

DICOM Correction Item

Correction Number CP 794	
Log Summary: Clarification of Ion Control Point Sequence	
Type of Modification Clarification	Name of Standard PS 3.3, 2007
<p>Rationale for Correction:</p> <p>The RT Ion Beams module was initially structured based on the RT Beams module. In the RT Beams module, the representation of Control Point parameters is defined and several examples illustrating their use are given. The RT Ion Beams section does not reference these examples and definitions.</p> <p>In the ion community, a common understanding of the Control Point Sequence design (as used in the RT Beams and RT Ion Beams modules) is not present. This has led to some uncertainty about the use of control points to define physical and geometrical parameters at the Control Points. Those values are highly critical for treatments and must be understood correctly and be used in a vendor-independent and release-independent way. The following paragraphs add some explicit clarification using an Ion Beam example to directly illustrate the proper use of Control Points (similarly to what is done for RT Beams).</p>	
<p>Sections of documents affected</p> <p>PS 3.3</p>	
Correction Wording:	

In PS 3.3, Section C.8.8.25 RT Ion Beams Module, add a reference to the new section in Table C.8.8.25-1 and add the following paragraphs after paragraph C.8.8.25.6.5 Gantry Pitch Angle

**Table C.8.8.25-1
 RT ION BEAMS MODULE ATTRIBUTES**

Attribute Name	Tag	Type	Description
...			
>Ion Control Point Sequence	(300A,03A8)	1	Introduces 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 C.8.8.25.7.

C.8.8.25.7 Ion Control Point Sequence

The control point sequence for RT Ion Beams is defined using the same rule set as in the RT Beams module (see Section C.8.8.14.5 Control Point Sequence). Specifically, the following rules apply:

- All parameters that change at any control point of a given beam shall be specified explicitly at all control points (including those preceding the change).
- All parameters of an irradiation segment (i.e. with values of the Cumulative Meterset Weight (300A,0134) different at the beginning and at the end of the segment) shall therefore be specified in 2 separate control points denoting the beginning and at the end of this segment. Each irradiation segment is therefore represented by 2 control points.
- Parameters changing during the segment shall be represented by their different values at those control points. Parameters which do not change during the segment shall be represented with equal values at both control points (unless they are constant for all control points of the beam). For example, a beam delivery involving two independent irradiation segments will require 4 control points. Control Points 0 and 1 define the first irradiation segment. Between control points 1 and 2, no radiation is given (meterset is constant), but other parameters may change. Finally, the second irradiation segment occurs between control points 2 and 3.

This definition allows unambiguous and explicit determination of those parameters changing while irradiation is occurring, as opposed to those parameters that change between irradiation segments. No assumptions are made about the behavior of machine parameters between specified control points, and communicating devices shall agree on this behavior outside the standard.

The following example illustrates this rule (not all parameters are shown), in the case of a scanning beam with 2 segments and Total Cumulative Meterset of 70.

Control Point 0: All applicable treatment parameters defined, Cumulative Meterset Weight = 0

Nominal Energy: 200

Scan Spot Position Map: -40, -35, -40, -30 (Positions for 1st segment)

Scan Spot Meterset Weight: 0.5, 0.3, 1.2, (Values add up to meterset difference between Control Points 0 and 1)

Control Point 1: All applicable treatment parameters defined, Cumulative Meterset Weight = 30.0

Nominal Energy: 200

Scan Spot Position Map: -40, -35, -40, -30 (Positions for 1st segment)

Scan Spot Meterset Weight:

0.0, 0.0, 0.0, ... (All values are 0.0, because Meterset Weight difference between Control Point 1 and 2 is 0.0)

Control Point 2: All applicable treatment parameters defined, Cumulative Meterset Weight = 30.0

Nominal Energy: 180

Scan Spot Position Map: -55, -40, -55, -35, (Positions for 2nd segment)

Spot Meterset Weight: 0.7, 0.8, 1.5 (Values add up to meterset difference between Control Points 2 and 3)

Control Point 3: All applicable treatment parameters defined, Cumulative Meterset Weight = 70.0

Nominal Energy: 180

Scan Spot Position Map: -55, -40, -55, -35, (Positions for 2nd segment)

Spot Meterset Weight: 0.0, 0.0, 0.0, (All values are 0.0, because there is no following control point (end of sequence)).