

Long-term Mirnov array upgrade plans

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Present systems

- 12 sensor toroidal array
 - Limited to 500kHz, 250ms of DAQ
 - Routinely used for n-number determination up to n=8
- 12 sensor outboard poloidal gap array
 - Also 500kHz, 250ms of DAQ
 - Also, gains of sensors are too low for CAMAC DAQ
 - Gains were reduced to build more robust sensors
- Divertor Mirnovs
 - Awaiting replacement with more robust sensors
- CS Mirnovs
 - Gains also too low for CAMAC DAQ

Present systems

- This year, NSTX focused on CAE diagnosis
- 7 high frequency sensors
 - 2-4MHz bandwidth
 - 3 sensors used for high-n toroidal array
 - Use 8 channel PC DAQ, 5MS/s for 1s
 - 1 wideband sensor
 - Use 4 channel PC DAQ, 10MS/s for 0.8 s
 - Also used HP wide-band spectrum analyzer
 - Measured CAE n-number, and f above 2 MHz

Future plans – FY03-05

- Toroidal array
 - Replace CAMAC DAQ with PC DAQ
 - 4MS/s for 1+ seconds (i.e. entire shot)
 - Have DAQ PC post-process data with FTs
 - Frequency spectrum stored in MDS+ for rapid access
 - Eventually compute toroidal mode numbers and store in MDS+
 - Replace sensors with non-magnetic versions (want linear gain)
- Poloidal array
 - Install dedicated outboard array at same ϕ as inboard array
 - Purchase computers and hardware
 - Need much higher channel count
 - Probably 24 channels each on CS and outboard (48 total)
 - Need 2 computers, 24ch, 2MS/s, 1 computer in each potential class
 - Difficulty in clock and trigger synchronization due to CHI

Future plans – FY03-05

- CAE sensors and DAQ
 - Present wideband sensor circuits acted as antennae in NTC
 - Measured fixed-f noise on many frequencies from 3.5-10MHz
 - Radio Cuba?, trucker CB radios?
 - Greatly complicated CAE measurements above 3MHz
 - Need to better design lead exit from vessel and shielding
 - DAQ
 - Spectrum analyzer worked well
 - Great sensitivity: -90dBm noise floor
 - But, sweep time is too slow (90ms minimum)
 - Purchase dedicated PC with fast DAQ card: 1ch 50MS/s, 2ch 25MS/s
- Fast Mirnov head on reciprocating probe?
 - Measure CAE in plasma, get edge radial profile
 - Only a thought at this point – good thesis project?

Summary

- Toroidal array will be in good shape soon
- We have no m-number determination!
 - Would greatly aid TM and other MHD physics
 - Presently resource limited
- CAE physics can be improved significantly
 - Very high frequency measurements
 - Measure CAE B-field inside plasma?
 - Better test CAE stochastic heating models?