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# Meeting Minutes

## DICOM WORKING GROUP SEVEN (RADIOTHERAPY)

<b>Meeting Location</b>	Online Meeting	
<b>Dates and Times</b>	February 15-16 & 23-24, 2021	
	Mon-Tues, Tues-Wed	9:00 – 13:00 EDT
<b>Presiding Officers</b>	Christof Schadt, Co-Chair Jim Percy, Co-Chair	
<b>Secretary</b>	Shayna Knazik, MITA	

# Participants

Name	Affiliation	Mon 2/15	Tue 2/16	Tue 2/23	Wed 2/24
Jim Percy	Elekta	X	X	X	X
Walter Bosch	AAPM	X	X	X	X
Yulong Yan	AAPM	X	X	X	X
Bruce Curran	AAPM	X	X	X	
Bruce Rakes	Mevion	X	X	X	X
Bob Pekarek	Accuray	X	X	X	X
Kari Jyrkkälä	Varian	X	X	X	X
Ulrich Busch	Self	X	X	X	X
David Wikler	IBA	X	X	X	X
Christof Schadt	Brainlab	X	X	X	X
Stefan Pall Boman	RaySearch	X		X	X
Chris Pauer	Sun Nuclear	X			
Shayna Knazik	MITA	X		X	X
Jon Treffert	RaySearch	X	X	X	X
Marcus Bergman	RaySearch	X	X	X	
Hansen Chen	Philips		X		

## Actual Week Schedule

	Monday	Tuesday	Wednesday	Thursday
Session 1 09:00-09:55	Setup, Administrative, Opening Group Status	Supp 177	Supp 177	CPs
Session 2 10:00-10:50	General Discussions	Supp 177	Supp 177	CPs
Session 3 11:10-12:00	General Discussions	Supp 177 / Supp 213	Supp 177	CPs
Session 4 12:05-13:00	Supp 178 Review of Teams Procedures	Supp 177	Supp 177	Remaining Items

# Topics

## Administrative

- Introductions, identified participants.
- Shayna Knazik presented DICOM anti-trust and patent policies
- Reviewed the agenda and revised as needed.
  - Discussion of Supp 177 and Supp 178 in the first week
- Meeting minutes from the last meeting(s)
  - Minutes from the November 2020 meeting were reviewed and approved without objection or abstention.

## Subgroups and related Group Status

Update reports were presented:

- Brachytherapy Subgroup
- Ion Subgroup
- Motion Management Subgroup – PowerPoint presentation posted, next meeting is Feb 25
- IHE-RO
- IEC
  - Discussion of restructuring of IEC 62
  - Bruce Curran to join US TAG
- WG-28
  - Finalizing Supp 214 on Cone Beam RDSR
- CodeX
  - Meeting two weeks ago to present RT domain to FHIR group
- Other Subgroup reports as needed.

## General Discussions

### Treatment Preparation Record IOD

How can it be recorded that the treatment preparation has been accomplished as per the instructions?  
What are the options? An RT Treatment Preparation Record IOD?

- Discussion of restructuring Macros in Supp 160 to facilitate recording of both specified and actual parameters
- Yulong Yan and Ion Group to identify Use Cases for Setup recording.

### Surface Scan Mesh IOD

Kari presented findings from his attempts to implement texture (photo images) mapping (UV Mapping) on surface scan meshes. He found problems in managing AE references in the linkage between Composite instances. Dynamic information (AE Title) works for Normalized objects, but is not appropriate for Composite IODs.

- Kari to draft a CP to bring the problem to the attention of WG-06

## “Unattached Contours”

With CP 2006 being part of the DICOM Standard since 2020e, the question is how to continue with this topic?

- This CP introduces a means to provide information about the underlying pixel grid to allow contour definitions to be independent of image pixel planes.
- **ACTION:** IHE-RO to consider developing a new Profile for Segmentation independent of image geometry.

## Beam Dose Point Depth

Regarding the old Beam Dose Point Depth attributes: should WG-07 send an email to the QA vendors to ask for details about general usage and support in the field? Or even set up a separate TCon?

- Beam Dose Specification Point (and Beam Dose Point Depth) values are not needed for nominal doses.
- Some QA vendors now use CT and RT Structure Set to compute dose and no longer use Beam Dose Point Depth. Can Dose Point Depth be retired from the Standard?
- **ACTION:** Christof to draft a CP to retire Beam Dose Point Depth. WG-07 to solicit comments to confirm that this attribute is not being used.

## Dose Reference UID

Marcus Bergman requested clarification of the usage of the Dose Reference UID.

- Dose Reference UIDs provide a means to accumulate dose over a set of Prescriptions.

## Revision of DPDW Model

It is proposed to revise the DPDW model. As the DPDW working group is a joint effort of the IHE-RO TC and DICOM WG-07, we should come up with a decision.

Jon Treffert presented an update:

- A new generation of imaging and positioning systems are being developed, which are intended to be integrated and orchestrated using DICOM.
- Imaging subsystems include Proton imaging
- Several Treatment Session Manager products are in development to facilitate managed workflow.
- Real-time Adaptive Particle Therapy of Cancer (RAPTOR) Consortium is seeking common interface.
- Next steps? Are 2<sup>nd</sup> Gen RT objects needed for DPDW?

## DICOM WG-07 Management Procedures

The WG-07 Document Procedures.docx document was revised by the group.

- The primary means of communication remains the NEMA E-mail Listserver.
- Extends collaborative work of the group in Microsoft Teams.
- Teams channels helpful for collaborative preparation on specific topics in sub-groups.
- Additions or removals of users to be managed by the DICOM Secretariat.

- **ACTION** : Shayna to draft a “Tips for using Teams” document.
- Management of supplement revisions: a copy to be stored to the FTP server both before and after reading with WG-06.
- Latest version of CPs are maintained in Teams during development. Final copy saved to the FTP Server
- All WG-07 members present agreed to the revised procedures (2/16/21 9:30am)

Review of Documents organization in SharePoint

## IEC Linac Safety Standard

The standard covers display of treatment plan information and user interactions.

- Some of the requirements this standard are not supported by DICOM 1<sup>st</sup> gen RT objects.
- Concern that manufacturers will use non-standard DICOM tags to satisfy regulatory requirements.
- Argument that changes to 1<sup>st</sup> gen RT IODs are needed to satisfy the IEC standard.
- This topic to be discussed at the next WG-07 meeting.

## Supplements

For the status of the Supplements and the corresponding naming conventions and nomenclatures see documents on top level of the Supplement folder on the ftp server:

<ftp://medical.nema.org/MEDICAL/Private/Dicom/WORKGRPS/Wg07/Sup/>

For a document overview see here:

[Project Status](#)

### Supplement 177 – Dose Objects [2/16/21]

The document was cleaned up v.39 of the document was created with all prior changes accepted. During clean up, several issues were found that require discussion with WG-07.

See [Supp 177](#) and the [Reading Notes](#).

Review of comments from group members

- Use Cases include representing all doses from a course of adaptive treatments.
- The Frame of Reference Module has been removed from the Dose Map Annotation and Dose Samples IODs. It is moved to the Map (Dose Map Annotation) and Dose Samples (?) Sequence.
- Synchronization and Respiratory Synchronization Modules were removed for now. They may be added later as User Optional.
- Section C.36.1.1 Second Generation Radiation Concepts is not needed, was removed.

- Dose Scope Description Sequence (contains user-readable description) was moved inside the Dose Scope Constituent Sequence to allow unstructured, i.e., textual description of referenced legacy dose constituents.
- Re-using existing attributes for Contributing RT Dose (Referenced RT Dose) was proposed. Same for Contributing RT Radiation Set and Contributing RT Radiation. It was decided that this is not possible, as then existing macros would have to be extended.
- Examples of partial delivery specification for incomplete fractions would be helpful.
  - **ACTION**: Uli to draft concrete examples.
- Proposal to factor out partial delivery specification as a Macro and include detailed example with the Macro. A macro may not work for Treatment Record.
  - **ACTION**: Christof to present a proposal for a separate macro.
- Referenced RT Segment Annotation Sequence was replaced by a reference to Conceptual Volumes affecting dose calculation.
  - **ACTION**: Christof to edit offline.
- Conceptual Volume Sequence contains CVs used to calculate dose. Any CV that affects the dose calculation result should be included, such as material overrides, couch or patient contours.
- Dose Scope Description Sequence – contains unstructured description of dose constituent.
- Review of Supp 177 to be resumed on Tuesday 2/23
- The RT Dose Context Macro was re-worked.
  - Dose Context UID wording in section C.36.2.N.1.1 was revised.
  - The Dose Additional Labeling Sequence (Type 2) was removed.
  - Dose Representative Value Sequence was retained as Type 2.
  - Re-use Dose Unit Code Sequence with CID SUP177008 “Radiotherapy Dose Real World Units”
  - Referenced Pertinent Documents Index changed to multi-valued.
  - Dose Context UID
    - The semantics for this attribute are not well-defined and are use-case dependent.
    - Proposal to add a Dose Context Code to allow semantics for grouping of doses to be defined outside the standard. Define extensible CID with one code for doses which share all context (including dose calculation), but may differ in spatial sampling.
    - **ACTION**: Jim to re-work RT Dose Context Macro to include a Dose Context Grouping UID and Dose Context Grouping Code. Also, revise C.36.2 N.1.1.2 to de-couple Dose Representative Value from Dose Context.
- Partial Delivery Limits Sequence – Sentence regarding “multiple partial fractions” was removed.

- Material Composition Information Source – no change needed.
- Homogeneous Material Code Sequence – Zero or One item present
- Radiation Device Configuration and Commissioning Key Sequence – zero or more items present
- Dose Reporting Material Code Sequence – zero or one item present
- Long Label Macro was added to Dose Map Annotation Module, Dose Metrics Module, and Dose Samples Module
- Replace Referenced Series Sequence (0008,1115) with an invocation of the Related Information Entities Macro
- Removed requirement for General Reference Module to be present.
- Multi-Frame Function Groups for Parametric Map used to store Dose grid:
  - Require Pixel Measures to be a Shared FG. This means frames must be evenly spaced.
  - Cardiac & Respiratory Synchronization – shall be shared FG
  - Contrast/Bolus - shall not be used
- Real-world mapping: allow dose units of Gray or Sievert defined in CID.

### Supplement 178 – RT Course [2/15/21]

Uli has been working on the Supplement draft.

- Several Use Case descriptions were reviewed by the group.
  - Adaptation/Re-planning
  - Patient Transfer
  - Clinical Trial/Registry
  - Research/Teaching File
- Notes on Functionality and Data
  - RT Course immutability: Snapshot, but what constitutes the chain of “versions”
  - Time is certainly the key parameter of instances
  - Is there a notion of a single source of truth? How to represent the scope of knowledge?
  - We have an RT Course entity as the entirety of what happens to a patient during an RT treatment, represented by references to other objects.
  - RT Course may be too overloaded in practice, therefore we may need another term. For the time being, RT Course remains a working term only.
  - Perspectives of viewer interest may be Site, others
  - Identify by Reporting Entity, Time
  - Terminology
    - One approach may be to use RT Treatment \_\_\_\_, e.g., \_\_ Snapshot, \_\_ Report, \_\_ Statement, \_\_ State, ...
  - Reporting of the source by equipment
  - Potentially, we could define an instruction which conveys what the RT Course should contain
  - Should we have a separate Manifest object?



- Content
  - States (approvals... ) of various other entities
  - Images (approve for some use)
  - Segmentation (Patient Model)
  - Annotate
    - Clinical State
    - Quality Level
    - Role in clinical process
    - Orthogonal set of approvals
  - Use of absolute times versus logical timepoints
  - State variables (not contained in persistent objects)
- RT Course as a manifest of the RT Treatment
  - What are the manifest data? Some structured representation of the patient's treatment(s) including:
    - Treatment Sites (incl. Prescriptions, Conceptual Volume UIDs)
    - Main dosage information
    - What has been treated
    - Related segmentations
    - Summary of the treatment
- Uli to summarize for next Supp 178 session.

### Supplement 213 – Enhanced RT Image [2/16/21]

Items from/for review with WG-06.

- Frame Type Attribute is multi-valued. Defined Terms for Value 4 include DOSE. Is there a published reference to validation of Integrated dose measurement?
  - **ACTION:** Bruce Curran to send citation to Uli
- The Position Acquisition Instruction Module references source images
  - Proposal to specify in the acquisition instruction a reference image for position verification; It was discussed whether this is not in competition with position verification, registration and other instructions which will be developed by the DPDW subgroup.
  - The Related Information Entities Macro could be used to reference images in position acquisition instructions. It also includes a Purpose of Reference Codes, Study and Series Instance UIDs.
  - Brief discussion of using the Related Information Entities Macro for entity references in Supp 177.
    - The Purpose of Reference Code in Supp 177 contains zero or more codes.
    - RT Reference Series Purposes of Reference Codes (Supp 177) have
    - Alternatively, instances references can be handled inside the Parametric Map IOD.
  - More than one Purpose of Reference Code is not needed in Supp 213.
  - The “For Dose Display” Purpose of Reference code was removed.

- Discussion of whether to use Parametric Maps to represent dose was tabled. To be resumed later this meeting (2/23)

## Supplement 214 – Cone Beam CT Radiation Dose SR

This Supplement, drafted by WG-28, is in Letter Ballot. Questions to WG-07:

- Table TID eRDSRT02 utilizes [CID 10010 “Dose Measurement Devices”](#), should we propose [CID 7026 “Radiotherapeutic Dose Measurement Devices”](#) or a subset thereof to be added to CID 10010?
  - WG-07 to review CID 7026 whether some of the types are valid for use in this TID
- Any comments on usage of [CID 10030 “Detector Types”](#)?
  - High level categories. No changes.
- Row 22: “Reference Points” – are these of any interest to RT?
  - Reference points are for detector placement in phantoms and QA measurements. Not relevant for Radiation Oncology.
- Should we fold in the Treatment Session UID as an optional parameter (and as a code)?
  - It may be helpful to identify dose reports for 2D images/CBCT/fluoro acquired during RT sessions. This is not specifically of interest to Rad Onc.
- eRDSRCD008, Equipment Origin: The origin of the Frame of Reference is defined as part of the equipment – do we want to fold in more?
  - No additions identified.

## Correction Proposals

See also: [WG-07 CP Status List](#)

### CPs new to WG-07

none

### CPs in Work

### CPs new to WG-07

#### [cp RT163 Extend Source Pixel Plane Characteristics](#)

Extend CP 2006 “Unattached Contours”

- Add number of Rows, Column, Frames for consistency with voxel-based segmentation
- Ready for reading with WG-06

#### [cp RT169 UV Mapping Module](#)

Finding by Kari in UV Mapping Module

- Adds Referenced Surface Number in UV Mapping Sequence. This is Type 1C (required when Surface Sequence has >1 item and macro is used in Surface Scan Mesh IODs).
- Additional issue regarding access to referenced texture information.

- The current standard works with Normalized services, but has problems with Composite objects.
- This issue was split out. **ACTION**: Christof to draft a separate CP to address it.

#### **cp RT170 Extend RT Segment Characteristics**

Extension of RT Segment Characteristics for high-level material definition

- Use case is for implants, mainly prosthetics
- Ready for reading with WG-06

#### **cp RT166 Differentiate Geometric Types of CT Imaging Sources**

Continue discussion, as there is no conclusion yet.

See also comments on Supplement 214 “Cone Beam CT Radiation Dose SR”.

- Yulong to finish editing and post to CP Teams channel
- **ACTION**: Shayna to send to WG-28 for review

#### **cp RT168 Clarify Origin Of Device-Based FOR**

Review of CP after discussion in Nov 2020: Usage of Well-known FOR.

- Use Case relates to initial position of treatment table, prior to image acquisition.
- “When a Frame of Reference of a patient model is not available, then the well-known Frame of Reference of a patient support device may be used.”
- The well-known FoR is to be documented in the Conformance Statement.

#### **CPs RT 152/155**

These CPs address the mapping between 1<sup>st</sup> and 2<sup>nd</sup> gen RT objects.

The consensus of WG-07 is that the Implementation of 2<sup>nd</sup> Gen RT has not yet achieved sufficient traction to move forward.

Plan to review again in another year.

#### **CPs with WG-06**

##### **CP 2058 (was RT157) Enhance specification of Base Beam Coordinate System**

Draft version requires re-wording based on comment by Kevin O’Donnell, as even the initial sentence was not properly worded.

Continue on version [DFT2](#).

Canon comment:

A Base Beam Modifier Coordinate System is defined with respect to **a parent coordinate system, which may be the Equipment Coordinate System (see [Section 10.39.1.1](#)) or another coordinate system derived from the Equipment Coordinate System. The parent coordinate system is specified in Equipment Frame of Reference UID (300A,0675) (see [C.36.12](#)) using a Well-known Frame of Reference UID listed in section [C.36.12.2](#).**

As proposed by CP:

A Base Beam Modifier Coordinate System is defined with respect to **a parent coordinate system, which may be the Equipment Coordinate System (see [Section 10.39.1.1](#)) or another coordinate system derived from the Equipment Coordinate System. The parent coordinate system is specified for each Equipment Coordinate System by a Well-known Frame of Reference UID listed in section C.36.12.2.**

New wording:

For each Equipment Coordinate System defined by a Well-Known Frame of Reference in section C.36.12.2, a Base Beam Modifier Coordinate system is defined.

- Christof will send to WG-06 for review.

## **Future Meeting Dates, Agenda for the Next Meeting and other Administrative Topics**

### **Schedule**

The list should be reviewed again, whether any adaptations are required since the last meeting.

[Teams Meeting List](#)

## **Appendix: General Information**

### **I. Project List**

The list of major projects pursued by WG-07 can be found [here](#).

### **II. Presentation Material for 2nd Generation RT Objects**

A folder is maintained containing material of presentations on 2<sup>nd</sup> Generation topics.

Everyone is invited to use any material out of that folder for presentations.

In turn everyone should to add his presentations to this folder, if they could be of general use. As needed, take care to remove any company- or institution-confidential parts before posting.

<ftp://medical.nema.org/MEDICAL/Private/Dicom/WORKGRPS/Wg07/2ndGeneration/Presentations>

Meeting adjourned 1:05pm ET 2/24/21

Prepared by Walter Bosch

Submitted by Shayna Knazik

Reviewed by Counsel 4/15/21