Purpose: To commission a proton-therapy system for the treatment of uveal melanoma and age-related macular degeneration.

Methods: Proton therapy system is the proto-type of a commercial product developed by Ion Beam Applications. Proton beam is brought into the treatment room at 105 MeV through a fixed beam line. A single-scattering system with absorber/scattering foils spreads the beam into a Gaussian profile. A library of 10 range-modulator wheels and 16 range-modulator blocks generate spread-out Bragg peaks of various range and modulation width. Source-to-axis distance of the system is 169 cm. Two orthogonal digital x-ray panels are used for alignment. EyePlan software is used both for both treatment planning and in-room alignment.

Results: Range can be varied continuously between 0.5 and 3.4 g/cm2. Range accuracy is measured to be better than 0.05 g/cm2 with an accuracy of 0.05 g/cm2 or 2%. Maximum aperture diameter is 2.5 cm and maximum dose rate >32 Gy/min. Strong dependence of output on range (7%/mm) and dose rate (0.2%/Gy/min)) is found. Distal and lateral fall-off (80%-20%) are =0.23 and =0.18 g/cm2 and do not depend much on range or depth. When reducing the aperture diameter to 6 mm no significant change is observed in shape of depth-dose curve or absolute dose (<2.5%). Measurements show a significant portion of the dose at shallow depth (=0.7 g/cm2) is delivered by protons scattering off of snout elements. Simple collimation could reduce this effect.

Conclusion: The dosimetric and positioning properties of the IBA ocular proton system are adequate to treat ocular lesions with acceptable clinical margins. Suggested improvements include limiting the output-dependence on range and reducing snout scatter.