

# Study of Long-Term Constancy of EPID Performance for Dosimetric Applications



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## Introduction

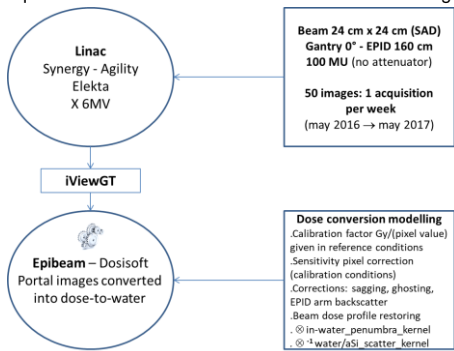
Beyond using Electronic Portal Imaging Device (EPID) for checking patient set up in External Beam RadioTherapy, EPIDs show suitable technical characteristics for dosimetric applications: high spatial resolution of the detector panel, availability on current treatment units and ease of use. EPID dosimetry offers an interesting alternative solution for pretreatment beam verification and for *in vivo* dosimetry, the so-called transit dosimetry. The value of the dose results achieved with EPID is then highly dependent on intrinsic image quality and image acquisition reproducibility.

## Aim

The goal of this study is to observe long-term constancy of the EPID response in **usual conditions of Quality Control and of device maintenance** as performed when used for only patient positioning imaging – i.e. annual manufacturer service operations relative to *dark field* » (df) and « *flood field* » (ff) tuning of the detector.

## Materials and Method

Acquisition and dose-to-water conversion of EPID images

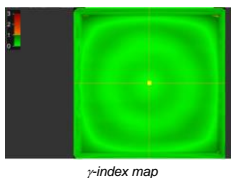


- Theoretical dose image #1 computed by the Epibeam dose prediction model (reference data: Point Kernel *Collapsed Cone Convolution*, TPS Isogray - Dosisoft S.A.)
- EPID images dose conversion modelling in reference to EPID image #1
- 2D  $\gamma$ -index analysis: computation of  $\gamma_{\text{mean}}$  and GAI values (threshold at 10%  $D_{\text{max}}$ )
- Converted / Predicted comparison: image #1 with gamma criteria 3% (global) - 2mm
- Converted EPID images #1 with reference image #1 comparison: 2% (global) - 2mm
- Converted EPID images #1 (cGy) over the whole evaluation period

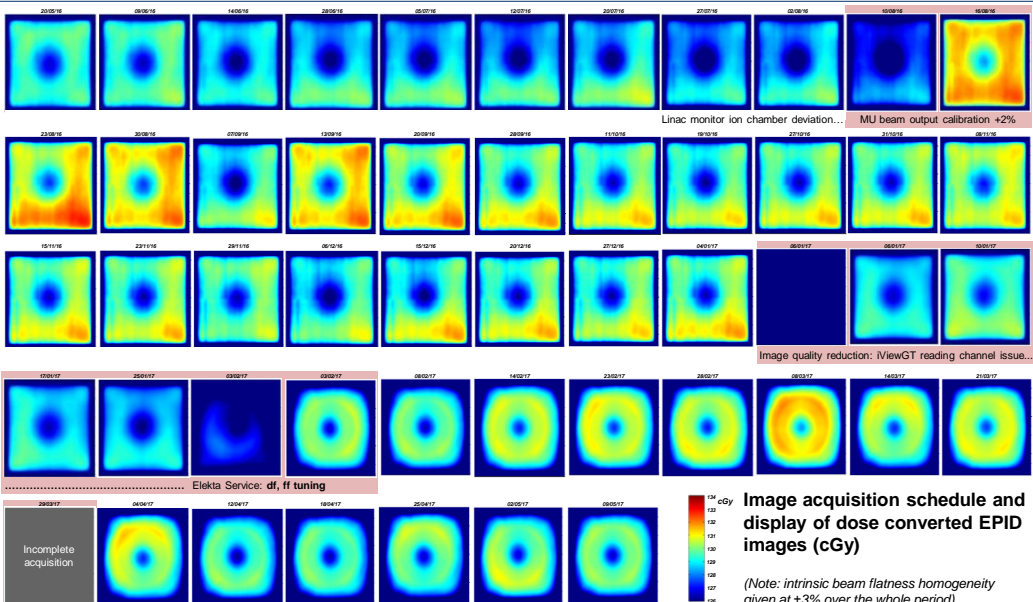
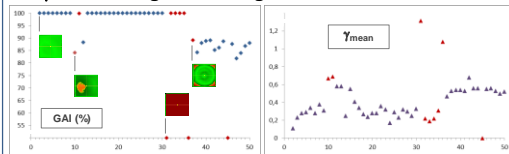
## Results

**image #1**  
Predicted vs Converted  
GAI = 99,92 %  
 $\gamma_{\text{mean}} = 0,25$

→ Validation of EPID image dose conversion modelling,  
→ EPID image #1: reference for following portal images



2D  $\gamma$ -index: image #i vs image #1



## Conclusion

From weekly portal image acquisitions during this one-year study and given the intrinsic beam output variations, the overall long term stability of the EPID has been confirmed. However, special care has to be taken during device manufacturer service. These maintenance tasks must periodically include specific image uniformity tests and dose calibration factor check.

Providing these precautions, appropriate EPID result quality is obtained, making possible its use for dosimetric applications with confidence and accuracy (routine beam output check, patient specific pretreatment verifications).