DICOM Correction Proposal

STATUS	Assigned
Date of Last Update	2024/03/01
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Correction Number CP-2373
Log Summary: Clarify Description related to Range Shifter Settings
Name of Standard PS3.3, PS3.6
Rationale for Correction: The description of the Range Shifter Type (300A,0320) in RT Ion Beams Module lists two Defined Terms which are ambiguous and therefore different vendors could pick different values. The original intent was that ANALOG encoding can be used for devices that can be programmed to provide one of multiple thicknesses. BINARY encoding can be used for devices that can be programmed to combine one or more slabs of different thicknesses. These slabs can be individually moved into or out of the beam path, each slab being encoded as 0 for out of the beam path and 1 for in the beam path. Devices inserted by hand by the user are typically identified by a barcode ID and set to either IN or OUT of the beam path. This correction proposal clarifies the description of Range Shifter Type (300A,0320) and Range Shifter Setting (300A,0362), it also fixes the inappropriate use of the enumerated values IN or OUT in C.8.8.25.5.
Correction Wording:

In PS 3.3, section C.8.8.25 RT Ion Beams Module, perform the following modifications

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
>Range Shifter Sequence	(300A,0314)	1C	Sequence of range shifters associated with Beam. Required if Number of Range Shifters (300A,0312) is non-zero. The number of Items shall be identical to the value of Number of Range Shifters (300A,0312).
>>Range Shifter Number	(300A,0316)	1	Identification number of the Range Shifter. The value of Range Shifter Number (300A,0316) shall be unique within the Beam in which it is created.
>>Range Shifter ID	(300A,0318)	1	User or machine supplied identifier for Range Shifter.
>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader.

Attribute Name	Tag	Type	Description
>>Range Shifter Type	(300A,0320)	1	**Encoding t~~T~~**ype of the Range Shifter **Setting (300A,0362) value**. Defined Terms: **ANALOG** **~~Device is variable thickness and is composed of opposing sliding wedges, water column or similar mechanism.~~The Range Shifter Setting value selects the applied thickness of a device.** **BINARY** **~~Device is composed of different thickness materials that can be moved in or out of the beam in various stepped combinations.~~Each digit of the Range Shifter Setting value selects the insertion of one slab of material into the beam path.** **See Section C.8.8.25.5**
>>Material ID	**(300A,00E1)**	**3**	**User-supplied identifier for material of the range shifter**
>>Material Density	**(gggg,eeee)**	**3**	**Physical density of the range shifter in g/cm³**
…			
>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.
>>>Referenced Range Shifter Number	(300C,0100)	1	Uniquely references Range Shifter described by Range Shifter Number (300A,0316) in Range Shifter Sequence (300A,0314).
>>>Range Shifter Setting	(300A,0362)	1	**Specifies the presence or thickness of~~Machine specific setting Attribute for~~** the range shifter. The specific encoding of this value **is machine specific and shall~~should~~** be documented in a Conformance Statement. See Section C.8.8.25.5
>>>Isocenter to Range Shifter Distance	(300A,0364)	3	Isocenter to downstream edge of range shifter (mm) at current control point. See

Attribute Name	Tag	Type	Description
			Section C.8.8.25.4 and Section C.8.8.25.10
>>>Range Shifter Water Equivalent Thickness	(300A,0366)	3	Water equivalent thickness (in mm) of the range shifter at the central axis for the beam energy incident upon the device.
…			
>>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.
…			
>>>Lateral Spreading Device Setting	(300A,0372)	1	**Specifies the presence or characteristics of~~Machine specific setting Attribute for~~** the lateral spreading device.~~-~~The specific encoding of this value **is machine specific and shall~~should~~** be documented in a Conformance Statement. See Section C.8.8.25.5
…			

In PS 3.3, section C.8.8.25.5 Range Shifter and Lateral Spreading Device Settings, perform the following modifications.

C.8.8.25.5 Range Shifter and Lateral Spreading Device Settings

The Range Shifter and Lateral Spreading Device Settings Attributes are used to **either specify the presence of the device or to set**~~capture~~ machine~~--~~specific values related to these devices.

For example, some machines **use devices of variable thickness such as opposing sliding wedges, water column or similar mechanisms and** may specify the Range Shifter setting as the desired Water-Equivalent Thickness (in mm) **or as the position of the device mechanism**. **Such encoding is generally defined as ANALOG where the value selects the applied thickness of a device.** Other~~s~~ **machines may** contain a series of interchangeable plates, whose position in or out of the beam is specified by a series of ones and zeros (i.e., 100010 would specify that plates #1 and #5 are in the beam). **Such encoding could be defined as BINARY where the value selects the insertion of each plate.**

~~**If the device does not use a specific setting, but rather is defined by the ID, then the Enumerated Values IN/OUT shall be used for the setting**~~

In PS 3.3, section C.8.8.26 RT Ion Beams Session Record Module, perform the following modifications

Table C.8.8.26-1 specifies the Attributes of the RT Ion Beams Session Record Module, which 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
>Recorded Range Shifter Sequence	(3008,00F2)	1C	Sequence of range shifters recorded with Beam. Required if Number of Range Shifters (300A,0312) is non-zero. One or more Items shall be included in this Sequence. The number of Items shall be identical to the value of Number of Range Shifters (300A,0312).
>>Referenced Range Shifter Number	(300C,0100)	1	Uniquely identifies range shifter specified by Range Shifter Number (300A,0316) within Beam referenced by Referenced Beam Number (300C,0006).
>>Range Shifter ID	(300A,0318)	1	User or machine supplied identifier for Range Modulator.
>>Accessory Code	(300A,00F9)	3	An accessory identifier to be read by a device such as a bar code reader.
…			
>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 Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Range Shifter Setting (300A,0362) changes during beam administration, and Number of Range Shifters (300A,0312) is non-zero.
>>>Referenced Range Shifter Number	(300C,0100)	1	Uniquely references Range Shifter described by Range Shifter Number (300A,0316) in Range Shifter Sequence (300A,0314).
>>>Range Shifter Setting	(300A,0362)	1	**Specifies the presence or thickness of**~~**Machine specific setting Attribute for**~~ the range shifter. The specific encoding of this value **is machine specific and shall**~~**should**~~ be documented in a Conformance Statement. See Section C.8.8.25.5

Attribute Name	Tag	Type	Description
>>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 Control Point 0 of Ion Control Point Delivery Sequence (3008,0041) or if Lateral Spreading Device Setting (300A,0372) changes during beam administration, and Number of Lateral Spreading Devices (300A,0330) is non-zero.
>>>Referenced Lateral Spreading Device Number	(300C,0102)	1	Uniquely references Lateral Spreading Device described by Lateral Spreading Device Number (300A,0334) in Lateral Spreading Device Sequence (300A,0332).
>>>Lateral Spreading Device Setting	(300A,0372)	1	**Specifies the presence or characteristics of~~Machine-specific setting Attribute for~~** the lateral spreading device. The specific encoding of this value **is machine specific and shall~~should~~** be documented in a Conformance Statement. See Section C.8.8.25.5.
…			

In PS 3.6, section 6. Registry of DICOM Data Elements, add the following

Table 6-1. Registry of DICOM Data Elements

Tag	Name	Keyword	VR	VM	
(gggg,eeee)	Material Density	MaterialDensity	FL	1	