LHC accelerator status

answers to questions

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How many transformers are in LHC / at CERN?
And at how many points of the LHC?

Time to recover from a quench in general?

Time to recover from a weak beam induced quench at injection, and to have beam again?

Original ultimate LHC luminosity

how many transformers are in LHC / at CERN? and at how many points of the LHC?

there are **several 100 transformers** (of different types, for the French and Swiss electricity networks)

at 5 LHC access points

details can be found in today's LHCPerC presentation by Gunnar Fernqvist

http://ab-div.web.cern.ch/ab-div/Meetings/lhcperc/Meetings/2008/lhcperc_05f.pdf

time to recover from a quench in general?

demonstrated recovery after resistive transition (quench) of single cell:

2-3 hours for I < 9 kA (= expected)

10-20 hours for I > 9 kA (while 4-5 h are expected)

[note 9 kA ~ 5.3 TeV beam energy]

full sector: 2 day recovery

fast discharge (no quench): 2 h recovery

time to recover from a weak beam induced quench at injection, and to have beam again?

On 7 September 2×10^9 protons quenched a s.c. dipole in Sector 23 during the synchronization test. Time interval after quench without beam was exactly **44 minutes**.

Dipole string was discharged automatically after quench and was ramped back to injection plateau during this time.

original ultimate LHC luminosity

$2.3\times10^{34}\ cm^{-2}s^{-1}$

E.g. J. Gareyte "Beam-Beam Design Criteria for LHC", LHC-99 workshop
Workshop on Beam-Beam Effects in Large Hadron Colliders - **LHCBB '99 LHC '99** 12 - 17 Apr 1999 - Geneva, Switzerland / Zimmermann, Frank (ed.); Poole, John (ed.)
Geneva : CERN, 1999 - 176 p. CERN-SL-99-039-AP

"The best compromise found empirically in the SPPS, the Tevatron and HERA is to operate with a tune difference of 0.005. In the LHC, we expect the coupling resonance to be more strongly excited than in the previous machines, owing to the larger size of the LHC and the magnet imperfections. We have therefore taken a larger safety margin, and plan to operate with a tune difference of 0.01. If this could be reduced to 0.005 after careful adjustments, ***the tolerable beam-beam tune shift could increase to Q = 0.015, leading to a luminosity of 2.3x10^34cm−2s−1. This is called the "ultimate luminosity" and all systems of the machine and the injectors have safety margins just sufficient to allow this luminosity to be reached."***

See also
LHC Luminosity and energy upgrade : A Feasibility Study, O, Bruning et al,
F. Ruggiero (ed), LHC-Project-Report-626, 2002