

8 TeV / 30 fb⁻¹

LS1
2013 -
end 2014

LS1 projects: complete detector and consolidate operation for 10³⁴ Hz/cm², prepare Phase 1 upgrade

- Completes muon coverage (ME4), improve readout of CSC ME1/1 and DTs
- Replace HCF, HF and HO photo-detectors and HF backend electronics
- Install new beam pipe. Test slices of new systems.

LS2
mid 2018 -
end 2019

Phase 1 upgrades: use YETS to decouple from LS2, prepare for 1.6 10³⁴ Hz/cm² by LS2 and up to 2.4 10³⁴ Hz/cm² by LS3

- Commission L1-Trigger upgrade in parallel to operation in 2015
- Ready to install new pixel detector in extended YETS in 2016/2017
- Replace HF FE in YETS and HB/HE photo-detectors and FE in LS2

LS3
2023 -
mid 2023

Phase 2 upgrades: address detector aging, high occupancy and radiation hardness issues, mitigate PU for > 5 10³⁴ Hz/cm²

- Replace Tracker
- Replace endcap calorimeters
- Upgrade Trigger/DAQ: implement Track Trigger, L1/HLT rates increased
- Consider extended η range for tracker and muon system, precision timing also for calorimeters
- Replace obsolete electronics
- Modifications needed for new quadrupoles and shielding

HL-LHC
14 TeV
> 2500 fb⁻¹

Phase 1 13-14 TeV / 300 - 500 fb⁻¹