BLM Status and Experience from 2008

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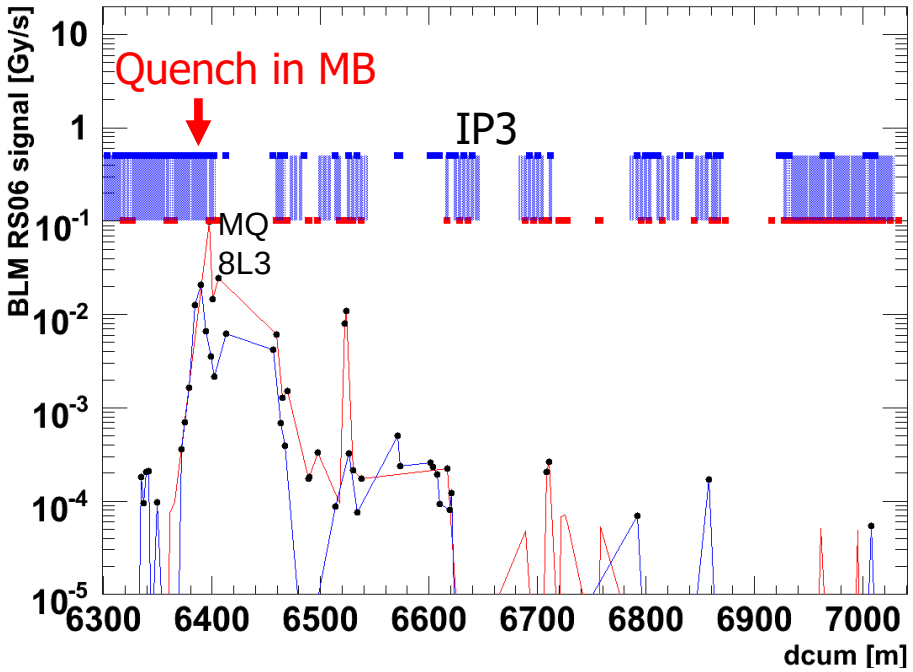
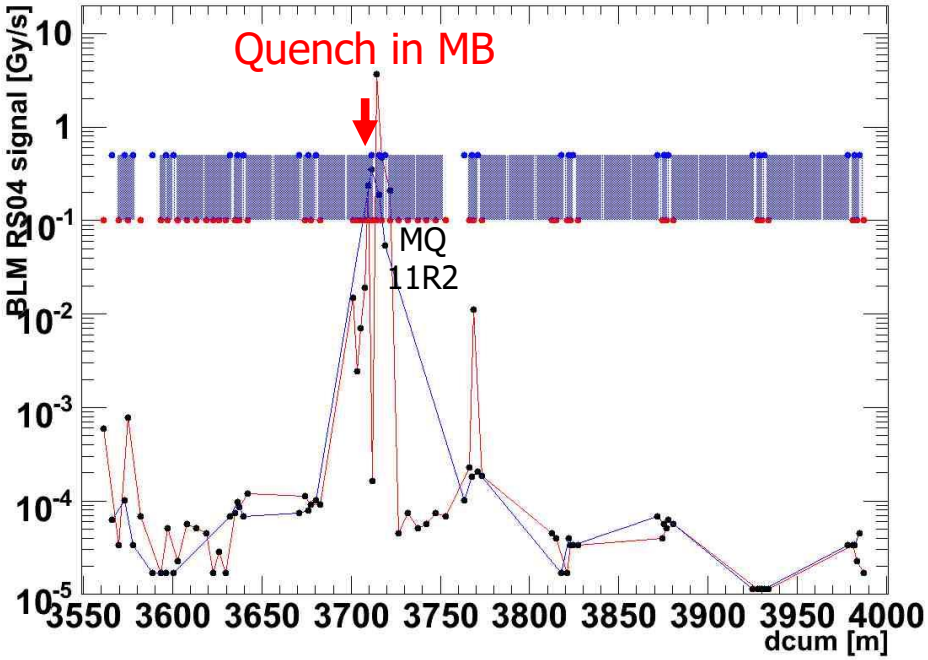
Losses: First and Second Quench

- Very different in loss distribution
- Analysis ongoing, first estimate: simulated energy deposition 15 mJ/cm^3 (to be compared with 31 mJ/cm^3, quench level)



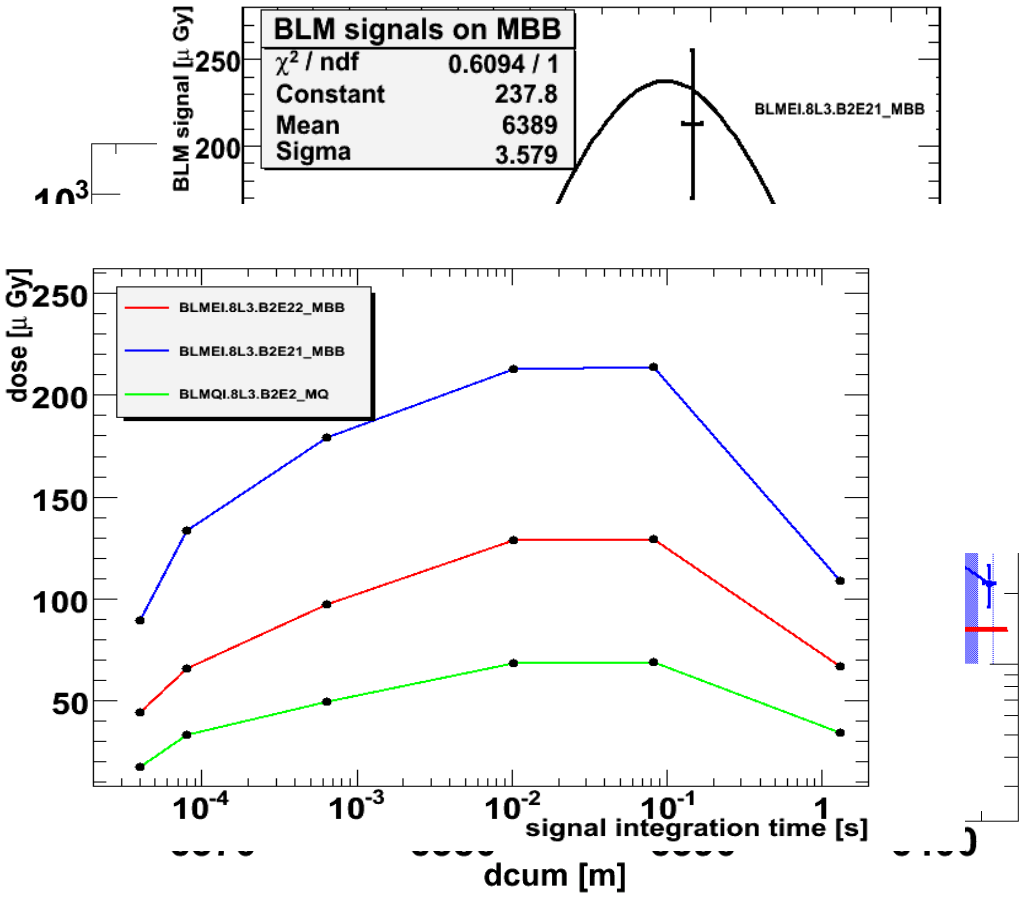
700m



450m

Beam Induced Bending Magnet Quench

- Two beam induced trigger by the quench protection system during injection tests of 2 and 4 10^9 protons
- The one quench occurred at the end of a MB magnet => more difficult to use for analysis
- Beam current, impact location and loss distribution width are used to constrain the simulations => max energy density in coil
- Comparisons with enthalpy of coil (31 mJ/cm^3) results in error of 50 % (rel. difference)
- To be done for nest quench tests
  - Measurement of beam emittance
  - More accurate definition of beam position



BLM System Changes/Upgrades

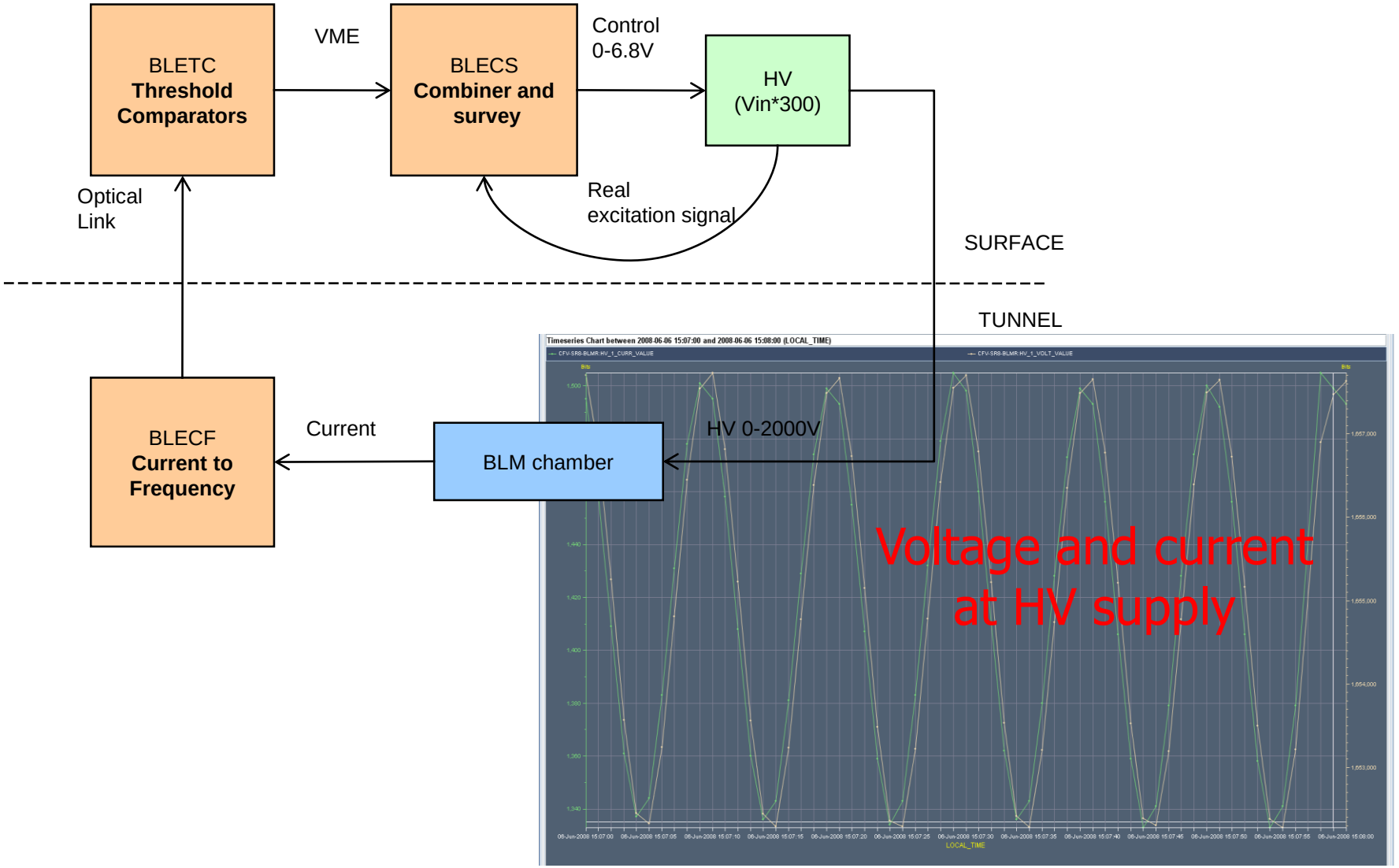
- Cross talk between ionisation chambers and secondary emission detectors => separation of high voltage supply cables
- Full reset of front end electronics => adding mezzanine card to electronics
- Noise check of signal cable network => repair and replacing connectors and cables
  - Determination of probability for false alarms, do be done
  - Not finished yet
  - New fellow position open (candidate not selected yet)
  - New technical student, will start in February
- Increase of spare parts => production of electronics boards
- Installation of a full test system in LHC, IP2
  - Two crates each with some monitors, timing and data combiner cards
- Dismounting of about 200 chambers, testing needed
- Radioactive source testing after the installation of the QPS system of all chambers
- Rad hard cables will be prepared for dump monitors
- Study of saturation effect, establishing overlap region
- FPGA code
  - Construction of PASS/FAIL regression test bench (to avoid unintended consequences of software changes)

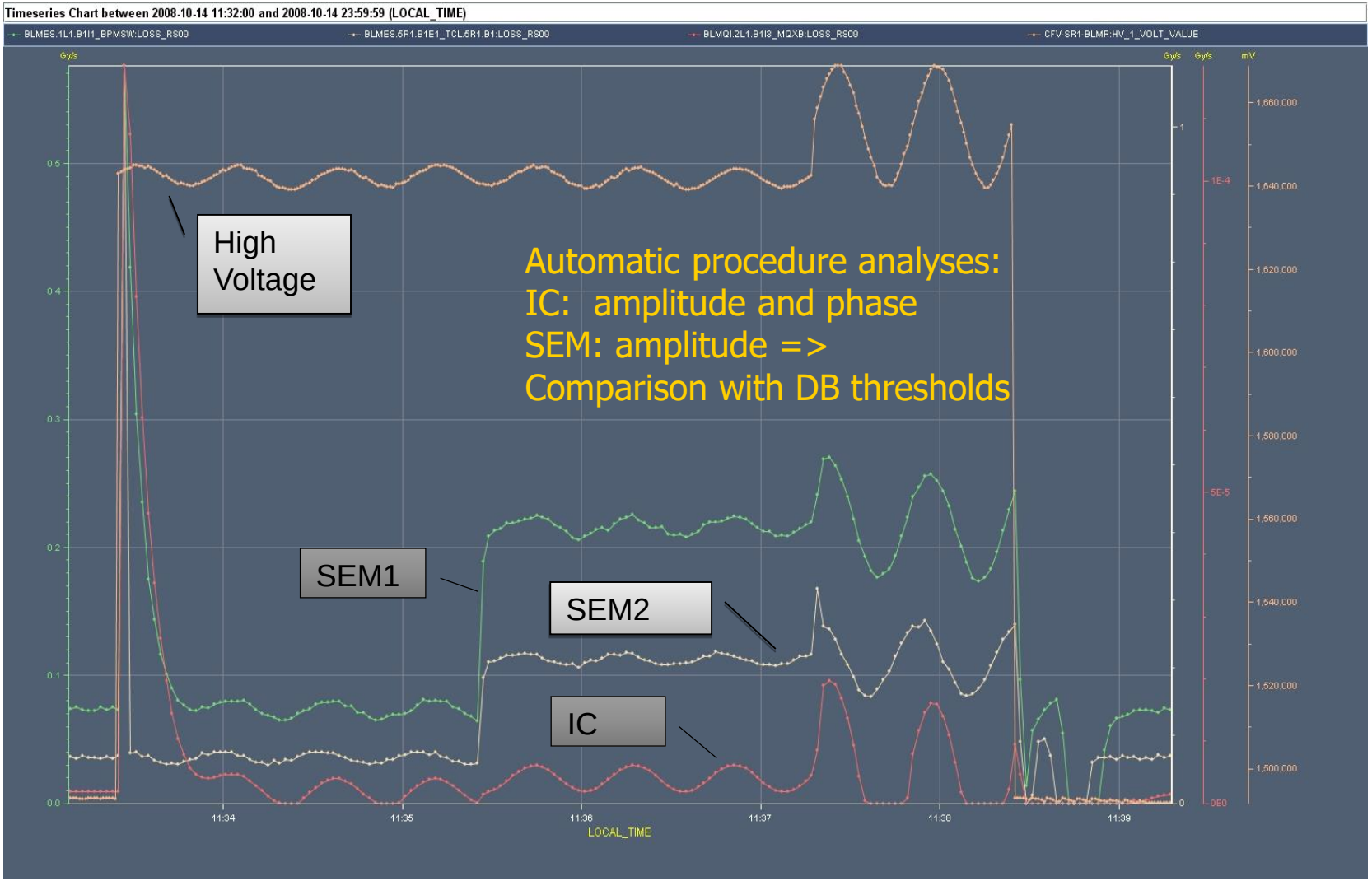
LSA + Monitor Coefficients GUI

- LSA
  - all fields/tables have been specified and are available
  - settings are imported from MTF->LAYOUT->LSA (see later slide)
  - no mechanism to import reliably threshold data but scripts for most imports exist already yet
    - Technical student started to write GUI for the manipulation of the settings by the experts
- Monitor Coefficients GUI
  - prototype ready
  - history of changes - roll back function needs more work
- Monitor GUI for concentrator
  - Status
  - Restarting/reloading of settings
  - Addition and removal of frontends
  - To be done

Management of Critical Settings and Others

- Proof-of-concept implementation of the "MCS Check" has been done. .
  - Prototype ready for loading of Thresholds and Settings in the TC
  - Not done for CS (extension of TC implementation)
  - Planning First complete prototype before end of the 2008 - testing first weeks of 2009
- Timing:
  - needs investigation on possibilities to improve the trigger received with better accuracy w.r.t. the original event, to be done
- Status Display:
  - first specs are written, needs to be done


BLETC
Threshold
Comparators
VME
BLECS
Combiner and
survey
Control
0-6.8V
HV
(Vin*300)
Optical
Link
Real
excitation signal
SURFACE
TUNNEL
BLECF
Current to
Frequency
Current
BLM chamber
HV 0-2000V
Timeseries Chart between 2008.06.06 15:07:00 and 2008.06.06 15:08:00 (LOCAL_TIME)
Voltage and current
at HV supply


Timeseries Chart between 2008-10-14 11:32:00 and 2008-10-14 23:59:59 (LOCAL_TIME)
BLMES.1L1.B1I1_BPMSW:LOSS_RS09
BLMES.5R1.B1E1_TCL.5R1.B1:LOSS_RS09
BLMQI.2L1.B1I3_MQXB:LOSS_RS09
CFV-SR1-BLMR:HV_1_VOLT_VALUE
Gy/s
mV
High Voltage
Automatic procedure analyses:
IC: amplitude and phase
SEM: amplitude =>
Comparison with DB thresholds
SEM1
SEM2
IC
11:34
11:35
11:36
11:37
11:38
11:39
LOCAL_TIME

Testing

- Auto checks and tunnel tests triggering:
  - Beam permit lines check, TC->CS implemented, CS->CIBUS(interlock) the lines are ready to be controlled by external systems.
  - Modulation
    - Signal & HV cables continuity check (Modulation), prototype exist, more analysis are needed to select the best processing technique and to calculate the thresholds.
    - Need to commission all the auto checks and tests including the triggering of the tunnel card tests (100pA, Dac reset, goh reset, FPGA reset?).
  - Sequencer
    - Procedure and tools definition and implementation for diagnostics when issues during operation. (Beam permit lines, modulation, reset dac & more tests, to start them and analyze the results).

Logging (measurement and logging DB)

BLM data sent to logging

Version: 10/10/2008
checked/modified by Ronny 10/10/2008

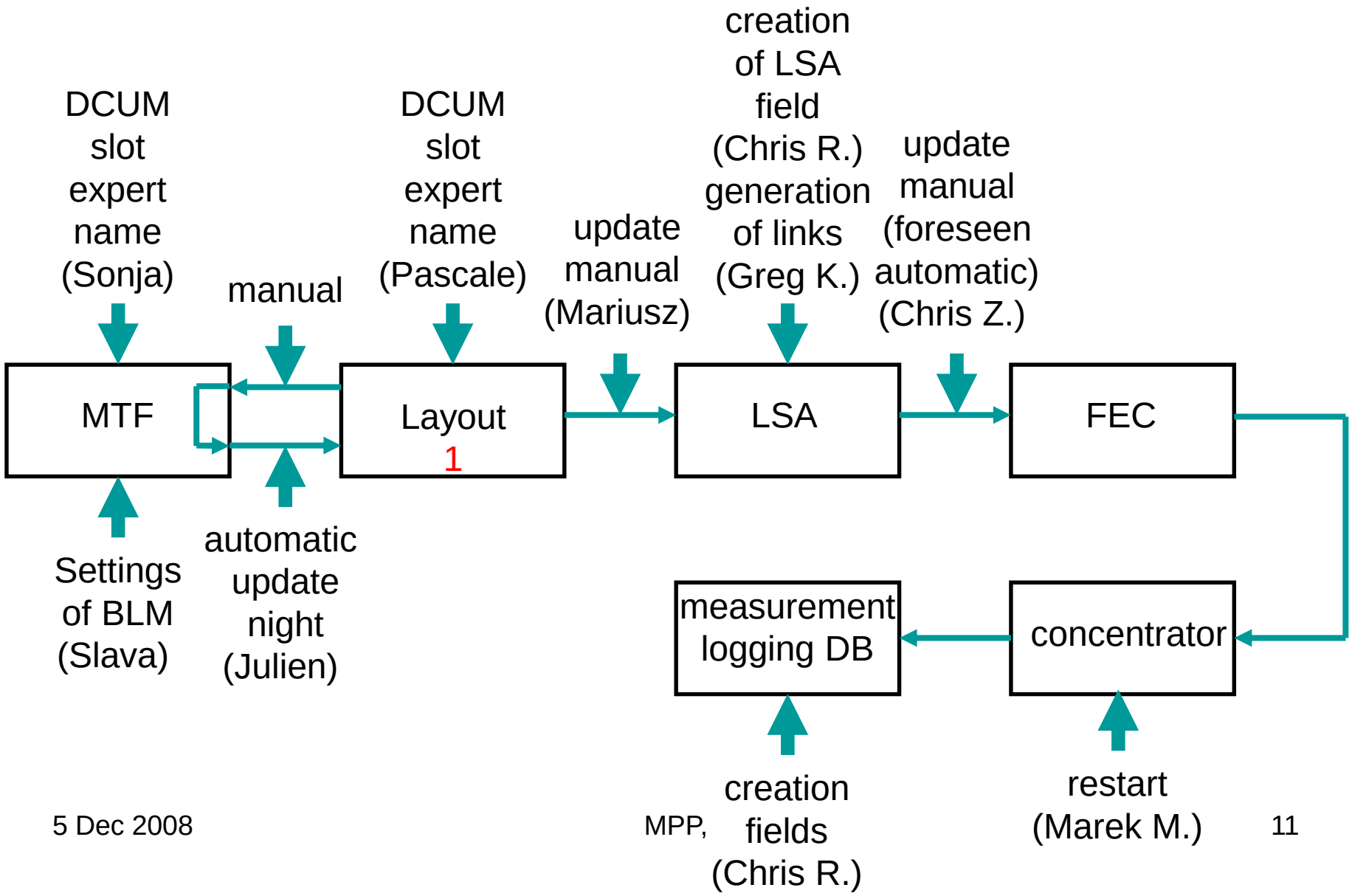
category	data type	devices	variables	values	reduction factor variables	byte / value	byte / timestamp	byte / id	byte / record	logging period s	byte / s	GB / day
losses	NUMERIC	3902	47304	1	0.5	4	7	4	15	2	177390	**14.3**
thresholds	NUMERIC	3902	47401	1	0.5	4	7	4	15	337.5	1053	**0.1**
status	VECTORNUMERIC	436	5904	16	1	4	7	4	75	2	221400	**17.8**
										GB/day total		***32.2***

reduction factor: logging of 6 running summs

- Data type NUMERIC: 4 byte per value => total 15 byte per value
- Data type VECTORNUMERIC: 4 byte per value => total 4.6 byte per value (for the BLM case)

- BLM data are transferred every **2** seconds to the DB, due to limitation in writing speed, temporarily agreed for 2008, to be changed in 2009
- Reduction of logging volume (only logging of 6 sums), temporarily agreed for 2008, to be changed in 2009
- Redefinition of threshold for the transfer of data sent from measurement to logging DB (reduction by a factor 40 measurement/logging)

Procedure to follow for introducing a new monitor in the BLM system



Database Setup and Operation

- The storage of BLM settings in three databases is:
  - Complex,
    - synchronisations need close follow up
    - High likelihood to introduce error
  - Changes are time consuming
  - Manpower requirement is high

Reduction to two will be requested

- Request from BLM Audit:
  - An SLA or MoU (service level agreement / memorandum of understanding) stating the responsibilities of IT department in case of database failure is recommended
  - A similar SLA/MoU should be set up with AB/CO/DM

Will be prepared, specialy important because of the complexity of the storage of settings

BLM Data

- Post mortem
  - Hardware part is complete and tested
  - 1,000 turns available through the PM system + 10 sec of averaged data
  - 20,000 turns available (on demand) directly from BLMS
  - advanced prototype of the PM GUI is operational
  - investigating the possibility to link PM with the fixed displays
  - verification needed for the CS time-stamping (CS doesn't have a circular buffer)
- XPOC
  - implementation is complete and tested
  - logging needs update of the variable - still based on old expert names
- Capture
  - implementation is complete and tested
  - concentrator is operational
  - work in progress to improve the speed of the display