ICRF and LHCD on Alcator C-Mod

**Motivation and Background**

- ICRF and LHCD coupling strongly depends on SOL density profiles.
- SOL density profiles, however, can be nonlinearly affected by ICRF and LHCD power.
- Measurement and understanding of nonlinear effects are required to understand coupling between plasma, ICRF, antenna, and LHCD launcher.
- Reflector measurements of the nonlinear effect due to ICRF, LHCD, and ICRF + LHCD on the SOL density profiles are shown.
- Possible physical mechanisms are suggested.
- Effects on ICRF and LHCD coupling are discussed.

**ICRF and LHCD on Alcator C-Mod**

- Use 100-145 GHz Frequency in X-Mode operation.
- Radially shifting reflectometer horns measure density profile at three poloidal locations adjacent to the LH launcher (see left picture above).
- Uses a differential phase technique to minimize effect of density fluctuations.
- Yields density range of ~ 5x10¹⁶ to 6x10¹⁹ m⁻³ at B₀ = 5.4 T.
- Comparisons between density profiles, however, should be very accurate.
- ICRF and LHCD on Alcator C-Mod

**Conclusions**

- Effects of ICRF + LHCD on SOL Density Profiles

**Effects of ICRF + LHCD on SOL Density Profiles**

- **High-density Bruhns**
  - High. T. ICRF-LHCD discharges in both B⁺ and 16-modes seem to be more strongly influenced by LH effects.

- **Low-density Bruhns**
  - Low. plywood-ICRF-LHCD discharges in 1-3 ending seem to be more strongly influenced by LH effects.

**References**

5. Hanson[3], D’Ippolito[4]. TFTR reflectometer measurements as a function of major radius shows good agreement between experimentally measured reflectometer density profile measurements and a RF sheath convective cell model on TFTR.
6. Will similar type of model explain effects on Alcator C-Mod?
7. Will this model explain effects for LH launcher locations at both 9135m and 9195m?