

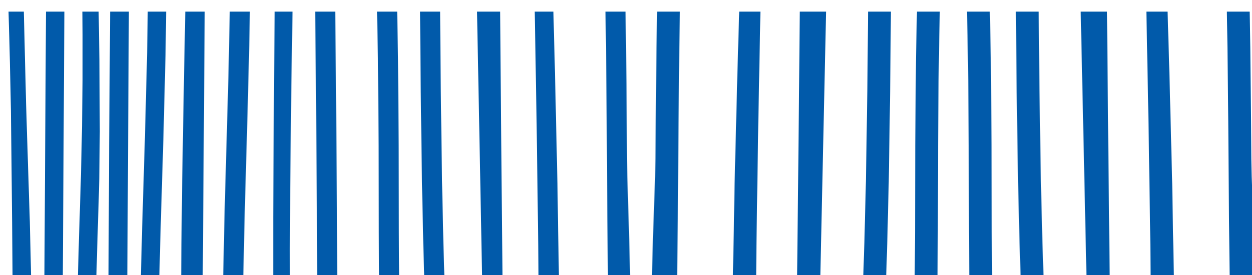


# RAP 2023

**INTERNATIONAL CONFERENCE  
ON RADIATION APPLICATIONS**

In Physics, Chemistry, Biology, Medical Sciences,  
Engineering and Environmental Sciences

# BOOK OF ABSTRACTS



May 29 - June 2, 2023 | Hellenic Centre of Marine Research | Anavyssos | Attica | Greece | [www.rap-conference.org](http://www.rap-conference.org)

## BOOK OF ABSTRACTS

INTERNATIONAL CONFERENCE ON RADIATION APPLICATIONS (RAP 2023)  
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## Evaluation of a new procedure for stability checks of well-type brachytherapy chambers

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Well-type ionization chambers are routinely used for measurements in brachytherapy departments. Since there is no calibration service for brachytherapy ionization chambers available in Serbia, Secondary Standards Dosimetry Laboratory (SSDL) in Vinca Institute of Nuclear Sciences started establishing this service, using a reference well-type chamber Standard Imaging HDR-1000 plus with a PTW Unidos Webline electrometer. The outer wall of the chamber is made of 20 mm thick aluminum, which reduces the influence of the scattered radiation. For each source there is a unique source holder for placement in a reproducible geometry inside the well of the chamber.

The ionization chamber stability has to be checked periodically to ensure reliable measurements. IAEA Technical Report Series (TRS) 1274 [IAEA TRS 1247, IAEA 2002] gives guidelines on standardized procedures at SSDLs and hospitals, including the procedure for stability checks of well-type chambers. According to this procedure, <sup>137</sup>Cs or <sup>60</sup>Co check sources are inserted in the chamber well, using spacers or holders to achieve reproducible geometry. Measurements during stability checks should remain within  $\pm 0.5\%$ .

In this research, a different procedure for stability checks was tested. A teletherapy <sup>60</sup>Co irradiator was used for external irradiation of the well-type chamber. All measurements were corrected for air density (ambient temperature and pressure). Measurements were done in a minimum scatter environment, which was achieved by positioning the ionization chamber 1 m from the irradiator, with the field size of 20x20cm. Correction for <sup>60</sup>Co half-life was applied to all measurements. First, the influence of the source holders was tested, and no significant differences were found (0.16% maximum difference when holder is placed in chamber, compared to no holder present). All the subsequent measurements were performed without source holders. During the second test, 4 stability checks were performed during a period of 4 days without moving the chamber or irradiator. The deviations were within the interval  $-0.39\% - +0.25\%$  compared to the first stability check measurement. During the third test, 7 stability checks were performed during a period of 7 days, and complete setup was repeated during each check (chamber positioning, bench positioning, collimator setup etc.). The purpose of the second test was to check the repeatability of positioning, because the positioning can artificially increase deviations between subsequent measurements, making the chamber stability appear worse. All the results were within the interval  $-0.17\% - +0.27\%$ . The results show that this procedure can be adequate for the stability checks of well-type chambers, because the repeatability due to the changes in measurement procedures setup is better than the 0.5%. Differences between second and third test could be caused by insufficient thermalization of the chamber during the second test.

**Keywords:** brachytherapy, HDR, dosimeters, stability control

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