UT-BATTELLE

Fault Tree

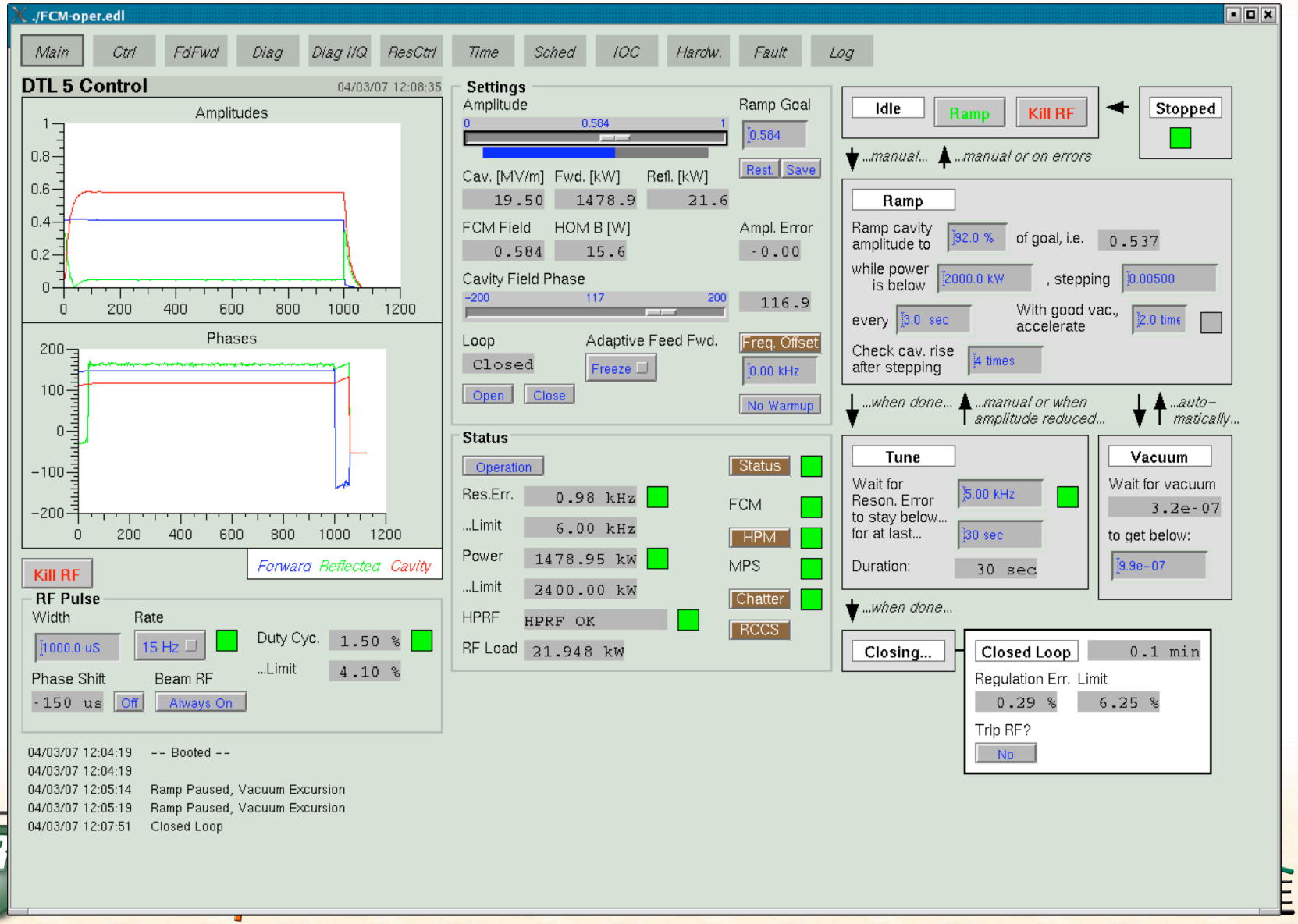
Kay Kasemir, March 2007

HFIR

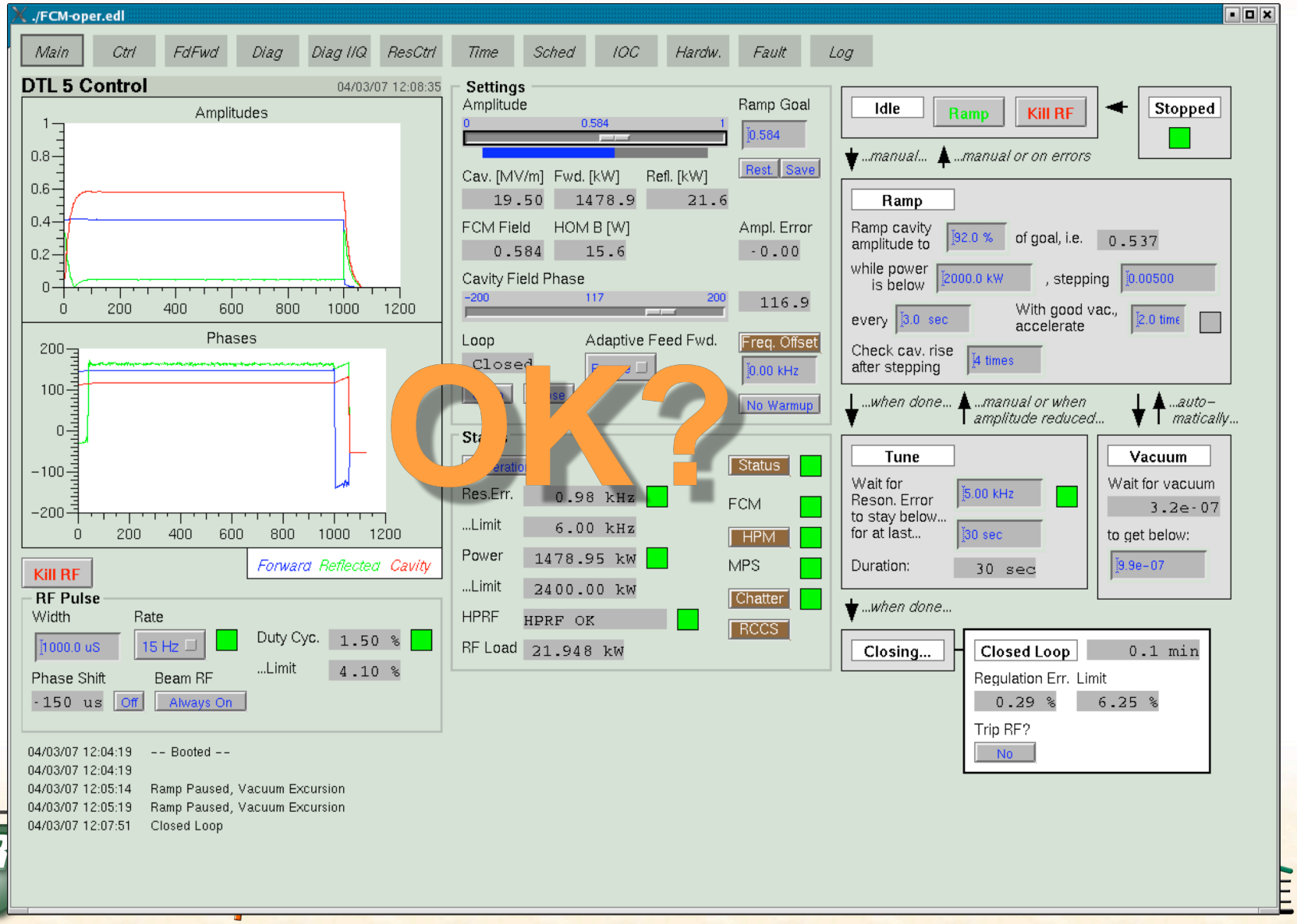
SNS
SPALLATION NEUTRON SOURCE

OAK RIDGE NATIONAL LABORATORY
U. S. DEPARTMENT OF ENERGY

SNS LLRF Main Screen

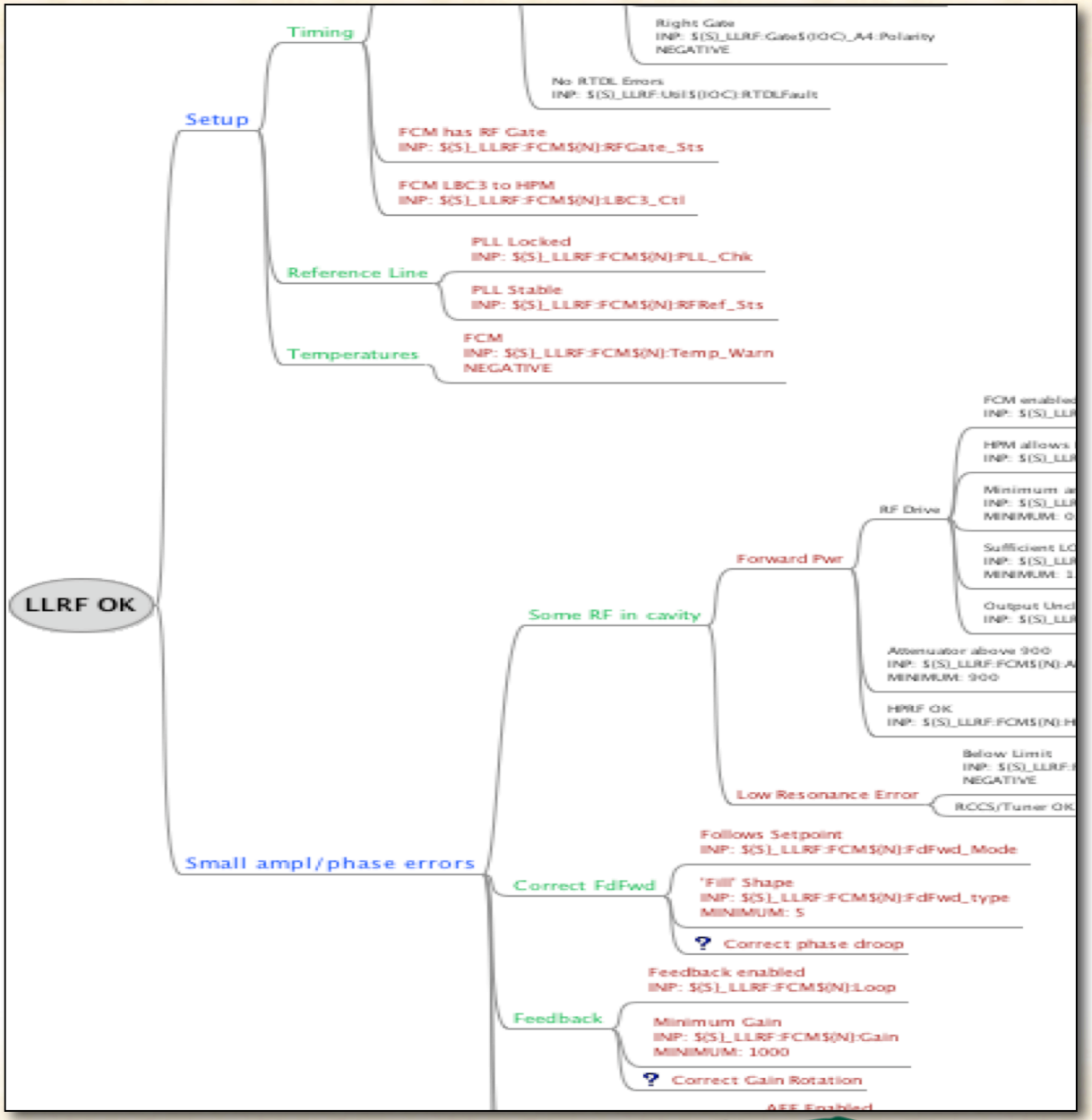


SNS LLRF Main Screen



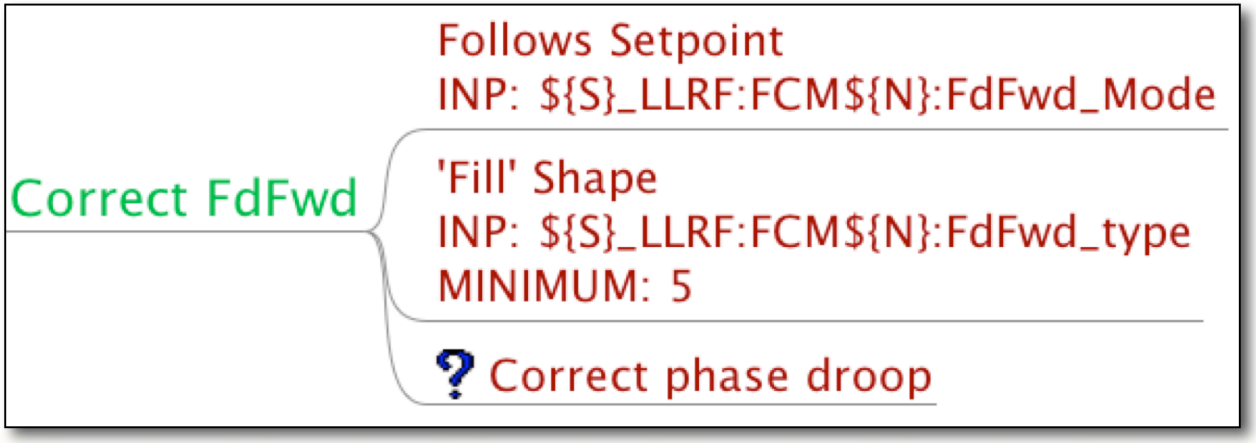
"Fault Tree"

- Shows consequences of faults, respectively conditions for proper operation
- Create graphically with "FreeMind", a free Java "Mind Mapping" tool
- Basis to discuss, document, understand subsystem dependencies



Detail..

- Some conditions directly match PVs
  - INP: ….
- Some conditions easily compute from PVs
  - NEGATIVE, MINUMUM: 5, ABS_MINIMUM: 10
- Some are unclear
  - No PV nor recipe beyond "Expert tries some values".
  - Still: At least you know that you don't know.

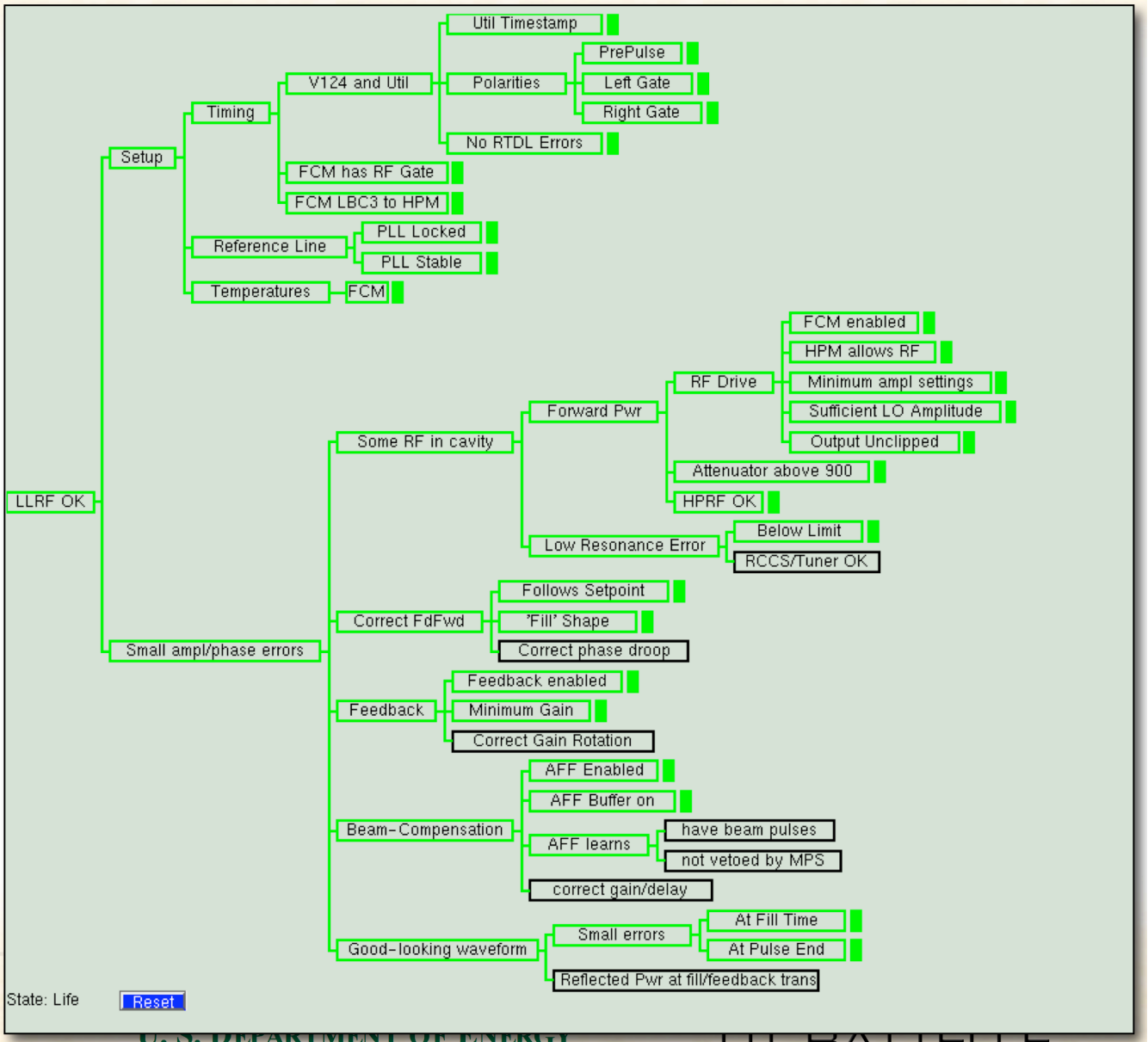


Turn this into software?

- Script converts FreeMind config (XML) into a simpler "Fault Tree" config (XML)
  - Not locked to FreeMind
- Other scripts create EPICS database (mostly calc records) and EDM screen
  - Thanks: Rolf Keitel/TRIUMF, perl edl lib

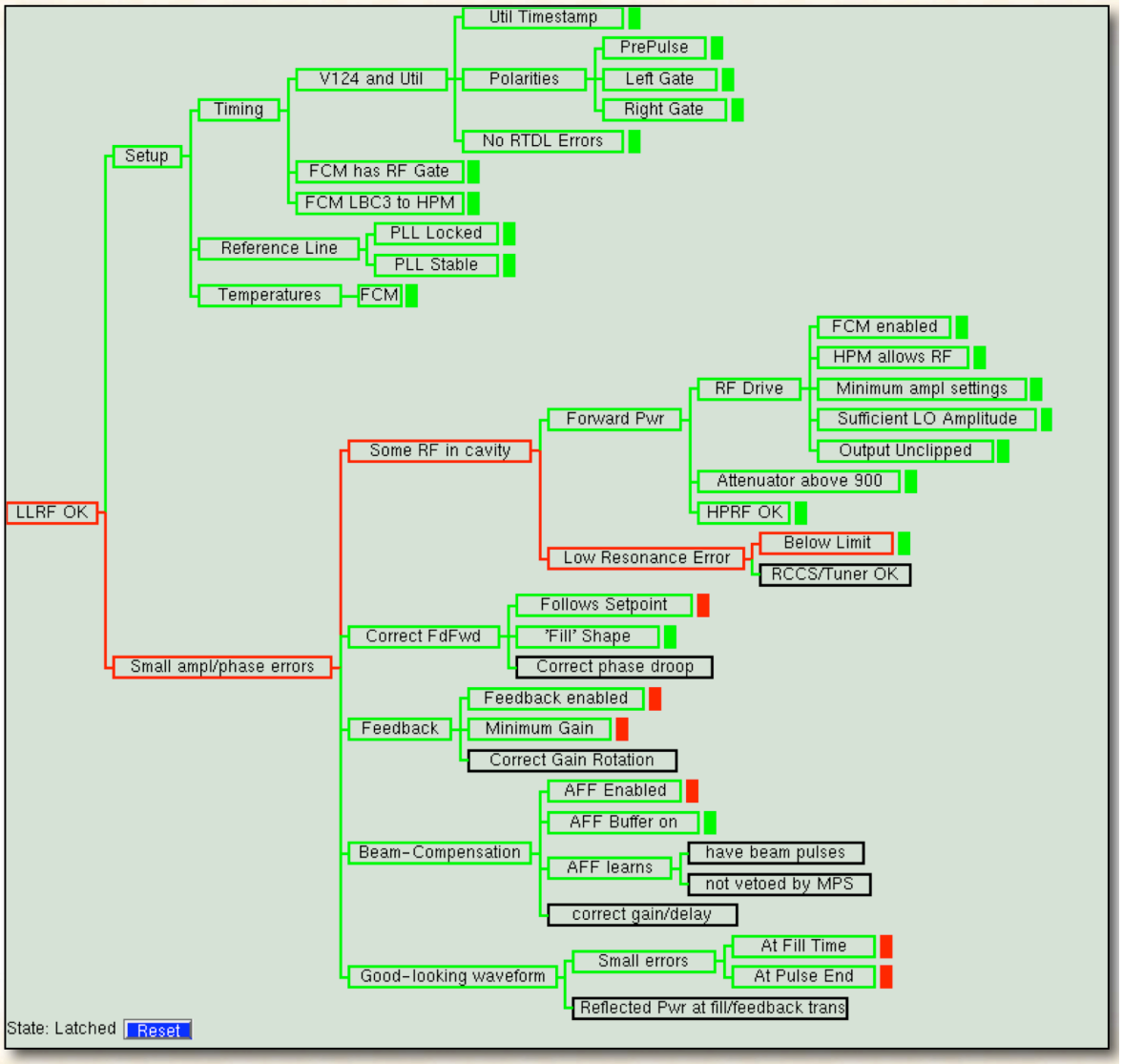
Live Fault Tree

- **Logic and OPI generated from Mind Map**



Latches on First Fault

- **Example: Resonance Error was too high**
  - **Consequences: Loop opened,**
  - **Feedback disabled, …**
- **Lead nodes continue to reflect 'current' state**
- **Resets when all faults clear. Manual unlatch to update tree for current faults.**



Summary

- FaultTree type view of system useful in general
- Database & screens
  - real nice to have
  - Hardly any added work
- "First Fault" display sometimes useful
  - .. but driven by "CP" links, so depending on races with other database logic, the true "first fault" is not always obvious.
- No "alarm handler" with logging, overrides, acknowledgement, phone dialer, …