

STARLIT

Aiming for 'first-time-right' treatment for cancer patients



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The global incidence rate of cancer is expected to grow by 70% over the next two decades, with Radiation Therapy (RT) treatment currently recommended for 52% of new patients. Although radiation oncology has led to a drop in mortality for several cancers, the need remains to reduce side effects such as incontinence or dysphagia. The solution lies in 'first-time-right' treatment in which the right dose is given to the tumour while keeping the dose to healthy tissue as low as possible to prevent side effects.

The ITEA project STARLIT - a follow-up to the award-winning ITEA project SoRTS - gathered 14 partners from Austria, Canada, the Netherlands and Sweden and developed technology to improve treatment accuracy and minimise the unintended dose in image-guided radiation therapy. A focus area for both projects was to improve the real-time connections within a system of systems called Elekta Unity, comprising a Philips MRI scanner for imaging and an Elekta linear accelerator for radiotherapy.

Impact highlights

- > As a result of the STARLIT project, the number of radiotherapy treatments needed for cancer patients will be reduced and so too will the related burden.
- > A cancer patient can also benefit from a risk reduction of side effects as less tissue is damaged. This improves overall safety of the treatment and reduces recovery time.
- > The projected annual top-line revenues for the consortium are over USD 650 million after 2020.
- > Before the project, low-latency motion detection for tracking was clinically impracticable or suffered delays of over 500 ms, whereas STARLIT has created a prototype with delays of just 200 ms.
- > High-resolution imaging has also seen an enormous boost thanks to STARLIT: an echo time reduction from over 100 ms to 70 ms, a 20-30% increase in signal-to-noise ratio (this ratio compares the level of a desired signal to the level of background noise) and a decrease in distortion from more than 10 mm to less than 1 mm.
- > Elekta has already received over 80 orders in more than 25 countries.
- > Philips had sold roughly 10,000 Compressed SENSE software licences by Q4 2022, which have been used in nearly 25 million examinations.
- > Thanks to participation in STARLIT, Tesla Dynamic Coils (TDC) was able to address a new market for flexible and wearable coils which increase the comfort for the patient, especially children. They are maturing the technology to TRL 8.
- > In addition to generating 19 full-time positions within the consortium, STARLIT has led to eight Master theses, one PhD thesis and four new courses at Utrecht University.

Project results

STARLIT has improved Elekta Unity's software to speed up imaging, thereby allowing a number of intervention and monitoring processes to be carried out in real time. The STARLIT system is integrated with low-latency connections, causing minimal delay in the processing of computer data, and a feedback loop, allowing for real-time adaption of treatment based on separate monitoring processes. These verify that the delivered dose and the position of the tumour are correct.

The project's main focus was technical feasibility, which resulted in several very successful outcomes. Thanks to these strong technical improvements, physicians can benefit from higher confidence and control of treatment delivery and potentially reduce margins while the patient, as a result of margin reductions, can potentially benefit from a risk reduction of side effects.

As reported in a press release by Elekta, in December 2022, a milestone was reached in radiation therapy as the first patients completed their full course of radiation therapy treatment with Elekta Unity using Comprehensive

Motion Management (CMM) with True Tracking and automatic gating functionalities. Based on initial results, there is great potential in using Unity's CMM functionality to treat abdominal cancers, lung tumours, prostate tumours – wherever there is motion, regardless of the cause.

Exploitation

The STARLIT partners show a real complementarity in their collaboration, in which the SMEs involved have a unique role as the creators of additional products that improve STARLIT's efficiency. For example, IT-V Medizintechnik from Austria created the Head & NeckSTEP M and the HeadSTEP MRL PushPIN, respectively the only head and neck positioning devices for iCAST and PushPIN masks officially certified for use with Elekta Unity.

Tesla Dynamic Coils (TDC) from the Netherlands developed a head-and-neck coil for the Elekta Unity system. The outcome was a radiolucent flexible coil that demonstrated a threefold increase in signal-to-noise ratio (the quality indicator of MR images) compared to the traditional coil in the Elekta Unity.

Modus QA from Canada contributed to quality assurance

during project testing with the Quasar MRI⁴D Motion Phantom, which is the world's first MR-safe programmable motion phantom. The 4D motion phantom has a patented deformable tumour target, reduces measurement latency from over 50 ms to roughly 500 µs and improves target position precision from 1 mm to 0.25 mm.

Quantib from the Netherlands developed and improved upon its Visual Scoring Tool, which has played an important role in image quality assessment for Quantib's current line of products, including those for brain and prostate MRI.

In addition, Philips had sold roughly 10,000 Compressed SENSE software licences by Q4 2022, which have been used in nearly 25 million examinations and Elekta has already received over 80 orders from more than 25 countries.

Promising uptake paves the way for STARLIT's most important result: improved quality of life for patients, who currently go through the radiation procedure up to 20 times. Higher doses with greater accuracy could reduce this to two or three times – perhaps even just once. This means less travel to hospital and potentially fewer side effects.

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16016

PROJECT LEADER

Frank van der Linden, Philips

PROJECT START

October 2017

PROJECT END

September 2020

PROJECT WEBSITE

<https://itea4.org/project/starlit.html>

PARTNERS

Austria

IT-V Medizintechnik

Canada

Elekta

Modus Medical Devices

The Netherlands

MR CODE

MR Coils

Nucletron Operations

Philips Electronics Nederland

Quantib

Tesla Dynamic Coils

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UMC Utrecht

Sweden

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