Science & Technology Facilities Council
Engineering Technology Centre

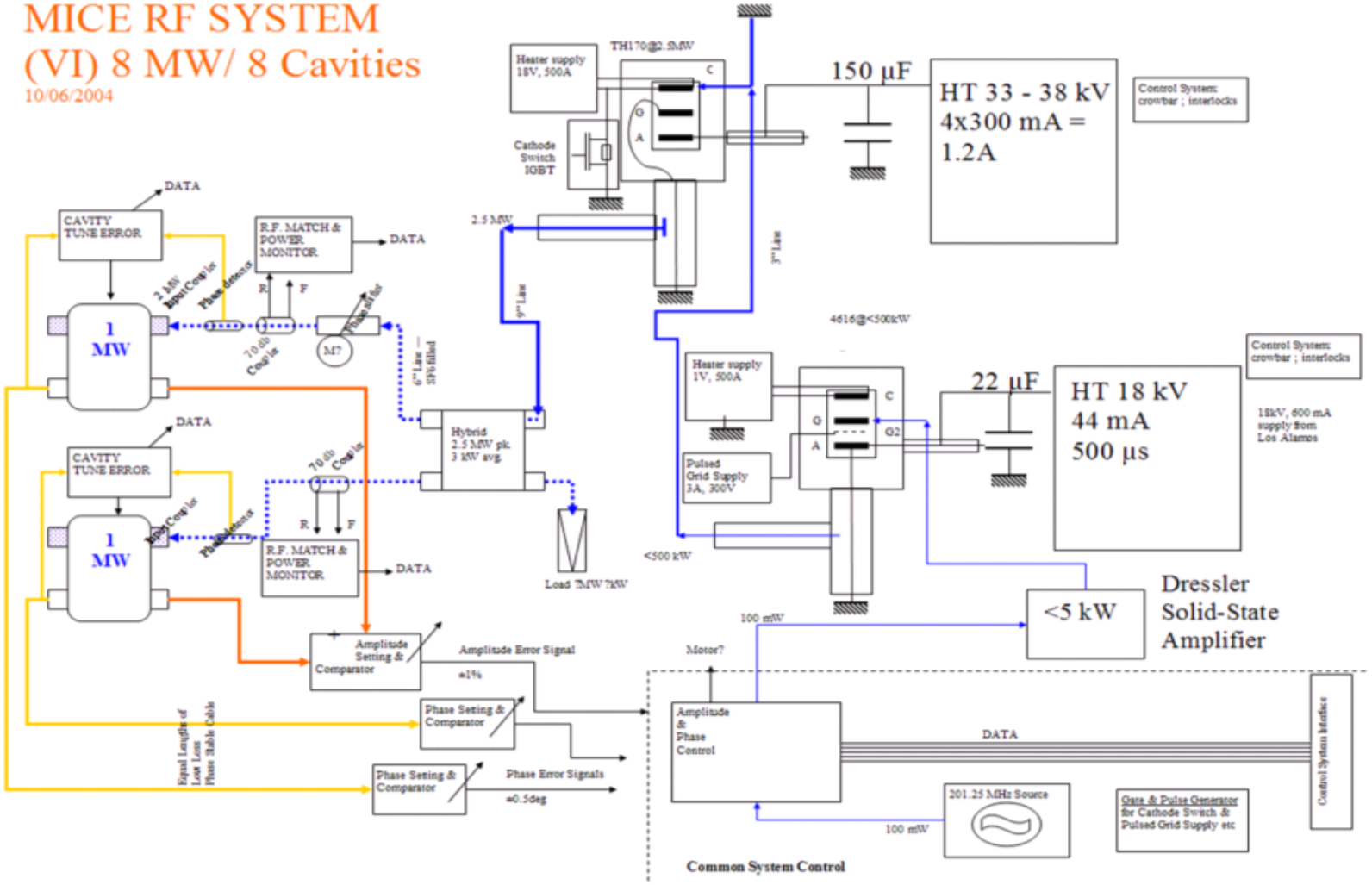
MICE RF System

Power Supplies, Control and Monitoring Status report

December 2011

Chris White, STFC Daresbury Laboratory

MICE RF SYSTEM
(VI) 8 MW/ 8 Cavities
10/06/2004



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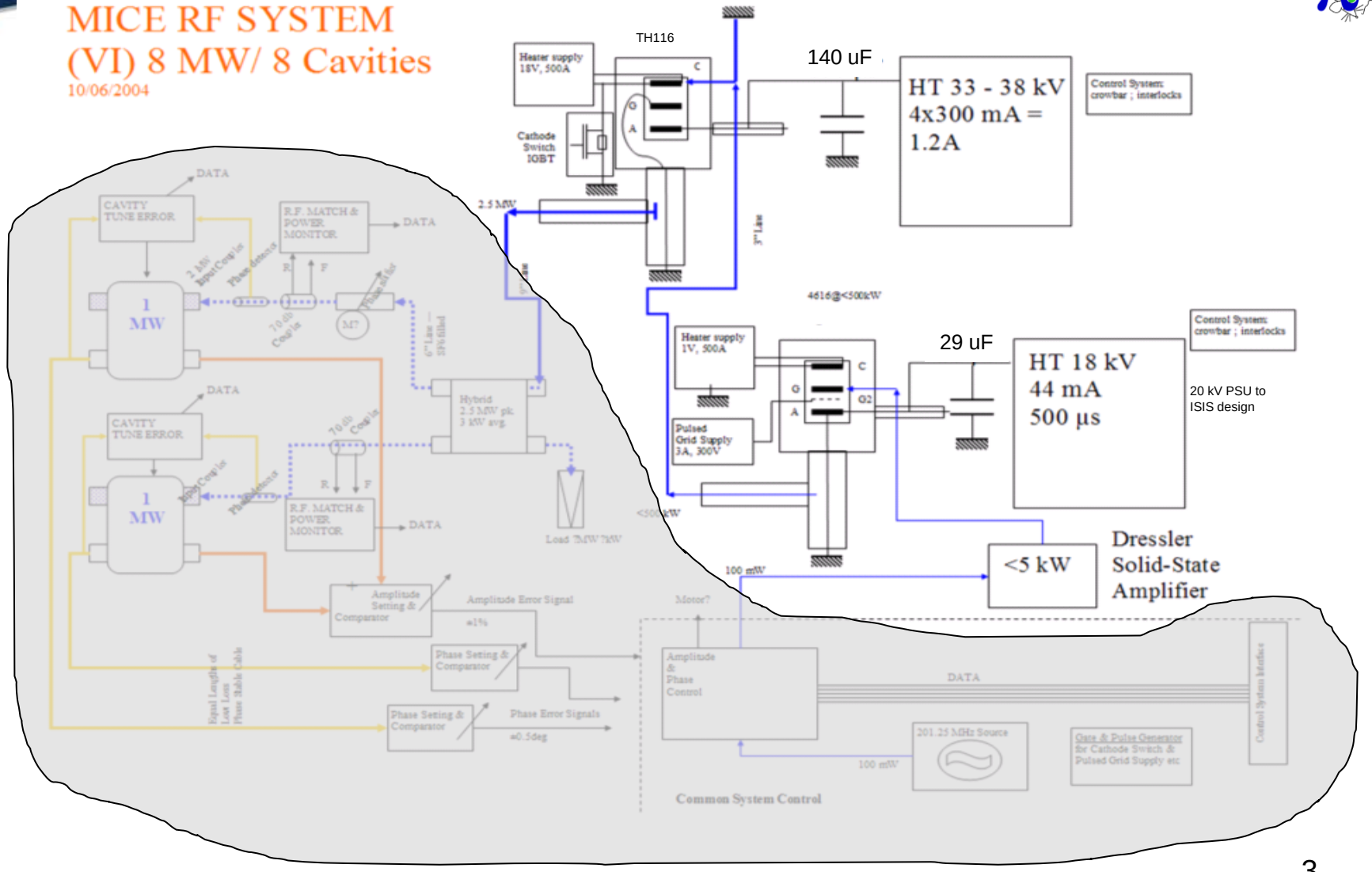
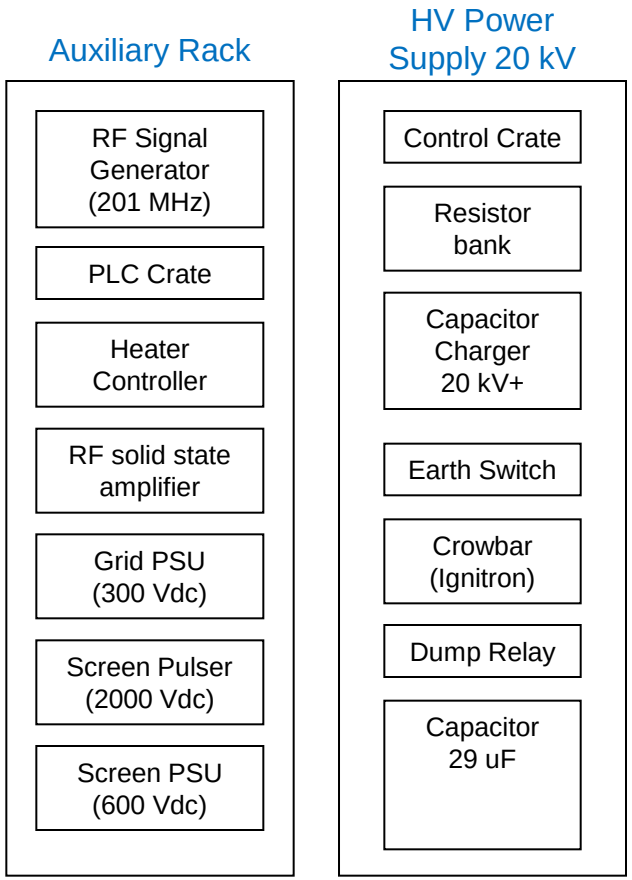
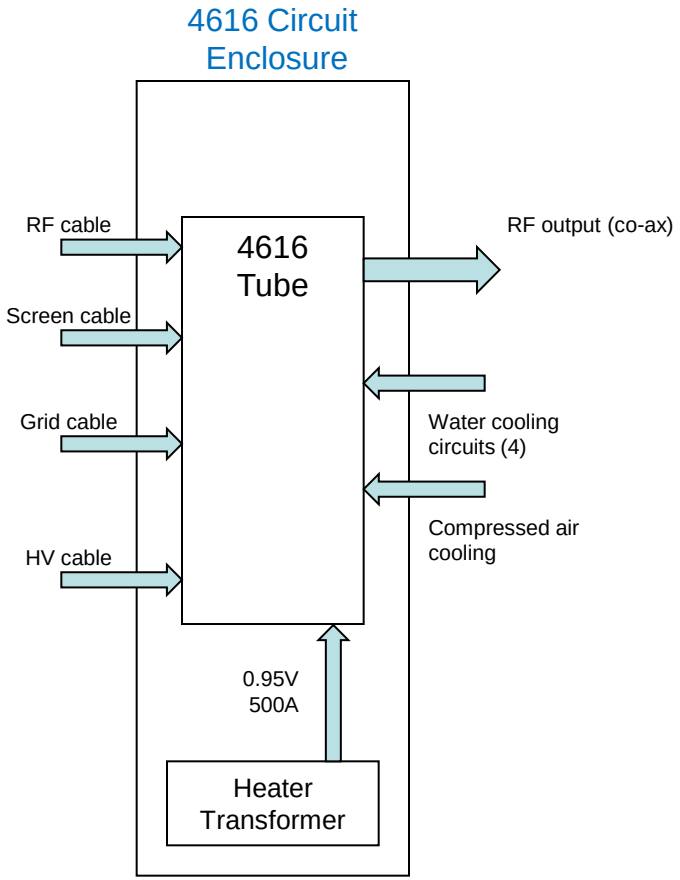
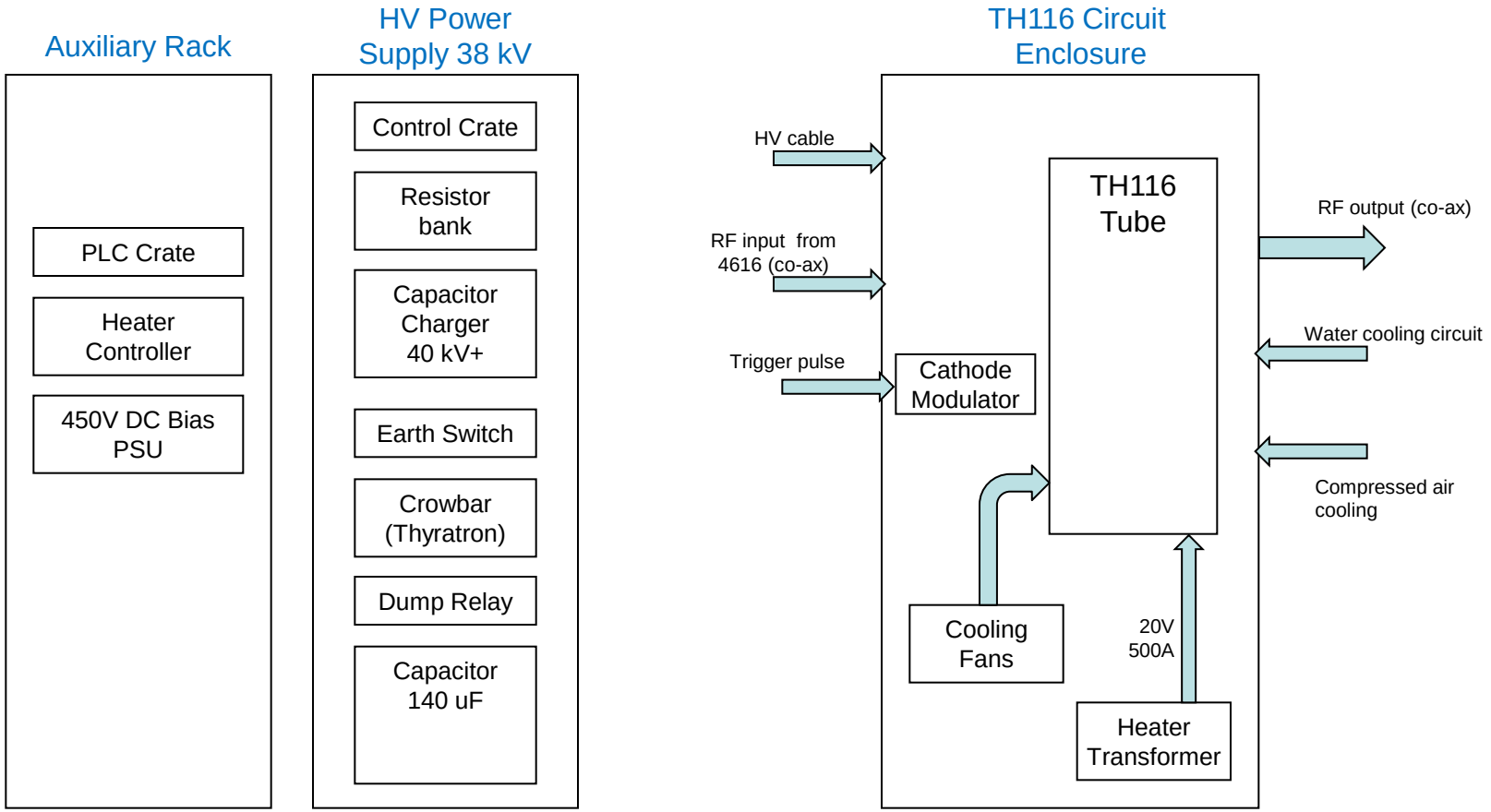


20 kV Power Supply for 4616





38 kV Power Supply for TH116



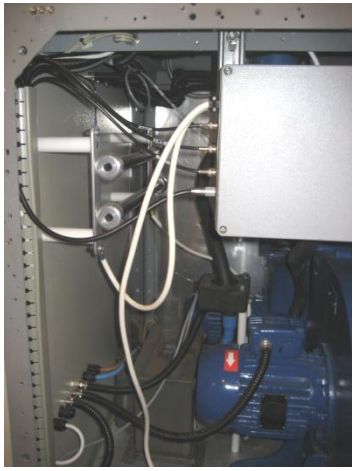
Daresbury Laboratory - Plant Room 1 - RF Test Area

Cooling Water Systems (DL)

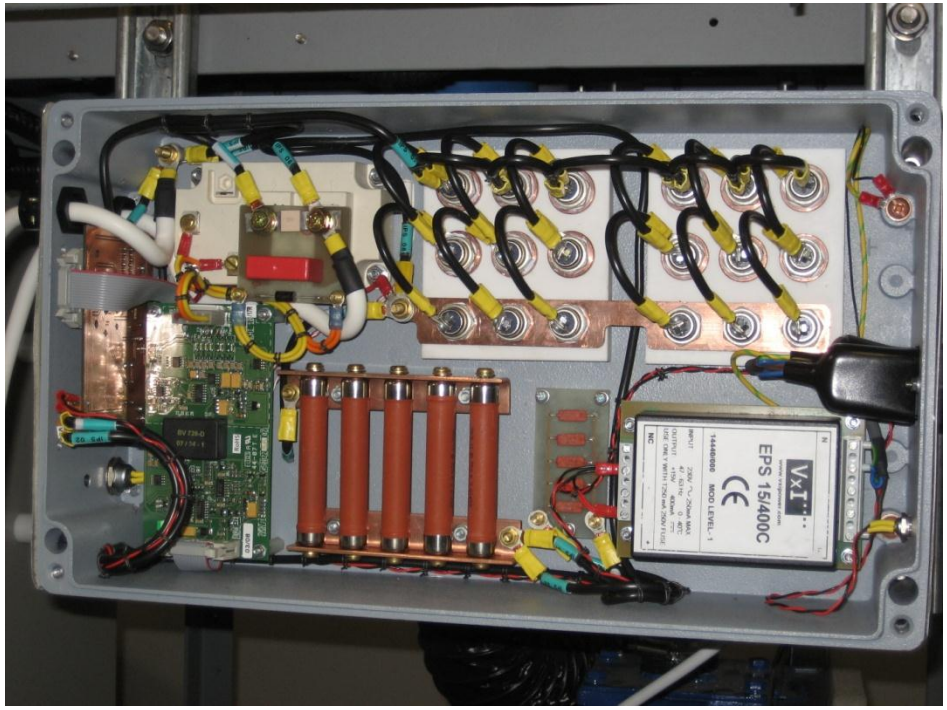
- DL site cooling system decommissioned
- Ex-SRS twin-circuit chiller installed
  - Demin for amplifiers
  - Glycol for load
- Now fully operational

TH116 Circuit #1

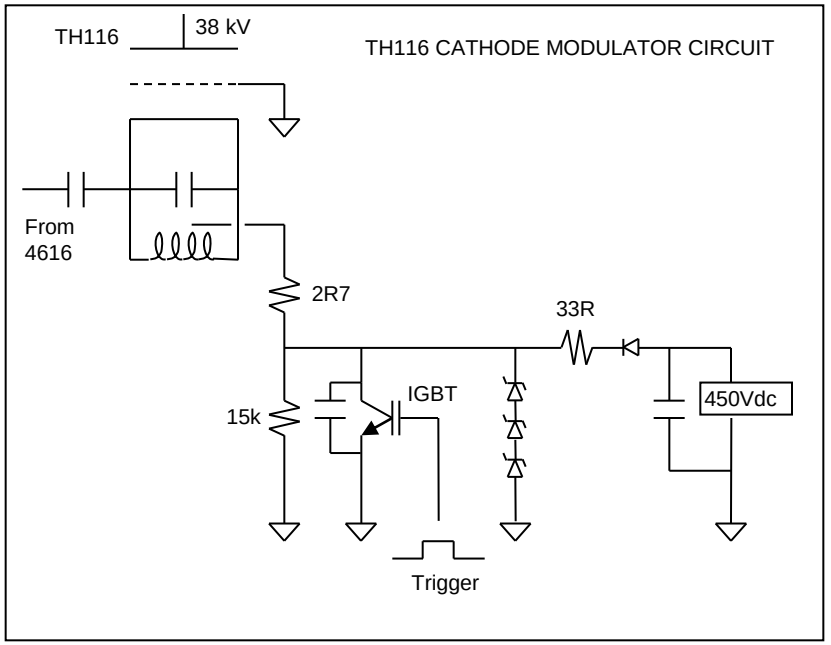
- Mechanically complete
- New fans fitted
- Cathode modulator built
- Motorised tuners
- Electrical control panel
- Heater controller
- Safety interlocks
- Tested to 1 MW RF output



Cathode Modulator



- IGBT switch
- IGBT control board
- Potential divider
- Zener diode array

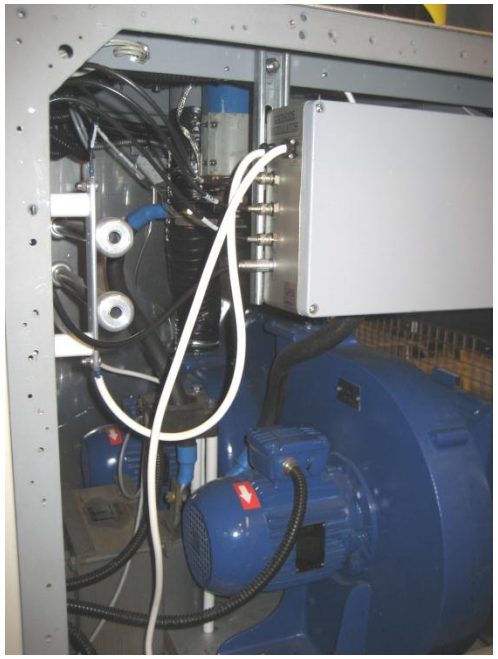


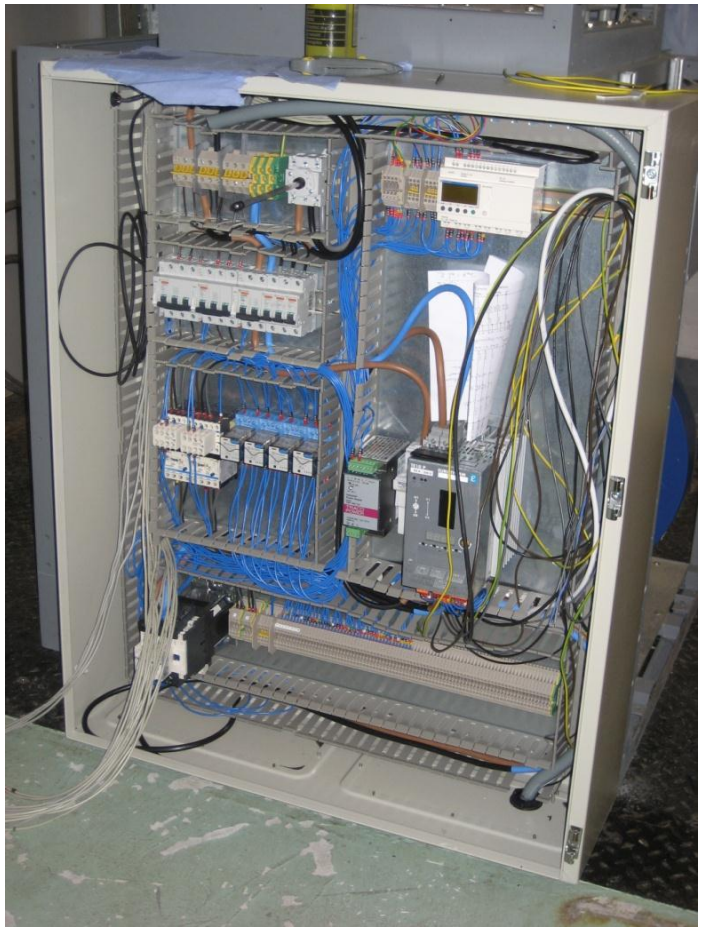
- Fully operational
- Second unit almost complete

Circuit tuning motors

TH116 Electrical Control Panel

- Fan control-gear
- Heater controller (thyristor)
- Circuit-breakers
- Tuning control relays

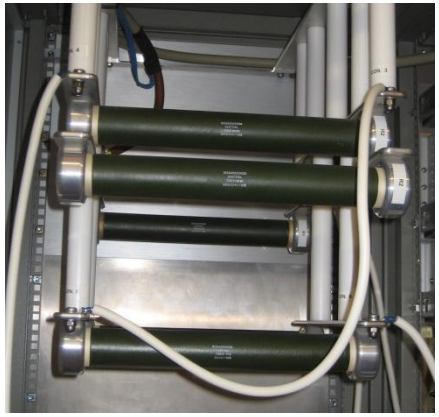




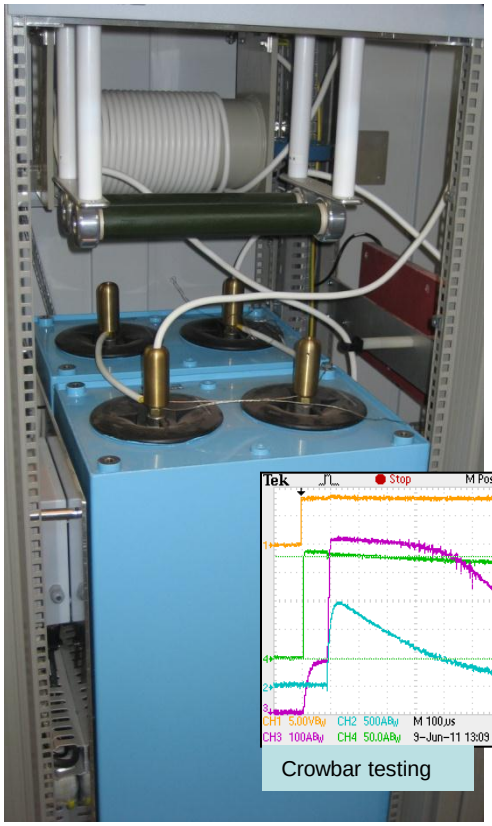
TH116 38kV Power Supply

- 2 x 70 µF Capacitors
- Crowbar (thyratron)
- Control unit
- Power module
- Dump relay
- Earth switch
- Charger (40 kV)
- Resistors

Crowbar (Thyratron)



HV Resistors



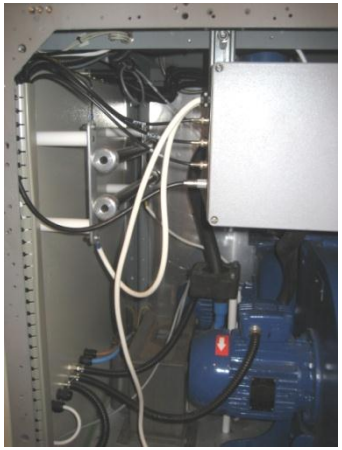
Crowbar testing

HV Capacitors (140 uF)

Power Supply Rack (Front)

RF HV Power Supplies - Components

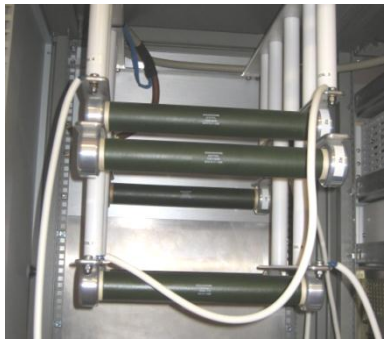
20 kV PSU & Aux. rack – front view



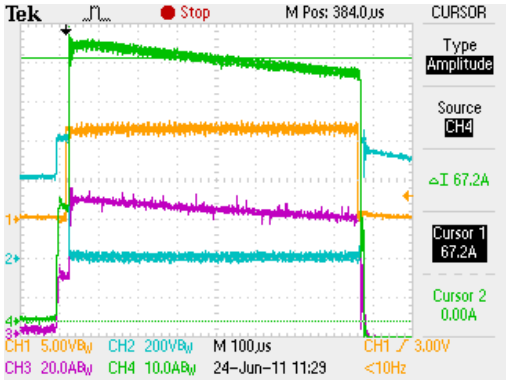
TH116 Circuit (lower part)

HV PSU Control Unit

38 kV PSU – rear view



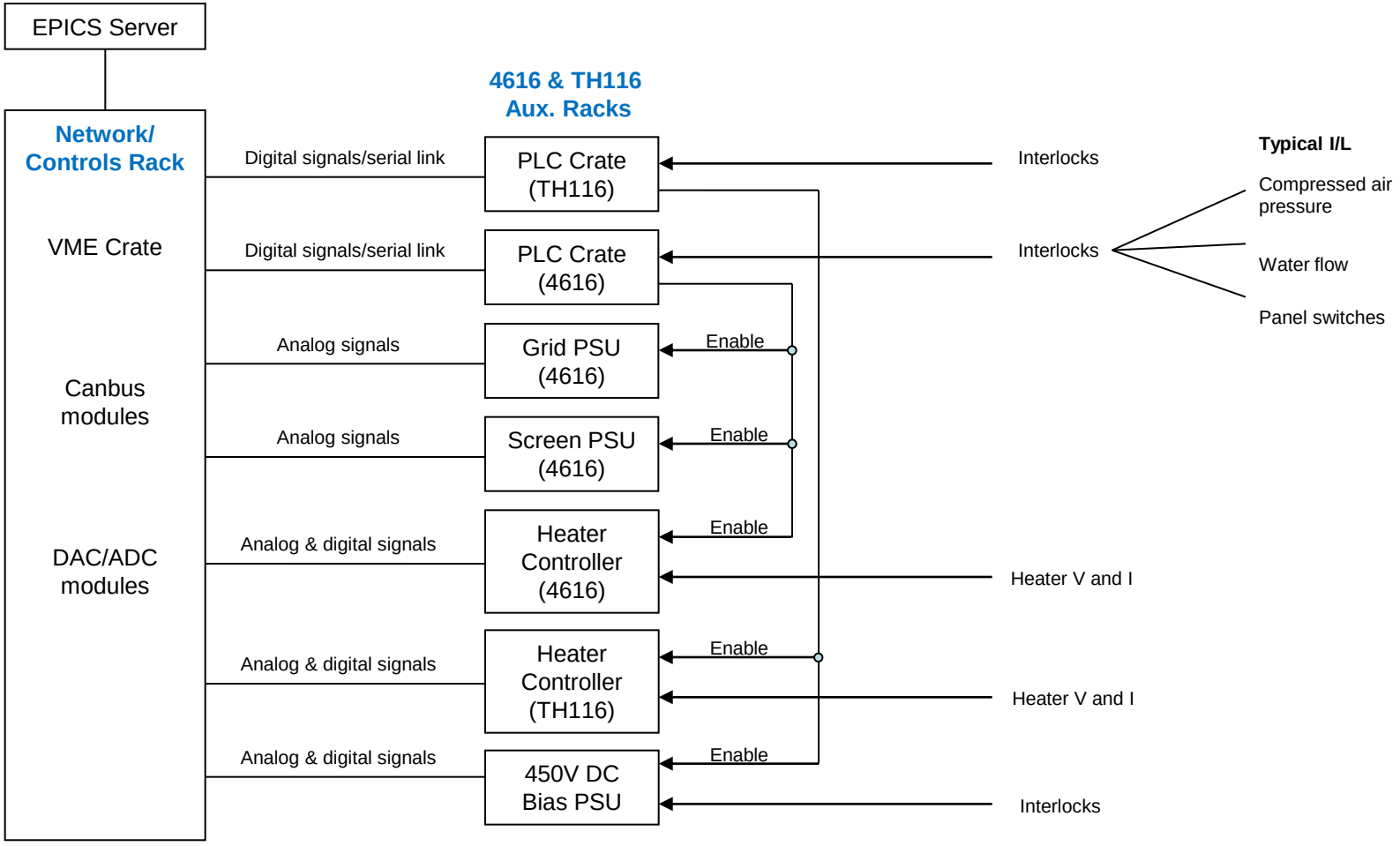
38 kV PSU – resistor bank



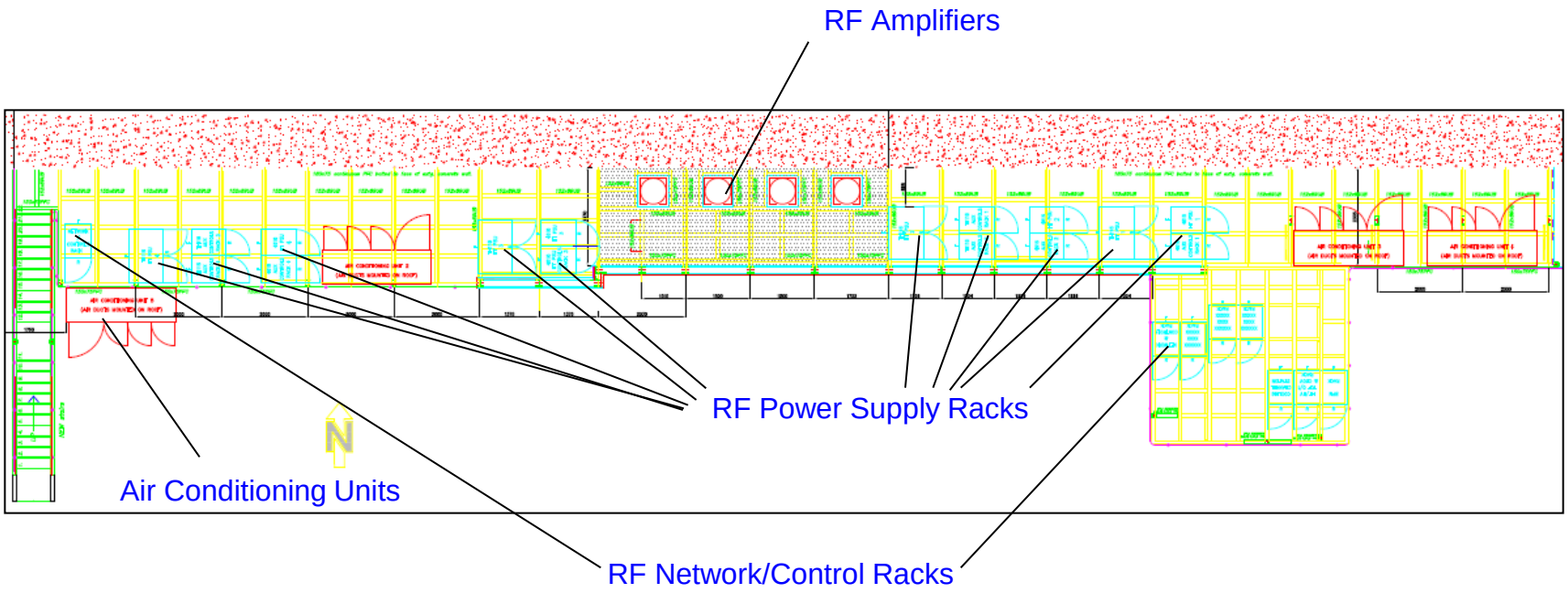
38 kV PSU – 1 MW RF output

Crowbar (38 kV Thyratron)

RF Control & Monitoring System



RF Power Supplies - MICE Hall Layout



Layout of North Mezzanine

Timescale

Current work in progress:

- RF testing of System #1 with new 4616 and TH116 tubes — Nov 11 to Dec11

Future work (Step V): time-scales to be confirmed

- Assembly of CERN TH116 amplifier (System #2) ---------- (July 2012)
- Test CERN amplifier at Daresbury ---------- (December 2012)
- Develop RF Control Systems
- Pack & ship complete system #1 to RAL ---------- (January 2013)
- Install RF System #1 in MICE Hall ---------- (May 2013)
- Test complete RF system #1 at RAL ---------- (September 2013)
- Construct & test 4616 #2 amplifier, power supply & controls
- Construct & test TH116 #2 power supply & controls
- Test complete RF system #2 at DL
- Pack & ship system #2 to RAL
- Install RF System #2 in MICE Hall
- Test complete RF system #2 at RAL

Tasks in red are required for TIARA (deadline in brackets)

Power Supplies – Construction Status - Step V

RF System #1 built and under test (manually controlled)

Work required:

- Control & monitoring upgrade for 4616 Screen Pulser (2 kV)
- Interface to MICE control system
  - Interface to PLC (Siemens S7-200)
  - Interface to Heater Controller (Eurotherm)
- Interface to Low Level RF and Timing System

4616 Tube & Connections

RF System #2:

- 4616 amplifer circuit refurbishment has started
- 20 kV Power Supply rack to be built (some components available, some ordered)
- 4616 Auxiliary rack to be built (components to be ordered)
- CERN amplifier at DL – to be assembled when required
- Cathode modulator virtually complete
- 38 kV Power Supply rack to be built (components to be ordered)
- TH116 Auxiliary rack to be built (components to be ordered)
- Second dummy load to be procured for use with CERN amplifier (twin output)

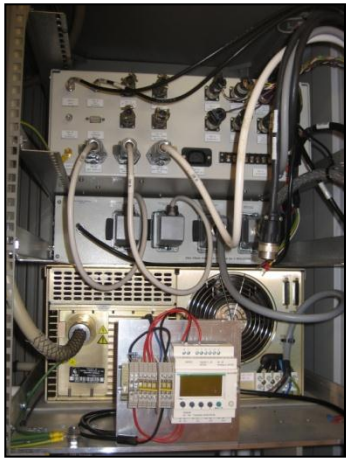
Power Supplies – Construction Status - Step VI

RF Systems #3 and #4:


20 kV PSU and Aux. Rack

- TH116 amplifier circuit (ex-LBNL):
  - Mechanical refurbishment complete, tuning motors fitted
  - Electrical control panel to be built
- Second CERN amplifier at DL – to be assembled when required
- Cathode modulators to be built
- 4616 amplifer circuit (ex-LBNL) refurbishment has started
- Fourth 4616 amplifier circuit to be purchased
- 20 kV Power Supply racks to be built (some components available, some ordered)
- 4616 Auxiliary racks to be built (components to be ordered)
- CERN amplifier at DL – to be assembled when required
- 38 kV Power Supply racks to be built (components to be ordered)
- TH116 Auxiliary racks to be built (components to be ordered)

RF Power Supplies



38 kV PSU – Charger (rear)

Questions ?

38 kV PSU Dump Relay & Voltage divider

38 kV PSU - rear view

20 kV PSU (front)