Results: In axis beams are well within agreement (deviation<4%) for 2 and 1 mm grid sizes. For the 4 mm grid size, at shallow depths (< depth at maximum) larger differences are observed and for narrow field sizes (widths ≤ 10 mm) those differences occur at all depths. Oblique incidence (60°) of the same beams results in an identical deviation pattern. On top of these deviations a non monotonous decay after the buildup zone is observed for the 4mm grid size for all narrow beams ≤ 14 mm. A similar behavior is also observed for off-axis fields; 1 mm and 2 mm grid sizes are equivalent for all the field sizes except at 5 mm depth but 4 mm grid sizes induces errors in output and irregular depth dose curves for field sizes 14 mm or smaller. Several Pinnacle models are evaluated for different Elekta accelerators and output factors are verified using data measured with small cylindrical and liquid ion chambers. The 8 mm field size is not included while chamber volume effects underestimate the maximal dose values. The average agreement for the 4 mm grid size between calculation values and the measured data for both detectors (SSD=90 cm depth 10 cm) for off-axis field settings is underestimation of 2.49%±3.10% while an overestimation 0.13%±1.39% is obtained using a 2 mm grid size. Those findings are confirmed by the less accurate agreement for the 4 mm calculation grid size on treatment plans for IMRT planning verified on a Delta4 phantom for breast treatment.

Conclusions: The influence of the grid size on the dose prediction in the treatment planning system is confirmed. Commissioning tests revealed inaccuracy for the 4 mm grid sizes for small oblique and off axis segments. This inaccuracy was confirmed on Delta-4 pre-treatment evaluations.

Purpose/Objective:
To compare analytic anisotropic algorithm (AAA) and collapsed cone convolution/superposition (CCCS) dose calculation algorithms for cranial intensity modulated radiosurgery (IMRS) treatments.

Materials and Methods: Cranial radiosurgery is planned at the Quiron Hospital Radiotherapy Department using sliding-window IMRT modality (IMRS). The IMRS plans are calculated using the AAA algorithm of the Eclipse TPS (version 10.0, Varian Medical Systems, Palo Alto, CA). 6MV beams from a Varian Clinac 2100 C/D equipped with the Millennium 120 MLC were used. Accuracy of AAA for IMRS treatments was previously reported by our group (Med Dosim. 2014 Summer; 39(2):129-33). The Mobius3D system (M3D, Mobius Medical Systems, LP, Houston, TX) is a dose calculation software based on the CCCS algorithm. The CCCS algorithm was factory-configured with independent basic input data for our linac model. The planning system offers a way to cross-check our AAA-based breast SIB plans using an independent and advanced algorithm as CCCS.

Conclusions: Excellent dosimetric agreement between the Eclipse/AAA and the M3D system was found. The M3D system offers a way to cross-check our AAA-based breast SIB plans using an independent and advanced algorithm as CCCS.

EP-1424
Comparison of AAA and collapsed cone algorithms for planning of cranial intensity modulated radiosurgery
J. Casals Farran1, J.F. Calvo-Ortega1, S. Moragues Femenia1, M. Pozo Masso1, M. Hermida-López2,3
1Hospital Quiron Barcelona, Radiation Oncology, Barcelona, Spain
2Hospital Universitari Vall d’Hebron, Servei de Física i Protecció Radiològica, Barcelona, Spain
3Strahlenklinik Universitätsklinikum Essen, NCT Team, Essen, Germany

Purpose/Objective: To evaluate simultaneous integrated boost (SIB) breast cancer plans calculated with the anisotropic analytical algorithm (AAA) using the collapsed cone convolution/superposition algorithm (CCCS) of an independent dose calculation software.
modulated beams ranged from 0.9 to 4.4 cm$^2$. Differences software (version 1.3). The same monitor units and Eclipse were retrospectively recalculated using the Mobius3D field size. Twelve cranial IMRS plans calculated using the Eclipse were compared by the Eclipse and by the M3D system. Gamma passing rates for the target and organs at risks (OARs: brainstem, chiasm, optic nerves and normal brain tissue) were compared for 3%/1 mm, 3%/2 mm and 5%/1 mm criteria.

Results: 1) Differences (M3D vs. measured) within 1 mm were found for the isocenter dose measurements in a polystyrene phantom. Three correction values to the factory DLG value were compared to the calculated ones for five IMRS stereotactic plans. Three correction values to the factory DLG value were analyzed: 0.0, -0.25 and -0.5 mm. Accuracy of the M3D software to reproduce the penumbra of stereotactic fields was investigated by comparing the profiles measured in water with the calculated ones for a 1x1 cm$^2$ MLC-collimated field size. Twelve cranial IMRS plans calculated using the Eclipse were retrospectively recalculated using the Mobius3D software (version 1.3). The same monitor units and calculation voxel sizes (1 mm) were used for both systems. The aperture (complete irradiation area outline) of the modulated beam ranges from 0.9 to 4.4 cm$^2$. Differences between both algorithms were evaluated using the 3D gamma tool available in the M3D system. Gamma passing rates for the target and organs at risks (OARs: brainstem, chiasm, optic nerves and normal brain tissue) were compared for 3%/1 mm, 3%/2 mm and 5%/1 mm criteria.

Results: 1) Differences (M3D vs. measured) within 1 mm were found for the isocenter dose measurements in a polystyrene phantom. Three correction values to the factory DLG value were compared to the calculated ones for five IMRS stereotactic plans. Three correction values to the factory DLG value were analyzed: 0.0, -0.25 and -0.5 mm, respectively. 2) Using the optimal DLG correction (-0.5 mm), the target 3D gamma passing rates were: 94% (73-94%), 97% (80-100%) and 100% (97-100%) for the 3%/1 mm, 3%/2 mm and 5%/1 mm criteria, respectively. 100% rates were obtained for all OARs regardless of the gamma criterium.

Conclusions: Great agreement was obtained (within 5% and 1 mm) between IMRS plans calculated by the Eclipse and by the independent dose calculation software M3D. Our findings are restricted to small field sizes down to 1x1 cm$^2$. The M3D software may be proposed as an alternative to patient-specific QA based on measurements for IMRS plans.

EP-1425
Frameless linac based radiosurgery of arteriovenous malformations: geometrical accuracy
R. Tijssen1, A.N.T. Kotte1, A.J.M. Wopereis1, E. Brand1, C.J.M. Klijn2, G.A.P. De Kort3, J. Berkelbach3, W.S.C. Eppinga1, E. Seravalli1
1UMC Utrecht, Department of Radiation Oncology, Utrecht, The Netherlands
2UMC Utrecht, Department of Neurosurgery, Utrecht, The Netherlands
3UMC Utrecht, Department of Radiology, Utrecht, The Netherlands

Purpose/Objective: To assess the geometrical accuracy, by an end-to-end test, of frameless linac based radiosurgery of brain arteriovenous malformations (AVMs).

Materials and Methods: Throughout the treatment chain (angiography, CT imaging, and stereotactic radiotherapy) a three point thermoplastic head mask is used, which replaces the invasive stereotactic frame. The angiographic and CT images are co-registered by means of six conventional skin markers, which are placed on the mask. An anthropomorphic skull phantom (Accuray, Inc.) was used to perform the end-to-end test. The phantom has an insert with a spherical target in the center which can hold two orthogonal Gafchromic films. The films are tightened by four notches at each axial and sagittal plane. The CT coordinates of these notches were used to register the film during analysis. The accuracy of the CT to angiography (projection) registration was assessed based on the markers deviation. The shift was calculated to align the film measured dose with the calculated one was attributed to be the targeting error. Moreover, brain radiosurgery (SRS) patient data were analyzed to determine the uncertainty introduced by movement of the patient within the mask upon repositioning between the angiography and the CT scan sessions. The overall geometrical accuracy of the treatment chain is obtained combining these uncertainties.

Results: Angiography to CT registration was performed with subvoxel accuracy. The targeting accuracy of the frameless radiosurgery AVMs treatment chain was smaller than 1 mm for the three spatial directions and the two investigated linear accelerators. Patient data revealed a motion in the range of (0.70-1.5) mm and (0.6 - 1) degrees (absolute average) due to the repositioning of the mask between treatment sessions. Combining these uncertainties an overall geometrical accuracy of 1.5 mm is found.

Conclusions: Frameless linac based radiosurgery of AVMs is feasible with a geometrical accuracy comparable to the frameless linac based SRS treatment chain.

EP-1426
Target coverage: VMAT vs 3D in the treatment of lung cancer
M. Rincon Perez1, J. Luna Tirado1, S. Gomez-Tejedor Alonso1, M.A. Garcia Castejon1, J.M. Penedo Cobos1, J.P. Marin Arango1, A.M. Perez Casas1
1IDC-Fundación Jimenez Diaz, Radiotherapy, Madrid, Spain

Purpose/Objective: To compare the uniformity of the absorbed-dose distribution and the dose conformity of two different radiotherapy treatments for lung cancer: conformal 3D (3D CRT) and double-arc volumetric modulated arc therapy (VMAT).

Materials and Methods: 3DCRT and VMAT plans were optimized for 12 lung cancer patients. Treatment planning was performed using two treatment planning systems: XIO 4.80 for 3D CRT plans with superposition algorithm and Monaco 3.30.01, based on the Monte Carlo algorithm, for VMAT plans. For all patients, the target prescription dose was 60 Gy delivered in 30 fractions on an Elekta Synergy Beam Modulator linear accelerator equipped with 40 pairs of opposing leaves with 4mm thickness at isocenter. 3D CRT plans consisted of 3-5 coplanar 6MV fields, while VMAT plans comprised two 6MV 360º arcs. All the plans were considered to be clinically acceptable when at least 99% of the PTV volume received 98% of the prescribed dose and maximum dose was less than 107%. The constraints for the OAR included: volume of spinal cord receiving more than 45 Gy < 10%, volume of heart receiving more than 45 Gy < 4% and the V20 of lung minus PTV was set at < 35%. The two techniques were compared in terms of target homogeneity, target conformity and irradiated volume of normal tissues. Target conformity was quantified using the conformity index (CI) defined by Paddick as: