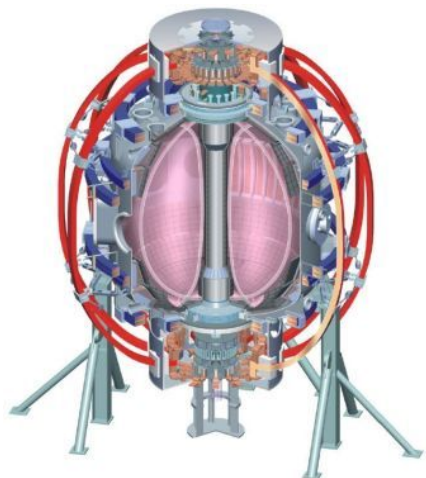


Upgrades to PCS Hardware (Incomplete)

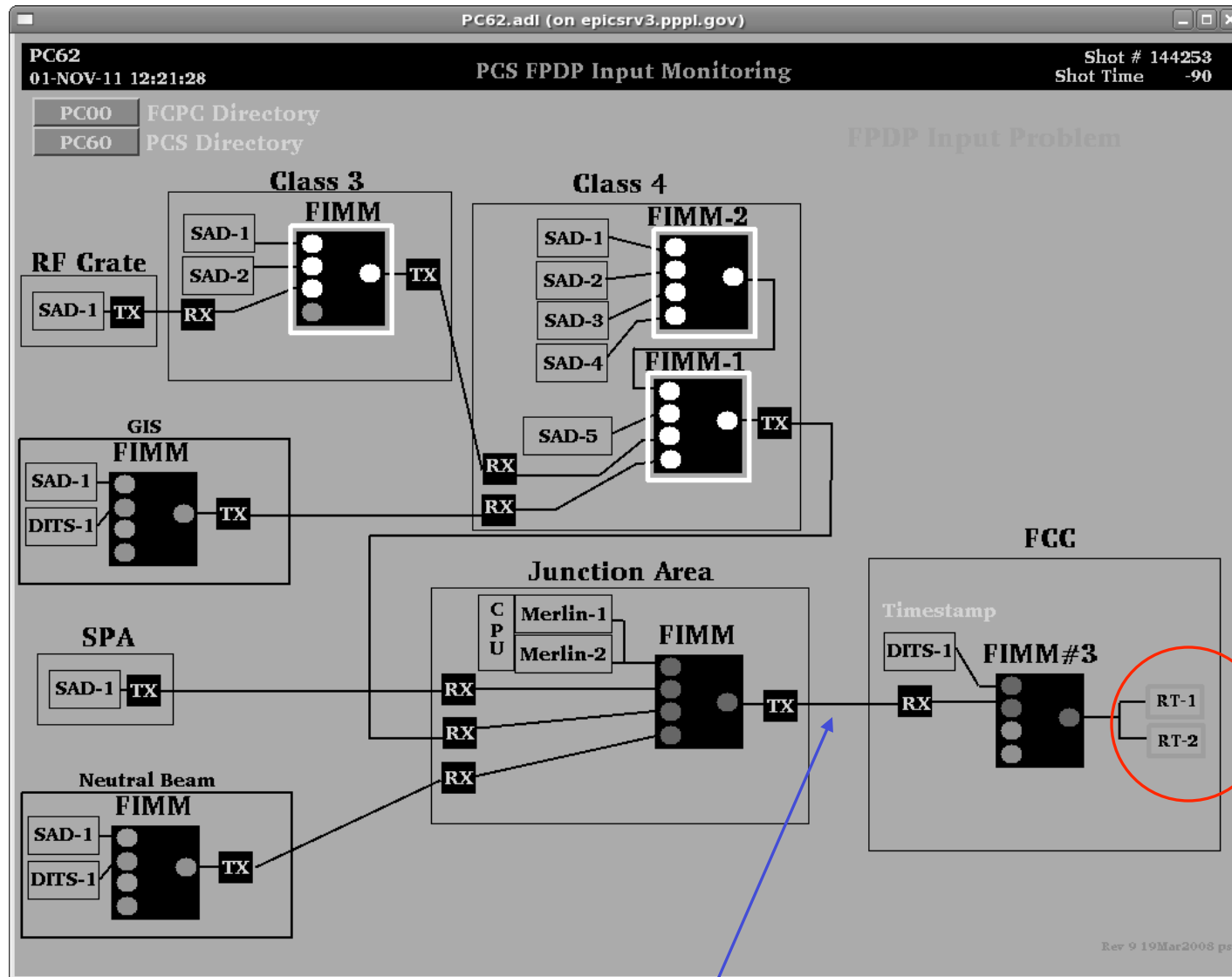
KE, DAG, SPG, EK, DM, PS

Columbia U
CompX
General Atomics
FIU
INL
Johns Hopkins U
LANL
LLNL
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MIT
Nova Photonics
New York U
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KAIST
POSTECH
ASIPP
ENEA, Frascati
CEA, Cadarache
IPP, Jülich
IPP, Garching
ASCR, Czech Rep

Present PCS Data Stream Is Combined In The Junction Area for Transmission to FCC



Control computers with single copper input for data stream.

All data must be carried by single fiber from D-site to control computer

PCS Hardware Upgrades

- Legacy power supply control link (PCLink) is being replaced as part of the firing generator upgrade.
 - This was the limiting component for the system speed.
- Have already placed requisition for new PCS computer.
 - 8 cores, 64-bit, improved realtime OS, ...will purchase additional machine as operations backup as run approaches
 - New input card has 4 fiber optic inputs.
- P. Sichta's group is preparing a plan making multiple parallel input streams.
 - Goal is to increase sampling rate from 5 kHz to 40 kHz.
 - Essentially eliminate the input data stream in contributing to the system latency.
 - New Systrans, additional fiber runs, reconfiguration of the data acquisition code.
- Also need additional digitizer in Cat. 3 racks for additional IV magnetics signals.
- NSTX coil currents were displayed with ancient scopes (looks like a high school science lab) using ancient and unmaintainable data links from junction area to control room.
- D-IIID, with the same PCS, has realtime displays of relevant parameters in multiple place in the control room.
 - Coil and plasma currents, boundary shape.
 - MHD Signals, fault indicators
- Provide more flexibility about what data is displayed, where it is displayed, and how it looks.

Additional Realtime Diagnostics/Actuators That Could Be Beneficial (not complete)

- Actuators (PCS control means that settings can be restored)
 - Timing of SGI, divertor D_2 & CD_4 injection, GPI valves (allows pulses to be restored, use in feedback, keeps them under phys. operators control).
 - Timing of startup schemes (CHI gap-bank firing, point-source injection turn-on).
- Diagnostics
 - MPTS: Improved realtime reconstructions of things like magnetic axis radius, outer gap, pressure peaking, density control (interferometer?).
 - MSE: Necessary for realtime current profile control.
 - V-phi: Necessary for rotation profile control.
 - Divertor heat flux and/or temperature: detachment and/or balance control.
 - Rotating MHD from: Disruption avoidance or discharge shutdown.
- But recall: PCS provides “discharge protection”, not machine protection.
 - If it can break NSTX, needs additional interlocks.