

## Developing 2D-IR instrument using pulse shaping and attenuated total reflection

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Two-dimensional infrared (2DIR) spectroscopy has been widely used in structure study and energy transfer of bulk samples. However, in the last decade, 2DIR spectroscopy has been extended to study molecules at interfaces. Our target was to develop a user-friendly 2D ATR IR spectrometer, which will benefit a broad group of laboratories and researchers, expanding the borders of regular 2DIR experiments. In order to perform rapid 2DIR measurements over a broad range of frequencies, we developed and built a fully automated beam stabilization scheme that allows us to optimize the spatial overlap of the beams in the sample. The measurements occur in attenuated total reflection (ATR) mode, which benefits thin samples. It also allows us to use liquid samples and even samples in water which were not suitable before due to high absorption in IR. In addition to that, we developed and built the Pulse shaper, which brings ample opportunities of altering IR pulses. It permits alternating the phase of a single pulse, chopping every other pulse, or creating double pulses with an arbitrary delay between them. The combination of all units makes our spectrometer a very versatile instrument, we can measure linear and different 3rd-order 2DIR as well as relaxation-assisted 2DIR. Besides, the instrument was designed to be fully automated. Therefore, no additional alignment will be required during regular use.

### Topics

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