Characterization of commercial photo-devices as dose-rate sensors

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**MOTIVATION AND OBJECTIVES**

• The aim of this work is to characterize commercial photodiodes and phototransistors as dose rate sensors for linear accelerators. The photodiodes used in this work are designed for infrared and visible light measurements and are manufactured with mass production processes reducing their final cost. No scintillator transducer was used, the devices were irradiated directly under a build-up layer of solid water.

**METHOD AND MATERIALS**

Experimental setup

• LINAC: Siemens Artiste, 6 MV. Devices to test BPW85B and VTB8440BH.
• LINAC: Siemens KDS, 18 MV: Device to test OP505.
• Devices located at the isocentre of the linac, with a build-up layer to reach electronic equilibrium
• Dose rates of 0.5, 1.0, 1.5, 2.0, 2.5 and 3.0 Gy/min, repeated from high to low and from low to high dose rates.

Commercial devices under test:

• Two photo-transistors:
  • OP505 (Optek)
  • BPW85B (Vishay Siliconix).
• Photodiode VTB8440BH (VTB Process Photodiode)

Reader unit for MOSFET dosmetry:

• Previously designed (M.A. Carvajal et al., “Dose verification system based on MOS transistor for real-time measurement”, Sensors and Actuators A 247, 2016)

**RESULTS AND CONCLUSIONS**

Conclusions:

• Average degradation of the sensitivity measured increasing and reducing the dose rate (after the first 12 Gy) was of 10% for the OP505, 30% for the BPW85B and 40% for the VTB8440BH.
• The OP505 shows a better response to be used as dose rate sensor with our reader module.

![System modules and connections](image)

![Buildup layer](image)

![Light shielding box with a photodiode](image)