

## Comparison of Beam Parameter Equations for Photons

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Set	Vendor	Flatness (Homogeneity)	Symmetry	Deviation
AFSSAPS-JORF	IBA	$\frac{100}{D_{CAX}} \cdot \frac{D_{Max} + D_{Min}}{2}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	$100 \cdot \left( \frac{D_{Max}}{D_{CAX}} \right) \quad (1)$
	PTW	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)} \right] \quad (2)$	$\frac{D_{Max}}{D_{CAX}}$
	SNC	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	$100 \cdot \frac{D(-FS/3)}{D(FS/3)} \quad (6)$
DIN (7)	IBA	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	
	SNC	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	
IEC 60976	IBA	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	$100 \cdot \max \left[ \frac{ D_{Min} - D_{CAX} }{D_{CAX}}, \frac{ D_{Max} - D_{CAX} }{D_{CAX}} \right] \quad (1)$
	PTW	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)} \right] \quad (2)$	$\frac{D_{Max}}{D_{CAX}}$
	SNC	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	$100 \cdot \max \left[ \frac{ D_{Min} - D_{CAX} }{D_{CAX}}, \frac{ D_{Max} - D_{CAX} }{D_{CAX}} \right]$
Elekta	IBA	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	$100 \cdot \frac{(D_{Max} - D_{Min})}{D_{CAX}}$
	PTW	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)} \right] \quad (2)$	

	SNC	$100 \cdot \frac{D_{Max}}{D_{Min}}$	$100 \cdot \max \left[ \frac{D(-x)}{D(x)}, \frac{D(x)}{D(-x)} \right]$	$100 \cdot \max \left[ \frac{ D_{Min} - D_{CAX} }{D_{CAX}}, \frac{ D_{Max} - D_{CAX} }{D_{CAX}} \right]$
Siemens	IBA	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}}$	$100 \cdot \frac{ AreaL - AreaR }{(AreaL + AreaR)/2}$	$100 \cdot \left( \frac{D_{Max}}{D_{CAX}} \right)$
	PTW	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}} \quad (3)$	$100 \cdot \frac{ AreaL - AreaR }{(AreaL + AreaR)} \quad (4)$	
	SNC	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}}$	$100 \cdot \frac{ AreaL - AreaR }{(AreaL + AreaR)}$	$100 \cdot \left( \frac{D_{Max}}{D_{CAX}} \right)$
Varian	IBA	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}}$	$100 \cdot \max \frac{ D(-x) - D(x) }{D_{CAX}}$	
	PTW	$\frac{100}{D_{CAX}} \cdot \frac{D_{Max} - D_{Min}}{2} \quad (5)$	$100 \cdot \max \frac{ D(-x) - D(x) }{D_{CAX}} \quad (5)$	
	SNC	$100 \cdot \frac{D_{Max} - D_{Min}}{D_{Max} + D_{Min}}$	$100 \cdot \max \frac{ D(-x) - D(x) }{D_{CAX}}$	

#### Where:

REdge is the first position where the dose value reaches 50% of the CAX dose right of the CAX.

LEdge is the first position where the dose value reaches 50% of the CAX dose left of the CAX.

80% is the first position where the dose value reaches 80% of the CAX dose. Usually calculated separately for positions left and right of CAX.

20% is the first position where the dose value reaches 20% of the CAX dose. Usually calculated separately for positions left and right of CAX.

$D_{Max}$  maximum dose within the flattened area.

$D_{Min}$  minimum dose within the flattened area.

CAX is the position of the central axis. This is usually the defined axis of the linac. It is usually assumed that the detector has been aligned with this axis so that the centre of the detector corresponds to CAX.

$D_{CAX}$  dose at the central axis point. Practically the dose at the middle of the detector.

$D(x)$  dose at point x away from CAX

$D(-x)$  dose at symmetric point -x away from CAX

#### General Notes:

Empty cells have no parameter definitions for that vendor/parameter.

All vendors calculate field size at 50% of CAX value.  $FS = |REdge - LEdge|$

Field centre is  $FC = \frac{REdge + LEdge}{2}$

PTW automatically corrects for central axis deviation.

IBA does not correct symmetry for central axis deviation.

IBA uses nominal field size

**Specific Notes:**

(1) The definition of this parameter in the IBA manual is unclear.

(2) This definition is one sided. The DataAnalyze software correctly calculates both sides and the equation should be similar to the IBA.

(3) The help specifies  $100 \cdot \frac{D_{Max}}{D_{Min}}$ , but the software is set to this definition.

(4) This definition gives half the value of the IBA definition.

(5) PTW definition does not show normalisation to CAX.

(6) This differs considerably from other definitions. BeamScheme currently does not expose the FS/3 value.

(7) PTW does not define parameters for DIN.