

**Purpose:** We show that one only requires measurement of the energy spread and pencil-beam width to commission any particle beam scanning (PBS) planning system apart from the geometric representation and a table of the available equipment energies. We commissioned a treatment planning system (TPS) where dose distributions are calculated analytically or by a novel Monte Carlo, YAMC. YAMC resolves the limitation of analytical pencil-beams: the insensitivity to lateral heterogeneities and at depth. Our approach uses absolute depth doses [ $\text{Gy(RBE).mm}^2/\text{Gigaproton}$ ], generated by GEANT4 Monte Carlo at zero energy spread, and measurements of the beam spot width and energy spread as a function of energy. This approach reduces the number of commissioning measurements. We present results from commissioning at our facility. **Methods:** The analytic dose calculation divides physical pencil beams into a grid of “computational” (zero-width) pencil beams and transports those through the patient. Physical depth dose distributions are derived from GEANT4 pristine peaks by convolving with the measured energy spread and are subsequently verified against measurements. The YAMC simulation is implemented on a graphics processing unit (GPU). **Results:** The performance of YAMC is evaluated with a  $10 \times 10 \text{cm}^2$  field and was computed in 10s with 3% statistical error on a 32-core 0.9GHz GPU ( $\sim 200,000$  protons/sec). Measured dose distributions satisfy the gamma (2mm,2%) criterion compared to the TPS for uniform and irregularly shaped fields. The measured longitudinal flatness of fields optimized for uniformity in the plateau varies between  $\pm 1$  to  $\pm 3\%$ . **Conclusion:** Dose distributions in the TPS have good agreement with measurements in water and are calculated either analytically or by YAMC. The YAMC improves dose accuracy near heterogeneities and the simulation time is more than adequate for treatment planning. Commissioning for other sites is reduced to the smallest possible set of machine-dependent parameters: energy spread and spot width.