

Digital Imaging and Communications in Medicine (DICOM)

Supplement 237: High-Resolution ECG

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Document History

2022/09/02	Version 0		Initial version, fragmentary
2022/10/01	Version 1		after First Read, recommendations incorporated
2022/11/18	Version 3		pre-Public Comment
2022/11/21	Version 4		Public Comment

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Open Issues

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Closed Issues

1.	<p>Q: Should there be a general recommendation to use the new High Resolution ECG SOP Class, or should both be possible (dependent on the properties of the recording device)?</p> <p>WG-32 is considering to recommend usage of High Resolution ECG for all neurophysiology studies.</p> <p>Feedback from implementations of ECG viewers and storage systems is encouraged.</p> <p>A: Depending on the capabilities of the recording device, the vendor decides which SOP class to support.</p>
2.	<p>Q: Should the Acquisition Context contain a reference to the related EEG SOP Instance and vice versa, if the ECG is acquired in a neurophysiology study?</p> <p>A: No, SOP Instances in a study may be created by different equipment, which don't know of each other. The presence of a reference cannot be guaranteed</p>

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Scope and Field of Application

6 This supplement defines a new ECG Waveform SOP Class (based on the existing General ECG SOP
 7 Class) with fewer constraints. The General ECG SOP class can store waveform with 16 bits per sample.
 8 This High Resolution SOP class permits 32 bits per sample as well.

9 In clinical neurophysiology it is common practice to acquire ECG data together with the routine scalp EEG
 10 or in case of a sleep study.

11 **Changes to NEMA Standards Publications PS3.2**
 12 **Digital Imaging and Communications in Medicine (DICOM)**
 13 **Part 2: Conformance**

14 *Add the new SOP Classes to Table A.1-2. UID Values*

15 **Table A.1-2. UID Values**

UID Value	UID Name	Category
....		
<u>1.2.840.10008.5.1.4.1.1.9.1.x</u>	<u>High Resolution ECG Waveform Storage SOP Class</u>	<u>Transfer</u>
...		

17 **Changes to NEMA Standards Publications PS3.3**
 18 **Digital Imaging and Communications in Medicine (DICOM)**
 19 **Part 3: Information Object Definitions**

20 *Add new IODs to Overview Table PS3.3 Table A.1-8:*

21 **Table A.1-8. Composite Information Object Modules Overview – Waveforms**

IOD Modules	...	General ECG WF	...	<u>High Resolution ECG WF</u>	...
Patient		M		<u>M</u>	
Clinical Trial Subject		U		<u>U</u>	
General Study		M		<u>M</u>	
Patient Study		U		<u>U</u>	
Clinical Trial Study		U		<u>U</u>	
General Series		M		<u>M</u>	
Clinical Trial Series		U		<u>U</u>	
Synchronization		U		<u>U</u>	
General Equipment		M		<u>M</u>	
Enhanced General Equipment				<u>M</u>	
Waveform Identification		M		<u>M</u>	

Waveform		M		<u>M</u>	
Waveform Annotation		C		<u>C</u>	
Acquisition Context		M		<u>M</u>	
SOP Common		M		<u>M</u>	

22 *Extend A.34.4.1 General ECG IOD Description*

23 **A.34.4.1 General ECG IOD Description**

24 The General ECG IOD is the specification of digitized electrical signals from the patient cardiac
 25 conduction system collected on the body surface, which has been acquired by an ECG modality or by an
 26 ECG acquisition function within an imaging modality **or by another recording device**.

27

28 *Add the following new content to PS3.3Section A.34.xx*

29 **A.34.xx High Resolution ECG IOD**

30 **A.34.xx.1 High Resolution ECG IOD Description**

31 The High Resolution ECG IOD is the specification of digitized electrical signals from the patient cardiac
 32 conduction system collected on the body surface, which has been acquired by an ECG modality or by an
 33 ECG acquisition function within an imaging modality or by another recording device.

34 Note

35 This IOD differs from the General ECG IOD by allowing higher sampling frequencies and greater bit depth.

36

37 **A.34.xx.2 High Resolution ECG IOD Entity-Relationship Model**

38 This IOD uses the E-R Model in Section A.1-2, with only the Waveform IE below the Series IE.

39 **A.34.xx.3 High Resolution ECG IOD Module Table**

40 Table A.34.xx.1-1 specifies the Modules of the High Resolution ECG IOD

41

Table A.34.xx.1-1- High Resolution ECG IOD Modules

IE	Module	Reference	Usage
Patient	Patient	C.7.1.1	M
	Clinical Trial Subject	C.7.1.3	U
Study	General Study	C.7.2.1	M
	Patient Study	C.7.2.2	U
	Clinical Trial Study	C.7.2.3	U
Series	General Series	C.7.3.1	M
	Clinical Trial Series	C.7.3.2	U
	Presentation Series	C.7.3.3	M
Frame of Reference	Synchronization	C.7.4.2	C – Required if time synchronization was applied.

Equipment	General Equipment	C.7.5.1	M
	Enhanced General Equipment	C.7.5.2	M
Waveform	Waveform Identification	C.10.8	M
	Waveform	C.10.9	M
	Acquisition Context	C.7.6.14	M
	Waveform Annotation	C.10.10	C- Required if annotation is present.
	SOP Common	C.12.1	M

42

43 **A.34.xx.4 High Resolution ECG IOD Content Constraints**44 **A.34.xx.4.1 Modality**

45 The value of Modality (0008,0060) shall be ECG.

46 **A.34.xx.4.2 Waveform Sequence**

47 The number of Waveform Sequence (5400,0100) Items is not constrained.

48 **A.34.xx.4.3 Number of Waveform Channels**

49 The value of Number of Waveform Channels (003A,0005) in each Waveform Sequence (5400,0100) Item is not constrained.

51 **A.34.xx.4.4 Sampling Frequency**

52 The value of Sampling Frequency (003A,001A) in each Waveform Sequence Item is not constrained.

53 **A.34.xx.4.5 Channel Source and Channel Source Modifiers**54 For Channel Source Sequence (003A,0208) in each Channel Definition Sequence (003A,0200) Item
55 DCID 3001 "ECG Lead" shall be used.

56 Note

57 Terms from other Context Groups may also be used for extended specification of the Channel Source, as
58 declared in the Conformance Statement for an application (see PS3.2).

59

60 **A.34.xx.4.6 Waveform Sample Interpretation**61 The value of Waveform Sample Interpretation (5400,1006) in each Waveform Sequence Item shall be SS
62 or SL.63 **A.34.xx.4.7 Waveform Annotation Module**64 For Concept Name Code Sequence (0040,A043) in the Waveform Annotation Sequence (0040,B020)
65 DCID 3335 "ECG Annotation" shall be used.

66

67 **Changes to NEMA Standards Publications PS3.4**
 68
 69 **Digital Imaging and Communications in Medicine (DICOM)**
 70 **Part 4: Service Class Specifications**

71 *Add new SOP Class to PS 3.4 Annex B tables*

72 **B.5 Standard SOP classes**

73 The SOP Classes in the Storage Service Class identify the Composite IODs to be stored. Table B.5-1
 74 identifies Standard SOP Classes.

75 **Table B.5-1. Standard SOP Classes**

SOP Class Name	SOP Class UID	IOD Specification (defined in PS 3.3)	Specialization
...	
High Resolution ECG Waveform Storage	1.2.840.10008.5.1.4.1.1.9.1.x	High Resolution ECG IOD	
...			

77 **Changes to NEMA Standards Publications PS3.6**
 78
 79 **Digital Imaging and Communications in Medicine (DICOM)**
 80 **Part 6: Data Dictionary**

81 *Add new SOP Classes to PS3.6 Annex A Table A-1. UID Values*

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UID Value	UID Name	UID Keyword	UID Type	Part
...
1.2.840.10008.5.1.4.1.1.9.1.x	High Resolution ECG Waveform Storage	HighResolutionECGWaveformStorage	SOP Class	PS3.4
...				

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85 **Changes to NEMA Standards Publications PS 3.17**

86 **Digital Imaging and Communications in Medicine (DICOM)**
 87 **Part 17: Explanatory Information**
 88

89 ***Adapt SSSS.1.5.1 Mapping of Polysomnographic Data to DICOM***

90 **SSSS.1.5.1 Mapping of Polysomnographic Data to DICOM**

91 Neurophysiology time series SOP Classes relevant to sleep studies are:

92 ...

93 Non-neurophysiologic time series or video SOP Classes relevant to sleep studies, are:

94 General ECG Waveform Storage The General ~~Electrocardiogram (ECG) Waveform~~ Storage
 95 SOP Class is used to store digitized electrical signals from the
 96 patient cardiac conduction system collected on the body
 97 surface, which ~~has~~ have been acquired by an ECG modality or
 98 by an ECG acquisition function within an imaging modality or a
 99 recording device.

100 **High Resolution ECG Waveform Storage** **The High Resolution ECG Waveform Storage**
 101 **SOP Class is used to store digitized electrical signals from**
 102 **the patient cardiac conduction system collected on the**
 103 **body surface, which have been acquired by an ECG**
 104 **modality or by an ECG acquisition function within an**
 105 **imaging modality or arecording device**
 106