HHFW Relationship to IPPA Milestones

- Comprehensive evaluation of HHFW as a tool for use in ST (heating, CD and startup) for IPPA 5 year goal
- Utilize HHFW in conjunction with other techniques to achieve 5 second operation for IPPA 10 year goal

HHFW Heating and CD Program Goals

- 2003 Complete fast ion interaction studies
- 2004 CD experiments with MSE diagnostic
- 2004/5 Comprehensive evaluation of HHFW as a tool for use in ST (heating, CD and startup)
- 2005/7 Establish reliable HHFW operation in various ST regimes to control P(R) and J(R)
- 2008/9 Utilize HHFW in conjunction with other techniques to achieve 5 second operation

Near Term Experimental Goals

Understand power accountability in variety of scenarios

Complete on going fast ion interaction studies

Look for thermal ion heating

Continue early RF studies

Characterize HHFW H-modes

Diagnostic Needs

- CD studies
  - MSE Crucial
- Wave Studies
  - Probes for surface waves
  - PCI ?
  - Reflectometry
  - Fast probe head
  - Instrument passive plates for sheaths
- Power Balance
- Power Deposition
  - Good Abel inversion of USXR
  - EBW radiometer

Theory and Modeling Issues

- Develop comprehensive model of HHFW- Fast ion interaction
  - Time dependent
  - Finite orbit and loss cones
  - Self consistent distributions
  - Resonance overlap
- Develop comprehensive model for HHFW CD
  - Incorporate in TRANSP
  - 2D Fokker-Planck vs Adjoint approach
  - DC electric field
  - Electron transport effects
- Effect of MHD on CD efficiency

Hardware Issues: Voltage Handling

- HHFW power limited by Voltage limit on antennas
  - Significantly lower in plasma than in vacuum
  - Limit is independent of antenna phasing, plasma conditions
  - One strap a little worse, but all demonstrate this

- Antenna Modifications could be carried out in 2004
  - Double end fed antenna
    - Reduces voltage for same power
    - Removes hard ground
  - Tilt straps
    - May symmetrize voltage between CO and CTR
  - Add more BN insulation to prevent plasma penetration
  - In situ heating of antennas

Inter-Device Research Opportunities

- High voltage prototype antenna to be tested on ET
  - Also low field device
- C-MOD antenna diagnostics
  - Extensive array of existing diagnostics
- Conventional ICRF scenarios to be explored on GLOBUS-M
- HHFW studies on Pegasus
  - Simpler antenna (better alignment)