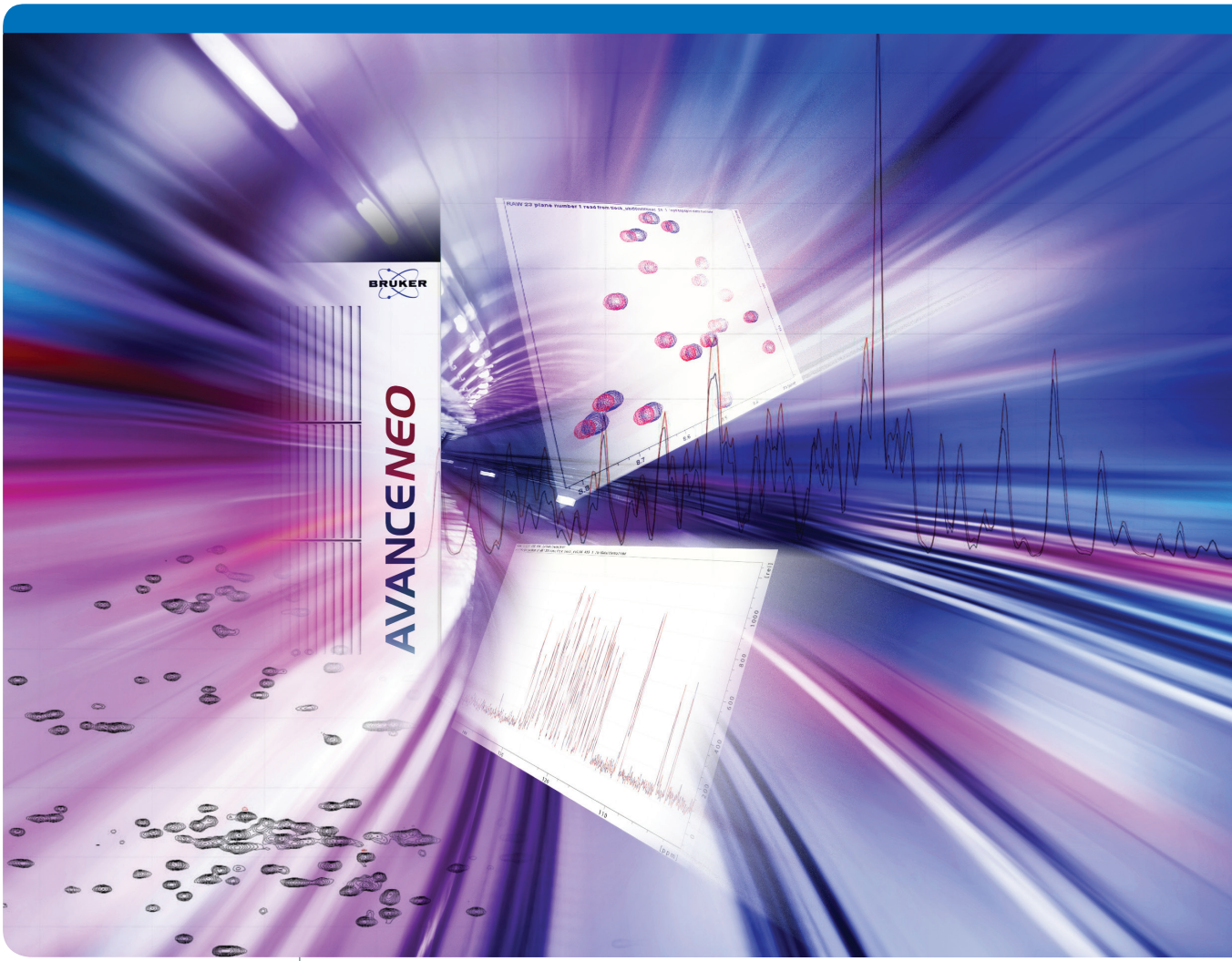

AVANCE NEO

- Takes NMR to a New, Highly Controlled, Ultra-fast Level

Innovation with Integrity

NMR

Ready for the future in NMR research

The AVANCE NEO is the next generation of Bruker's successful AVANCE product line. Offering ultra-fast control, greater dynamic range and enhanced flexibility, the AVANCE NEO takes NMR research to an even higher performance level.

True NMR Channel System

The AVANCE NEO NMR acquisition system is based on a fully modular, highly integrated RF transmit and receive concept. Each NMR channel (a TRX1200 transceiver) consists of a fully autonomous and independent pulse programmer, transmitter and receiver. All transceivers can be synchronized with each other within a 12.5ns timescale at pulse program level, which is 4 times faster than before. RF pulses are generated with the simultaneous amplitude, phase and frequency setting, within 12.5ns.

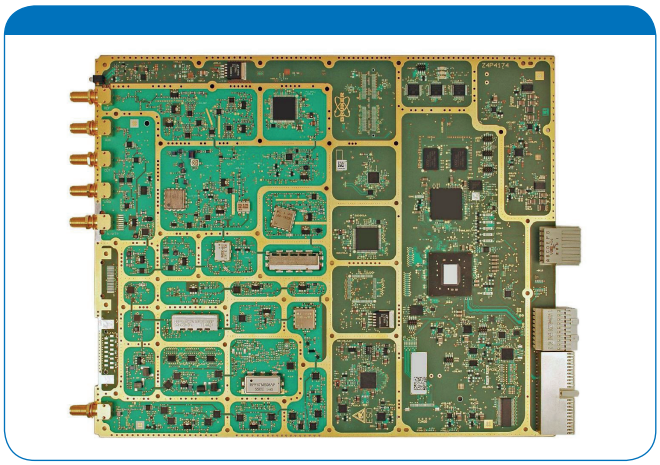

Fig. 1: TRX1200 transceiver.

Each channel has a dedicated pulse program execution engine (system on chip) with an onboard high speed 1GB waveform memory. The highly digital implementation incorporates a 960 MSPS digital up-converter (DUC) for transmit, and a high speed 240 MSPS ADC with a high speed digital down converter (DDC).

This provides ultra stable and precise RF pulse generation, as well as high dynamic, spurious free NMR detection with further enhanced dynamic range. A state-of-the-art and well-designed heterodyne receiver results in approximately 50% less noise than previous technology. This delivers full sensitivity even at very low receiver gains.

Further Enhanced Dynamic Range

State-of-the-art ADC and receiver electronics improve the sensitivity of AVANCE NEO consoles at low receiver gains compared to the AVANCE III HD.

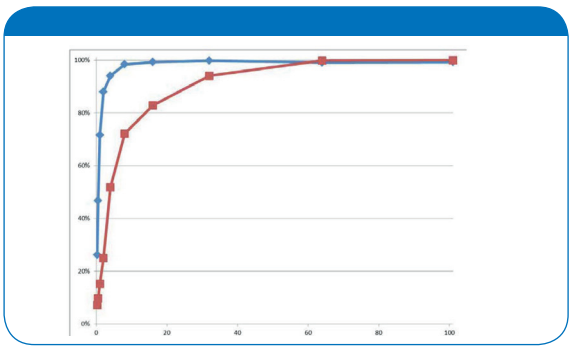

Fig. 2: Increased sensitivity for AVANCE NEO (blue) compared to AVANCE III HD (red) in high dynamic range situations. For receiver gains below 32, the gain is 20% to over 100%.

High IF Technology

The receiver within the TRX1200 uses a very high intermediate frequency (IF) of 1.852 GHz for NMR signal generation and detection. This avoids any compromise with local oscillator (LO) windows, with regards to noise and decoupling leakage.

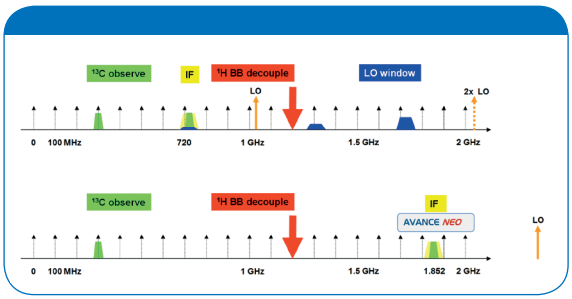

Fig. 3: A high IF avoids unwanted folding of noise and leakage from unintended LO windows (blue, upper) into the IF. With a high IF the unwanted LO window can be avoided by design.

With this architecture, there is no possible conflict between any observed and decoupled nuclei within the full range of NMR at any NMR field (eg 1.2 GHz).

Enhanced Sensitivity for X-Nuclei

GaAs transistor technology has been used with ^{1}H preamplifiers for decades. Its superior performance provides maximum sensitivity on ^{1}H. Preamplifiers for low γ nuclei such as ^{13}C, ^{2}H, ^{15}N, etc are now also using GaAs transistor technology, benefiting from a sensitivity increase of 6 - 8% together with RT probes. This corresponds to about 15% higher throughput, for example with a SmartProbe™.

With the enhanced sensitivity of the ^{2}H preamplifier, field stability can be increased under experimental conditions with a low amount of deuterated solvent and labs exposed to external field perturbations (trams, elevator, etc).

Full Broadband RF Amplifiers

Latest RF power transistor technology used in the new and fully broad-banded RF amplifiers (BLABB) provides high RF power from 15 MHz up to 600 MHz. Together with the ^{1}H RF amplifier this larger bandwidth allows any combination of ^{1}H / ^{19}F or low γ-nucleus. In addition, ^{1}H and ^{19}F experiments run in parallel with independent RF channels even on two channel systems equipped with broad-banded probes (e.g. SmartProbe™).

Ready for the Future

AVANCE NEO is a truly unified NMR electronics platform for all applications from high resolution to solids spectroscopy and micro-imaging. Most additional functionality can be easily added to an existing AVANCE NEO configuration, offering maximum flexibility and possibilities for future evolution. Your AVANCE NEO NMR spectrometer is ready for any routine or high-end NMR experiment. Its improved performance and capabilities allow plenty of headroom for future NMR developments.

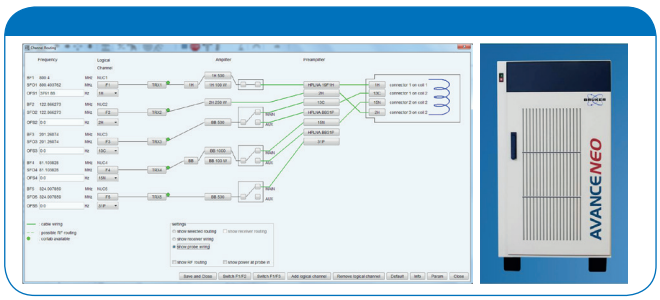

Fig 4: Number of RF channels (transmit) equals number of receivers (RX). AVANCE NEO has lean point-to-point connection for easy, simple RF routing, also for very complex experiments.

More Compact and Always Multi-Receive

AVANCE NEO has an integrated and compact design: Each RF channel contains frequency generation, ADC and receiver in a single transceiver board. This means that every AVANCE NEO console is inherently multi-receive capable with any available nucleus and probe combination.

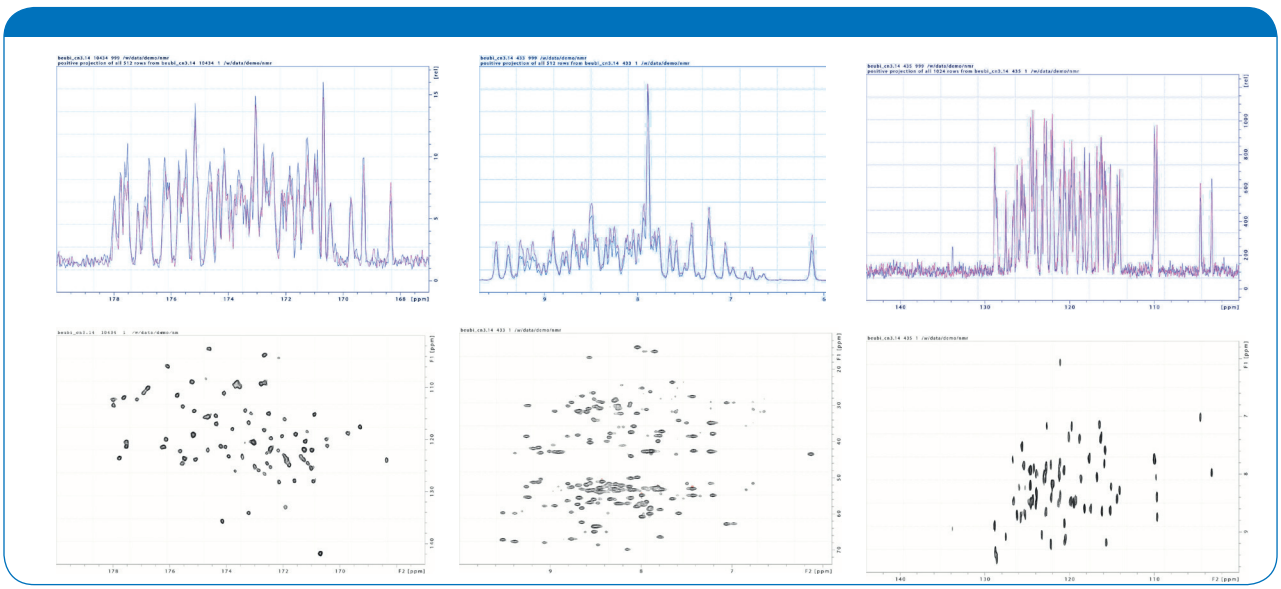

Fig. 5: UTOPIA-NMR*: triple receive experiment with double labeled ubiquitin: 2D CON (left), 2D HCBCA (center) and 2D NH (right) correlation experiment acquired simultaneously. 1D projections on top illustrate the well matched relative sensitivity of individual 2D's. Note virtually equal sensitivity for Multi-receive Utopia experiments as shown in projections (blue) compared to individually optimized single experiments (red).

Network Analyzer Functionality

Factory calibrated preamplifiers and complex tuning data give AVANCE NEO users enhanced 2nd generation automatic tuning and matching (2G ATMA). Routine applications profit from even faster and more reliable tuning and matching. Method developers benefit from the network analyzer functionality built in to the NMR console for spin noise experiments and probe over-coupling.

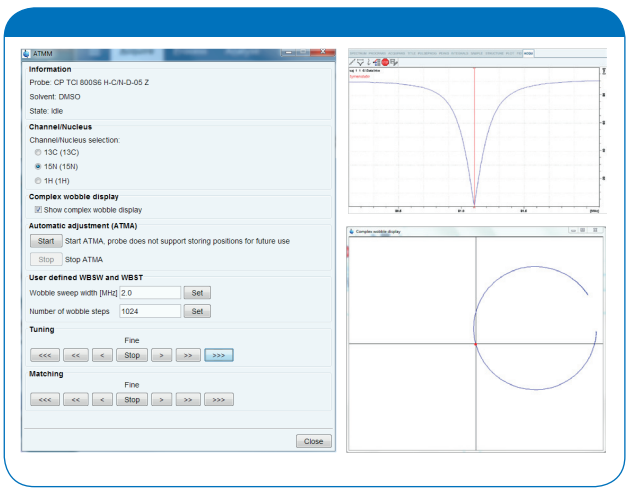

Fig. 6: Automatic tuning and matching (left) with AVANCE NEO electronics using real and cartesian (complex) wobble data representation (right).

NMR Thermometer™

By combining both 2G DigiLock and SmartVT, Bruker's unique NMR Thermometer controls the sample temperature via the temperature dependent ^{2}H chemical shift of NMR signals inside the sample.

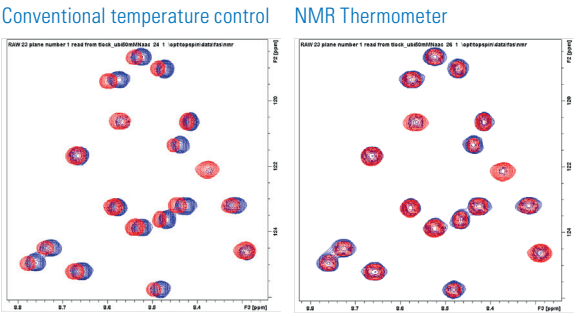

Fig. 7: Overlay of NOESY-HSQC (blue) and TOCSY-HSQC (red) experiments. Conventional temperature control results in peak shifts (left) induced by RF heating, NMR Thermometer control (right) maintains perfect chemical shift match between the spectra.

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