AbstractID: 12780 Title: Dose Increase in Radiotherapy evaluated to Biocompatible Levels of Gold Nanoparticle: a Quantitative analysis by MRI Gel Dosimetry and Monte Carlo Spectrometry

Purpose: Apply gel dosimetry to evaluate the dose-increase dependency with nanoparticle concentration in a tissue-simulator dosimeter irradiated with 250kV Radiotherapy beam. Quantify the components of dose contribution by Monte Carlo spectrometry. **Material and Methods:** Gold nanoparticles (AuNP) were embedded in MAGIC-*f* gel in different biocompatible concentrations: 0.11mM(A), 0.06mM(B) and 0.03mM(C). Dosimetric control measures with gel without AuNP were made in the 250kV x-ray beam studied. An acrylic box was positioned behind the gel samples to guarantee backscattered conditions similar to clinical situations accessed with the beam studied. A dose of 5Gy was delivered to all samples. Polymer gel readings were proffered in a 3Tesla nuclear-magnetic-resonance by relaxometry: 5 echoes; Echo-time=20ms; Repetition-time=4000ms; Pixel-size=250μm; Time-delay-to-reading: 12h. Monte Carlo simulations were performed in PENELOPE code precisely reproducing all experimental conditions. **Results:** Signal of non-irradiated gel samples (with and without AuNP) presents no significant variation (<0.5%), evidencing no influences of AuNP in MRI reading. Concentrations A, B and C presents a 106%, 90% and 77% of signal increase, respectively. Comparing with the dose calibration curve of gel, the signal growth represents dose enhancements of 5.3Gy, 4.5Gy and 3.9Gy to concentrations A, B and C respectively. Monte Carlo shows a dose increase of 10.2keV/g, 9.1eV/g and 7.3eV/g, representing 105%, 93% and 75% of perceptual dose growth to concentrations A, B and C respectively. Spectrometry analysis revel a fluorescence dose fraction that contributes to dose increase of 0.98, 0.89 and 0.73 and low-energy Compton events that contributes to local dose increase in fractions of 0.66, 0.38 and 0.12 to concentrations A, B and C respectively. **Conclusions:** Dose increase in Radiotherapy due to AuNP presence has a non-linear dependency with the concentration. The growth of local doses may be high expressed indicating possible clinical benefits of using AuNP added Radiotherapy.