Objective:
A prototypical low-cost thin-film digital detector system is developed and tested for kV/MV dosimetry. Similarly to radio-graphic films, the detector is flexible, but its response is digitalized and transmitted to the host computer by a wireless sys-tem in real-time. Dosimetric properties of the detector are determined and compared to ion-chamber dosimetry.

Material and Methods:
Different thin-film detector cells in a solid water phantom were irradiated at various conditions: energies (80kVp, 130kVp, 6MV, 15MV), dose rates (different ms*mA, 100-600MU/min), total doses (0.1cGy-500cGy), depths (0.5cm-20cm), irradia-tion angles with respect to the detector surface (0°-180°), and IMRT tests (closed MLC, sweeping gap). Device properties were characterized in terms of the aforementioned parameters. The detector is an embedded-system consisting of an ultra low-power microcontroller, RF transmitter, a low-noise adjustable amplification circuit and commercial available (of the shelf) flexible thin-film photodiodes. The signal is amplified and transmitted via a wireless system to be integrated and proc-essed on the host computer.

Results:
The detector response is linear with total dose and does not depend on dose rate. Its energy response is similar to that of ionization chamber and gafchromic film. No angular dependence is observed for anterior beams, but small angular depend-ence is observed for posterior beams. The detector can measure both MV and kV doses. Gain and frequency of sampling need to be maximized to obtain accurate dose for low instantaneous dose rate conditions such as closed MLC irradiations.

Conclusion:
Even in this early stage of development, the properties of the thin-film photodiode detector are comparable to the standard ionization chamber measurements. Due to its mechanical flexibility, the low-cost realization of the device and the wireless data acquisition it is ideal for quality assurance and specifically for real-time dose monitoring in challenging QA setup con-figurations, including large-area and 3D detection.