

MICE Pathways to Impact

The following points summarise the economic and societal impact of hosting the international Muon Ionization Cooling Experiment (MICE) at the Rutherford Appleton Laboratory:

- 1) The main impact of MICE is its contribution to the worldwide Accelerator R&D programme. Techniques developed in MICE are essential for future high power proton facilities including the Neutrino Factory and the Muon Collider. These will benefit the worldwide accelerator industry, including the development of future RF cavities that can operate inside magnetic fields, the development of large superconducting technology that may be realised in a simpler and more cost-effective way, and the development of innovative instrumentation to operate at such facilities.
- 2) The training of accelerator physicists and engineers underpins the increasing use of accelerators in research and industry, including such disparate areas as medical treatment and diagnosis, security applications and power generation. MICE has trained over 67 STFC and university staff and students, including 22 PhD students (12 have graduated and are deploying their skills in industry, such as IT consultancy, the financial sector, IBM and defence industries), 16 post-doctoral and contract staff and 11 faculty (8 PDRA staff trained on the project have taken their expertise to other projects or to private industry). MICE has developed UK expertise in running a major project in the UK, with 4 STFC and 7 university staff playing senior roles in the project leadership. The expertise in university and STFC staff developed include: low frequency RF for future accelerators, large superconducting solenoids, novel liquid hydrogen handling systems and accelerator instrumentation.
- 3) The MICE project will benefit the following collaborations: the international MICE collaboration encompassing 34 institutions in 8 countries; the International Design Study for a Neutrino Factory (IDS-NF), (<https://www.ids-nf.org/wiki/FrontPage>) and the EC-funded EUROnu project (<http://www.euronu.org/>), the nuSTORM collaboration (<http://arxiv.org/pdf/1206.0294v1.pdf>) and the 'Proton Accelerators for Science and Innovation' (PASI) collaboration, (http://pasi.org.uk/Main_Page).
- 4) The MICE project is benefitting UK and international industry through engineering and construction partnerships: cryogenic engineering (AS Scientific), collaborative development of unusually large superconducting magnets with closed-circuit cooling with TESLA engineering (UK) and Wang NMR (USA), knowledge exchange in the development of the MICE target with TechVac, Multigrind Watford, ExcelPrecision and CCFE-Babcock, and knowledge exchange with UK industry in the manufacture of RF amplifier components, HT safety systems, high power, high frequency electrical contacts and specialist plating and joining methods.
- 5) The MICE project is active in the dissemination of its activities, with refereed journal and conference publications, a freely accessible archive record (<http://www.mice.iit.edu/>), organised outreach activities for school students, participation in the Annual Goldsmiths courses for A-level teachers, participation in the Particle Physics masterclasses, public events, such as the "Accelerator extravaganza" at RAL and the General Public Access Day at RAL (8 July 2015), 15 undergraduate, PGI and summer projects hosted by MICE, publicity through Physics World and the CERN Courier, a prizewinning paper at the "SET for Britain" Meeting in 2009, and other public and media activities.