

DICOM Correction Proposal

STATUS	Assigned
Date of Last Update	2019/03/29
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Correction Number	CP1721
Log Summary:	Clarification of Distances in Ion Beams
Name of Standard	PS 3.3 2019a
Rationale for Correction:	<p>Some accessories such as Block and Range Compensator can be attached directly or indirectly (through an Applicator) to a Snout.</p> <p>The relative position of these accessories relative to the Snout is fixed (for the scope of one beam), therefore with constant distance between them.</p> <p>However, Snout position (300A,030D) is defined at the Control Point level, meaning that it could vary within the Beam, while the equivalent information for the accessories such as Isocenter to Block Tray Distance (300A,00F7) and Isocenter to Compensator Distances, (300A,02E6) are defined at the Beam level, implying that they are constant for the whole beam.</p> <p>To resolve this apparent conflict, this CP clarifies the meaning of these Isocenter to beam modifier distances as being the value for the first Control Point.</p> <p>Further on, for beam modifiers whose distances are defined on control point level and which move with the snout, the relation of Snout Position and these distances is clarified.</p>
Correction Wording:	

In PS 3.3, change the following in C.8.8.25 RT Ion Beams Module

C.8.8.25 RT Ion Beams Module

The RT Ion Beams Module contains information defining equipment parameters for delivery of external Ion radiation beams.

Table C.8.8.25-1. RT Ion Beams Module Attributes

Attribute Name	Tag	Type	Description
Ion Beam Sequence	(300A,03A2)	1	Sequence of setup and/or treatment beams for current RT Ion Plan. One or more Items shall be included in this Sequence.
...			

Attribute Name	Tag	Type	Description
>Ion Beam Limiting Device Sequence	(300A,03A4)	3	Sequence of beam limiting device (collimator) jaw or leaf (element) sets. One or more Items are permitted in this Sequence.
...			
>>Isocenter to Beam Limiting Device Distance	(300A,00BB)	2	Isocenter to beam limiting device (collimator) distance (in mm) of the equipment that is to be used for beam delivery. See Section C.8.8.25.4 <u>and C.8.8.25.XX1</u>
...			
>Ion Wedge Sequence	(300A,03AA)	1C	Sequence of treatment wedges. Required if Number of Wedges (300A,00D0) is non-zero. The number of items shall be identical to the value of Number of Wedges (300A,00D0).
...			
>>Isocenter to Wedge Tray Distance	(300A,00D9)	1	Isocenter to downstream edge of wedge tray (mm). See Section C.8.8.25.4 <u>and C.8.8.25.XX1</u>
...			
>Ion Range Compensator Sequence	(300A,02EA)	1C	Sequence of compensators. Required if Number of Compensators (300A,00E0) is non-zero. The number of items shall be identical to the value of Number of Compensators (300A,00E0).
...			
>>Isocenter to Compensator Tray Distance	(300A,02E4)	1C	Isocenter to compensator tray attachment edge distance (in mm) for current range compensator. Required if Compensator Mounting Position (300A,02E1) is not DOUBLE_SIDED. See Section C.8.8.25.4 <u>and C.8.8.25.XX1</u>
...			
>>Isocenter to Compensator Distances	(300A,02E6)	1C	A data stream of the pixel samples that comprise the distance from the isocenter to the compensator surface closest to the radiation source (in mm). The order of pixels encoded is left to right, top to bottom (upper left pixel, followed by the remainder of row 1, followed by the remainder of the rows). Required if Material ID (300A,00E1) is non-zero length, and Compensator Mounting Position (300A,02E1) is DOUBLE_SIDED. See Section C.8.8.14.9 and Section C.8.8.25.4, <u>C.8.8.25.XX1 and C.8.8.25.XX2</u>
...			
>Ion Block Sequence	(300A,03A6)	1C	Sequence of blocks associated with Beam. Required if Number of Blocks (300A,00F0) is non-zero. The number of items shall be identical to the value

Attribute Name	Tag	Type	Description
			of Number of Blocks (300A,00F0).
...			
>>Isocenter to Block Tray Distance	(300A,00F7)	1	Isocenter to downstream edge of block tray (mm). See Section C.8.8.25.4 <u>and C.8.8.25.XX1</u>
..			
>>Block Data	(300A,0106)	1	A data stream of (x,y) pairs that comprise the block edge. The number of pairs shall be equal to Block Number of Points (300A,0104), and the vertices shall be interpreted as a closed polygon. Coordinates are projected onto the machine isocentric plane in the IEC BEAM LIMITING DEVICE coordinate system (mm). <u>See C.8.8.25.XX2</u>
...			
>Snout Sequence	(300A,030C)	3	Sequence of Snouts associated with Beam. Only a single item is permitted in this Sequence.
>>Snout ID	(300A,030F)	1	User or machine supplied identifier for Snout.
>>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader.
...			
>Applicator Sequence	(300A,0107)	3	Sequence of Applicators associated with Beam. Only a single item is permitted in this Sequence.
>>Applicator ID	(300A,0108)	1	User or machine supplied identifier for Applicator.
>>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader.
>>Applicator Type	(300A,0109)	1	Type of applicator. Defined Terms: ION_SQUARE square ion applicator ION_RECT rectangular ion applicator ION_CIRC circular ion applicator ION_SHORT short ion applicator ION_OPEN open (dummy) ion applicator INTRAOPERATIVE intraoperative (custom) applicator STEREOTACTIC stereotactic applicator
>>>Applicator Description	(300A,010A)	3	User-defined description for Applicator.
...			
>General Accessory Sequence	(300A,0420)	3	Introduces a Sequence of General Accessories associated with this Beam. One or more Items are permitted in this Sequence.
>>Source to General Accessory Distance	(300A,0425)	3	Radiation source to general accessory distance (in mm) for current accessory.
>>Isocenter to General	(yyyy,xxxx)	3	Isocenter to general accessory distance (in mm)

Attribute Name	Tag	Type	Description
<u>Accessory Distance</u>			<u>for current accessory.</u> <u>See C.8.8.25.XX1.</u>
...			
>Ion Control Point Sequence	(300A,03A8)	1	Sequence of machine configurations describing Ion treatment beam. The number of items shall be identical to the value of Number of Control Points (300A,0110). See Section C.8.8.25.7.
...			
>>Range Shifter Settings Sequence	(300A,0360)	1C	Sequence of Range Shifter settings for the current control point. One or more Items shall be included in this Sequence. Required for first item of Control Point Sequence if Number of Range Shifters (300A,0312) is non-zero, or if Range Shifter Setting (300A,0362) changes during Beam.
...			
>>>Isocenter to Range Shifter Distance	(300A,0364)	3	Isocenter to downstream edge of range shifter (mm) at current control point. See Section C.8.8.25.4 and section C.8.8.25.XX1
...			
>>Lateral Spreading Device Settings Sequence	(300A,0370)	1C	Sequence of Lateral Spreading Device settings for the current control point. One or more Items shall be included in this Sequence. Required for first item of Control Point Sequence if Number of Lateral Spreading Devices (300A,0330) is non-zero, or if Lateral Spreading Device Setting (300A,0372) changes during Beam.
...			
>>>Isocenter to Lateral Spreading Device Distance	(300A,0374)	3	Isocenter to downstream edge of Lateral Spreading Device (mm) at current control point. See Section C.8.8.25.4 and section C.8.8.25.XX1
...			
>>Range Modulator Settings Sequence	(300A,0380)	1C	Sequence of Range Modulator Settings for current control point. One or more Items shall be included in this Sequence. Required for first item of Control Point Sequence if Number of Range Modulators (300A,0340) is non-zero, or if Range Modulator Setting changes during Beam.
...			
>>>Isocenter to Range Modulator Distance	(300A,038A)	3	Isocenter to downstream edge of range modulator (mm) at current control point. See

Attribute Name	Tag	Type	Description
			Section C.8.8.25.4 and section C.8.8.25.XX1
...			
>>Snout Position	(300A,030D)	2C	Axial position of the snout (in mm) measured from isocenter to the downstream side of the snout (without consideration of variable length elements such as applicator, blocks, MLC and/or compensators). Required for first item in Control Point Sequence, or if Snout Position changes during Beam.
...			

C.8.8.25.1 Beam Identifying Information

...

C.8.8.25.XX1 Isocenter to accessory distance

Snout Position (300A,030D) is defined at the Control Point level and can therefore vary during the beam, causing all the accessories attached to the Snout (Applicator, Block, Compensator, etc.) to move as well.

For each accessory which is attached to the Snout and has its distance to isocenter defined at the Beam level (such as Isocenter to Beam Limiting Device Distance (300A,00BB), Isocenter to Compensator Tray Distance (300A,02E4), Isocenter to Block Tray Distance (300A,00F7)), the prescribed physical position of the accessory is defined at the first Control Point.

This is consistent with the approach used for Beam Limiting Device Boundaries and Positions (see C.8.8.25.3 Leaf Position Boundaries).

For accessories which is attached to the Snout whose distance is defined at the Control Point level, such as Isocenter to Lateral Spreading Device Distance (300A,0374) and Isocenter to Range Modulator Distance (300A,038A), and are attached to the Snout, both the Snout Position (300A,030D) and the accessory distance must change by the same amount.

C.8.8.25.XX2 Block and Compensator Data

Similarly to C.8.8.25.3, in the case where Snout Position (300A,030D) changes between control points, the scaling factor to be used to convert from DICOM data defined at the isocenter plane (such as Block Data (300A,0106) and Isocenter to Compensator Distances (300A,02E6)) to the physical dimension of the accessories is purely based on the Isocenter to Compensator Tray Distance (300A,02E4) and Isocenter to Compensator Distances (300A,02E6) defined at the beam level and should not take into account the possible effect of Snout Position (300A,030D) changes between Control Points.

<i>In PS 3.3, change the following in C.8.8.26 RT Ion Beams Session Record Module</i>

C.8.8.26 RT Ion Beams Session Record Module

Table C.8.8.26-1 specifies the Attributes that describe the measured and recorded settings acquired during Ion Radiation Treatments.

Table C.8.8.26-1. RT Ion Beams Session Record Module Attributes

Attribute Name	Tag	Type	Description
Referenced Fraction Group Number	(300C,0022)	3	Identifier of fraction group within referenced RT Ion Plan.
Number of Fractions Planned	(300A,0078)	2	Total number of treatments (fractions) planned for current fraction group.
Primary Dosimeter Unit	(300A,00B3)	1	Measurement unit of the machine dosimeter. Enumerated Values: MU Monitor Units NP Number of Particles
Treatment Session Ion Beam Sequence	(3008,0021)	1	Sequence of setup and/or treatment beams administered during treatment session. One or more Items shall be included in this Sequence.
>Referenced Beam Number	(300C,0006)	1	References Beam specified by Beam Number (300A,00C0) in Ion Beam Sequence (300A,03A2) in RT Ion Beams Module within the referenced RT Ion Plan.
...			
>General Accessory Sequence	(300A,0420)	3	A Sequence of General Accessories associated with this Beam. One or more Items are permitted in this Sequence.
>>General Accessory Number	(300A,0424)	1	Identification Number of the General Accessory. The value shall be unique within the Sequence.
>>General Accessory ID	(300A,0421)	1	User or machine supplied identifier for General Accessory.
>>General Accessory Description	(300A,0422)	3	User supplied description of General Accessory.
>>General Accessory Type	(300A,0423)	3	Specifies the type of accessory. Defined Terms: GRATICULE Accessory tray with a radio-opaque grid IMAGE_DETECTOR Image acquisition device positioned in the beam line RETICLE Accessory tray with radio-transparent markers or grid
>>Accessory Code	(300A,00F9)	3	Machine-readable identifier for this accessory
>>Source to General Accessory Distance	(300A,0425)	3	Radiation source to general accessory distance (in mm) for current accessory.
...			

Add to PS 3.6, Section 6, add the following new attributes:

<u>(xxxx,yyyy)</u>	<u>Isocenter to General Accessory Distance</u>	<u>IsocenterToGeneral AccessoryDistance</u>	<u>DS</u>	<u>1</u>
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