The “stable” helical mode in arc discharge.

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As early as 70’s to 80’s, the helical plasma “instability” was found in the basic plasma research on high pressure (~10^5 Pa), low current (~10^0A) but ultra-high current density hydrogen arc discharge (10A/3mm^2 in other dimension this is as big as 10MA/m^2 !) and theoretically explained in phenomenological bases especially in Germany[1,2,3]. On the other hand, three dimensional MHD simulation on the low pressure linear plasma has been conducted in National Institute of Fusion Sciences around 80’s. Both of these trends aiming for controlling the instability when the current is increasing.

In this proposed presentation, we would like to concentrate on controlling the helical pitch and demonstrate the existence of the “stable” helical plasma and discuss the application of these techniques by applying massively parallel but bench top GPGPU system. The high pressure arc discharge has complicated boundary layer construction originated from multiple dissociation / ionization levels of the plasma components. This should give good simulation on the fusion plasma such as the Internal Transport Barriers and Serpens mode.

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