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## Determination of the strong coupling constant $\alpha_s(m_Z)$ from measurements of inclusive $W^\pm$ and Z boson production cross sections in proton-proton collisions at $\sqrt{s} = 7$ and 8 TeV (Article) [\(Open Access\)](#)

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### Abstract

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Twelve measurements of inclusive cross sections of  $W^\pm$  and Z boson production, performed in proton-proton collisions at centre-of-mass energies of 7 and 8 TeV, are compared with perturbative quantum chromodynamics calculations at next-to-next-to-leading order (NNLO) accuracy obtained with the CT14, HERAPDF2.0, MMHT14, and NNPDF3.0 parton distribution functions (PDFs). Data and theory agree well for all PDF sets, taking into account the experimental and theoretical uncertainties. A novel procedure is employed to extract the strong coupling constant at the Z pole mass from a detailed comparison of all the experimental fiducial cross sections to the corresponding NNLO theoretical predictions, yielding  $\alpha_s(m_Z)=0.1163-0.0031+0.0024$  (CT14),  $0.1072-0.0040+0.0043$  (HERAPDF2.0),  $0.1186 \pm 0.0025$  (MMHT14), and  $0.1147 \pm 0.0023$  (NNPDF3.0). Using the results obtained with the CT14 and MMHT14 PDFs, which yield the most robust and stable  $\alpha_s(m_Z)$  extractions, a value  $\alpha_s(m_Z)=0.1175-0.0028+0.0025$  is determined. [Figure not available: see fulltext.] © 2020, The Author(s).

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