

Reference LHC Luminosity Upgrade: workpackages and tentative milestones

| accelerator | WorkPackage | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | after 2015 |
|------------------|--------------------------------|-------------------------------------|------------------------------------|--------------------------------------|-----------------------|-------------------------------------|------------------------------------|------|------|--|------------------------------|---|
| LHC Main Ring | Accelerator Physics | | | | | | | | | | | |
| | High Field Superconductors | | | | | | | | | | | |
| | High Field Magnets | | | | | | | | | | | |
| | Magnetic Measurements | | | | | | | | | | | |
| | Cryostats | | | | | | | | | | | |
| | Cryogenics: IR magnets & RF | | | | | | | | | | | |
| | RF and feedback | | | | | | | | | | | |
| | Collimation&Machine Protection | | | | | | | | | | | |
| | Beam Instrumentation | | | | | | | | | | | |
| Power converters | | | | | | | | | | | | |
| SPS | SPS kickers | | | | | | | | | | | |
| | Tentative Milestones | Beam-beam compensation test at RHIC | SPS crystal collimation test | LHC collimation tests | LHC collimation tests | Install phase 2 collimation | LHC tests: collimation & beam-beam | | | Install new SPS kickers | new IR magnets and RF system | |
| | Other Tentative Milestones | Crab cavity test at KEKB | Low-noise crab cavity test at RHIC | LHC Upgrade Conceptual Design Report | | LHC Upgrade Technical Design Report | Nominal LHC luminosity 10^{34} | | | Ultimate LHC luminosity 2.3×10^{34} | beam-beam compensation | Double ultimate LHC luminosity 4.6×10^{34} |

LHC Upgrade Reference Design Report

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| R&D - scenarios & models | |
| specifications & prototypes | |
| construction & testing | |
| installation & commissioning | |

Reference LHC Upgrade scenario: peak luminosity $4.6 \times 10^{34}/(\text{cm}^2 \text{ sec})$
Integrated luminosity 3 x nominal $\sim 200/(\text{fb} \cdot \text{year})$ assuming 10 h turnaround time
 new superconducting IR magnets for $\beta^* = 0.25 \text{ m}$
 phase 2 collimation and new SPS kickers needed to attain ultimate LHC beam intensity of 0.86 A
 beam-beam compensation may be necessary to attain or exceed ultimate performance
 new superconducting RF system: for bunch shortening or Crab cavities
 hardware for nominal LHC performance (cryogenics, dilution kickers, etc) not considered as LHC upgrade
 R&D for further luminosity upgrade (intensity beyond ultimate) is recommended: see Injectors Upgrade