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Development of a Reliable Target Mechanism for the Muon Ionisation Cooling Experiment

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The International Muon Ionisation Cooling Experiment (MICE) is a proof of principle demonstration of ionisation cooling for application in a future neutrino factory or muon collider. The experiment will measure the beam emittance before and after cooling to a high precision using individual particle measurements.
MICE is under construction at the Rutherford Appleton Laboratory (UK), where a transport beam line has been commissioned. Particles are produced inside the ISIS Proton Synchrotron by means of a target mechanism that dips a small titanium shaft into the beam at the end of an acceleration cycle, removing it 10ms later to prevent unnecessary activation of the accelerator.
These requirements are met with a precise linear motor capable of accelerating at 80g, while maintaining a controllable insertion depth. The conditions within ISIS prevent the use of lubricants and need the mechanism to operate for months without direct interaction.

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