AbstractID: 11885 Title: Introduction: Challenges of Post-treatment and Real-time Imaging of Dose Deposition in Proton Therapy

The finite range of protons is the primary physical advantage leading to the potentially greatly improved dose distributions in proton radiation therapy. The other side of the coin is that it takes extra care to make sure that the protons actually stop at the right location. Fortunately, proton therapy provides unique opportunities to visualize interactions of the therapeutic beam with the patient. These interactions are more or less closely related to the delivered dose distribution, and can therefore be used as a dose surrogate for treatment verification. In this symposium we will highlight three examples of such interaction mechanisms, as well as their potential to provide clinically useful information about the in-vivo dose distribution either post-treatment or even in real-time. Some of the methods are applicable to photon therapy as well.

In this short introduction we will discuss various reasons that lead to uncertainties in the proton range and will show estimates of the magnitude of the range uncertainties. We will then go over techniques to deal with range uncertainties in treatment planning, and will finally discuss what could be gained if we could reduce or eliminate range uncertainties.

Learning objectives:

1. Name three reasons for range uncertainties in proton therapy.
2. Quantify the magnitude of range uncertainties.
3. Name at least one method that reduces the impact of range uncertainties.