Contribution ID: **37** Type: **oral without proceeding**

Improved determination of the dissociation energy of H2

Friday 18 May 2018 09:50 (20 minutes)

The dissociation energy (D_0) of H_2 is a benchmark value in quantum chemistry, with recent QED calculations now approaching accuracies achievable in simple atoms. Precise measurement of the GK-X molecular transition, in combination with other precision measurements, provides a determination of D_0. The GK-X transition is excited through Doppler-free two-photon spectroscopy using 179-nm radiation, based on frequency up-conversion using a special KBBF crystal. The optical frequency of the fundamental (716 nm), which is the output of a narrowband pulsed Ti:Sa laser system, is locked to a frequency comb. This enables accuracies of the GK-X transition to a few parts in 10^{10} or MHz level, leading to an order-of-magnitude improvement for D_0. The comparison of this accurate experimental result with the best calculations may provide a test of the Standard Model of Physics.

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Session Classification: Molecules #2