Test Communication and Data Sharing

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5th HiLumi LHC Annual Meeting

October 30, 2015

Outline

Goals:

- Review experience from past LARP magnets
- Formulate and discuss *preliminary* proposals for MQXF

Topics:

- Test planning
- Test operations
- Modifications to the test plan
- Progress updates during the test
- Data distribution for later analysis

- *Thanks to Hugo Bajas, Guram Chlachidze, Joe DiMarco, Maxim Marchevsky, Heng Pan, Xiaorong Wang for providing initial information and suggestions*

- *Soliciting input and feedback across the collaboration*

Test Planning

Collect input:

- Main goals/priorities from a project standpoint
- Constraints on schedule, infrastructure
- Specific magnet or facility limitations
- Requests for specific tests to be performed

Optimize plan:

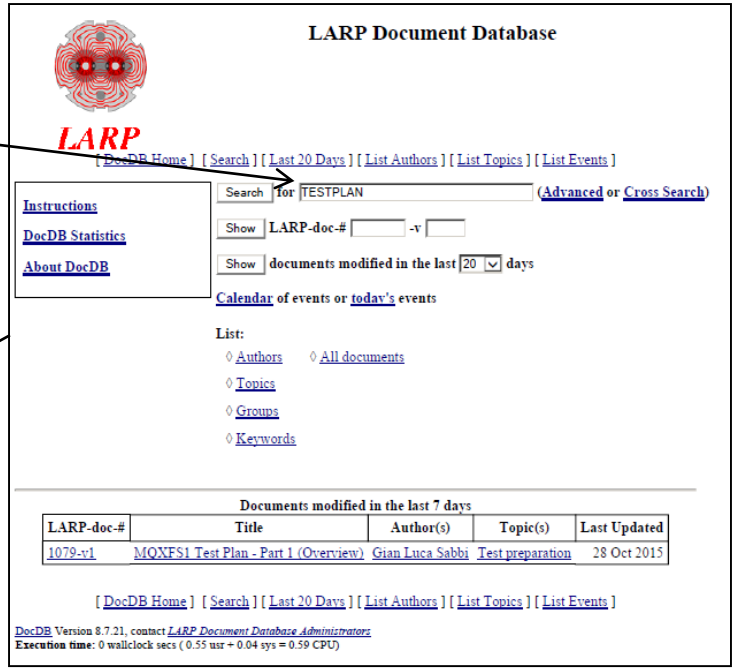
- Anticipate possible scenarios and courses of action
- Define the best sequence of experiments
- Provide details on the selection of specific parameters

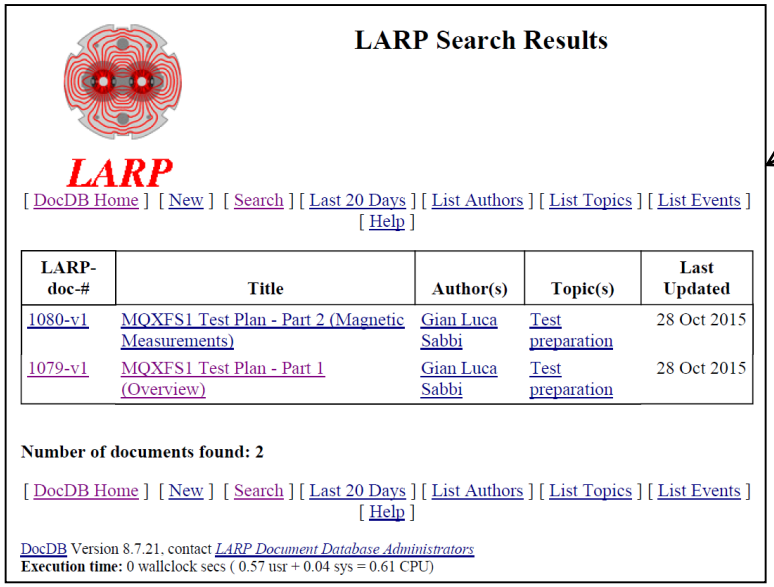
➢ We have seen increases emphasis on test planning over the years

➢ Many improvements made, good basis for MQXF

Access to Test Plan in DocDB

1. Go to: http://larpdocs.fnal.gov/LARP-public/DocDB/DocumentDatabase
   (no password required for viewing)
2. Type TESTPLAN in search field
3. Search result display:





4. In the future, as number of tests increases: add more keywords to refine search (e.g. MQXFS1)

Test Plan Implementation

Primary responsibility to implement the plan is with the facility where the test is performed

- In particular, the decision to proceed with each step depending on availability of resources/infrastructure, and safety considerations
- For each test/facility we identify a test coordinator who will be the main reference for communication and decision making

However, primary responsibility for changes in the plan are with the project

- Proposals should be made to project leaders, who may approve or call for further discussion
- Major transitions among test phases (e.g. stop training) are identified in the plan and should also be approved by project leaders

Progress Updates

Daily email updates by the test coordinator have been used in the past:

- Brief account of what was achieved, next steps, issues with the availability of systems/resources
- Call meetings when there are questions on how to proceed

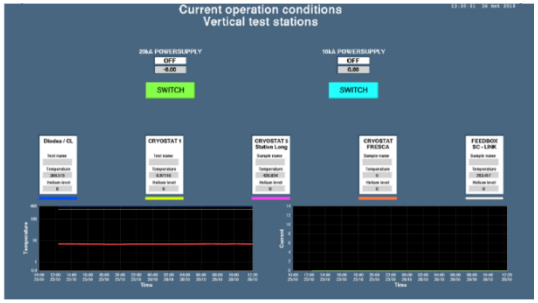
- Some questions on the level of detail to be provided – *see next slides*
- Some questions on distribution, different approaches have been used
  - Ad-hoc list of recipients, selected with ad-hoc process
  - List server (with closed or open/self-managed subscription)
    - *Sending (and "reply all") to the list is generally restricted*
- Another option, in addition or possibly in alternative to the update email, is to post the information on a "status page" on the web – *see next slides*

Test Status Pages

CERN (e.g. HQ02b)

http://lhcdashboard.web.cern.ch/lhcdashboard/SM18/Vertical1024.html

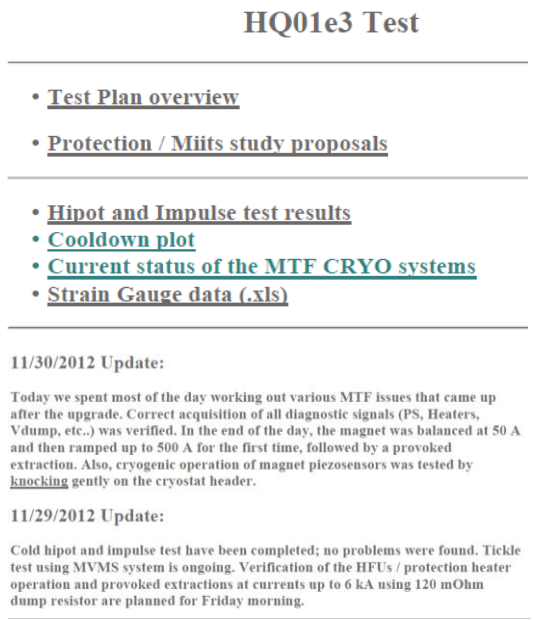
- Timing of next quench
- Current ramp for last several quenches



LBNL (e.g. HQ01e)

http://supercon.lbl.gov/mmartchevskii/hq01e3/index.html

- Useful links
  - Reference: Test plan, QA data
  - SG data for download
- Status updates (from emails)



HQ01e3 Test

- Test Plan overview
- Protection / Miits study proposals

- Hipot and Impulse test results
- Cooldown plot
- Current status of the MTF CRYO systems
- Strain Gauge data (.xls)

11/30/2012 Update:

Today we spent most of the day working out various MTF issues that came up after the upgrade. Correct acquisition of all diagnostic signals (PS, Heaters, Vdump, etc..) was verified. In the end of the day, the magnet was balanced at 50 A and then ramped up to 500 A for the first time, followed by a provoked extraction. Also, cryogenic operation of magnet piezosensors was tested by knocking gently on the cryostat header.

11/29/2012 Update:

Cold hipot and impulse test have been completed; no problems were found. Tickle test using MVMS system is ongoing. Verification of the HFUs / protection heater operation and provoked extractions at currents up to 6 kA using 120 mOhm dump resistor are planned for Friday morning.

May expand to individual systems using available tools (e.g. TeamViewer)

Level of detail of progress updates

Strong interest in making critical information available as it's generated

- Quench conditions, currents, origins *(generally provided in daily updates)*
- Plots of quench history, training, ramp rate and temp. dependence, field quality *(approach has not been consistent across tests/magnets/projects)*

Proposal: distribute (post) a basic table with quench conditions (e.g. time, temperature, ramp rate) results (e.g. currents, MIITs), special notes. Example:

Date	Q#	Train. Q#	Current	Iss %	Grad	Bpeak	Location	Ramp-rate profile	MIITS	Remarks
			kA		T/m	T				
4/12/2011	18	16	14.82	86	169	11.7	8A78,8A76(-4.1), 8A53(-4.0)	50/7; 20/Q	10.4	

Questions:

- Include quench origins in table? (coil/segment are usually analyzed right after the quench, and reliable)
- Which (implicitly official) plots to generate, and how to vet/distribute
  - A template may be generated for both table and plots

Summary of test results

Test results meeting:

- Shortly (1-2 weeks) after the end of the test
- All aspects of the test are covered
- Evaluation/discussion of results

Test report:

- Technical report, comprehensive but simple, without detailed analysis
- Approach has not been consistent across test/magnet/project

Proposal:

Attach to the report tables (e.g. excel file) of data used to generate the plots

Video Meeting on HQ03a Test Results

February, 19, 2015 @ 8am/10am/11am/5pm (LBNL/FNAL/BNL/CERN)

Agenda:

- Test overview, quench performance and studies – Guram
- Mechanical performance – Helene
- Quench antenna results – Maxim
- Magnetic measurements – Joe
- Ramp rate effects and magnetic shim correction – Xiaorong
- Next steps – GianLuca

1/05/10
TD-10-001

LARP LQS01 Magnet Test Summary

G. Chlachidze, G. Ambrosio, N. Andreev, E. Barzi, R. Carcagno, S. Caspi, D. Dietderich, H. Felice, P. Ferracin, A. Ghosh, V.V. Kashikhin, M.J. Kim, M.J. Lamm, F. Lewis, F. Nobrega, I. Novitski, D. Orris, G.L. Sabbi, J. Schmalzle, C. Sylvester, M. Tartaglia, J.C. Tompkins, G. Velev, P. Wanderer, A.V. Zlobin

Test Data Distribution

Traditional approach:

- The system owner carries out data acquisition, validation, analysis
- Original data is not made broadly available, but is provided on a case by case basis to carry out special analysis, or cross-correlate between system or tests performed in different magnets/facilities

Motivations:

- Very different, custom made DAQ systems, no common standards
- Large amount of data; post-processing and/or validation often required
- Access may require special rights and/or direct (local) connection

New elements:

- Expanding collaboration and project requirements: increased need to integrate information from different tests/facilities
- Modern DAQ systems provide built-in sharing/integration capabilities

Moving Forward

General guidelines:

- Proceed in stages taking into account project priorities and technical challenges
- Develop solutions for each individual system considering its specific characteristics

Next steps:

- For each system we define a set of data that would be made available, in a format independent of the implementation (e.g. facility)
- For each system implementation we identify an owner in charge of validating raw data and making reduced data available
- For the near term: use DocDB when practical, in other cases contact the owner
- Proposals welcome for storage/distribution in the longer term
- Opportunities for Toohig fellows to play a role

Comments on Individual Systems

Strain gauges

- LARP: established process, data files (~1 Mb/quench) can be posted on docDB and read in excel
- CERN: dedicated DAQ with potentially remote viewing. Generate and post files similar to LARP?

Magnetic measurements:

- Include data taken during assembly (warm) and test (warm/cold)
- Require data reduction and validation - raw data not a priority
- For z-scans:
  - Tables of harmonics as function of current and location
  - Limited size (~10's of kb/scan) does not require efficient storage
  - Uploaded in docdb as csv (see next slide)
- Current loops:
  - Large number of data points, need to discuss

Magnetic Measurements in DocDB

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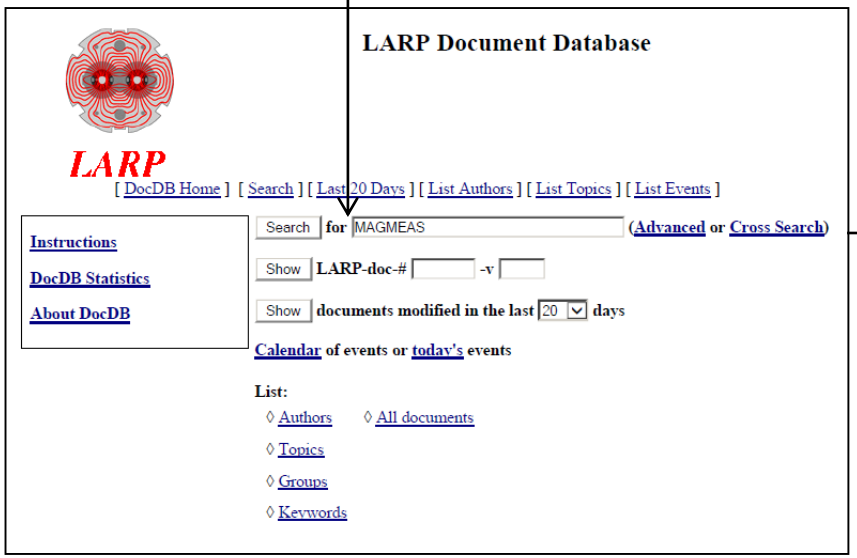
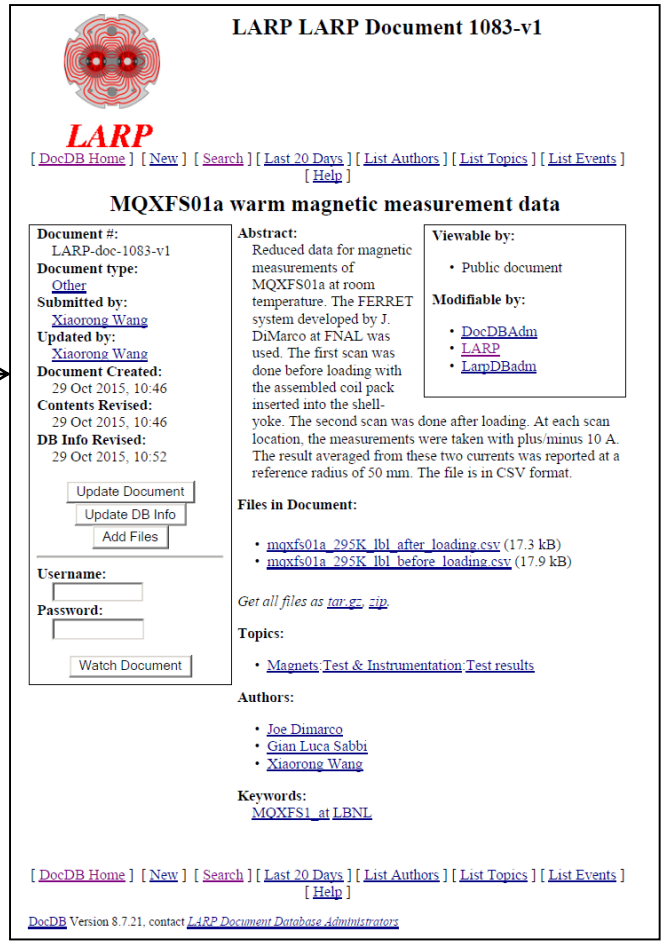
2. Type MAGMEAS in search field:





3. In the future, as number of tests increases: add more keywords to refine search (e.g. MQXFS1)

Comments on Individual Systems /2

Quench data:

V-taps, CERN:

- Working on a plan to make all data available for distribution
- Proposing NI-TDMS file format

V-taps, FNAL:

- Custom software built on SunOS operating system, requires direct (local) connection, binary format cannot be directly transferred to other systems
- For the near term, selected data will be made available based on specific requests
- Longer term options: translate binary files, upgrade system

Quench antenna:

- Possibility to connect to dedicated DAQ for added flexibility