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Abstracts

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Characterization of phenolic solid state pellets for ESR dosimetry with radio-therapeutic photon and electron beams

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Introduction
Among the various dosimetric techniques used for characterizing the radiation beams used in radiation therapy, the electron spin resonance (ESR) arouses increasing interest for applications in various therapy procedures. In this work we report the ESR investigation of particular phenol compound (IRGANOX 1076) exposed to clinical photon and electron beams (Gallo et al., 2017).

Methods
Phenol (IRGANOX 1076 - Sigma Aldrich) pellets were produced also with paraffin (10% by weight). Phenol pellets were exposed to clinical photon and electron beams at various energies produced by a linear accelerator (LINAC) Siemens Primus (Siemens Medical Systems, CA, USA) installed at the Radiotherapy Department of A.R.N.A.S. – Hospital Civico-Di Cristina-Benfratelli (Palermo) with absorbed doses ranging between 0 and 13 Gy.

ESR measurements were performed through a X band Spectrometer. Readout parameters were optimized to maximise the signal without excessive spectrum distortions.

Results
Basic dosimetric properties of phenolic dosimeters, such as reproducibility, dose-response, sensitivity, linearity and dose rate dependence were investigated. A satisfactory intra-batch reproducibility of the ESR signal of the manufactured dosimeters was obtained. The analysis of the ESR signal as function of absorbed dose highlights that the response of this material is linear in the dose range investigated (1-13 Gy) and is independent of the beam energy.

The presence of an intrinsic background signal limits the minimum detectable dose to a value of approximately 0.6 Gy. Reliable and accurate assessment of the dose was achieved, independently of the dose rate. The dosimeters were tested by measuring the depth dose profile of a 6 MV photon beam.

Conclusion
Such characteristics, together with the fact that IRGANOX 1076® is almost tissue-equivalent, and the stability of the ESR signal, make these dosimeters promising materials for ESR dosimetric applications in radiotherapy.

References
S. Gallo et al., Response characterization of phenolic solid-state pellets for ESR dosimetry with radiotherapeutic photon beams. Radiation and Environmental Biophysics (2017) doi: 10.1007/s00411-017-0716-3.