

## THE CENTRE FOR ADVANCED IMAGING

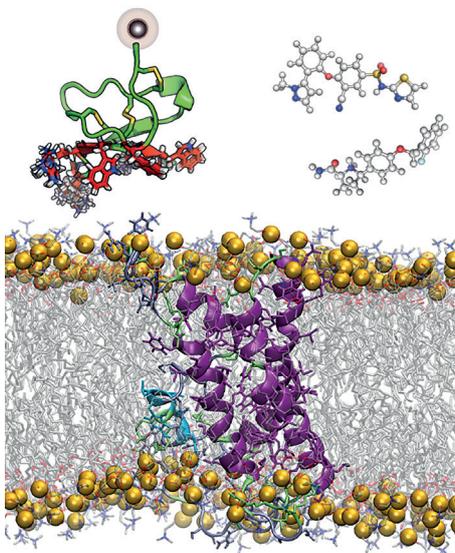
# High Resolution Nuclear Magnetic Resonance at CAI

The Centre for Advanced Imaging (CAI) houses a range of nuclear magnetic resonance (NMR) instrumentation including Australia's highest field strength NMR (900 MHz). Expertise and facilities are available for structural studies, metabolomics and materials research.

Access to the CAI NMR facilities is available on a fee basis. Expert staff at CAI offer support for:

- Structural studies
- Metabolomics
- Materials research
- Sample preparation and data analysis service

CAI is also able to prepare and run samples for all researchers, including those interstate.



Structure, function and ligand binding of membrane embedded proteins using NMR

### Avance 900 – Biomolecules

The Bruker 900 MHz spectrometer is optimised for biomolecular NMR studies. This system provides the highest field strength available in Australia and is equipped with a cryo-probe to provide the greatest possible sensitivity.

The spectrometer is used routinely to solve high-resolution, three-dimensional structures of soluble and membrane proteins, complex carbohydrates and natural products, nucleic acids, protein-protein complexes and to map macromolecular interactions.

#### Capabilities:

- Triple resonance cryoprobe ( $^{13}\text{C}/^{15}\text{N}/^1\text{H}$ )
- Observable nuclei: H, C, N and D
- Seamless interface for non-uniform sampling (Topspin 3.2)
- High-throughput screening using a cooled SampleJet (metabolomics, drug/fragment screening)
- Compatible with salt tolerant sample spinners
- Optimal for studies of very large molecules where the field-dependent TROSY effect allows for NMR signals to be measured for complexes up to 1 MDa
- Avance III HD console

This instrument is part of the Queensland NMR Network (QNN), a consortium of linked NMR facilities at UQ, QUT and Griffith University.

## Avance 700 – High-throughput

The Bruker 700 MHz spectrometer facilitates a broad range of life science and materials research. The spectrometer has a cooled high-throughput sample changer that enables metabolomic and fragment library screening. The high sensitivity of the cryoprobe allows the investigation of small quantities of compounds such as in natural product structural elucidation and conformational studies.

### Capabilities:

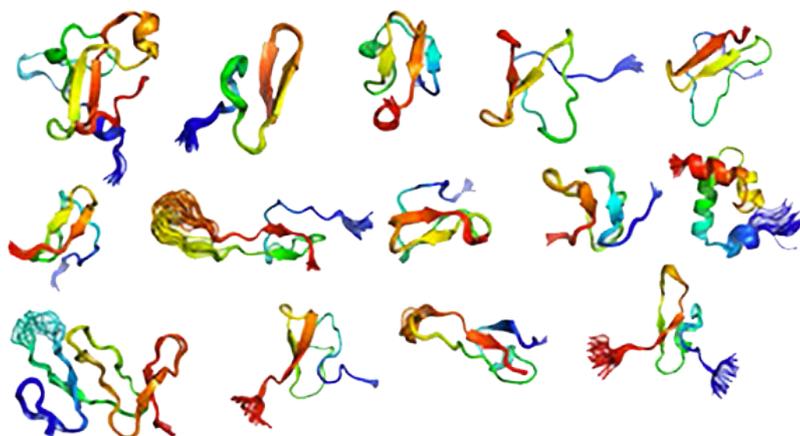
- Cooled SampleJet high-throughput sample handling and analysis system (480 samples)
- Triple resonance cryoprobe ( $^{13}\text{C}/^{15}\text{N}/^1\text{H}$ ) with  $^{19}\text{F}$  capability
- Avance III HD console
- Observable nuclei: H, F, C, N and D
- Ideal for metabolomics, pharmacy and biotechnology, chemistry, nutritional science and molecular diagnostics research

## Avance 500 – Tailored applications

The Bruker Avance 500 high-resolution NMR spectrometer is used in research applications ranging across the chemical, physical and biological sciences. The spectrometer has multinuclear capability for observation of a wide range of NMR isotopes.

### Capabilities:

- Avance III HD console (3 channels)
- BBFO smart probe –  $^{19}\text{F}$
- Multinuclear NMR:  $^{119}\text{Sn}$ ,  $^{77}\text{Se}$ ,  $^{29}\text{Si}$ ,  $^{31}\text{P}$
- Variable temperature, low and high extended range
- Research applications include small molecules, natural products, biological compounds and material science.



## Avance 300 SS – Materials science

The Bruker Avance 300 solid state NMR facility at CAI provides modern instrumentation for material characterisation.

Solid State NMR is non-destructive and requires only a small amount of material for analysis, depending on the isotope studied (50 mg or less). A combination of spectroscopy with spectral editing and relaxometry allows investigation of structural and dynamic properties, in addition to chemical composition.

The expertise available includes experience with a wide variety of materials, from newly-synthesised chemicals to polymers, complex inorganic composites, hydrogels, hybrid materials and mixed organic substances.

### Capabilities:

- Avance III HD console (2 channels) with high-power proton decoupling and temperature control
- 4.0 mm MAS HX probe. Maximum spinning rate 9 kHz. Wide range of isotope frequencies are available. Temperature range:  $-30$  to  $+70^\circ\text{C}$
- 7 mm static probe. Single channel (13 to 123 MHz)
- 4 mm MAS X-H ( $^1\text{H}$  or  $^{19}\text{F}$ ) Doty probe



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