Specification of the **Bluetooth®** System

Bluetooth Core Specification

Addendum 5

Bluetooth®

CSA 5

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ABOUT ADDENDUM 5

This addendum provides an optional update to the Bluetooth® Core Specification. When the addendum is applied to an allowed Core Specification, the following parts of the specification shall be replaced, added, or appended with the revised versions:

Volume 1	Part D	Mixing of Specification Versions
Volume 6	Part A	Physical Layer Specification

Architecture & Terminology Overview

Part D

MIXING OF SPECIFICATION VERSIONS

CONTENTS

1 MIXING OF SPECIFICATION VERSIONS

This part describes how volumes, and parts within volumes, of different versions and Specification Addenda of the Core Specification may be mixed in Bluetooth implementations. The Core System consists of a BR/EDR Controller Package (see Volume 2), a Low Energy Controller Package (see Volume 6), a Host Package (see Volume 3) and AMP Protocol Adaptation Layers (see Volume 5).

- All parts within a Primary Controller implementation shall comply with the same version of Volume 2 and Volume 6.
- All parts within a Host implementation of Volume 3 shall comply with the same version.
- An AMP Controller implementation shall contain parts of Volume 2 and Volume 5 from the same version.
- The Primary Controller, AMP Controller, and Host may comply with different versions within a single implementation.

In order to describe how these volumes and parts within volumes can be mixed, one needs to distinguish between four categories of features specified in the different specification versions. The four categories are:

Category	Description
Type 1	Feature that exists below HCI and cannot be configured/enabled via HCI
Type 2	Feature that exists below HCI and can be configured/enabled via HCI
Type 3	Feature that exists below and above HCI and requires HCI command/ events to function
Type 4	Feature that exists only above HCI

Table 1.1: Feature type definitions

The outcome of mixing different Core System Packages are derived from the feature definitions in the table above:

- If an implementation contains features of type 1 or type 4, these features can function with any combination of Host Package and Controller Package or AMP Protocol Adaptation Layer (PAL) versions with applicable addenda.
- If an implementation contains features of type 2, these features can only be used under a default condition if a Host Package of an older version with applicable addenda is mixed with a Controller Package or AMP PAL of this version with applicable Core Specification Addenda (CSAs).

- In order to fully use the feature under all conditions, the Host Package, Controller Package, and AMP PAL must comply with the same or later version with applicable CSAs.
- If an implementation contains features of type 3, these features can only function if the Host Package supports this version or a later version with applicable CSAs and if the Controller Package complies with this version or a later version with applicable CSAs.

See the Bluetooth Brand Book for specification naming requirements.

1.1 FEATURES AND THEIR TYPES

The following table lists the features, their types, and the version or addendum where the feature was first introduced.

Feature	Version	Type
Basic AFH operation	1.2	1
Enhanced inquiry	1.2	1
Configuration of AFH (setting channels and enabling/disabling channel assessment)	1.2	2
Enhanced synchronization capability	1.2	2
Interlaced inquiry scan	1.2	2
Interlaced page scan	1.2	2
Broadcast encryption	1.2	2
Enhanced flow specification and flush time-out	1.2	3
Extended SCO links	1.2	3
Inquiry Result with RSSI	1.2	3
L2CAP flow and error control	1.2	4
2 Mb/s EDR	2.0 + EDR	2
3 Mb/s EDR	2.0 + EDR	2
3 slot packets in EDR	2.0 + EDR	2
5 slot packets in EDR	2.0 + EDR	2
2 Mb/s eSCO	2.0 + EDR	2[1]
3 Mb/s eSCO	2.0 + EDR	2[1]
3 slot packets for EDR eSCO	2.0 + EDR	2[1]
Erroneous Data Reporting	2.1 + EDR	3
Extended Inquiry Response	2.1 + EDR	3
Encryption Pause and Resume	2.1 + EDR	1
Link Supervision Timeout Changed Event	2.1 + EDR	3
Non-Flushable Packet Boundary Flag	2.1 + EDR	3
Sniff subrating	2.1+ EDR	3
Secure Simple Pairing	2.1.+ EDR	3
L2CAP Enhanced Retransmission Mode	Addendum 1/ 3.0 + HS	4
L2CAP Streaming Mode	Addendum 1/ 3.0 + HS	4
Enhanced Power Control	3.0 + HS	1

Table 1.2: Features and their types

Feature	Version	Type
AMP Manager Protocol (A2MP)	3.0 + HS	4
L2CAP Enhancements for AMP	3.0 + HS	4
802.11 PAL	3.0 + HS	3
Generic Test Methodology	3.0 + HS	3
Unicast Connectionless Data	3.0 + HS	4
Low Energy Controller (PHY and LL)	4.0	3
Low Energy Host (L2CAP and Security Manager)	4.0	4
Attribute Protocol and Generic Attribute Profile	4.0	4
Appearance Data Type	Addendum 2	4
802.11n Enhancements to the 802.11 PAL	Addendum 2	3
MWS Coexistence Signaling	Addendum 3	2
Connectionless Slave Broadcast	Addendum 4	3
Unencrypted UCD	Addendum 4	4
BR/EDR Secure Connections	4.1	3
Train Nudging	4.1	2
Generalized Interlaced Scan	4.1	2
Piconet Clock Adjustment	4.1	3
Low Duty Cycle Directed Advertising	4.1	2
32-bit UUID Support in LE	4.1	4
LE Dual Mode Topology	4.1	4
LE L2CAP Connection Oriented Channel Support	4.1	4
LE Privacy v1.1	4.1	4
LE Link Layer Topology	4.1	3
LE Ping	4.1	2
LE Data Packet Length Extension	4.2	3
LE Secure Connections	4.2	4
Link Layer Privacy	4.2	3
Link Layer Extended Filter Policies	4.2	3
Higher Output Power	Addendum 5	1

Table 1.2: Features and their types

1. The EDR eSCO options are marked as 2* because eSCO requires profile support, but if a product includes the eSCO option from V1.2, then EDR eSCO will be supported without any new support above HCI.

1.2 CORE SPECIFICATION ADDENDA

A Core Specification Addendum (CSA) contains one or more parts of a single volume, one or more parts in multiple volumes, changes on one or more parts, or a combination of parts and changes. Addenda are used to supersede a part in a volume or may be used to add a part to a volume according to the rules in Table 1.3.

Note: Each Change may contain changes and/or additions to one or more parts of the Core Specification.

Addendum	Volume and Part or Change Name	Addition/ Changes/ Replacement	Allowed Versions & Addendum	Mandatory / Optional / Conditional	Type
1	Volume 3, Part A	Replacement	2.0 + EDR, 2.1 + EDR	O	4
2	Audio Architecture HCI Changes	Change	2.1 + EDR, 3.0 + HS, 4.0	O	2
	Audio Architecture USB Changes	Change	2.1 + EDR, 3.0 + HS, 4.0	O	2
	LE Limited Discovery Time Changes	Change	4.0	C.1	4
	EIR and AD Data Types in GAP Changes	Change	4.0	C.1	4
	EIR and AD Data Types Specification	Addition	4.0	C.1	4
	Volume 5, Part A	Replacement	3.0 + HS, 4.0	O	3

Table 1.3: Adopted core specification versions to use with addenda.

Addendum	Volume and Part or Change Name	Addition/ Changes/ Replacement	Allowed Versions & Addendum	Mandatory / Optional / Conditional	Type
3	LE Errata	Change	4.0 with CSA2	C.2	Multiple
	GAP Connection Parameters Changes	Change	4.0 with CSA2	C.1	4
	GAP Authentication and Lost Bond Changes	Change	4.0 with CSA2	C.1	4
	Common Profile and Services Error Code Range Changes	Change	4.0 with CSA2	C.1	4
	Private Addressing Changes	Change	4.0 with CSA2	C.1	4
	Dual Mode Addressing Changes	Change	4.0 with CSA2	C.3	4
	MWS Coexistence Logical Signaling Specification	Addition	2.1 + EDR, 3.0 + HS, 4.0 with CSA2	O	2
	MWS Coexistence HCI	Addition	2.1 + EDR, 3.0 + HS, 4.0 with CSA2	C.4	2
	Wireless Coexistence Interface 1 (WCI-1) Transport Layer Specification	Addition	2.1 + EDR, 3.0 + HS, 4.0 with CSA2	C.4	2
	Wireless Coexistence Interface 2 (WCI-2) Transport Layer Specification	Addition	2.1 + EDR, 3.0 + HS, 4.0 with CSA2	C.4	2

Table 1.3: Adopted core specification versions to use with addenda.

Addendum	Volume and Part or Change Name	Addition/ Changes/ Replacement	Allowed Versions & Addendum	Mandatory / Optional / Conditional	Type
4	Connectionless Slave Broadcast	Change	3.0 + HS, 4.0 with CSA3	O	3
	Unencrypted UCD	Change	3.0 + HS, 4.0 with CSA3	O	4
	Fast Advertising Interval	Change	4.0 with CSA3	C.1	4
	eSCO Reserved Slot Clarification	Change	2.1 + EDR, 3.0 + HS, 4.0 with CSA3	O	1
5	Higher Output Power	Change	4.0 with CSA3, 4.0 with CSA4, 4.1, 4.2	O	1

Table 1.3: Adopted core specification versions to use with addenda.

C.1: Mandatory if either the Host Part of the Low Energy Core Configuration or the Host Part of the Basic Rate and Low Energy Combined Core Configuration is supported, otherwise Excluded.

C.2: Mandatory if either the Host Part of the Low Energy Core Configuration, Controller Part of the Low Energy Core Configuration, Host Part of the Basic Rate and Low Energy Combined Core Configuration, or Controller Part of the Basic Rate and Low Energy Combined Core Configuration is supported, otherwise Excluded.

C.3: Mandatory if the Host Part of the Basic Rate and Low Energy Combined Core Configuration is supported, otherwise Excluded.

C.4: Optional if MWS Coexistence Logical Signaling is supported, otherwise Excluded.

HIGHER OUTPUT POWER

CONTENTS

1 VOL 6, PART A (PHYSICAL LAYER SPEC) CHANGES

3 TRANSMITTER CHARACTERISTICS [Updated]

The requirements stated in this section are given as power levels at the antenna connector of the LE device. If the device does not have a connector, a reference antenna with 0 dBi gain is assumed.

Due to the difficulty in making accurate radiated measurements, systems with an integral antenna should provide a temporary antenna connector during LE PHY qualification testing.

For a transmitter, the output power level at the maximum power setting shall be within the limits defined in Table 3.1.

Minimum Output Power	Maximum Output Power
0.01 mW (-20 dBm)	100 mW (+20 dBm)

Table 3.1: Transmission power

Devices shall not exceed the maximum allowed transmit power levels set by the regulatory bodies that have jurisdiction over the locales in which the device is to be sold or intended to operate. Implementers should be aware that the maximum transmit power level permitted under a given set of regulations might not be the same for all modulation modes.

Note: The maximum output power for LE in v4.0, v4.1, and v4.2 is 10 mW.

Note: Using high transmit power in use cases where short ranges could be encountered may cause the receiver on the remote device to be saturated and result in link failure. Implementers should avoid use of high output power in such scenarios or employ a mechanism for switching between two or more transmit power levels in an attempt to establish, re-establish, or maintain connections.

The output power control of a device may be changed locally, for example to optimize the power consumption or reduce interference to other equipment.

Bluetooth devices may be informatively classified into power classes based on the highest output power the LE PHY supports, as defined in Table 3.2.

Power Class	Maximum Output Power (P_{max})	Minimum Output Power[1]
1	100 mW (+20 dBm)	10 mW (+10 dBm)

Table 3.2: LE PHY power classes

Power Class	Maximum Output Power (P_{max})	Minimum Output Power[1]
1.5	10 mW (+10 dBm)	0.01 mW (-20 dBm)
2	2.5 mW (+4 dBm)	
3	1 mW (0 dBm)	

Table 3.2: LE PHY power classes

1. Minimum output power at maximum power setting