluetooth Products* in the Bluetooth Qualification Program Reference Document (PRD): "Combinations involving Bluetooth Component Products shall repeat all Bluetooth profile interoperability tests applicable to the combination." These tests can be performed on the end product using the PTS dongle, which can be obtained on the BT SIG store [19]. Only the Adopted Bluetooth profiles need to be tested, and testing can be self-performed. Custom profiles that utilize a 128-bit custom UUID do not require testing during the listing process.

2.3.2 Information Regarding Errata

Errata are corrections to Bluetooth specifications provided after the specification in question is adopted. If the erratum is adopted after Texas Instruments has produced the QDL and the corresponding QDID, then extra documentation is required to go through the qualification process. The list of the specification errata is available on the Bluetooth website [14].

2.3.2.1 Erratum 10734

[Erratum 10734](#) related to pairing is mandatory for CC26x0/CC13x0 and CC26x2/CC13x2 devices (not for CC254x devices).

For CC26x0 or CC13x0, none of the BLE-Stacks require a code change because of this erratum. For CC26x2 or CC13x2, an update has been made in the BLE5-Stack version 2.01.00.00 released within the SIMPLELINK-CC13X2-26X2-SDK version 3.30. If users are using an SDK version anterior to 3.30, then users are invited to contact the local sales teams to implement the proper modifications.

For CC26x0 or CC13x0 and CC26x2 or CC13x2, some extra test evidences and test reports can be required for the qualification process to prove the erratum 10734 has been implemented. Users can find this extra material on E2E [24]. For CC26x2 or C13x2 devices, the BLE5-Stack 2.2.x.x released within the SIMPLELINK-CC13X2-26X2-SDK version 4.40 and later is qualified with TCRL 2020-1. Therefore, no extra test evidences or test reports for erratum 10734 are required.

2.3.2.2 Erratum 11838

[Erratum 11838](#) related to encryption key size applies to Bluetooth core specification v4.2, 5.0 and 5.1. The erratum is mandatory for CC26x0 or CC13x0 and CC26x2 or CC13x2 devices. This erratum does not impact CC254x devices because CC254x devices implement the Bluetooth core specifications v4.0.

For CC26x0 or CC13x0,

- An update has been made in the BLE5-Stack version **1.01.09.00** released within the SIMPLELINK-CC2640R2-SDK version 4_10_00_10. If users are using an SDK version prior to 4_10_00_10, then are required to migrate to a newer SDK version.
- An update has been made in the BLE-Stack version **3.03.03.00** released within the SIMPLELINK-CC2640R2-SDK version 4_10_00_10. If users are using an SDK version prior to 4_10_00_10, then are required to migrate to a newer SDK version.

For CC26x2 or CC13x2, an update has been made in the BLE5-Stack version **2.01.02.00** released within the SIMPLELINK-CC13X2-26X2-SDK version 4_10_00_78. If you are using an SDK version prior to 4_10_00_78, you are required to migrate to a newer SDK version.

Both for CC26x0 or CC13x0 and for CC26x2 or CC13x2, some extra test evidence or test report can be required for the qualification process to prove the erratum 11838 has been implemented. Users can find this extra material on E2E [24]. For CC26x2 or C13x2 devices, the BLE5-Stack 2.2.x.x released within the SIMPLELINK-CC13X2-26X2-SDK version 4.40 and later is qualified with TCRL 2020-1. Therefore, no extra test evidences or test reports for erratum 11838 are required.

2.4 CC254x Guidelines

The CC254x family, together with the BLE-Stack, has qualified subsystems that can be referred to when listing the product. The Controller subsystem includes RF PHY testing performed on TI evaluation boards. As this RF

PHY testing is not representative for the specific HW, the test facility can request PHY testing on the product to make sure the product meets the requirements.

Follow these steps to create a product listing:

1. Navigate to the Bluetooth SIG qualification page [\[9\]](#) and select *Path 2: Qualification Process with No Required Testing*.
2. Reference the TI Controller and Host QDIDs from [Section 2.4.1](#).
3. The remaining steps are self-explanatory when users are performing the steps. This is basically just a series of one-option buttons to click on.

2.4.1 Qualified Designs CC254x

Table 2-8. QDIDs for CC254x

Design Model Number	Device	BT Core Spec	Declaration ID	QDID	Includes	Core Spec Features
CC254x Host Subsystem - Core 5.0	CC2540/CC2541	v5.0	D043835	127435	GAP, GATT, ATT, SMP, L2CAP, HCI	v4.0
CC254x Controller Subsystem - Core 5.0	CC2540/CC2541	v5.0	D043834	127418	HCI, Link Layer, RF PHY	v4.0
CC254x Bluetooth Low Energy- End Product Listing	CC2540/CC2541	v5.0	D059860	127435 and 127418	GAP, GATT, ATT, SMP, L2CAP, HCI, HCI, Link Layer, RF PHY	v4.0

2.5 RF PHY Test Parameters

[Table 2-9](#) lists the required information for performing RF PHY qualification.

Table 2-9. RF PHY Test Parameters

IXIT Reference	Identifier	Sub-Identifier	CC254x Value	CC26xx/ CC13xx Value	CC23xx/ CC27xx Value	Units
RF-PHY:P1:1	Inband Image frequency	Low frequency	+2	-2	-2	MHz
RF-PHY:P1:2	Inband Image frequency	Middle frequency	≤2440: +2, >2440: -2	-2	-2	MHz
RF-PHY:P1:3	Inband Image frequency	High frequency	-2	-2	-2	MHz
RF-PHY:P2:1	Value n for Intermodulation test	Low frequency	5	3	3	Integer
RF-PHY:P2:2	Value n for Intermodulation test	Middle frequency	5	3	3	Integer
RF-PHY:P2:3	Value n for Intermodulation test	High frequency	5	3	3	Integer
RF-PHY:P11:1	Inband Image Frequency (2Ms/s)	Low frequency	NA	-1.7	-2	MHz
RF-PHY:P11:2	Inband Image Frequency (2Ms/s)	Middle frequency	NA	-1.7	-2	MHz
RF-PHY:P11:3	Inband Image Frequency (2Ms/s)	High frequency	NA	-1.7	-2	MHz
RF-PHY:P12:1	Value n for Intermodulation test (2Ms/s)	Low frequency	NA	3	3	Integer
RF-PHY:P12:2	Value n for Intermodulation test (2Ms/s)	Middle frequency	NA	3	3	Integer
RF-PHY:P12:3	Value n for Intermodulation test (2Ms/s)	High frequency	NA	3	3	Integer

2.6 How to Enable Bluetooth and Regulatory Test Modes

There are multiple ways to enable your product for Bluetooth RF-PHY testing and for regulatory approval testing. This section briefly describes the various options.

2.6.1 Bluetooth RF-PHY Testing

Bluetooth RF-PHY testing is performed by placing and controlling the device under test (DUT) in Direct Test Mode (DTM). Through DTM, an external Bluetooth RF test instrument can issue standardized HCI test commands to the DUT over a 2-wire universal asynchronous receiver or transmitter (UART) interface to execute required receiver and transmitter tests. An overview of the DTM interface is provided in the Bluetooth specification, Volume 6, Part F. DTM is only intended for lab test purposes. When DTM is activated, normal Bluetooth Low Energy protocol communication is not permitted.

Note that if the product does not normally provide a UART interface for performing DTM RF-PHY testing, then this is usually acceptable to modify the product to expose these pins provided the modification does not interfere with or alter RF or antenna performance.

The TI Bluetooth Low Energy protocol stack supports the DTM interface and required HCI test commands natively as part of the HostTest network processor project that is supplied within the respective SDK. For standalone embedded projects (for example, simple_peripheral) that do not normally expose a UART or HCI interface, a special Production Test Mode (PTM) can be added to the application to expose the required DTM interfaces. With PTM, the required IO pins are reserved for the UART HCI interface; however, the DTM interface is only activated by the application in response to a software API function call. For details on how to add PTM to your application, see the documentation in the corresponding SDK.

Since the Bluetooth receiver and transmitter radio performance is a function of the Bluetooth Low Energy protocol stack and radio configuration, this is possible to use the HostTest network processor project for RF-PHY testing of end products that utilize a standalone or embedded project. The use of HostTest for RF-PHY testing purposes is acceptable provided that both the protocol stack and radio configuration are identical to the corresponding standalone or embedded project used by the end product.

2.6.1.1 Regulatory Approval Testing

For regulatory approval testing, this is typically required to configure the radio for static receiver and transmitter operation at certain frequencies. To facilitate such testing, the TI Bluetooth Low Energy or Bluetooth Low Energy 5 protocol stack implements the following HCI vendor-specific test commands:

- HCI_EXT_ModemTestTxCmd
- HCI_EXT_ModemTestRxCmd

For a full overview of the applicable HCI extension commands, parameters and associated events, see the *HCI Vendor Specific Guide* included with the Bluetooth Low Energy protocol stack documentation in the SDK.

The commands above can be invoked in a few different ways:

- Through HCI extension commands over a UART interface using the HostTest project as described in [Section 2.6.1](#). A tool such as BTool or HCITester can be used to enter test commands to the Bluetooth Low Energy-Stack.
- Through Production Test Mode as described in [Section 2.6.1](#).
- Implementing a stand-alone test sequence or test mode in the embedded application, which calls the appropriate HCI extension command APIs directly from the application code. For example, this can be controlled by a timer or push button interface.

Additionally, the [SmartRF Studio](#) tool can be used to perform some of these tests. SmartRF™ Studio software does not rely upon any firmware on the device and instead directly controls the radio over a test interface (JTAG). However, for some regulatory testing purposes, the actual protocol stack firmware can be required.

Since regulatory testing requirements can vary from jurisdiction to jurisdiction, consult the test lab on specific test requirements based on where the product is sold.

2.7 FAQ

Question: What does the Declaration ID cost?

Answer: Details on declaration and listing fees can be found on the [Bluetooth SIG Qualification & Listing Fees](#) page.

Question: Can I reuse TI's Declaration ID when listing my product with Bluetooth SIG?

Answer: No. Each product must obtain a Declaration ID. Users can reference TI's qualified components or subsystems (QDID's) in the product's listing, as noted in [Section 2](#), to reduce the amount of testing required to qualify the end product.

Question: If I do not put the Bluetooth logo on my product, do I still need to list my product with Bluetooth SIG?

Answer: For more information, see the *Do I Need to List or Qualify My Product?* guide on the Bluetooth SIG website. Additional questions on this topic needs to be directed to Bluetooth SIG directly by the contact information. Note that TI cannot determine whether a product must be listed or qualified as this is the customer's responsibility to adhere to all regulatory, certification and qualification requirements.

If users determine to list (certify) the product with BT SIG, then follow the process that is listed under [Section 2.3](#). Users can combine with the TI BLE-Stack QDID (this saves the bulk of the testing). Test only the adopted services users are using with the PTS tool and do the RF-PHY testing (if users are not using a pre-certified module). The TI software has all the necessary hooks to enable the RF-PHY testing on the device side.

If users determine to not list the product with BT SIG, then these steps are not required. However, users need to perform regulatory testing (for example, FCC) depending on where to sell or ship the product.

Question: My test facility has said that the QDIDs are expired and, thus, ineligible for use, or I need to test with the latest TCRL.

Answer: The introduction of QDPRv3 removes the three-year expiration of QDIDs (now called DNs). TI recommends using the most recent QDID/DN during the qualification process. The QDIDs and DNs listed in this document are still valid and indicated as such when submitted to the SIG Qualification Listing Interface. There is no certification requirement to test with updated TCRLs when referencing a QDID/DN.

Question: What is a Bluetooth Qualification Consultant (BQC)?

Answer:

- Previously known as a BQE or "Bluetooth Qualification Expert (BQE)", an individual recognized by the Bluetooth SIG to provide a Bluetooth member with qualification related services [\[7\]](#).
- Expert in understanding the qualification policy and process
- Optional for members to use them

Question: I have created my own proprietary profiles, do I need to qualify them?

Answer: No, those are not part of the qualification process. However, note that the profiles need to follow the GATT protocol (that is, have a primary service, characteristic declarations with proper formatting, and so forth) and use 128-bit custom UUIDs.

Question: Can I reuse the CC2640 or CC254x FCC Certification?

Answer: The CC2640 and CC254x devices are wireless MCUs and thus cannot be individually certified by the FCC (or any regulatory body) since the wireless MCU + external RF design combination must be considered for regulatory listing purposes. However, users can reuse a module certification (MCU + Antenna) provided this is pre-certified with the respective regulatory body and users follow the layout placement guidelines from the data sheet. For example, the CC2650 Module from TI (CC2650MODA [\[12\]](#)) has FCC, ETSI, IC (Canada) and Japan regulatory pre-certification. A listing of modules that incorporate TI Bluetooth Low Energy wireless MCUs can be found on the main Bluetooth Low Energy Wiki page. TI provides the necessary interfaces to allow you to perform the required regulatory testing. For more details, see the following regulatory sections.

Question: Where can I find a list of test facilities to perform regulatory and Bluetooth testing?

Answer: A list of Test Facilities can be found on the Bluetooth SIG website (requires login). Many of these test facilities can also perform regulatory testing.

Question: My test lab is requesting me to fill out a form. Where can I find the required information?

Answer: All of the device-specific information can be found in the wireless MCU data sheet and the RF-PHY Test Parameters table listed above. The remaining items are obtained by performing actual measurements on the board using Direct Test Mode (DTM) or Modem Test Commands. Details about the internal radio architecture needed for regulatory filing can be obtained by reviewing TI CC254x and CC26xx FCC filings. For more information, see [Section 3](#).

3 FCC Certification

Under Part 15 of the FCC rules, all electronic devices with a clock or oscillator exceeding 9kHz need to be verified that these electronic devices are not causing harmful radiated emissions. FCC Part 15 covers unintentional testing and evaluation and low power un-licensed transmitters. In addition, all transmitters must be registered and certified by the FCC to make sure the transmitters are not causing harmful emissions and interference on regulated frequencies.

Note

Devices that incorporate a radio transceiver (*intentional radiators*) must comply with FCC Part 15 Sub Part C, commonly referred to as *FCC Part 15C*. All Bluetooth Low Energy wireless MCUs incorporate a transceiver and fall under the FCC Part 15C requirements.

Section 15.209 of the radio contains general radiated emission limits that apply to all Part 15 transmitters using frequencies at and above 9kHz. Section 15.247 and 15.249 provide more detailed information about the emission requirements in the unlicensed 2.4GHz ISM band. Bluetooth Low Energy products are typically certified under 15.247 as Systems Using Digital Modulation. This allows the radio to have higher output power than under 15.249, which is limited to 0dBm. Bluetooth Low Energy is not considered FHSS under FCC.

There are two ways of getting a FCC certification: directly from the FCC or through a Telecommunications Certification Body (TCB). For almost all devices, you can choose either to use a TCB or FCC for the certification. The exception is when the equipment uses new technology or when the test methods are undefined or unclear, then FCC is the only party that can provide certification.

Devices can reuse a modular radio pre-certification provided that the module manufacturer's layout and placement guidelines are strictly followed, including display of the module's FCC ID. For more information, see the module provider's data sheet.

3.1 FCC ID

The FCC ID is a unique identifier, consisting of 4-17 characters, for the equipment and consists of two elements, the Grantee Code and the Equipment Product Code. The Grantee code is a three character alphanumeric string representing the Grantee or Applicant. The Grantee Code always begins with an alphabetic character and does not contain the numbers one or zero. The Grantee Code is assigned by the Commission permanently to a company for authorization of all radio frequency equipment. The Product Code is the non-grantee code portion of the FCC ID that begins after the first three characters. The Product Code can include hyphens and/or dashes (-). The Product code needs to consist of minimum 1 and maximum 14 characters.

The FCC ID must be permanently marked either directly on the transmitter, or on a tag that is permanently affixed. The FCC ID label must be readily visible to the purchaser at the time of purchase. For more information, see the latest FCC regulations at the time of listing.

4 CE Certification

To CE Mark and place any radio equipment on the market in EU, users need to demonstrate compliance with the Radio Equipment Directive (RED). CE marking is a mandatory conformance mark on products placed on the European market. A CE mark indicates that the manufacturer or the authorized EU representative has declared that the product or equipment complies with all applicable European Directives, and enables the free movements of product within the European market. The CE marking is a declaration by the manufacturer, importer, or the entity first placing the product on the market that the product conforms to the appropriate directives. This is confirmed by the legally binding signature on the Declaration of Conformity.

For short range devices operating in the 2.4GHz ISM band, the relevant Harmonized Standards are:

- EN 300 328: radio equipment testing of data transmission equipment operating in the 2.4GHz ISM Band
- EN 301 489: electromagnetic compatibility
- EN 62479: compliance to human exposure to electromagnetic fields
- EN 50566 + EN 62209-2: for handheld and body-mounted devices

Bluetooth Low Energy does not classify as FHSS under ETSI specification and instead classifies as other type of wideband modulation (see section 4.2.1 of the EN 300 328 specification). Relevant test requirements for Bluetooth Low Energy are defined in Section 4.3.2. Note that revision 1.9.1 of the test specification introduced a few new tests such as Medium Utilization factor and Duty Cycle, TX-Sequence and TX-Gap. These tests only applies to equipment with higher output power than 10dBm. Bluetooth Low Energy devices are limited to 10dBm output power in the EU due to the Power Spectral Density requirement (4.3.2.3), which limits the radiated PSD to 10dBm/MHz. As such, all required testing for CE/RED can be performed with continuous (static) RF output such as for FCC testing.

EN 300 328 v. 2.1.1 was released in November 2016, and introduced receiver categories and a receiver blocking test. More details about this and how to perform this test can be found in this application note: ETSI EN 300 328 RX Blocking Test for Bluetooth Low Energy [23].

There are several routes to demonstrate compliance with the Radio Equipment Directive; for most cases, meeting with the requirements of the relevant Harmonized Standards provides presumption of conformity required, thus enabling users to sign a Declaration of Conformity with confidence. A certified test house provides the necessary guidance and help required to place the radio product on the market.

5 Industry Canada (IC) Certification

Industry Canada (IC) is the Canadian authority for certifications and standards making. As the FCC certification, the IC certification can either be done through IC or a TCB. An IC certification requires to have a Canadian representative and a confirmation letter from the representative to be submitted with the application.

There is no need for extra RF testing when applying for certification in Canada if the equipment is already certified by FCC and meets the following conditions:

- The test report must be less than one year old
- The test house must have the Test Site (OATS or Anechoic chamber) approved by IC
- A cross-reference table must be submitted with the test report to show that the equipment meets all of the applicable Canadian requirements.

5.1 IC-ID

As for equipment intended for the US market, the radio or EVM needs to be marked with the IC-ID. The IC-ID consists of two parts: Company Number (CN) and a Unique Product Number (UPN) that is chosen by the manufacturer). To obtain a CN number, use the E-filing system. The CN is then provided by e-mail.

An example is: IC: 451H-2541SENSOR.

6 Summary

This application note gives an overview of how customers can qualify the product for Bluetooth SIG. This document also contains the DN or QDID for all TI Bluetooth Low Energy Wireless MCUs. Finally, the document describes how to certify a product for different regulatory standards.

7 References

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26. <https://www.bluetooth.com/specifications/qualification-test-requirements/>
27. Component Test Evidence Inheritance
28. ICS Form Inconsistencies for Inter-Layer Dependencies

Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision L (October 2024) to Revision M (February 2025)	Page
• Added Table 2-2 in Section 2.2.1.....	5
• Updated Table 2-1 in Section 2.2.1.....	5
• Updated Table 2-3 in CC13xx and CC26xx Qualified Designs section.....	6
• Added CC27xx in RF PHY Test Parameters table.....	11

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