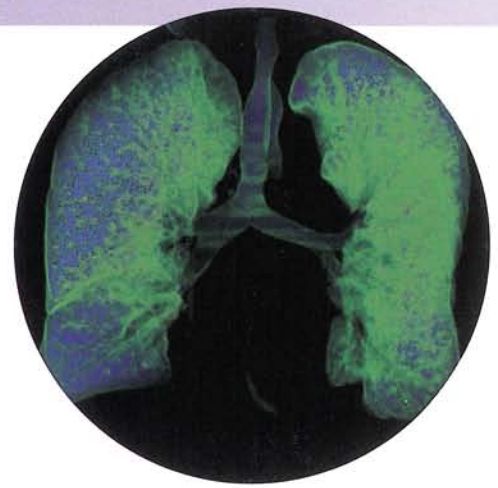


# Improved Cancer treatment with PSD



*Patient safety has become increasingly important in healthcare, and is crucial with regard to radiation treatment for cancer. As radiation to some extent also affects healthy tissue surrounding tumours, there is a risk of side effects.*

*At the Proton Medical Research Center at the University of Tsukuba, Japan, a PSD-based system has been developed to increase the precision of radiation treatment for patients with lung or liver cancer.*

Radiation treatment is one of the commonest methods of treating cancer, and roughly one in two patients receives radiation treatment at some stage. Treatment usually involves external radiation, which means use of equipment that radiates the body from the outside. With this treatment it is very important to concentrate the radiation on the tumour so that the healthy surrounding tissue is damaged as little as possible. This is particularly complicated in radiation treatment of lung and liver cancer, as the tumour moves when the patient breathes.

## *Respiration-controlled radiation system – using a PSD*

To facilitate radiation treatment of patients with lung or liver cancer, radiation takes place when patients are holding their breath and lying relatively still. The method is not 100% reliable, as many patients find it hard to lie motionless.

To increase the precision of this type of radiation treatment and reduce damage to healthy surrounding tissue, a group of Japanese researchers have developed a respiration-controlled system that registers when the patient's chest is still. Thanks to this technology you can precisely concentrate the dose of radiation on the tumour without patients needing to hold their breath.

The researchers realised that there is a link between the movement of the chest during respiration and the way the internal organs move. By positioning an omnidirectional IR LED on the patient's chest and

using a PSD camera, every change in position of the chest – and thus the tumour – is registered. The tumour's position can be read with great precision, and radiation takes place during the final phase of expiration, when the patient's organs are moving the least.

## *Stringent requirements for the sensor equipment*

During the development of the respiration-controlled system the keywords when choosing the sensor

electronics to process the signals that are sent, e.g. to a computer. By modulating the light from one or more IR LEDs the camera can detect their positions with high resolution, despite strong background lighting.

## *Greater precision leads to safer treatment*

The clinical studies performed using the PSD-based equipment showed a decrease in radiation of the healthy tissue surrounding the tumour. With this method it was possible to



◀ Measurement of chest movements during radiation.

▶ PSD camera from TNK containing a SiTek PSD.



were reliability, stability and easy setting. To meet these requirements a PSD camera made by the Japanese manufacturer TNK was used. Like an ordinary camera, this camera has a lens system and the heart of the system is a SiTek PSD mounted on the focal plane. The camera is also equipped with sophisticated

decrease the safety margin to 5-10 mm, despite the actual target of the radiation moving two to three times more during treatment.

PSD-controlled radiation is now a routine treatment at the Tsukuba University Hospital, and over 200 patients with lung or liver cancer have been treated.

