DICOM Secretariat/MITA
1300 North 17th Street, Suite 900
Arlington, VA 22209, USA
http://www.dicomstandard.org/
dicom@dicomstandard.org

# MINUTES

**MEETING NAME** WG-32

**MEETING PLACE/DIAL IN** Via Zoom

**DATE & TIME** Thursday 16 October 2025
10:00 – 11:00 AM Eastern Daylight Time (EDT)

**PRESIDING OFFICERS** Jonathan J. Halford,
Ralph H. Johnson VA Medical Center (Charleston, SC)
User Co-Chair
Andrew Ehrenberg, Nihon Kohden Corporation
Vendor Co-Chair

**IFCN SECRETARIAT** Kim Zaiss

**DICOM SECRETARIAT** Shayna Knazik

| Present | First Name | Last Name | Organization | Voting Status |
|---|---|---|---|---|
| | Kevin | O'Donnell | Canon Medical Research USA, Inc. | Voting |
| | Felix | Rosenow M.D. | DGKN (German Society of Clinical Neurophysiology and Functional Imaging) | Voting |
| | Jan | Remi | Ludwig-Maximilians-University of Munich | Voting |
| X | Benjamin | Brinkmann | Mayo Clinic Rochester | Voting |
| X | Jonathan | Halford | Ralph H. Johnson VA Medical Center | Voting |
| X | Andrew | Ehrenberg | Nihon Kohden Corporation | Voting |
| | Alan | Huang | Philips | Voting |
| | Wim | Corbijn van Willenswaard | Philips | Alt. Voting |
| | Justin | Dauwels | TU Delft | Voting |
| | Jeroen | Medema | Philips | Alt. Voting |
| X | Raymond | Kraskinski | Philips | Observer |
| | David | Clunie | PixelMed Publishing | Voting |
| X | Silvia | Winkler | Sigma Software Solutions | Voting |
| | Ana | Alves | CortexXus Inc. | Observer |
| | Giuseppe | Campobello | University of Messina | Observer |
| | David | Alves | CortexXus Inc. | Observer |
| | Babak | Razavi | CortexXus Inc. | Observer |
| | Matt | Stead | Dark Horse Neuro, Inc. | Observer |
| | Gritsch | Gerhard | AIT Austrian Institute of Technology GmbH | Observer |
| | Ignacio Ramírez | Paulino | Facultad de Ingeniería - Universidad de la República | Observer |
| | Sandor | Benizcky | Aarhus University | Observer |
| | Gardar | Thorvardsson | Kvikna / Stratus EEG | Observer |

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| | Richard | Moberg | Moberg Research, Inc. | Observer |
| | Casey | Stengel | NeuraLynx, Inc. | Observer |
| | Bill | Antilla | Nihon Kohden Corporation | Observer |
| | Koichiro | Matsumoto | Nihon Kohden Corporation | Observer |
| | Andrey | Pirozhenko | Persyst Development Corporation | Observer |
| | Shane | Poznikoff | Persyst Development Corporation | Observer |
| X | Stefan | Rampp | University Klinikum Erlangen | Observer |
| | Dagmar | Krefting | University Medical Center Göttingen | Observer |
| | Gloria | Menegaz | University of Verona, Italy | Observer |
| | Jonathan | Pfaff | Fraunhofer Heinrich Hertz Institute (HHI) | Observer |
| X | Gary | Sullivan | Dolby Laboratories | Observer |
| X | Kristian | Bernard Nilsen | Oslo University Hospital | Observer |
| X | NS | Nagarajan | GE Healthcare | Observer |
| | Bruno | Monnerat | University of Sao Paulo | Observer |
| X | Christof | Fersch | Dolby Germany | Guest |
| X | Heidi-Maria | Lehtonen | Dolby Germany | Guest |
| | Brian | Lee | Dolby Laboratories | Guest |
| X | Mattia | Galanti | Clemson University | Guest |
| | | | | |

## 1. CALL TO ORDER AND REVIEW OF ANTI-TRUST RULES AND DICOM PATENT POLICY

The meeting was called to order at 10:00 AM EDT. Participants were reminded that the Guidelines for Conducting NEMA Meetings and Patent Disclosure Policy are in effect and they may be found here: https://www.dicomstandard.org/patent.

## 2. WELCOME/ATTENDANCE/INTRODUCTION

Attendance was taken.

## 3. REVIEW AND APPROVE AGENDA

The agenda was reviewed, motion to approve by JH and seconded by RK.

## 4. REVIEW MINUTES

The minutes of the 17 September 2025 meeting were reviewed, motion to approve by JH and seconded by RK.

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## 5. OLD BUSINESS

- Update on the ITU-T Call for Proposals (CfP) for Biomedical Waveform Coding
  - Gary Sullivan (GS) reported that an ITU-T SG-21 meeting was going on in Geneva now and that the H.BWC design was beginning to stabilize. He reported that there was progress on incorporating a quality index parameter which controlled fidelity of encoding. He said that the quality index parameter was essentially the step size.
  - Christof Fersch reported that there was now a collaborative interchange between SC29/WG6 (MPEG Audio) and ITU-T Q6/21 (VCEG) such that H.BWC would also be standardized as an MPEG codec (ISO/IEC 23003-8). Official information will be sent to DICOM WG-32 via liaison. He also reported that ITU-T Q6/21 (VCEG) had been asked by the World Health Organization (WHO) to prepare a summary on T.261 (aka. H.BWC) for a presentation to WHO in Geneva.
  - Jonathan Pfaff (JP) presented data on the performance of a freeware automated detection model run on 16-bit 100 Hz sampled ECG data. The automated detection model performed just as well (based on the AUC metric) with original waveform data in comparison to H.BWC lossy compressed/decompressed waveform data as bit rates were lowered down to a bit rate of approximately 1 (equivalent to 16x compression). When the bitrate was lowered below one, model performance rapidly degraded, likely due to distortion of the waveforms.

- Objective Development of H.BWC Lossy Transfer Syntaxes
  - Description of Reference Datasets

    Jonathan Halford (JH) reported that a document had been circulated with a plan for objective development of lossy H.BWC DICOM transfer syntaxes. The different types of reference datasets to be collected for this project were discussed:
    (1) Needle EMG-- sampled at 40 kHz, to be contributed by Martijn Tannemaat.
    (2) Intracranial macroelectrode clinical EEG data sampled at 16-bit depth. Stefan Rampp said he will contribute this.
    (3) Microelectrode EEG data sampled at 24-bit depth-- Ben Brinkmann said that he will donate a few "microwire" microelectrode EEG recordings with epileptiform activity in them
    (4) Surface EEG data sampled at 256 Hz. JH stated he would ask permission to use Human Epilepsy Project surface EEG data, which contains epileptiform discharges and seizures.
  - Process for Sharing of Reference Datasets

    JH discussed how David Clunie had recommended uploading data to Zenodo (CERN; https://zenodo.org/) which had multiple advantages including (1) built-in donor agreements and user agreements (based on a CC-BY license), (2) donors can upload separate datasets free of charge of size less than 50 GB each, and (3) DOI is automatically assigned. Kristian Bernard Nelson (KBN) brought up that in the research

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plan that had been circulated there was a requirement that contributing academic centers or companies needed to indicate on the Zenodo website (when they uploaded a dataset) that they had regulatory approval to share de-identified and non-coded waveform data for this project. He asked that since investigators from European countries were not required to have IRB approval to share de-identified and non-coded EEG waveform data, if this requirement could be dropped. JH agreed that this should not be a requirement if de-identified and non-coded waveform data was contributed from a country that did not require regulatory approval to share such data, and he would change the research protocol to include a statement to this effect.

- Collection of Expert Opinion

  JH proposed expert annotation of reference datasets in two phases:
  (1) Phase I will use intracranial EEG data and H.BWC "quality index" set at multiple levels of fidelity, comparing H.BWC lossy compressed/decompressed versus original waveform, and use a few clinical expert annotators. Expert opinion will be collected using EEGnet mounted on Google Cloud. Phase I will determine a good setting for the H.BWC quality index to test with a larger number of reference datasets and clinical experts in Phase II below.
  (2) Phase II will use at least five reference datasets (surface EEG, needle EMG, intracranial EEG, microelectrode EEG, surface ECG, others?), with many clinical experts giving opinion on each reference dataset using EEGnet, with just 1-2 quality index settings tested.

- Development of an IOD for LTM and Sleep Studies

  JH stated that, as has been previously discussed in WG-32 telecons this year, he thought that the next Supplement document that WG-32 should develop should be a Supplement for an IOD for LTM EEG and Sleep Studies. This new Supplement would incorporate several transfer syntaxes for lossless H.BWC encoding and would include a plan for blocking and indexing for random access. SW asked ITU-T SG-21 attendees if the design for H.BWC for lossless encoding had stabilized. JP and GS reported that they thought that the design had stabilized sufficiently to be able to work on this. JH mentioned that, in reading through parts of the DICOM Standard, he had noted that there were many sections of the Standard that would need to be edited if use of a codec for waveform encoding was to be added. SW agreed, and stated that there were many locations in the DICOM Standard that referred to codecs to encapsulate image data, but none that discuss encapsulation of waveform data, and that the Standard currently reads that waveform data is always encoded in native (uncompressed) format. JH also stated that the question of whether all waveform data should be H.BWC encapsulated interleaved or whether there should be an additional H.BWC transfer syntax developed that included encoding of waveform data with subsets of channels had also not been discussed. JH mentioned that the topic of whether basic offset tables or extended offset tables would be used for encoding byte offsets into random access points had not yet been discussed as well. JH

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stated he continued to edit his planning document for the IOD for LTM EEG and Sleep studies to discuss this and he would circulate the document to WG-32 soon.

## 6. NEW BUSINESS

- SW mentioned that the DICOM Standard Committee meeting will be held on December 4, 2025. DICOM WG-32 will need to provide an annual summary report to be updated on the DICOM webpage (www.dicomstandard.org). JH stated that he would draft an annual summary and assist with editing the WG-32 information on the DICOM webpage.

## 7. DATE AND TIME OF NEXT MEETINGS

| | |
|---|---|
| Thursday 20 November 2025 | 10:00- 11:00 am UD ET |
| Thursday 17 December 2025 | 10:00- 11:00 am UD ET |