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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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UK Vote

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



100/4243/CD

COMMITTEE DRAFT (CD)

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DATE OF CIRCULATION: 2024-11-29	CLOSING DATE FOR COMMENTS: 2025-01-24
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IEC TC 100 : AUDIO, VIDEO AND MULTIMEDIA SYSTEMS AND EQUIPMENT	
SECRETARIAT: Japan	SECRETARY: Ms Mahiru Uehara
OF INTEREST TO THE FOLLOWING COMMITTEES:	HORIZONTAL FUNCTION(S):
ASPECTS CONCERNED:	

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TITLE: Low and Ultra-low Latency Communication and Control Systems
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LOW AND ULTRA-LOW LATENCY COMMUNICATION AND CONTROL
SYSTEM**

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- The text of this International Standard is based on the following documents:

Draft	Report on voting
XX/XX/FDIS	XX/XX/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

147 The committee has decided that the contents of this document will remain unchanged until the
148 stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to
149 the specific document. At this date, the document will be

- 150 • reconfirmed,
- 151 • withdrawn,
- 152 • replaced by a revised edition, or
- 153 • amended.

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INTRODUCTION

156 The focus of this document is low and ultra-low latency communication and control system
157 (ULCCS) technology to address the challenges of communication and control for multimedia-
158 centric applications in local environments. State-of-the-art wireless systems targeting
159 multimedia delivery do not adequately fulfil the stringent performance requirements of emerging
160 control-centric applications. Hence, there is a need to develop a new protocol which can satisfy
161 the stringent requirements of such applications.

LOW AND ULTRA-LOW LATENCY COMMUNICATION AND CONTROL SYSTEM

1 Scope

This document specifies the low and ultra-low latency communication and control system (ULCCS) technology to address the communication and control challenges of multimedia-centric applications. It describes the medium access control (MAC) layer specifications:

- MAC frame design for control-centric scheduling.
- Message types and packet formats for MAC layer operation.
- System management aspects at the MAC layer for multiple control domains and multi-hop operation.

Note: Multimedia technologies for control-centric applications are becoming increasingly important [1]. State-of-the-art wireless systems supporting multimedia delivery are inadequate in meeting stringent performance requirements of emerging control-centric applications, particularly in terms of reliability, responsiveness, and timeliness.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

Abbreviated Terms

AES – Advanced encryption standard

AFN – Absolute frame number

AR – Augmented reality

ASG – Assignment

ASN – Absolute slot number

BAN – Body area network

BLE – Bluetooth low energy

CSMA/CA – Carrier sense multiple access with collision avoidance

CMAC – Cipher-based message authentication code

DECT – Digital enhanced cordless telecommunications

DLS – Downlink signaling

G-NACK – Group negative acknowledgement

HSI – Human system interface

LE – Low energy

MAC – Medium access control

MIC – Message integrity check

NIN – Non-IP networking

MR – Mixed reality

NR – New radio

OFDMA – Orthogonal frequency division multiple access

232	PDU – Protocol data unit
233	PHY – Physical
234	PTP – Precision Time Protocol
235	RC – Route construction
236	RFR – Request for resources
237	RFU – Reserved for future use
238	SIFS – Short interframe space
239	SNR – Signal-to-noise ratio
240	TA – Timing advertisement
241	TM – Timing measurement
242	TSF – Timing synchronization function
243	ULCCS – Ultra-low latency communication and control system
244	VR – Virtual reality
245	WLAN – Wireless local area network

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264 Common Terms and Definitions**265 Closed-loop control**

266 Type of control which uses feedback to control the output or state of a dynamic process or
267 system.

268 Closed-loop control system

269 A spatially distributed system comprising a controller and a plurality of sensors and actuators
270 for feedback control.

271 Communication channel

272 A resource allocated for a fixed duration for communication.

273 Controlled (secondary) domain

274 The domain comprising one or more devices that receives/generates command/feedback
275 messages from/for the master domain.

276 Controller

277 A controller in ULCCS refers to a device which handles closed-loop control, i.e., it uses
278 feedback to control the state or output of a dynamic process or system.

279 Cycle time

280 The cumulative time of successfully transmitting command messages from the controller to all
281 the devices and successfully receiving response from each device in the system.

282 Device

283 A device in ULCCS refers to a sensor or an actuator.

284 Downlink

285 The downlink in ULCCS refers to communication from the controller to the devices.

286 Initiator

287 A node in ULCCS which initiates the time synchronization process.

288 Master controller

289 A controller which handles the operation of other controllers in case of parallel operation of
290 multiple domains.

291 Master (primary) domain

292 The domain comprising one or more controllers that generate/receive command/feedback
293 messages for/from the controlled (secondary) domain.

294 Multicast

295 A one-to-many transmission between a sender and a group of receivers.

296 Node

297 A node in ULCCS is either a device or a controller.

298 Phase

299 A phase in ULCCS refers to the duration of the signaling phase or the data communication
300 phase.

301 **Relay**

302 A relay in ULCCS refers to a device that participates in cooperative transmissions for a device
303 with failed transmissions.

304 **Unicast**

305 A one-to-one transmission between a sender and a receiver.

306 **Uplink**

307 The uplink in ULCCS refers to the communication from the devices to the controller.

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