LE Radio Physical Layer (RFPHY)

***Bluetooth*® Implementation Conformance Statement (ICS) Proforma**

- **Revision:** RFPHY.ICS.p15
- **Revision Date:** 2026-11-03
- **Prepared By:** BTI
- **Published during TCRL:** TCRL.pkg105

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1 General principles

1.1 Implementation Under Test (IUT) identification

Using the Bluetooth SIG qualification tool, the implementer is expected to declare details about what will be implemented.

2 ICS declarations

2.1 Capability statement

Table 0: RFPHY Configuration

Item	Capability	Reference	Status
1	LE Transmitter	[1] 3	C.1
2	LE Receiver	[1] 4	C.1

C.1: Mandatory to support at least one.

Table 1: Bluetooth LE RF Capabilities

Item	Capability	Reference	Status
1–3	No longer used	N/A	N/A
4	LE 2M PHY	[2] 3, 4	O
5	Stable Modulation Index - Transmitter	[2] 3.1.1	C.3
6	Stable Modulation Index - Receiver	[2] 3.1.1	C.4
7	LE Coded PHY	[2] 3, 4	O
8	Transmitting Constant Tone Extensions	[3] 5	C.10
9	2 µs Antenna Switching During Constant Tone Extension Transmission (AoD)	[3] 5	C.5
10	1 µs Antenna Switching During Constant Tone Extension Transmission (AoD)	[3] 5	C.6
11	2 µs Antenna Sampling During Constant Tone Extension Reception (AoD)	[3] 5	C.11
12	2 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)	[3] 5	C.7
13	1 µs Antenna Sampling During Constant Tone Extension Reception (AoD)	[3] 5	C.7
14	1 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)	[3] 5	C.8
15	No longer used	N/A	N/A
16	Channel Sounding	[4] 1	C.12
17	High Data Throughput	[7] 3	C.13
18	High Data Throughput Packet Format 1	[7] 8.1	C.14
19	High Data Throughput SNR	[7] 4.2	C.14

C.1–C.2: No longer used.

C.3: Optional IF RFPHY 0/1 “LE Transmitter”, otherwise Excluded.

C.4: Optional IF RFPHY 0/2 “LE Receiver”, otherwise Excluded.

C.5: Optional IF RFPHY 1/8 “Transmitting Constant Tone Extensions”, otherwise Excluded.

C.6: Optional IF RFPHY 1/9 “2 µs Antenna Switching During Constant Tone Extension Transmission (AoD)”, otherwise Excluded.

C.7: Optional IF RFPHY 1/11 “2 µs Antenna Sampling During Constant Tone Extension Reception (AoD)”, otherwise Excluded.

C.8: Mandatory IF RFPHY 1/12 “2 µs Antenna Switching and Sampling During Constant Tone Extension Reception (AoA)” AND RFPHY 1/13 “1 µs Antenna Sampling During Constant Tone Extension Reception (AoD)”, otherwise Excluded.

C.9: No longer used.

C.10: Optional IF CORE 1a/51 “Controller Core v5.1 or later” AND RFPHY 0/1 “LE Transmitter”, otherwise Excluded.

C.11: Optional IF CORE 1a/51 “Controller Core v5.1 or later” AND RFPHY 0/2 “LE Receiver”, otherwise Excluded.

C.12: Optional IF CORE 1a/60 “Controller Core v6.0 or later” AND RFPHY 0/1 “LE Transmitter” AND RFPHY 0/2 “LE Receiver”, otherwise Excluded.

C.13: Optional IF CORE 1a/70, otherwise Excluded.

C.14: Optional IF RFPHY 1/17 “High Data Throughput”, otherwise Excluded.

Table 2: No longer used

2.2 Channel Sounding capabilities

Table 3: Channel Sounding Capabilities

Prerequisite: RFPHY 1/16 “Channel Sounding”

Item	Capability	Reference	Status
1	CS Initiator	[5] 4.6.41 [6] 4.3	O
2	CS Reflector	[5] 4.6.41 [6] 4.3	O
3	No longer used	N/A	N/A
3a	2:2 Antenna Array	[4] 5.3	O
3b	1:1 Antenna Array	[4] 5.3	O
4	CS Phase-Based Measurements	[4] 6	M
5	CS Mode-1	[4] 3.4	M
6	CS Mode-2	[4] 3.4	M
7	CS Mode-3	[4] 3.4	O
8	TX/SNR	[4] 3.1.3	O
9	CS LE 2M 2BT PHY	[4] 3, 4	O
10	CS LE 2M PHY	[4] 3, 4	C.1
11	CS Inline PCT	[4] 6.2	C.2

C.1: Optional IF RFPHY 1/4 “LE 2M PHY”, otherwise Excluded.

C.2: Optional IF RFPHY 3/6 “CS Mode-2” OR RFPHY 3/7 “CS Mode-3”, otherwise Excluded.

2.3 High Data Throughput Rates

Table 4: HDT Rates

Prerequisite: RFPHY 1/17 “High Data Throughput”

Item	Capability	Reference	Status
1	HDT2	[7] 8	M
2	HDT3	[7] 8	M
3	HDT4	[7] 8	M
4	Receive HDT6	[7] 8	C.1
5	Transmit HDT6	[7] 8	C.2
6	Receive HDT7.5	[7] 8	C.2
7	Transmit HDT7.5	[7] 8	O

C.1: Mandatory IF RFPHY 4/5 “Transmit HDT6“ OR RFPHY 4/6 “Receive HDT7.5”, otherwise Optional.

C.2: Mandatory IF RFPHY 4/7 “Transmit HDT7.5“, otherwise Excluded.

3 Bridge mapping (informational)

Bridge mapping provides a logical mapping for ICS items defined in the latest TCRL release to one or more ICS items present in an older TCRL release. The bridge mapping logic can change depending on the old TCRL release. An implementation qualified under an older TCRL release will use the bridge mapping logic to indicate support for an ICS item that is missing from the old TCRL release when upgrading to a new TCRL release. Using bridge mapping when upgrading a design to a new TCRL release should prevent unnecessary consistency check errors.

Table 3.1 provides a bridge mapping example for GAP 7/3a (from the GAP ICS as defined in TCRL pkg103). Depending on the TCRL of the old design, the following apply:

- GAP 7/3a was introduced in TCRL pkg103. Therefore, bridge mapping is not applicable for designs qualified on TCRL pkg103 or newer TCRL releases.
- For old designs qualified before TCRL pkg103, but not before TCRL 2019-2, support for GAP 7/3a in the upgraded design is determined by the support of LL 9/33 in the old design and by whether GAP itself was selected in the original design. The addition of GAP into the bridge mapping logic prevents the GAP layer from being added to the old design in the event that it did not exist before (e.g., in the case of a Core-Controller design), unless it is intended (e.g., automatically adding SEC or LESEC to an older design from before Core v6.0).
- For old designs qualified before TCRL 2019-2, GAP 7/3a is not supported in the upgraded design.

ICS Item	Description	Bridge Mapping Logic	TCRL Information
GAP 7/3a	Isochronous Broadcaster	Not applicable	≥ TCRL pkg103
		GAP AND LL 9/33	< TCRL pkg103
		Not supported	< TCRL 2019-2 (Core v5.2)

Table 3.1: Bridge mapping (Example)

Bridge mapping for this layer is provided in Table 3.2:

ICS Item	Description	Bridge Mapping Logic	TCRL Information
RFPHY 0/1	LE Transmitter	Not applicable	≥ TCRL pkg103
		RFPHY 1/1 OR RFPHY 1/3	< TCRL pkg103
RFPHY 0/2	LE Receiver	Not applicable	≥ TCRL pkg103
		RFPHY 1/2 OR RFPHY 1/3	< TCRL pkg103

Table 3.2: Bridge mapping (informational)

4 References

[1] Bluetooth Core Specification, Version 4.0 or later, Volume 6, Part A, Radio Physical Layer (RFPHY)

[2] Bluetooth Core Specification, Version 5.0 or later, Volume 6, Part A, Radio Physical Layer (RFPHY)

[3] Bluetooth Core Specification, Version 5.1 or later, Volume 6, Part A, Radio Physical Layer (RFPHY)

[4] Bluetooth Core Specification, Version 6.0 or later, Volume 6, Part A, Radio Physical Layer (RFPHY)

[5] Bluetooth Core Specification, Version 6.0 or later, Volume 6, Part B, Link Layer (LL)

[6] Bluetooth Core Specification, Version 6.0 or later, Volume 6, Part H, Channel Sounding (CS)

[7] Bluetooth Core Specification, Version 7.0 or later, Volume 6, Part A, Radio Physical Layer (RFPHY)

5 Revision history and acknowledgments

Revision History

Publication Number	Revision Number	Date	Comments
0	4.0.0	2009-12-15	Prepare for publication
	4.1.0r01	2013-11-11	Updated revision to 4.1.0 Updated top sheet to include version 4.1
1	4.1.0	2013-12-03	Prepare for Publication
	4.2.0r00	2014-11-17	Revved version to align with Core Specification Version 4.2 Release.
2	4.2.0	2014-12-04	Prepare for TCRL 2014-2 publication
	5.0.0r00	2016-06-01	Integrated changes for Core Specification 5.0 release
	5.0.0r01	2016-09-01	Issue 7534: Updated “TBD” reference in Table 1. Issue 7550: Added new reference and conditionals C.3 and C.4 to Table 1. Added new reference for Bluetooth Core Specification 5.0.
	5.0.0r01	2016-11-14	Updated to current template. Removed unnecessary parentheses and replaced with quotation marks.
3	5.0.0	2016-12-13	Approved by BTI. Prepared for TCRL 2016-2 publication.
	5.1.0r00-r01	2018-11-13 – 2018-11-27	Updated revision number to 5.1.0 to align with the adoption of Core Specification version 5.1. Updated conditionals in Table 1 for Core 5.1.
4	5.1.0	2018-12-07	Approved by BTI. Prepared for TCRL 2018-2 publication.
	5.1.1r00–r02	2019-04-24– 2019-06-12	TSE 11791 (rating 2): Updated Capability Statement table and notes and References section to address issues with the number and gain of the antennas and the length of the CTE. TSE 11957 (rating 1): Updated references section to more accurately reflect the correct Part of the spec and updated field codes to reflect resulting new numbering.
5	5.1.1	2019-08-01	Approved by BTI. Prepared for TCRL 2019-1 publication.
	p6r00–r02	2019-09-16 – 2019-11-12	TSE 12127 (rating 2): Updated Table 1 (items 1–3) and C.1–C.4 and C.6 conditionals to clarify roles after TCMT updates to take into account the PHYs for the IQ sample tests. Removed deprecated specs from 1:C.2–C.4 per integration review feedback. Revised document numbering convention, setting last release publication of 5.1.1 as p5; added publication number column to Revision History.
6	p6	2020-01-07	Approved by BTI on 2019-12-22. Prepared for TCRL 2019-2 publication.

Publication Number	Revision Number	Date	Comments
	p7r00–r01	2021-03-29 – 2021-06-11	TSE 16485 (rating 4): To address E16372 regarding Transmit Power Level for Power Class, added a reference to LL v4.2; updated table 1 with new item 15 and new conditional C.9. TSE 16697 (rating 1): Changed title of document and updated all instances of “RF PHY” and “RF-PHY” to “RFPHY” to align with new TCID structure. Minor editorials to item 14 and conditional C.8. Template-related and consistency checker editorials.
7	p7	2021-07-13	Approved by BTI on 2021-06-27. Prepared for TCRL 2021-1 publication.
	p7ed2r00	2022-02-18	TSE 18365 (rating 1): Updated “is/not supported” language in conditionals globally to align with new conventions. Made template-related editorials, including aligning the copyright page with v2 of the DNMD.
	p7, edition 2	2022-03-07	Approved by BTI on 2022-03-07. Prepared for edition 2 publication.
	p8r00–r03	2022-03-14 – 2022-04-18	TSE 18260 (rating 2): Updated row 8 and C.4 and added C.10 in Table 1. TSE 18347 (rating 2): Updated C.9 of Table 1. Performed template-related formatting fixes. Made consistency checker editorials.
8	p8	2022-06-28	Approved by BTI on 2022-05-31. Prepared for TCRL 2022-1 publication.
	p9r00–r02	2023-08-28 – 2023-11-03	TSE 23057 (rating 1): Removed Table 2, and related section header of the now-empty section. TSE 24078 (rating 2): Replaced SUM ICS references with CORE ICS references. Updated Table 1 conditionals C.2, C.3, C.4, C.9, C.10, and C.11, affecting items 1/4 – 1/8, 1/11, and 1/15. Updated the document to align with latest standards.
9	p9	2024-07-01	Approved by BTI on 2024-05-22. Prepared for TCRL 2024-1 publication.
	p10r00–r05	2024-07-03 – 2024-08-20	Incorporated CR CS_Test_CR_r16-jorg (which includes Test Issues 23205, 23293, 23331, 23332, 23361, 23362, 23363, 23364, 23365, 23378, 23379, 23381, 23382, 23384, 23404, 23419, 23422, 23424, 23425, 23500, 23501, 23502, 23503, 23504, 23506, 23594, 23693, 23694, 23696, 23701, 23706, 23711, 23732, 23736, 23737, 23738, 23776, 23842, 23923, 23993, 24023, 24033, 24043, 24049, 24133, 24135, 24137, 24138, 24139, 24141, 24142, 24143, 24146, 24147, 24149, 24150, 24151, 24153, 24177, 24181, 24231, 24232, 24330, 24331, 24332, 24410, 24411, 24418, 24419, 24478, 24483, 24515, 24531, 24599, 24601, 24602, 24614, 24618, 24619, 24621, 24623, 24624, 24625, 24627, 24630, 24639, 24645, 24646, 24655, 24656, 24657, 24659, 24660, 24669, 24681, 24717, 24769, 24776, 24789, 24808, 24809, 24838, 24844, 24850, 24867, 24868, 24893, 24894, 24895,

Publication Number	Revision Number	Date	Comments
			25028, 25029, 25040, 25042, 25053, 25055, 25111, 25112, 25120, 25139, 25140, 25141, 25142, 25143, 25148, 25149, 25150, 25157, 25166, 25209, 25240, 25278, 25282, 25299, 25428, 25443, 25479, 25498, 25511, 25512, 25525, 25585, 25617, 25632). To account for the Channel Sounding feature of Core v6.0, added references to Core Vol. 6 Part B and Vol. 4 Part E, added new items 1/16–1/27 and related conditionals C.12–C.15. Incorporated Test Issue 25785. TSE 26029 (rating 2): Updated the prerequisite for Table 3 to improve test coverage.
10	p10	2024-09-04	Approved by BTI on 2024-08-14. Prepared for TCRL 2024-2 publication.
	p11r00–r04	2024-11-01 – 2024-12-06	TSE 25993 (rating 2): Updated capability description of 3/9 and added new 3/10. TSE 26020 (rating 4): In Table 3a, added Item 3/3a and conditional C.2. TSE 26085 (rating 2): Updated C.12 in Table 1 and Table 3 prerequisite. TSE 26327 (rating 2): Removed 3/3 “CS Antenna Array”. TSE 26599 (rating 1): Updated the test doc title to better align with the associated spec. Deleted draft revision history comments prior to p0.
11	p11	2025-02-18	Approved by BTI on 2024-12-26. Prepared for TCRL 2025-1 publication.
	p12r00	2025-01-30	TSE 26947 (rating 1): Corrected reference abbreviations for RFPHY, deleted reference for LL v4.2 or later; updated 1/15 capability name to include LE and corrected its reference.
12	p12	2025-05-06	Approved by BTI on 2025-04-16. Prepared for TCRL 2025-2 publication.
	p13r00	2025-07-30	TSE 27633 (rating 2): Added item 3b to Table 3.
13	p13	2025-11-04	Approved by BTI on 2025-10-05. Prepared for TCRL pkg101 publication.
	p14r00–r03	2026-01-12 – 2026-01-23	TSE 28541 (rating 2): Added a new Table 0 to house the LE Transmitter and LE Receiver. Removed those items and LE Transmitter from Table 1 and updated all conditionals affected to reflect the new structure. Added a new Bridge Mapping section. TSE 28548 (rating 1): To accommodate the deprecation of Core v4.2, set 1/4 and 1/7 to Optional and corrected conditionals as necessary to align. TSE 28685 (rating 2): Incorporated material for the Channel Sounding Inline PCT Transfer feature of Core v6.3. Added new item 3/11 and associated conditional C.2.
14	p14	2026-05-05	Approved by BTI on 2026-04-07. Prepared for TCRL pkg103 publication.

Publication Number	Revision Number	Date	Comments
	p15r00–r05	2026-07-17 – 2026-08-21	TSE 29110 (rating 2): Updated the Bridge mapping section to enable easier automatic import. TSE 29316 (rating 1): To accommodate ES-29098 changes, set 1/15 to "No longer used". TSE 29494 (rating 4): To accommodate changes needed for the LE High Data Throughput (HDT) feature of the Core v7.0 release, added new items 1/17, 1/18, and 1/19 and related conditionals C.13 and C.14 and added entire new Table 4 in a new “High Data Throughput Rates” section. Added references for Core v7.0 for the RFPHY layer. Editorial updates to references to align with BTI’s desired test doc conventions.
15	p15	2026-11-03	Approved by BTI on 2026-10-12. Prepared for TCRL pkg105 publication.

Acknowledgments

Name	Company
Alexandru Andreescu	Bluetooth SIG, Inc.
Miles Smith	Nordic Semiconductor A/S
Magnus Sommansson	Qualcomm
Clive Feather	Samsung Cambridge Solution Centre