Kickers and Dumps

LHC Performance Workshop Chamonix
Session 3 – Shutdown 2012 Part II

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Outline:
Dump systems
Injection kickers
Other works + ideas

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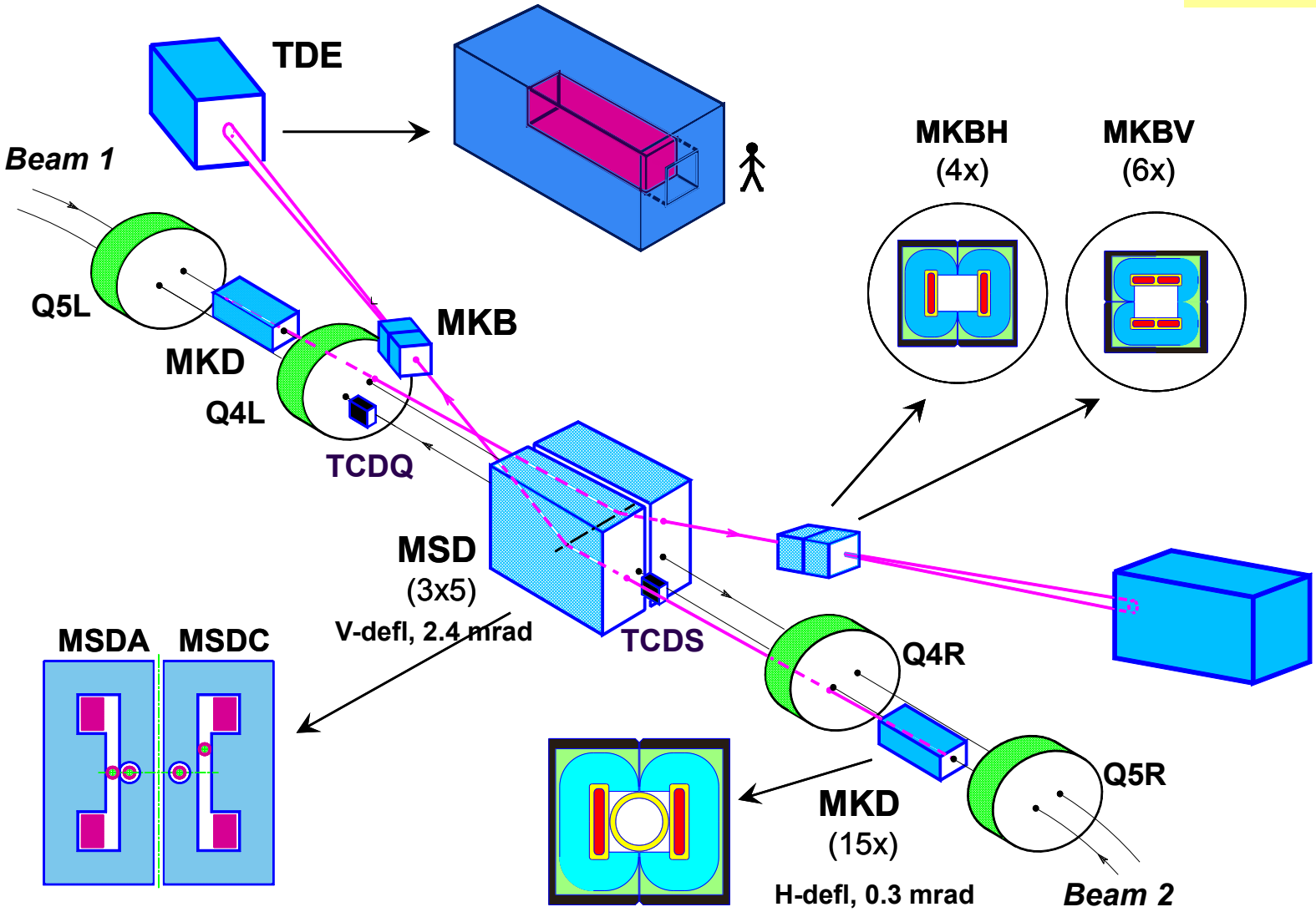
LHC Beam Dumping System (schematic)



MKD pulse generators

Overhaul programme already launched in 2010 - to be continued and finalised in stop

- Tightening contacts to avoid erosion, and adjusting mounting pressure of GTO stack
- Adding insulation pieces to avoid self-firing (which would result in asynchronous dump)
- Developing improved trigger transformer to inject more current into GTO gates

Presently investigating sensitivity of GTOs and power triggers to stray radiation in gallery

If an issue need to add GTOs to stacks – early indications looking fairly good

Dilution kickers (MKB)

Inside of pulse generator (power part)

HE VSC ABP

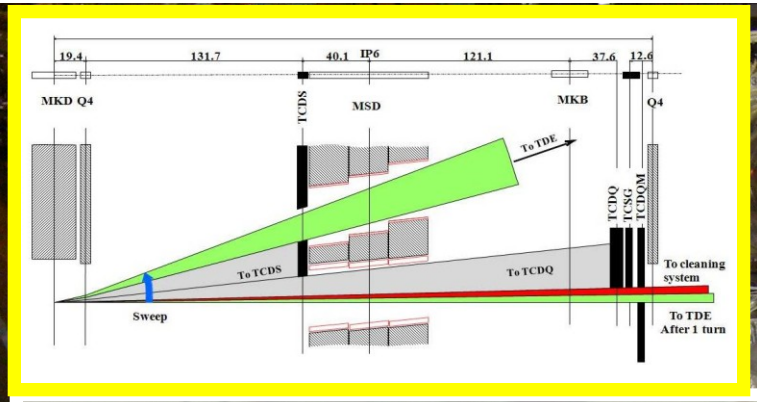
COUPURE D'URGENCE
DILUTION KICKER
MKB
EMERGENCY SWITCHING

Installation of last 2 tanks – 1 tank (= 2 magnets) per beam + associated generators
(decision in 2001 to stage the production, since not all MKB needed from the start)

Tanks (+ spares) ready since a while

W/o these last 2 tanks already ok for nominal intensity @ 7 TeV (complete for ultimate)

Protects downstream Q4 against bunches swept during asynchronous dump



Absorber length 2 x 3 m, all 1.77 g/cm^3 graphite

ABP

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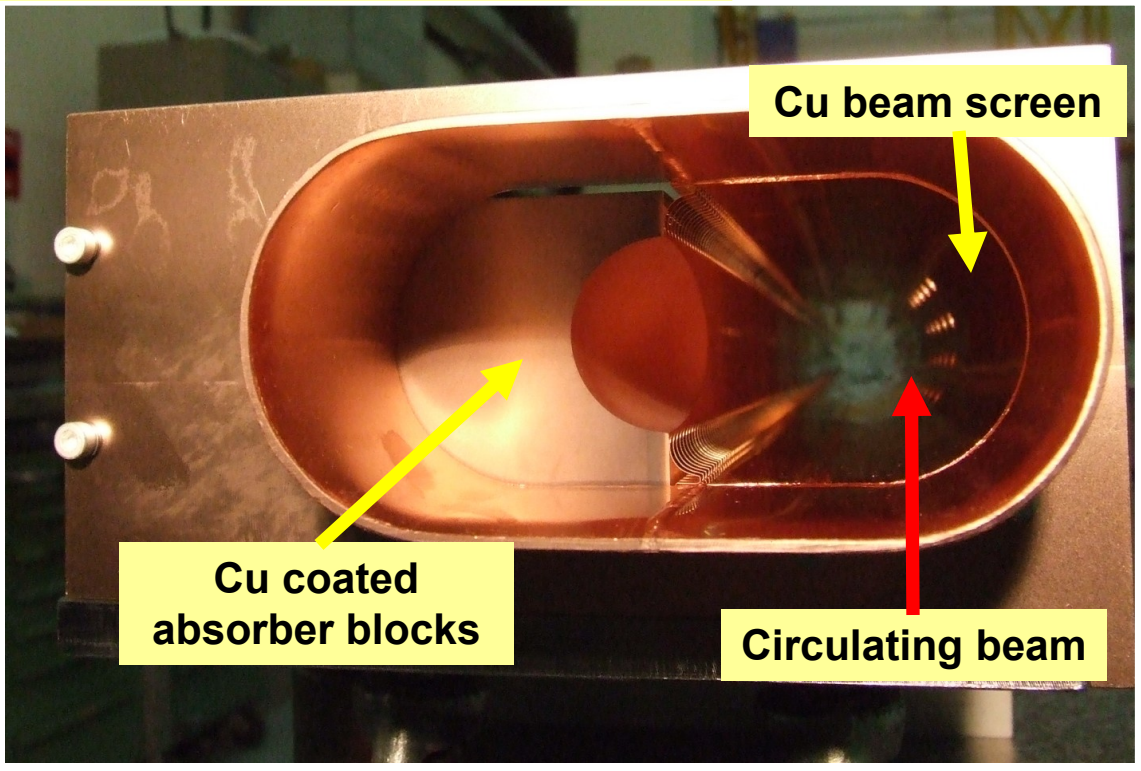
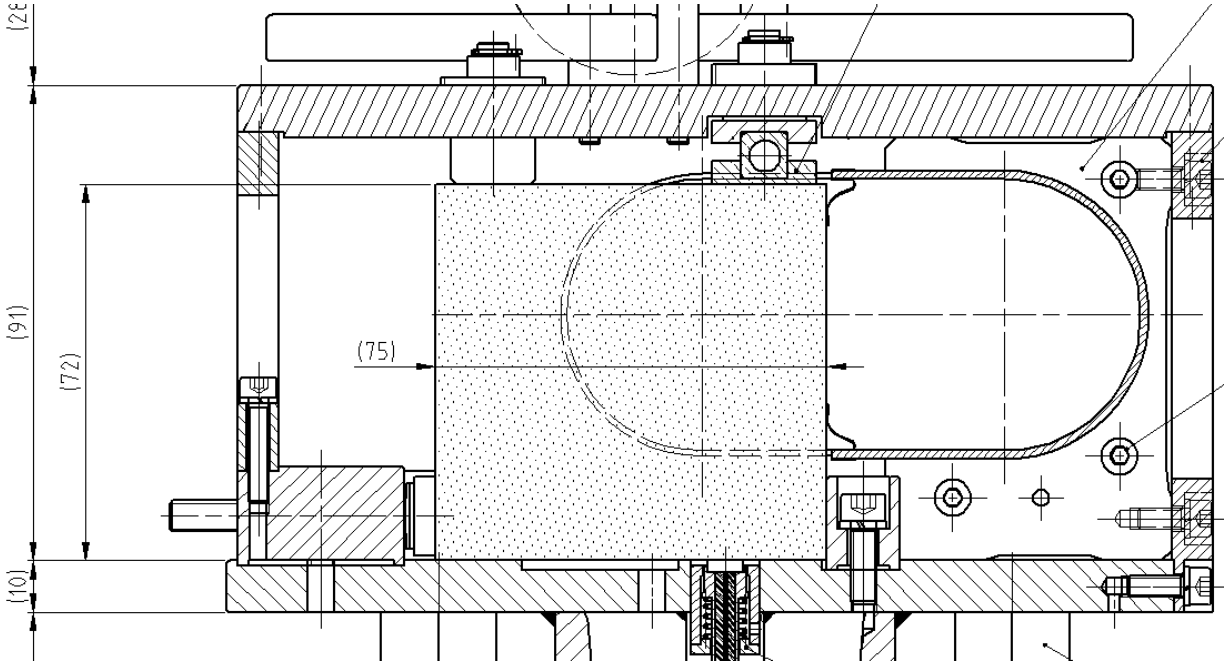


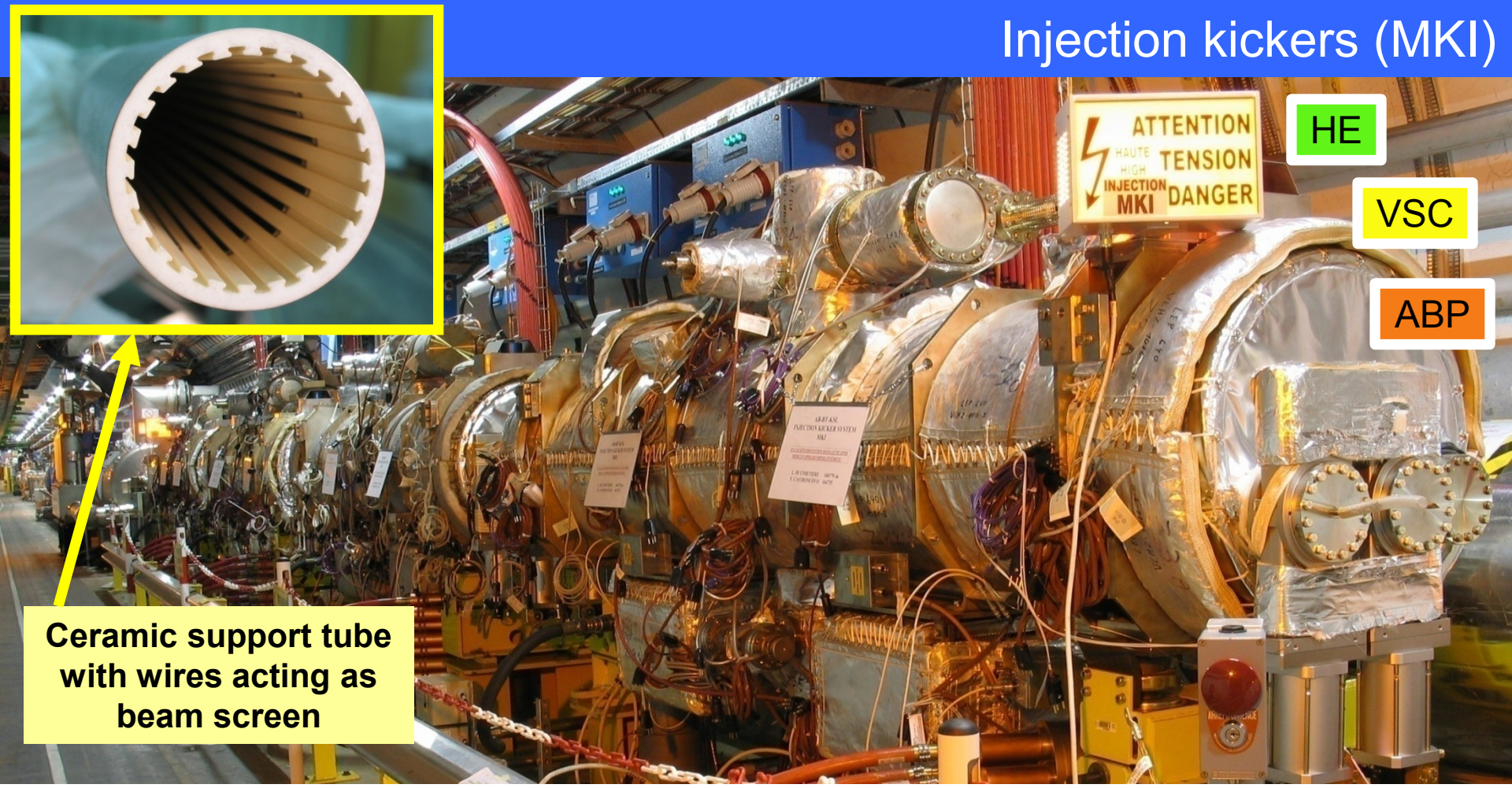
2 tanks on mobile girder

Present design based on initial TCDS calc. (TCDS upgraded for ultimate intensity)
Rough calculation: 28 bunches @ 25 ns @7 TeV: 7 10^9 p+/b < **SAFE LIMIT**< 7 10^{10} p+/b
→ upgrade needed (demand depending more on intensity than on energy ….)



Calculations ongoing for C-C instead of graphite (STI) - time consuming
→ difficult to consider all cases – presently focusing on LHC ultimate intensity
In parallel inquiries being made with potential supplier on feasibility
Desirable to upgrade ASAP to improve robustness
if diluter length unchanged, swap of blocks might fit into short stop (2011/2012 ?)
if length change needed should get ready for exchange during long stop (2013 w help …)

Injection kickers (MKI)



Presently working to have 4 spares ready sometime in 2012 (= 1 full injection)
Possibly exchange of MKI against models with modified ceramic tube (beam screen) to further improve the voltage holding and thus the margin against flashovers

Working on 2 approaches – lengthy manufacturing process

probably only 1 – 2 MKI possible if stop in 2012, potentially up to 4 if in 2013

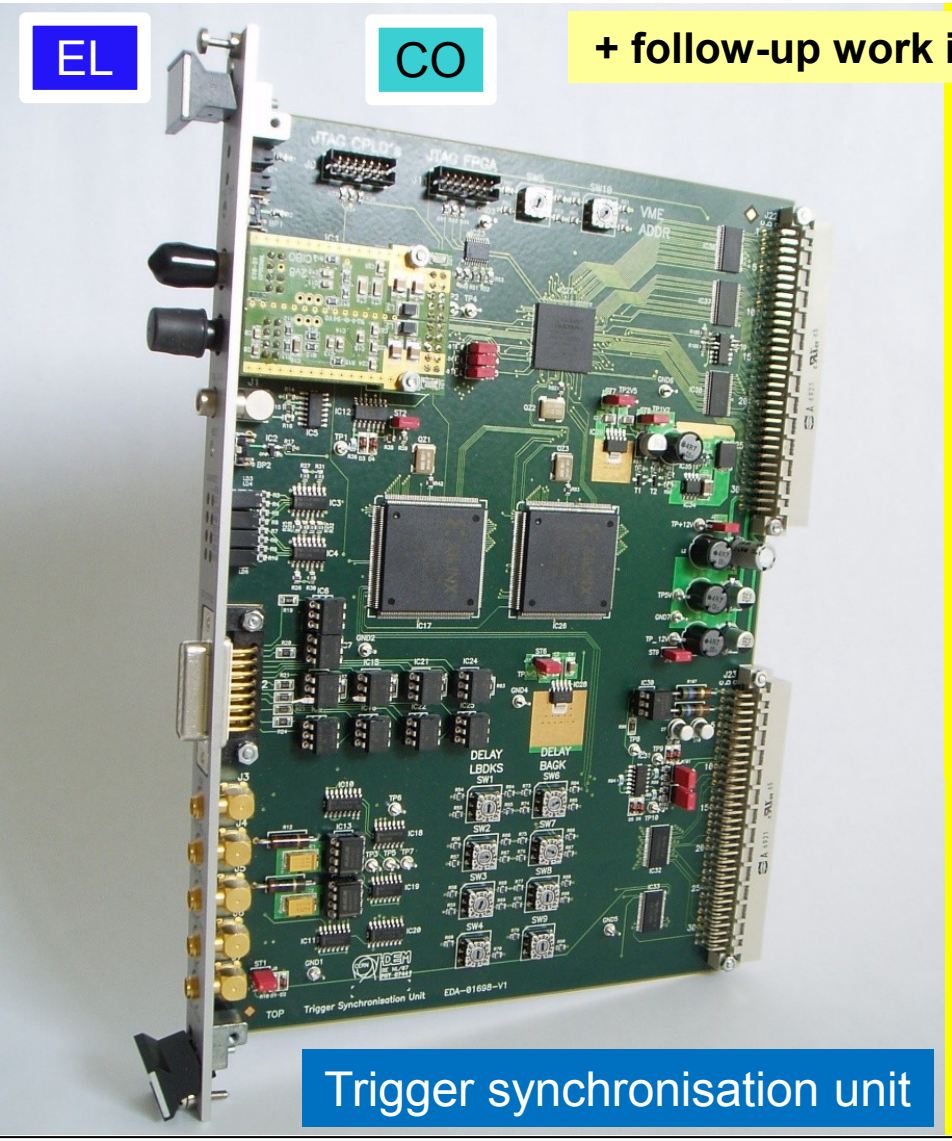
Modification of some hydraulic pipework which interferes with 6-vacuum-valve version

Loads of modifications and upgrades on most above mentioned systems
to further improve performance, reliability and diagnostics capabilities

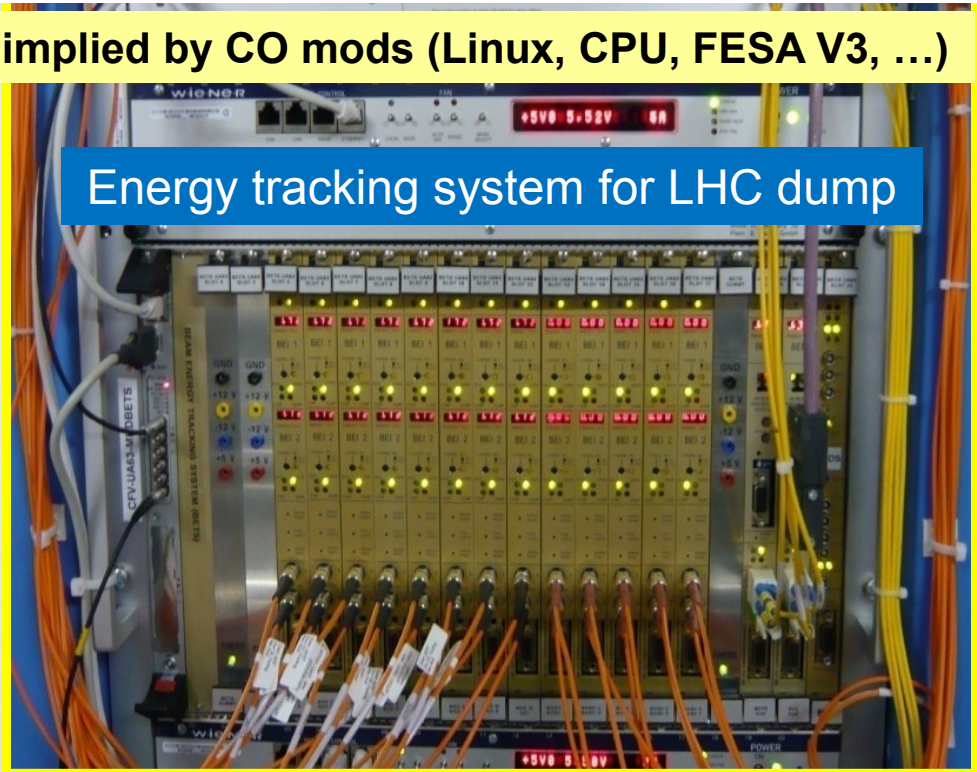
EL

CO

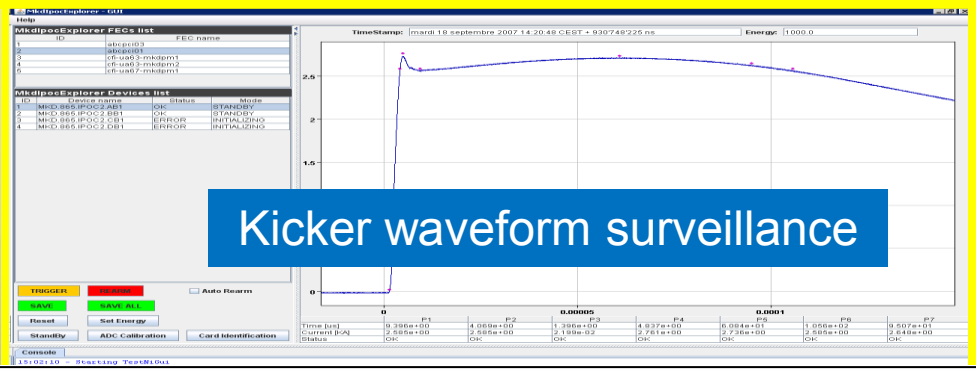
+ follow-up work implied by CO mods (Linux, CPU, FESA V3, …)



Trigger synchronisation unit

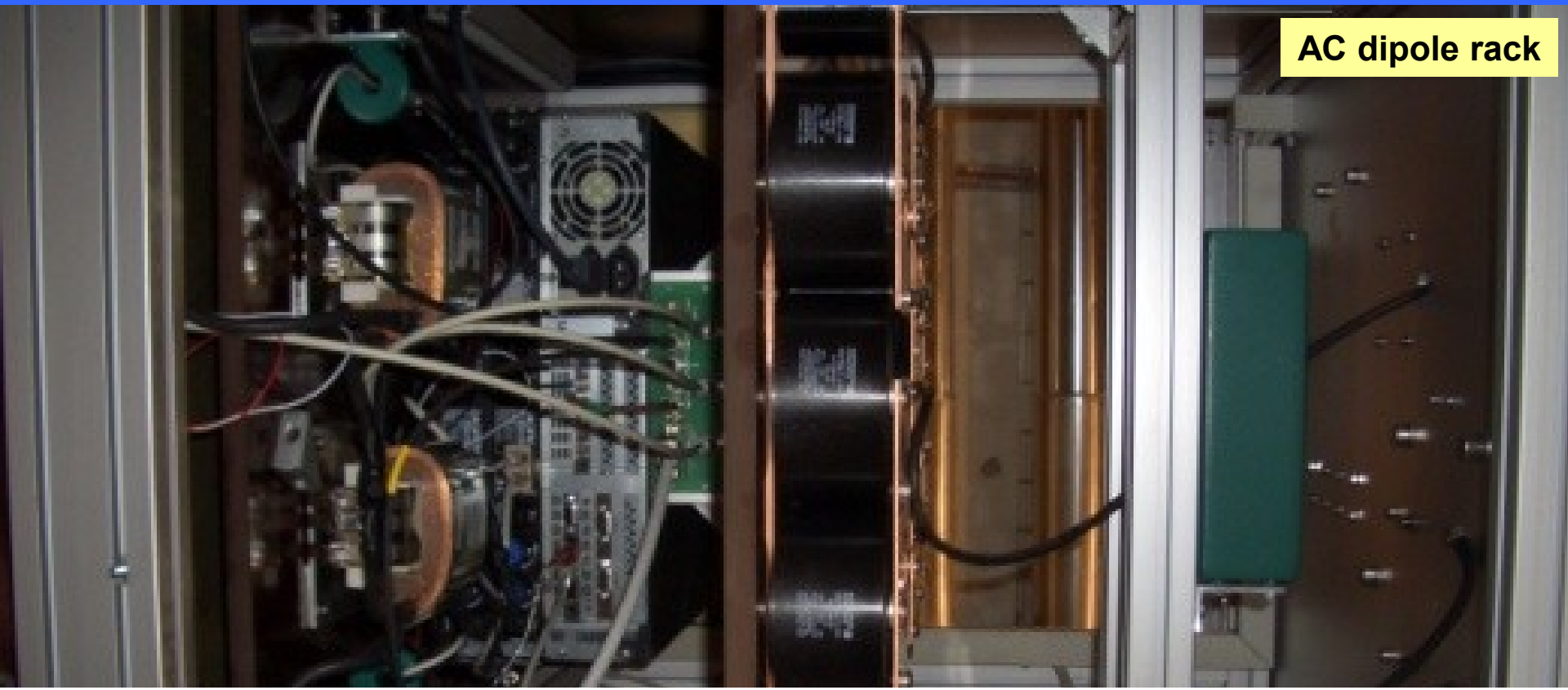


Energy tracking system for LHC dump



Kicker waveform surveillance

Other works (as far as known) and ideas



AC dipole (MKQA) – electrical distribution to be made more robust

Ideas for other “related” mods/upgrades:

- Some improvements on TDI (replace motor coupling – STI)
- Addition of TCLA, near TCDQM – to be confirmed
- 12 elements in LSS6 (BPMs, TCDS/Q, BTVSE, …) aligned in 2007 with inverted tilt – BPMs corrected for, aperture loss ~ “in noise” … - but should still be put straight one day, when opening anyway the vacuum

General comments (as conclusion)

Thorough check and requalification programme needed – to be planned in properly.
Not to forget: in parallel heavy programme from other machines and projects

CO

Established procedures and practical experience exist for all mentioned works –
should give no surprises for planning and execution
required services typically well defined (→ see support tags)

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Exact plan of interventions depends on progress until then (work partly already ongoing, development, new problems surfacing, workload from other activities, …)
Most interventions are quite “point-like” in time (can be planned in where it fits, or are anyway fairly – but of course not totally – decoupled from other work)
Some activities (e.g. overhaul of MKD generators) stretch over extended periods

Risks of work (besides unforeseeable mishaps):
mainly not finding back easily the required performance (HV, vacuum)
nearby works (!)
Risks of not doing the work:
persisting limitations and performance degradation
(as mentioned under respective items)
Consequences of postponing long stop to 2013 – rather beneficial for development work
MKD generators (if adding GTOs turns out to be necessary)
TCDQ (if layout change is required)
MKI (if new beam screens turn out to be better for HV performance)