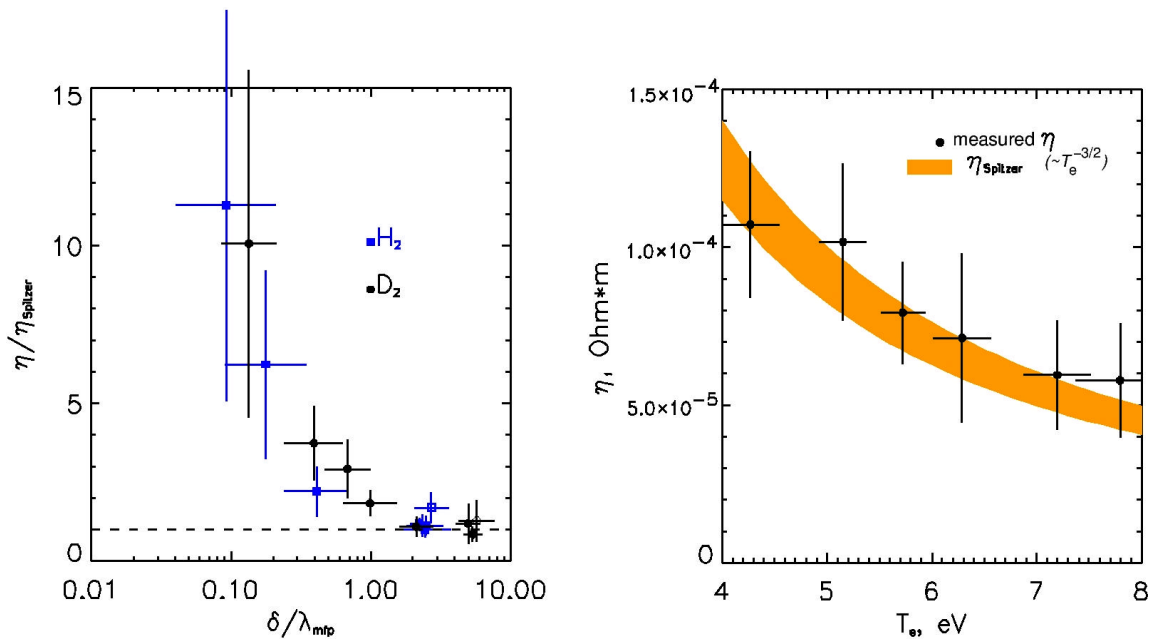


Magnetic Reconnection in MRX and Spitzer's Transverse Plasma Resistivity

The Magnetic Reconnection Experiment (MRX) at Princeton Plasma Physics Laboratory has been used to study the phenomena of magnetic reconnection in plasmas. Magnetic reconnection is common in the universe, in stars, solar flares, the earth's magnetosphere and laboratory fusion plasmas. Recently, magnetic reconnection rate was measured in the neutral sheet of highly collisional plasmas, where the mean free paths of electrons are much shorter than the sheet width. The Spitzer's transverse resistivity has been verified in these plasmas as shown in the picture below. In a typical neutral sheet where plasma is reconnecting without a guide (bias) field, the transverse resistivity is directly related to the reconnection rate of merging plasmas. A remarkable agreement is found between the measured resistivity and the classical values derived by L. Spitzer. In his calculation the transverse resistivity for electrons should be two times the parallel resistivity. The measured values have verified this theoretical number within 30% errors. This is the most accurate measurement of the transverse Spitzer resistivity to date. For more detailed information, contact myamada@pppl.gov.



Comparison of experimental data for the transverse resistivity with the Spitzer values; (a) Normalized resistivity vs. ratio of current sheet thickness to mean free path (b) Measured transverse resistivity values vs. electron temperature. The colored region indicates spitzer values.