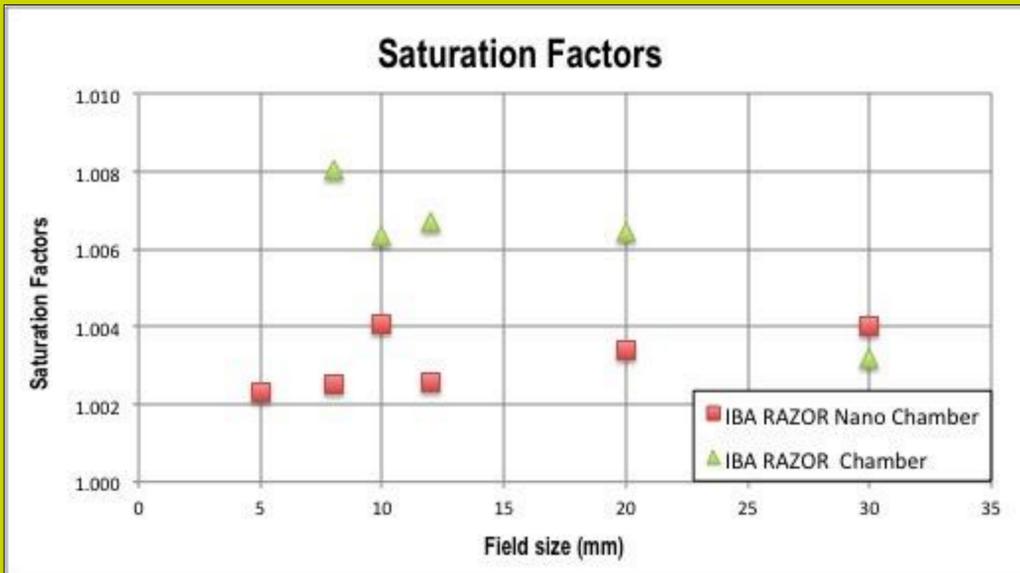
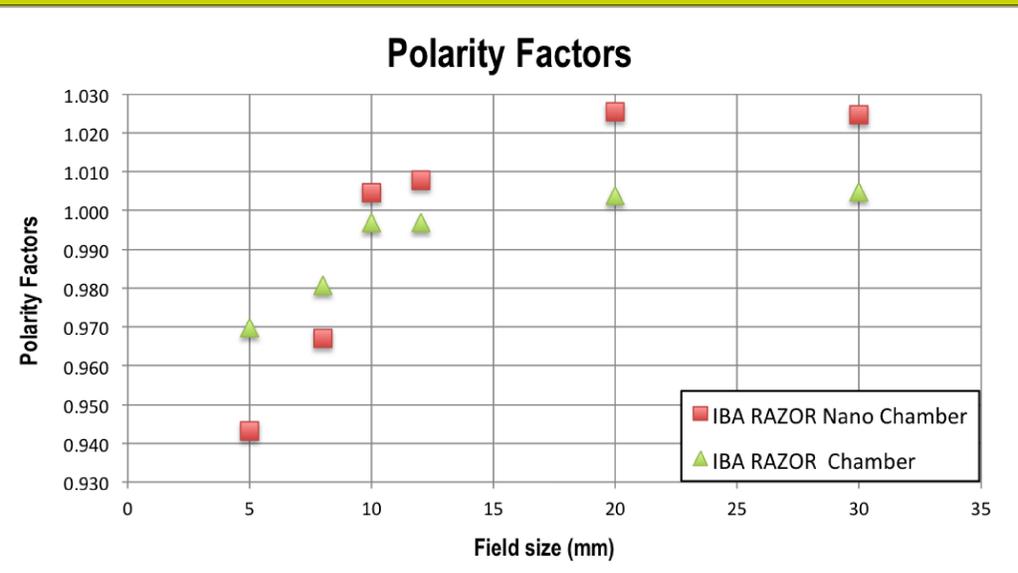
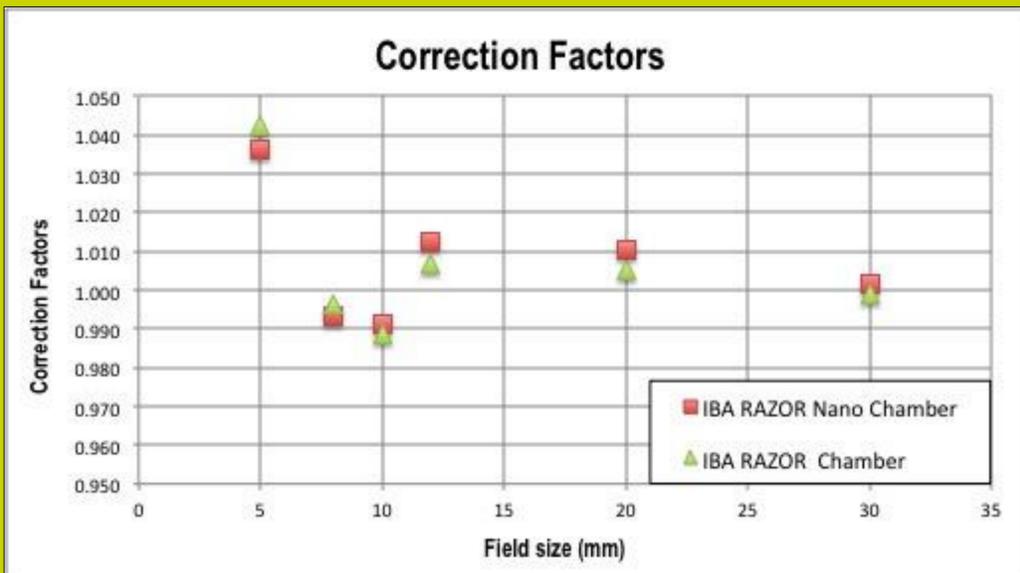
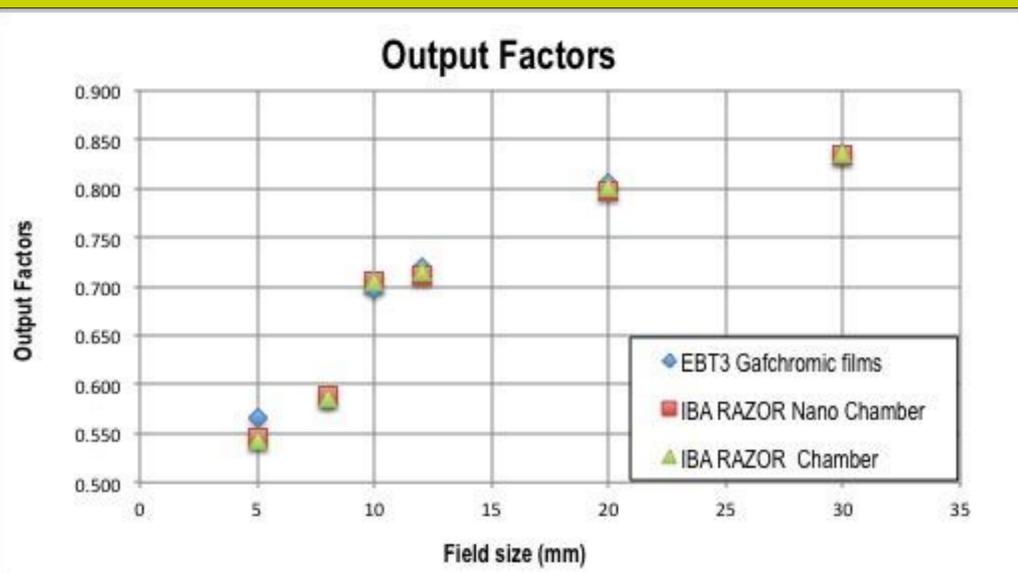


**Purpose:** To measure small beam output factors (OFs) using the IBA Razor Nano Chamber (RNC) and the IBA Razor Chamber (RC) and to determine correction factors for comparison with Gafchromic EBT3 films.

**Methods:** The detectors were irradiated with 6 MV photon beams using a Varian TrueBeam STx system equipped with a HD multileaf collimator (MLC). Fields ranging from 0.5×0.5 to 10×10 cm<sup>2</sup> were defined by both the X-Y collimator jaws and the MLC. The microchambers were used in parallel configuration at a source-surface distance of 100 cm and at 10 cm depth in a Sun Nuclear 3D SCANNER water phantom. A bias voltage of - 300 V were applied to collect measurements and correction factors for polarity and saturation were determined and used to correct the raw measurements. Films were irradiated inside a Solid Water phantom in the same geometry.



**Results:** Deviations from unity of polarity factors were observed for field size less than 1 cm and greater than 2 cm, ranging from 0.943 to 1.025 for the RNC and from 0.970 to 1.005 for the RC. Saturation factors were close to one for both the detectors. Output Factors corrected for polarity and saturation showed an underestimation for the smallest beam for both the detectors with respect to films ( $k=1.036$  and  $1.042$  for the RNC and the RC respectively). Correction factors values for beams ranging from 8 to 30 mm were close to unity.

**Conclusions:** OFs corrected for the RNC and the RC were in agreement with films, although an underestimation has been observed for the smallest beam connected to a small volume averaging effect. The similar behavior of the two ionization chambers is probably due to the same size of the electrode diameter (2 mm). Both the detectors could be used for output factors measurements in small beam geometry, albeit the magnitude of the polarity effect suggests to correct the readings carried out with the two chambers in order to achieve a better accuracy. Differences in polarity factors could be assessed using a lower voltage supply.

#### References

- 1 Small field characterization of a Nano-chamber prototype under flattening filter free photon beam, Reggiori G. et al., Phys. Med. 2017, doi: 10.1016/j.ejmp.2017.08.007
- 2 Ion recombination and polarity corrections for small volume ionization chamber in high-dose-rate flattening-filter-free pulsed photon beams, Hyun MA, Med. Phys. 2017, <http://dx.doi.org/10.1002/mp.12053>