

Overview of Magneto-Inertial Fusion

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Magneto-inertial fusion (MIF) is a pulsed high energy density approach to achieving fusion in that combines features of both inertial (ICF) and magnetic fusion (MFE) techniques. When a magnetic field is embedded in a warm dense plasma, thermal insulation is improved, thereby allowing compression to be achieved with the use of lower power (and hence cheaper) inertial drivers. At the ICF end of the spectrum, one might consider ICF targets with an embedded external magnetic field. At the other end of the spectrum, we consider “fast” adiabatic compression of conventional magnetic fusion plasmas. Magnetized Target Fusion (MTF) starts with a modest magnetic field in a warm ~100 eV plasma, and then radially compresses it with a metallic flux conserver (liner) by factors of 10, to achieve fusing plasma conditions. At Los Alamos we are developing a plasma for magnetized target fusion experiments, consisting of a small field reversed configuration (FRC) plasma, called FRX-L, which will be translated into a region surrounded by an aluminum liner. Later (in the next few years) we plan to demonstrate the physics of plasma/liner implosions for MTF jointly with the Air Force Research Laboratory, at the Shiva Star pulsed power driver facility in Albuquerque. This talk will cover issues relevant to MIF, including present research, ranges of expected fusion gain, batch burn, fusing versus burning plasmas, possible reactor concerns such as driver standoff, liquid-walled chambers, and debris from the liner. This work is supported by the DOE Office of Science, and contract #W-7405-ENG-36.