Beam Data Collection List for DIAMOND

Version 5.2 or higher

1 General

DIAMOND requires base data for calculation for each therapy treatment unit. General machine data and measured beam data are required. Data are similar as for a TPS. Due to simplified and transparent algorithms, less beam data are required for DIAMOND. Field sizes (FS) and depths in the lists below are recommended and can be changed depending on the requirements for the used treatment technique.

Additional information about the beam data collection and calculation background can be found in the DIAMOND user's manual.

2 Getting Started with a Treatment Machine

Please ask PTW for a standard treatment machine for the used machine type, MLC type and energies. The machine in DIAMOND can be imported as a file which can be send by email. This is a good start, which can be optimized by individual beam data sets of the local machine. The individual data sets can be transferred easily by coping data from excel tables into the data tables of the machine in DIAMOND. All machine data tables can be exported and imported with "Ctrl+C" and "Ctrl+V" in DIAMOND.

MEPHYSTO table generator can be used to generate the required tables easily if beam data are available in PTW mcc format.

Data can also be sent to PTW for machine generation. In general beam data should be in ASCII format, other formats on request.

3 Machine Data

Type	Description
Machine	Type and name in DIAMOND
MLC	Type, number, thickness and width of the leaves
Radiation Qualities	Energies for photons and electrons
Wedges	Wedge types, names, angles and orientations
Applicators	Applicator sizes
Coordinate system	Rotation direction of collimator, gantry and couch, jaw names and orientations

4 Beam Data

4.1 Photons

4.1.1 Open Field

Data set is required for each energy with and without flattening filter.

Data Type	Description
PDD	Squared FS (2, 3, 4, 6, 8, 10, 12, 15, 20 …to max.) cm at SSD (90 or 100) cm
Profiles (half sided)	Max. squared FS at depths (dmax, 5, 10, 20, 30) cm at SSD (90 or 100) cm
Sc* (coll. scatter)	Squared FS (2, 3, 4, 6, 8, 10, 12, 15, 20 … to max.) cm in air at SAD*
Scp (total scatter)	Measurement in water same FS as used for Sc measurement at SAD, depth 10 cm
Sp (phantom scatter)	To calculate: Sp(FS) = Scp(FS) / Sc(FS)
Calibration	cGy/Mu for FS 10 cm at reference depth in SAD or SSD 100 cm
Tray factor	One factor for each tray holder

4.1.2 Wedge Field

Data set is required for each energy and each wedge angle.

Data Type	Description for hard wedges
Wedge factors	*Squared FS (5, 10, 15, 20, 30 and max.) cm at SSD (90 or 100) cm at depths (dmax, 5, 10, 20, 30) cm (at least one depth)*
Wedge profiles	Max. FS at depths (dmax, 5, 10, 20, 30) cm

Other wedge types:

EDW (Varian):	Gold standard table from Varian can be used, delivered with DIAMOND Installation, no measured data required
Virtual Wedge (Siemens):	Wedge factors as hard wedges (dose rates for wedge angles required)
Motorized Wedge (Elekta):	See table hard wedge above, data for 60° wedge angle required

4.1.3 Transmission and Optional Penumbra Optimization for IMRT

Data Type	Description
Transmission	Values for jaws, blocks, through leaf and inter leaf transmission of the MLC
MLC penumbra** optimization for IMRT	Squared FS of 4 cm (MLC) and 20 cm (jaws) at depth 10 cm and SSD 90 cm Profile with complete penumbra (12 cm scans half sided X and Y)**

4.2 Electrons

Three different electron calculations methods are possible in DIAMOND:

1) Simple: Electron calculations with output factors for each applicator/insert combination

2) Extended: Electron Output Factors (OF) like Simple Electron calculation but with the ability to enter output factors versus equivalent square values to allow the interpolation of output factors

3) MDA***: Extended Electron Output Factors plus electron depth dose data for each energy and electron air gap data for each energy***

Data Type	Description
Output factors	1) for each applicator/insert combination at each used SSD 2) for each applicator and equivalent insert? field sizes at each used SSD 3) min. to max. used squared insert for each applicator Electron applicator insert sizes @ 100 cm: 6x6: 2, 3, 4, 5, 6 10x10: 2, 3, 4, 6, 8, 10 15x15: 2, 3, 4, 6, 8, 10, 12, 15 20x20: 2, 3, 4, 6, 8, 10, 12, 15, 20 25x25: 2, 3, 4, 6, 8, 10, 12, 15, 20, 25
Virtual SSD	1) and 2) for each cone and energy, or only for each energy
Air gap factors	3) no measurement required, will be calculated from OF. Air gap factors for squared insert sizes (2, 3, 4, 6, 8, 10, 15, 20, 25) cm at SSD (105, 110, 115, 120) cm. The air gap factors can be determined from measurements OFs. The air gap factor is the ratio of the output measured at a specified SSD to the inverse-square-predicted output for that SSD.
PDD	3) for squared insert sizes of (2, 3, 4, 5, 6, 8, 10, 15, 20, 25) cm at SSD 100 cm. Min. depth of Rp + 5 cm. The measurement for each insert size should be made using the smallest electron applicator that can accommodate that insert size. Note: For electron energies less than 20 MeV, some of the larger insert sizes will not be needed. For example, if the depth dose data for the 6x6 cm² insert is identical to the 25x25 cm² insert, then only the depth dose data for insert sizes (2, 3, 4, 5, 6, 25) cm are needed.

* Mini-Phantoms are required depending on the available detectors:
ESTRO Mini-Phantom for squared FS above 4 cm: T40023.1.010, T40036.1.010 or T40036.1.020
Brass Mini-Phantom for squared FS below 5 cm: T31016.1.300 or T40064

** Small field detector required: T31016, T60017 or T60019

*** MDA calculation method available as option: S070020.002

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