

## DICOM Correction Item

Correction Number CP-484	
Log Summary: RT Brachytherapy Source Strength	
Type of Modification	Name of Standard
Omission	PS 3 2004
<p>Rationale for Correction:</p> <p>The item Reference Air Kerma Rate (300A,022A) is only applicable if the Source is a Gamma emitting Source. For Beta emitting Sources the Source Strength is specified as dose rate in water at a specified reference point. The standard needs to be modified to account for Beta-emitting sources. The modifications in this Change Proposal add this support without invalidating existing implementations that support non-gamma sources.</p>	
<p>Sections of documents affected</p> <p>PS 3.3, C.8.8 (Radiotherapy modules) PS 3.6 Section 6 (Registry of DICOM Data Elements)</p>	
Correction Wording:	

***In PS 3.3, C.8.8.15, RT Brachy Application Setups Module, Table C.8-51 (RT Brachy Application Setups Module Attributes), add or modify the following attributes as indicated in bold:***

Attribute Name	Tag	Type	Attribute Description
Source Sequence	(300A,0210)	1	Introduces Sequence of Sources to be used within Application Setups. One or more items may be included in this sequence.
...	...	...	...
>Source Isotope Half Life	(300A,0228)	1	Half-life of Isotope (days).
<b>&gt;Source Strength Unit</b>	<b>(300A,0229)</b>	<b>1C</b>	<p><b><u>Measurement unit of Source Strength.</u></b>  <b><u>Required if the source is not a gamma-emitting (photon) source. May be present otherwise.</u></b>  <b><u>Enumerated Values:</u></b>  <b><u>AIR KERMA RATE = Air Kerma Rate if Source is Gamma emitting Isotope.</u></b>  <b><u>DOSE RATE WATER = Dose Rate in Water if Source is Beta emitting Isotope.</u></b></p>
>Reference Air Kerma Rate	(300A,022A)	1	Air Kerma Rate in air of Isotope specified at Air Kerma Rate Reference Date (300A,022C) and Air Kerma Rate Reference Time (300A,022E) (in $\mu\text{Gy h}^{-1}$ at 1 m). <b><u>Value shall be zero for non-gamma sources.</u></b>

> <b>Source Strength</b>	<b>(300A,022B)</b>	<b>1C</b>	<b>Source Strength of Isotope at Source Strength Reference Date (300A,022C) and Source Strength Reference Time (300A,022E), in units specified in Source Strength Unit (300A,0229).</b> <b>Required if the source is not a gamma-emitting (photon) source. See C.8.8.15.12.</b>
>Air Kerma Rate <b>Source Strength</b> Reference Date	(300A,022C)	1	Reference date <b>for</b> Reference Air Kerma Rate (300A,022A) <b>or Source Strength (300A,022B)</b> of Isotope.
>Air Kerma Rate <b>Source Strength</b> Reference Time	(300A,022E)	1	Reference time <b>for</b> Reference Air Kerma Rate (300A,022A) or <b>Source Strength (300A,022B)</b> of Isotope.
...	...	...	...
>Total Reference Air Kerma	(300A,0250)	1	Total Reference Air Kerma for current Application Setup, i.e. the product of Air Kerma Rate of all Sources in all Channels with their respective Channel Times ( $\mu\text{Gy}$ at 1 m). <b>Value shall be zero for non-gamma sources.</b>

***In PS 3.3,C.8.8.22, RT Brachy Session Record Module, Table C.8-58 (RT Brachy Session Record Module Attributes), add or modify the following attributes as indicated in bold:***

Attribute Name	Tag	Type	Attribute Description
Recorded Source Sequence	(3008,0100)	1	Introduces Sequence of Sources to be used within Application Setups. One or more items may be included in this sequence.
...	...	...	...
>Source Isotope Half Life	(300A,0228)	1	Half-life of Isotope (days).
> <b>Source Strength Unit</b>	<b>(300A,0229)</b>	<b>1C</b>	<b>Measurement unit of Source Strength.</b> <b>Required if the source is not a gamma-emitting (photon) source. May be present otherwise.</b> <b>Enumerated Values:</b> <b><u>AIR KERMA RATE = Air Kerma Rate if Source is Gamma emitting Isotope.</u></b> <b><u>DOSE RATE WATER = Dose Rate in Water if Source is Beta emitting Isotope.</u></b>
>Reference Air Kerma Rate	(300A,022A)	1	Air Kerma Rate in air of Isotope specified at Air Kerma Rate Reference Date (300A,022C) and Air Kerma Rate Reference Time (300A,022E) (in $\mu\text{Gy h}^{-1}$ at 1 m). <b>Value shall be zero for non-gamma sources.</b>

> <u>Source Strength</u>	<u>(300A,022B)</u>	<u>1C</u>	<u>Source Strength of Isotope at Source Strength Reference Date (300A,022C) and Source Strength Reference Time (300A,022E), in units specified in Source Strength Unit (300A,0229).</u> <u>Required if the source is not a gamma-emitting (photon) source. See C.8.8.15.12.</u>
>Air Kerma Rate <u>Source Strength</u> Reference Date	(300A,022C)	1	Reference date <b>for</b> Reference Air Kerma Rate (300A,022A) <b>or Source Strength (300A,022B)</b> of Isotope.
>Air Kerma Rate <u>Source Strength</u> Reference Time	(300A,022E)	1	Reference time <b>for</b> Reference Air Kerma Rate (300A,022A) <b>or Source Strength (300A,022B)</b> of Isotope.
...	...	...	...
>Total Reference Air Kerma	(300A,0250)	1	Total Reference Air Kerma for current Application Setup, i.e. the product of Air Kerma Rate of all Sources in all Channels with their respective Channel Times ( $\mu\text{Gy}$ at 1 m). <b>Value shall be zero for non-gamma sources.</b>

*In PS 3.3, add the following note after C.8.8.15.11:*

**C.8.8.15.12 Reference Point for calibration of beta emitting isotopes**

**For beta emitting isotopes, the Source Strength (300A,022B) shall be defined at reference point  $(r_0, \theta_0)$ , where  $r_0$  is the radial distance of 2 mm from the source longitudinal axis, and  $\theta_0$  is the angle of 90 degrees between the source longitudinal axis and the line defined by the center of the source and the reference point. Refer to:**

- **IEC 60601-2-17 (Medical electrical equipment – Particular requirements for the safety of automatically-controlled brachytherapy afterloading equipment), where the beta source strength is defined as: ABSORBED DOSE RATE [ $\text{Gy s}^{-1}$ ] in water at 2 mm along the perpendicular bisector from a RADIOACTIVE SOURCE emitting beta RADIATION.**
- **Nath et. al.: Intravascular brachytherapy physics: Report of the AAPM Radiation Therapy Committee Task Group No. 60, Med. Phys 26 (2) Feb 1999, pp 119-152.**

*In PS3.6, Section 6, add the following new attributes:*

Tag	Name	VR	VM
<u>(300A,0229)</u>	<u>Source Strength Unit</u>	<u>CS</u>	<u>1</u>
<u>(300A,022B)</u>	<u>Source Strength</u>	<u>DS</u>	<u>1</u>

*In PS3.6, Section 6, modify the following attributes as indicated in bold:*

Tag	Name	VR	VM
(300A,022C)	Air Kerma Rate <b>Source Strength</b> Reference Date	DA	1
(300A,022E)	Air Kerma Rate <b>Source Strength</b> Reference Time	TM	1