Confronto tra ArcCHECK® e Delta4® nella verifica di piani VMAT
Comparison between ArcCHECK® and Delta4® in VMAT treatment plans verification

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Purpose: The aim of present work is to compare ArcCHECK® and Delta4® with respect to the results of comparison between delivered and calculated radiotherapy treatment plans.

Methods and materials: The ArcCHECK® is calibrated in absolute dose according to the indications provided by Sun Nuclearar Corporation[1], Delta4® is also calibrated in absolute dose. Both are used to acquire the same delivered treatment plans with volumetric arc therapy technique (VMAT), and these are compared with calculated ones using gamma index[2].

Results: The results of gamma index are shown in following table for ArcCHECK and Delta4:

Plan	head and neck 1	head and neck 2	prostate	rectum
Local gamma 2% 2mm TH10%	ArcCHECK (74.4%) Delta 4 (92.3%)	ArcCHECK (73.2%) Delta 4 (94.5%)	ArcCHECK (87.1%) Delta 4 (95.3)	ArcCHECK (78.1%) Delta 4 (94.5%)
Local gamma 3% 3mm TH10%	ArcCHECK (90.5%) Delta 4 (98.3%)	ArcCHECK (89.5%) Delta 4 (99.6%)	ArcCHECK (96.4%) Delta 4 (99.6%)	ArcCHECK (93.9%) Delta 4 (98.9%)
Global gamma 2% 2mm TH10%	ArcCHECK (83.0%) Delta 4 (97.0%)	ArcCHECK (85.9%) Delta 4 (98.7%)	ArcCHECK (94.8%) Delta 4 (97.2%)	ArcCHECK (86.8%) Delta 4 (97.9%)
Global gamma 3% 3mm TH10%	ArcCHECK (96.1%) Delta 4 (99.6%)	ArcCHECK (97.3%) Delta 4 (100%)	ArcCHECK (98.5%) Delta 4 (99.7%)	ArcCHECK (98.1%) Delta 4 (99.6%)

Conclusion: The results of gamma index are better with Delta4 respect to ArcCHECK. The difference decreases when less stringent criteria are used, such as 3% 3mm TH 10% global gamma. Probably using ArcCHECK "in highly modulated beams, a higher overresponse effect may accumulate" in diods and this can explain the difference respect to Delta4 "if stringent criteria are used, such as 2% 2mm local" [3][1].

References:

[1] Sun Nuclear Corporation, ArcCHECK Density, Application note 05-12 (2017), document 1220029 rev E, https://support.sunnuclear.com/login
[2] Low DA, Harms WB, Mutic S, Purdy JA, A technique for the quantitative evaluation of dose distributions, Med Phys (1998), 25(5):656-61
[3] Shi J, Differences Between Original and New ArcCHECK and Clinical Impact, Application note 01-15 (2016), document 1220044 rev B, https://support.sunnuclear.com/login

1 Probably "Out of Beam" mode in ArcCHECK acquisition software can reduce this difference (it may be checked using software versions that provide this functionality).