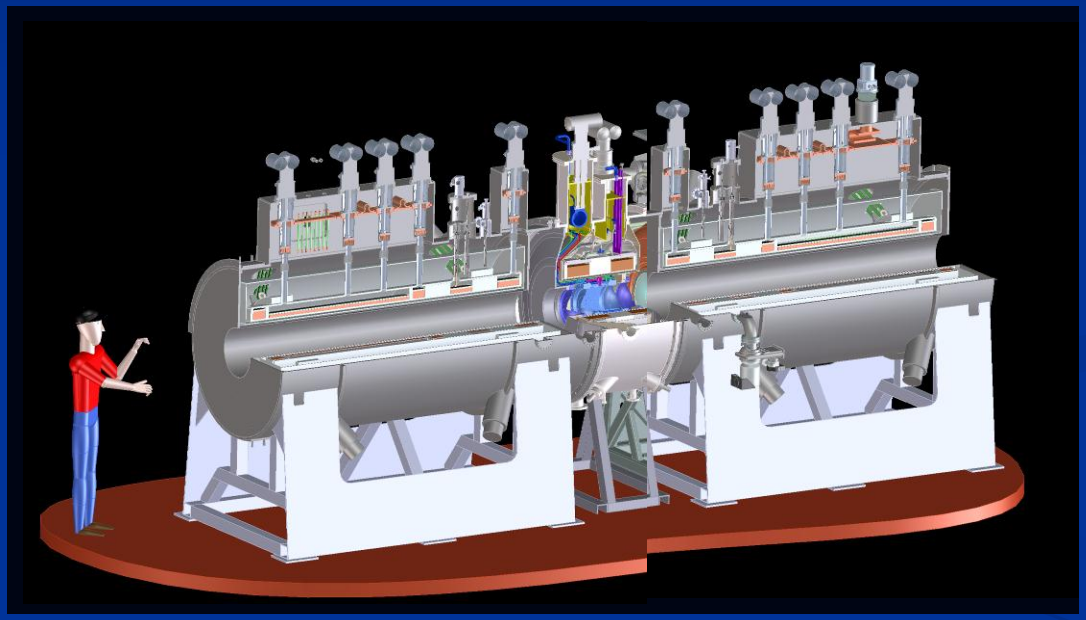
Online Summary and MICE Operations



Linda R. Coney – UCR

CM35 – 16 Feb 2013

Online Parallel Session:

- Overall Online Update – Linda
- Controls & Monitoring – Pierrick
- DAQ – Yordan
- Online MAUS – Alex Richards
- MICE Computing – Chris Rogers – ended up in plenary

Since CM34 in October

- December run – primary goals to test changes in Online systems and train shifters
  - Did not go smoothly (as with Oct run)
  - Issues with DAQ, C&M, OnlineMonitoring
  - Prompted evaluation of reliability within Online Systems
    - Need develop more robust pre-run procedures for DAQ, C&M, Online Reconstruction
    - Need higher priority on documentation
  - Need fake data (more than cosmics) – test full chain of DAQ, unpacker, Online Reco

- Activation run – Wednesday (13 Feb) – goal to increase beam loss limit with beam bump in ISIS
  - beam to DSA due to upgrades in PPS
  - All went very well

Since CM34: PPD Computing Outage

- PPD-hosted computing services loss over holiday
  - Failure of AC in PPD computing area – downtime of PPD-hosted MICE services/computing
- Highlighted confusion regarding these services and how they relate to MICE activities
- Prompted review of service loss and current agreements
- Strengthened link between Online Group, Software Group, and overall Computing
- Led to improvement in computing documentation across the board
- Review of MICE Operations connection to services
- Conclusion: MICE is able to take data without connection to services or computing external to micenet

C&M – Pierrick Hanlet (IIT)

- Daresbury Team has been very busy
  - Building all major control systems for MICE
    - FC – standalone system, commissioning, support
    - SS – standalone system, commissioning, remote support
    - DS – quench protection redo, power supply
  - Welcome back to Steve Griffiths
    - Must have been just too hot in Australia…
  - Big thank you to the team for all the good work!

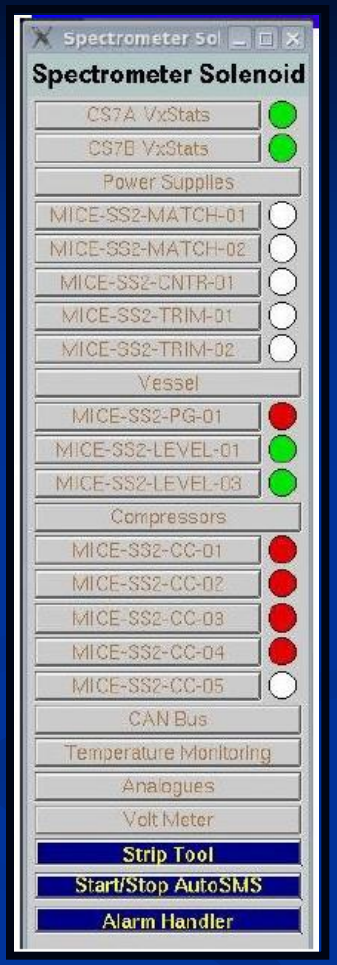
- Spectrometer Solenoid Controls Review (Dec 2012)
  - In response to difficulties during the last training run serires
  - Goal – work C&M into final configuration
  - Good feedback → improvements to system (hardware and software)
  - Run plan defined – included additional test plans

C&M – Pierrick

- SS2 effort
  - Hardware improvements
    - HTS leads replaced
    - Reconfigured power supplies – use trim supplies to power end coils as designed (rather than at same current as center coil)
    - external internet, additional instrumentation (pressure gauge, heater current, PSU current shunts), UPS on C&M rack
    - Backup He gas bottle to provide emergency positive pressure
    - New AMI-PSU controller
    - Fixed energy absorbers – problems with shorts during testing
  - Software improvements
    - Replaced heater loop, fixed instrument readout, added EPICS interface for HTS and LTS voltages (previously only in quench detection DAQ), Alarm Handler, autoSMS, remote monitoring through EPICS gateway
  - Full list in Pierrick's slides

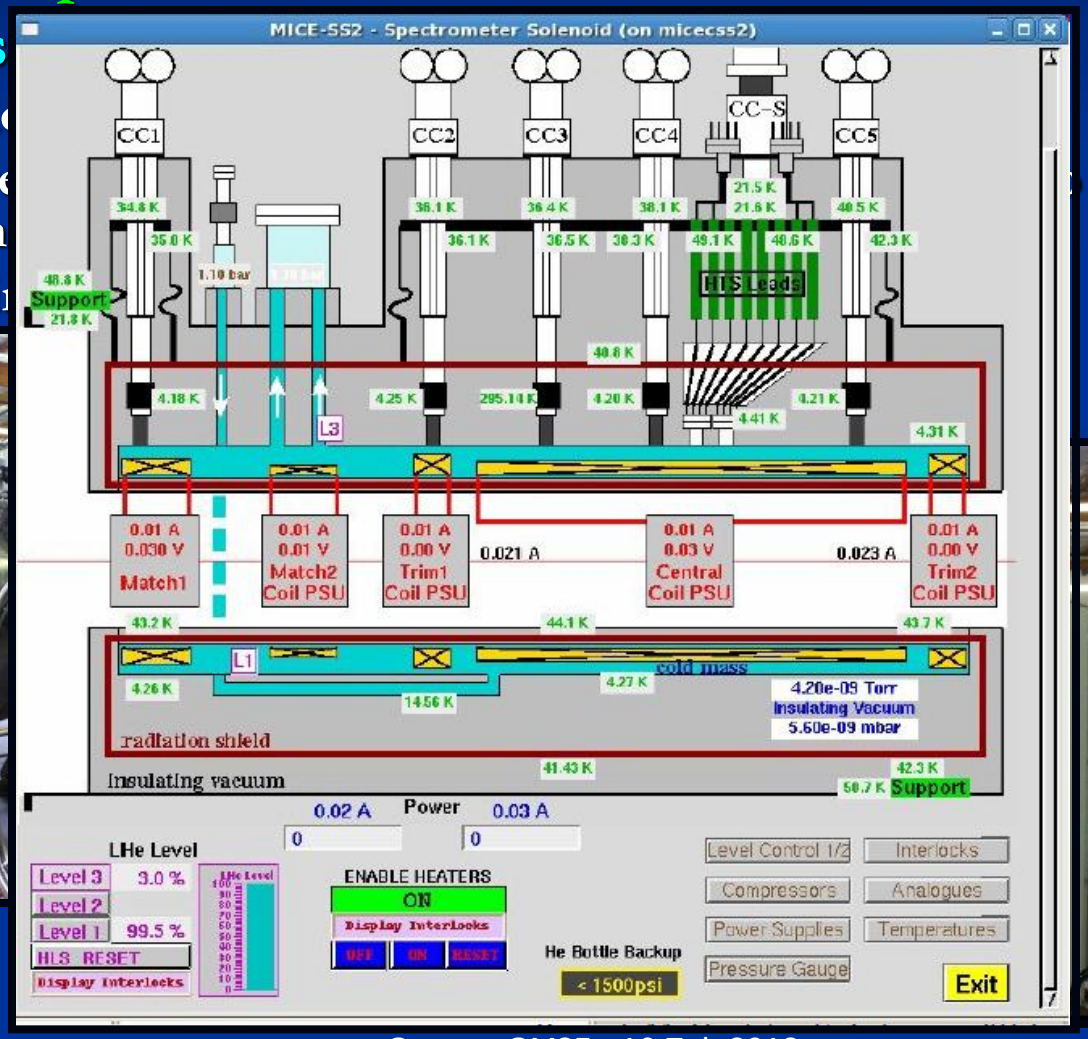
C&M – Pierrick

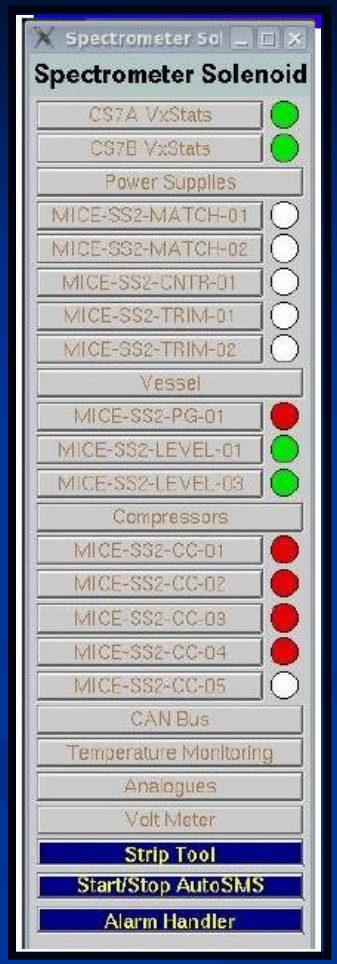
- New EPICS user interface – Standalone C&M system operational
- SS2 testing restarted
  - cooldown Jan 30
  - Steve, Ian, Adrian, Pierrick, Maria, Linda, Roman to Wang
  - Training & troubleshooting system ongoing…



C&M – Pierrick

- New EPICS user interface – Standalone C&M system operational
- SS2 tes
  - cool
  - Steve
    Wan
  - Trai





C&M – Pierrick

- New EPICS user interface – Standalone C&M system operational

MICE Spectrometer Solenoid - Coil Power Supplies

MICE-SS2 - Specrometer Solenoid - Coil Power Supplies

Voltage	-0.090 V	0.010 V	0.0001 V	-0.040 V	0.0000 V
Ramp Rate	0.0237 A/s	0.0250 A/s	0.0040 A/s	0.0248 A/s	0.0027 A/s
Set Point	270.000 A	285.000 A	-44.0000 A	283.000 A	-29.0000 A
	270.000	285.000	-44.0000	283.000	-29.0000
	Ramp	Ramp	Stop Ramp	Ramp	Stop Ramp

	Matching Coil 1	Matching Coil 2	End Coil 1	Centre Coil	End Coil 2
Current	70.445 A	74.296 A	-11.7368 A	73.705 A	-7.8872 A
Field	T	T	-0.0117 T	T	-0.7887 T
Status					
Quench					

PSU Quench	OK	SD 01 Temperature	OK	47.95 K	
CC 1-3 Flow	OK	SD 08 Temperature	OK	47.51 K	
CC 4-5 + SS Flow	OK	Helium Level	Full	100.0 %	
Dump Flow	OK	He Level Switch	Upper (2)		

PSU CONTACTORS: ON | Display Interlocks | OFF | ON | RESET

PSU ENABLE: ON | Display Interlocks | OFF | ON | RESET

Compressors | Vessel | Preset Values

C&M – Pierrick

- SS2 State Machine in progress
  - Model for other MICE state machines
- SS C&M review led to significant changes in priorities in C&M
- Knock-on effect on non-SS C&M work
  - All other C&M projects slipping
    - Installation of iocpc1, computing monitoring in EPICS, FC Controls Review, Run Control, Rack Room Monitoring, HV control documentation, Run Control shifter guide & manual, Pneumatic Proton Absorber, Decay Solenoid state machine, new HV control
  - All requires time/effort from Pierrick – usually requires him to be at RAL
  - Need additional personnel for C&M – takes time but will pay off in the long run

Expanding Expertise

- Recent issues with running & looking to Step IV running made it clear we needed additional expertise
- Need to distribute knowledge across personnel

- Personnel changes:
  - New network village manager – Chris Brew (RAL)
  - New RAL network liaison – Antony Wilson (RAL)
  - New DAQ deputy – David Adey (FNAL)
  - New Online Monitoring owner – Rhys Gardener (Brunel grad student)
  - New C&M deputy – ??????????

- If you are interested in joining the effort – contact Linda
  - Opportunity to play an essential role in Step IV

- Infrastructure in hand – thanks to good effort by Matt and Antony

Online Progress

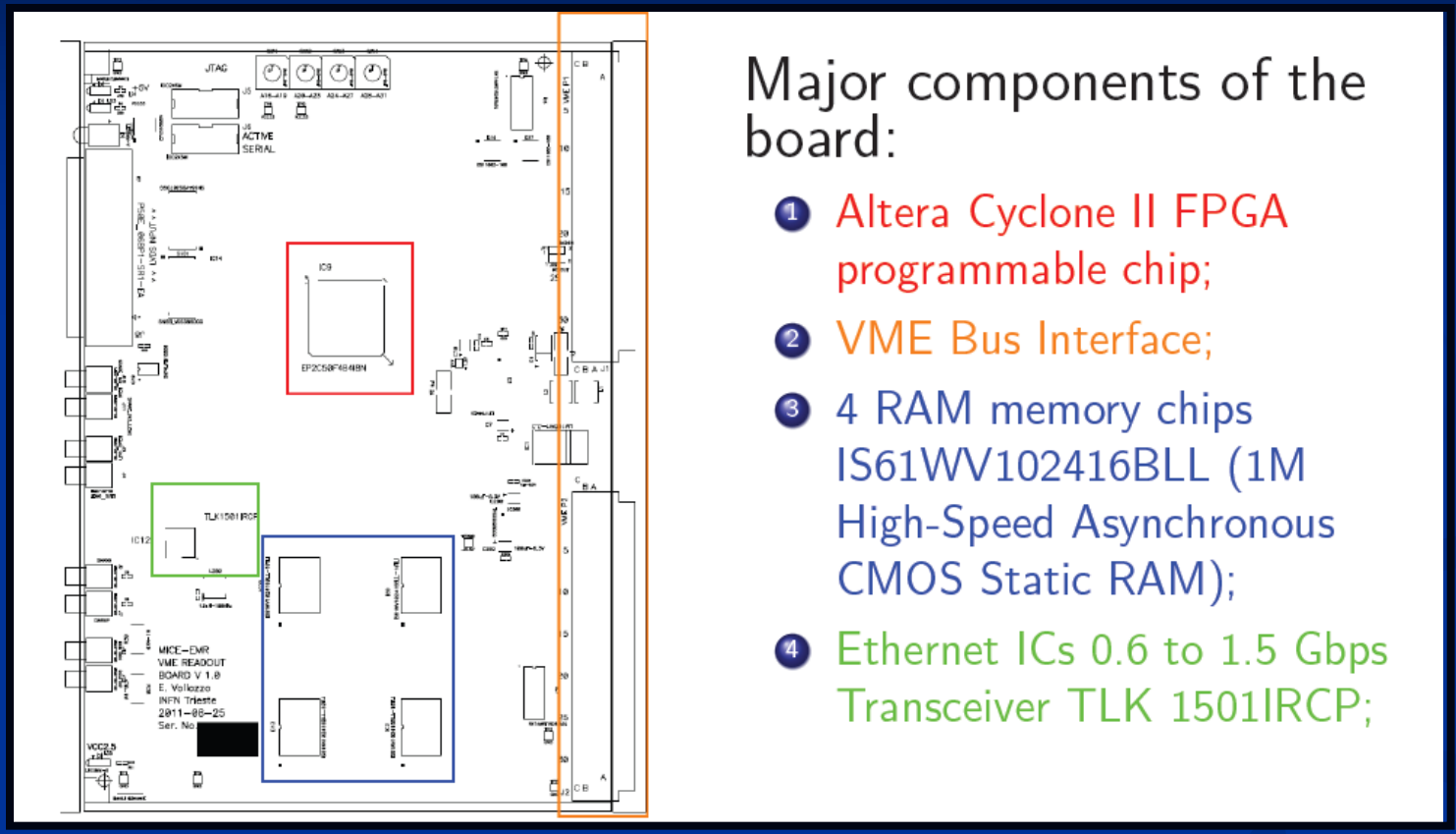
- Level of green text shows progress made
- Functional
  - All C&M for each element
  - Fully commissioned SS controls system
  - Fully commissioned FC controls system – incorporate with LH2 system
  - Alarm Handler values set appropriately
  - Add capability to Online Reco/Analysis
  - Automate run infrastructure – Run Control
- Safety/Security
  - Implement formal shifter training
  - Remote readout of neutron monitor restored
  - Update Operations/Online documentation & instructions
  - Develop comprehensive list of safety-critical maintenance
  - Update safety paperwork – develop overall system for MICE operations
  - Access limited to micenet

Online Progress

- Easy to use
  - Improving Online Reconstruction/Data Quality plots
  - Add Online Reco for KL/EMR/accelerator analysis
  - Run Control
  - Mature Alarm Handler
  - Computing documentation on micemine
- Reliable
  - Automated operating system updates including MOM-accessible OFF switch for data-taking
  - Additional UPS installed for important systems
  - Installation of new iocpc1 (C&M machine)
  - Installation of new Online Reco computers
  - Spare hardware now organized in R9 – crates/computers/etc
  - Computing monitoring in EPICS
  - Implement histogram comparison tool – verify code & beam settings
  - Implement formal releases of C&M code

DAQ: Yordan Karadzhov (UniGeneve)

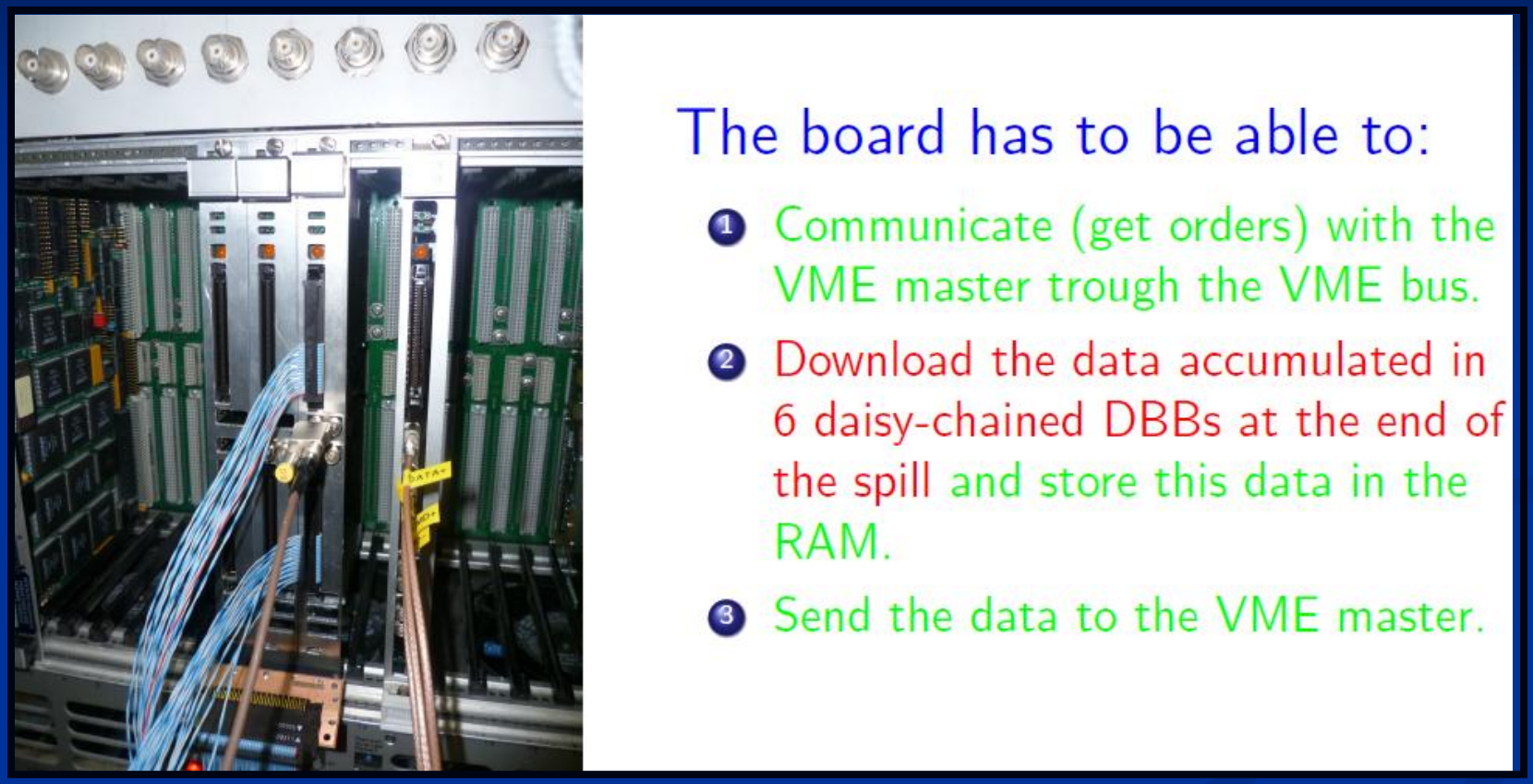
- **Description of the EMR VME readout board**



- **Explanation of firmware development for the board**
- **What's happening next?**

DAQ – Yordan

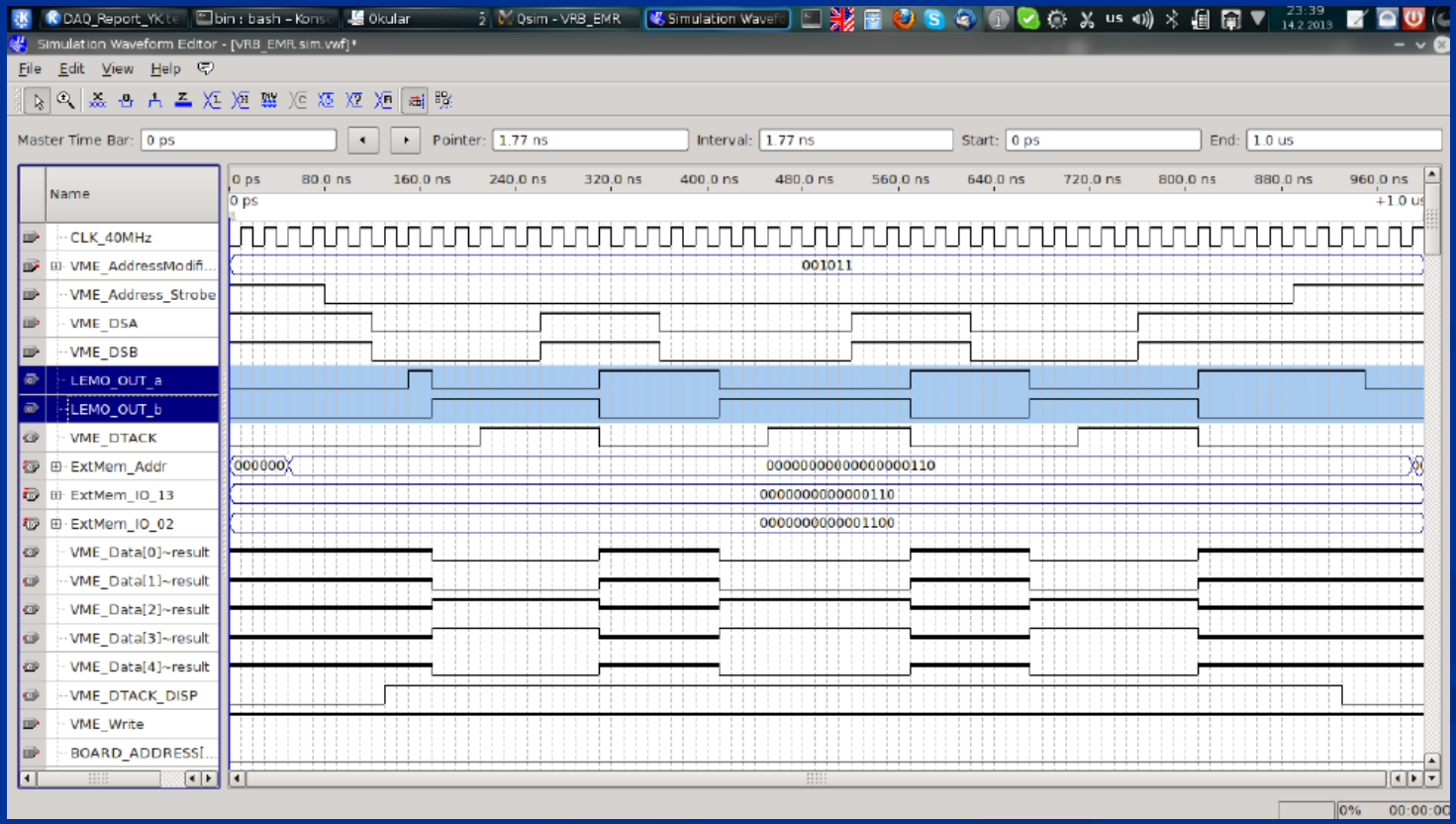
- **Description of the EMR VME readout board**



- **Explanation of firmware development for the board**
- **What's happening next?**

DAQ – Yordan

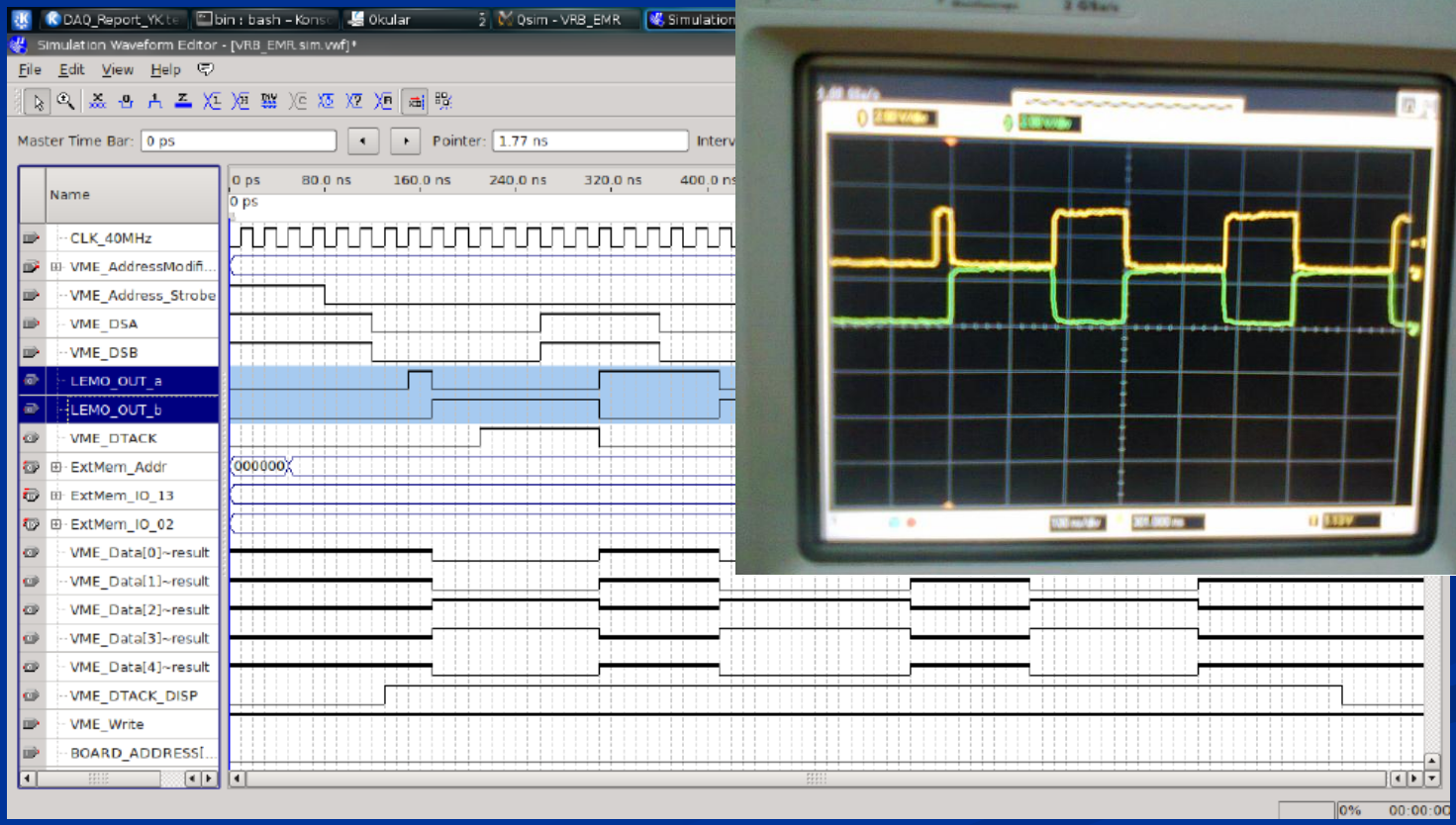
- Description of the EMR VME readout board
- Explanation of firmware development for the board
  - VME tutorial - Data read, write; interaction between the master and slave
  - MICE VME Interface: Four-State Moore State Machine
  - Simulation of Block Transfer



- What's happening next?

DAQ – Yordan

- Description of the EMR VME readout board
- Explanation of firmware development for the board
  - VME tutorial - Data read, write; interaction between the master and slave
  - MICE VME Interface: Four-State Moore State Machine
  - Real Block Transfer



- What's happening next?

DAQ – Yordan

- Description of the EMR VME readout board
- Explanation of firmware development for the board
- What's happening next?
  - End Feb – EMR cosmic test stand
  - 15 March – First data taking with FEB + DBB + VRB + VCB
  - Mid-May – Full VRB capability implemented before shipping to RAL

Online MAUS: Alex Richards (Imperial)

- Developed new histogram regression testing framework in MAUS
  - Compares the physics output of code – in this case, histograms – to a reference
  - Compares two sets of histograms using ROOT tests – new histogram, reference histogram
  - Result (ie. PASS/FAIL) depends on comparison for *all* histograms
  - Gave examples on how to use for MAUS developers
- Offline test – already working 
  - Run at build time
  - Compare histograms created with new/updated software with reference set created before changes made to code
- Online test
  - Run live during data-taking
  - Compare histograms to reference plots from data set
  - Can use to verify that beam setting is producing correct beam
  - Verify getting good physics during running
- *Provides excellent tool to ensure data quality*

MICE Operations

MICE Operations

- Changes to the MOM process
  - Progress in MOMing – handover working better
  - Improved continuity of knowledge
  - Documentation updates/improvements on micemine
  - Electrical work sign-off
    - MOM no longer responsible – not necessarily qualified
  - Neutron monitor
    - MOM no longer responsible for this – needs continuity
    - Responsibility lies with MICE RPS (Tim Hayler) & RAL Radiation Safety group
  - Safety documents updated (RA/MS)
- Need MOM2013 sign-up
  - Includes me…shame shame
- December Run
  - Feedback into Ops and Online procedures (as described earlier)

Shifter Training

- Went well in December
  - Trained new shifters: Yagmur Torun (IIT), David Adey (FNAL), Ian Taylor (Warwick), Celeste Pidcott (Warwick)
  - Took longer than anticipated – Refining training process
- Need to arrange in advance
  - Requires coordination of training experts, trainees, Hall work, preparedness of Operations hardware and software
  - Need safety training before start shifter training
- We need to sign up more MICE collaborators
- Step IV running will require many more shifter-capable MICE
  - More on this later
- Periodic 3 day (weekend) running to exercise equipment AND train shifters
  - March 22, 23, 24
  - May 31, June 1, June 2 (also EMR commissioning)
  - July 19, 20, 21
  - Proposed dates – need feedback from Hall work & EMR

Shifter Training

- List of trained (or in progress) MICE
- Note – many not at RAL

Name	Institution	Safety Training Completed	Safety Training Renewal Date	Qualified Lead Shifter	Qualified Shifter	Date Training Completed	Other
UK							
Paul Kyberd	Brunel Uni	Yes	??	No	Yes	May 2012	
Matt Littlefield	Brunel Uni	Yes	??	No	Yes	May 2012	
Henry Nebrensky	Brunel Uni	Yes	May 2012	Yes	Yes	May 2012	BLOC, MOM qualified
Adam Dobbs	Imperial, London	Yes	??	Yes	Yes	May 2012	BLOC, MOM qualified
Edward Santos	Imperial, London	Yes	??	No	No		
Ray Gamet	Liverpool	Yes	??	Yes	Yes	May 2012	MOM qualified
Ed Overton	Sheffield	Yes	??	No	No		BLOC qualified
Paul Smith	Sheffield	Yes	??	No	No		BLOC, MOM qualified
Ian Taylor	Warwick	Yes	? August 2012	Yes	Yes	October 2012	based at RAL
Celeste Pidcott	Warwick	Yes	?	No	Yes	October 2012	
US							
Justin Christensen	Berkeley	Yes	May 2012	No	Yes	May 2012	
Sio-Chong Lo	Berkeley	Yes	May 2012	No	Yes	May 2012	
Maria Leonova	Fermilab	Yes	May 2012	Yes	Yes	May 2012	
Pierrick Hanlet	IIT, Chicago	Yes	??	Yes	Yes	May 2012	BLOC, MOM qualified
Yagmur Torun	IIT, Chicago	Yes	??	No	No		MOM qualified
Chris Heidt	UC Riverside	Yes	??	Yes	Yes	May 2012	based in London
David Adey	Fermilab	Yes	??	No	Yes	Dec 2012	Based at RAL. MOM qualified

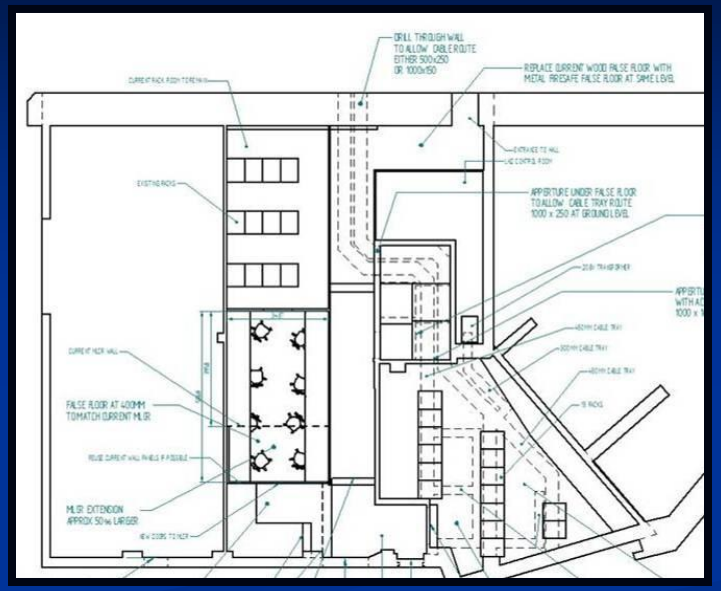
Operations Documentation

- Good news
  - Doing much better writing and maintaining operations docs – located on micemine and MICO page
  - Computing documentation much improved – also on micemine

- But.... we need (at least) the following:
  - Target manual update (controls & BPS) – Ed O.
  - Updated Online Reco shifter manual (improved plots) – Durga, Linda
  - HV Control Manual – Pierrick
  - Run Control shifter guide – Pierrick
  - SS Testing C&M instructions – Pierrick, Linda, Maria
  - C&M Troubleshooting – Pierrick, MOM
  - Detailed DAQ test plan – Yordan, Linda, MOM
  - Computer Monitoring manual – Pierrick, Matt R.

Near-Future Ops

- Changes to MLCR
  - Expansion of control room and new rack room
  - Much-needed extra space
- Complete list of safety-related maintenance for Hall
  - Started…stalled – needs to be on the calendar



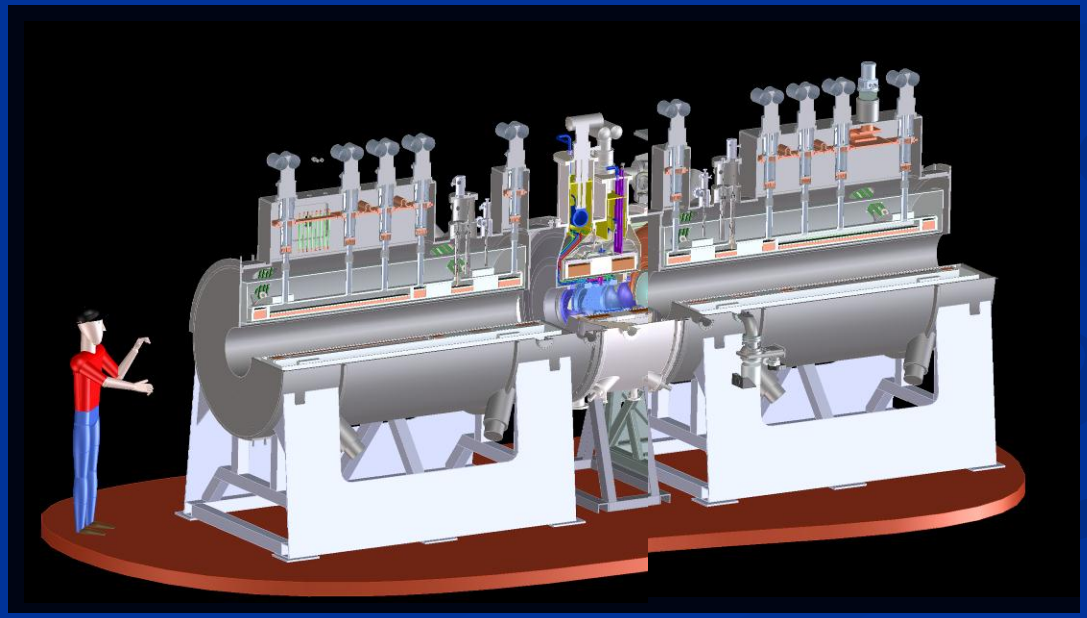
- PPS
  - Recent upgrades to improve the security of external Hall door during running
  - Fully incorporate superconducting magnet use
    - hardware in place – need understand how applies to commissioning
  - Use RF permits for TIARA test in Summer 2013
- Electrical jobs – fallen off list – need better link with Hall meeting and electrical priorities

Fall 2013 Ops

- Spectrometer Solenoids arrive at RAL
- Cooldown/retraining
  - Much more hands-on/interactive than the decay solenoid
  - Huge – seeing is believing – space will get very tight
  - Training requires daily (or 2x daily) dewar change
  - Warming up of components on top of the magnet after quench – ladders, heat gun, cryogenics
- Hoping to iron out kinks in system here (CA).
- How will we do this in the Hall?
  - He line from outside? Heaters on leads? Modifications to system?
  - Have much better idea what is involved now..need to think on how applies to Hall.

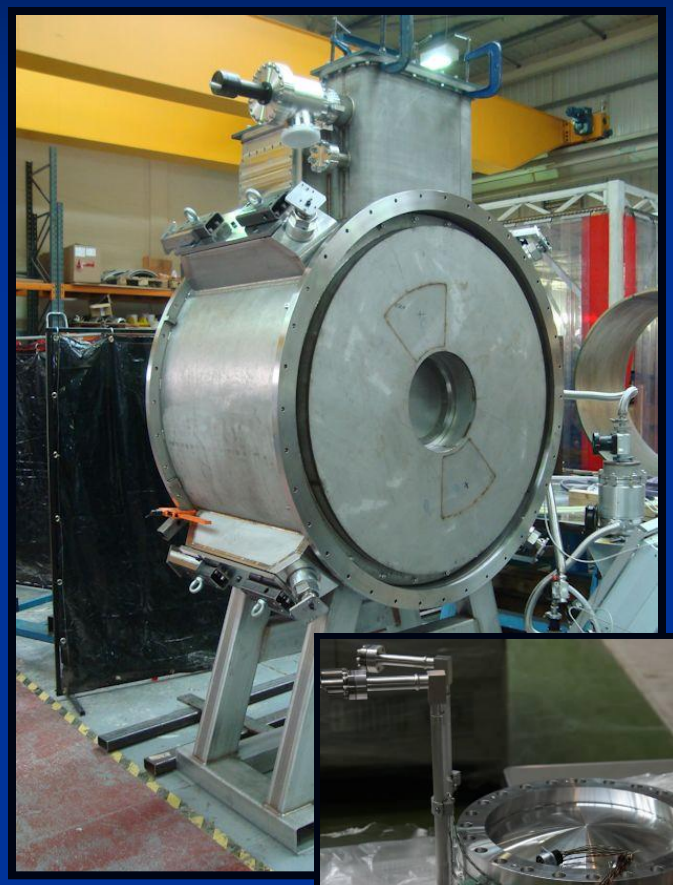
MICE Step IV

- Change operational mode
- Define for rest of experiment (Step IV, Step VI)
- Equipment:
  - Both Spectrometer Solenoids
  - Two trackers installed in the SS magnets
  - One AFC (Focus Coil magnet & LH2 system)



Step IV

- We will have much more in the Hall!



Step IV Operations

- At least 1 year running → ~5 ISIS cycles/year
- Draft plan (as of March 2012 – Victoria's MPB talk)
  - Assume 100k μ/2 hrs
  - 140 hours for 100k μ and changes to settings = 2 weeks – every day, 12 hrs/day
  - 12 hours/day running → 3 MICE shifters
- ISIS cycle 1 – 1 July to 14 Aug 2014 – 6 weeks
  - detector calibration, magnet performance and alignment, coil force evaluation, beamline matching, empty channel all settings (ε, p)
- ISIS cycle 2 – 10 March to 16 April 2015 – 5 weeks
  - empty absorber/LH2 absorber
  - LH2 requires 24 hour support even when not running
- ISIS cycle 3 & 4 – LiH solid absorber, other solid absorbers, multiple scattering/energy loss
- ISIS cycle 5 – wedge absorber
- Still the plan? When LH2 integration happen – one month? When magnetic field measurements done? Perhaps decided at this meeting?

Step IV Operations

- Anticipated personnel needs (have seen this before, just a reminder):
  - (At least) 3 new system-specific experts:
    - LH2 expert
    - Cryogenic systems
    - Superconducting magnets
  - Integration physicist
  - Operations head (superMOM)
  - Monthly MOMs
    - continue as now – 24/7 on call for 1 month
  - MICE shifters – 12 hour shift → 3 shifters
  - On call – BLOC (beamline), SOC (software), TROC (tracker)

Step IV Operations

- Drafting operational support plan
- Need consult more with UK personnel
- Questions remaining to be sorted out:
  - How do we leave equipment when not taking data?
    - Ex. Spectrometer solenoid cooled (+) powered?
    - Three hours ramp up/down
    - If cannot leave powered, 12 hr/day running g 6 hr/day beam data – doubles time for Step IV
    - If ramp down to ~200A = ~1 hr
  - LH2 requires 24/7 support per agreement with RAL
  - Determine on-call definition
  - Do new experts replace MICE collaborator shifter?
  - Housing for shifters?

Conclusions

- Steady progress in Online systems
  - Exciting work and much effort applied to spectrometer solenoid systems
  - Influx of new people to expand expertise
  - Yordan is our new VME expert – making progress on EMR readout
  - New MAUS tool ensures data quality
- Operations getting smoother
  - Communication/documentation/MOM handover improved
  - Shifter training going well – be prepared to be recruited!
  - Refining plans for commissioning & support
- Big changes soon to come – Much to do for Step IV!