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## Meeting Minutes

### DICOM WORKING GROUP SEVEN (RADIOTHERAPY)

### Participants

Company/Organization	Represented by	8/30	8/31	9/6	9/7
AAPM	Walter Bosch	x	x	x	x
AAPM	Bruce Curran		x	x	
AAPM	Yulong Yan	x	x	x	x
Accuray	Bob Pekarek	x	x		
Advanced Oncotherapy	Ondrej Sevela				x
Brainlab	Christof Schadt	x	x	x	x
Elekta	Jim Percy	x	x	x	x
Elekta	Abdul Sayeed	x			
IBA	David Wikler	x		x	x
Mevion	Bruce Rakes	x	x	x	x
MITA/DICOM	Shayna Knazik	x	x		
RaySearch	Marcus Bergman	x	x	x	x
RaySearch	Stefan Páll Boman	x			
RaySearch	Jon Treffert	x		x	x
Reflexion	Michael Owens				

Self	Ulrich Busch	x	x	x	x
Varian	Kari Jyrkkälä	x	x	x	x
GE Healthcare	Steven Nichols		x		
Chuck McCrobie	Accuray			x	x
Jeffrey Lewis	Accuray			x	

## Actual Week Schedule

**Meeting Focus:** Hybrid 1<sup>st</sup>/2<sup>nd</sup> Gen DICOM RT

	Tuesday 8/30	Wednesday 8/31	Tuesday 9/6	Wednesday 9/7
Session 1 09:00-09:55	Setup, Administrative Opening General Discussions	CPs	CPs Discuss: 2185, 1319, 2203 Review: RT217	Hybrid RT Plan
Session 2 10:00-10:50	CPs	IHE Sharazone Presentation	Hybrid RT Plan	CP 2185 Hybrid RT Plan
Session 3 11:10-12:00	CPs	CPs	Hybrid RT Plan	Hybrid RT Plan
Session 4 12:05-13:00	CPs	CPs	Hybrid RT Plan	Hybrid RT Plan

# Topics

## Administrative

- The meeting was called to order August 30, 2022 at 9:04am EDT.
- Introductions, identified participants
- Shayna reminded the group of NEMA anti-trust rules and DICOM Patent Disclosure Policy.
- Reviewed the agenda and revised as needed.
- Reviewed meeting minutes from the last meeting(s).
  - Action items from the June 13-17, 2022 minutes were reviewed.
  - Minutes from June 13-17, 2022 WG meeting were approved without objection or abstention.

## Subgroups and related Group Status

Updated reports were presented as needed/available:

- WG-07 Brachytherapy Subgroup - work on plan content continues for IHE-RO TPPC-Brachy Profile
- WG-07 Ion Subgroup - IHE-RO TDRC Profile has been accepted for public comment. Decision not to seek advice regarding inclusion of (X-ray) setup beams in RT Ion Plan and RT Ion Beams Treatment Record. CP for consideration by WG-07
- WG-07 Motion Management Subgroup
- IHE-RO
  - Discussion of hybrid 1<sup>st</sup>/2<sup>nd</sup> Gen RT
  - TDOR is out for public comment.
  - Work to manage test data in Gazelle
  - Connectathon is scheduled for November 2022.
  - Consistent dose (dose tracking, dose reference) and prescription module was discussed.
- IEC – Jim Percy reported on IEC activities
  - Upcoming IEC meeting in San Francisco in Nov 2022
  - IEC 62274 R&V standard 62274 – need to decide whether to revise or replace
- WG-28 – September 14-16, 2022 meeting in Trento, Italy (Bruce Curran to attend virtually)
- Other Subgroup reports as needed.

## Organizational

- No update at this time.

## General Discussions

### Ion Subgroup

Discrepancy between setup beam imaging and recording.

- The RT Ion Beams Treatment Record records only treatment delivery parameters from the delivery machine, not the imaging device.
- Philosophical question regarding the use and content of setup beams. Setup beams were not designed to convey imaging parameters. Imaging parameters are volatile, i.e., may change from day to day. Supp 213 addresses this need.
- Use cases for recording setup imaging were discussed.
  - Actual repositioning information (patient shifts) are not recorded.
  - Imaging and position may not be directly tied to a treatment beam.
  - The BDI conveys table movement instructions. However, this is not a record of actual table movements.
  - The DICOM treatment record records the table position at the start of beam delivery. DICOM does not currently support (continuous) recording of positioning events.
- Further discussion of using the treatment record to record setup information.
  - It is important to distinguish between recording of beam delivery and recording of setup events.
  - Extending the RT (Ion) Beams Treatment Record (new Module?) to record setup (and other) events was discussed.
  - **Action:** Bruce and David (and any others) to draft requirements for Session Events Capture for discussion Sept 6-7. Document in Teams / Discussions / Session Events Capture

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

The following CPs are now in Final Text: CP\_RT193, CP\_RT194, CP\_RT195, CP\_RT197, and CP\_RT198

### CPs new to WG-07

#### cp\_RT215 RT ROI Interpreted Type Clean Up

Clean up of CP 2182 – could also be done via CP RT 216. Removes outdated text referencing ROI Observation Label. **Decision:** Accepted for reading with WG-06.

#### cp\_RT216 Extend RT Structure Set Definition

Proposal based on the discussions for an extension of ROI meta information. Requires input from WG-07 and thus more work.

- Adding a flag to require the presence of extended attributes was rejected as this would be a type of “versioning” of the RT Structure Set IOD. Extended ROI meta-information tags must be Type 3.
- Discussion of semantics of ROI DateTime, Structure Set Date / Time, Instance Creation Date / Time.

- Clarify description of Structure Set Date: “Date at which **the content of the** Structure Set is last modified.”
- Do we need separate datetime for ROI definitions (segmentation) and ROI observations (clinical interpretation/prescription). Logical separation is helpful to support separate workflow steps. General agreement to keep them separate despite extra complexity.
- ROI Creator Sequence (“The person or device that last modified this ROI.”) contains Identified Person or Device Macro. Only one item may be present.
- RT Protocol Code Sequence references protocol(s) selected by the RT Physician.

*[Adjourned for the day 8/30/22 at 12:55pm EDT.]*

*[Resumed meeting 8/31/22 at 9:03am EDT.]*

- Discussion of how to reference image Series from which ROI contours are derived.
  - Source Series Instance UID to reference images used in contouring at the ROI level
  - Contributing Series Sequence
    - Series Instance UID
    - Modality
    - Series Identifier
    - Date
    - Time
- Christof will continue work on CP for discussion at the next WG-07 meeting.
- Categories for RT ROI Context codes to be reviewed by Christof and Walter.

### **cp RT217 Add Gen 2 Termination Codes to Gen 1 Treatment Records**

Bruce Rakes presented a CP drafted by the Ion subgroup.

Treatment Termination Code (3008,002B) has a VR of SH, but has no real meaning.

- CP adds RT Treatment Termination Reason Code Sequence to RT Beams Session Record IOD, RT Ion Treatment Session Record IOD, and RT Brachy Treatment Record IOD.
- Decision to retire Treatment Termination Code (3008,002B) Attribute
- RT Treatment Termination Reason Code Sequence is “Expected if the RT Treatment Termination Status (3008,002A) is not NORMAL. One or more items are permitted in this Sequence.”
- Machine-Specific Treatment Termination Code Sequence is “Expected if the RT Treatment Termination Code is (110501, DCM, Equipment Failure)”
- Correct the Description for RT Treatment Termination Reason Code Sequence (300A,0715). This is not a “machine termination code.” Also correct Gen2 attribute description.

Group members reviewed the revised CP wording on Sep 6. A note indicating that Treatment Termination Code (3008,002B) has been retired in RT Beams Session Record Module, RT Ion Beams Session Record Module and RT Brachy Session Record Module was reviewed/revised.

**Decision:** Accepted for reading with WG-06.

**cp RTNNN Reference Multiple RT Structure Sets from RT Plan**

Continue draft from discussion in Chicago, to see whether this should become a CP.

Tabled for Oct meeting.

**CPs in Work****CP-RT214 4D Imaging Support**

Work continues.

Kari reported on discussions with Till Hoenig (WG-21). Several options for including Respiratory Phase information were discussed.

Minimum requirements for RT are (a) a way to combine instances for one phase together and (b) an Index to relate the order of phases.

**CPs with WG-06****CP-2185 Extend use of Treatment Session UID**

Rework based on Tx Session UID should not reside in Study Module.

- Discussion of Study semantics in the context of RT. More than one Treatment Sessions may be associated with objects in a Study.
- An RT Treatment Session is a collection of RT treatment events that are performed in a contiguous manner without any break in-between (other than time needed for required preparations) during a single Visit.
- Generalizing the type of Session used to group Instances was discussed. However, this would likely cause a delay.

Treatment Session UID is already present (Type 1) on the root level of the RT Radiation Record Common Module.

Decision to link Treatment Session with Series. Move Treatment Session UID to the following modules: General Series, RT Series, KOS Series, SR Document Series, and Encapsulated Document Series.

Uli to add text linking RT Treatment Session UID to a Treatment Session in Scheduled Procedure Step.in Section 7.14.10

WG-07 reviewed the CP again on 9/7/22

- Reviewed and revised text defining RT Treatment Session UID (300A,0700).
- Added RT Treatment Session UID to Scheduled Procedure Step Module, Modality Performed Procedure Step

**Decision:** Accepted for reading with WG-06 pending completion of edits by Uli.

**CP-2203 Add References between 1st and 2nd Gen Rad IODs**

Uli reviewed comments received for this CP, currently in letter ballot.

A comment (submitted by Hologic) regarding the approach used to reference from 2<sup>nd</sup> Gen into 1<sup>st</sup> Gen RT Plan and RT Beams Treatment Record was discussed. Text in section C.36.2.1.6.1 describing Sequence Attributes and Attributes containing the Referenced Number was revised.

Also, in C.8.8.21.n Definition Source Sequence, remove all but Section C.36.13.RT Radiation Common Module. **Decision:** Accepted for reading with WG-06.

### **CP-2220 Differentiate Geometric Types of CT Imaging Sources**

State? Will WG-2/21 look at this?

Shayna will make sure CP-2220 is on the agenda for the next WG-21 meeting.

### **CP-1319 Frame of Reference Reliability**

Uli reported on the status of this CP.

Adds Frame of Reference Evidence Macro to Frame of Reference Module to indicate that the Frame of Reference is reliably related (spatially and/or temporally) to a part of the image identified by a Position Reference Indicator.

**Decision:** Turn over further work on this CP to WG-02. Uli will inform WG-02 (and WG-06) that WG-07 is not specifically supporting the CP and that he will withdraw as assigned person.

## **IHE Sharazone Presentation (Steve Nichols)**

Steve Nichols presented an overview of IHE Sharazone test environment.

- Objective is to provide a public exchange of DICOM objects for interoperability testing.
- Safe, neutral test environment.
- Participants submit objects and test plan (“test suite”)
- Continuous access (24/7)
- Both commercial and open source products
- Launched November 1, 2021
- Process
  - Creator submits Share Test Input (Test items + test suite)
  - Consumer downloads test input, uploads test report
  - Creator reviews test report (only Creator, Consumer have access)
- Repository is Gazelle test environment
- Administrator facilitates and monitors testing (NDA + Contract)
- Test Report template is available in Gazelle
- Dialog via Rocket.Chat
- Annual participation fee for unlimited testing is based on company size and role
- Complementary to Connectathon: Sharazone tracks product versions, targets object content
- Currently ~30 systems are registered, 17 shared test inputs, 54 test reports
- Managed by IHE-Europe & operated by IHE Catalyst

### **Links:**

- Registration information: [https://www.ihe-europe.net/IHE\\_SHARAZONE](https://www.ihe-europe.net/IHE_SHARAZONE)
- Test instance: <https://sharazone.ihe-europe.net/gazelle/home.seam>
- Statistics: <https://sharazone.ihe-europe.net/statistics.html>

Steve will follow up with IHE-RO at the TC face-to-face meeting in October 2022.

*[Adjourned for the day 8/31/22 at 1:00pm EDT.]*

*[Resumed meeting 9/6/22 at 9:05am EDT.]*

## Hybrid Discussions Overview

### RT Plan

CP on reference 1<sup>st</sup> <--> 2<sup>nd</sup> Gen (2203)

CP on introducing the new BLD macro in the 1<sup>st</sup> Gen (2229)

Hybrid Plan document – Uli

- Renaming RT Prescription to RT Dose Reference/Tracking
- New Module called RT Prescription Overview containing all “prescription items” and to address IEC requirements and adding a reference to an RT Physician Intent Instance.

Topics for this meeting

- Discuss introducing Tomo in 1<sup>st</sup> Gen RT Plan – have a solution
- Discuss how to handle Robotic and lay out a path
- Discuss how to handle Multi-Source plans and lay out a path
- Discuss use of CV UID in RT Plan
- Prepare CP to discuss the use of the RT Treatment Preparation IOD (e.g., enable linking to 1<sup>st</sup> Gen) - Uli
- Prepare CP to discuss referencing multiple RTSS from Plan – Christof

Discussion of support for new (non-C-arm) machines.

- Separate (a) public information for everyone (e.g., TMS, QA applications) and (b) private information that is used by TDD alone.
  - Similar public/private representation for treatment record
  - Dose tracking does not require access to delivery details, but requires indices to Control Points.
  - Support for third party device integration

Suggestion for white paper on how 1<sup>st</sup> Gen RT Plan could be adapted for new machines.

- RT Plan extensions folder has been created in Teams: [RT Plan Extension in Wiki](#)
- Further discussion 9/7/22

*[Adjourned for the day 9/6/22 at 1:00pm EDT.]*

*[Resumed meeting 9/7/22 at 9:06am EDT.]*

Discussion of strategies for supporting new machines in the absence of 2<sup>nd</sup> Gen Information Objects.

Audience

- Goal is to extend RT Plan to contain all needed information for treatment delivery while maintaining interoperability with 3<sup>rd</sup> party devices for a subset of plan information.
- Need input from device manufacturers.

- Use cases include the following:
  - TMS (dose tracking)
  - 3<sup>rd</sup> party Plan QA
  - 3<sup>rd</sup> party Device QA
  - 3<sup>rd</sup> party Patient Positioning (imaging)
  - Delivery machines
  - (3<sup>rd</sup> party) TPS
  - Clinical trials / research / registries

#### Goals

- Extensibility of RT Plan
- Safety

#### Requirements

- Extensible model, also for new machines
- Re-use existing concepts
  - Cumulative Meterset Weight
  - Cumulative Dose Reference Coefficient
  - Isocenter?
- If possible, do not overload existing C-arm Control Points with non-C-arm concepts
- Reflect “dynamic” treatment machine
  - Do not instruct the details for the machine

#### Discussion of Approach

##### General approach

- Use flag to switch off unneeded attributes in RT Beams Sequence and include Modules with detailed plan payload
- For safety reasons, the scheme must break the existing Beam Sequence when using alternative beams.

WG-07 discussed a scheme for representing various C-arm and non-C-arm plans.

- General Plan
  - Simple Control Point Flag: True/False
  - Control Point Type Code: C-arm, Robotic, Tomotherapeutic, Multi-Source, Other
- Beams Sequence
  - Beam number
  - Switch off: Gantry Angle, Patient Support Angle, BLD Angle, Isocenter
  - Still use: Ref Dose Ref Sequence, Cumulative Meterset
- Robotic Sequence
  - Referenced Beam Number
  - Gantry Head Angle
  - Patient-Equipment Mapping
- Machine-Specific Beam Sequence (?)
  - Referenced Beam Number

- All other private stuff

#### Discussion of Strategies

Challenge of extending the Standard to support new treatment machines. The complexity of treatment plans makes this especially difficult. It is important to find a unified solution for communicating the needed plan (overview) information to TMS. Input is needed from TMS manufacturers: what information is needed to manage therapy?

#### ACTION ITEMS

1. **Action:** Jim and Kari to interview colleagues internally regarding their minimum need for plan/record information for their TMS.
2. **Action:** Jon to contact Viewray, Zap; Jim to contact GammaKnife; Christof to contact Reflexion to invite them to join the Oct/Nov 2022 WG-07 meeting.

#### RT Dose

Discussion was deferred to future meetings.

- Check DVH regarding multiple RT Structure Sets
- Renovate DVH Data
- Clean up current state of RT Dose in existing Supplement for review
- Discuss introducing an Enhanced DVH Module based on the 2<sup>nd</sup> Gen RT Dose Metrics.
- Latest document: [sup177 RTDose DoseObjects 3.docx](#)

#### Supplements

For a document overview see here:

[Project Status](#)

Supplement 213 – Enhanced RT Image

No update this meeting.

Supplement NNN – Assertion Collection

NWI to be discussed at the next DSC meeting in order to get a number assigned.

### **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

### WG-07 Online Meetings

- Oct 24 & 26, 2022, 9:00am – 1:00pm ET
- Nov 9-10, 2022, 9:00am – 1:00pm ET
- Dec 7-8, 2022, 9:00am – 1:00pm ET
- Mar 6-7, 2023, 9:00am – 1:00pm ET
- Mar 13-14, 2023, 9:00am – 1:00pm ET

Proposal for F2F meeting in June 2023 in Europe.

- Proposed dates: June 5-9, 2023
- Possible venues: Munich, Helsinki, or Stockholm.
- Other meetings:
  - WG-06: June 19-23, 2023 (location TBD)
  - PTCOG: June 11-17, 2023 (Madrid)

## **Appendix: General Information**

### **- Project List**

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

### **- Presentation Material for 2nd Generation RT Objects**

A folder on the FTP 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.

The August-September WG-07 meeting was adjourned on Wednesday, Sept. 7, 2022 at 12:52pm EDT.

Minutes prepared by Walter Bosch

Submitted by Shayna Knazik

Legal Bezalel Stern 1-23-23