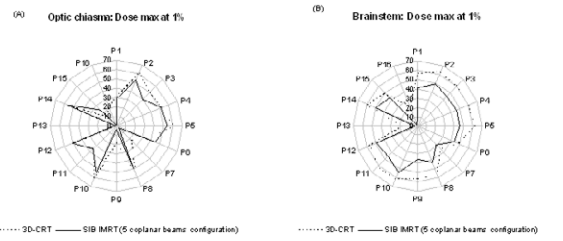

Figure 3:

Comparison of the doses received by organs at risk between 3D-CRT and SIB-IMRT with the 5 coplanar beams configuration for all 16 patients (P1 to P16). Doses relative to 3D-CRT are plotted in dashed line and doses relative to SIB-IMRT are plotted in solid line. No significant difference between 3D-CRT and SIB IMRT is found when considering the maximum dose received by 1% of the optic chiasm (median of 42.08 Gy vs 41.63 Gy, p=0.109) (figure 3A). For the brainstem the maximum dose received by 1% of the organ is significantly lower (median of 44.00 Gy vs 57.01 Gy, p=0.001) (figure 3B).

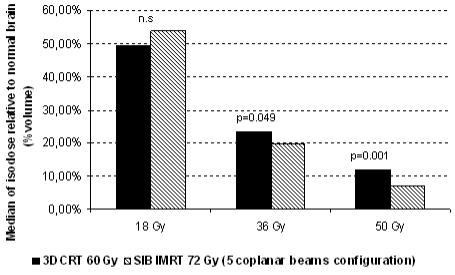

Figure 4: Histograms of isodose volumes relative to normal brain (in % of volume) comparing conventional 3D-CRT delivering 60 Gy (black) vs. 72-Gy-SIB-IMRT with the 5 coplanar beams configuration (hatched). No significant difference between the plans is found when considering the isodose of 18 Gy but SIB-IMRT showed isodose volumes of 36 Gy and 50 Gy significantly smaller (respectively, median of 20% vs 23% , p=0.049 and 7% vs 12% , p=0.001)

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SCINTILLATING OPTICAL FIBER DOSIMETER FOR LOW DOSE RATE

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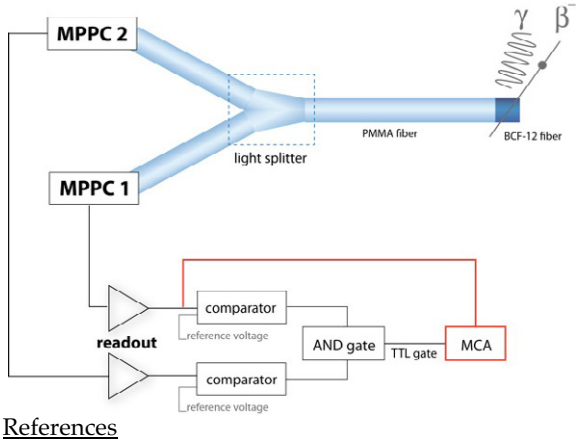
Brachytherapy has become a first choice treatment in certain cancer pathologies and new developments allow for better planning and more efficient delivery of radiation dose. Quality assurance in these treatments requires an efficient control of the dose delivery to the tumor and surrounding healthy tissues. Currently, one of the best solutions for radiation dosimetry is based on plastic scintillators. These plastic scintillators have interesting features such as near water-equivalence in a wide energy range, fast decay time, temperature independence, radiation resistance and possibility of in-vivo and real-time readout [1-3]. These characteristics overcome some of the known disadvantages of the other dosimetric techniques. For low dose rate dosimetry (LDR), a highly sensitive dosimeter is desirable. Since the light yield of typical scintillating fibers is relatively low (8000 photons/ MeV) compared to the most popular inorganic and organic scintillators, their application to LDR is limited. However, the new developments in high gain silicon photodetectors (SiPM), such as the Multi-Pixel Photon Counter from Hamamatsu, open the possibility of using scintillating optical fibers in LDR dosimetry. When compared with PMTs, the MPPCs are smaller devices, insensitive to magnetic fields, require lower bias voltage, making them easier to use in radiation dosimetry. Our group previously demonstrated that this scintillating fiber could be used for dosimetry even for low doses and LDR with MPPC readout. The biggest disadvantage of these silicon-based sensors is their high dark noise [4]. In this work we propose a solution to overcome this problem. The sensitive probe consists of a 10 mm-long scintillating fiber (BCF-12, Saint-Gobain Crystals) with 1 mm in diameter. The scintillation light is divided by a 1x2 optical splitter into two PMMA optical fibers, which in turn are coupled to the MPPCs. The dosimeter is designed to operate in coincidence mode allowing the rejection of false events generated by thermal noise (Fig. 1).

For this specific application, all the readout electronics and coincidence units were developed. In preliminary tests carried out, good results were obtained with a significant rejection of the dark noise events. Further developments are under way in particular to optimize the optical splitter and to efectively control the MPPC temperature.



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EPIDEMIOLOGICAL, IN VITRO AND MONTE CARLO MODELLED BASIC DATA IN PREDICTING AND PRESENTING RISKS ASSOCIATED WITH SECONDARY CANCERS.

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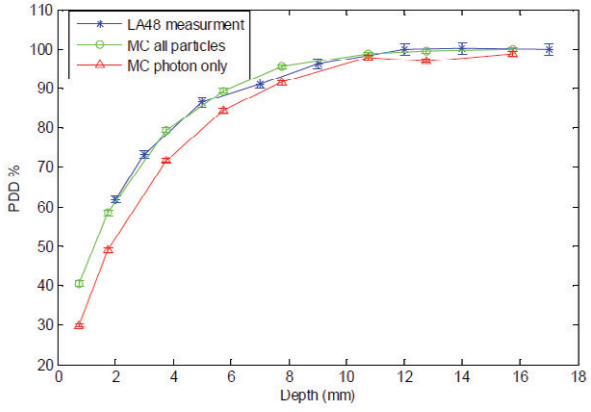
Objectives: Radiotherapy is an important front-line treatment in cancer care; however side-effects, including long-term issues for patients like secondary cancer, are increasingly becoming a concern due to the longer term survival of cancer sufferers plus the introduction of new radiotherapy modalities that change dramatically the dose pattern to normal tissues. In recent years, conventional radiotherapy is being replaced with more highly conformal techniques; however, the base-line of dose-risk relationships is derivative from epidemiological data dating back to the early 1900s. In addition, the detailed radiation components (internal scattering and external scattering such as the production of charged particles) of these techniques have not linked in the literature to the second cancer risk. Therefore, this study will present the second cancer risk to contralateral breast after conventional left breast 6MV radiotherapy. In particular, to understand how electron contribute to shallow organ risk. Conventional 6MV radiotherapy treatment to contralateral breast dose has been modelled using Monte Carlo treatment planning (MCTP) method and thus detailed contribution to the radiation-induced cancer risk have been included.
Methodology: In this study, two similar MCTP plans were computed, the first MC plan with photon only and the second MC plan with all particles. For both MC plans, the second cancer risk was estimated using a dose-risk model to convert the dose distribution to a risk probability density distribution in treatment planning software. The difference between these two risk estimations allows us to understand the contribution of charged particle contamination from treatment head to the contralateral breast risk. The calculations were compared with measurements using an LA48 liquid ion chamber array (PTW).
Results and Conclusion: The relative radiative excess risk is shown to increase by about 30% due to electron produced in treatment head. This estimated risk is of contributional risk to contralateral breast due to scatter radiation affected by the size of the treated breast and thus the tangential fields' angles. A simple solution for the reduction of scattered electrons that has been suggested is a plastic bolus material (superflab) which can be placed on the contralateral breast to absorb the scattered radiation from electrons and thus can reduce the risk of second cancer by approximately 30%.

(a)



(b)

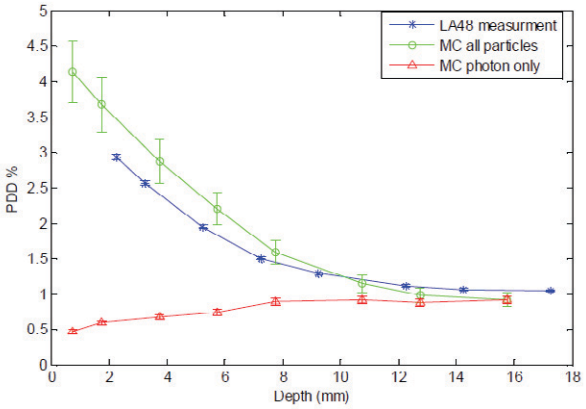


Figure 1: Percentage depth dose measured near the surface with the LA48 liquid ion-chamber array for 6 MV photon beam (a) on the central-axis and (b) 12 cm off-axis, and modelled using BEAM/EGSnrc with and without contaminant electrons.

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RESPONSE OF HUMAN LUNG ADENO-CARCINOMA CELLS TO PROTON RADIATION AND ERLOTINIB

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Purpose/Objective: Lung cancer is the leading cause of cancer death throughout the world. Fifteen percent of all lung cancers diagnosed is small cell lung carcinoma (SCLC), while non-small cell lung carcinoma (NSCLC) accounts for 85%. The prognosis of patients with lung cancer is poor despite recent advances in surgery, radio- and chemo-therapy. It has been shown that radiation induces an over-expression of epidermal growth factor receptor (EGFR). The fact that signaling by EGFR plays a key role in tumorigenesis prompted efforts to target this receptor in anticancer therapy. Moreover, EGFR is frequently overexpressed in NSCLC and has been implicated in the pathogenesis of this disease. Erlotinib, tyrosine kinase inhibitor of the EGFR, is one of first molecularly targeted agents clinically available for the treatment of NSCLC. Based on these facts, in this study erlotinib was used as a supplementary agent to boost NSCLC CRL5876 cell inactivation in the combined treatment with proton irradiations.