# AbstractID: 1847 Title: Intra-fraction re-optimization of radiation therapy

On-board imaging capabilities on radiotherapy treatment systems do not enable only better patient positioning, but also provide basis for eventual treatment plan modification. If the patient geometry change compared to the treatment planning geometry includes a non-rigid transformation, the plan needs to be *re-optimized*. Once patient is prepared for treatment, no much time is available for re-optimization. Therefore, one has to compromise between speed and re-optimization accuracy. The question appears though, whether one can start treatment and perform re-optimization while the treatment has already started; in other words – how effectively can re-optimization remedy previously delivered errors.

In order to test intra-fraction re-optimization, a continuously moving W-shaped target and continuous tomotherapy delivery were assumed. The target was designed to be sharp and with large motion amplitude. The continuous re-optimization prescription was first tested on a static example. Several cases with and without motion and with and without on-line imaging feedback were considered. Even though continuous motion was assumed, a set-up error (a single-point motion) is also covered as a limiting case.

The consistency test proved correctness of the re-optimization prescription method. Furthermore, it is shown that intra-fraction re-optimization is able to successfully correct for the errors, even when some errors have accumulated. On the other hand, if change of the geometry is not accounted for, intra-fraction re-optimization is not successful, even when dose reconstruction information is available.