



A.R.P. Cruz¹, L.D. Albino², E. Roesler², V.K. Asfora¹, V.S.M. Barros¹, C.C.B. Viegas³, H.J. Khoury¹

¹ Energy Nuclear Department, Federal University of Pernambuco (DEN/UFPE), Recife, Brazil

² Real Hospital Português de Beneficência em Pernambuco, Recife, Brazil

³ Instituto Nacional de Câncer (INCA), Rio de Janeiro, Brazil

ariciacruz@gmail.com

1. Background and Goal of the present work

Dosimetry audit is a key component in radiotherapy quality assurance programs as it plays an important role in identifying and resolving problems, as well as reducing uncertainty and increasing the consistency of dosimetry protocols among participating institutions. However, the access of radiotherapy centers across the world to dosimetry audit services is still insufficient.

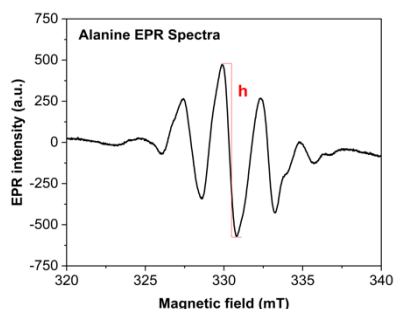
Thus, the aim of this study was to validate a postal quality control system for radiotherapy using alanine/EPR dosimeters by comparison with results from the Quality in Radiotherapy Program (PQRT) from the National Cancer Institute (INCA) in Brazil that uses thermoluminescent dosimeters (TLD).

2. Materials and methods

2.1. Alanine dosimeters



93% alanine + 7% binder
Mass: 38.2 ± 0.1 mg
Diameter: 4 mm
Height: 2 mm



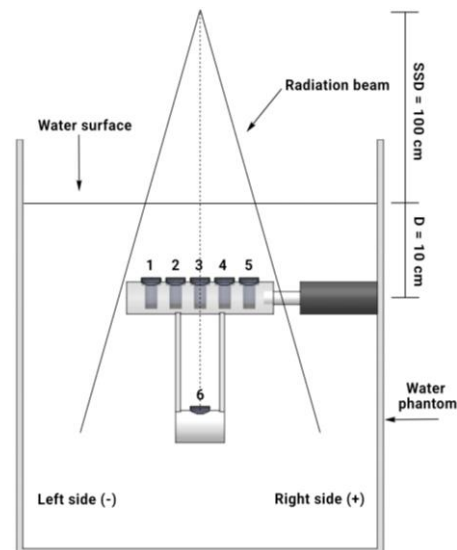
Alanine dosimeters (Aérial, France) and their respective EPR signal.

Alanine measurement parameters:

EPR spectrometer - Bruker Magnetech ESR 5000	
Magnetic field	320 mT - 360 mT
Microwave power	10 mW
Modulation amplitude	0.7 mT
Modulation frequency	100 kHz
Number of scans	10
Scan time	60 s

2.2. Quality control setup - DEN/UFPE system

The system below allows the positioning and irradiation of six dosimeter holders simultaneously, enabling the evaluation of central axis dose at 10 and 20 cm depths, off-axis dose at 2 and 4 cm, in addition to the quality, flatness and symmetry of the radiation beam.



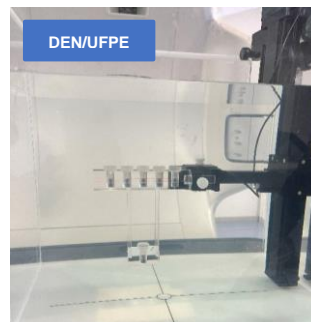
Front view of experimental setup for irradiation of the postal system.



Components of dosimeter holder.



2.3. Intercomparison with the TLD postal audit service of PQRT/INCA



DEN/UFPE

Linear accelerator:
Varian True Beam STX

Radiation doses:
DEN/UFPE – 10 Gy
PQRT/INCA – 2 Gy

Dose data obtained were compared with those from **ionization chambers** irradiated under the same conditions.



PQRT/INCA

3. Results

3.1. DEN/UFPE system

Parameter	Dose measured (Gy)		Deviation %
	DEN/UFPE	Ionization chamber	
Dose in the central axis in reference conditions	9.99	9.97	0.22%
Off-axis dose at -2 cm	9.95	9.98	-0.39%
Off-axis dose at +2 cm	9.84	9.96	-1.15%
Off-axis dose at -4 cm	9.68	9.70	-0.17%
Off-axis dose at +4 cm	9.77	9.67	1.08%
Beam flatness	1.57%	1.60%	-0.03%
Beam symmetry	-0.92%	0.28%	-1.20%

3.2. PQRT/INCA system

Parameter	Dose measured (Gy)		Deviation %
	PQRT/INCA	Ionization chamber	
Dose in the central axis in reference conditions	2.03	2.02	0.43%
Off-axis dose at -2 cm	2.01	2.05	-0.77%
Off-axis dose at +2 cm	2.03	2.02	0.66%
Off-axis dose at -4 cm	1.98	1.97	0.90%
Off-axis dose at +4 cm	1.98	1.96	0.87%
Beam flatness	1.37%	1.60%	-0.23%
Beam symmetry	0.31%	0.28%	0.03%

4. Conclusions and Acknowledgements

The proposed postal audit system is suitable for quality control purposes in radiotherapy.

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