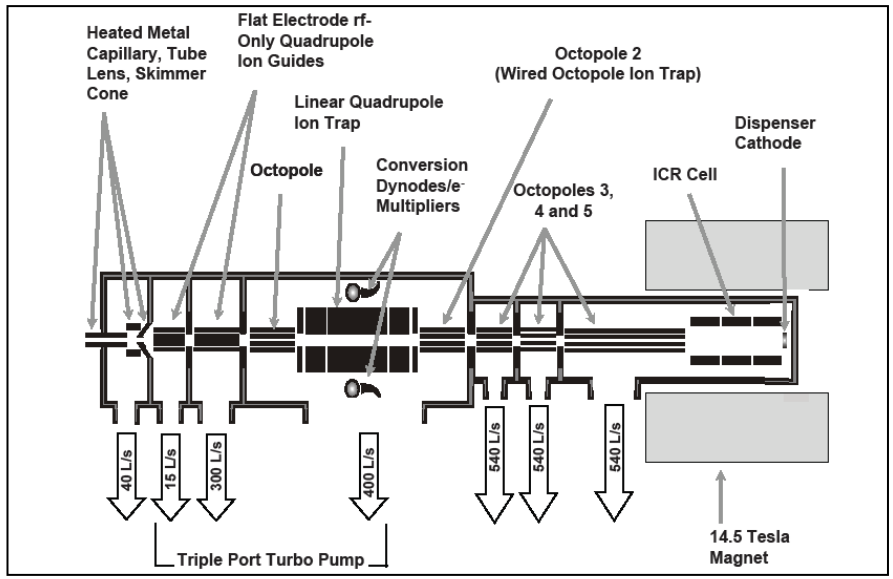
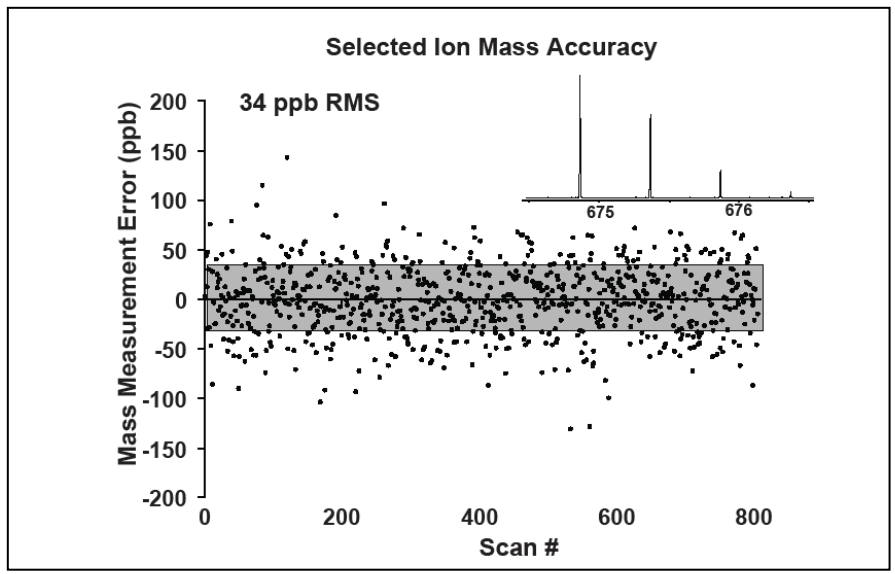
High Performance Mass Spectrometry: FT-ICR at 14.5 T

National High Magnetic Field Laboratory

Ion Cyclotron Resonance User Program, Florida State University

The schematic diagram shows the NHMFL's 14.5 Tesla hybrid linear quadrupole ion trap FT-ICR mass spectrometer. Ion masses are routinely determined at four-fold better mass accuracy and two-fold higher resolving power than similar 7 T systems at the same scan rate. External calibration broadband mass accuracy typically less than 300 ppb rms (34 ppb for a single peptide isotopic distribution) and resolving power of 200,000 ($m/\Delta m_{50\%}$ at m/z 400) is achieved at >1 mass spectrum/second. Novel ion storage optics and methodology increase the maximum number of ions that can be delivered to the FT-ICR cell, thereby improving dynamic range for tandem mass spectrometry and complex mixture applications.





Schaub, T.M.; Hendrickson, C.L.; Horning, S.; Quinn, J.P.; Senko, M.W. and Marshall, A.G. "High Performance Mass Spectrometry: FT-ICR at 14.5 Tesla," ***Analytical Chemistry***, **80**, 3985-3990 (2008).

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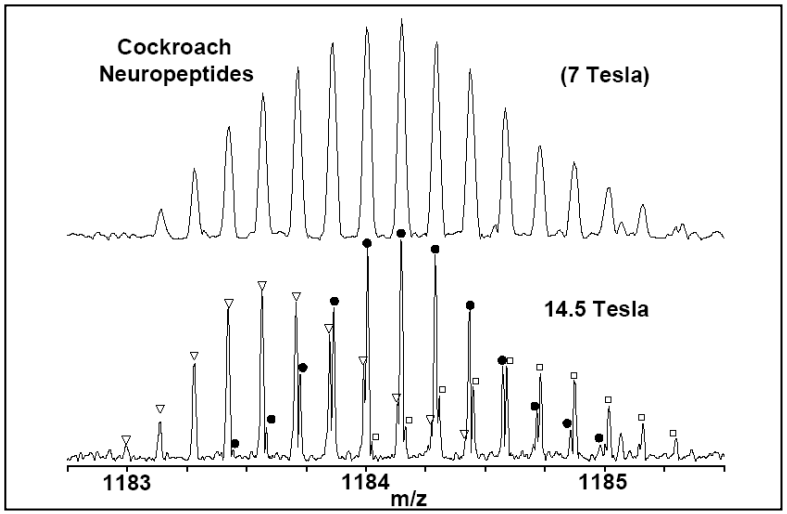

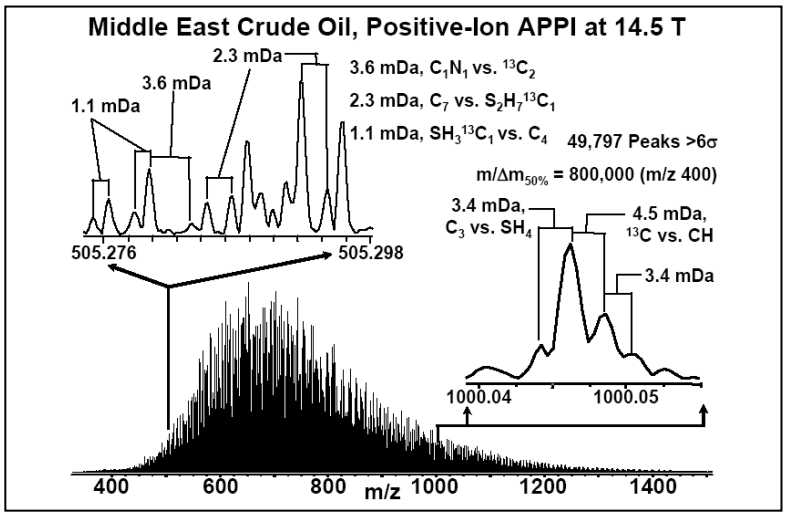

The improvements in Fourier Transform Ion Cyclotron Resonance (FT-ICR) are transformative, not incremental: mixtures that are unresolved at lower field are resolved at 14.5 T (see the three cockroach peptides).

Organic mixtures as complex as petroleum crude oil (up to 50,000 peaks in a single spectrum) can now be resolved and the chemical components identified.

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