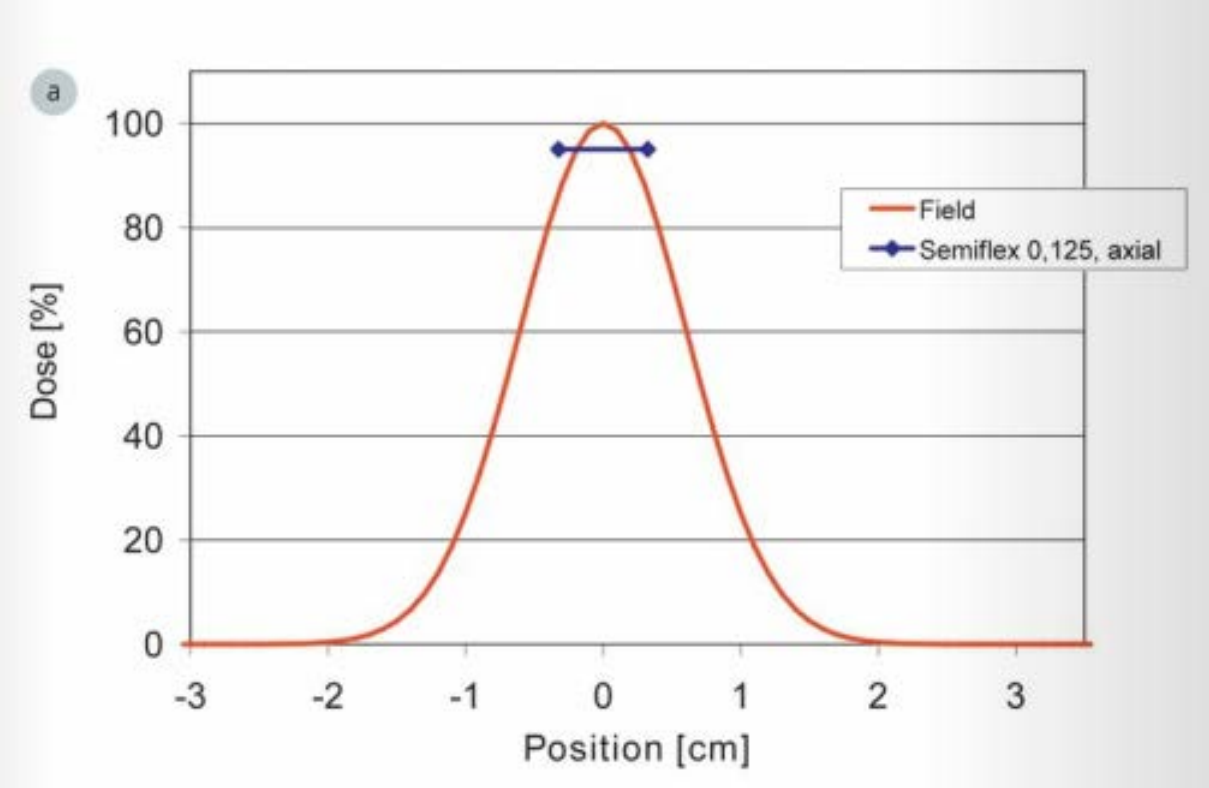
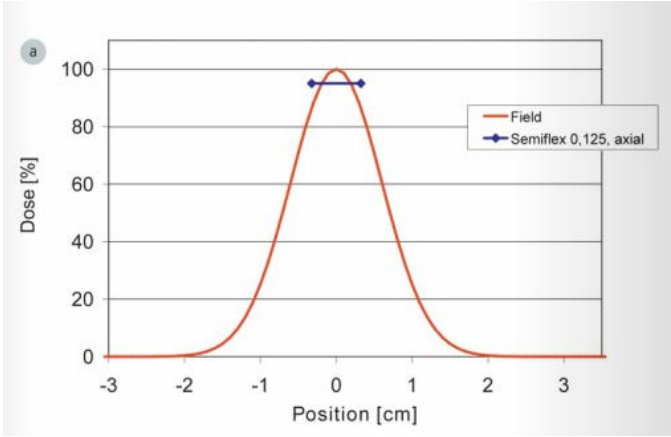
What effect does the volume of a thimble chamber have on measuring the following parameters for a small field:

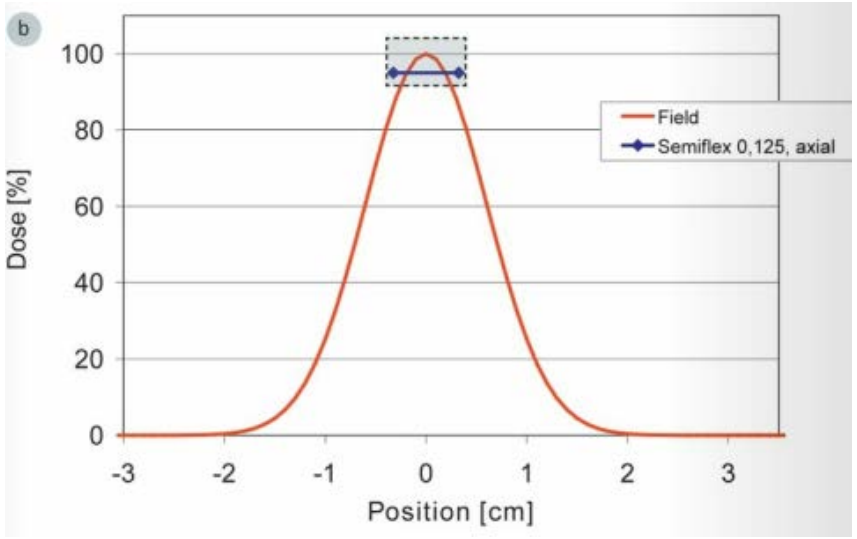
- Output?
- Profile?
- (i.e. if the volume of the chamber is large relative to the field size…)



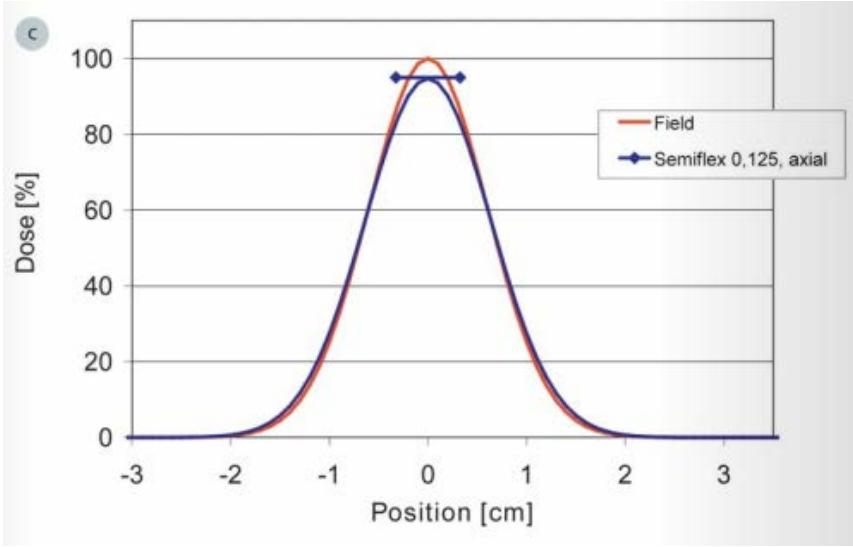
Volume effect example in small field dosimetry



Semiflex 0.125 cc chamber vs. 2 x 2 FWHM



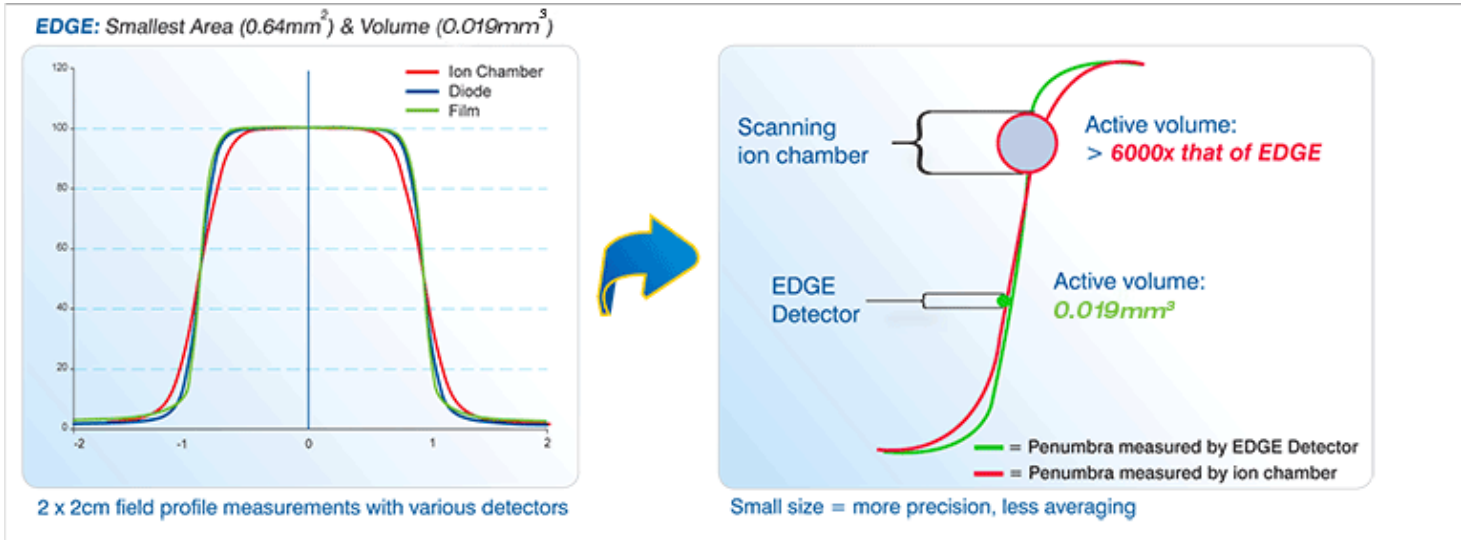
Chamber will average across blue box volume



Blue curve shows detector signal after averaging

Effect of chamber volume

- Volume averaging in steep gradients/small fields
- Small field dosimetry
  - Dose volume effect = dose changes noticeably across the detector
    - Underestimate the dose in the center of the field
    - Overestimate penumbra width
    - Rule of thumb: detector > 1/4th lateral field dimension --> volume effect
- Small volume chambers more sensitive to stem effect (Leakage current induced by irradiating stem) due to low signal
- Profile measurements with detector diameter < 3.5 mm can reproduce penumbra width within 1 mm (TG-42)
- measured



Volume effects in small field dosimetry

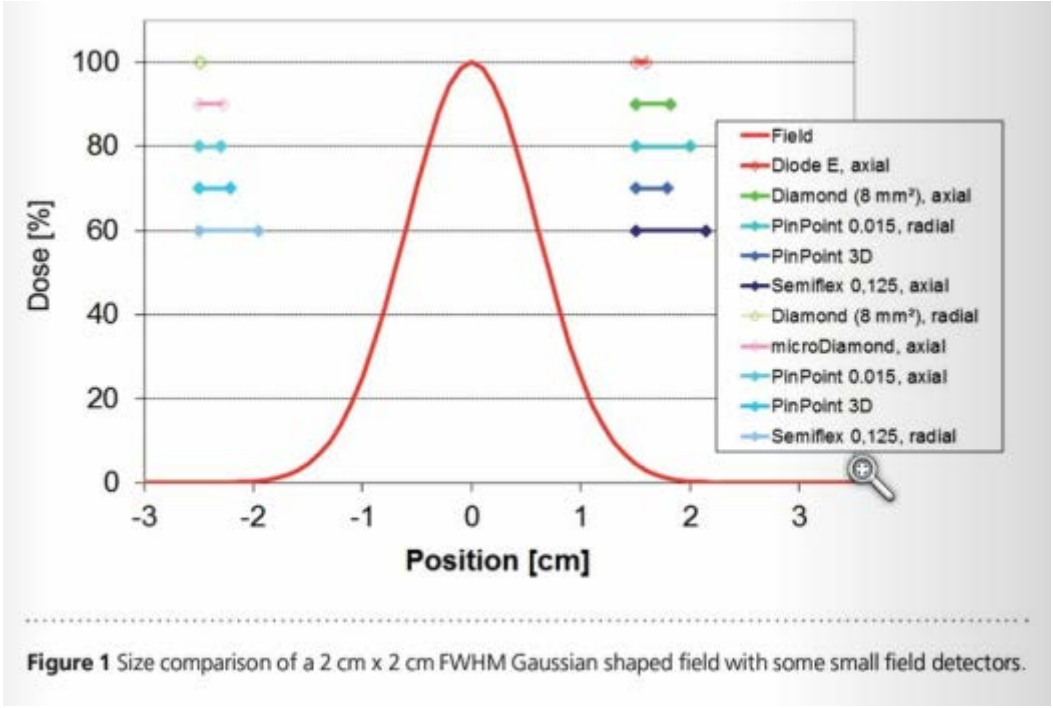
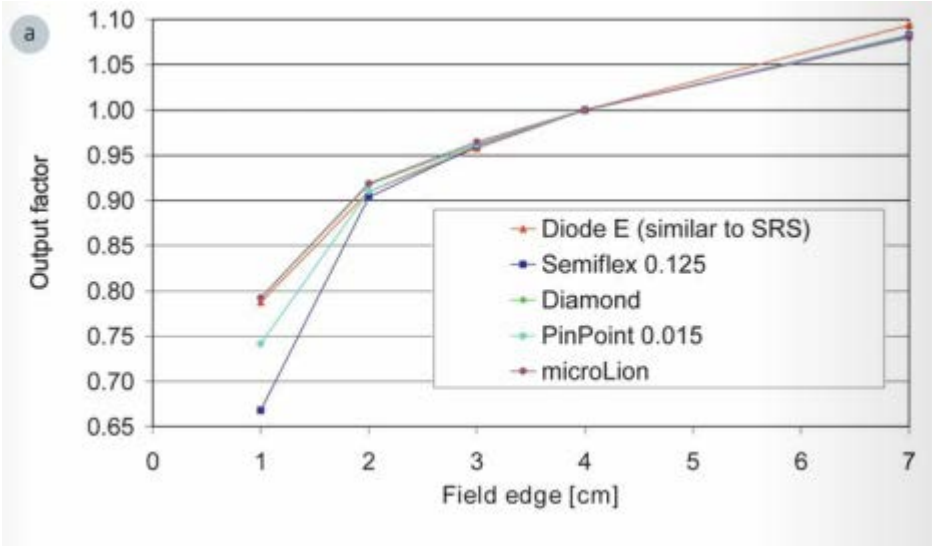
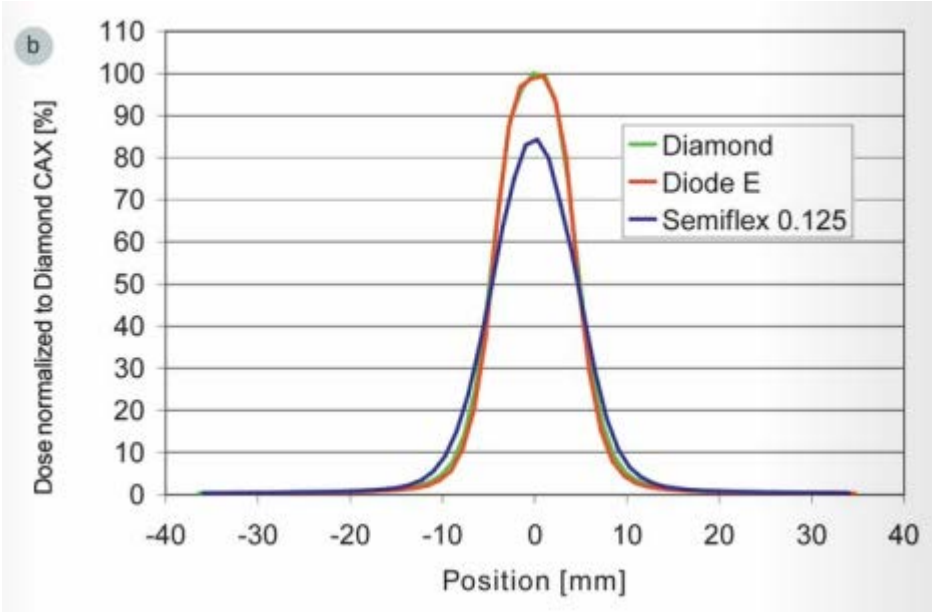


Figure 1 Size comparison of a 2 cm x 2 cm FWHM Gaussian shaped field with some small field detectors.



Output factors. Underestimated dose with Semiflex 0.125 cc chamber clear



1 cm x 1 cm field profile. Semiflex shows under-response at CAX, accurate field width (50%), widened penumbra.

- Source: PTW small field dosimetry guide http://connect.physicsworld.com/Journals//2014/12/19/PTW_Small_Field_Application_Guide_Note_en_92020000_04.pdf