Bruker BioSpin’s 263 GHz AVANCE DNP-NMR Spectrometer is the world’s first commercially available solid-state DNP-NMR system. The 263 GHz spectrometer enables extended DNP solid-state NMR experiments, delivering unsurpassed sensitivity for exciting new applications. Signal enhancements from a factor of 20 to 80 are possible on a wide range of samples, with ongoing system optimization delivering ever higher DNP efficiency. The new high power gyrotron system, powering microwaves at 263 GHz, is robust, safe and easy-to-use, enabling long term DNP experiments without time limits. Experiments are performed at a low temperature of ~100 K using Bruker’s innovative low-temperature MAS probe for sample polarization in-situ, directly at the NMR field.

Features
- Turn-key solution for DNP-enhanced solids NMR experiments at high field
- Polarization enhancement yields up to a factor of 80 gain in sensitivity for solid-state NMR
- Unique high power (25 W) 263 GHz microwave source
- Easy-to-use software-controlled high power gyrotron (9.7 T)
- Optimum beam propagation to the sample ensured by microwave transmission lines
- New low-temperature MAS probe technology with built-in waveguide and cold spinning gas supply
- AVANCE III 400 wide-bore NMR system
DNP-Enhanced Experiments on Large Biological Systems

Dynamic Nuclear Polarization (DNP) experiments at 263 GHz/400 MHz provide a large gain in sensitivity and dramatically reduce signal averaging time. This enhanced sensitivity enables researchers to study samples that otherwise would have been inaccessible to NMR, such as certain membrane proteins or samples which are only available in very limited amounts or dilute concentration. Unmodified NMR experiments benefit from continuous DNP-enhanced signal intensity through CW microwave irradiation.

DNP-enhanced NMR experiments on $^{15}$N Proteorhodopsin (WHYIF-reversely labeled) with 10 mM TOTAPOL, 6 mg of sample in 3.2 mm rotor. 8 kHz MAS at 105 K.

Figure A: $^{15}$N CPMAS experiment showing single Schiff base resonance (SB) in 512 scans, 2 second recycle delay.

Figure B: $^{15}$N-$^{13}$C NCA correlation experiment to natural abundance $^{13}$C. $^{15}$N Proteorhodopsin (WHYIF-reversed labeled), 6 mg, 10 mM TOTAPOL. 40 hour experiment time. Microwaves on continuously. Sample courtesy of L. Shi, E. Lake, L. Brown, V. Ladizhansky, University of Guelph

DNP-Enhanced CPMAS of $^{13}$C-Proline

DNP signal enhancement = 70

Solid-State DNP-NMR System with 400 MHz Wide-Bore magnet