		Open field		DMLC		tVMAT		cVMAT	
FFF		Meas.	Calc.	Meas.	Calc.	Meas.	Calc.	Meas.	Calc.
Lateral	0-2 mm	45 %	50 %	45 %	44 %	46 %	47 %	48 %	52 %
	2-5 mm	66 %	73 %	59 %	55 %	62 %	70 %	68 %	76 %
Central	0-2 mm	69 %	66 %	55 %	62 %	55 %	56 %	50 %	52 %
	2-5 mm	98 %	94 %	87 %	84 %	89 %	89 %	90 %	84 %
FF		Meas.	Calc.	Meas.	Calc.	Meas.	Calc.	Meas.	Calc.
Lateral	0-2 mm	46 %	50 %	45 %	48 %	44 %	42 %	50 %	48 %
	2-5 mm	69 %	66 %	66 %	69 %	63 %	63 %	74 %	75 %
Central	0-2 mm	62 %	71 %	64 %	62 %	62 %	59 %	48 %	49 %
	2-5 mm	92 %	88 %	94 %	91 %	96 %	92 %	80 %	82 %

Conclusion: The accuracy of surface dose calculation was acceptable in Monaco TPS. There was no significant difference in surface doses between FFF and FF beams. Based on our results the VMAT techniques produce more homogeneous surface doses when compared to tangential open fields.

OC-0359
Superficial dose verification of four dose calculation algorithms

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Purpose or Objective: The aim of this study is to verify superficial dose calculation accuracy of four commonly used algorithms in commercial available treatment planning systems (TPS) by Monte Carlo (MC) simulation and film measurements.

Material and Methods: EGSnrc (BEAMnrc\DOSXYZnrc) code was performed to simulate the central axis dose distribution of Varian Trilogy accelerator, combined with measurements of superficial dose distribution viaa extrapolation method of multilayer radiochromic films, to verify the dose calculation accuracy of four algorithms of AXB (Acuros XB), AAA (Analytical Anisotropic Algorithm), CCC (Collapsed Cone Convolution) and PBC (Pencil Beam Convolution) in the superficial region which was described in detail by ICRU and ICRP, under the conditions of source to surface distance (SSD) of 100cm, field size (FS) of 10cm×10 cm, solid water size of 30cm×30cm×30cm and the incident angles of 0°, 30° and 60°.

Results: In superficial region, good agreement was achieved between MC simulation and film extrapolation method, with the mean differences respectively less than 1%, 2% and 4% , and the relative skin dose difference were 0.84%, 1.88% and 3.90% for 0°, 30° and 60°; the mean dose errors (0°, 30° and 60°) between four algorithms and MC simulation were AXB (2.41±1.55%, 3.11±2.40%, 1.53±1.05%), CCC (3.09±3.0%, 3.10±3.01%, 3.77±3.59%), AAA (3.16±1.5%, 8.7±2.84%, 18.2±4.1%) and PBC (14.45±4.66%, 10.74±4.54%, 3.34±3.26).

Table 1. Skin dose difference of film measurements and different algorithm calculations (%)

Incident angle	Method				
	Film	AXB	AAA	CCC	PBC
0°	0.84	-0.05	4.07	11.37	22.15
30°	1.88	-0.71	0.15	12.17	20.00
60°	3.94	0.74	-9.51	14.11	11.74

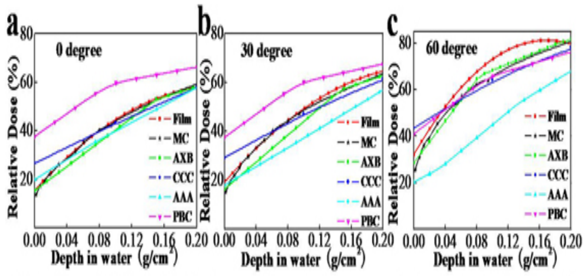

Fig. 1. Superficial dose distributions of film measurements and algorithm calculations with incident angle of 0° (a), 30° (b) and 60° (c) compared with those of MC simulations within the initial 2 mm depth.

Conclusion: Monte Carlo simulation validated the feasibility of the superficial dose measurement via multilayer Gafchromic film detectors. And the rank of superficial dose calculation accuracy of four algorithms was AXB>CCC>AAA>PBC. AAA and PBC algorithms were not applicable for superficial dose calculation.

OC-0360
TomoTherapy tangential breast treatment position uncertainty via exit detector fluence

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Purpose or Objective: To analyze the exit detector fluences from tangential breast treatments in estimation of the breast position uncertainty of daily IGRT on the TomoTherapy system.

Material and Methods: Twenty patients who received tangential breast radiotherapy on the TomoTherapy system were selected randomly. All patients were aligned daily to the planning-kVCT using MVCT prior to treatment. For each detector measurement, the treatment projection containing the fluence passing through the midpoint of the breast was extracted for analysis in MATLAB. The high fluence gradient indicating the interface between the breast surface and tangential beam flash was easily observed and used for analysis (Fig 1). Each CT detector channel has a nominal width of ~0.76 mm projected at treatment isocenter, therefore absolute position of the projected breast surface was calculated. Separately, a study was performed using the TomoTherapy Cheese phantom simulating breast patient. A radiotherapy plan mimicking that of the breast patients was created. The plan was delivered onto the phantom in the correct treatment position, as well as with known phantom displacements in increments of 1-mm along the x- and z-axes. The analysis described above was subsequently performed on the phantom detector data to correlate the known displacements to those measured from the detector fluence. The correlation fit obtained from the phantom measurements was applied to the patients in estimation of breast surface position.