

The UK High-Field Solid-State NMR NRF: Serving the Physical and Life Sciences

High-field solid-state NMR has applications across a wide range of research areas, including batteries, catalysts, energy materials, and pharmaceuticals in the physical sciences and protein and plant cell wall biochemistry and biophysics with relevance to disease and plant biomass energy. This is reflected in a userbase from a wide range of departments spanning Biochemistry, Biological Sciences, Chemical Engineering, Chemistry, Earth Sciences, Life Sciences, Materials Science, Pharmacy and Physics, funded by EPSRC, BBSRC, MRC, NERC and STFC.

As such, NMR is a flagship example for the wider research community coming together. In particular, since its inception, the UK high-field solid-state NMR Facility has played a pivotal role in making the case for joined-up funding across the different research councils through the Facility Executive (FE) that is comprised of eight academics from different UK institutions covering the breadth of solid-state NMR research applications. Specifically, building upon a 2013 EPSRC report by FE member, Mark Smith (then at Lancaster), entitled “Understanding the Current Portfolio and Resourcing Implications of NMR Infrastructure Underpinning World Class Physical Sciences” [1], NMR was the first research area for which EPSRC produced a roadmap in 2013: “Roadmap to provide Internationally Leading NMR Infrastructure for UK Physical Sciences” [2]. Moreover, close working together between NMR spectroscopists in the physical and life sciences led to a “A UK-wide cross-disciplinary integrated infrastructure for NMR spectroscopy” in 2015 and an update of the review by Smith in 2017: “Understanding the Current Portfolio and Resourcing Implications of NMR Infrastructure Underpinning World Class Science in the UK” [4]. The culmination of these efforts was £20M UKRI investment in 2018 in high-field NMR infrastructure [5] including the 1 GHz solid-state NMR spectrometer at the high-field solid-state NMR NRF that in 2020 became the first 1 GHz NMR magnet at field in the UK (see feature article in Chemistry World [6]).

The working together of the distinct physical and life science NMR communities is exemplified by the Connect NMR UK: A National NMR Network for the Physical and Life Sciences network grant (EP/S035958/1) led by FE member, Frédéric Blanc, Liverpool, with co-Is, Christina Redfield, Oxford, and Craig Butts, Bristol [7]. The Network spans three main existing interdisciplinary communities and two learned societies encompassing virtually all UK NMR scientists. Here, the UK High-Field Solid-State NMR NRF provides high-profile representation for the UK solid-state NMR community, with the annual 1-day symposium in March-April being a focal point for exchange of knowledge and viewpoints. The other communities brought together by the Network are the liquid-state, biological NMR community (who are brought together by the MRC-funded Collaborative Computational Project in NMR, CCPN www.ccpn.ac.uk) and the UK-NMR managers group community (UKMRM) which connects industrial and academic NMR facility managers. These communities also hold regular meetings to promote collaboration and outreach, and to share best practice and exchange knowledge. The learned societies comprise the RSC NMRDG, an RSC Interest Group aiming to further scientific understanding and applications of NMR spectroscopy and which organises three 1-day meetings in March-April (thematic meeting), June (postgraduate spring meeting, held the day after the UKMRM meeting) and in December (general meeting); the BRSBG: the Magnetic Resonance Group of the IOP aimed at fundamental developments in magnetic resonance techniques, and their applications, which holds an annual 1-day December meeting. The UK High-Field Solid-State NMR NRF links directly to the activities of these societies, with Facility users regularly speaking at their meetings and FE member John Griffin and NRF Technical Director Dinu Iuga being current members of the BRSBG committee. As such, the UK High-Field Solid-State NMR NRF forms one of the cornerstones of the UK NMR community, and the integration of its activities with those of the other parts of the UK NMR community via Connect NMR UK is leading into current efforts to secure funding for the next generation of NMR magnet at 1.2 GHz, with the first instruments brought to field in 2020 in Florence, Italy, and Zurich, Switzerland [6].

[1] <https://epsrc.ukri.org/newsevents/pubs/understanding-the-current-portfolio-and-resourcing-implications-of-nmr-infrastructure-underpinning-world-class-physical-sciences/>

[2] <https://epsrc.ukri.org/newsevents/pubs/roadmap-to-provide-internationally-leading-nmr-infrastructure-for-uk-physical-sciences/>

[3] https://warwick.ac.uk/fac/sci/physics/research/condensedmatt/nmr/850/future_investment/a_uk-wide_cross-disciplinary_integrated_infrastructure_for_nmr_spectroscopy_march_2015.pdf

[4] <https://epsrc.ukri.org/files/newsevents/news/nmr-infrastructure-in-the-uk/>

[5]

<https://webarchive.nationalarchives.gov.uk/20200930161535/https://epsrc.ukri.org/newsevents/news/nmrequipmentinvestment/>

[6] <https://www.chemistryworld.com/news/uk-reaches-the-gigahertz-nmr-level-behind-other-nations/4012642.article?adredir=1>

[7] <https://gow.epsrc.ukri.org/NGBOViewGrant.aspx?GrantRef=EP/S035958/1>