integration allows us to compare machine utilization with clinical indications for two different Proton Pencil Beam Scanning (PBS) gantry-based systems. Preliminary results show that while the number of new patients was similar for both rooms, the Proteus™ONE exhibits greater efficiency based on patient numbers and number of treatment fields treated.

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SO010 / #176

A REAL-WORLD ASSESSMENT OF THE POWER CONSUMPTION REQUIRED TO OPERATE THE PROTEUS®PLUS AND PROTEUS®ONE PROTON THERAPY SYSTEMS

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Background and Aims: As our institution has both a multi-room ProteusPLUS and single-room ProteusONE system operating at the same facility, we have the unique opportunity to assess differences in power consumption and provide data that may help others estimate their utility cost prior to installation.

Methods: Power consumption (kW) data was retrieved from our utility provider between 2017 and mid-2024 at 15-minute time intervals. Several periods were identified representing events in which either both proton therapy systems were offline or one system was operating and not the other. By comparing the power consumption of the facility during these time periods, it is possible to parse out the individual contributions of each system. The entire dataset was further analyzed for trends related to installation, daily operation, system maintenance, and downtime.

Results: Figure 1 displays data retrieved from the utility provider as color coded by time of day. Red indicates peak hours (7 AM–7 PM), orange/yellow represents “shoulder hours” (6–7 AM, 7–11 PM), and teal/blue represents after hours (11 PM–6 AM). Construction of the ProteusONE expansion began in January of 2018 with beam commissioning in July 2019. Several spikes in facility power are noted during the commissioning process. The overall power consumption of the facility increased by 15% between 2018 and 2019, though this includes not only proton therapy components but all other ancillary systems drawing power within the additional 15,000 sqft. Power consumption during mutual downtime events indicates a baseline facility power of roughly 400 kW. Power consumption of the ProteusPLUS and ProteusONE systems based on periods of individual operation are estimated to be 425–450 kW and 25–40 kW, respectively (**Figure 2**). **Figure 1.** Power consumption (kW) of facility over multi-year time period as color coded by time of day. **Figure 2.** Event review of power consumption. Red indicates an offline system(s); green indicates normal operation.

Conclusions: By using multiple time windows to separate out the baseline power consumption of the facility, both proton systems, and knowing the annual cost of electricity for the institution, it is roughly estimated that the ProteusPLUS and ProteusONE utlize \$380K–410K and \$25K–33K per year in electricity, respectively, based on our operation and geographic region.

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SO011 / #313

A PROMPT GAMMA IMAGING CAMERA FOR RANGE VERIFICATION IN HADRONTHERAPY WITH REAL-TIME NEUTRON BACKGROUND REJECTION

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Background and Aims: Prompt Gamma Imaging (PGI) is a promising technique in particle therapy for range verification with millimeter precision. It is clinically applied in proton therapy and has recently been investigated for Carbon Ion Radiation Therapy (CIRT), where, however, a higher neutron background, uncorrelated with the particle range, affects Bragg Peak (BP) retrieval precision. In this work, we present a compact detector for PGI with real-time gamma/neutron discrimination capability and its first CIRT PG profile measurement.

Methods: The detector employs Pulse Shape Discrimination (PSD) to distinguish the neutron and gamma-ray signals in a CLYC scintillator, known for its particle-dependent time response. It integrates a CLYC crystal, SiPMs, and compact electronics to acquire real-time PSD coefficients, enabling dual-particle imaging and PGI with effective neutron rejection. The system’s capability to distinguish Prompt Gammas from neutrons in a hadrontherapy environment was tested and optimized at CNAO (Pavia), with the uncollimated detector placed perpendicularly to a carbon ion beam (100 spills of 10^8 particles) irradiating a tissue-equivalent phantom. Additionally, a preliminary dual particle imaging test was successfully performed using a gamma and neutron-emitting Americium-Beryllium source at 1 meter, with full, half, and no cadmium shielding to block thermal neutrons. A first PGI measurement using a CLYC-based knife-edge slit camera with neutron rejection for improved BP retrieval is planned at CNAO in March 2025 and will be presented at the conference.

Results: The first experiment yielded a Figure of Merit of ~1.3 and a well distinguished thermal neutron peak emerging at 3.2 MeV (Figure 1). The Neutron-to-gamma ratio of 1.1–1.8 varied with beam energy and detector distance from the phantom.

Real-time PSD-resolved images measured in different irradiation conditions are reported in Figure 2, also with the 1D-profile of the reconstructed y-coordinate.

The red and green lines correspond to the unshielded and fully shielded crystal configurations, respectively. The blue profile shows neutron attenuation on the shielded half of the crystal.

Conclusions: Our detection module has demonstrated satisfactory discrimination and dual particle imaging capabilities towards a potential improvement of the PGI BP retrieval precision in CIRT. Experimental results of a first PGI application will be presented at the conference.

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