Liver cancer and liver metastases are among the most prevalent types of cancer. Unfortunately only about 30-35% of the patients suffering from liver cancer are suitable for surgical resection of the lesion. An alternative treatment is the thermal destruction of the tumour by heat, which can be induced by focused ultrasound (FUS). FUS therapy is non-invasive as it allows for heating of the tumourous tissue deep inside the patient’s body without possibly harming healthy tissue. In the liver, however, the location of the tumour is difficult to reach due to the rib cage, lungs and intestines. Another major challenge is the motion of the abdominal organs as the patient breathes. With the support of the FUSIMO system, the attending physician is able to decide on the feasibility of the procedure. Simulating the procedure beforehand and obtaining information about the thermal effects on the tissue, the physician determines how the procedure can be conducted safely and successfully.
Expected Results & Impacts & Preliminary Results

The expected outcome of the FUSIMO project is a demonstrator software that incorporates the validated multi-level models for FUS application in moving organs. This software demonstrator shall support the physician in planning, monitoring and assessing the outcome of a FUS procedure in moving abdominal organs and therefore facilitate the use of MR-guided FUS. In fact, the results obtained in FUSIMO will have the potential to make FUS treatment in the abdomen a competitive alternative to the surgical gold standard.

FUSIMO’s patient specific models will have a great capability for translation to other organs and different types of tumour treatment. In principle all thermal therapies like radiofrequency- and laser-ablation, as well as targeted drug delivery and radiotherapy applications can benefit from the organ- and motion-models created in FUSIMO.

The long-term impact of FUSIMO lies in improving the treatment of cancer and metastases in a variety of organs and for a wide range of patients. This will contribute to substantially reducing the estimated 1.7 million deaths in Europe each year. The reduced side effects (compared to conventional surgery, systemic chemotherapy and radiation therapy) of the MR guided focused ultrasound surgery and targeted chemotherapeutic drug delivery will reduce complications and consequently lead to a higher quality treatment of the patients at lower financial demand for health insurance and social welfare.