

Targeting Cancer Treatment More Accurately

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About 90 percent of tumor treatment successes are due to the efficacy of surgery and radiotherapy. The more familiar forms of cancer treatment—chemotherapy and radiation—often cause severe damage to both healthy and tumor cells. But there's good news: the use of accelerated particle beams, known as hadron or proton therapy, is a step toward developing more targeted and effective cancer treatments that spare healthy tissues, which is critical when cancer develops near vital organs in the body.

Depending on the particular formation of each tumor, oncologists must frequently adjust the physical characteristics of particle beams, which requires a precise control system. By aiming the energetic ionizing particles accurately at the tumor, less energy is deposited into the healthy tissue surrounding the target tissue.

This complex treatment requires nearly 300 devices networked together to control the operation of the machine as well as access to the room itself. For secure access to the treatment rooms during the emission of nuclear radiation, engineers at CNAO developed a safety interlock system using the NI [LabVIEW FPGA Module](#) [1] and NI [PXI](#) [2] hardware.

Directing the beam at the tumor requires systems to prepare the beam, then measure and control beam intensity and position while distributing it evenly across

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the tumor. These systems, developed with LabVIEW and real-time NI PXI and NI [CompactRIO](#) [3] FPGA-based hardware, measure beam intensity every microsecond and beam position every 100 μ s with 100 to 200 micrometer accuracy. This beam controller system delivers the measurements, real-time control, and data visualization needed by the scientists operating the beam.

After completing dosimetry and radiobiology tests with proton beams, CNAO obtained the authorization to start treating patients. They estimate more than three percent of Italian radiotherapy patients (more than 3,000 new patients per year) will be treated with hadron therapy, and this number will steadily increase.

[Watch a video of the hadron therapy system in action.](#) [4]

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Links:

[1] <http://www.ni.com/fpga/>

[2] <http://www.ni.com/pxi/>

[3] <http://www.ni.com/compactrio/>

[4] <http://www.mdtmag.com/videos/2013/08/labview-helps-revolutionize-cancer-treatments#.UgPeKG1O46s>