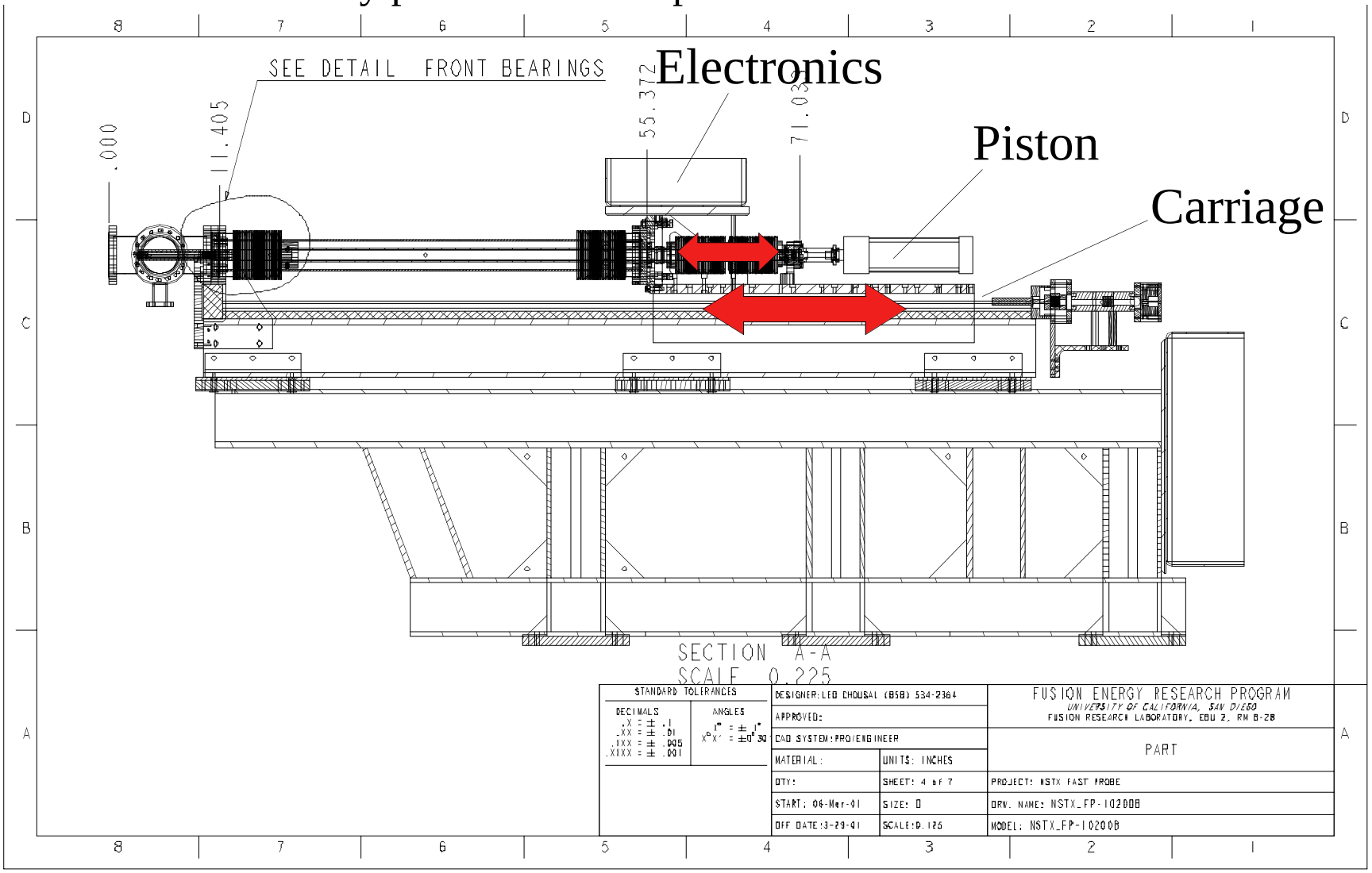
UCSD Probe System Overview

By J. Boedo

For the UCSD and NSTX Teams

Mechanical Standby and Pneumatic Reciprocation

- Probe consists of a fast reciprocating section mounted on a slow moving carriage
- Motorized to standby position and reciprocates from there



Probe Head Description

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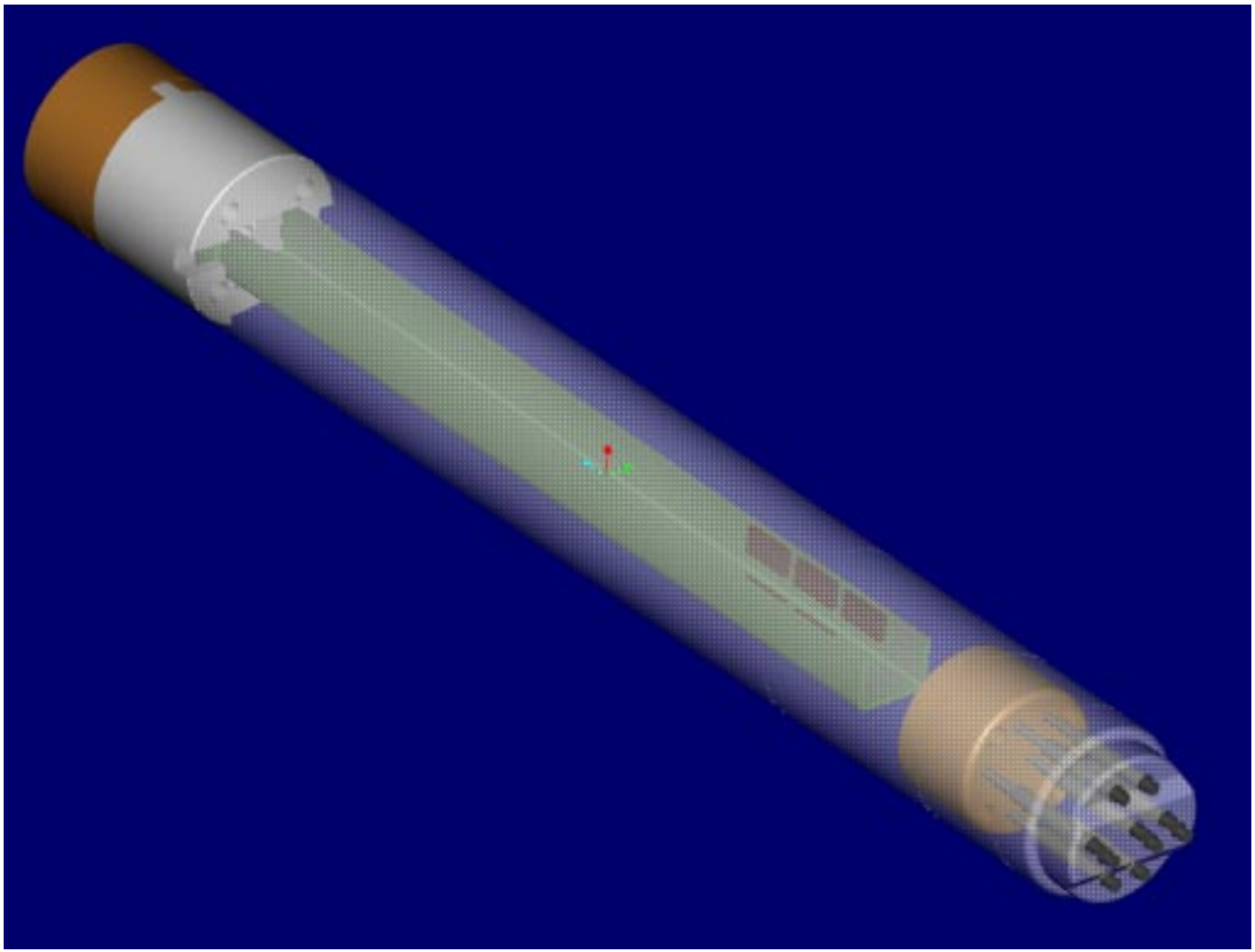
- Head is mostly Boron Nitride with a graphite shroud
- Tips are graphite



- Equipped with 10 tips but capable of up to 21 connections to shaft and feedthrough

- Incorporates new vacuum compatible, high temperature PC board for flexibility and future expansion

Probe System Overview

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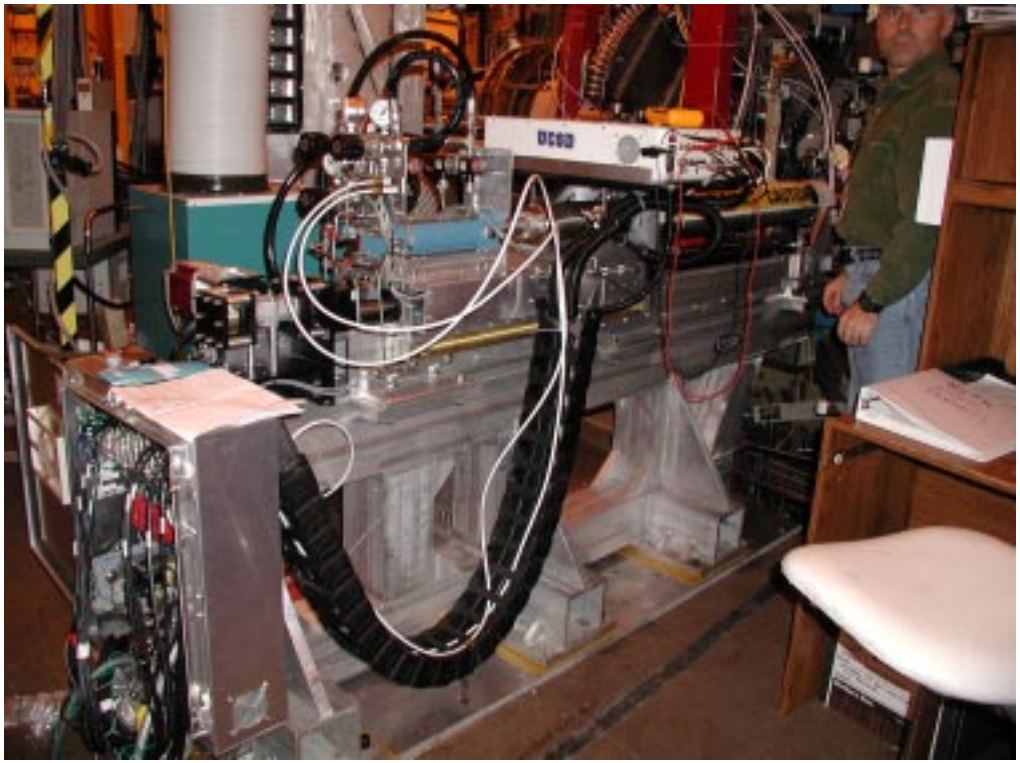
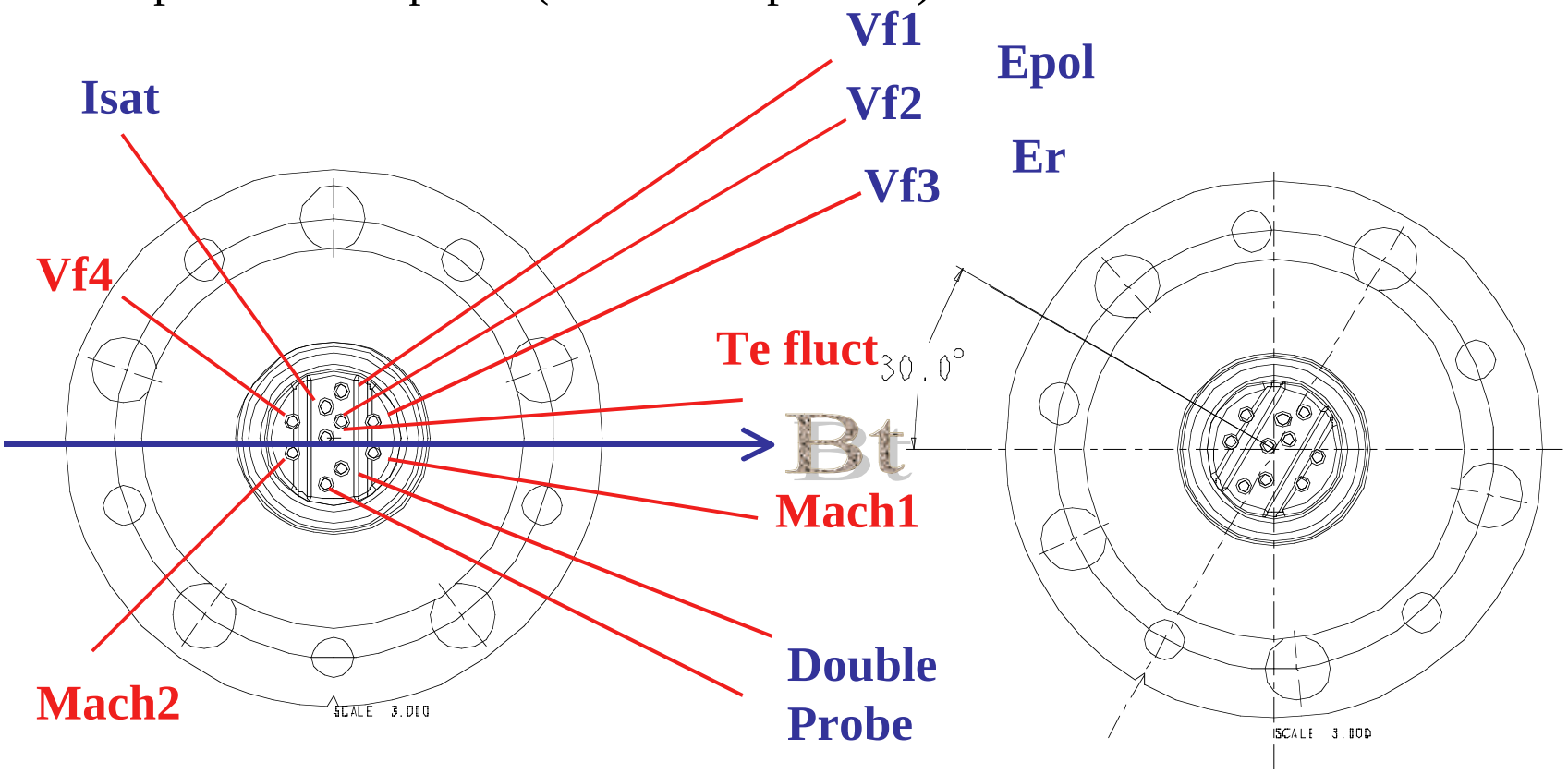
- 10 Bipolar Kepcos to power the tips (100V, 4A)
- Double probe sweeps at 600 Hz
- Mach probes at 1 kHz
- 2 Joerger digitizers, 12 channels at 3 Ms/s, 12 bits
- Room for expansion in the CAMAC crate
- Custom electronics good to 3 MHz



Probe Head has 10 Tips

- Tips in blue will be active on day one, the rest implemented as upgrades (not funded)
- Fluctuations to 3 MHz
- Two Vf tips used for Epol (and fluctuations)
- Two Vf tips used as Er (and fluctuations) >> Reynolds Stress
- One tip as Isat >> ne
- Two tips as double probe (Te and Ne profiles)



Measurement Summary

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- Probe reciprocates at ~5 m/s
- Penetrates up to ~10” in the plasma (power load is limitation)

- **E_theta** at 1.5 MHz
- **Er** at 1.5 MHz
- **Ne** at 1.5 MHz

- >> $\Gamma_r = \frac{\langle \tilde{n}_e \tilde{E}_\theta \rangle}{B_\phi}$ Electrostatic particle flux profile
- >> R_{xy} Reynolds Stress profile

- >> Er profile (calculate poloidal rotation) >> **V_theta**
- >> V_plasma profile (from Vf and Te)
- Double probe swept at 600 Hz >> **Te, ne** every ~3 mm >> High resolution profiles
- Mach probes swept at 1 kHz >> **M, V** (Upgrade)
- **Te** (harmonics technique) up to 200 kHz (Upgrade)

Physics Topics

UC San Diego

- *Radial particle and heat transport (perpendicular and parallel, broadband and intermittent)*
- *Physics of L-H transition*
- *Direct studies of velocity shear stabilization*
- *Direct measurements of Zonal Flows*
- *Some measurement of energy cascades*
- *Parallel flow physics, poloidal asymmetries*
- *Edge particle and energy profiles and scaling*
- *Radial electric field and conductivity*
- *RF ponderomotive forces*