



# Ultrahigh Performance Molecular Imaging by MALDI at 21 Teslas



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Mass spectrometry imaging (MSI) combines the chemical specificity of mass spectrometry with spatial localization to provide thousands of label-free, molecular images directly from complex biological tissue sections. The MagLab's ICR program partnered with users from the Netherlands to combine the ultrahigh performance of the MagLab's 21 tesla Fourier transform ion cyclotron resonance (FT-ICR) mass spectrometer with an imaging source for ultrahigh performance molecular imaging. These high-magnetic-field experiments exemplify the advantages of high mass resolving power and high mass accuracy for identifying imaged molecules in MSI studies.

A matrix-assisted laser desorption ionization (MALDI) ion source was coupled to the 21T FT-ICR MS and rat brain sections were imaged. Exact mass analysis identified 1,364 unique lipid species, and molecules with mass differences as small as 1.79 mDa were resolved and imaged (see top figures with zoom mass inset, assigned elemental compositions, and molecular classes).

The bottom figure shows the spatial distributions in the brain of three different lipids. This technique is now available for users to image lipids, drugs and drug metabolites, as well as intact proteins from biological tissue sections.

**Facilities used:** ICR, 21 T FT-ICR mass spectrometer

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