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# NMR Spectroscopy of Organic Compounds

## Lesson 3: Fourier transform



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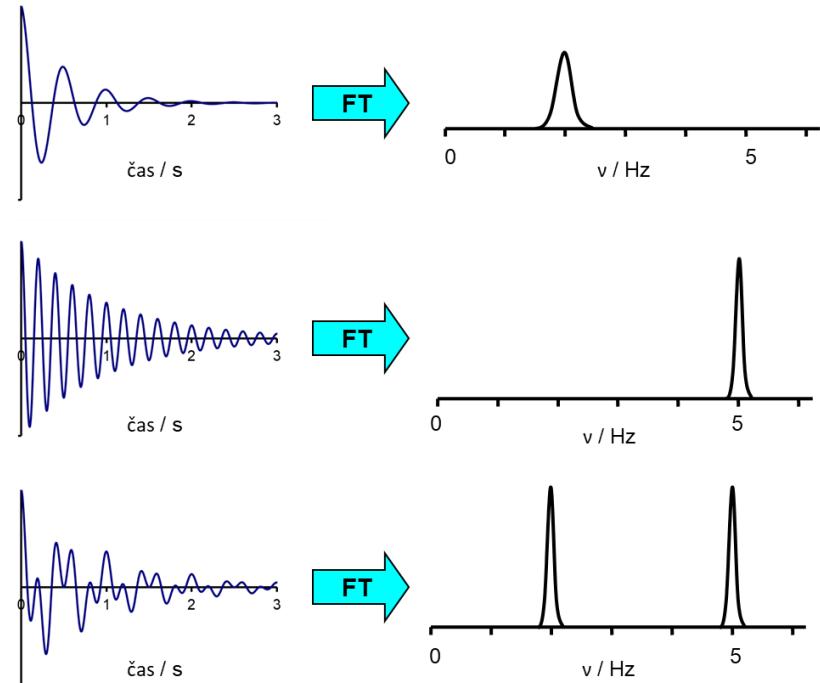
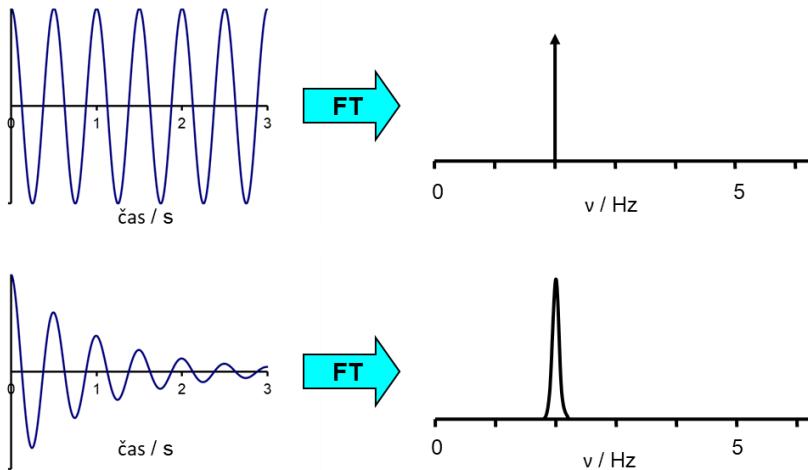
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# Overview

- Fourier transform
- Acquisition parameters
- Processing

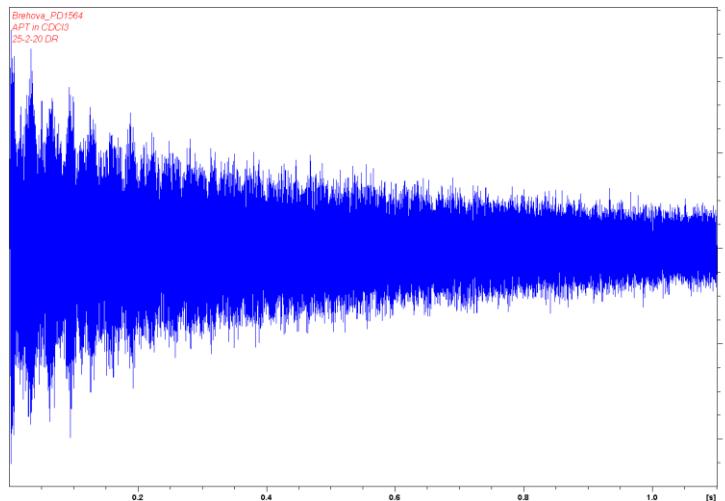
# Fourier transform

FID      **FT**      Spectrum

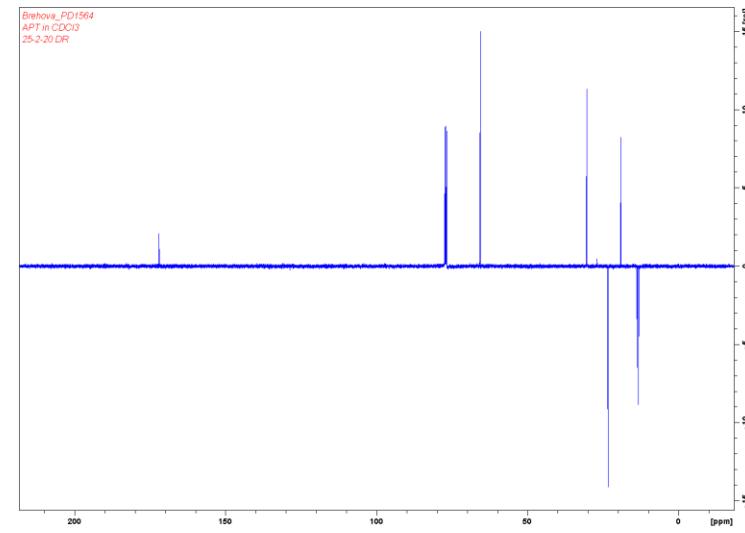


# Fourier transform

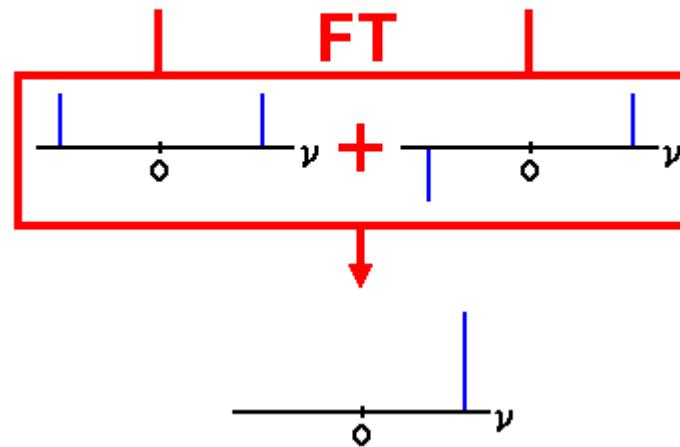
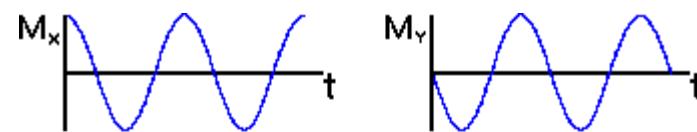
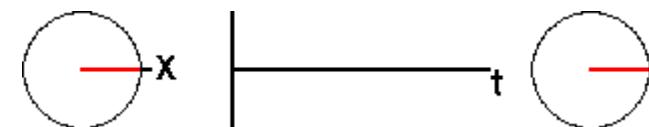
FID      FT      Spectrum



FT



# Quadrature detection



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# Fourier transform

$$e^{+ix} = \cos x + i \sin x$$

$$e^{-ix} = \cos x - i \sin x$$

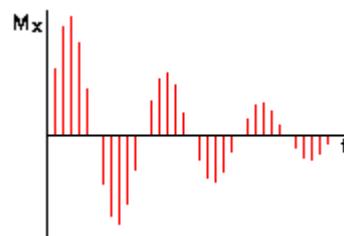
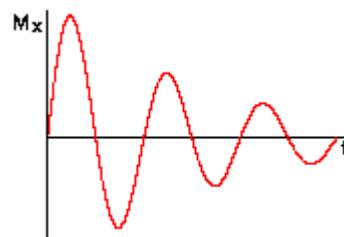
$$F(\omega) = \int f(t) e^{-i\omega t} dt$$

$$F(\omega) = \int f(t) [\cos(\omega t) - i \sin(\omega t)] dt$$

$$F(\omega) = \sum f(t) [\cos(\omega t) - i \sin(\omega t)] \Delta t$$

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# Acquisition parameters



$N$  – number of points in FID

$SW$  – spectral width (spectral window), Hz

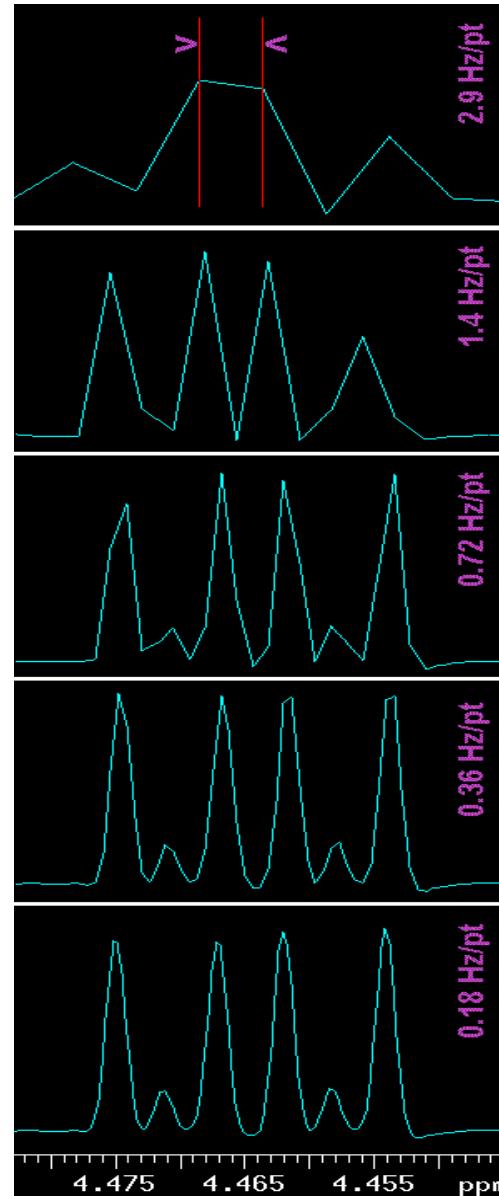
$AT$  – acquisition time

$$N = 2 \cdot SW \cdot AT$$

# Acquisition parameters

Digital resolution  $DR$

$$DR = 2 \cdot SW / N = 1 / AT$$



# Acquisition parameters

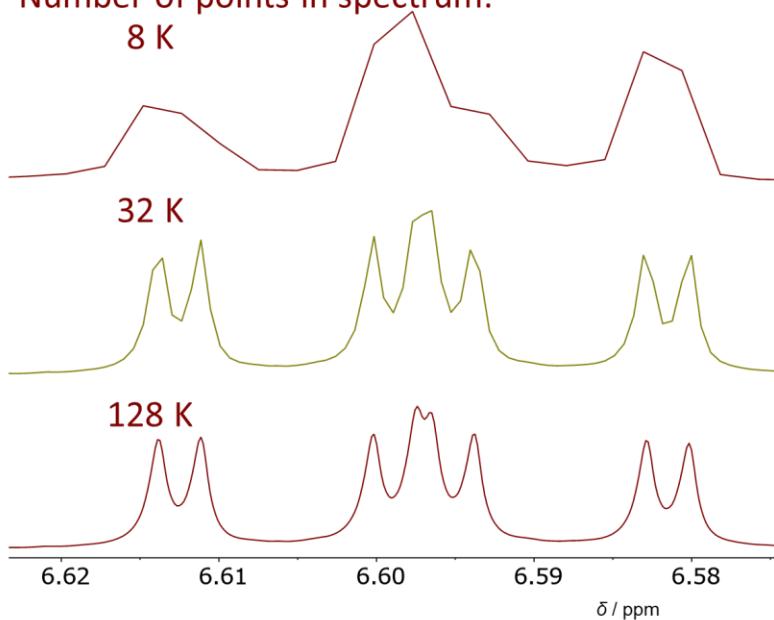
Number of points in FID: 32 K

Number of points in spectrum:

8 K

32 K

128 K



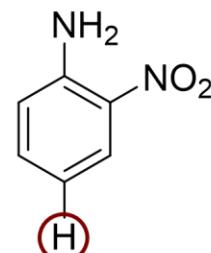
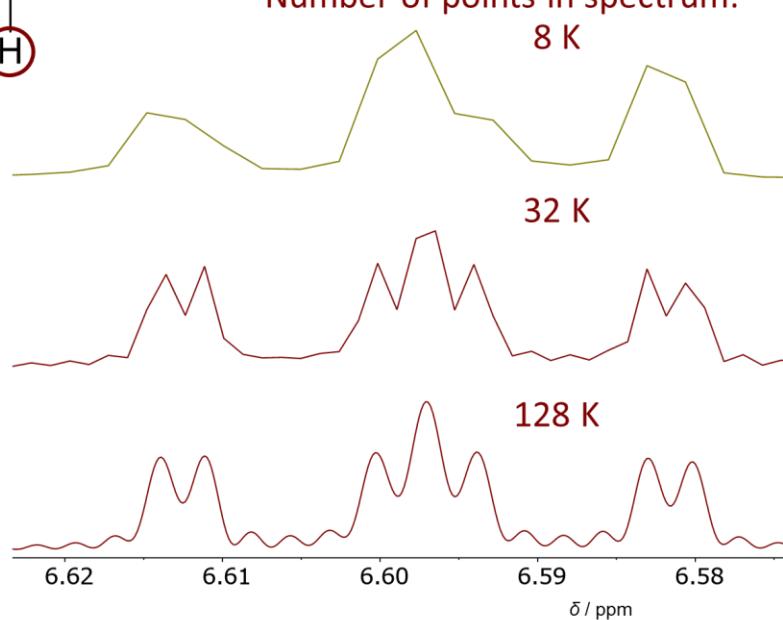
Number of points in FID: 8 K

Number of points in spectrum:

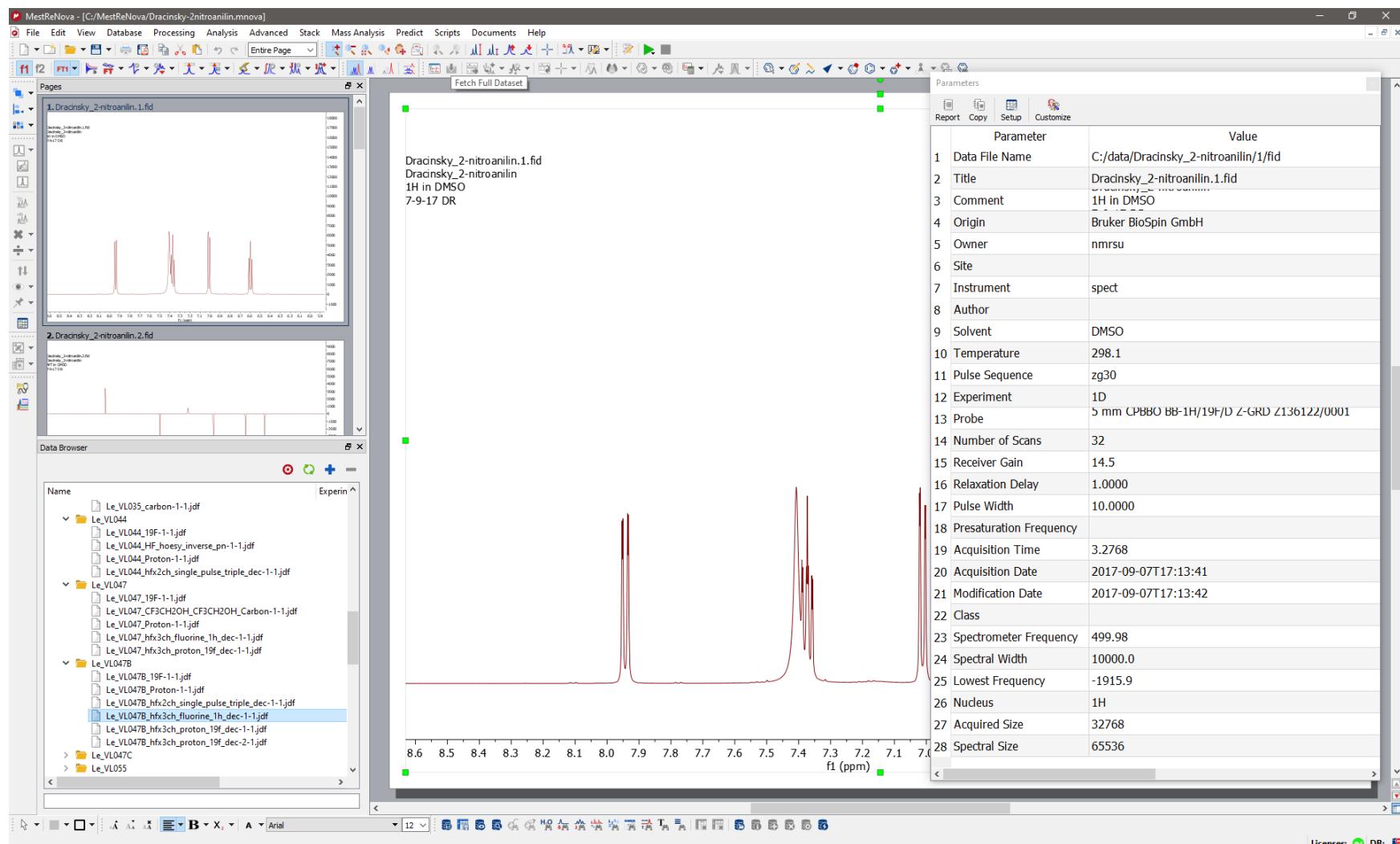
8 K

32 K

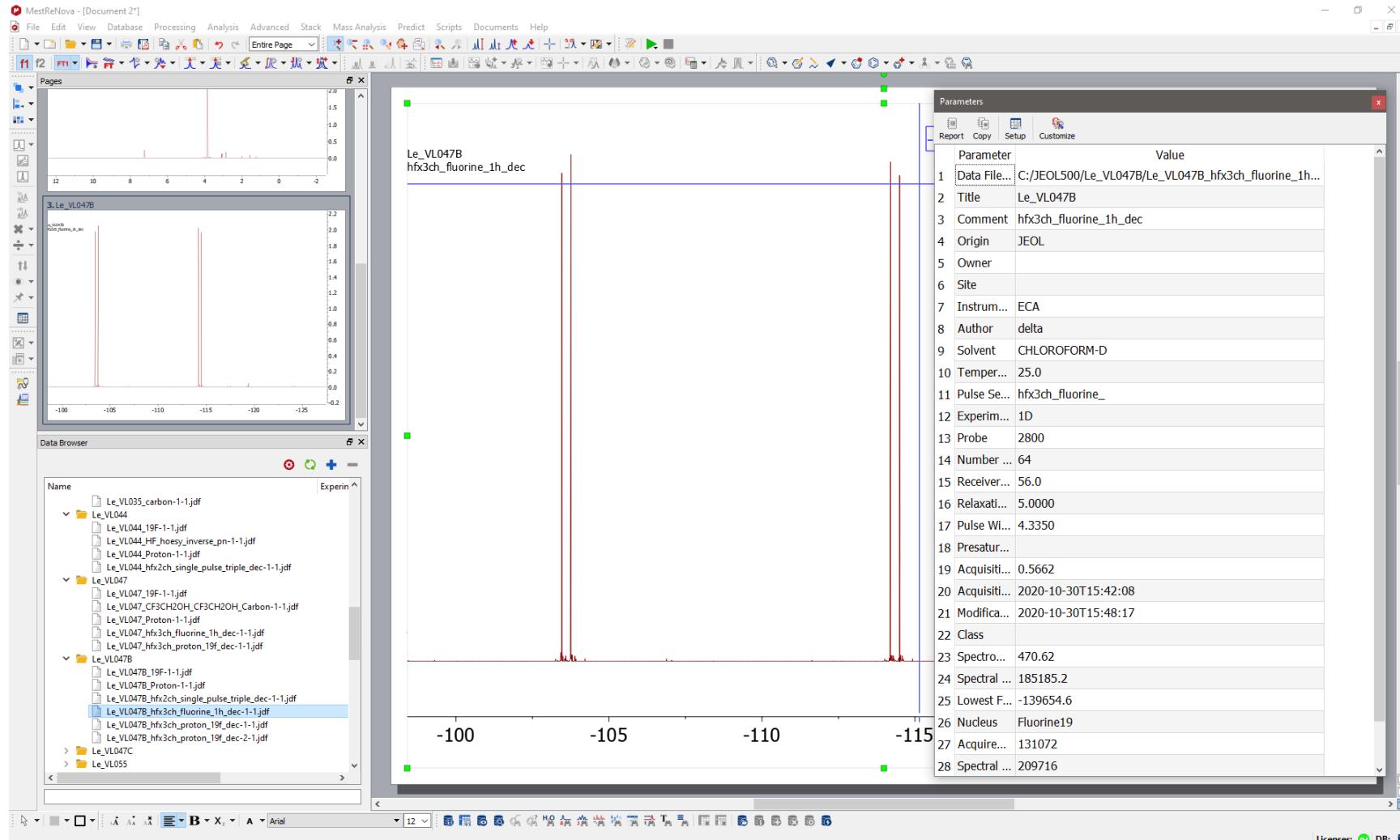
128 K



# Acquisition parameters



# Acquisition parameters



# Processing

