The lecture will overview R&D program at CMRP on development of radiation semiconductor detectors and readout electronics for advanced medical dosimetry on a medical linac, brachytherapy, interventional radiology and particle therapy. Some outcomes of R&D program are mentioned below.

**MO Skin dosimetry in brachytherapy QA and interventional radiology**

MO Skin is only detector able to measure the skin dose H (0.07) in real time. Development of MO Skin wireless dosimetry system and its application for in vivo dosimetry on medical linac, HDR brachytherapy and fluoroscopically-guided interventional procedures for real time dose quality assurance will be discussed and demonstrated.

**QA dosimetry for real-time motion adaptive radiotherapy on LINAC**

Real-time adaptive radiotherapy aims to improve radiation treatment through re-optimization of treatment delivery based on patient-specific organ motion during treatment. MLC tracking to adapt beam to the tumor is a solution. We have developed high spatial and temporal resolution monolithic 2D diode array named “MagicPlate-512” which is mimicking tumor motion and allow 2D dose mapping simultaneously with resolution 1 mm / 1 ms. In conjunction with Calypso motion tracking system MP 512 provides an ideal QA system for dynamic MLC allowing retrospectively to analyze delivery and errors. These detectors are B-field tolerant and found application for dose QA on MRI Linac.

**QA in HDR brachytherapy pre-treatment and in vivo treatment delivery verification**

Magic Plate (MP) is an array of radiation detectors embedded in a thin kapton substrate utilizing special CMRP technology. Based on MP a novel QA device, named “magic phantom” (MPh), has been developed which allow for the pre-treatment delivery verification of plans in HDR brachytherapy. It assesses source dwell positions, dwell times and compare with TPS in real time. A new metric, the “position-time gamma index”, was introduced to quantify the quality of the measured delivery when compared to the treatment plan. Application of MP in a transmission mode for in vivo dosimetry on a linac will be presented.

**Solid State Microdosimetry for RBE and detectors for ion range verifications in 12C ion therapy**

A novel miniature silicon microdosimeter which is based on innovative 3D detector technology has been introduced for RBE QA. It was demonstrated firstly an excellent agreement in RBE obtained with silicon microdosimeter and TEPC. New detector and technique for verification of ion range in proton and HIT with resolution 0.1 mm has been developed.