

1. Title of Case Study: Training activities at the UK High-Field Solid-State NMR National Research Facility

2. Grant Reference Number: EP/S035958/1, EP/S036458/1, EP/S036067/1

3. One sentence summary: Providing solid-state NMR spectroscopy awareness and training opportunities to liquid-state NMR spectroscopists at the UK High-Field Solid-State NMR National Research Facility.

One paragraph summary: The National Research Facility (NRF) has hosted two in-person NMR workshops (in 2022 and 2023) providing training activities covering the most important theoretical and practical aspects of solid-state NMR spectroscopy that were delivered by members of the NRF's Facility Executive. These workshops were successful as evidenced by several metrics including their oversubscription from members of the UK NMR community, the range of career stage from PhD student to Professor represented, ongoing new collaborative projects being discussed, and the positive feedback received from the delegates.

5. Key outputs in bullet points:

- *Creating awareness of solid-state NMR spectroscopy methodologies and capabilities to solution-state NMR scientists using state-of-the-art high-field NMR instrumentation*
- *Training in 2022 and 2023 of 30 early career researchers and established scientists from 19 UK academic institutions and 3 industries in solid-state NMR spectroscopy*
- *New collaborations with the Universities of Bristol, Kingston, Oxford, and Imperial College London*
- *Increasing visibility of the UK High-Field Solid-State NMR National Research Facility amongst other NMR heavy users*

6. Main body text: The NRF works with the Connect NMR UK network initiative to deliver training in solid-state NMR. The collective national vision for Connect NMR UK is to maximise the impact of the UK NMR infrastructure by connecting the NMR communities in the physical and life sciences together to support, enhance and extend their current efforts by creating synergies. One of the main objectives is to coordinate workshops and training opportunities in order for the UK NMR community to promote the NMR discipline and share their NMR expertise within the other subdisciplines of NMR and the wider fields such as organic chemistry and materials science.

In this context, the NRF has hosted two Connect NMR UK "Solid-state NMR for liquid-state NMR scientists" workshops on Wednesday 30th March 2022 and Monday 27th March 2023. These events strategically took place on the days that preceded the 2022 and 2023 NRF Annual Symposia, so as to also provide opportunities, beyond the training provided by the workshops, to allow the participants to attend the Annual Symposia and hear about the most recent research activities enabled by access to the Facility. These workshops were in-person events with direct interaction with the hardware, so as to maximise the awareness of the available high-field solid-state NMR infrastructure. They were both oversubscribed (*e.g.*, the 2022 event was 200% oversubscribed) and limited to 15 participants to provide the participants with the most useful hands on experience. All attendees had excellent knowledge in solution-state NMR (that is their project largely focused on NMR rather than using it for *e.g.* synthetic chemistry), but none in solid-state NMR. Whilst in 2022, early-career researchers (PhD students and postdocs) and research technical professionals, from several Universities or various industrial sectors, made all the attendees of the inaugural event, in

2023, most participants were academic members of staff spanning all career stage (from Lecturer to Professor) as well as research technical professionals.

In both years, the 15 participants were split into 3 different groups of a manageable size of 5, rotating between 3 different activities. These were delivered by Facility Executive members, namely Prof John Griffin lecturing on anisotropic NMR interactions that distinguish solid-state NMR from solution-state NMR, Prof Frédéric Blanc exploring experimentally a number of concepts discussed in the lecture and showcasing standard solid-state NMR experiments at 850 MHz in 2022 and at 1 GHz in 2023, together with the support of the Facility Management Team with Dr. Dinu Iuga and Dr. Trent Franks demonstrating Magic Angle Spinning and Charlie Whitewood providing administrative support.

Social interactions such as dinner on the previous days and lunch and tea breaks during the days of the workshops also enabled the strengthening of existing interactions and triggering new collaborative projects. For example, delegates shared their research interests and the facility executive members discussed how high-field solid-state NMR spectroscopy could be utilised in their research, opening up new collaborative research projects.

Excellent feedback was received from attendees, e.g. *"Thank you, for a really wonderful opportunity to experience and learn about solid state NMR. I found it fascinating and great to network with people in similar fields to my own!"* and *"Again thank you for organising the solid-state workshop. It was really useful!"* and from PIs who supported attendance of group members, e.g. *"My PhD student was absolutely buzzing when he came back - he was really impressed. In fact his one problem was that he choose not to stay for the NRF presentations the next day and realised that was a big mistake cause he now knew enough that he felt confident sitting through solid-state NMR talks!"*

Building on the success of these workshops, a third workshop is planned to take place on Wednesday 17th April 2024, the day before the 2024 Annual Symposium.

7. Names of key academics and any collaborators:

Professor Frédéric Blanc, University of Liverpool
Professor John M. Griffin, Lancaster University

8. Sources of significant sponsorship (if applicable):

EPSRC, BBSRC and MRC funding for the Connect NMR UK network grant

9. Who should we contact for more information?

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