



BSI Standards Publication

Dosimetry with radiophotoluminescent glass dosimeters for dosimetry audit in MV X-ray radiotherapy

National foreword

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**Dosimetry with
radiophotoluminescent glass
dosimeters for dosimetry audit in MV
X-ray radiotherapy**

*Dosimétrie avec dosimètres radiophotoluminescents de type verre
utilisée pour l'audit dosimétrique en radiothérapie à rayons X de
haute énergie*





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Foreword

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Introduction

A radiophotoluminescent glass dosimeter (RPLD) is a cumulative radiation dosimeter usually made of silver-activated phosphate glass. The silver atoms act as radiophotoluminescence (RPL) centres excited by ionizing radiation. The number of RPL centres excited is proportional to the absorbed dose to the RPLD. Since the first RPLD was produced in 1949, improvements have been made to the reading precision and reliability^[1]. The latest products, rod-like dosimeters of a few millimetres in size, measure the absorbed dose that can be evaluated with an uncertainty of about 1 % to 2 % ($k = 1$) in certain conditions^[2] to ^[5]. The RPL centres do not disappear after readout. Therefore, repeated readouts for a single exposure is possible. The results are stable and good accuracy of the signal readouts is possible. In addition, since the RPL centres once formed are hardly affected by fading, it is suitable in long-term dose measurement with retention capacity. RPLDs can be reused by annealing at high temperature.

RPLDs have been widely used for personal dosimetry and environmental radiation measurements^[6] to ^[7]. They are also used for radiation dose assessment of patients and staff in the field of radiation medicine, including interventional radiology, external radiotherapy, and brachytherapy^[8] to ^[21]. Due to their advantages of compactness, repeatable readout, good precision, and small fading, RPLDs have been recently used as a dosimeter for dosimetric external audits in external radiotherapy with high-energy X-rays^[22] to ^[27]. Thermoluminescent Dosimeter (TLD) and optically stimulated luminescent dosimeter (OSLD) have also been used for the audits. The three dosimeters, RPLD, TLD, and OSLD, are passive solid-state dosimeters and have some similar characteristics. However, there are variations in the handling, reading methodology, and dose evaluation, including tissue-equivalency.

This document focuses on the RPL dosimetry from the viewpoint of the dosimetry audit in MV X-ray radiotherapy highlighting the procedures for handling, reading, and corrections to the response dependency of beam quality and dose.