

Future research on solenoid-free inductive start-up in GLOBUS-M *(with application to NSTX)*

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Solenoid-free inductive start-up



- Motivation
 - Saving OH volt-seconds in inductive STs is advantageous
 - Future ST scenarios rely on BS-overdrive and other CD to generate plasma target for heating
- Goal
 - Generate plasma current without solenoid starting from $I_p = 0$
 - MAST already successfully uses induction-compression
 - But, uses internal PF coils to generate 200-400kA plasma
 - **Instead, attempt to use external PF coils only + ICRF (NSTX)**
 - Use ICRF to initiate outboard plasma (similar to ECH pre-ionization)
 - Generate outboard loop voltage with vertical field (similar to OH)
 - Use other coils to control early field-null and field index
 - Then, use RF to heat inductively-driven plasma

Solenoid-free inductive start-up in GLOBUS-M



- Progress
 - Early scoping studies were done for NSTX using LRDIAG
 - Indicated 5-10 volts could be generated with PF5
 - Ramp-rate would have to exceed 10MA/s to achieve crude force-balance
 - Used high aspect ratio calculations
 - Resultant stability of current profile is unknown, possibly problematic
- Plan \Rightarrow Prototype concept on GLOBUS-M
 - PF coil layout similar to NSTX
 - Has outboard ICRF antenna like NSTX
 - Received vessel and coil geometry from GLOBUS-M (V. Gusev)
 - Presently working on developing LRDIAG model for GLOBUS-M
 - Feasibility of experiments should be better known by Spring 2002
 - If plausible, perform experiments
 - If successful, apply to NSTX?