

**IHE-RO Technical Committee  
Face-to-Face  
May 4-6, 2021 9:00-13:00 EST**

**Technical Committee Chairs:  
Scott Hadley, PhD  
John Treffert**

**IHERO Working Group Co-Chairs  
Bruce Curran, MS, ME, FAAPM, FACMP, FACR, AAPM / VCU Health  
Bridget Koontz, MD, Medical Director, RO Services, Duke Regional**

**Mission Statement:** *The American Association of Physicists in Medicine (AAPM) sponsors a multi-society Task Force to undertake an initiative to promote the Integration of the Healthcare Enterprise (IHE) – Radiation Oncology (RO). Originally formed by the American Society for Radiation Oncology (ASTRO), it fosters seamless connectivity and integration of radiotherapy equipment and the patient health information systems. The Technical Committee of IHE-RO will undertake use cases defined by members from ASTRO, RSNA, American Association of Physicists in Medicine (AAPM), the American College of Radiology (ACR) and the Medical Imaging and Technology Alliance (MITA). In addition, members of the International community have also been invited to participate in IHE-RO. The IHE-RO Task Force, in close collaboration with radiotherapy product manufacturers, will develop appropriate integration profiles for radiation therapy and setup a demonstration of seamless communication among the full array of radiotherapy products.*

**Attendees:**

Name	Affiliation	Email	5/4	5/5	5/6
Chris Pauer	Sun Nuclear	<a href="mailto:chrispauer@sunuclear.com">chrispauer@sunuclear.com</a>	X	X	X
Scott Hadley	U. Mich.	<a href="mailto:swhadley@umich.edu">swhadley@umich.edu</a>	X	X	X
Jon Treffert	Raysearch Labs	<a href="mailto:Jon.treffert@raysearchlabs.com">Jon.treffert@raysearchlabs.com</a>			
Jill Moton	AAPM	<a href="mailto:Jill@aapm.org">Jill@aapm.org</a>	X	X	X
Walter Bosch	Wash. Univ.	<a href="mailto:wbosch@wustl.edu">wbosch@wustl.edu</a>	X	X	X
Bruce Curran	AAPM / VCU	<a href="mailto:bhcurran@gmail.com">bhcurran@gmail.com</a>	X	X	X
Jim Percy	Elekta	<a href="mailto:Jim.percy@elekta.com">Jim.percy@elekta.com</a>	X	X	
Christof Schadt	Brainlab	<a href="mailto:Christof.schadt@brainlab.com">Christof.schadt@brainlab.com</a>	X		
Bruce Rakes	Mevion	<a href="mailto:rbrakes@mevion.com">rbrakes@mevion.com</a>	X	X	X
David Wikler	IBA	<a href="mailto:David.Wikler@iba-group.com">David.Wikler@iba-group.com</a>	X	X	X
Harold Beunk	ICT	<a href="mailto:Harold.Beunk@ict.nl">Harold.Beunk@ict.nl</a>	X	X	X
Thomas Schwere	Varian	<a href="mailto:Thomas.Schwere@varian.com">Thomas.Schwere@varian.com</a>	X	X	X
Bob Pekarek	Accuray	<a href="mailto:bpekarek@accuray.com">bpekarek@accuray.com</a>	X	X	X
Richard Voegele	Brainlab	<a href="mailto:richard.voegele@brainlab.com">richard.voegele@brainlab.com</a>	X	X	X
Stefan Pall Boman	Raysearch Labs	<a href="mailto:Stefan.p.boman@raysearchlabs.com">Stefan.p.boman@raysearchlabs.com</a>	X	X	X
Rickard Holmberg	Raysearch Labs	<a href="mailto:Rickard.Holmberg@raysearchlabs.com">Rickard.Holmberg@raysearchlabs.com</a>			
Marcus Bergman	Raysearch Labs	<a href="mailto:Marcus.bergman@raysearchlabs.com">Marcus.bergman@raysearchlabs.com</a>	X	X	X
Sanjay Bari	Elekta	<a href="mailto:Sanjay.Bari@elekta.com">Sanjay.Bari@elekta.com</a>	X	X	X
John Stamm	EPIC	<a href="mailto:jstamm@epic.com">jstamm@epic.com</a>		X	
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30 **Dropbox link:**

<https://www.dropbox.com/sh/mv6l6x9luga5057/AADo7nIowqqz8AdDsoDQRAv8a?dl=0>

35 **Minutes:**

I. Meeting was called to order at 9:05 am, May 4, 2021. A quorum was present.

II. Meeting Scope

A. Review Agenda

40 B. Minutes from the April 15, 2021 TC T-con were reviewed and approved without objection.

III. Topic 2: CP 2006

A. Christof Schadt reviewed DICOM CP-2006 (“Unattached Contours”) that extends the RT Structure Set with attributes that provides pixel-plane (position, orientation, and spacing) parameters and structure contours that need not coincide with image planes.

45 1. Christof described experience using this high-definition approach data to mitigate the loss of spatial information when representing small volumes when using RT Structure Set.

2. Christof’s presentation is to be shared on the IHE-RO DropBox.

B. This approach could be incorporated in an IHE-RO Profile to provide high-definition volume specification.

50 1. Argument that a separate high-resolution volume definition content Profile would be better than adding options to existing BRTO-\*.

C. DICOM WG-07 is working on extensions of several 1<sup>st</sup> Gen RT information objects, including RT Structure Set and RT Dose.

55 1. New IHE-RO content Profiles are needed to assure interoperable implementation of these extensions.

2. Suggestion to use TPPC (Content Profile with Producer and Consumer Actors).

a. Profile name TBD, e.g., “Treatment Planning Segmentation Content”.

b. Clinical Impact Statement?

c. Profile Champion?

60 IV. Topic 1: Level Set

A. Updates on IHE-RO Committees

B. ASTRO & AAPM

1. Proposed IHE-RO presentation at ASTRO 2021 Annual Meeting was not accepted.

C. DICOM WG-07 Update

65 1. WG-07 has reconsidered its approach to DICOM 2<sup>nd</sup> Gen RT, deciding to shift from a pure 2<sup>nd</sup> Gen effort and working on a hybrid solution that combines 1<sup>st</sup> and 2<sup>nd</sup> Gen concepts (with CPs, Supplements) to address current clinical needs.

D. Connectathon Testing & Results

70 1. The 2021A Connectathon report has been submitted and is awaiting presentation to IHE Testing and Tools Committee.

2. Connectathon vendor survey results were reviewed.

3. Logistics for a possible hybrid Connectathon were discussed.

a. Could use AAPM Conference Room for those who travel

b. Local network bandwidth limitations may be an issue.

75 c. Scheduling

i One week vs two weeks? Two weeks is better for remote, but may be problematic for those who travel.

ii Schedule Tues – Thurs (avoid Friday for Asia/Pacific participants)

4. VPN Agreement update

80 a. A draft of the VPN Agreement has been prepared and is nearly ready for distribution to vendors.

V. Topic 4: Future Meetings

- 85 A. AAPM Summer Meeting (July 25-29) will be virtual
1. TC Meeting tentatively set for July 19-22, 2021 (Jill to confirm)
- B. September Face-to-Face or still remote?
1. TC Meeting tentatively set for Sept 20-24, 2021
- C. 2021B Connectathon
1. Nov 8-10 (M-W) and 16-18 (Tu-Th), 2021
  2. Wrap-up Meeting Nov 22, 2021 9am-12pm ET
- 90 D. AAPM Spring Clinical Meeting (Mar 2022) – TBD

VI. Topic 6: Test Tools

- 95 A. Beam Dose Specification Point (300A,0082) has been retired in DICOM (CP 1879)
1. Consensus that the requirement that this attribute be present (Type R+) should be removed from TPPC.
  2. **ACTION 210501**: Jim to draft CP to update TPPC (and BRTO-II, TP\*, CDEB) to reflect DICOM CP 1879
- B. TDW-II Test Tool Issues from Connectathon (to be discussed with TDW-II, later in this meeting)
1. Discontinuation Reason – clarify Profile text to say what reasons are supported.
  2. N-SET Response – copy Attributes whose values have been changed
- 100

VII. Topic 8: TPPC-Brachy

- 105 A. Jim Percy reviewed v2.17 of the TPPC-Brachy Profile draft. This Profile includes content requirements for RT Plan, US Image, RT Structure Set.
1. TPPC-Brachy uses an Extended SOP Class for Ultrasound (adds Image Plane Module)
  2. The Profile defines Transactions to specify content requirements
  3. References DICOM 2021c edition (not yet released) – includes a relevant CP
  4. Review of Profile
    - a. US Image
      - i Add Image Plane Module (Image Orientation (Patient), Image Position (Patient), Pixel Spacing)
      - ii General Equipment Module (Manufacturer/Model/Software Version – refers to Equipment creating the Extended SOP Class).
        - Jim to add text in Base Content.
    - b. RT Dose – RT DVH Module
      - i Discussion regarding clinical usefulness of DVHs. Concern was expressed that removing this Module would be inappropriate.
    - c. RT Plan – review of attributes
    - d. RT Structure Set
      - i ROI Interpreted Type for brachy applicators and shields
      - ii Geometric type can be POINT, CLOSED\_PLANAR, OPEN\_NONPLANAR
  5. **ACTION 210502**: Jim to finish cleanup of TPPC-Brachy Profile for public comment review by TC at the July 2021 meeting.
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- 115
- 120

*Adjourned for the day 5/4/21 at 12:38pm ET*

*Resume meeting 5/5/21 at 9:06am ET*

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VIII. Topic 3: TDW-II (David)

- 130 A. David Wikler discussed issues for clarification in TDW-II (Revision 1.2)
- a. Requirements for UPS Progress Update
    - i The Profile requires a Referenced Beam Number to be included in the Procedure Step Progress Parameters Sequence for N-SET Progress Updates. However, the Beam Number may not be known in some use cases.
    - ii Final update of 100% indicates normal delivery. If final update is not 100%, then beam delivery is abnormal, i.e., cancelled.
    - iii If the TDD cancels the *session* before a beam is selected, *no Final Update is needed*. Requirements for cancellation prior to beam selection were discussed.
- 135

iv **ACTION 210503**: David to draft clarification for further discussion and review by the TC

#### IX. Topic 7: XRTS

- 140 A. Rishabh and Martin reported on progress in the Mitre/mCODE group
1. The group has developed a minimalist data model for the treatment summary use case.
  2. The group is also working on a prescription use case.
- B. Two levels of Treatment Summary are defined: Course and Treatment Phase
1. CodeX (Common Oncology Data Elements eXtensions) is an ASTRO-supported group that has developed minimum data elements for communication between RT vendors and EHRs
  - 145 2. FHIR standard mCODE – extensions to FHIR standard.
- C. Coding/Nomenclature
1. SNOMED code (subset) is available to use in IHE Profiles
- D. Communication model
1. Subscription for Treatment Summary Updates by a consumer
  - 150 2. Triggered reporting of updates by a provider
- E. Server Infrastructure: Open-source implementations are available
1. <https://confluence.hl7.org/display/FHIR/Open+Source+Implementations>
    - a. Include Validation Tool for Profile Resources?
    - b. Support subscription service?
- 155 F. Testing (Validation of Resources)
1. In the short term, it is expected that syntactic validation will be performed by manual testing of scenarios based on Resource Profiles.
- G. Development Plan
1. Initial implementation of End of Treatment Summary use case.
  - 160 2. Subsequent extension to include Prescription
- H. **ACTION 210504**: Test Committee to explore FHIR testing infrastructure
- I. **ACTION 210505**: Jill to add Jurgen Kerstna (jurg.kerstna@raysearchlabs.com) to Test Committee list

#### X. Topic 5: DRRO

- 165 A. Stina Svensson reviewed DRRO Profile draft (rev. 1.1) with the TC. This document (uploaded to wiki) has been revised in response to Public Comment.
1. Recommendation to require use of Frame of Reference Identity (125021) code (CID 7100) in MMRO-\* for the base FoR transformation code
  2. Safe handling of NaN values in the deformation map – no changes to DICOM requirements.
  - 170 3. Creator name is Type 2 (ok)
  4. Fiducials and structure tracing for deformation analysis is not supported.
  5. Post Deformation Matrix – if present, shall be Identity.
- B. **DECISION**: The DRRO Profile as reviewed (to be saved as 1.2) was approved for Trial Implementation by the TC without objection.
- 175 C. **ACTION 210506**: Jon Treffert to forward DRRO Profile rev 1.2 Mary Jungers.

#### XI. Topic 12: Patient Surface Scans

- A. Thomas Schwere discussed use cases for interoperable exchange of patient
1. Input for Treatment Planning
    - 180 a. Extending FOV of CT scan
    - b. Trajectory Optimization
    - c. Collision prevention
  2. Patient Positioning
  3. Surface-guided RT
  - 185 4. Post-treatment review of patient surfaces (for billing purposes)
  5. Patient identity verification
  6. 4D patient surfaces?
  7. 4D CBCT retrospectively using the real-time patient surfaces acquired during the acquisition
- B. Potential consumers
- 190 1. TDD (collision prevention)

2. 3<sup>rd</sup> part patient identification verification system
  3. TPS
  4. Ion: calculate the air gap
- C. Multiple vendors have surface scan applications. However, it appears they are using proprietary storage formats.
1. Brainlab
  2. C-RAD
  3. VisionRT
  4. Varian/IDENTIFY
  5. Siemens
  6. ...
- D. Several DICOM IODs could be used to represent surfaces
1. Surface Segmentation IOD (Surface Meshes)
  2. Surface Scan Mesh IOD (Surface Meshes)
  3. Surface Scan Point Cloud IOD (Unstructured Point Cloud)
- E. ACTION 210507: Scott to draft of a Clinical Impact Statement for Patient Surface Profile
- F. ACTION 210508: Bruce to communicate with AAPM corporate affiliates re interest in Patient Surface Profile

Adjourned for the day 5/5/21 at 12:04pm ET  
Resume meeting 5/6/21 at 9:09am ET

## XII. Topic 3: TDW-II (continued)

- A. Discussion regarding the requirement to indicate Referenced Beam Number in N-SET Update.
1. UPS Progress Update Trigger Events (section 3.62.4.1.1) was reviewed and changes to trigger events were considered.
  2. Indication of completion of delivery: Table 3.65.2-2 Status of (therapeutic) Tx Delivery, Note 1 states that the Procedure Step State is the indicator that the UPS was performed as expected. PS Progress equal to 100% at completion is good practice (but should not be relied upon as an indicator of completion).
  3. After a long discussion, it was decided to reconsider the requirement for Referenced Beam Number in N-SET Updates. This feature appears to be used by only one TMS for user display.
  4. Further work is needed to clarify issues and agree on a solution.
    - a. Conclusion that progress updates reflect UPS workflow, rather than dosimetry
    - b. Simplify Profile requirements, if possible
- B. ACTION 210509: David to forward document to Jill to place in DropBox (editable by TC members).
- C. ACTION 210510: Thomas to include TDW-II discussion in the next DPDW subgroup call on May 18.

## XIII. Topic 13: TDOR

- A. Thomas reviewed a draft (rev. 0.3) of the TDOR Profile.
- B. Re-use of TDW-II Actors
1. TDD, TMS, OST Actors can be reused for this Profile. The behavior of these Actors is specified in the context of this Profile.
- C. Transactions
1. Worklist Query for Treatment Delivery uses the same query requirements as for TDW-II. The returned Processing Parameters Sequence in the returned shall include Treatment Session UID.
- D. ACTION 210511: Thomas to use the latest version of TDW-II to update the TDOR Profile.

## XIV. Topic 10: ROTH

- A. Discussion was deferred.

## XV. Topic 14: DOSE

- A. Chris Pauer reviewed rev 0.04 of the Abbreviated Dose Reference (DOSE) Profile.
1. This is a content Profile that adds references to related DICOM instances in an RT Dose
    - a. CT References have been removed.
  2. How to indicate that an RT Dose Instance contains extended reference information?

- a. Use of new Defined Term(s) for Dose Summation Type was considered.
- 3. ACTION 210512: Chris to follow up with DICOM CP

XVI. Topic 9: TPPC-Ion

- 250 A. The TPPC-Ion Profile has been released for Public Comment (starts 5/7/21)
- B. Some open issues remain.
- C. Test Tool development will be needed to prepare for Connectathon testing.
  - 1. The Content Validator Test Tool includes support for TPPC-Ion
  - 2. Vendors should begin using the Content Validator.
- 255 D. Testing Issues
  - 1. Machine characterization.
    - a. Select machine for testing and distribute parameters
  - 2. Clinical/academic guidance
    - a. Clinical physicist input to provide domain expertise
    - 260 b. What plans to have vendors make?
    - c. What machine configurations to use?
  - 3. There may be 3-5 participants for informal testing

265 XVII. Topic 11: TDIC

- A. Discussion was deferred.

XVIII. Action Item Review

- 270 XIX. Meeting was adjourned at 1:00pm ET