TOPAS-nBio-dev (TOPAS v4.0)

Regression testing (cf. TOPAS-nBio-dev (TOPAS v4.0))

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March 13, 2024

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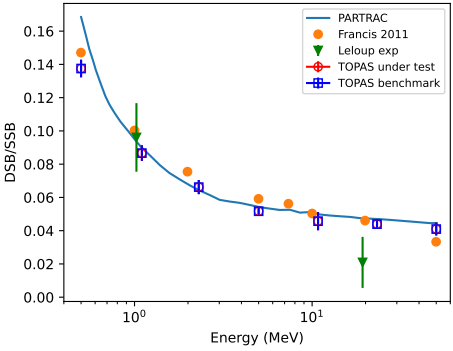
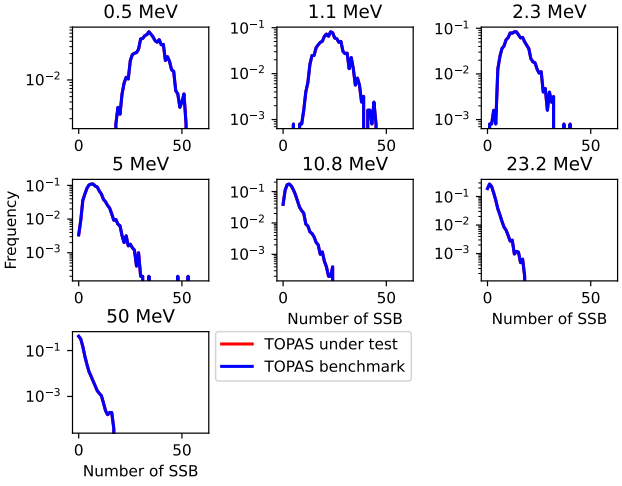
DBSCAN - TsEmDNAPhysics

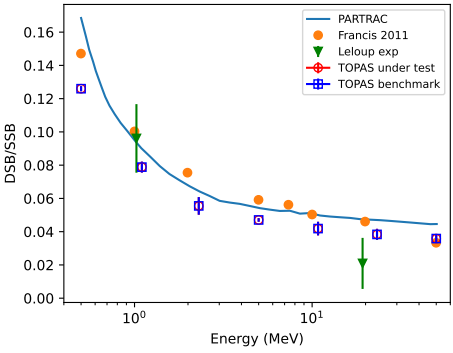


	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	152.2 +/- 0.6	152.2 +/- 0.6
Final.	0.0 +/- 0.0	0.0 +/- 0.0

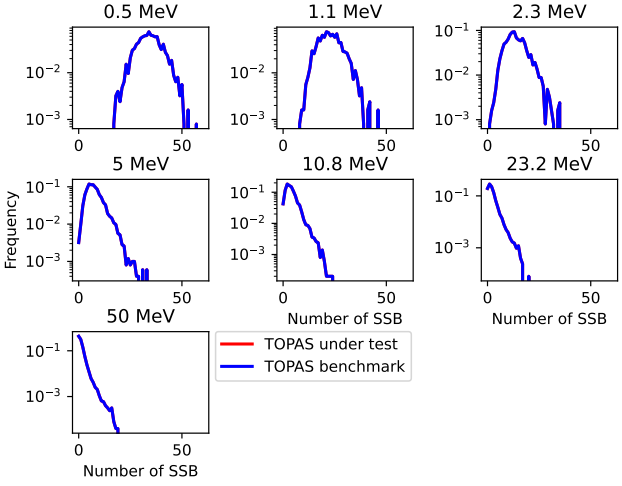


Francis Z, Villagrasa C, Clairand I. Simulation of DNA damage clustering after proton irradiation using an adapted DBSCAN algorithm. *Comput Methods Programs Biomed.* 2011; 101(3):265-270. doi:10.1016/j.cmpb.2010.12.012

DBSCAN - g4em-dna_opt2

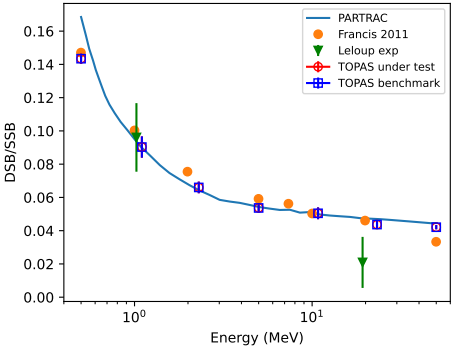


	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	146.4 +/- 1.2	146.4 +/- 1.2
Final.	0.0 +/- 0.0	0.0 +/- 0.0

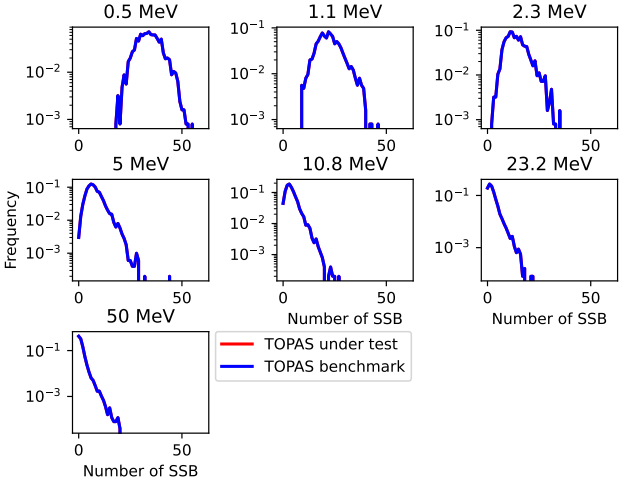


Francis Z, Villagrasa C, Clairand I. Simulation of DNA damage clustering after proton irradiation using an adapted DBSCAN algorithm. *Comput Methods Programs Biomed.* 2011; 101(3):265-270. doi:10.1016/j.cmpb.2010.12.012

DBSCAN - g4em-dna_opt4

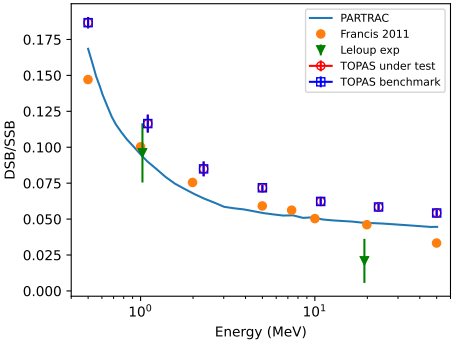


	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	450.9 +/- 1.0	450.9 +/- 1.0
Final.	0.0 +/- 0.0	0.0 +/- 0.0

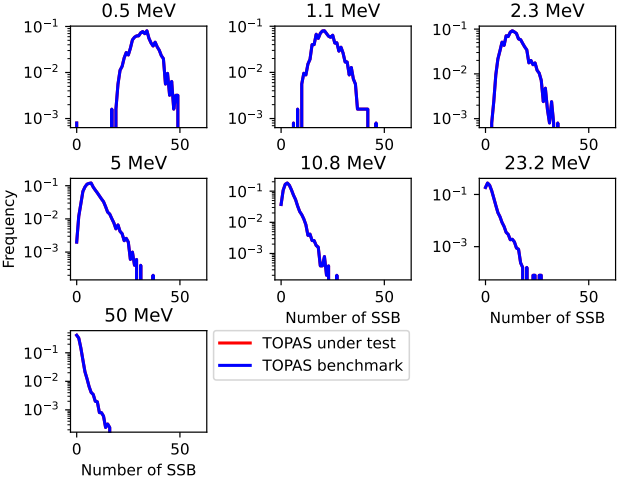


Francis Z, Villagrasa C, Clairand I. Simulation of DNA damage clustering after proton irradiation using an adapted DBSCAN algorithm. *Comput Methods Programs Biomed.* 2011; 101(3):265-270. doi:10.1016/j.cmpb.2010.12.012

DBSCAN - g4em-dna_opt6

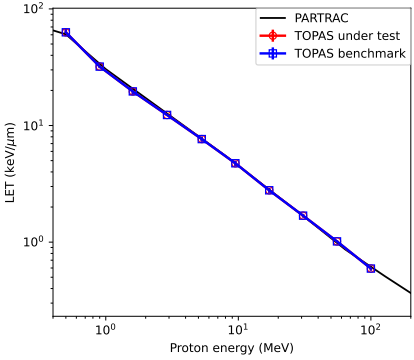


	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	129.0 +/- 0.9	129.0 +/- 0.9
Final.	0.0 +/- 0.0	0.0 +/- 0.0

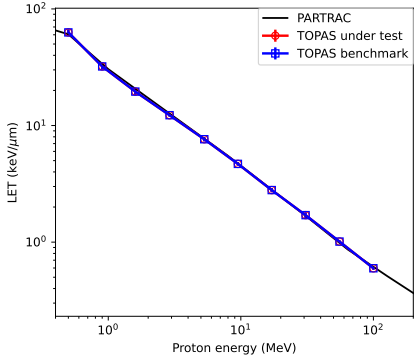


Francis Z, Villagrasa C, Clairand I. Simulation of DNA damage clustering after proton irradiation using an adapted DBSCAN algorithm. *Comput Methods Programs Biomed.* 2011; 101(3):265-270. doi:10.1016/j.cmpb.2010.12.012

LET I



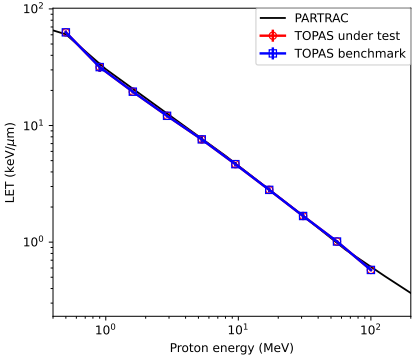
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	264.0 +/- 1.4	264.0 +/- 1.4
Final.	0.0 +/- 0.0	0.0 +/- 0.0



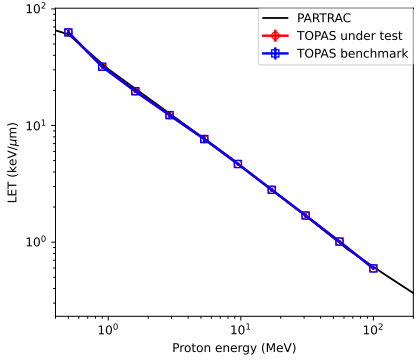
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	253.6 +/- 0.5	253.6 +/- 0.5
Final.	0.0 +/- 0.0	0.0 +/- 0.0

- LET as a function of proton energy for TsEmDNAPhysics (left) and g4em-dna_opt2 (right).

LET II



	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	724.3 +/- 1.0	724.3 +/- 1.0
Final.	0.0 +/- 0.0	0.0 +/- 0.0

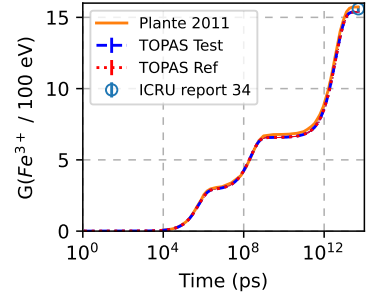


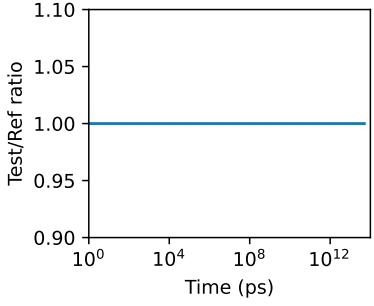
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	234.9 +/- 0.9	234.9 +/- 0.9
Final.	0.0 +/- 0.0	0.0 +/- 0.0

- LET as a function of proton energy for g4em-dna_opt4 (left) and g4em-dna_opt6 (right).

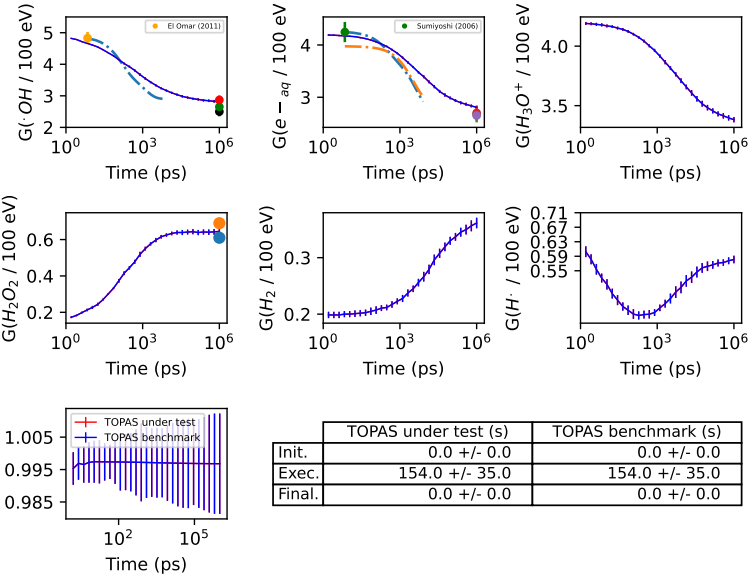
Fricke: IRT

	TOPAS under test	TOPAS benchmark
Init. (s)	0.010 +/- 0.000	0.010 +/- 0.000
Exec. (s)	7.768 +/- 0.365	7.768 +/- 0.365
Final. (s)	0.006 +/- 0.005	0.006 +/- 0.005
Value (/100eV)	15.382 +/- 0.039	15.382 +/- 0.039



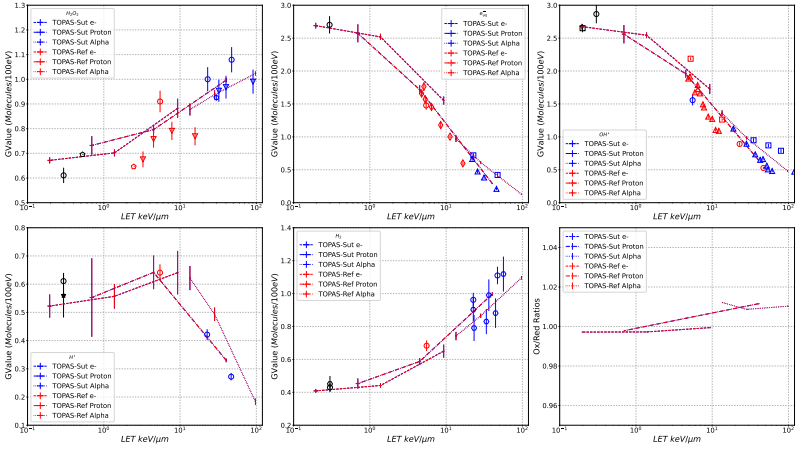


G-value: step-by-step



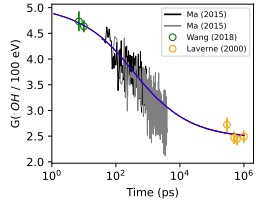
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	154.0 +/- 35.0	154.0 +/- 35.0
Final.	0.0 +/- 0.0	0.0 +/- 0.0

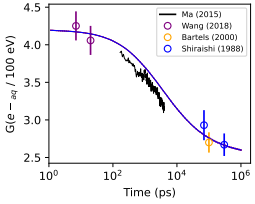
G-value vs. LET: step-by-step

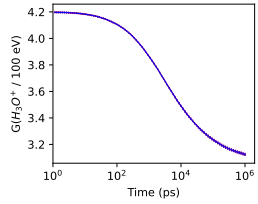


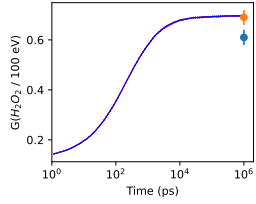
	TOPAS-Ref	TOPAS-Sut
Real	35918.750 +/- 564.408	35918.750 +/- 564.408
User	35895.032 +/- 564.205	35895.032 +/- 564.205
Sys	16.572 +/- 0.227	16.572 +/- 0.227

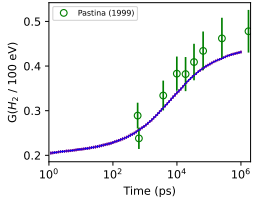
G-value: IRT

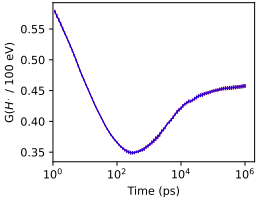


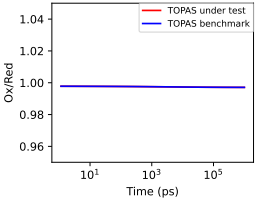






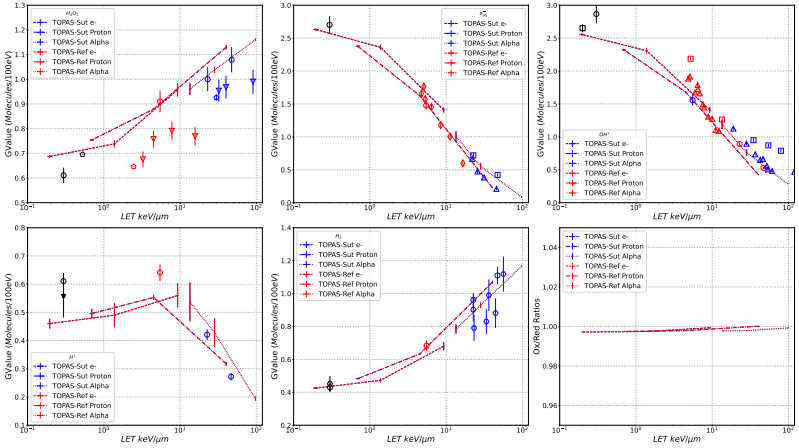






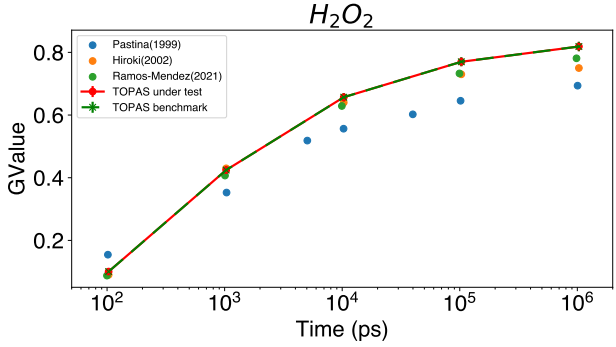
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.010 +/- 0.000	0.010 +/- 0.000
Exec.	116.020 +/- 0.957	116.020 +/- 0.957
Final.	0.000 +/- 0.000	0.000 +/- 0.000

G-value vs. LET: IRT



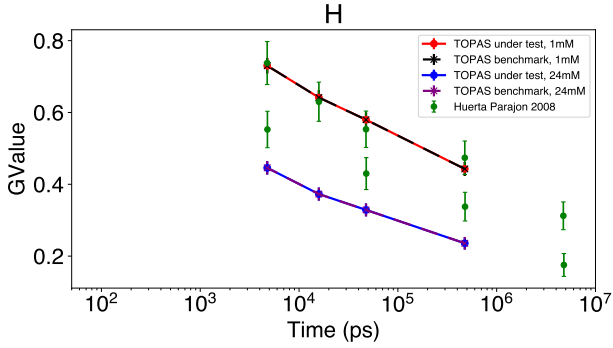
	TOPAS-Ref	TOPAS-Sut
Real	1365.454 +/- 23.439	1365.454 +/- 23.439
User	1090.800 +/- 23.443	1090.800 +/- 23.443
Sys	10.438 +/- 0.247	10.438 +/- 0.247

G-value of H_2O_2: IRT



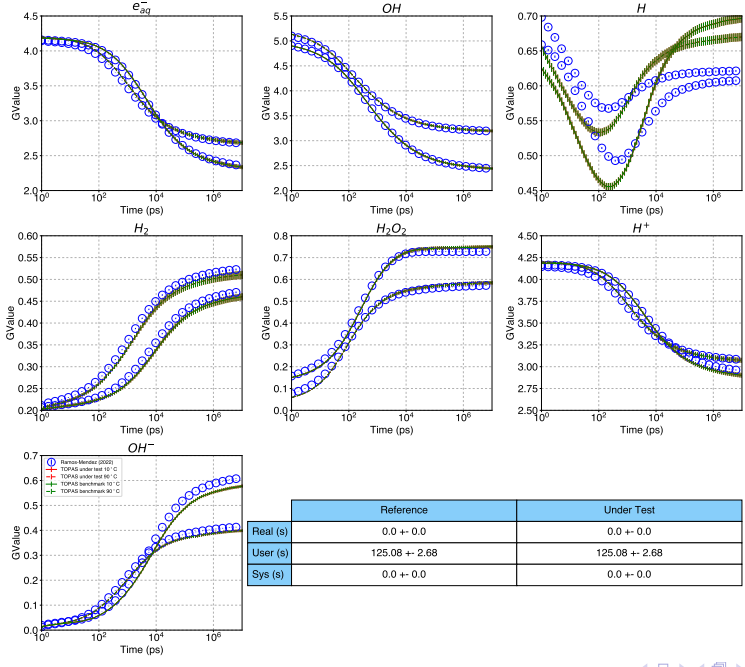
	Reference	Under Test
Real (s)	0.0 +- 0.0	0.0 +- 0.0
User (s)	213.47 +- 1.17	213.47 +- 1.17
Sys (s)	0.0 +- 0.0	0.0 +- 0.0

G-value of H: IRT

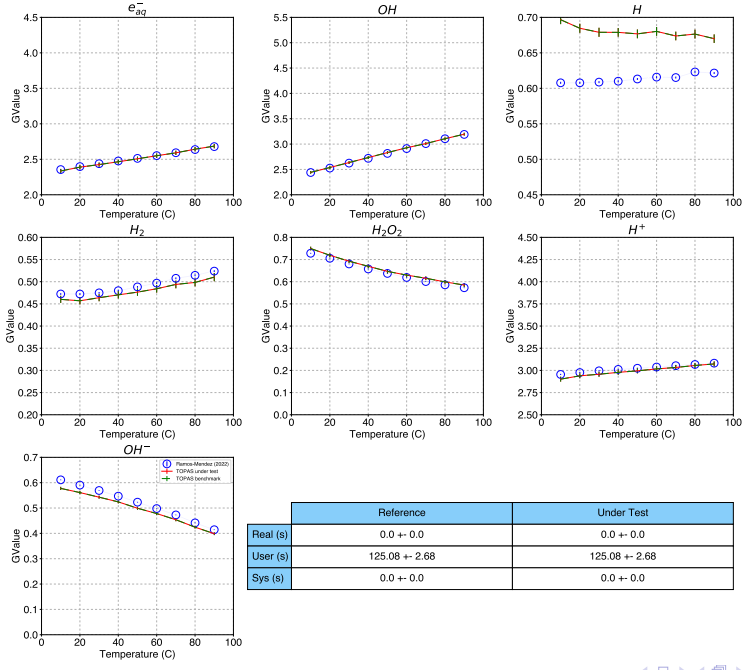


	Reference	Under Test
Real (s)	0.0 +- 0.0	0.0 +- 0.0
User (s)	572.38 +- 11.45	572.38 +- 11.45
Sys (s)	0.0 +- 0.0	0.0 +- 0.0

G-value and Temperature I: IRT

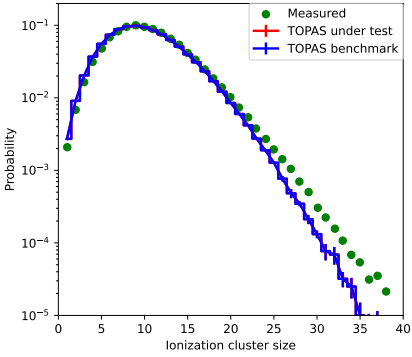


G-value and Temperature II: IRT

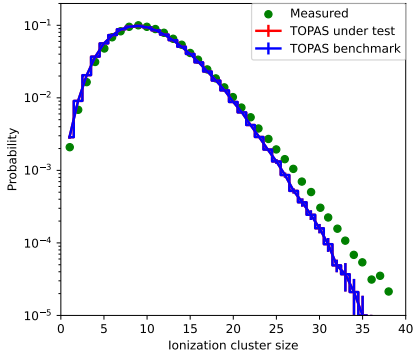


	Reference	Under Test
Real (s)	0.0 +- 0.0	0.0 +- 0.0
User (s)	125.08 +- 2.68	125.08 +- 2.68
Sys (s)	0.0 +- 0.0	0.0 +- 0.0

Nanodosimetry I: TsEmDNAPhysics and g4em-dna_opt2



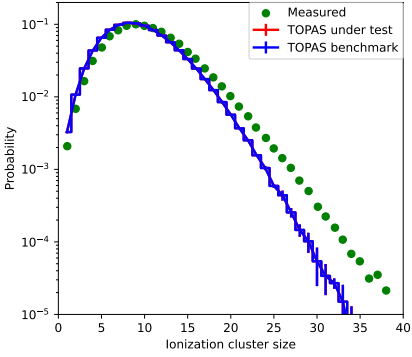
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	10342.3 +/- 25.4	10342.3 +/- 25.4
Final.	0.0 +/- 0.0	0.0 +/- 0.0



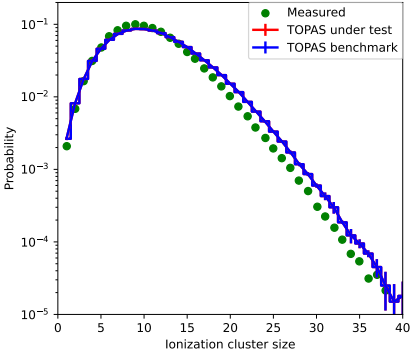
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	10082.1 +/- 49.3	10082.1 +/- 49.3
Final.	0.0 +/- 0.0	0.0 +/- 0.0

Conte V, Selva A, Colautti P, et al., Nanodosimetry: Towards a new concept of radiation quality. *Radiat Prot Dosimetry*. 2018;180(1-4):150-156. doi:10.1093/rpd/ncx175

Nanodosimetry I: g4em-dna_opt4 and g4em-dna_opt6



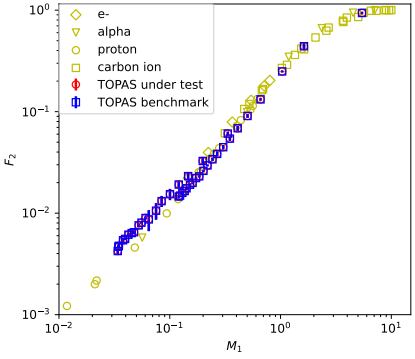
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	8531.7 +/- 11.6	8531.7 +/- 11.6
Final.	0.0 +/- 0.0	0.0 +/- 0.0



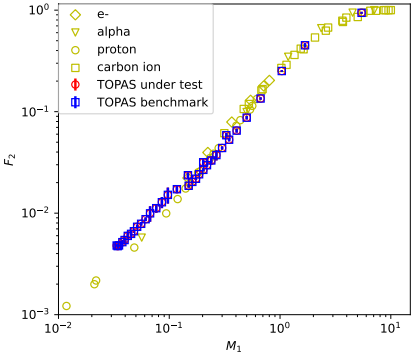
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	7789.4 +/- 37.9	7789.4 +/- 37.9
Final.	0.0 +/- 0.0	0.0 +/- 0.0

Conte V, Selva A, Colautti P, et al., Nanodosimetry: Towards a new concept of radiation quality. *Radiat Prot Dosimetry*. 2018;180(1-4):150-156. doi:10.1093/rpd/ncx175

Nanodosimetry II: TsEmDNAPhysics and g4em-dna_opt2



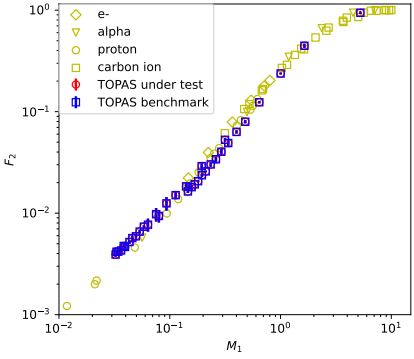
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	119.6 +/- 0.6	119.6 +/- 0.6
Final.	0.0 +/- 0.0	0.0 +/- 0.0



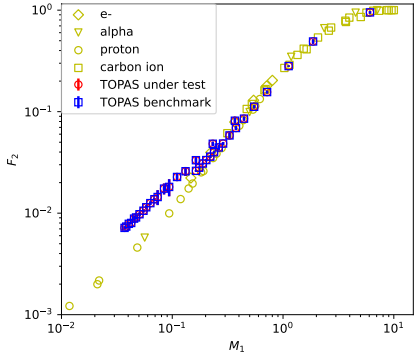
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	93.8 +/- 0.2	93.8 +/- 0.2
Final.	0.0 +/- 0.0	0.0 +/- 0.0

Conte V, Selva A, Colautti P, et al., Nanodosimetry: Towards a new concept of radiation quality. *Radiat Prot Dosimetry*. 2018;180(1-4):150-156. doi:10.1093/rpd/ncx175

Nanodosimetry II: g4em-dna_opt4 and g4em-dna_opt6



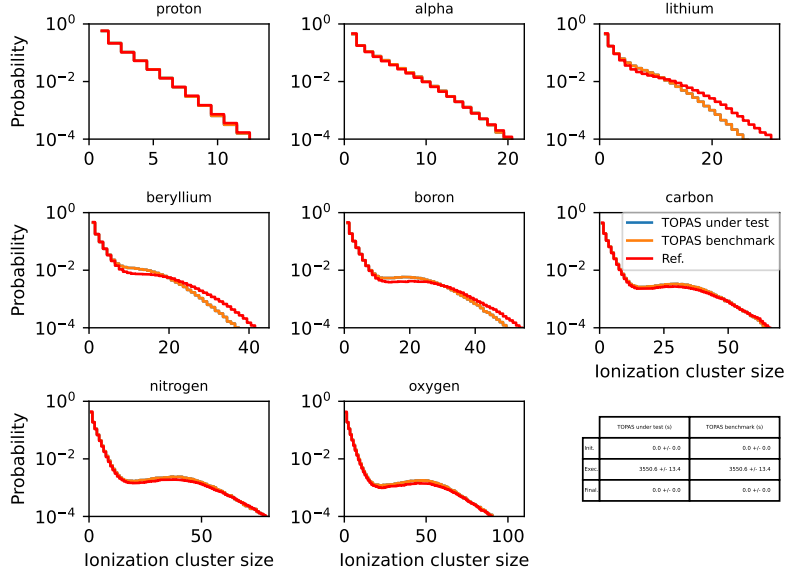
	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	1796.0 +/- 3.7	1796.0 +/- 3.7
Final.	0.0 +/- 0.0	0.0 +/- 0.0



	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	1312.8 +/- 5.1	1312.8 +/- 5.1
Final.	0.0 +/- 0.0	0.0 +/- 0.0

Conte V, Selva A, Colautti P, et al., Nanodosimetry: Towards a new concept of radiation quality. *Radiat Prot Dosimetry*. 2018;180(1-4):150-156. doi:10.1093/rpd/ncx175

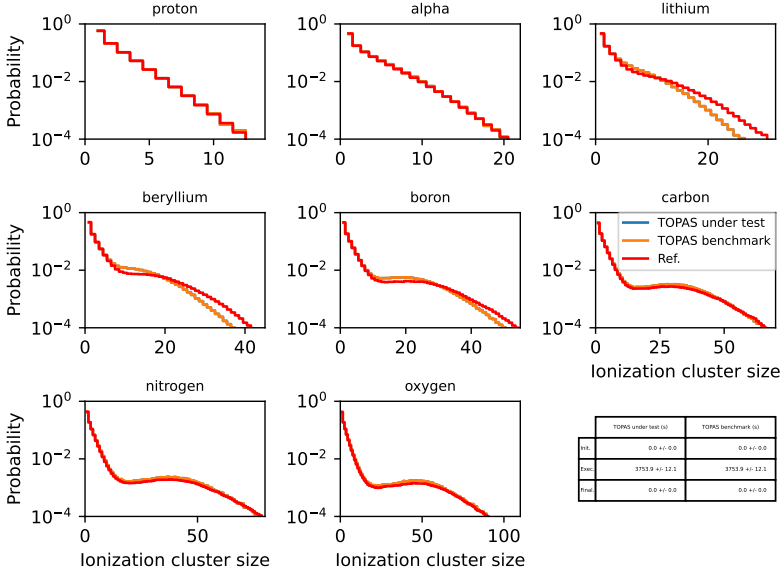
Nanodosimetry III: TsEmDNAPhysics



	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	3550.6 +/- 13.4	3550.6 +/- 13.4
Final	0.0 +/- 0.0	0.0 +/- 0.0

- Ramos-Méndez J, Burigo LN, Schulte R, Chuang C, Faddegon B. Fast calculation of nanodosimetric quantities in treatment planning of proton and ion therapy. *Phys Med Biol*. 2018;63(23):235015. doi:10.1088/1361-6560/aaeeee

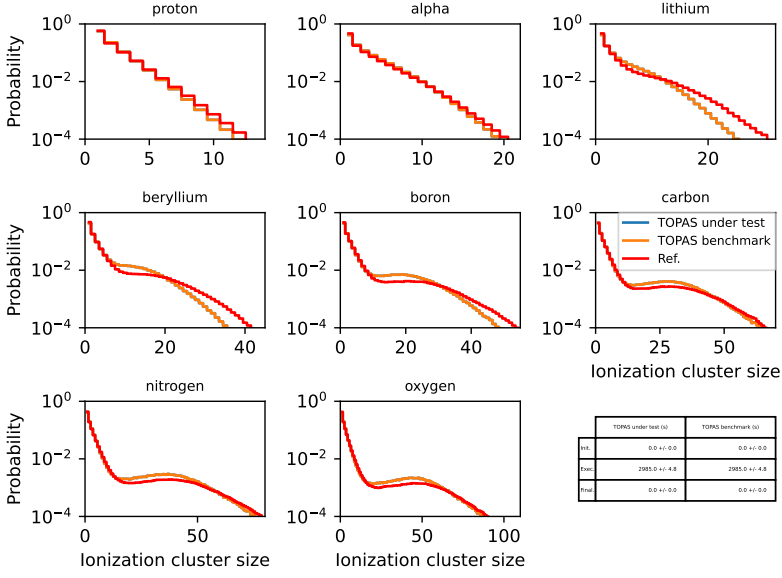
Nanodosimetry III: g4em-dna_opt2



	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.0 +/- 0.0	0.0 +/- 0.0
Exec.	3753.9 +/- 12.1	3753.9 +/- 12.1
Final	0.0 +/- 0.0	0.0 +/- 0.0

- Ramos-Méndez J, Burigo LN, Schulte R, Chuang C, Faddegon B. Fast calculation of nanodosimetric quantities in treatment planning of proton and ion therapy. *Phys Med Biol*. 2018;63(23):235015. doi:10.1088/1361-6560/aaeeee

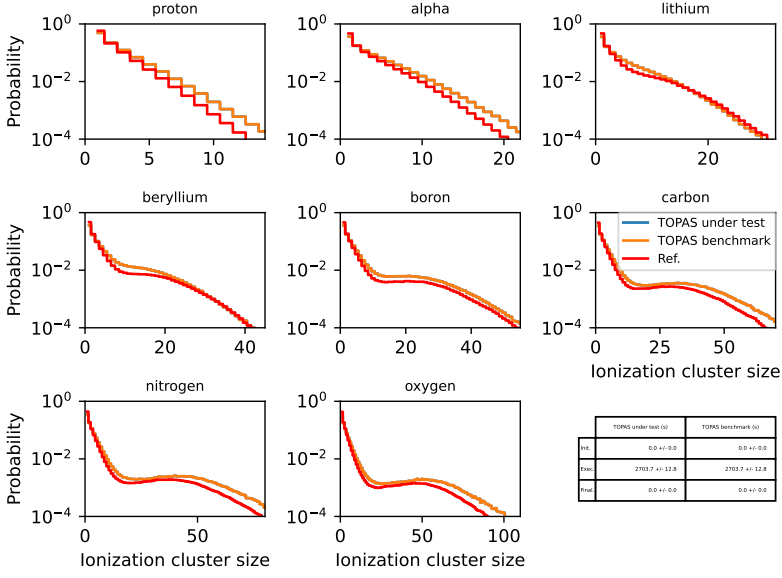
Nanodosimetry III: g4em-dna_opt4



	TOPAS under test (s)	TOPAS benchmark (s)
Init	0.0 +/- 0.0	0.0 +/- 0.0
Exec	2985.0 +/- 4.8	2985.0 +/- 4.8
Final	0.0 +/- 0.0	0.0 +/- 0.0

- Ramos-Méndez J, Burigo LN, Schulte R, Chuang C, Faddegon B. Fast calculation of nanodosimetric quantities in treatment planning of proton and ion therapy. *Phys Med Biol*. 2018;63(23):235015. doi:10.1088/1361-6560/aaeeee

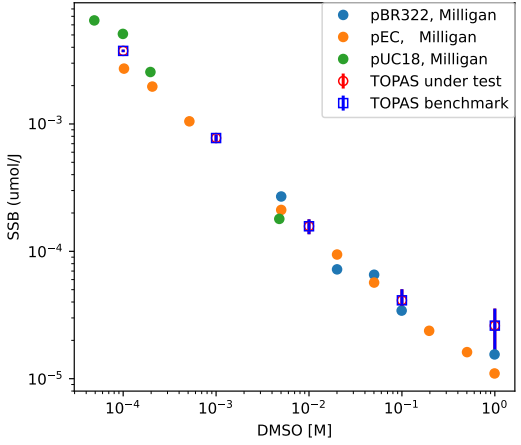
Nanodosimetry III: g4em-dna_opt6



	TOPAS under test (s)	TOPAS benchmark (s)
Init	0.0 +/- 0.0	0.0 +/- 0.0
Exec	2703.7 +/- 12.8	2703.7 +/- 12.8
Final	0.0 +/- 0.0	0.0 +/- 0.0

- Ramos-Méndez J, Burigo LN, Schulte R, Chuang C, Faddegon B. Fast calculation of nanodosimetric quantities in treatment planning of proton and ion therapy. *Phys Med Biol*. 2018;63(23):235015. doi:10.1088/1361-6560/aaeeee

SSBs as a function of DMSO: pulsed beam



	TOPAS under test (s)	TOPAS benchmark (s)
Init.	0.9 +/- 0.0	0.9 +/- 0.0
Exec.	24577.5 +/- 344.9	24577.5 +/- 344.9
Final.	0.0 +/- 0.0	0.0 +/- 0.0