

DICOM Correction Item

Correction Number CP 795	
Log Summary: RT Leaf Position Note	
Type of Modification Addition	Name of Standard PS 3.3, 2007
Rationale for Correction: MLC boundaries and positions are defined at the plane of isocenter. However, in Ion Therapy, the snout/collimator may be rotated and the effects of different X/Y Virtual SADs must be taken into account. In addition, clarification is needed about the effect of MLC leaf position boundaries when the snout position is changed (e.g. Source-to-MLC distance may be changed). This CP adds clarification to an existing narrative text section.	
Sections of documents affected PS 3.3	
Correction Wording:	

In PS3.3 Section C.8.8.25.3 Leaf Position Boundaries, add the following new (bold-underlined) text:

C.8.8.25.3 Leaf Position Boundaries

The Leaf Position Boundaries (300A,00BE) shall be the positions of the mechanical boundaries (projected to the isocentric plane) between beam limiting device (collimator) leaves, fixed for a given beam limiting device (collimator). Leaf/Jaw Positions (300A,011C) are values specific to a given control point, specifying the beam limiting device (collimator) leaf (element) openings.

In an RT Ion Plan, the Virtual SAD can have different values along the X/Y axes (see C.8.8.25.4). Thus the effects of possibly different X/Y SADs shall be taken into account when leaf position boundaries and leaf/jaw positions are projected from the virtual source to the plane of isocenter.

Leaf Position Boundaries (300A,00BE), are outside the control point sequence, which may define a collimator rotation. Therefore their values shall be defined for a collimator angle of 0 Deg IEC nominal position). For rotated collimators, the leaf position calculation is as follows: Define M_x and M_y as the magnification factors for the scaling of the leaf positions from their real space position to the isocenter plane. M_x and M_y are calculated from the virtual SADs VSAD_x or VSAD_y, respectively, and the Isocenter to Beam Limiting Device Distance (300A,00BB).

$$M_x = \frac{\text{VirtualSAD}_x}{\text{VirtualSAD}_x - \text{IsocenterToBeamLimitingDeviceDistance}}$$

The magnification factor M_α for an arbitrary beam limiting device angle α then becomes:

$$M_\alpha = \frac{x \cdot y}{\sqrt{x^2 \cos(\alpha)^2 + y^2 \sin(\alpha)^2}}$$

The Snout Position (300A,030D) may be changed between beams, and possibly between control points as well. This results in different effective isocenter to beam limiting device distances and thus leaf position boundaries for the same physical beam limiting device for each beam and possibly control points.

The values for Beam Limiting Device Distances (300A,00BB) and Leaf Position Boundaries (300A,00BE) are defined outside the control point sequence. Therefore the Isocenter to Beam Limiting Device Distance (300A,00BB) and the Leaf Position Boundaries (300A,00BE) shall be defined to apply to the first control point of the respective beam. If the snout position changes for subsequent control points, this must be taken into account for the projection of the leaf/jaw positions (i.e. replace *IsocenterToBeamLimitingDeviceDistance* in the above formula by the effective distance as calculated from the shift in snout position).