

UNB Physics Department Seminar

Using Tagged MRI(TMRI) to reduce a characteristic measurement time in MRI of fast flow

Shahla Ahmadi
UNB Physics

MRI is a non-invasive tool for quantitative visualisation of fast and complex fluid flows. Studying fast flowing fluid with MRI has its own challenges. One of them is related to resolution vs time. We are interested in encoding the velocity inside the nozzle and in the near-nozzle regions where sample speed changes from approx. 1 m/s to 25 m/s over 1cm length. Two main techniques of MRI velocimetry are phase contrast and time-of-flight techniques. Phase contrast technique uses a bipolar gradient to encode velocity information into the phase of the MRI signal which gives velocity measurements for each pixel in the field of view. In this method motion-encoding and detection occur at the same time, which is our characteristic measurement time t_p . At our flow speeds, long measurement times will lead to a displacement and a subsequent misregistration of the flowing liquid. Unlike the phase encoding technique, in the time-of-flight technique it is possible to separate two stages. In this approach the fluid is labeled by a spatially periodic modulation of the magnetization. In the image, acquired immediately after this modulation procedure, the modulated spins appear as a grid of dark and bright stripes. Fluid motion between the first and subsequent acquired images is extracted from the displacement and distortion(deformation) of the grid. Since the modulation part can be performed when the liquid is still moving slowly, and the imaging part does not require the bipolar gradient switching on and off, it is in principle possible to considerably reduce the characteristic measurement part and detect the fast flow with a greater accuracy. In this talk I will present and discuss result of these methods.

Thursday Jan. 31, 2019, 1:15--2:15 pm in
P204. Colloquium tea in P203 beforehand