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# MINUTES

## DICOM WORKING GROUP SEVEN (RADIOTHERAPY)

<b>Meeting Location</b>	Online Meeting	
<b>Dates and Times</b>	Monday, Mar 07, 2022	9:00 – 13:00 EDT
	Tuesday, Mar 08, 2022	9:00 – 13:00 EDT
	Monday, Mar 14, 2022	9:00 – 13:00 EDT
	Tuesday, Mar 15, 2022	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	Mar 7	Mar 8	Mar 14	Mar 15
Jim Percy	Elekta	X	X	X	X
Walter Bosch	AAPM	X	X	X	X
Yulong Yan	AAPM	X	X		X
Bruce Curran	AAPM	X	X	X	X
Bob Pekarek	Accuray	X	X	X	X
Kari Jyrkkälä	Varian	X	X	X	X
Ulrich Busch	Varian	X	X	X	X
David Wikler	IBA			X	X
Christof Schadt	Brainlab	X	X	X	X
Stefan Pall Boman	RaySearch	X	X		X
Marcus Bergman	RaySearch	X	X	X	X
Jon Treffert	RaySearch	X	X	X	X
Steve Weston	Leeds Teaching Hosp. NHS	X			
Bruce Rakes	Mevion	X	X	X	X
Ondrej Sevela	Advanced Oncotherapy			X	
Shayna Knazik	MITA	X	X	X	X

## **Week Overview**

**Meeting Focus:** Hybrid Discussions, Assertion Collection

	Monday	Tuesday	Monday	Tuesday
Session 1 09:00-09:55	Setup, Administrative, Opening General Discussions	CPs	Assertion Collection	CP RT 166 CP RT 187 CP RT 152
Session 2 10:00-10:50	General Discussions	Physical Beam Dose	Assertion Collection	Encoding ROI Meta-Information
Session 3 11:10-12:00	CPs	Supp 213	Hybrid RT Plan	Encoding ROI Meta-Information
Session 4 12:05-13:00	CPs	Supp 213	Hybrid RT Plan	Hybrid RT Plan Future meetings

For details on the topics, see the sections below.

## Details

### **Administrative**

- Introductions and identified participants.
- Shayna reminded the group anti-trust rules and DICOM Patent Disclosure Policy
- Reviewed the agenda and revise as needed.
- Reviewed meeting minutes from the last meeting(s).

### **Subgroups and related Group Status**

Updated reports were only presented as needed:

- Brachytherapy Subgroup - one CP regarding brachy applicators to be discussed in WG-07
- Ion Subgroup - group is prioritizing work on RT Ion Treatment Session Record
- Motion Management Subgroup
- IHE-RO – high-def structure set Profile in development, no progress reported on Query/Retrieve
- IEC – update of Verify and Record standard, treatment planning safety standard is nearly complete, issues with backward compatibility remain, no consensus yet
- WG-28 – work continues on the RDSR informative annex
- Other Subgroup reports as needed.

### **Organizational**

No updates at this meeting.

### **General Discussions**

#### **CP List for IHE-RO**

During the February face-to-face meeting of the IHE-RO TC it was discussed that WG-07 could support maintenance and extension of existing profiles by providing a list of Correction Proposals and which profiles could be potentially affected:

<https://nemaorg137.sharepoint.com/:x:/r/sites/DICOMWG-07Radiotherapy/Shared%20Documents/IHE-RO/ProposedProfileUpdates.xlsx?d=w5c899f1b734a442082964759d4a0bbad&csf=1&web=1&e=0Gd1aL>

CPs relevant to IHE-RO Profiles

- BRTO: 2037, 2150, 2151, 2152, 2182, 2184
- TPPC: 2153, 2155, 2157
- MMRO: 2183

#### **ROI Identification**

During the discussion of CP 2151, Walter Bosch brought up a use case that might currently not yet be addressed. The details were not quite clear at that point, but Walter will bring up the issue for discussion so that WG-07 can identify if there is missing anything from the RT Structure Set. See also the corresponding [Teams discussion](#).

The issue involves distinguishing among multiple ROIs representing the same CV. Such ROIs can be distinguished by (free text) ROI Name, but may not be well distinguished using codes.

Walter reviewed several use cases involving multiple ROIs representing “versions” of the same CV are described below.

1. An OAR or TV is defined using multiple imaging modalities or images acquired with differing acquisition parameters.
  - a. Prostate defined by CT and T1-weighted MR
  - b. Target defined by CT and PET images.
2. Multiple images in the same frame of reference are used to track a target volume during a treatment session
  - a. ROIs representing the same target at various respiratory phases
  - b. ROIs representing pelvic structures with full/empty bladder or rectum
3. Multiple, registered image Series are used to track the size/shape and position of a head/neck target volume over a course of adaptive therapy.
  - a. Initial and final TV and OAR structures are registered to the same frame of reference and an accumulated dose distribution is used to compare cumulative dose to each.
4. The same volumes are segmented by multiple individuals or devices.
  - a. A target volume is drawn by a resident and an attending physician in a teaching hospital.
  - b. A clinical OAR volume is modified for consistency with a clinical trial protocol.
  - c. An OAR is delineated by a human observer and an AI.
  - d. Multiple experts delineate a CTV for a consensus contouring project.

## **ISO Discussion**

Update on the discussion with the ISO group: Jim and Walter are available to discuss TCP/NTCP plan metrics with Kevin O’Donnell and Japanese ISO representative(s).

## CPs

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

### CPs new to WG-07

#### **cp RT201 Add missing Treatment Site Modifier**

When introducing the Treatment Site Code Sequence to the RT Plan and the Plan Overview Sequence in RT Dose, we missed the Treatment Site Modifier Code Sequence. Approved for review by WG-06.

#### **cp RT202 – Clarification for Number of RT Beam Limiting Device Openings**

It seemed there was an issue with this number that it is always required which seemed wrong. But this was on purpose to avoid any egregious error, such as the NYT case. Therefore, it was agreed that a section is required to document this (and also for the number of Wedge Positions). A draft was prepared by Bob.

**Action:** Bob Pekarek will rework example 3 in Section C.36.2.2.5.1.2.

#### **cp RT203 – Retire Robotic Base Location Indicator**

The Robotic Base Location Indicator (3010,0090) Attribute has been determined to be unnecessary (and unused) in the RT Robotic Arc Radiation IOD and can be retired. Implementation is currently limited.

**Action:** Bob Pekarek will clean up draft. This CP remains a work in progress.

#### **cp RT204 Clarify Block Accessory Codes**

Based on a comment by WG-06 when reviewing CP 2156, the Accessory Code attributes in the RT Ion Beams and RT Ion Beams Session Record are clarified and harmonized. Ambiguity noted in application of coded for blocks and block trays. **Action:** Christof will continue work.

#### **cp RT205 Dose Calibration Conditions Verified Flag Clarification**

An update by Kari on CP 2153 “Add Linac Calibration Parameters to RT Plan”: Wording was updated to clarify that the verification of calibration conditions takes place on the treatment delivery device, not the treatment planning system.

#### **cp RT206 Prescription Overview Sequence**

An update by Kari on CP 2152 “Add Plan Overview Parameters to RT Dose”:

Add an Entity Long Label attribute in the Prescription Overview Sequence (300C,0114) to provide a label of the prescription dose.

[3/8/22]

Added requirement that Prescription Overview references be unique in the Plan Reference Sequence.

Further discussion of content of Entity Long Label in Prescription Overview Sequence.

Kari revised to include context.

Change description of Entity Long Label to “Label identifying the Prescription Overview”

Other issues noted:

1. The description of Prescription Overview Sequence (300C,0114): “evaluation” may not be appropriate for some use cases. Consensus that the existing wording is adequate.
2. Referenced ROI Number (3006,0084) is Type 3. This is a weak requirement. Could be Type 2. Consensus to refer to IHE-RO.

#### **cp RT207 Originating Series Sequence In Source Pixel Planes Characteristics Sequence**

Provide a hint in the RT Structure Set in case the ROI was contoured in a different image data set than the referenced series.

Topic to be revisited after discussion of ROI identification.

#### **cp RT208 Attribute wording corrections for Brachy**

Corrects a cut/paste error in the RT Brachy Session Record Module attribute descriptions.

- Referenced Verification Image Sequence
- Referenced Control Point Index

### **CPs in Work**

#### **cp RT152 RT Physician Intent Reference from RT Plan**

Should this also be covered with CP 2203 or are we handling this topic separately?

CP is generally acceptable. Some details, e.g., reference to treatment sites need further work.

**Action:** Kari to revise. Decision to review 3/14.

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

Y. Yan presented the latest draft of this CP to distinguish image acquisition geometries to better interpret cone beam CT images.

Decision (WG-07 Oct 2021) to replace detailed description of image acquisition geometry with a single flag indicating acquisition with planar detector. Yulong to re-work CP for review 3/15/22.

[3/15/22]

Updated CP adds Planar Projection Acquisition flag Type 3 attribute (Enumerated Values: YES, NO) to the CT Image Module.

- Discussion of adding specialization to value 3, 4, or 5 of Image Type (0008,0008). It was not clear if this would conflict with other usage of these values. Using a new attribute appears to be a safer choice.
- Discussion of whether to add this attribute to the CT Acquisition Details Macro in the functional groups of the Enhanced CT IOD, as well. Consensus that this is not necessary.

**Action:** Yulong will do final cleanup. CP was approved for presentation to WG-06.

#### **cp RT175 Retire Beam Dose Depth Parameters**

No update yet.

### **cp RT185 Add Patient to Equipment Matrix Examples**

Status: Work in progress

### **cp RT187 Multi-layer MLC**

CP adds support for Enhanced MLC types, including multi-layer, binary, and movable-carriage MLCs. Rationale for correction is that the current standard supports limited modeling of MLCs. Newer radiotherapy devices use MLCs with two levels of leaves moving in the same direction, binary leaf positions, or movable carriages. The CP extends RT Plan, RT Image, and RT Beams Treatment Record IODs. The CP also includes clarification of descriptions of Enumerated Values of the RT Beam Limiting Device Type (300A,00B8) attribute.

For safety reasons, it should be possible to express these new MLC types while assuring that systems that do not support them can still operate safely by not consuming RT Plans with the new encoding. The Beam Limiting Device Sequence is present if and only if the Extended RT Beam Limiting Device Definition Flag is absent or has value NO. This deliberate breaking change prevents misinterpretation of new data by systems that do not recognize the new MLC types.

- Added note in section C.8.8.14.n1 to indicate that the Beam Limiting Device Sequence and Enhanced Beam Limiting Device Sequence are mutually exclusive.
- Extended Beam Limiting Device to be renamed Enhanced Beam Limiting Device (Uli TODO).
- A note regarding coordinates and orientation used for the Extended BLD Type was added in section C.8.8.14.n2

**Action:** Uli will clean up for presentation to WG-06 to get a number for this CP.

### **cp RT199 Retirement of unused modules from RT Dose IOD**

Stuart Swerdlhoff has concerns, see comment here: [Retirement of unused modules from RT Dose IOD - WG 7 RADIOTHERAPY - NEMA Forums](#) - comment was noted and discussed.

Proposal: Contact Open Source vendors to identify whether this causes an issue with them.

Discussion of retiring unused modules in RT Dose. They have not been used interoperably.

It was also noted that retiring such attributes does not prevent their use.

CP was approved for presentation to WG-06.

### **cp RT200 Add mAs parameter to record exposure**

Status – CP has been cancelled.

## **CPs with WG-06**

### **cp2182 Simplification of RT ROI Observations**

Adaptation required due to an oversight of the RT ROI Observation Label being mentioned in a separate section.

**cp2185 Extend use of Treatment Session UID**

Re-discuss the updated E-R diagram. Are relations correct?

An RT Treatment Session is part of an RT Course. RT Treatment Session was moved under RT Course. The CP adds Treatment Session UID to several imaging and RT Series.

**cp2203 Add References between 1st and 2nd Gen Rad IODs**

WG-06 did not like the Referenced Number approach

**Part 17 RT Template**

The organization of RT material for Part 17 was discussed briefly.

## Effective Dose for Ion Therapy

Current practice in ion therapy is to use Beam Dose Type = PHYSICAL for RBE-corrected dose from RT Ion Plan. This has been done (a) for interoperability with treatment planning/management infrastructure, and (b) intercomparison with dose from external-beam photon plans.

A change in usage to correct this inconsistency requires a clear indication to avoid ambiguity.

2<sup>nd</sup> Gen Radiobiological Dose Effect Description Macro describe method used for Effective dose calculation.

A possible solution from Hybrid discussions is to use Dose Summation Type = CONTEXT\_DEFINED (details of dose calculation are defined by the RT Dose Context) to encode RBE corrections as part of the RT Dose Context.

Further work as part of 1<sup>st</sup> – 2<sup>nd</sup> Gen Hybrid discussions.

## Hybrid Discussions

[3/14/22 at 11am ET]

Uli Busch presented the “Hybrid RT Plan 1.1” document to the group.

Three 2<sup>nd</sup> Gen RT IODs were identified as being of interest for references from the RT Plan: RT Physician Intent, RT Segment Annotation, RT Treatment Preparation.

- Discussion of exchanging the Prescription Module with a new RT Dose Contribution Module which takes into account the facilities of the RT Physician Intent using CVs. The new Module could support dose tracking at the control point level.
- Breaking changes include support for multi-layer MLCs
- Discussion of referencing multiple RT Segment Annotation instances.
- RT Treatment Preparation IOD
- Options for differentiating existing RT Plans from Extended RT Plans were discussed. Adding a new Type 3 flag could indicate new content. Also, since the Plan Geometry uses Defined Terms, a new Defined Term could be used to flag new features.
- Options for hybrid plans include a new SOP Class and extending the existing RT General Plan Module (with optional reference to RT Physician Intent, optional reference to RT Segment Annotation(s), and optional reference to RT Treatment Preparation IODs.
- The RT Fraction Scheme Module currently supports multiple fraction groups.
  - Retire Fraction Group Description and Referenced Dose Reference Sequence
  - Add Referenced Conceptual Volume UID (Type 3) in Referenced Beam Sequence. (Alternatively, could include Conceptual Volume Reference Macro.)
- Dose Reference usage: by coordinates for QA, by CV for TMS.

**Action:** Uli will continue work on Hybrid Document.

## 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 213

Review of public comments received. (LB period closes March 16.)

Usage of Synchronization, Respiratory Synchronization, and Enhanced Contrast/Bolus Modules was changed from C to U.

Align Cardiac Synchronization Modules and Conditions with those for Enhanced MR.

Multi-frame Dimension Module Usage changed from M to U.

Treatment Session UID was added to the Enhanced RT Image Module. Type 2C (required if image was acquired or reconstructed during an RT Treatment Session).

Start/Stop Cumulative Meterset – TODO: align requirements for Type 2C, TODO: add unit specification

**Action:** Uli to continue TODO to complete review

### Supplement NNN – Assertion Collection

[3/14/22 at 9am ET]

The Supplement was formerly known as Data Baseline. WG-07 reviewed and revised wording of a work item proposal for the Assertion Collection IOD. The relationship between creation of immutable information objects and the transient assertions about them was discussed.

- Assertions have a different life cycle/temporal nature than the assessed SOP instances.
- Assertions are specific to the context or purpose for which SOP instances are to be used.
- No approval mechanism in 2<sup>nd</sup> Gen RT and use of non-RT IODs underscores need for independent mechanism.

A revised draft of the work item proposal was prepared by the group. A draft of the Supplement has been started. “Sup NNN Assertion Collection” folder has been created in the SharePoint and will be added to Teams when the work item is approved.

## **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](#)

Strategy is to have at least one face-to-face meeting annually.

Travel requirements for travel to US:

<https://travel.state.gov/content/travel/en/traveladvisories/ea/requirements-for-air-travelers-to-the-us.html>

Tentative face-to-face meeting June 13-17, 2022 in Chicago at Brainlab, 8am-5pm with Teams access for off-site participation. **Action:** Shayna will send Doodle poll. Response by March 30, 2022.

## **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>

Minutes prepared by Walter Bosch

Submitted by Shayna Knazik

Reviewed by Counsel 6/15/2022