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Beam optics studies for a uranium ion micro-beam[1] BRANDON RAYHAUN, Argonne National Laboratory and UChicago, JERRY NOLEN, BRAHIM MUSTAPHA, SERGEY KUTSAEV, PETER OSTROUMOV, Argonne National Laboratory — The proposed XMAT (eXtreme MATerials) facility at the Argonne Advanced Photon Source (APS) promises to advance our understanding of and aid in the development of advanced materials for fusion and fission reactor fuels and structural elements. An ion-beam accelerator for this facility is being designed by the nuclear physics accelerator group in the Argonne Physics Division. The ion energy of $\sim$ 1 MeV/u was chosen to create damage at a depth of 10 microns, far enough below the surface to affect the bulk material. By co-locating this accelerator at the APS, the XMAT facility will have the unique capability of in-situ 3D X-ray imaging of the material as the damage evolves in time. This sub-project is to design the focusing optics with the high accuracy needed to simulate a heavy ion micro-beam to deliver at least 10^7 ions/s into a 10 micron diameter spot. The plan is to use 2 superconducting solenoids, a first stage magnification of 0.2 and the second 0.5 to achieve an overall flux density increase of 100 times that at the linac output while maintaining a final working distance of at least 50 cm between the superconducting solenoid and the sample. High accuracy transfer maps using COSY Infinity and a custom-written ion tracking program have been shown to agree at the sub-micron level.

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Brandon Rayhaun
Argonne National Laboratory and UChicago

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