

Observation of a Centrality-Dependent Dijet Asymmetry in Lead-Lead Collisions at $\sqrt{s_{NN}} = 2.76$ TeV with the ATLAS Detector at the LHC

G. Aad *et al.* (The ATLAS Collaboration)*

Using the ATLAS detector, observations have been made of a centrality-dependent dijet asymmetry in the collisions of lead ions at the Large Hadron Collider. In a sample of lead-lead events with a per-nucleon center of mass energy of 2.76 TeV, selected with a minimum bias trigger, jets are reconstructed in fine-grained, longitudinally-segmented electromagnetic and hadronic calorimeters. The underlying event is measured and subtracted event-by-event, giving estimates of jet transverse energy above the ambient background. The transverse energies of dijets in opposite hemispheres is observed to become systematically more unbalanced with increasing event centrality leading to a large number of events which contain highly asymmetric dijets. This is the first observation of an enhancement of events with such large dijet asymmetries, not observed in proton-proton collisions, which may point to an interpretation in terms of strong jet energy loss in a hot, dense medium.

PACS numbers: 25.75.-q

Collisions of heavy ions at ultra-relativistic energies are expected to produce an evanescent hot, dense state, with temperatures exceeding two trillion kelvins, in which the relevant degrees of freedom are not hadrons, but quarks and gluons. In this medium, high-energy quarks and gluons are expected to transfer energy to the medium by multiple interactions with the ambient plasma. There is a rich theoretical literature on in-medium QCD energy loss extending back to Bjorken, who proposed to look for “jet quenching” in proton-proton collisions [1]. This work also suggested the observation of highly unbalanced dijets when one jet is produced at the periphery of the collision. For comprehensive reviews of recent theoretical work in this area, see Refs. [2, 3].

Single particle measurements made by RHIC experiments established that high transverse momentum (p_T) hadrons are produced at rates a factor of five or more lower than expected by assuming QCD factorization holds in every binary collision of nucleons in the oncoming nuclei [4, 5]. This observation is characterized by measurements of R_{AA} , the ratio of yields in heavy ion collisions to proton-proton collisions, divided by the number of binary collisions. Di-hadron measurements also showed a clear absence of back-to-back hadron production in more central heavy ion collisions [5], strongly suggestive of jet suppression. The limited rapidity coverage of the experiment, and jet energies comparable to the underlying event energy, prevented a stronger conclusion being drawn from these data.

The LHC heavy ion program was foreseen to provide an opportunity to study jet quenching at much higher jet energies than achieved at RHIC. This letter provides the first measurements of jet production in lead-lead collisions at $\sqrt{s_{NN}} = 2.76$ TeV per nucleon-nucleon collision, the highest center of mass energy ever achieved for nuclear collisions. At this energy, next-to-leading-order QCD calculations [6] predict abundant rates of jets above 100 GeV produced in the pseudorapidity region $|\eta| < 4.5$ [7], which can be reconstructed by ATLAS.

The data in this paper were obtained by ATLAS during the 2010 lead-lead run at the LHC and correspond to an integrated luminosity of approximately $1.7 \mu b^{-1}$.

For this study, the focus is on the balance between the highest transverse energy pair of jets in events where those jets have an azimuthal angle separation, $\Delta\phi = |\phi_1 - \phi_2| > \pi/2$ to reduce contributions from multi-jet final states. In this letter, jets with $\Delta\phi > \pi/2$ are labeled as being in opposite hemispheres. The jet energy imbalance is expressed in terms of the asymmetry A_J ,

$$A_J = \frac{E_{T1} - E_{T2}}{E_{T1} + E_{T2}}, \Delta\phi > \frac{\pi}{2} \quad (1)$$

where the first jet is required to have a transverse energy $E_{T1} > 100$ GeV, and the second jet is the highest transverse energy jet in the opposite hemisphere with $E_{T2} > 25$ GeV. The average contribution of the underlying event energy is subtracted when deriving the individual jet transverse energies. The event selection is chosen such that the first jet has high reconstruction efficiency and the second jet is above the distribution of background fluctuations and the intrinsic soft jets associated with the collision. Dijet events are expected to have A_J near zero, with deviations expected from gluon radiation falling outside the jet cone, as well as from instrumental effects. Energy loss in the medium could lead to much stronger deviations in the reconstructed energy balance.

The ATLAS detector [8] is well-suited for measuring jets due to its large acceptance, highly segmented electromagnetic (EM) and hadronic calorimeters. These allow efficient reconstruction of jets over a wide range in the region $|\eta| < 4.5$. The detector also provides precise charged particle and muon tracking. An event display showing the Inner Detector and calorimeter systems is shown in Fig. 1.

Liquid argon (LAr) technology providing excellent energy and position resolution is used in the electromagnetic calorimeter that covers the pseudorapidity range

Published in Phys.Rev.Lett.105:252303,2010 and arXiv:1011.6182.

Work supported in part by US Department of Energy under contract DE-AC02-76SF00515.

SLAC National Accelerator Laboratory, Menlo Park, CA 94025

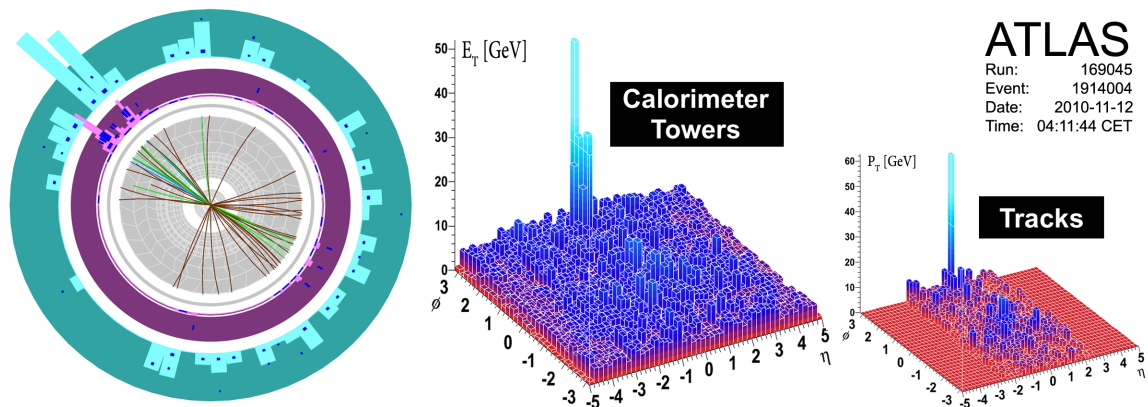


FIG. 1: Event display of a highly asymmetric dijet event, with one jet with $E_T > 100$ GeV and no evident recoiling jet, and with high energy calorimeter cell deposits distributed over a wide azimuthal region. By selecting tracks with $p_T > 2.6$ GeV and applying cell thresholds in the calorimeters ($E_T > 700$ MeV in the electromagnetic calorimeter, and $E > 1$ GeV in the hadronic calorimeter) the recoil can be seen dispersed widely over azimuth.

$|\eta| < 3.2$. The hadronic calorimetry in the range $|\eta| < 1.7$ is provided by a sampling calorimeter made of steel and scintillating tiles. In the end-caps ($1.5 < |\eta| < 3.2$), LAr technology is also used for the hadronic calorimeters, matching the outer $|\eta|$ limits of the electromagnetic calorimeters. To complete the η coverage, the LAr forward calorimeters provide both electromagnetic and hadronic energy measurements, extending the coverage up to $|\eta| = 4.9$. The calorimeter (η, ϕ) granularities are 0.1×0.1 for the hadronic calorimeters up to $|\eta| = 2.5$ (except for the third layer of the Tile calorimeter, which has a segmentation of 0.2×0.1 up to $|\eta| = 1.7$), and then 0.2×0.2 up to $|\eta| = 4.9$. The EM calorimeters are longitudinally segmented into three compartments and feature a much finer readout granularity varying by layer, with cells as small as 0.025×0.025 extending to $|\eta| = 2.5$ in the middle layer. In the data taking period considered, approximately 187,000 calorimeter cells (98% of the total) were usable for event reconstruction.

The bulk of the data reported here were triggered using coincidence signals from two sets of Minimum Bias Trigger Scintillator (MBTS) detectors, positioned at $z = \pm 3.56$ m, covering the full azimuth between $2.09 < |\eta| < 3.84$ and divided into eight ϕ sectors and two η sectors. Coincidences in the Zero Degree Calorimeter and LUCID luminosity detectors were also used as primary triggers, since these detectors were far less susceptible to LHC beam backgrounds. These triggers have a large overlap and are close to fully efficient for the events studied here.

In the offline analysis, events are required to have a time difference between the two sets of MBTS counters of $\Delta t < 3$ ns and a reconstructed vertex to efficiently reject beam-halo backgrounds. The primary vertex is derived from the reconstructed tracks in the Inner Detector (ID), which covers $|\eta| < 2.5$ using silicon pixel and

strip detectors surrounded by straw tubes. These event selection criteria have been estimated to accept over 98% of the total lead-lead inelastic cross section.

The level of event activity or “centrality” is characterized using the total transverse energy (ΣE_T) deposited in the Forward Calorimeters (FCal), which cover $3.2 < |\eta| < 4.9$, shown in Fig. 2. Bins are defined in centrality according to fractions of the total lead-lead cross section selected by the trigger and are expressed in terms of percentiles (0-10%, 10-20%, 20-40% and 40-100%) with 0% representing the upper end of the ΣE_T distribution. Previous heavy ion experiments have shown a clear correlation of the ΣE_T with the geometry of the overlap region of the colliding nuclei and, correspondingly, the total event multiplicity. This is verified in the bottom panel of Fig. 2 which shows a tight correlation between the energy flow near mid-rapidity and the forward ΣE_T . The forward ΣE_T is used for this analysis to avoid biasing the centrality measurement with jets.

Jets have been reconstructed using the infrared-safe anti- k_t jet clustering algorithm [9] with the radius parameter $R = 0.4$. The inputs to this algorithm are “towers” of calorimeter cells of size $\Delta\eta \times \Delta\phi = 0.1 \times 0.1$ with the input cells weighted using energy-density dependent factors to correct for calorimeter non-compensation and other energy losses. Jet four-momenta are constructed by the vectorial addition of cells, treating each cell as an (E, \vec{p}) four-vector with zero mass.

The jets reconstructed using the anti- k_t algorithm contain a mix of genuine jets and jet-sized patches of the underlying event. For each event, we estimate the average transverse energy density in each calorimeter layer in bins of width $\Delta\eta = 0.1$, and averaged over azimuth. In the averaging, we exclude jets with $D = E_T(\text{max})/\langle E_T \rangle$, the ratio of the maximum tower energy over the mean tower energy, greater than 5. The value $D_{\text{cut}} = 5$ is chosen

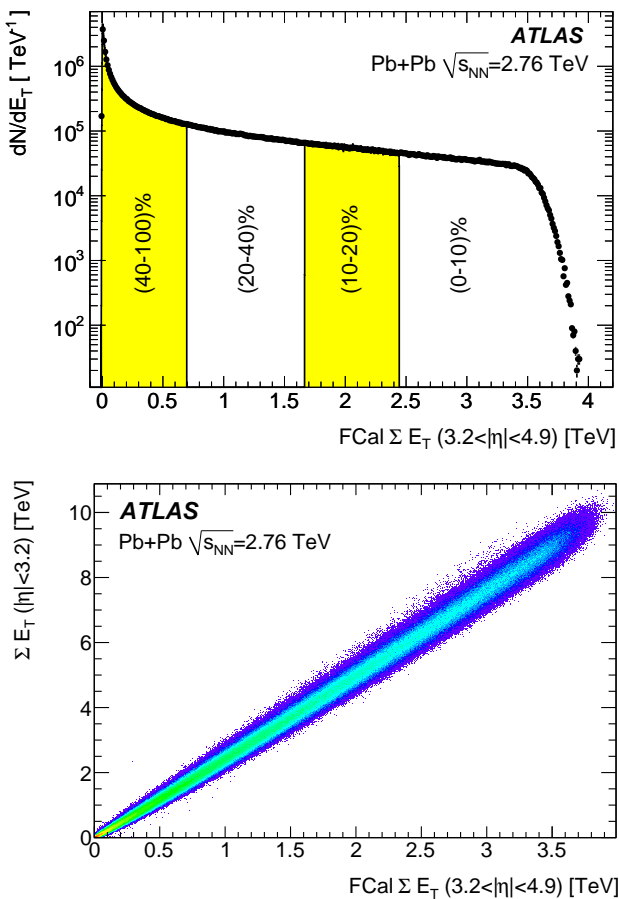


FIG. 2: (top) Distribution of uncorrected ΣE_T in the Forward Calorimeter (FCal). Bins in event activity or “centrality” are indicated by the alternating bands (see text for details) and labeled according to increasing fraction of lead-lead total cross section starting from the largest measured ΣE_T . (bottom) Correlation of uncorrected ΣE_T in $|\eta| < 3.2$ with that measured in the FCal ($3.2 < |\eta| < 4.9$).

based upon simulation studies, and the results have been tested to be stable against variations in this parameter. These average energies are subtracted layer-by-layer from the cells that make up each jet, scaling appropriately for the cell area. The final reported four-momentum for each jet is then recalculated from the remaining energy in the cells.

The efficiency of the jet reconstruction algorithm, and other event properties, have been studied using PYTHIA [10] events superimposed on HIJING events [11]. There is no parton-level interference between the PYTHIA and HIJING generated events. A GEANT4 [12] simulation models the detector response [13] to all the final state particles from the two generated events. The HIJING parameters used do not include jet quenching, but variations in flow as a function of centrality are added. It is found that jets with $E_T > 100$ GeV are reconstructed with nearly 100% effi-

ciency at all centralities.

Simulations have been used to check the overall linearity and resolution of the reconstruction with respect to the primary jet energy, assuming jet shapes similar to those found in proton-proton collisions [14]. However, the efficiency, linearity, and resolution for reconstructing jets may be poorer if the jets are substantially modified by the medium. To check the sensitivity to such effects, the jet shape, characterized here as the ratio of the “core” energy (integrated over $\sqrt{\Delta\eta^2 + \Delta\phi^2} < 0.2$) to the total energy, has been studied. This ratio shows only a weak dependence on centrality, providing evidence that the high-energy jets do look approximately like jets measured in proton-proton collisions, and that the energy subtraction procedure does not introduce significant biases.

After event selection, the requirement of a leading jet with $E_T > 100$ GeV and $|\eta| < 2.8$ yields a sample of 1693 events. These are called the “jet selected events”. The lead-lead data are also compared with a sample of 17 nb^{-1} of proton-proton collision data [14], which yields 6732 events.

A striking feature of this sample is the appearance of events with only one high E_T jet clearly visible in the calorimeter, and no high E_T jet opposite to it in azimuth. Such an event is shown in Fig. 1. The calorimeter E_T and charged particle Σp_T are shown in regions of $\Delta\eta \times \Delta\phi = 0.1 \times 0.1$. Inspection of this event shows a highly asymmetric pair of jets with the particles recoiling against the leading jet being widely distributed in azimuth.

To quantify the transverse energy balance between jets in these events, we calculate the dijet asymmetry, A_J , in different centrality bins between the highest E_T (leading) jet and the highest E_T jet in the opposite hemisphere (second jet). The second jet is required to have $E_T > 25$ GeV in order to discriminate against background from the underlying event. This excludes around 5% of the jet selected events in the most central 40% of the cross section, and accepts nearly all of the more peripheral events.

The dijet asymmetry and $\Delta\phi$ distributions are shown in four centrality bins in Fig. 3, where they are compared with proton-proton data and with fully-reconstructed HIJING+PYTHIA simulated events. The simulated events are intended to illustrate the effect of the heavy ion background on jet reconstruction, not any underlying physics process. The dijet asymmetry in peripheral lead-lead events is similar to that in both proton-proton and simulated events; however, as the events become more central, the lead-lead data distributions develop different characteristics, indicating an increased rate of highly asymmetric dijet events. The asymmetry distribution broadens; the mean shifts to higher values; the peak at zero asymmetry is no longer visible; and for the most central events a peak is visible at higher asymmetry values

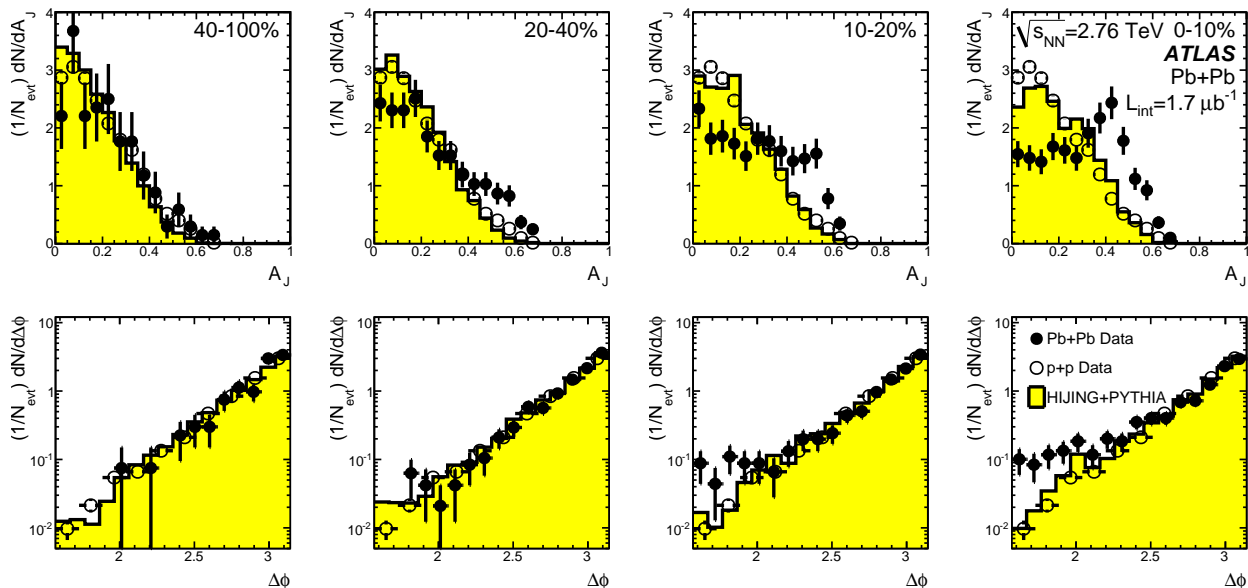


FIG. 3: (top) Dijet asymmetry distributions for data (points) and unquenched HIJING with superimposed PYTHIA dijets (solid yellow histograms), as a function of collision centrality (left to right from peripheral to central events). Proton-proton data from $\sqrt{s} = 7$ TeV, analyzed with the same jet selection, is shown as open circles. (bottom) Distribution of $\Delta\phi$, the azimuthal angle between the two jets, for data and HIJING+PYTHIA, also as a function of centrality.

(asymmetries larger than 0.6 can only exist for leading jets substantially above the kinematic threshold of 100 GeV transverse energy). The $\Delta\phi$ distributions show that the leading and second jets are primarily back-to-back in all centrality bins; however, a systematic increase is observed in the rate of second jets at large angles relative to the recoil direction as the events become more central.

Numerous studies have been performed to verify that the events with large asymmetry are not produced by backgrounds or detector effects. Detector effects primarily include readout errors and local acceptance loss due to dead channels and detector cracks. All of the jet events in this sample were checked, and no events were flagged as problematic. The analysis was repeated first requiring both jets to be within $|\eta| < 1$ and $|\eta| < 2$, to see if there is any effect related to boundaries between the calorimeter sections, and no change to the distribution was observed. Furthermore, the highly-asymmetric dijets were not found to populate any specific region of the calorimeter, indicating that no substantial fraction of produced energy was lost in an inefficient or uncovered region.

To investigate the effect of the underlying event, the jet radius parameter R was varied from 0.4 to 0.2 and 0.6 with the result that the large asymmetry was not reduced. In fact, the asymmetry increased for the smaller radius, which would not be expected if detector effects are dominant. The analysis was independently corroborated by a study of “track jets”, reconstructed with ID tracks of $p_T > 4$ GeV using the same jet algorithms. The ID has an estimated efficiency for reconstructing charged

hadrons above $p_T > 1$ GeV of approximately 80% in the most peripheral events (the same as that found in 7 TeV proton-proton operation) and 70% in the most central events, due to the approximately 10% occupancy reached in the silicon strips. A similar asymmetry effect is also observed with track jets. The jet energy scale and underlying event subtraction were also validated by correlating calorimeter and track-based jet measurements.

The missing E_T distribution was measured for minimum bias heavy ion events as a function of the total E_T deposited in the calorimeters up to about $\Sigma E_T = 10$ TeV. The resolution as a function of total E_T shows the same behavior as in proton-proton collisions. None of the events in the jet selected sample was found to have an anomalously large missing E_T .

The events containing high- p_T jets were studied for the presence of high- p_T muons that could carry a large fraction of the recoil energy. Fewer than 2% of the events have a muon with $p_T > 10$ GeV, potentially recoiling against the leading jet, so this can not explain the prevalence of highly asymmetric dijet topologies in more central events.

None of these investigations indicate that the highly-asymmetric dijet events arise from backgrounds or detector-related effects.

In summary, first results are presented on jet reconstruction in lead-lead collisions, with the ATLAS detector at the LHC. In a sample of events with a reconstructed jet with transverse energy of 100 GeV or more, an asymmetry is observed between the transverse energies of the

leading and second jets that increases with the centrality of the collisions. This has a natural interpretation in terms of QCD energy loss, where the second jet is attenuated, in some cases leading to striking highly-asymmetric dijet events. This observation is the first of an enhancement of such large dijet asymmetries, not observed in proton-proton collisions, which may point to an interpretation in terms of strong jet energy loss in a hot, dense medium.

We wish to thank CERN for the efficient commissioning and operation of the LHC during this initial high-energy data-taking period as well as the support staff from our institutions without whom ATLAS could not be operated efficiently. We acknowledge the support of ANPCyT, Argentina; YerPhI, Armenia; ARC, Australia; BMWF, Austria; ANAS, Azerbaijan; SSTC, Belarus; CNPq and FAPESP, Brazil; NSERC, NRC and CFI, Canada; CERN; CONICYT, Chile; CAS, MOST and NSFC, China; COLCIENCIAS, Colombia; MEYS (MSMT), MPO and CCRC, Czech Republic; DNRF, DNSRC and Lundbeck Foundation, Denmark; ARTEMIS, European Union; IN2P3-CNRS, CEA-DSM/IRFU, France; GNAS, Georgia; BMBF, DFG, HGF, MPG and AvH Foundation, Germany; GSRT, Greece; ISF, MINERVA, GIF, DIP and Benoziyo Center, Israel; INFN, Italy; MEXT and JSPS, Japan; CNRST, Morocco; FOM and NWO, Netherlands; RCN, Norway; MNiSW, Poland; GRICES and FCT, Portugal; MERYS (MECTS), Romania; MES of Russia and ROSATOM, Russian Federation; JINR; MSTD, Serbia; MSSR, Slovakia; ARRS and MVZT, Slovenia; DST/NRF, South Africa; MICINN, Spain; SRC and Wallenberg Foundation, Sweden; SER, SNSF and Cantons of Bern and Geneva, Switzerland; NSC, Taiwan; TAEK, Turkey; STFC, the Royal Society and Leverhulme Trust, United Kingdom; DOE and NSF, United States of America. The crucial computing support from all WLCG partners is acknowledged gratefully, in particular from CERN and the ATLAS Tier-1 facilities at TRIUMF (Canada), NDGF (Denmark, Norway, Sweden), CC-IN2P3 (France), KIT/GridKA (Germany), INFN-CNAF (Italy), NL-T1 (Netherlands), PIC (Spain), ASGC (Taiwan), RAL (UK) and BNL (USA) and in the Tier-2 facilities worldwide.

* Full author list given at the end of the article in Appendix .

- [1] J. D. Bjorken, FERMILAB-PUB-82-059-THY (1982).
- [2] U. A. Wiedemann, arXiv:0908.2306 [hep-ph].
- [3] A. Majumder and M. Van Leeuwen, arXiv:1002.2206 [hep-ph].
- [4] K. Adcox et al. [PHENIX Collaboration], Phys. Rev. Lett. **88**, 022301 (2002)
- [5] C. Adler et al. [STAR Collaboration], Phys. Rev. Lett.

- 89**, 202301 (2002)
- [6] B. Jager, M. Stratmann and W. Vogelsang, Phys. Rev. D **70**, 034010 (2004)
- [7] The ATLAS reference system is a Cartesian right-handed coordinate system, with the nominal collision point at the origin. The anticlockwise beam direction defines the positive z-axis, while the positive x-axis is defined as pointing from the collision point to the center of the LHC ring and the positive y-axis points upwards. The azimuthal angle ϕ is measured around the beam axis, and the polar angle θ is measured with respect to the z-axis. Pseudorapidity is defined as $\eta = -\ln(\tan(\theta/2))$.
- [8] The ATLAS Collaboration, JINST **3**, S08003 (2008).
- [9] M. Cacciari, G. P. Salam and G. Soyez, JHEP **0804**, 063 (2008)
- [10] T. Sjostrand, S. Mrenna and P. Z. Skands, JHEP **0605**, 026 (2006)
- [11] X.-N. Wang and M. Gyulassy, Phys. Rev. **D44**, 3501 (1991).
- [12] S. Agostinelli et al. [GEANT4 Collaboration], Nucl. Instrum. Meth. A **506**, 250 (2003).
- [13] The ATLAS Collaboration, <http://dx.doi.org/10.1140/epjc/s10052-010-1429-9> Eur. Phys. J. C (2010)
- [14] The ATLAS Collaboration, arXiv:1009.5908 [hep-ex], Accepted by EPJC.

THE ATLAS COLLABORATION

G. Aad⁴⁸, B. Abbott¹¹¹, J. Abdallah¹¹, A.A. Abdelalim⁴⁹, A. Abdesselam¹¹⁸, O. Abdinov¹⁰, B. Abi¹¹², M. Abolins⁸⁸, H. Abramowicz¹⁵³, H. Abreu¹¹⁵, E. Acerbi^{89a,89b}, B.S. Acharya^{164a,164b}, M. Ackers²⁰, D.L. Adams²⁴, T.N. Addy⁵⁶, J. Adelman¹⁷⁵, M. Aderholz⁹⁹, S. Adomeit⁹⁸, P. Adragna⁷⁵, T. Adye¹²⁹, S. Aefsky²², J.A. Aguilar-Saavedra^{124b,a}, M. Aharrouche⁸¹, S.P. Ahlen²¹, F. Ahles⁴⁸, A. Ahmad¹⁴⁸, M. Ahsan⁴⁰, G. Aielli^{133a,133b}, T. Akdogan^{18a}, T.P.A. Åkesson⁷⁹, G. Akimoto¹⁵⁵, A.V. Akimov⁹⁴, M.S. Alam¹, M.A. Alam⁷⁶, S. Albrand⁵⁵, M. Aleksa²⁹, I.N. Aleksandrov⁶⁵, M. Aleppo^{89a,89b}, F. Alessandria^{89a}, C. Alexa^{25a}, G. Alexander¹⁵³, G. Alexandre⁴⁹, T. Alexopoulos⁹, M. Alhroob²⁰, M. Aliev¹⁵, G. Alimonti^{89a}, J. Alison¹²⁰, M. Aliyev¹⁰, P.P. Allport⁷³, S.E. Allwood-Spiers⁵³, J. Almond⁸², A. Aloisio^{102a,102b}, R. Alon¹⁷¹, A. Alonso⁷⁹, J. Alonso¹⁴, M.G. Alviggi^{102a,102b}, K. Amako⁶⁶, P. Amaral²⁹, C. Amelung²², V.V. Ammosov¹²⁸, A. Amorim^{124a,b}, G. Amorós¹⁶⁷, N. Amram¹⁵³, C. Anastopoulos¹³⁹, T. Andeen³⁴, C.F. Anders²⁰, K.J. Anderson³⁰, A. Andreazza^{89a,89b}, V. Andrei^{58a}, M.-L. Andrieux⁵⁵, X.S. Anduaga⁷⁰, A. Angerami³⁴, F. Anghinolfi²⁹, N. Anjos^{124a}, A. Annovi⁴⁷, A. Antonaki⁸, M. Antonelli⁴⁷, S. Antonelli^{19a,19b}, J. Antos^{144b}, F. Anulli^{132a}, S. Aoun⁸³, L. Aperio Bella⁴, R. Apolle¹¹⁸, G. Arabidze⁸⁸, I. Aracena¹⁴³, Y. Arai⁶⁶, A.T.H. Arce⁴⁴, J.P. Archambault²⁸, S. Arfaoui^{29,c}, J.-F. Arguin¹⁴, E. Arik^{18a,*}, M. Arik^{18a}, A.J. Armbruster⁸⁷, K.E. Arms¹⁰⁹, S.R. Armstrong²⁴, O. Arnaez⁴, C. Arnault¹¹⁵, A. Artamonov⁹⁵, G. Artoni^{132a,132b}, D. Arutinov²⁰, S. Asai¹⁵⁵, J. Silva^{124a,d}, R. Asfandiyarov¹⁷², S. Ask²⁷, B. Åsman^{146a,146b}, L. Asquith⁵, K. Assamagan²⁴, A. Astbury¹⁶⁹, A. Astvatsatourov⁵², G. Atoian¹⁷⁵, B. Aubert⁴, B. Auerbach¹⁷⁵, E. Auge¹¹⁵, K. Augsten¹²⁷, M. Auresseau⁴, N. Austin⁷³, R. Avramidou⁹, D. Axen¹⁶⁸, C. Ay⁵⁴, G. Azuelos^{93,e}, Y. Azuma¹⁵⁵, M.A. Baak²⁹, G. Baccaglioni^{25a}, C. Bacci^{134a,134b}, A.M. Bach¹⁴, H. Bachacou¹³⁶, K. Bachas²⁹, G. Bachy²⁹, M. Backes⁴⁹, E. Badescu^{25a}, P. Bagnaia^{132a,132b}, S. Bahinipati², Y. Bai^{32a}, D.C. Bailey¹⁵⁸, T. Bain¹⁵⁸, J.T. Baines¹²⁹, O.K. Baker¹⁷⁵, S. Baker⁷⁷, F. Baltasar Dos Santos Pedrosa²⁹, E. Banas³⁸, P. Banerjee⁹³, Sw. Banerjee¹⁶⁹, D. Banfi^{89a,89b}, A. Bangert¹³⁷, V. Bansal¹⁶⁹, H.S. Bansil¹⁷, L. Barak¹⁷¹, S.P. Baranov⁹⁴, A. Barashkou⁶⁵, A. Barbaro Galtieri¹⁴, T. Barber²⁷, E.L. Barberio⁸⁶, D. Barberis^{50a,50b}, M. Barbero²⁰, D.Y. Bardin⁶⁵, T. Barillari⁹⁹, M. Barisonzi¹⁷⁴, T. Barklow¹⁴³, N. Barlow²⁷, B.M. Barnett¹²⁹, R.M. Barnett¹⁴, A. Baroncelli^{134a}, A.J. Barr¹¹⁸, F. Barreiro⁸⁰, J. Barreiro Guimarães da Costa⁵⁷, P. Barrillon¹¹⁵, R. Bartoldus¹⁴³, A.E. Barton⁷¹, D. Bartsch²⁰, R.L. Bates⁵³, L. Batkova^{144a}, J.R. Batley²⁷, A. Battaglia¹⁶, M. Battistin²⁹, G. Battistoni^{89a}, F. Bauer¹³⁶, H.S. Bawa¹⁴³, B. Beare¹⁵⁸, T. Beau⁷⁸, P.H. Beauchemin¹¹⁸, R. Beccherle^{50a}, P. Bechtel⁴¹, H.P. Beck¹⁶, M. Beckingham⁴⁸, K.H. Becks¹⁷⁴, A.J. Beddall^{18c}, A. Beddall^{18c}, V.A. Bednyakov⁶⁵, C. Bee⁸³, M. Begel²⁴, S. Behar Harpaz¹⁵², P.K. Behera⁶³, M. Beimforde⁹⁹, C. Belanger-Champagne¹⁶⁶, P.J. Bell⁴⁹, W.H. Bell⁴⁹, G. Bella¹⁵³, L. Bellagamba^{19a}, F. Bellina²⁹, G. Bellomo^{89a,89b}, M. Bellomo^{119a}, A. Belloni⁵⁷, K. Belotskiy⁹⁶, O. Beltramello²⁹, S. Ben Ami¹⁵², O. Benary¹⁵³, D. Benckroun^{135a}, C. Benchouk⁸³, M. Bendel⁸¹, B.H. Benedict¹⁶³, N. Benekos¹⁶⁵, Y. Benhammou¹⁵³, D.P. Benjamin⁴⁴, M. Benoit¹¹⁵, J.R. Bensinger²², K. Benslama¹³⁰, S. Bentvelsen¹⁰⁵, D. Berge²⁹, E. Bergeas Kuutmann⁴¹, N. Berger⁴, F. Berghaus¹⁶⁹, E. Berglund⁴⁹, J. Beringer¹⁴, K. Bernardet⁸³, P. Bernat¹¹⁵, R. Bernhard⁴⁸, C. Bernius²⁴, T. Berry⁷⁶, A. Bertin^{19a,19b}, F. Bertinelli²⁹, F. Bertolucci^{122a,122b}, M.I. Besana^{89a,89b}, N. Besson¹³⁶, S. Bethke⁹⁹, W. Bhimji⁴⁵, R.M. Bianchi²⁹, M. Bianco^{72a,72b}, O. Biebel⁹⁸, J. Biesiada¹⁴, M. Biglietti^{132a,132b}, H. Bilokon⁴⁷, M. Bindi^{19a,19b}, A. Bingul^{18c}, C. Bini^{132a,132b}, C. Biscarat¹⁷⁷, U. Bitenc⁴⁸, K.M. Black²¹, R.E. Blair⁵, J.-B. Blanchard¹¹⁵, G. Blanchot²⁹, C. Blocker²², J. Blocki³⁸, A. Blondel⁴⁹, W. Blum⁸¹, U. Blumenschein⁵⁴, G.J. Bobbink¹⁰⁵, V.B. Bobrovnikov¹⁰⁷, A. Bocci⁴⁴, R. Bock²⁹, C.R. Boddy¹¹⁸, M. Boehler⁴¹, J. Boek¹⁷⁴, N. Boelaert³⁵, S. Böser⁷⁷, J.A. Bogaerts²⁹, A. Bogdanchikov¹⁰⁷, A. Bogouch^{90,*}, C. Bohm^{146a}, V. Boisvert⁷⁶, T. Bold^{163,f}, V. Boldea^{25a}, M. Boonekamp¹³⁶, G. Boorman⁷⁶, C.N. Booth¹³⁹, P. Booth¹³⁹, J.R.A. Booth¹⁷, S. Bordini⁷⁸, C. Borer¹⁶, A. Borisov¹²⁸, G. Borisso⁷¹, I. Borjanovic^{12a}, S. Borroni^{132a,132b}, K. Bos¹⁰⁵, D. Boscherini^{19a}, M. Bosman¹¹, H. Boterenbrood¹⁰⁵, D. Botterill¹²⁹, J. Bouchami⁹³, J. Boudreau¹²³, E.V. Bouhova-Thacker⁷¹, C. Boulahouache¹²³, C. Bourdarios¹¹⁵, N. Bousson⁸³, A. Boveia³⁰, J. Boyd²⁹, I.R. Boyko⁶⁵, N.I. Bozhko¹²⁸, I. Bozovic-Jelisavcic^{12b}, J. Bracinik¹⁷, A. Braem²⁹, E. Brambilla^{72a,72b}, P. Branchini^{134a}, G.W. Brandenburg⁵⁷, A. Brandt⁷, G. Brandt⁴¹, O. Brandt⁵⁴, U. Bratzler¹⁵⁶, B. Brau⁸⁴, J.E. Brau¹¹⁴, H.M. Braun¹⁷⁴, B. Brelier¹⁵⁸, J. Bremer²⁹, R. Brenner¹⁶⁶, S. Bressler¹⁵², D. Breton¹¹⁵, N.D. Brett¹¹⁸, P.G. Bright-Thomas¹⁷, D. Britton⁵³, F.M. Brochu²⁷, I. Brock²⁰, R. Brock⁸⁸, T.J. Brodbeck⁷¹, E. Brodet¹⁵³, F. Broggi^{89a}, C. Bromberg⁸⁸, G. Brooijmans³⁴, W.K. Brooks^{31b}, G. Brown⁸², E. Brubaker³⁰, P.A. Bruckman de Renstrom³⁸, D. Bruncko^{144b}, R. Bruneliere⁴⁸, S. Brunet⁶¹, A. Bruni^{19a}, G. Bruni^{19a}, M. Bruschi^{19a}, T. Buanes¹³, F. Bucci⁴⁹, J. Buchanan¹¹⁸, N.J. Buchanan², P. Buchholz¹⁴¹, R.M. Buckingham¹¹⁸, A.G. Buckley⁴⁵, S.I. Buda^{25a}, I.A. Budagov⁶⁵, B. Budick¹⁰⁸, V. Büscher⁸¹, L. Bugge¹¹⁷, D. Buira-Clark¹¹⁸, E.J. Buis¹⁰⁵, O. Bulekov⁹⁶, M. Bunse⁴², T. Buran¹¹⁷, H. Burckhart²⁹, S. Burdin⁷³, T. Burgess¹³, S. Burke¹²⁹, E. Busato³³, P. Bussey⁵³, C.P. Buszello¹⁶⁶, F. Butin²⁹, B. Butler¹⁴³, J.M. Butler²¹, C.M. Buttar⁵³, J.M. Butterworth⁷⁷, W. Buttinger²⁷, T. Byatt⁷⁷, S. Cabrera Urbán¹⁶⁷, M. Caccia^{89a,89b,g}, D. Caforio^{19a,19b},

O. Cakir^{3a}, P. Calafiura¹⁴, G. Calderini⁷⁸, P. Calfayan⁹⁸, R. Calkins¹⁰⁶, L.P. Caloba^{23a}, R. Caloi^{132a,132b}, D. Calvet³³, S. Calvet³³, A. Camard⁷⁸, P. Camarri^{133a,133b}, M. Cambiaghi^{119a,119b}, D. Cameron¹¹⁷, J. Cammin²⁰, S. Campana²⁹, M. Campanelli⁷⁷, V. Canale^{102a,102b}, F. Canelli³⁰, A. Canepa^{159a}, J. Cantero⁸⁰, L. Capaso^{102a,102b}, M.D.M. Capeans Garrido²⁹, I. Caprini^{25a}, M. Caprini^{25a}, D. Capriotti⁹⁹, M. Capua^{36a,36b}, R. Caputo¹⁴⁸, C. Caramarcu^{25a}, R. Cardarelli^{133a}, T. Carli²⁹, G. Carlino^{102a}, L. Carminati^{89a,89b}, B. Caron^{159a}, S. Caron⁴⁸, C. Carpentieri⁴⁸, G.D. Carrillo Montoya¹⁷², S. Carron Montero¹⁵⁸, A.A. Carter⁷⁵, J.R. Carter²⁷, J. Carvalho^{124a,h}, D. Casadei¹⁰⁸, M.P. Casado¹¹, M. Cascella^{122a,122b}, C. Caso^{50a,50b,*}, A.M. Castaneda Hernandez¹⁷², E. Castaneda-Miranda¹⁷², V. Castillo Gimenez¹⁶⁷, N.F. Castro^{124b,a}, G. Cataldi^{72a}, F. Cataneo²⁹, A. Catinaccio²⁹, J.R. Catmore⁷¹, A. Cattai²⁹, G. Cattani^{133a,133b}, S. Caughron⁸⁸, A. Cavallari^{132a,132b}, P. Cavalleri⁷⁸, D. Cavalli^{89a}, M. Cavalli-Sforza¹¹, V. Cavasinni^{122a,122b}, A. Cazzato^{72a,72b}, F. Ceradini^{134a,134b}, C. Cerna⁸³, A.S. Cerqueira^{23a}, A. Cerri²⁹, L. Cerrito⁷⁵, F. Cerutti⁴⁷, S.A. Cetin^{18b}, F. Cevenini^{102a,102b}, A. Chafaq^{135a}, D. Chakraborty¹⁰⁶, K. Chan², B. Chapleau⁸⁵, J.D. Chapman²⁷, J.W. Chapman⁸⁷, E. Chareyre⁷⁸, D.G. Charlton¹⁷, V. Chavda⁸², S. Cheatham⁷¹, S. Chekanov⁵, S.V. Chekulaev^{159a}, G.A. Chelkov⁶⁵, H. Chen²⁴, L. Chen², S. Chen^{32c}, T. Chen^{32c}, X. Chen¹⁷², S. Cheng^{32a}, A. Cheplakov⁶⁵, V.F. Chepurinov⁶⁵, R. Cherkaoui El Moursli^{135d}, V. Tcherniatine²⁴, E. Cheu⁶, S.L. Cheung¹⁵⁸, L. Chevalier¹³⁶, F. Chevallier¹³⁶, G. Chiefari^{102a,102b}, L. Chikovani⁵¹, J.T. Childers^{58a}, A. Chilingarov⁷¹, G. Chiodini^{72a}, M.V. Chizhov⁶⁵, G. Choudalakis³⁰, S. Chouridou¹³⁷, I.A. Christidi⁷⁷, A. Christov⁴⁸, D. Chromek-Burckhart²⁹, M.L. Chu¹⁵¹, J. Chudoba¹²⁵, G. Ciapetti^{132a,132b}, A.K. Ciftci^{3a}, R. Ciftci^{3a}, D. Cinca³³, V. Cindro⁷⁴, M.D. Ciobotaru¹⁶³, C. Ciocca^{19a,19b}, A. Cicio¹⁴, M. Cirilli^{87,i}, M. Ciubancan^{25a}, A. Clark⁴⁹, P.J. Clark⁴⁵, W. Cleland¹²³, J.C. Clemens⁸³, B. Clement⁵⁵, C. Clement^{146a,146b}, R.W. Clift¹²⁹, Y. Coadou⁸³, M. Cobal^{164a,164c}, A. Cocco^{50a,50b}, J. Cochran⁶⁴, P. Coe¹¹⁸, J.G. Cogan¹⁴³, J. Coggeshall¹⁶⁵, E. Cogneras¹⁷⁷, C.D. Cojocaru²⁸, J. Colas⁴, B. Cole³⁴, A.P. Colijn¹⁰⁵, C. Collard¹¹⁵, N.J. Collins¹⁷, C. Collins-Tooth⁵³, J. Collot⁵⁵, G. Colon⁸⁴, R. Coluccia^{72a,72b}, G. Comune⁸⁸, P. Conde Muño^{124a}, E. Coniavitis¹¹⁸, M.C. Conidi¹¹, M. Consonni¹⁰⁴, S. Constantinescu^{25a}, C. Conta^{119a,119b}, F. Conventi^{102a,j}, J. Cook²⁹, M. Cooke¹⁴, B.D. Cooper⁷⁵, A.M. Cooper-Sarkar¹¹⁸, N.J. Cooper-Smith⁷⁶, K. Copic³⁴, T. Cornelissen^{50a,50b}, M. Corradi^{19a}, S. Correard⁸³, F. Corriveau^{85,k}, A. Cortes-Gonzalez¹⁶⁵, G. Cortiana⁹⁹, G. Costa^{89a}, M.J. Costa¹⁶⁷, D. Costanzo¹³⁹, T. Costin³⁰, D. Côté²⁹, R. Coura Torres^{23a}, L. Courneyea¹⁶⁹, G. Cowan⁷⁶, C. Cowden²⁷, B.E. Cox⁸², K. Cranmer¹⁰⁸, M. Cristinziani²⁰, G. Crosetti^{36a,36b}, R. Crupi^{72a,72b}, S. Crépe-Renaudin⁵⁵, C. Cuenca Almenar¹⁷⁵, T. Cuhadar Donszelmann¹³⁹, S. Cuneo^{50a,50b}, M. Curatolo⁴⁷, C.J. Curtis¹⁷, P. Cwetanski⁶¹, H. Cziri¹⁴¹, Z. Czyczula¹¹⁷, S. D'Auria⁵³, M. D'Onofrio⁷³, A. D'Orazio^{132a,132b}, A. Da Rocha Gesualdi Mello^{23a}, P.V.M. Da Silva^{23a}, C. Da Via⁸², W. Dabrowski³⁷, A. Dahlhoff⁴⁸, T. Dai⁸⁷, C. Dallapiccola⁸⁴, S.J. Dallison^{129,*}, M. Dam³⁵, M. Dameri^{50a,50b}, D.S. Damiani¹³⁷, H.O. Danielsson²⁹, R. Dankers¹⁰⁵, D. Dannheim⁹⁹, V. Dao⁴⁹, G. Darbo^{50a}, G.L. Darlea^{25b}, C. Daum¹⁰⁵, J.P. Dauvergne²⁹, W. Davey⁸⁶, T. Davidek¹²⁶, N. Davidson⁸⁶, R. Davidson⁷¹, M. Davies⁹³, A.R. Davison⁷⁷, E. Dawe¹⁴², I. Dawson¹³⁹, J.W. Dawson^{5,*}, R.K. Daya³⁹, K. De⁷, R. de Asmundis^{102a}, S. De Castro^{19a,19b}, S. De Cecco⁷⁸, J. de Graat⁹⁸, N. De Groot¹⁰⁴, P. de Jong¹⁰⁵, E. De La Cruz-Burelo⁸⁷, C. De La Taille¹¹⁵, B. De Lotto^{164a,164c}, L. De Mora⁷¹, L. De Nooij¹⁰⁵, M. De Oliveira Branco²⁹, D. De Pedis^{132a}, P. de Saintignon⁵⁵, A. De Salvo^{132a}, U. De Sanctis^{164a,164c}, A. De Santo¹⁴⁹, J.B. De Vivie De Regie¹¹⁵, S. Dean⁷⁷, R. Debbe²⁴, G. Dedes⁹⁹, D.V. Dedovich⁶⁵, J. Degenhardt¹²⁰, M. Dehchar¹¹⁸, M. Deile⁹⁸, C. Del Papa^{164a,164c}, J. Del Peso⁸⁰, T. Del Prete^{122a,122b}, A. Dell'Acqua²⁹, L. Dell'Asta^{89a,89b}, M. Della Pietra^{102a,l}, D. della Volpe^{102a,102b}, M. Delmastro²⁹, P. Delpierre⁸³, N. Delruelle²⁹, P.A. Delsart⁵⁵, C. Deluca¹⁴⁸, S. Demers¹⁷⁵, M. Demichev⁶⁵, B. Demirköz¹¹, J. Deng¹⁶³, S.P. Denisov¹²⁸, C. Dennis¹¹⁸, D. Derendarz³⁸, J.E. Derkaoui^{135c}, F. Derue⁷⁸, P. Dervan⁷³, K. Desch²⁰, E. Devetak¹⁴⁸, P.O. Deviveiros¹⁵⁸, A. Dewhurst¹²⁹, B. DeWilde¹⁴⁸, S. Dhaliwal¹⁵⁸, R. Dhullipudi^{24,m}, A. Di Ciaccio^{133a,133b}, L. Di Ciaccio⁴, A. Di Girolamo²⁹, B. Di Girolamo²⁹, S. Di Luise^{134a,134b}, A. Di Mattia⁸⁸, R. Di Nardo^{133a,133b}, A. Di Simone^{133a,133b}, R. Di Sipio^{19a,19b}, M.A. Diaz^{31a}, F. Diblen^{18c}, E.B. Diehl⁸⁷, H. Dietl⁹⁹, J. Dietrich⁴⁸, T.A. Dietzsch^{58a}, S. Diglio¹¹⁵, K. Dindar Yagci³⁹, J. Dingfelder²⁰, C. Dionisi^{132a,132b}, P. Dita^{25a}, S. Dita^{25a}, F. Dittus²⁹, F. Djama⁸³, R. Djilkibaev¹⁰⁸, T. Djobava⁵¹, M.A.B. do Vale^{23a}, A. Do Valle Wemans^{124a}, T.K.O. Doan⁴, M. Dobbs⁸⁵, R. Dobinson^{29,*}, D. Dobos⁴², E. Dobson²⁹, M. Dobson¹⁶³, J. Dodd³⁴, O.B. Dogan^{18a,*}, C. Doglioni¹¹⁸, T. Doherty⁵³, Y. Doi^{66,*}, J. Dolejsi¹²⁶, I. Dolenc⁷⁴, Z. Dolezal¹²⁶, B.A. Dolgoshein⁹⁶, T. Dohmae¹⁵⁵, M. Donadelli^{23b}, M. Donega¹²⁰, J. Donini⁵⁵, J. Dopke¹⁷⁴, A. Doria^{102a}, A. Dos Anjos¹⁷², M. Dosil¹¹, A. Dotti^{122a,122b}, M.T. Dova⁷⁰, J.D. Dowell¹⁷, A.D. Doxiadis¹⁰⁵, A.T. Doyle⁵³, Z. Drasal¹²⁶, J. Drees¹⁷⁴, N. Dressnandt¹²⁰, H. Drevermann²⁹, C. Driouichi³⁵, M. Dris⁹, J.G. Drohan⁷⁷, J. Dubbert⁹⁹, T. Dubbs¹³⁷, S. Dube¹⁴, E. Duchovni¹⁷¹, G. Duckeck⁹⁸, A. Dudarev²⁹, F. Dudziak¹¹⁵, M. Dührssen²⁹, I.P. Duerdoth⁸², L. Duflot¹¹⁵, M-A. Dufour⁸⁵, M. Dunford²⁹, H. Duran Yildiz^{3b}, R. Duxfield¹³⁹, M. Dwuznik³⁷, F. Dydak²⁹, D. Dzahini⁵⁵, M. Düren⁵², J. Ebke⁹⁸, S. Eckert⁴⁸, S. Eckweiler⁸¹, K. Edmonds⁸¹, C.A. Edwards⁷⁶, I. Efthymiopoulos⁴⁹, W. Ehrenfeld⁴¹, T. Ehrich⁹⁹, T. Eifert²⁹, G. Eigen¹³, K. Einsweiler¹⁴, E. Eisenhandler⁷⁵, T. Ekelof¹⁶⁶, M. El Kacimi⁴, M. Ellert¹⁶⁶, S. Elles⁴, F. Ellinghaus⁸¹, K. Ellis⁷⁵,

N. Ellis²⁹, J. Elmsheuser⁹⁸, M. Elsing²⁹, R. Ely¹⁴, D. Emeliyanov¹²⁹, R. Engelmann¹⁴⁸, A. Engl⁹⁸, B. Epp⁶², A. Eppig⁸⁷, J. Erdmann⁵⁴, A. Ereditato¹⁶, D. Eriksson^{146a}, J. Ernst¹, M. Ernst²⁴, J. Ernwein¹³⁶, D. Errede¹⁶⁵, S. Errede¹⁶⁵, E. Ertel⁸¹, M. Escalier¹¹⁵, C. Escobar¹⁶⁷, X. Espinal Curull¹¹, B. Esposito⁴⁷, F. Etienne⁸³, A.I. Etievre¹³⁶, E. Etzion¹⁵³, D. Evangelakou⁵⁴, H. Evans⁶¹, L. Fabbri^{19a,19b}, C. Fabre²⁹, K. Facius³⁵, R.M. Fakhrutdinov¹²⁸, S. Falciano^{132a}, A.C. Falou¹¹⁵, Y. Fang¹⁷², M. Fanti^{89a,89b}, A. Farbin⁷, A. Farilla^{134a}, J. Farley¹⁴⁸, T. Farooque¹⁵⁸, S.M. Farrington¹¹⁸, P. Farthouat²⁹, D. Fasching¹⁷², P. Fassnacht²⁹, D. Fassouliotis⁸, B. Fatholahzadeh¹⁵⁸, A. Favareto^{89a,89b}, L. Fayard¹¹⁵, S. Fazio^{36a,36b}, R. Febbraro³³, P. Federic^{144a}, O.L. Fedin¹²¹, I. Fedorko²⁹, W. Fedorko⁸⁸, M. Fehling-Kaschek⁴⁸, L. Feligioni⁸³, D. Fellmann⁵, C.U. Felzmann⁸⁶, C. Feng^{32d}, E.J. Feng³⁰, A.B. Fenyuk¹²⁸, J. Ferencei^{144b}, D. Ferguson¹⁷², J. Ferland⁹³, B. Fernandes^{124a,n}, W. Fernando¹⁰⁹, S. Ferrag⁵³, J. Ferrando¹¹⁸, V. Ferrara⁴¹, A. Ferrari¹⁶⁶, P. Ferrari¹⁰⁵, R. Ferrari^{119a}, A. Ferrer¹⁶⁷, M.L. Ferrer⁴⁷, D. Ferrere⁴⁹, C. Ferretti⁸⁷, A. Ferretto Parodi^{50a,50b}, M. Fiascaris³⁰, F. Fiedler⁸¹, A. Filipčić⁷⁴, A. Filippas⁹, F. Filthaut¹⁰⁴, M. Fincke-Keeler¹⁶⁹, M.C.N. Fiolhais^{124a,h}, L. Fiorini¹¹, A. Firan³⁹, G. Fischer⁴¹, P. Fischer²⁰, M.J. Fisher¹⁰⁹, S.M. Fisher¹²⁹, J. Flammer²⁹, M. Flechl⁴⁸, I. Fleck¹⁴¹, J. Fleckner⁸¹, P. Fleischmann¹⁷³, S. Fleischmann²⁰, T. Flick¹⁷⁴, L.R. Flores Castillo¹⁷², M.J. Flowerdew⁹⁹, F. Föhlich^{58a}, M. Fokitis⁹, T. Fonseca Martin¹⁶, D.A. Forbush¹³⁸, A. Formica¹³⁶, A. Forti⁸², D. Fortin^{159a}, J.M. Foster⁸², D. Fournier¹¹⁵, A. Foussat²⁹, A.J. Fowler⁴⁴, K. Fowler¹³⁷, H. Fox⁷¹, P. Francavilla^{122a,122b}, S. Franchino^{119a,119b}, D. Francis²⁹, T. Frank¹⁷¹, M. Franklin⁵⁷, S. Franz²⁹, M. Fraternali^{119a,119b}, S. Fratina¹²⁰, S.T. French²⁷, R. Froeschl²⁹, D. Froidevaux²⁹, J.A. Frost²⁷, C. Fukunaga¹⁵⁶, E. Fullana Torregrosa²⁹, J. Fuster¹⁶⁷, C. Gabaldon²⁹, O. Gabizon¹⁷¹, T. Gadfort²⁴, S. Gadomski⁴⁹, G. Gagliardi^{50a,50b}, P. Gagnon⁶¹, C. Galea⁹⁸, E.J. Gallas¹¹⁸, M.V. Gallas²⁹, V. Gallo¹⁶, B.J. Gallop¹²⁹, P. Gallus¹²⁵, E. Galyaev⁴⁰, K.K. Gan¹⁰⁹, Y.S. Gao^{143,o}, V.A. Gapienko¹²⁸, A. Gaponenko¹⁴, F. Garbersson¹⁷⁵, M. Garcia-Sciveres¹⁴, C. García¹⁶⁷, J.E. García Navarro⁴⁹, R.W. Gardner³⁰, N. Garelli²⁹, H. Garitaonandia¹⁰⁵, V. Garonne²⁹, J. Garvey¹⁷, C. Gatti⁴⁷, G. Gaudio^{119a}, O. Gaumer⁴⁹, B. Gaur¹⁴¹, L. Gauthier¹³⁶, I.L. Gavrilenko⁹⁴, C. Gay¹⁶⁸, G. Gaycken²⁰, J-C. Gayde²⁹, E.N. Gazis⁹, P. Ge^{32d}, C.N.P. Gee¹²⁹, Ch. Geich-Gimbel²⁰, K. Gellerstedt^{146a,146b}, C. Gemme^{50a}, M.H. Genest⁹⁸, S. Gentile^{132a,132b}, F. Georgatos⁹, S. George⁷⁶, P. Gerlach¹⁷⁴, A. Gershon¹⁵³, C. Geweniger^{58a}, H. Ghazlane^{135d}, P. Ghez⁴, N. Ghodbane³³, B. Giacobbe^{19a}, S. Giagu^{132a,132b}, V. Giakoumopoulou⁸, V. Giangiobbe^{122a,122b}, F. Gianotti²⁹, B. Gibbard²⁴, A. Gibson¹⁵⁸, S.M. Gibson²⁹, G.F. Gieraltowski⁵, L.M. Gilbert¹¹⁸, M. Gilchriese¹⁴, O. Gildemeister²⁹, V. Gilevsky⁹¹, D. Gillberg²⁸, A.R. Gillman¹²⁹, D.M. Gingrich^{2,p}, J. Ginzburg¹⁵³, N. Giokaris⁸, R. Giordano^{102a,102b}, F.M. Giorgi¹⁵, P. Giovannini⁹⁹, P.F. Giraud¹³⁶, D. Giugni^{89a}, P. Giusti^{19a}, B.K. Gjelsten¹¹⁷, L.K. Gladilin⁹⁷, C. Glasman⁸⁰, J. Glatzer⁴⁸, A. Glazov⁴¹, K.W. Glitza¹⁷⁴, G.L. Glonti⁶⁵, J. Godfrey¹⁴², J. Godlewski²⁹, M. Goebel⁴¹, T. Göpfert⁴³, C. Goeringer⁸¹, C. Gössling⁴², T. Göttfert⁹⁹, S. Goldfarb⁸⁷, D. Goldin³⁹, T. Golling¹⁷⁵, N.P. Gollub²⁹, S.N. Golovnia¹²⁸, A. Gomes^{124a,q}, L.S. Gomez Fajardo⁴¹, R. Gonçalves⁷⁶, L. Gonella²⁰, C. Gong^{32b}, A. Gonidec²⁹, S. Gonzalez¹⁷², S. González de la Hoz¹⁶⁷, M.L. Gonzalez Silva²⁶, S. Gonzalez-Sevilla⁴⁹, J.J. Goodson¹⁴⁸, L. Goossens²⁹, P.A. Gorbounov⁹⁵, H.A. Gordon²⁴, I. Gorelov¹⁰³, G. Gorfine¹⁷⁴, B. Gorini²⁹, E. Gorini^{72a,72b}, A. Gorišek⁷⁴, E. Gornicki³⁸, S.A. Gorokhov¹²⁸, B.T. Gorski²⁹, V.N. Goryachev¹²⁸, B. Gosdzik⁴¹, M. Gosselink¹⁰⁵, M.I. Gostkin⁶⁵, M. Gouanère⁴, I. Gough Eschrich¹⁶³, M. Goughri^{135a}, D. Goujdami^{135a}, M.P. Goulette⁴⁹, A.G. Goussiou¹³⁸, C. Goy⁴, I. Grabowska-Bold^{163,r}, V. Grabski¹⁷⁶, P. Grafström²⁹, C. Grah¹⁷⁴, K-J. Grah¹⁴⁷, F. Grancagnolo^{72a}, S. Grancagnolo¹⁵, V. Grassi¹⁴⁸, V. Gratchev¹²¹, N. Grau³⁴, H.M. Gray^{34,s}, J.A. Gray¹⁴⁸, E. Graziani^{134a}, O.G. Grebenyuk¹²¹, D. Greenfield¹²⁹, T. Greenshaw⁷³, Z.D. Greenwood^{24,t}, I.M. Gregor⁴¹, P. Grenier¹⁴³, E. Griesmayer⁴⁶, J. Griffiths¹³⁸, N. Grigalashvili⁶⁵, A.A. Grillo¹³⁷, K. Grimm¹⁴⁸, S. Grinstein¹¹, P.L.Y. Gris³³, Y.V. Grishkevich⁹⁷, J.-F. Grivaz¹¹⁵, J. Grognuz²⁹, M. Groh⁹⁹, E. Gross¹⁷¹, J. Grosse-Knetter⁵⁴, J. Groth-Jensen⁷⁹, M. Gruwe²⁹, K. Grybel¹⁴¹, V.J. Guarino⁵, C. Guichenev³³, A. Guida^{72a,72b}, T. Guillemain⁴, S. Guindon⁵⁴, H. Guler^{85,u}, J. Gunther¹²⁵, B. Guo¹⁵⁸, J. Guo³⁴, A. Gupta³⁰, Y. Gusakov⁶⁵, V.N. Gushchin¹²⁸, A. Gutierrez⁹³, P. Gutierrez¹¹¹, N. Guttman¹⁵³, O. Gutzwiller¹⁷², C. Guyot¹³⁶, C. Gwenlan¹¹⁸, C.B. Gwilliam⁷³, A. Haas¹⁴³, S. Haas²⁹, C. Haber¹⁴, R. Hackenburg²⁴, H.K. Hadavand³⁹, D.R. Hadley¹⁷, P. Haefner⁹⁹, F. Hahn²⁹, S. Haider²⁹, Z. Hajduk³⁸, H. Hakobyan¹⁷⁶, J. Haller^{54,v}, K. Hamacher¹⁷⁴, A. Hamilton⁴⁹, S. Hamilton¹⁶¹, H. Han^{32a}, L. Han^{32b}, K. Hanagaki¹¹⁶, M. Hance¹²⁰, C. Handel⁸¹, P. Hanke^{58a}, C.J. Hansen¹⁶⁶, J.R. Hansen³⁵, J.B. Hansen³⁵, J.D. Hansen³⁵, P.H. Hansen³⁵, P. Hansson¹⁴³, K. Hara¹⁶⁰, G.A. Hare¹³⁷, T. Harenberg¹⁷⁴, D. Harper⁸⁷, R.D. Harrington²¹, O.M. Harris¹³⁸, K. Harrison¹⁷, J.C. Hart¹²⁹, J. Hartert⁴⁸, F. Hartjes¹⁰⁵, T. Haruyama⁶⁶, A. Harvey⁵⁶, S. Hasegawa¹⁰¹, Y. Hasegawa¹⁴⁰, S. Hassani¹³⁶, M. Hatch²⁹, D. Hauff⁹⁹, S. Haug¹⁶, M. Hauschild²⁹, R. Hauser⁸⁸, M. Havranek¹²⁵, B.M. Hawes¹¹⁸, C.M. Hawkes¹⁷, R.J. Hawkings²⁹, D. Hawkins¹⁶³, T. Hayakawa⁶⁷, D. Hayden⁷⁶, H.S. Hayward⁷³, S.J. Haywood¹²⁹, E. Hazen²¹, M. He^{32d}, S.J. Head¹⁷, V. Hedberg⁷⁹, L. Heelan²⁸, S. Heim⁸⁸, B. Heinemann¹⁴, S. Heisterkamp³⁵, L. Helary⁴, M. Heldmann⁴⁸, M. Heller¹¹⁵, S. Hellman^{146a,146b}, C. Hensens¹¹, R.C.W. Henderson⁷¹, M. Henke^{58a}, A. Henrichs⁵⁴, A.M. Henriques Correia²⁹, S. Henrot-Versille¹¹⁵, F. Henry-Couannier⁸³, C. Hensel⁵⁴, T. Henß¹⁷⁴, Y. Hernández Jiménez¹⁶⁷, R. Herrberg¹⁵, A.D. Hershshorn¹⁵², G. Herten⁴⁸, R. Hertenberger⁹⁸, L. Hervas²⁹, N.P. Hessey¹⁰⁵, A. Hidvegi^{146a}, E. Higón-Rodriguez¹⁶⁷, D. Hill^{5,*},

J.C. Hill²⁷, N. Hill⁵, K.H. Hiller⁴¹, S. Hillert²⁰, S.J. Hillier¹⁷, I. Hinchliffe¹⁴, E. Hines¹²⁰, M. Hirose¹¹⁶, F. Hirsch⁴², D. Hirschbuehl¹⁷⁴, J. Hobbs¹⁴⁸, N. Hod¹⁵³, M.C. Hodgkinson¹³⁹, P. Hodgson¹³⁹, A. Hoecker²⁹, M.R. Hoferkamp¹⁰³, J. Hoffman³⁹, D. Hoffmann⁸³, M. Hohlfield⁸¹, M. Holder¹⁴¹, A. Holmes¹¹⁸, S.O. Holmgren^{146a}, T. Holy¹²⁷, J.L. Holzbauer⁸⁸, R.J. Homer¹⁷, Y. Homma⁶⁷, T. Horazdovsky¹²⁷, C. Horn¹⁴³, S. Horner⁴⁸, K. Horton¹¹⁸, J.-Y. Hostachy⁵⁵, T. Hott⁹⁹, S. Hou¹⁵¹, M.A. Houlden⁷³, A. Houmada^{135a}, J. Howarth⁸², D.F. Howell¹¹⁸, I. Hristova⁴¹, J. Hrivnac¹¹⁵, I. Hruska¹²⁵, T. Hryn'ova⁴, P.J. Hsu¹⁷⁵, S.-C. Hsu¹⁴, G.S. Huang¹¹¹, Z. Hubacek¹²⁷, F. Hubaut⁸³, F. Huegging²⁰, T.B. Huffman¹¹⁸, E.W. Hughes³⁴, G. Hughes⁷¹, R.E. Hughes-Jones⁸², M. Huhtinen²⁹, P. Hurst⁵⁷, M. Hurwitz¹⁴, U. Husemann⁴¹, N. Huseynov¹⁰, J. Huston⁸⁸, J. Huth⁵⁷, G. Iacobucci^{102a}, G. Iakovidis⁹, M. Ibbotson⁸², I. Ibragimov¹⁴¹, R. Ichimiya⁶⁷, L. Iconomidou-Fayard¹¹⁵, J. Idarraga¹¹⁵, M. Idzik³⁷, P. Iengo⁴, O. Igonkina¹⁰⁵, Y. Ikegami⁶⁶, M. Ikeno⁶⁶, Y. Ilchenko³⁹, D. Iliadis¹⁵⁴, D. Imbault⁷⁸, M. Imhaeuser¹⁷⁴, M. Imori¹⁵⁵, T. Ince²⁰, J. Inigo-Golfin²⁹, P. Ioannou⁸, M. Iodice^{134a}, G. Ionescu⁴, A. Irls Quiles¹⁶⁷, K. Ishii⁶⁶, A. Ishikawa⁶⁷, M. Ishino⁶⁶, R. Ishmukhametov³⁹, T. Isobe¹⁵⁵, C. Issever¹¹⁸, S. Istin^{18a}, Y. Itoh¹⁰¹, A.V. Ivashin¹²⁸, W. Iwanski³⁸, H. Iwasaki⁶⁶, J.M. Izen⁴⁰, V. Izzo^{102a}, B. Jackson¹²⁰, J.N. Jackson⁷³, P. Jackson¹⁴³, M.R. Jaekel²⁹, V. Jain⁶¹, K. Jakobs⁴⁸, S. Jakobsen³⁵, J. Jakubek¹²⁷, D.K. Jana¹¹¹, E. Jankowski¹⁵⁸, E. Jansen⁷⁷, A. Jantsch⁹⁹, M. Janus²⁰, G. Jarlskog⁷⁹, L. Jeanty⁵⁷, K. Jelen³⁷, I. Jen-La Plante³⁰, P. Jenni²⁹, A. Jeremie⁴, P. Jež³⁵, S. Jézéquel⁴, H. Ji¹⁷², W. Ji⁸¹, Y. Jiang^{32b}, M. Jimenez Belenguer²⁹, G. Jin^{32b}, S. Jin^{32a}, O. Jinnouchi¹⁵⁷, M.D. Joergensen³⁵, D. Joffe³⁹, L.G. Johansen¹³, M. Johansen^{146a,146b}, K.E. Johansson^{146a}, P. Johansson¹³⁹, S. Johnert⁴¹, K.A. Johns⁶, K. Jon-And^{146a,146b}, G. Jones⁸², R.W.L. Jones⁷¹, T.W. Jones⁷⁷, T.J. Jones⁷³, O. Jonsson²⁹, K.K. Joo^{158,w}, C. Joram²⁹, P.M. Jorge^{124a,b}, J. Joseph¹⁴, X. Ju¹³⁰, V. Juranek¹²⁵, P. Jussel⁶², V.V. Kabachenko¹²⁸, S. Kabana¹⁶, M. Kaci¹⁶⁷, A. Kaczmarek³⁸, P. Kadlecik³⁵, M. Kado¹¹⁵, H. Kagan¹⁰⁹, M. Kagan⁵⁷, S. Kaiser⁹⁹, E. Kajomovitz¹⁵², S. Kalinin¹⁷⁴, L.V. Kalinovskaya⁶⁵, S. Kama³⁹, N. Kanaya¹⁵⁵, M. Kaneda¹⁵⁵, T. Kanno¹⁵⁷, V.A. Kantserov⁹⁶, J. Kanzaki⁶⁶, B. Kaplan¹⁷⁵, A. Kapliy³⁰, J. Kaplon²⁹, D. Kar⁴³, M. Karagoz¹¹⁸, M. Karnevskiy⁴¹, K. Karr⁵, V. Kartvelishvili⁷¹, A.N. Karyukhin¹²⁸, L. Kashif⁵⁷, A. Kasmi³⁹, R.D. Kass¹⁰⁹, A. Kastanas¹³, M. Kataoka⁴, Y. Kataoka¹⁵⁵, E. Katsoufis⁹, J. Katzy⁴¹, V. Kaushik⁶, K. Kawagoe⁶⁷, T. Kawamoto¹⁵⁵, G. Kawamura⁸¹, M.S. Kayl¹⁰⁵, V.A. Kazanin¹⁰⁷, M.Y. Kazarinov⁶⁵, S.I. Kazi⁸⁶, J.R. Keates⁸², R. Keeler¹⁶⁹, R. Kehoe³⁹, M. Keil⁵⁴, G.D. Kekelidze⁶⁵, M. Kelly⁸², J. Kennedy⁹⁸, C.J. Kenney¹⁴³, M. Kenyon⁵³, O. Kepka¹²⁵, N. Kerschen²⁹, B.P. Kerševan⁷⁴, S. Kersten¹⁷⁴, K. Kessoku¹⁵⁵, C. Ketterer⁴⁸, M. Khakzad²⁸, F. Khalil-zada¹⁰, H. Khandanyan¹⁶⁵, A. Khanov¹¹², D. Kharchenko⁶⁵, A. Khodinov¹⁴⁸, A.G. Kholodenko¹²⁸, A. Khomich^{58a}, T.J. Khoo²⁷, G. Khoriauli²⁰, N. Khovanskiy⁶⁵, V. Khovanskiy⁹⁵, E. Khramov⁶⁵, J. Khubua⁵¹, G. Kilvington⁷⁶, H. Kim⁷, M.S. Kim², P.C. Kim¹⁴³, S.H. Kim¹⁶⁰, N. Kimura¹⁷⁰, O. Kind¹⁵, B.T. King⁷³, M. King⁶⁷, R.S.B. King¹¹⁸, J. Kirk¹²⁹, G.P. Kirsch¹¹⁸, L.E. Kirsch²², A.E. Kiryunin⁹⁹, D. Kisielewska³⁷, T. Kittelmann¹²³, A.M. Kiver¹²⁸, H. Kiyamura⁶⁷, E. Kladiva^{144b}, J. Klamber-Lodewigs⁴², M. Klein⁷³, U. Klein⁷³, K. Kleinknecht⁸¹, M. Klemetti⁸⁵, A. Klier¹⁷¹, A. Klimentov²⁴, R. Klingenberg⁴², E.B. Klinkby³⁵, T. Kliutchnikova²⁹, P.F. Klok¹⁰⁴, S. Klous¹⁰⁵, E.-E. Kluge^{58a}, T. Kluge⁷³, P. Kluit¹⁰⁵, S. Kluth⁹⁹, E. Kneringer⁶², J. Knobloch²⁹, A. Knue⁵⁴, B.R. Ko⁴⁴, T. Kobayashi¹⁵⁵, M. Kobel⁴³, B. Koblitz²⁹, M. Kocian¹⁴³, A. Kocnar¹¹³, P. Kodys¹²⁶, K. Köneke²⁹, A.C. König¹⁰⁴, S. Koenig⁸¹, S. König⁴⁸, L. Köpke⁸¹, F. Koetsveld¹⁰⁴, P. Koevesarki²⁰, T. Koffas²⁹, E. Koffeman¹⁰⁵, F. Kohn⁵⁴, Z. Kohout¹²⁷, T. Kohriki⁶⁶, T. Koi¹⁴³, T. Kokott²⁰, G.M. Kolachev¹⁰⁷, H. Kolanoski¹⁵, V. Kolesnikov⁶⁵, I. Koletsou^{89a,89b}, J. Koll⁸⁸, D. Kollar²⁹, M. Kollefrath⁴⁸, S.D. Kolya⁸², A.A. Komar⁹⁴, J.R. Komaragiri¹⁴², T. Kondo⁶⁶, T. Kono^{41,x}, A.I. Kononov⁴⁸, R. Konoplich^{108,y}, N. Konstantinidis⁷⁷, A. Kootz¹⁷⁴, S. Koperny³⁷, S.V. Kopikov¹²⁸, K. Korcyl³⁸, K. Kordas¹⁵⁴, V. Koreshev¹²⁸, A. Korn¹⁴, A. Korol¹⁰⁷, I. Korolkov¹¹, E.V. Korolkova¹³⁹, V.A. Korotkov¹²⁸, O. Kortner⁹⁹, S. Kortner⁹⁹, V.V. Kostyukhin²⁰, M.J. Kotamäki²⁹, S. Kotov⁹⁹, V.M. Kotov⁶⁵, C. Kourkoumelis⁸, A. Koutsman¹⁰⁵, R. Kowalewski¹⁶⁹, T.Z. Kowalski³⁷, W. Kozanecki¹³⁶, A.S. Kozhin¹²⁸, V. Kral¹²⁷, V.A. Kramarenko⁹⁷, G. Kramberger⁷⁴, O. Krasel⁴², M.W. Krasny⁷⁸, A. Krasznahorkay¹⁰⁸, J. Kraus⁸⁸, A. Kreisel¹⁵³, F. Krejci¹²⁷, J. Kretschmar⁷³, N. Krieger⁵⁴, P. Krieger¹⁵⁸, K. Kroeninger⁵⁴, H. Kroha⁹⁹, J. Kroll¹²⁰, J. Kroseberg²⁰, J. Krstic^{12a}, U. Kruchonak⁶⁵, H. Krüger²⁰, Z.V. Krumshteyn⁶⁵, A. Kruth²⁰, T. Kubota¹⁵⁵, S. Kuehn⁴⁸, A. Kugel^{58c}, T. Kuhl¹⁷⁴, D. Kuhn⁶², V. Kukhtin⁶⁵, Y. Kulchitsky⁹⁰, S. Kuleshov^{31b}, C. Kummer⁹⁸, M. Kuna⁸³, N. Kundu¹¹⁸, J. Kunkle¹²⁰, A. Kupco¹²⁵, H. Kurashige⁶⁷, M. Kurata¹⁶⁰, Y.A. Kurochkin⁹⁰, V. Kus¹²⁵, W. Kuykendall¹³⁸, M. Kuze¹⁵⁷, P. Kuzhir⁹¹, O. Kvasnicka¹²⁵, R. Kwee¹⁵, A. La Rosa²⁹, L. La Rotonda^{36a,36b}, L. Labarga⁸⁰, J. Labbe⁴, C. Lacasta¹⁶⁷, F. Lacava^{132a,132b}, H. Lacker¹⁵, D. Lacour⁷⁸, V.R. Lacuesta¹⁶⁷, E. Ladygin⁶⁵, R. Lafaye⁴, B. Laforge⁷⁸, T. Lagouri⁸⁰, S. Lai⁴⁸, E. Laisne⁵⁵, M. Lamanna²⁹, C.L. Lampen⁶, W. Lampl¹⁶, E. Lancon¹³⁶, U. Landgraf⁴⁸, M.P.J. Landon⁷⁵, H. Landsman¹⁵², J.L. Lane⁸², C. Lange⁴¹, A.J. Lankford¹⁶³, F. Lanni²⁴, K. Lantzsche²⁹, V.V. Lapin^{128,*}, S. Laplace⁴, C. Lapoire²⁰, J.F. Laporte¹³⁶, T. Lari^{89a}, A.V. Larionov¹²⁸, A. Lerner¹¹⁸, C. Lasseur²⁹, M. Lassnig²⁹, W. Lau¹¹⁸, P. Laurelli⁴⁷, A. Lavorato¹¹⁸, W. Lavrijsen¹⁴, P. Laycock⁷³, A.B. Lazarev⁶⁵, A. Lazzaro^{89a,89b}, O. Le Dortz⁷⁸, E. Le Guirriec⁸³, C. Le Maner¹⁵⁸, E. Le Menedeu¹³⁶, M. Leahu²⁹, A. Lebedev⁶⁴, C. Lebel⁹³, T. LeCompte⁵, F. Ledroit-Guillon⁵⁵, H. Lee¹⁰⁵, J.S.H. Lee¹⁵⁰, S.C. Lee¹⁵¹, L. Lee JR¹⁷⁵, M. Lefebvre¹⁶⁹, M. Legendre¹³⁶, A. Leger⁴⁹, B.C. LeGeyt¹²⁰, F. Legger⁹⁸,

C. Leggett¹⁴, M. Lehmacher²⁰, G. Lehmann Miotto²⁹, M. Lehto¹³⁹, X. Lei⁶, M.A.L. Leite^{23b}, R. Leitner¹²⁶, D. Lellouch¹⁷¹, J. Lellouch⁷⁸, M. Leltchouk³⁴, V. Lendermann^{58a}, K.J.C. Leney^{145b}, T. Lenz¹⁷⁴, G. Lenzen¹⁷⁴, B. Lenzi¹³⁶, K. Leonhardt⁴³, C. Leroy⁹³, J-R. Lessard¹⁶⁹, J. Lesser^{146a}, C.G. Lester²⁷, A. Leung Fook Cheong¹⁷², J. Levêque⁸³, D. Levin⁸⁷, L.J. Levinson¹⁷¹, M.S. Levitski¹²⁸, M. Lewandowska²¹, M. Leyton¹⁵, B. Li⁸³, H. Li¹⁷², S. Li^{32b}, X. Li⁸⁷, Z. Liang³⁹, Z. Liang^{118,z}, B. Liberti^{133a}, P. Lichard²⁹, M. Lichtnecker⁹⁸, K. Lie¹⁶⁵, W. Liebig¹³, R. Lifshitz¹⁵², J.N. Lilley¹⁷, A. Limosani⁸⁶, M. Limper⁶³, S.C. Lin^{151,aa}, F. Linde¹⁰⁵, J.T. Linnemann⁸⁸, E. Lipeles¹²⁰, L. Lipinsky¹²⁵, A. Lipniacka¹³, T.M. Liss¹⁶⁵, A. Lister⁴⁹, A.M. Litke¹³⁷, C. Liu²⁸, D. Liu^{151,ab}, H. Liu⁸⁷, J.B. Liu⁸⁷, M. Liu^{32b}, S. Liu², Y. Liu^{32b}, M. Livan^{119a,119b}, S.S.A. Livermore¹¹⁸, A. Lleres⁵⁵, S.L. Lloyd⁷⁵, E. Lobodzinska⁴¹, P. Loch⁶, W.S. Lockman¹³⁷, S. Lockwitz¹⁷⁵, T. Lodenkoetter²⁰, F.K. Loebinger⁸², A. Loginov¹⁷⁵, C.W. Loh¹⁶⁸, T. Lohse¹⁵, K. Lohwasser⁴⁸, M. Lokajicek¹²⁵, J. Loken¹¹⁸, V.P. Lombardo^{89a,89b}, R.E. Long⁷¹, L. Lopes^{124a,b}, D. Lopez Mateos^{34,ac}, M. Losada¹⁶², P. Loscutoff¹⁴, F. Losterzo^{132a,132b}, M.J. Losty^{159a}, X. Lou⁴⁰, A. Lounis¹¹⁵, K.F. Loureiro¹⁶², J. Love²¹, P.A. Love⁷¹, A.J. Lowe¹⁴³, F. Lu^{32a}, J. Lu², L. Lu³⁹, H.J. Lubatti¹³⁸, C. Luci^{132a,132b}, A. Lucotte⁵⁵, A. Ludwig⁴³, D. Ludwig⁴¹, I. Ludwig⁴⁸, J. Ludwig⁴⁸, F. Luehring⁶¹, G. Luijckx¹⁰⁵, D. Lumb⁴⁸, L. Luminari^{132a}, E. Lund¹¹⁷, B. Lund-Jensen¹⁴⁷, B. Lundberg⁷⁹, J. Lundberg²⁹, J. Lundquist³⁵, M. Lungwitz⁸¹, A. Lupi^{122a,122b}, G. Lutz⁹⁹, D. Lynn²⁴, J. Lys¹⁴, E. Lytken⁷⁹, H. Ma²⁴, L.L. Ma¹⁷², M. Maaßen⁴⁸, J.A. Macana Goia⁹³, G. Maccarrone⁴⁷, A. Macchiolo⁹⁹, B. Maček⁷⁴, J. Machado Miguens^{124a,b}, D. Macina⁴⁹, R. Mackeprang³⁵, R.J. Madaras¹⁴, W.F. Mader⁴³, R. Maenner^{58c}, T. Maeno²⁴, P. Mättig¹⁷⁴, S. Mättig⁴¹, P.J. Magalhaes Martins^{124a,h}, L. Magnoni²⁹, E. Magradze⁵¹, C.A. Magrath¹⁰⁴, Y. Mahalalel¹⁵³, K. Mahboubi⁴⁸, G. Mahout¹⁷, C. Maiani^{132a,132b}, C. Maidantchik^{23a}, A. Maio^{124a,q}, S. Majewski²⁴, Y. Makida⁶⁶, N. Makovec¹¹⁵, P. Mal⁶, Pa. Malecki³⁸, P. Malecki³⁸, V.P. Maleev¹²¹, F. Malek⁵⁵, U. Mallik⁶³, D. Malon⁵, S. Maltezos⁹, V. Malyshev¹⁰⁷, S. Malyukov⁶⁵, R. Mameghani⁹⁸, J. Mamuzic^{12b}, A. Manabe⁶⁶, L. Mandelli^{89a}, I. Mandić⁷⁴, R. Mandrysch¹⁵, J. Maneira^{124a}, P.S. Mangeard⁸⁸, I.D. Manjavidze⁶⁵, A. Mann⁵⁴, P.M. Manning¹³⁷, A. Manousakis-Katsikakis⁸, B. Mansoulie¹³⁶, A. Manz⁹⁹, A. Mapelli²⁹, L. Mapelli²⁹, L. March⁸⁰, J.F. Marchand²⁹, F. Marchese^{133a,133b}, M. Marchesotti²⁹, G. Marchiori⁷⁸, M. Marcisovsky¹²⁵, A. Marin^{21,*}, C.P. Marino⁶¹, F. Marroquim^{23a}, R. Marshall⁸², Z. Marshall^{34,ac}, F.K. Martens¹⁵⁸, S. Marti-Garcia¹⁶⁷, A.J. Martin¹⁷⁵, B. Martin²⁹, B. Martin⁸⁸, F.F. Martin¹²⁰, J.P. Martin⁹³, Ph. Martin⁵⁵, T.A. Martin¹⁷, B. Martin dit Latour⁴⁹, M. Martinez¹¹, V. Martinez Outschoorn⁵⁷, A.C. Martyniuk⁸², M. Marx⁸², F. Marzano^{132a}, A. Marzin¹¹¹, L. Masetti⁸¹, T. Mashimo¹⁵⁵, R. Mashinistov⁹⁴, J. Masik⁸², A.L. Maslennikov¹⁰⁷, M. Maß⁴², I. Massa^{19a,19b}, G. Massaro¹⁰⁵, N. Massol⁴, A. Mastroberardino^{36a,36b}, T. Masubuchi¹⁵⁵, M. Mathes²⁰, P. Matricon¹¹⁵, H. Matsumoto¹⁵⁵, H. Matsunaga¹⁵⁵, T. Matsushita⁶⁷, C. Mattravers^{118,ad}, J.M. Maugain²⁹, S.J. Maxfield⁷³, E.N. May⁵, A. Mayne¹³⁹, R. Mazini¹⁵¹, M. Mazur²⁰, M. Mazzanti^{89a}, E. Mazzoni^{122a,122b}, S.P. Mc Kee⁸⁷, A. McCarn¹⁶⁵, R.L. McCarthy¹⁴⁸, T.G. McCarthy²⁸, N.A. McCubbin¹²⁹, K.W. McFarlane⁵⁶, J.A. McFayden¹³⁹, H. McGlone⁵³, G. Mchedlidze⁵¹, R.A. McLaren²⁹, T. Mclaughlan¹⁷, S.J. McMahan¹²⁹, T.R. McMahan⁷⁶, T.J. McMahan¹⁷, R.A. McPherson^{169,k}, A. Meade⁸⁴, J. Mechnich¹⁰⁵, M. Mechtel¹⁷⁴, M. Medinnis⁴¹, R. Meera-Lebbai¹¹¹, T. Meguro¹¹⁶, R. Mehdiyev⁹³, S. Mehlhase⁴¹, A. Mehta⁷³, K. Meier^{58a}, J. Meinhardt⁴⁸, B. Meirose⁷⁹, C. Melachrinou³⁰, B.R. Mellado Garcia¹⁷², L. Mendoza Navas¹⁶², Z. Meng^{151,ae}, A. Mengarelli^{19a,19b}, S. Menke⁹⁹, C. Menot²⁹, E. Meoni¹¹, D. Merkl⁹⁸, P. Mermod¹¹⁸, L. Merola^{102a,102b}, C. Meroni^{89a}, F.S. Merritt³⁰, A. Messina²⁹, J. Metcalfe¹⁰³, A.S. Mete⁶⁴, S. Meuser²⁰, C. Meyer⁸¹, J-P. Meyer¹³⁶, J. Meyer¹⁷³, J. Meyer⁵⁴, T.C. Meyer²⁹, W.T. Meyer⁶⁴, J. Miao^{32d}, S. Michal²⁹, L. Micu^{25a}, R.P. Middleton¹²⁹, P. Miele²⁹, S. Migas⁷³, L. Mijović⁴¹, G. Mikenberg¹⁷¹, M. Mikestikova¹²⁵, B. Mikulec⁴⁹, M. Mikuž⁷⁴, D.W. Miller¹⁴³, R.J. Miller⁸⁸, W.J. Mills¹⁶⁸, C. Mills⁵⁷, A. Milov¹⁷¹, D.A. Milstead^{146a,146b}, D. Milstein¹⁷¹, A.A. Minaenko¹²⁸, M. Miñano¹⁶⁷, I.A. Minashvili⁶⁵, A.I. Mincer¹⁰⁸, B. Mindur³⁷, M. Mineev⁶⁵, Y. Ming¹³⁰, L.M. Mir¹¹, G. Mirabelli^{132a}, L. Miralles Verge¹¹, A. Misiejuk⁷⁶, A. Mitra¹¹⁸, J. Mitrevski¹³⁷, G.Y. Mitrofanov¹²⁸, V.A. Mitsou¹⁶⁷, S. Mitsui⁶⁶, P.S. Miyagawa⁸², K. Miyazaki⁶⁷, J.U. Mjörnmark⁷⁹, T. Moa^{146a,146b}, P. Mockett¹³⁸, S. Moed⁵⁷, V. Moeller²⁷, K. Mönig⁴¹, N. Möser²⁰, S. Mohapatra¹⁴⁸, B. Mohn¹³, W. Mohr⁴⁸, S. Mohrdieck-Möck⁹⁹, A.M. Moisseev^{128,*}, R. Moles-Valls¹⁶⁷, J. Molina-Perez²⁹, L. Moneta⁴⁹, J. Monk⁷⁷, E. Monnier⁸³, S. Montesano^{89a,89b}, F. Monticelli⁷⁰, S. Monzani^{19a,19b}, R.W. Moore², G.F. Moorhead⁸⁶, C. Mora Herrera⁴⁹, A. Moraes⁵³, A. Morais^{124a,b}, N. Morange¹³⁶, J. Morel⁵⁴, G. Morello^{36a,36b}, D. Moreno⁸¹, M. Moreno Llácer¹⁶⁷, P. Morettini^{50a}, M. Morij⁵⁷, J. Morin⁷⁵, Y. Morita⁶⁶, A.K. Morley²⁹, G. Mornacchi²⁹, M-C. Morone⁴⁹, J.D. Morris⁷⁵, H.G. Moser⁹⁹, M. Mosidze⁵¹, J. Moss¹⁰⁹, R. Mount¹⁴³, E. Mountricha⁹, S.V. Mouraviev⁹⁴, E.J.W. Moyse⁸⁴, M. Mudrinic^{12b}, F. Mueller^{58a}, J. Mueller¹²³, K. Mueller²⁰, T.A. Müller⁹⁸, D. Muenstermann⁴², A. Muijs¹⁰⁵, A. Muir¹⁶⁸, Y. Munwes¹⁵³, K. Murakami⁶⁶, W.J. Murray¹²⁹, I. Mussche¹⁰⁵, E. Musto^{102a,102b}, A.G. Myagkov¹²⁸, M. Myska¹²⁵, J. Nadal¹¹, K. Nagai¹⁶⁰, K. Nagano⁶⁶, Y. Nagasaka⁶⁰, A.M. Nairz²⁹, Y. Nakahama¹¹⁵, K. Nakamura¹⁵⁵, I. Nakano¹¹⁰, G. Nanava²⁰, A. Napier¹⁶¹, M. Nash^{77,af}, I. Nasteva⁸², N.R. Nation²¹, T. Nattermann²⁰, T. Naumann⁴¹, G. Navarro¹⁶², H.A. Neal⁸⁷, E. Nebot⁸⁰, P. Nechaeva⁹⁴, A. Negri^{119a,119b}, G. Negri²⁹, S. Nektarijevic⁴⁹, A. Nelson⁶⁴, S. Nelson¹⁴³, T.K. Nelson¹⁴³, S. Nemecek¹²⁵,

P. Nemethy¹⁰⁸, A.A. Nepomuceno^{23a}, M. Nessi²⁹, S.Y. Nesterov¹²¹, M.S. Neubauer¹⁶⁵, A. Neusiedl⁸¹, R.M. Neves¹⁰⁸, P. Nevski²⁴, P.R. Newman¹⁷, R.B. Nickerson¹¹⁸, R. Nicolaidou¹³⁶, L. Nicolas¹³⁹, B. Nicquevert²⁹, F. Niedercorn¹¹⁵, J. Nielsen¹³⁷, T. Niinikoski²⁹, A. Nikiforov¹⁵, V. Nikolaenko¹²⁸, K. Nikolaev⁶⁵, I. Nikolic-Audit⁷⁸, K. Nikolopoulos²⁴, H. Nilsen⁴⁸, P. Nilsson⁷, Y. Ninomiya¹⁵⁵, A. Nisati^{132a}, T. Nishiyama⁶⁷, R. Nisius⁹⁹, L. Nodulman⁵, M. Nomachi¹¹⁶, I. Nomidis¹⁵⁴, H. Nomoto¹⁵⁵, M. Nordberg²⁹, B. Nordkvist^{146a,146b}, O. Norriella Francisco¹¹, P.R. Norton¹²⁹, J. Novakova¹²⁶, M. Nozaki⁶⁶, M. Nožička⁴¹, I.M. Nugent^{159a}, A.-E. Nuncio-Quiroz²⁰, G. Nunes Hanninger²⁰, T. Nunnemann⁹⁸, E. Nurse⁷⁷, T. Nyman²⁹, B.J. O'Brien⁴⁵, S.W. O'Neale^{17,*}, D.C. O'Neil¹⁴², V. O'Shea⁵³, F.G. Oakham^{28,ag}, H. Oberlack⁹⁹, J. Ocariz⁷⁸, A. Ochi⁶⁷, S. Oda¹⁵⁵, S. Odaka⁶⁶, J. Odier⁸³, G.A. Odino^{50a,50b}, H. Ogren⁶¹, A. Oh⁸², S.H. Oh⁴⁴, C.C. Ohm^{146a,146b}, T. Ohshima¹⁰¹, H. Ohshita¹⁴⁰, T.K. Ohsaka⁶⁶, T. Ohsugi⁵⁹, S. Okada⁶⁷, H. Okawa¹⁶³, Y. Okumura¹⁰¹, T. Okuyama¹⁵⁵, M. Olcese^{50a}, A.G. Olchevski⁶⁵, M. Oliveira^{124a,h}, D. Oliveira Damazio²⁴, E. Oliver Garcia¹⁶⁷, D. Olivito¹²⁰, A. Olszewski³⁸, J. Olszowska³⁸, C. Omachi^{67,ah}, A. Onofre^{124a,ai}, P.U.E. Onyisi³⁰, C.J. Oram^{159a}, G. Ordonez¹⁰⁴, M.J. Oreglia³⁰, F. Orellana⁴⁹, Y. Oren¹⁵³, D. Orestano^{134a,134b}, I. Orlov¹⁰⁷, C. Oropeza Barrera⁵³, R.S. Orr¹⁵⁸, E.O. Ortega¹³⁰, B. Osculati^{50a,50b}, R. Ospanov¹²⁰, C. Osuna¹¹, G. Otero y Garzon²⁶, J.P. Ottersbach¹⁰⁵, M. Ouchrif^{135c}, F. Ould-Saada¹¹⁷, A. Ouraou¹³⁶, Q. Ouyang^{32a}, M. Owen⁸², S. Owen¹³⁹, A. Oyarzun^{31b}, O.K. Øye¹³, V.E. Ozcan⁷⁷, N. Ozturk⁷, A. Pacheco Pages¹¹, C. Padilla Aranda¹¹, E. Paganis¹³⁹, F. Paige²⁴, K. Pajchel¹¹⁷, S. Palestini²⁹, D. Pallin³³, A. Palma^{124a,b}, J.D. Palmer¹⁷, Y.B. Pan¹⁷², E. Panagiotopoulou⁹, B. Panes^{31a}, N. Panikashvili⁸⁷, S. Panitkin²⁴, D. Pantea^{25a}, M. Panuskova¹²⁵, V. Paolone¹²³, A. Paoloni^{133a,133b}, Th.D. Papadopoulou⁹, A. Paramonov⁵, S.J. Park⁵⁴, W. Park^{24,aj}, M.A. Parker²⁷, F. Parodi^{50a,50b}, J.A. Parsons³⁴, U. Parzefall⁴⁸, E. Pasqualucci^{132a}, A. Passeri^{134a}, F. Pastore^{134a,134b}, Fr. Pastore²⁹, G. Pásztor^{49,ak}, S. Patarai¹⁷², N. Patel¹⁵⁰, J.R. Pater⁸², S. Patricelli^{102a,102b}, T. Pauly²⁹, M. Pecsny^{144a}, M.I. Pedraza Morales¹⁷², S.V. Peleganchuk¹⁰⁷, H. Peng¹⁷², R. Pengo²⁹, A. Penso³⁴, J. Penwell⁶¹, M. Perantoni^{23a}, K. Perez^{34,ac}, T. Perez Cavalcanti⁴¹, E. Perez Codina¹¹, M.T. Pérez García-Están¹⁶⁷, V. Perez Reale³⁴, I. Peric²⁰, L. Perini^{89a,89b}, H. Pernegger²⁹, R. Perrino^{72a}, P. Perrodo⁴, S. Persebe^{3a}, P. Perus¹¹⁵, V.D. Peshekhonov⁶⁵, O. Peters¹⁰⁵, B.A. Petersen²⁹, J. Petersen²⁹, T.C. Petersen³⁵, E. Petit⁸³, A. Petridis¹⁵⁴, C. Petridou¹⁵⁴, E. Petrolo^{132a}, F. Petrucci^{134a,134b}, D. Petschull⁴¹, M. Petteni¹⁴², R. Pezoa^{31b}, A. Phan⁸⁶, A.W. Phillips²⁷, P.W. Phillips¹²⁹, G. Piacquadio²⁹, E. Piccaro⁷⁵, M. Piccinini^{19a,19b}, A. Pickford⁵³, R. Piegaia²⁶, J.E. Pilcher³⁰, A.D. Pilkington⁸², J. Pina^{124a,q}, M. Pinamonti^{164a,164c}, J.L. Pinfold², J. Ping^{32c}, B. Pinto^{124a,b}, O. Pirotte²⁹, C. Pizio^{89a,89b}, R. Placakyte⁴¹, M. Plamondon¹⁶⁹, W.G. Plano⁸², M.-A. Pleier²⁴, A.V. Pleskach¹²⁸, A. Poblaguev²⁴, S. Poddar^{58a}, F. Podlyski³³, L. Poggioli¹¹⁵, T. Poghosyan²⁰, M. Pohl⁴⁹, F. Polci⁵⁵, G. Polesello^{119a}, A. Policicchio¹³⁸, A. Polini^{19a}, J. Poll⁷⁵, V. Polychronakos²⁴, D.M. Pomarede¹³⁶, D. Pomeroy²², K. Pommès²⁹, L. Pontecorvo^{132a}, B.G. Pope⁸⁸, G.A. Popeneci^{25a}, D.S. Popovic^{12a}, A. Poppleton²⁹, X. Portell Bueso⁴⁸, R. Porter¹⁶³, C. Posch²¹, G.E. Pospelov⁹⁹, S. Pospisil¹²⁷, I.N. Potrap⁹⁹, C.J. Potter¹⁴⁹, C.T. Potter⁸⁵, G. Poulard²⁹, J. Poveda¹⁷², R. Prabhu⁷⁷, P. Pralavorio⁸³, S. Prasad⁵⁷, R. Pravahan⁷, S. Prell⁶⁴, K. Pretzl¹⁶, L. Pribyl²⁹, D. Price⁶¹, L.E. Price⁵, M.J. Price²⁹, P.M. Prichard⁷³, D. Prieur¹²³, M. Primavera^{72a}, K. Prokofiev²⁹, F. Prokoshin^{31b}, S. Protopopescu²⁴, J. Proudfoot⁵, X. Prudent⁴³, H. Przysieszniak⁴, S. Psoroulas²⁰, E. Ptacek¹¹⁴, J. Purdham⁸⁷, M. Purohit^{24,al}, P. Puzo¹¹⁵, Y. Pylypchenko¹¹⁷, J. Qian⁸⁷, Z. Qian⁸³, Z. Qin⁴¹, A. Quadt⁵⁴, D.R. Quarrie¹⁴, W.B. Quayle¹⁷², F. Quinonez^{31a}, M. Raas¹⁰⁴, V. Radescu^{58b}, B. Radics²⁰, T. Rador^{18a}, F. Ragusa^{89a,89b}, G. Rahal¹⁷⁷, A.M. Rahimi¹⁰⁹, S. Rajagopalan²⁴, S. Rajek⁴², M. Rammensee⁴⁸, M. Rammes¹⁴¹, M. Ramstedt^{146a,146b}, K. Randrianarivony²⁸, P.N. Ratoff⁷¹, F. Rauscher⁹⁸, E. Rauter⁹⁹, M. Raymond²⁹, A.L. Read¹¹⁷, D.M. Rebuffi^{119a,119b}, A. Redelbach¹⁷³, G. Redlinger²⁴, R. Reece¹²⁰, K. Reeves⁴⁰, A. Reichold¹⁰⁵, E. Reinherz-Aronis¹⁵³, A. Reinsch¹¹⁴, I. Reisinger⁴², D. Reljic^{12a}, C. Rembser²⁹, Z.L. Ren¹⁵¹, A. Renaud¹¹⁵, P. Renkel³⁹, B. Rensch³⁵, M. Rescigno^{132a}, S. Resconi^{89a}, B. Resende¹³⁶, P. Reznicek⁹⁸, R. Rezvani¹⁵⁸, A. Richards⁷⁷, R. Richter⁹⁹, E. Richter-Was^{38,am}, M. Ridel⁷⁸, S. Rieke⁸¹, M. Rijpstra¹⁰⁵, M. Rijssenbeek¹⁴⁸, A. Rimoldi^{119a,119b}, L. Rinaldi^{19a}, R.R. Rios³⁹, I. Riu¹¹, G. Rivoltella^{89a,89b}, F. Rizatdinova¹¹², E. Rizvi⁷⁵, S.H. Robertson^{85,k}, A. Robichaud-Veronneau⁴⁹, D. Robinson²⁷, JEM Robinson⁷⁷, M. Robinson¹¹⁴, A. Robson⁵³, J.G. Rocha de Lima¹⁰⁶, C. Roda^{122a,122b}, D. Roda Dos Santos²⁹, S. Rodier⁸⁰, D. Rodriguez¹⁶², Y. Rodriguez Garcia¹⁵, A. Roe⁵⁴, S. Roe²⁹, O. Röhne¹¹⁷, V. Rojo¹, S. Rolli¹⁶¹, A. Romaniouk⁹⁶, V.M. Romanov⁶⁵, G. Romeo²⁶, D. Romero Maltrana^{31a}, L. Roos⁷⁸, E. Ros¹⁶⁷, S. Rosati¹³⁸, M. Rose⁷⁶, G.A. Rosenbaum¹⁵⁸, E.I. Rosenberg⁶⁴, P.L. Rosendahl¹³, L. Rosselet⁴⁹, V. Rossetti¹¹, E. Rossi^{102a,102b}, L.P. Rossi^{50a}, L. Rossi^{89a,89b}, M. Rotaru^{25a}, I. Roth¹⁷¹, J. Rothberg¹³⁸, I. Rottländer²⁰, D. Rousseau¹¹⁵, C.R. Royon¹³⁶, A. Rozanov⁸³, Y. Rozen¹⁵², X. Ruan¹¹⁵, I. Rubinsky⁴¹, B. Ruckert⁹⁸, N. Ruckstuhl¹⁰⁵, V.I. Rud⁹⁷, G. Rudolph⁶², F. Rühr⁶, A. Ruiz-Martinez⁶⁴, E. Rulikowska-Zarebska³⁷, V. Rumiantsev^{91,*}, L. Rummyantsev⁶⁵, K. Runge⁴⁸, O. Runolfsson²⁰, Z. Rurikova⁴⁸, N.A. Rusakovich⁶⁵, D.R. Rust⁶¹, J.P. Rutherford⁶, C. Ruwiedel¹⁴, P. Ruzicka¹²⁵, Y.F. Ryabov¹²¹, V. Ryadovikov¹²⁸, P. Ryan⁸⁸, G. Rybkin¹¹⁵, N.C. Ryder¹¹⁸, S. Rzaeva¹⁰, A.F. Saavedra¹⁵⁰, I. Sadeh¹⁵³, H.F.-W. Sadrozinski¹³⁷, R. Sadykov⁶⁵, F. Safai Tehrani^{132a,132b}, H. Sakamoto¹⁵⁵, G. Salamanna¹⁰⁵, A. Salamon^{133a}, M. Saleem¹¹¹, D. Salihagic⁹⁹, A. Salnikov¹⁴³, J. Salt¹⁶⁷,

B.M. Salvachua Ferrando⁵, D. Salvatore^{36a,36b}, F. Salvatore¹⁴⁹, A. Salzburger²⁹, D. Sampsonidis¹⁵⁴, B.H. Samset¹¹⁷,
 H. Sandaker¹³, H.G. Sander⁸¹, M.P. Sanders⁹⁸, M. Sandhoff¹⁷⁴, P. Sandhu¹⁵⁸, T. Sandoval²⁷, R. Sandstroem¹⁰⁵,
 S. Sandvoss¹⁷⁴, D.P.C. Sankey¹²⁹, A. Sansoni⁴⁷, C. Santamarina Rios⁸⁵, C. Santoni³³, R. Santonico^{133a,133b},
 H. Santos^{124a}, J.G. Saraiva^{124a,q}, T. Sarangi¹⁷², E. Sarkisyan-Grinbaum⁷, F. Sarri^{122a,122b}, G. Sartiso¹⁷⁴,
 O. Sasaki⁶⁶, T. Sasaki⁶⁶, N. Sasao⁶⁸, I. Satsounkevitch⁹⁰, G. Sauvage⁴, P. Savard^{158,ag}, V. Savinov¹²³, P. Savva⁹,
 L. Sawyer^{24,an}, D.H. Saxon⁵³, L.P. SAYS³³, C. Sbarra^{19a,19b}, A. Sbrizzi^{19a,19b}, O. Scallon⁹³, D.A. Scannicchio¹⁶³,
 J. Schaarschmidt⁴³, P. Schacht⁹⁹, U. Schäfer⁸¹, S. Schaetzel^{58b}, A.C. Schaffer¹¹⁵, D. Schaile⁹⁸, R.D. Schamberger¹⁴⁸,
 A.G. Schamov¹⁰⁷, V. Scharf^{58a}, V.A. Schegelsky¹²¹, D. Scheirich⁸⁷, M.I. Scherzer¹⁴, C. Schiavi^{50a,50b}, J. Schieck⁹⁸,
 M. Schioppa^{36a,36b}, S. Schlenker²⁹, J.L. Schlereth⁵, E. Schmidt⁴⁸, M.P. Schmidt^{175,*}, K. Schmieden²⁰, C. Schmitt⁸¹,
 M. Schmitz²⁰, A. Schöning^{58b}, M. Schott²⁹, D. Schouten¹⁴², J. Schovancova¹²⁵, M. Schram⁸⁵, A. Schreiner⁶³,
 C. Schroeder⁸¹, N. Schroer^{58c}, S. Schuh²⁹, G. Schuler²⁹, J. Schultes¹⁷⁴, H.-C. Schultz-Coulon^{58a}, H. Schulz¹⁵,
 J.W. Schumacher²⁰, M. Schumacher⁴⁸, B.A. Schumm¹³⁷, Ph. Schune¹³⁶, C. Schwanenberger⁸², A. Schwartzman¹⁴³,
 Ph. Schwemling⁷⁸, R. Schwienhorst⁸⁸, R. Schwierz⁴³, J. Schwindling¹³⁶, W.G. Scott¹²⁹, J. Searcy¹¹⁴, E. Sedykh¹²¹,
 E. Segura¹¹, S.C. Seidel¹⁰³, A. Seiden¹³⁷, F. Seifert⁴³, J.M. Seixas^{23a}, G. Sekhmiadze^{102a}, D.M. Seliverstov¹²¹,
 B. Sellden^{146a}, G. Sellers⁷³, M. Seman^{144b}, N. Semprini-Cesari^{19a,19b}, C. Serfon⁹⁸, L. Serin¹¹⁵, R. Seuster⁹⁹,
 H. Severini¹¹¹, M.E. Sevier⁸⁶, A. Sfyrla²⁹, E. Shabalina⁵⁴, M. Shamim¹¹⁴, L.Y. Shan^{32a}, J.T. Shank²¹, Q.T. Shao⁸⁶,
 M. Shapiro¹⁴, P.B. Shatalov⁹⁵, L. Shaver⁶, C. Shaw⁵³, K. Shaw^{164a,164c}, D. Sherman¹⁷⁵, P. Sherwood⁷⁷,
 A. Shibata¹⁰⁸, S. Shimizu²⁹, M. Shimojima¹⁰⁰, T. Shin⁵⁶, A. Shmeleva⁹⁴, M.J. Shochet³⁰, D. Short¹¹⁸, M.A. Shupe⁶,
 P. Sicho¹²⁵, A. Sidoti¹⁵, A. Siebel¹⁷⁴, F. Siegert⁴⁸, J. Siegrist¹⁴, Dj. Sijacki^{12a}, O. Silbert¹⁷¹, Y. Silver¹⁵³,
 D. Silverstein¹⁴³, S.B. Silverstein^{146a}, V. Simak¹²⁷, Lj. Simic^{12a}, S. Simion¹¹⁵, B. Simmons⁷⁷, M. Simonyan³⁵,
 P. Sinervo¹⁵⁸, N.B. Sinev¹¹⁴, V. Sipica¹⁴¹, G. Siragusa⁸¹, A.N. Sisakyan⁶⁵, S.Yu. Sivoklokov⁹⁷, J. Sjölin^{146a,146b},
 T.B. Sjurseth¹³, L.A. Skinnari¹⁴, K. Skovpen¹⁰⁷, P. Skubic¹¹¹, N. Skvorodnev²², M. Slater¹⁷, T. Slavicek¹²⁷,
 K. Sliwa¹⁶¹, T.J. Sloan⁷¹, J. Sloper²⁹, V. Smakhtin¹⁷¹, S.Yu. Smirnov⁹⁶, L.N. Smirnova⁹⁷, O. Smirnova⁷⁹,
 B.C. Smith⁵⁷, D. Smith¹⁴³, K.M. Smith⁵³, M. Smizanska⁷¹, K. Smolek¹²⁷, A.A. Snesarev⁹⁴, S.W. Snow⁸²,
 J. Snow¹¹¹, J. Snuverink¹⁰⁵, S. Snyder²⁴, M. Soares^{124a}, R. Sobie^{169,k}, J. Sodomka¹²⁷, A. Soffer¹⁵³, C.A. Solans¹⁶⁷,
 M. Solar¹²⁷, J. Solc¹²⁷, U. Soldevila¹⁶⁷, E. Solfaroli Camillocci^{132a,132b}, A.A. Solodkov¹²⁸, O.V. Solovyanov¹²⁸,
 J. Sondericker²⁴, N. Soni², V. Sopko¹²⁷, B. Sopko¹²⁷, M. Sorbi^{89a,89b}, M. Sosebee⁷, A. Soukharev¹⁰⁷,
 S. Spagnolo^{72a,72b}, F. Spano³⁴, R. Spighi^{19a}, G. Spigo²⁹, F. Spila^{132a,132b}, E. Spiriti^{134a}, R. Spiwoks²⁹,
 M. Spousta¹²⁶, T. Spreitzer¹⁵⁸, B. Spurlock⁷, R.D. St. Denis⁵³, T. Stahl¹⁴¹, J. Stahlman¹²⁰, R. Stamen^{58a},
 E. Stanecka²⁹, R.W. Stanek⁵, C. Stanescu^{134a}, S. Stapnes¹¹⁷, E.A. Starchenko¹²⁸, J. Stark⁵⁵, P. Staroba¹²⁵,
 P. Starovoitov⁹¹, A. Staude⁹⁸, P. Stavina^{144a}, G. Stavropoulos¹⁴, G. Steele⁵³, P. Steinbach⁴³, P. Steinberg²⁴,
 I. Stekl¹²⁷, B. Stelzer¹⁴², H.J. Stelzer⁴¹, O. Stelzer-Chilton^{159a}, H. Stenzel⁵², K. Stevenson⁷⁵, G.A. Stewart⁵³,
 T. Stockmanns²⁰, M.C. Stockton²⁹, K. Stoerig⁴⁸, G. Stoicea^{25a}, S. Stonjek⁹⁹, P. Strachota¹²⁶, A.R. Stradling⁷,
 A. Straessner⁴³, J. Strandberg⁸⁷, S. Strandberg^{146a,146b}, A. Strandlie¹¹⁷, M. Strang¹⁰⁹, E. Strauss¹⁴³, M. Strauss¹¹¹,
 P. Strizenecek^{144b}, R. Ströhmer¹⁷³, D.M. Strom¹¹⁴, J.A. Strong^{76,*}, R. Stroynowski³⁹, J. Strube¹²⁹, B. Stugu¹³,
 I. Stumer^{24,*}, J. Stupak¹⁴⁸, P. Sturm¹⁷⁴, D.A. Soh^{151,z}, D. Su¹⁴³, S. Subramania², Y. Sugaya¹¹⁶, T. Sugimoto¹⁰¹,
 C. Suhr¹⁰⁶, K. Suita⁶⁷, M. Suk¹²⁶, V.V. Sulin⁹⁴, S. Sultansoy^{3d}, T. Sumida²⁹, X. Sun⁵⁵, J.E. Sundermann⁴⁸,
 K. Suruliz^{164a,164b}, S. Sushkov¹¹, G. Susinno^{36a,36b}, M.R. Sutton¹³⁹, Y. Suzuki⁶⁶, Yu.M. Sviridov¹²⁸, S. Swedish¹⁶⁸,
 I. Sykora^{144a}, T. Sykora¹²⁶, B. Szeless²⁹, J. Sánchez¹⁶⁷, D. Ta¹⁰⁵, K. Tackmann²⁹, A. Taffard¹⁶³, R. Tafirout^{159a},
 A. Taga¹¹⁷, N. Taiblum¹⁵³, Y. Takahashi¹⁰¹, H. Takai²⁴, R. Takashima⁶⁹, H. Takeda⁶⁷, T. Takeshita¹⁴⁰, M. Talby⁸³,
 A. Talyshev¹⁰⁷, M.C. Tamsett²⁴, J. Tanaka¹⁵⁵, R. Tanaka¹¹⁵, S. Tanaka¹³¹, S. Tanaka⁶⁶, Y. Tanaka¹⁰⁰, K. Tani⁶⁷,
 N. Tannoury⁸³, G.P. Tappern²⁹, S. Tapprogge⁸¹, D. Tardif¹⁵⁸, S. Tarem¹⁵², F. Tarrade²⁴, G.F. Tartarelli^{89a},
 P. Tas¹²⁶, M. Tasevsky¹²⁵, E. Tassi^{36a,36b}, M. Tatarkhanov¹⁴, C. Taylor⁷⁷, F.E. Taylor⁹², G. Taylor¹³⁷,
 G.N. Taylor⁸⁶, W. Taylor^{159b}, M. Teixeira Dias Castanheira⁷⁵, P. Teixeira-Dias⁷⁶, K.K. Temming⁴⁸, H. Ten Kate²⁹,
 P.K. Teng¹⁵¹, Y.D. Tennenbaum-Katan¹⁵², S. Terada⁶⁶, K. Terashi¹⁵⁵, J. Terron⁸⁰, M. Terwort^{41,v}, M. Testa⁴⁷,
 R.J. Teuscher^{158,k}, C.M. Tevlin⁸², J. Thadome¹⁷⁴, J. Therhaag²⁰, T. Theveneaux-Pelzer⁷⁸, M. Thioye¹⁷⁵,
 S. Thoma⁴⁸, J.P. Thomas¹⁷, E.N. Thompson⁸⁴, P.D. Thompson¹⁷, P.D. Thompson¹⁵⁸, A.S. Thompson⁵³,
 E. Thomson¹²⁰, M. Thomson²⁷, R.P. Thun⁸⁷, T. Tic¹²⁵, V.O. Tikhomirov⁹⁴, Y.A. Tikhonov¹⁰⁷,
 C.J.W.P. Timmermans¹⁰⁴, P. Tipton¹⁷⁵, F.J. Tique Aires Viegas²⁹, S. Tisserant⁸³, J. Tobias⁴⁸, B. Toczec³⁷,
 T. Todorov⁴, S. Todorova-Nova¹⁶¹, B. Toggerson¹⁶³, J. Tojo⁶⁶, S. Tokár^{144a}, K. Tokunaga⁶⁷, K. Tokushuku⁶⁶,
 K. Tollefson⁸⁸, M. Tomoto¹⁰¹, L. Tompkins¹⁴, K. Toms¹⁰³, A. Tonazzo^{134a,134b}, G. Tong^{32a}, A. Tonoyan¹³,
 C. Topfel¹⁶, N.D. Topilin⁶⁵, I. Torchiani²⁹, E. Torrence¹¹⁴, E. Torró Pastor¹⁶⁷, J. Toth^{83,ak}, F. Touchard⁸³,
 D.R. Tovey¹³⁹, D. Traynor⁷⁵, T. Trefzger¹⁷³, J. Treis²⁰, L. Tremblet²⁹, A. Tricoli²⁹, I.M. Trigger^{159a},
 S. Trincaz-Duvold⁷⁸, T.N. Trinh⁷⁸, M.F. Tripiana⁷⁰, N. Triplett⁶⁴, W. Trischuk¹⁵⁸, A. Trivedi^{24,ao}, B. Trocmé⁵⁵,
 C. Troncon^{89a}, M. Trottier-McDonald¹⁴², A. Trzupek³⁸, C. Tsarouchas⁹, J.C-L. Tseng¹¹⁸, M. Tsiakiris¹⁰⁵,
 P.V. Tsiarehka⁹⁰, D. Tsiou¹³⁹, G. Tsipolitis⁹, V. Tsiskaridze⁴⁸, E.G. Tskhadadze⁵¹, I.I. Tsukerman⁹⁵,

V. Tsulaia¹²³, J.-W. Tsung²⁰, S. Tsuno⁶⁶, D. Tsybychev¹⁴⁸, A. Tua¹³⁹, J.M. Tuggle³⁰, M. Turala³⁸, D. Turecek¹²⁷, I. Turk Cakir^{3e}, E. Turlay¹⁰⁵, P.M. Tuts³⁴, A. Tykhonov⁷⁴, M. Tylmad^{146a,146b}, M. Tyndel¹²⁹, D. Typaldos¹⁷, H. Tyrvainen²⁹, G. Tzanakos⁸, K. Uchida²⁰, I. Ueda¹⁵⁵, R. Ueno²⁸, M. Uglan¹³, M. Uhlenbrock²⁰, M. Uhrmacher⁵⁴, F. Ukegawa¹⁶⁰, G. Unal²⁹, D.G. Underwood⁵, A. Undrus²⁴, G. Unel¹⁶³, Y. Unno⁶⁶, D. Urbaniec³⁴, E. Urkovsky¹⁵³, P. Urquijo^{49,ap}, P. Urrejola^{31a}, G. Usai⁷, M. Uslenghi^{119a,119b}, L. Vacavant⁸³, V. Vacek¹²⁷, B. Vachon⁸⁵, S. Vahsen¹⁴, C. Valderanis⁹⁹, J. Valenta¹²⁵, P. Valente^{132a}, S. Valentinetti^{19a,19b}, S. Valkar¹²⁶, E. Valladolid Gallego¹⁶⁷, S. Vallecorsa¹⁵², J.A. Valls Ferrer¹⁶⁷, H. van der Graaf¹⁰⁵, E. van der Kraaij¹⁰⁵, E. van der Poel¹⁰⁵, D. van der Ster²⁹, B. Van Eijk¹⁰⁵, N. van Eldik⁸⁴, P. van Gemmeren⁵, Z. van Kesteren¹⁰⁵, I. van Vulpen¹⁰⁵, W. Vandelli²⁹, G. Vandoni²⁹, A. Vaniachine⁵, P. Vankov⁴¹, F. Vannucci⁷⁸, F. Varela Rodriguez²⁹, R. Vari^{132a}, E.W. Varnes⁶, D. Varouchas¹⁴, A. Vartapetian⁷, K.E. Varvell¹⁵⁰, V.I. Vassilikopoulos⁵⁶, F. Vazeille³³, G. Vegni^{89a,89b}, J.J. Veillet¹¹⁵, C. Vellidis⁸, F. Veloso^{124a}, R. Veness²⁹, S. Veneziano^{132a}, A. Ventura^{72a,72b}, D. Ventura¹³⁸, S. Ventura⁴⁷, M. Venturi⁴⁸, N. Venturi¹⁶, V. Vercesi^{119a}, M. Verducci¹³⁸, W. Verkerke¹⁰⁵, J.C. Vermeulen¹⁰⁵, A. Vest⁴³, M.C. Vetterli^{142,ag}, I. Vichou¹⁶⁵, T. Vickey^{145b,aq}, G.H.A. Viehhauser¹¹⁸, S. Viel¹⁶⁸, M. Villa^{19a,19b}, M. Villaplana Perez¹⁶⁷, E. Vilucchi⁴⁷, M.G. Vincter²⁸, E. Vinek²⁹, V.B. Vinogradov⁶⁵, M. Virchaux^{136,*}, S. Viret³³, J. Virzi¹⁴, A. Vitale^{19a,19b}, O. Vitells¹⁷¹, I. Vivarelli⁴⁸, F. Vives Vaque¹¹, S. Vlachos⁹, M. Vlasak¹²⁷, N. Vlasov²⁰, A. Vogel²⁰, P. Vokac¹²⁷, M. Volpi¹¹, G. Volpini^{89a}, H. von der Schmitt⁹⁹, J. von Loeben⁹⁹, H. von Radziewski⁴⁸, E. von Toerne²⁰, V. Vorobel¹²⁶, A.P. Vorobiev¹²⁸, V. Vorwerk¹¹, M. Vos¹⁶⁷, R. Voss²⁹, T.T. Voss¹⁷⁴, J.H. Vossebeld⁷³, A.S. Vovenko¹²⁸, N. Vranjes^{12a}, M. Vranjes Milosavljevic^{12a}, V. Vrba¹²⁵, M. Vreeswijk¹⁰⁵, T. Vu Anh⁸¹, R. Vuillermet²⁹, I. Vukotic¹¹⁵, W. Wagner¹⁷⁴, P. Wagner¹²⁰, H. Wahlen¹⁷⁴, J. Wakabayashi¹⁰¹, J. Walbersloh⁴², S. Walch⁸⁷, J. Walder⁷¹, R. Walker⁹⁸, W. Walkowiak¹⁴¹, R. Wall¹⁷⁵, P. Waller⁷³, C. Wang⁴⁴, H. Wang¹⁷², J. Wang¹⁵¹, J. Wang^{32d}, J.C. Wang¹³⁸, S.M. Wang¹⁵¹, A. Warburton⁸⁵, C.P. Ward²⁷, M. Warsinsky⁴⁸, P.M. Watkins¹⁷, A.T. Watson¹⁷, M.F. Watson¹⁷, G. Watts¹³⁸, S. Watts⁸², A.T. Waugh¹⁵⁰, B.M. Waugh⁷⁷, J. Weber⁴², M. Weber¹²⁹, M.S. Weber¹⁶, P. Weber⁵⁴, A.R. Weidberg¹¹⁸, J. Weingarten⁵⁴, C. Weiser⁴⁸, H. Wellenstein²², P.S. Wells²⁹, M. Wen⁴⁷, T. Wenaus²⁴, S. Wendler¹²³, Z. Weng^{151,ar}, T. Wengler²⁹, S. Wenig²⁹, N. Wermes²⁰, M. Werner⁴⁸, P. Werner²⁹, M. Werth¹⁶³, M. Wessels^{58a}, K. Whalen²⁸, S.J. Wheeler-Ellis¹⁶³, S.P. Whitaker²¹, A. White⁷, M.J. White⁸⁶, S. White²⁴, S.R. Whitehead¹¹⁸, D. Whiteson¹⁶³, D. Whittington⁶¹, F. Wicke¹¹⁵, D. Wicke¹⁷⁴, F.J. Wickens¹²⁹, W. Wiedenmann¹⁷², M. Wielers¹²⁹, P. Wienemann²⁰, C. Wigglesworth⁷³, L.A.M. Wiik⁴⁸, A. Wildauer¹⁶⁷, M.A. Wildt^{41,v}, I. Wilhelm¹²⁶, H.G. Wilkens²⁹, J.Z. Will⁹⁸, E. Williams³⁴, H.H. Williams¹²⁰, W. Willis³⁴, S. Willocq⁸⁴, J.A. Wilson¹⁷, M.G. Wilson¹⁴³, A. Wilson⁸⁷, I. Wingarter-Seez⁴, S. Winkelmann⁴⁸, F. Winklmeier²⁹, M. Wittgen¹⁴³, M.W. Wolter³⁸, H. Wolters^{124a,h}, G. Wooden¹¹⁸, B.K. Wosiek³⁸, J. Wotschack²⁹, M.J. Woudstra⁸⁴, K. Wraight⁵³, C. Wright⁵³, B. Wrona⁷³, S.L. Wu¹⁷², X. Wu⁴⁹, E. Wulf³⁴, R. Wunstorfer⁴², B.M. Wynne⁴⁵, L. Xaplanteris⁹, S. Xella³⁵, S. Xie⁴⁸, Y. Xie^{32a}, C. Xu^{32b}, D. Xu¹³⁹, G. Xu^{32a}, B. Yabsley¹⁵⁰, M. Yamada⁶⁶, A. Yamamoto⁶⁶, K. Yamamoto⁶⁴, S. Yamamoto¹⁵⁵, T. Yamamura¹⁵⁵, J. Yamaoka⁴⁴, T. Yamazaki¹⁵⁵, Y. Yamazaki⁶⁷, Z. Yan²¹, H. Yang⁸⁷, U.K. Yang⁸², Y. Yang⁶¹, Y. Yang^{32a}, Z. Yang^{146a,146b}, S. Yanush⁹¹, W.-M. Yao¹⁴, Y. Yao¹⁴, Y. Yasu⁶⁶, J. Ye³⁹, S. Ye²⁴, M. Yilmaz^{3c}, R. Yoosofmiya¹²³, K. Yorita¹⁷⁰, R. Yoshida⁵, C. Young¹⁴³, S.P. Youssef²¹, D. Yu²⁴, J. Yu⁷, J. Yu^{32c,as}, L. Yuan^{32a,at}, A. Yurkewicz¹⁴⁸, V.G. Zaets¹²⁸, R. Zaidan⁶³, A.M. Zaitsev¹²⁸, Z. Zajacova²⁹, Yo.K. Zalite¹²¹, L. Zanello^{132a,132b}, P. Zarzhitsky³⁹, A. Zaytsev¹⁰⁷, M. Zdrzil¹⁴, C. Zeitnitz¹⁷⁴, M. Zeller¹⁷⁵, P.F. Zema²⁹, A. Zemla³⁸, C. Zender²⁰, A.V. Zenin¹²⁸, O. Zenin¹²⁸, T. Ženiš^{144a}, Z. Zenonos^{122a,122b}, S. Zenz¹⁴, D. Zerwas¹¹⁵, G. Zevi della Porta⁵⁷, Z. Zhan^{32d}, H. Zhang⁸⁸, J. Zhang⁵, X. Zhang^{32d}, Z. Zhang¹¹⁵, L. Zhao¹⁰⁸, T. Zhao¹³⁸, Z. Zhao^{32b}, A. Zhemchugov⁶⁵, S. Zheng^{32a}, J. Zhong^{151,au}, B. Zhou⁸⁷, N. Zhou¹⁶³, Y. Zhou¹⁵¹, C.G. Zhu^{32d}, H. Zhu⁴¹, Y. Zhu¹⁷², X. Zhuang⁹⁸, V. Zhuravlov⁹⁹, D. Zieminska⁶¹, B. Zilka^{144a}, R. Zimmermann²⁰, S. Zimmermann²⁰, S. Zimmermann⁴⁸, M. Ziolkowski¹⁴¹, R. Zitoun⁴, L. Živković³⁴, V.V. Zmouchko^{128,*}, G. Zobernig¹⁷², A. Zoccoli^{19a,19b}, Y. Zolnierowski⁴, A. Zsenei²⁹, M. zur Nedden¹⁵, V. Zutshi¹⁰⁶, L. Zwalinski²⁹.

¹ University at Albany, 1400 Washington Ave, Albany, NY 12222, United States of America

² University of Alberta, Department of Physics, Centre for Particle Physics, Edmonton, AB T6G 2G7, Canada

³ Ankara University^(a), Faculty of Sciences, Department of Physics, TR 061000 Tandogan, Ankara; Dumlupinar University^(b), Faculty of Arts and Sciences, Department of Physics, Kutahya; Gazi University^(c), Faculty of Arts and Sciences, Department of Physics, 06500, Teknikokullar, Ankara; TOBB University of Economics and Technology^(d), Faculty of Arts and Sciences, Division of Physics, 06560, Sogutozu, Ankara; Turkish Atomic Energy Authority^(e), 06530, Lodumlu, Ankara, Turkey

⁴ LAPP, Université de Savoie, CNRS/IN2P3, Annecy-le-Vieux, France

⁵ Argonne National Laboratory, High Energy Physics Division, 9700 S. Cass Avenue, Argonne IL 60439, United States of America

⁶ University of Arizona, Department of Physics, Tucson, AZ 85721, United States of America

- ⁷ The University of Texas at Arlington, Department of Physics, Box 19059, Arlington, TX 76019, United States of America
- ⁸ University of Athens, Nuclear & Particle Physics, Department of Physics, Panepistimiopouli, Zografou, GR 15771 Athens, Greece
- ⁹ National Technical University of Athens, Physics Department, 9-Iroon Polytechniou, GR 15780 Zografou, Greece
- ¹⁰ Institute of Physics, Azerbaijan Academy of Sciences, H. Javid Avenue 33, AZ 143 Baku, Azerbaijan
- ¹¹ Institut de Física d'Altes Energies, IFAE, Edifici Cn, Universitat Autònoma de Barcelona, ES - 08193 Bellaterra (Barcelona), Spain
- ¹² University of Belgrade^(a), Institute of Physics, P.O. Box 57, 11001 Belgrade; Vinca Institute of Nuclear Sciences^(b)M. Petrovica Alasa 12-14, 11000 Belgrade, Serbia, Serbia
- ¹³ University of Bergen, Department for Physics and Technology, Allegaten 55, NO - 5007 Bergen, Norway
- ¹⁴ Lawrence Berkeley National Laboratory and University of California, Physics Division, MS50B-6227, 1 Cyclotron Road, Berkeley, CA 94720, United States of America
- ¹⁵ Humboldt University, Institute of Physics, Berlin, Newtonstr. 15, D-12489 Berlin, Germany
- ¹⁶ University of Bern, Albert Einstein Center for Fundamental Physics, Laboratory for High Energy Physics, Sidlerstrasse 5, CH - 3012 Bern, Switzerland
- ¹⁷ University of Birmingham, School of Physics and Astronomy, Edgbaston, Birmingham B15 2TT, United Kingdom
- ¹⁸ Bogazici University^(a), Faculty of Sciences, Department of Physics, TR - 80815 Bebek-Istanbul; Dogus University^(b), Faculty of Arts and Sciences, Department of Physics, 34722, Kadikoy, Istanbul; ^(c)Gaziantep University, Faculty of Engineering, Department of Physics Engineering, 27310, Sehirkamil, Gaziantep, Turkey; Istanbul Technical University^(d), Faculty of Arts and Sciences, Department of Physics, 34469, Maslak, Istanbul, Turkey
- ¹⁹ INFN Sezione di Bologna^(a); Università di Bologna, Dipartimento di Fisica^(b), viale C. Berti Pichat, 6/2, IT - 40127 Bologna, Italy
- ²⁰ University of Bonn, Physikalisches Institut, Nussallee 12, D - 53115 Bonn, Germany
- ²¹ Boston University, Department of Physics, 590 Commonwealth Avenue, Boston, MA 02215, United States of America
- ²² Brandeis University, Department of Physics, MS057, 415 South Street, Waltham, MA 02454, United States of America
- ²³ Universidade Federal do Rio De Janeiro, COPPE/EE/IF ^(a), Caixa Postal 68528, Ilha do Fundao, BR - 21945-970 Rio de Janeiro; ^(b)Universidade de Sao Paulo, Instituto de Fisica, R.do Matao Trav. R.187, Sao Paulo - SP, 05508 - 900, Brazil
- ²⁴ Brookhaven National Laboratory, Physics Department, Bldg. 510A, Upton, NY 11973, United States of America
- ²⁵ National Institute of Physics and Nuclear Engineering^(a)Bucharest-Magurele, Str. Atomistilor 407, P.O. Box MG-6, R-077125, Romania; University Politehnica Bucharest^(b), Rectorat - AN 001, 313 Splaiul Independentei, sector 6, 060042 Bucuresti; West University^(c) in Timisoara, Bd. Vasile Parvan 4, Timisoara, Romania
- ²⁶ Universidad de Buenos Aires, FCEyN, Dto. Fisica, Pab I - C. Universitaria, 1428 Buenos Aires, Argentina
- ²⁷ University of Cambridge, Cavendish Laboratory, J J Thomson Avenue, Cambridge CB3 0HE, United Kingdom
- ²⁸ Carleton University, Department of Physics, 1125 Colonel By Drive, Ottawa ON K1S 5B6, Canada
- ²⁹ CERN, CH - 1211 Geneva 23, Switzerland
- ³⁰ University of Chicago, Enrico Fermi Institute, 5640 S. Ellis Avenue, Chicago, IL 60637, United States of America
- ³¹ Pontificia Universidad Católica de Chile, Facultad de Fisica, Departamento de Fisica^(a), Avda. Vicuna Mackenna 4860, San Joaquin, Santiago; Universidad Técnica Federico Santa María, Departamento de Física^(b), Avda. España 1680, Casilla 110-V, Valparaíso, Chile
- ³² Institute of High Energy Physics, Chinese Academy of Sciences^(a), P.O. Box 918, 19 Yuquan Road, Shijing Shan District, CN - Beijing 100049; University of Science & Technology of China (USTC), Department of Modern Physics^(b), Hefei, CN - Anhui 230026; Nanjing University, Department of Physics^(c), Nanjing, CN - Jiangsu 210093; Shandong University, High Energy Physics Group^(d), Jinan, CN - Shandong 250100, China
- ³³ Laboratoire de Physique Corpusculaire, Clermont Université, Université Blaise Pascal, CNRS/IN2P3, FR - 63177 Aubiere Cedex, France
- ³⁴ Columbia University, Nevis Laboratory, 136 So. Broadway, Irvington, NY 10533, United States of America
- ³⁵ University of Copenhagen, Niels Bohr Institute, Blegdamsvej 17, DK - 2100 Kobenhavn 0, Denmark
- ³⁶ INFN Gruppo Collegato di Cosenza^(a); Università della Calabria, Dipartimento di Fisica^(b), IT-87036 Arcavacata di Rende, Italy
- ³⁷ Faculty of Physics and Applied Computer Science of the AGH-University of Science and Technology, (FPACS, AGH-UST), al. Mickiewicza 30, PL-30059 Cracow, Poland

- ³⁸ The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences, ul. Radzikowskiego 152, PL - 31342 Krakow, Poland
- ³⁹ Southern Methodist University, Physics Department, 106 Fondren Science Building, Dallas, TX 75275-0175, United States of America
- ⁴⁰ University of Texas at Dallas, 800 West Campbell Road, Richardson, TX 75080-3021, United States of America
- ⁴¹ DESY, Notkestr. 85, D-22603 Hamburg and Platanenallee 6, D-15738 Zeuthen, Germany
- ⁴² TU Dortmund, Experimentelle Physik IV, DE - 44221 Dortmund, Germany
- ⁴³ Technical University Dresden, Institut für Kern- und Teilchenphysik, Zellescher Weg 19, D-01069 Dresden, Germany
- ⁴⁴ Duke University, Department of Physics, Durham, NC 27708, United States of America
- ⁴⁵ University of Edinburgh, School of Physics & Astronomy, James Clerk Maxwell Building, The Kings Buildings, Mayfield Road, Edinburgh EH9 3JZ, United Kingdom
- ⁴⁶ Fachhochschule Wiener Neustadt; Johannes Gutenbergstrasse 3 AT - 2700 Wiener Neustadt, Austria
- ⁴⁷ INFN Laboratori Nazionali di Frascati, via Enrico Fermi 40, IT-00044 Frascati, Italy
- ⁴⁸ Albert-Ludwigs-Universität, Fakultät für Mathematik und Physik, Hermann-Herder Str. 3, D - 79104 Freiburg i.Br., Germany
- ⁴⁹ Université de Genève, Section de Physique, 24 rue Ernest Ansermet, CH - 1211 Geneve 4, Switzerland
- ⁵⁰ INFN Sezione di Genova^(a); Università di Genova, Dipartimento di Fisica^(b), via Dodecaneso 33, IT - 16146 Genova, Italy
- ⁵¹ Institute of Physics of the Georgian Academy of Sciences, 6 Tamarashvili St., GE - 380077 Tbilisi; Tbilisi State University, HEP Institute, University St. 9, GE - 380086 Tbilisi, Georgia
- ⁵² Justus-Liebig-Universität Giessen, II Physikalisches Institut, Heinrich-Buff Ring 16, D-35392 Giessen, Germany
- ⁵³ University of Glasgow, Department of Physics and Astronomy, Glasgow G12 8QQ, United Kingdom
- ⁵⁴ Georg-August-Universität, II. Physikalisches Institut, Friedrich-Hund Platz 1, D-37077 Göttingen, Germany
- ⁵⁵ Laboratoire de Physique Subatomique et de Cosmologie, 53 avenue des Martyrs, FR - 38026 Grenoble Cedex, France, France
- ⁵⁶ Hampton University, Department of Physics, Hampton, VA 23668, United States of America
- ⁵⁷ Harvard University, Laboratory for Particle Physics and Cosmology, 18 Hammond Street, Cambridge, MA 02138, United States of America
- ⁵⁸ Ruprecht-Karls-Universität Heidelberg: Kirchhoff-Institut für Physik^(a), Im Neuenheimer Feld 227, D-69120 Heidelberg; Physikalisches Institut^(b), Philosophenweg 12, D-69120 Heidelberg; ZITI Ruprecht-Karls-University Heidelberg^(c), Lehrstuhl für Informatik V, B6, 23-29, DE - 68131 Mannheim, Germany
- ⁵⁹ Hiroshima University, Faculty of Science, 1-3-1 Kagamiyama, Higashihiroshima-shi, JP - Hiroshima 739-8526, Japan
- ⁶⁰ Hiroshima Institute of Technology, Faculty of Applied Information Science, 2-1-1 Miyake Saeki-ku, Hiroshima-shi, JP - Hiroshima 731-5193, Japan
- ⁶¹ Indiana University, Department of Physics, Swain Hall West 117, Bloomington, IN 47405-7105, United States of America
- ⁶² Institut für Astro- und Teilchenphysik, Technikerstrasse 25, A - 6020 Innsbruck, Austria
- ⁶³ University of Iowa, 203 Van Allen Hall, Iowa City, IA 52242-1479, United States of America
- ⁶⁴ Iowa State University, Department of Physics and Astronomy, Ames High Energy Physics Group, Ames, IA 50011-3160, United States of America
- ⁶⁵ Joint Institute for Nuclear Research, JINR Dubna, RU-141980 Moscow Region, Russia, Russia
- ⁶⁶ KEK, High Energy Accelerator Research Organization, 1-1 Oho, Tsukuba-shi, Ibaraki-ken 305-0801, Japan
- ⁶⁷ Kobe University, Graduate School of Science, 1-1 Rokkodai-cho, Nada-ku, JP Kobe 657-8501, Japan
- ⁶⁸ Kyoto University, Faculty of Science, Oiwake-cho, Kitashirakawa, Sakyou-ku, Kyoto-shi, JP - Kyoto 606-8502, Japan
- ⁶⁹ Kyoto University of Education, 1 Fukakusa, Fujimori, fushimi-ku, Kyoto-shi, JP - Kyoto 612-8522, Japan
- ⁷⁰ Universidad Nacional de La Plata, FCE, Departamento de Física, IFLP (CONICET-UNLP), C.C. 67, 1900 La Plata, Argentina
- ⁷¹ Lancaster University, Physics Department, Lancaster LA1 4YB, United Kingdom
- ⁷² INFN Sezione di Lecce^(a); Università del Salento, Dipartimento di Fisica^(b) Via Arnesano IT - 73100 Lecce, Italy
- ⁷³ University of Liverpool, Oliver Lodge Laboratory, P.O. Box 147, Oxford Street, Liverpool L69 3BX, United Kingdom
- ⁷⁴ Jožef Stefan Institute and University of Ljubljana, Department of Physics, SI-1000 Ljubljana, Slovenia
- ⁷⁵ Queen Mary University of London, Department of Physics, Mile End Road, London E1 4NS, United Kingdom

- ⁷⁶ Royal Holloway, University of London, Department of Physics, Egham Hill, Egham, Surrey TW20 0EX, United Kingdom
- ⁷⁷ University College London, Department of Physics and Astronomy, Gower Street, London WC1E 6BT, United Kingdom
- ⁷⁸ Laboratoire de Physique Nucléaire et de Hautes Energies, Université Pierre et Marie Curie (Paris 6), Université Denis Diderot (Paris-7), CNRS/IN2P3, Tour 33, 4 place Jussieu, FR - 75252 Paris Cedex 05, France
- ⁷⁹ Fysiska institutionen, Lunds universitet, Box 118, SE - 221 00 Lund, Sweden
- ⁸⁰ Universidad Autonoma de Madrid, Facultad de Ciencias, Departamento de Fisica Teorica, ES - 28049 Madrid, Spain
- ⁸¹ Universität Mainz, Institut für Physik, Staudinger Weg 7, DE - 55099 Mainz, Germany
- ⁸² University of Manchester, School of Physics and Astronomy, Manchester M13 9PL, United Kingdom
- ⁸³ CPPM, Aix-Marseille Université, CNRS/IN2P3, Marseille, France
- ⁸⁴ University of Massachusetts, Department of Physics, 710 North Pleasant Street, Amherst, MA 01003, United States of America
- ⁸⁵ McGill University, High Energy Physics Group, 3600 University Street, Montreal, Quebec H3A 2T8, Canada
- ⁸⁶ University of Melbourne, School of Physics, AU - Parkville, Victoria 3010, Australia
- ⁸⁷ The University of Michigan, Department of Physics, 2477 Randall Laboratory, 500 East University, Ann Arbor, MI 48109-1120, United States of America
- ⁸⁸ Michigan State University, Department of Physics and Astronomy, High Energy Physics Group, East Lansing, MI 48824-2320, United States of America
- ⁸⁹ INFN Sezione di Milano^(a); Università di Milano, Dipartimento di Fisica^(b), via Celoria 16, IT - 20133 Milano, Italy
- ⁹⁰ B.I. Stepanov Institute of Physics, National Academy of Sciences of Belarus, Independence Avenue 68, Minsk 220072, Republic of Belarus
- ⁹¹ National Scientific & Educational Centre for Particle & High Energy Physics, NC PHEP BSU, M. Bogdanovich St. 153, Minsk 220040, Republic of Belarus
- ⁹² Massachusetts Institute of Technology, Department of Physics, Room 24-516, Cambridge, MA 02139, United States of America
- ⁹³ University of Montreal, Group of Particle Physics, C.P. 6128, Succursale Centre-Ville, Montreal, Quebec, H3C 3J7, Canada
- ⁹⁴ P.N. Lebedev Institute of Physics, Academy of Sciences, Leninsky pr. 53, RU - 117 924 Moscow, Russia
- ⁹⁵ Institute for Theoretical and Experimental Physics (ITEP), B. Chermushkinskaya ul. 25, RU 117 218 Moscow, Russia
- ⁹⁶ Moscow Engineering & Physics Institute (MEPhI), Kashirskoe Shosse 31, RU - 115409 Moscow, Russia
- ⁹⁷ Lomonosov Moscow State University Skobeltsyn Institute of Nuclear Physics (MSU SINP), 1(2), Leninskie gory, GSP-1, Moscow 119991 Russian Federation, Russia
- ⁹⁸ Ludwig-Maximilians-Universität München, Fakultät für Physik, Am Coulombwall 1, DE - 85748 Garching, Germany
- ⁹⁹ Max-Planck-Institut für Physik, (Werner-Heisenberg-Institut), Föhringer Ring 6, 80805 München, Germany
- ¹⁰⁰ Nagasaki Institute of Applied Science, 536 Aba-machi, JP Nagasaki 851-0193, Japan
- ¹⁰¹ Nagoya University, Graduate School of Science, Furo-Cho, Chikusa-ku, Nagoya, 464-8602, Japan
- ¹⁰² INFN Sezione di Napoli^(a); Università di Napoli, Dipartimento di Scienze Fisiche^(b), Complesso Universitario di Monte Sant'Angelo, via Cinthia, IT - 80126 Napoli, Italy
- ¹⁰³ University of New Mexico, Department of Physics and Astronomy, MSC07 4220, Albuquerque, NM 87131 USA, United States of America
- ¹⁰⁴ Radboud University Nijmegen/NIKHEF, Department of Experimental High Energy Physics, Heyendaalseweg 135, NL-6525 AJ, Nijmegen, Netherlands
- ¹⁰⁵ Nikhef National Institute for Subatomic Physics, and University of Amsterdam, Science Park 105, 1098 XG Amsterdam, Netherlands
- ¹⁰⁶ Department of Physics, Northern Illinois University, LaTourette Hall Normal Road, DeKalb, IL 60115, United States of America
- ¹⁰⁷ Budker Institute of Nuclear Physics (BINP), RU - Novosibirsk 630 090, Russia
- ¹⁰⁸ New York University, Department of Physics, 4 Washington Place, New York NY 10003, USA, United States of America
- ¹⁰⁹ Ohio State University, 191 West Woodruff Ave, Columbus, OH 43210-1117, United States of America
- ¹¹⁰ Okayama University, Faculty of Science, Tsushima-naka 3-1-1, Okayama 700-8530, Japan

- ¹¹¹ University of Oklahoma, Homer L. Dodge Department of Physics and Astronomy, 440 West Brooks, Room 100, Norman, OK 73019-0225, United States of America
- ¹¹² Oklahoma State University, Department of Physics, 145 Physical Sciences Building, Stillwater, OK 74078-3072, United States of America
- ¹¹³ Palacký University, 17.listopadu 50a, 772 07 Olomouc, Czech Republic
- ¹¹⁴ University of Oregon, Center for High Energy Physics, Eugene, OR 97403-1274, United States of America
- ¹¹⁵ LAL, Univ. Paris-Sud, IN2P3/CNRS, Orsay, France
- ¹¹⁶ Osaka University, Graduate School of Science, Machikaneyama-machi 1-1, Toyonaka, Osaka 560-0043, Japan
- ¹¹⁷ University of Oslo, Department of Physics, P.O. Box 1048, Blindern, NO - 0316 Oslo 3, Norway
- ¹¹⁸ Oxford University, Department of Physics, Denys Wilkinson Building, Keble Road, Oxford OX1 3RH, United Kingdom
- ¹¹⁹ INFN Sezione di Pavia^(a); Università di Pavia, Dipartimento di Fisica Nucleare e Teorica^(b), Via Bassi 6, IT-27100 Pavia, Italy
- ¹²⁰ University of Pennsylvania, Department of Physics, High Energy Physics Group, 209 S. 33rd Street, Philadelphia, PA 19104, United States of America
- ¹²¹ Petersburg Nuclear Physics Institute, RU - 188 300 Gatchina, Russia
- ¹²² INFN Sezione di Pisa^(a); Università di Pisa, Dipartimento di Fisica E. Fermi^(b), Largo B. Pontecorvo 3, IT - 56127 Pisa, Italy
- ¹²³ University of Pittsburgh, Department of Physics and Astronomy, 3941 O'Hara Street, Pittsburgh, PA 15260, United States of America
- ¹²⁴ Laboratorio de Instrumentacao e Fisica Experimental de Particulas - LIP^(a), Avenida Elias Garcia 14-1, PT - 1000-149 Lisboa, Portugal; Universidad de Granada, Departamento de Fisica Teorica y del Cosmos and CAFPE^(b), E-18071 Granada, Spain
- ¹²⁵ Institute of Physics, Academy of Sciences of the Czech Republic, Na Slovance 2, CZ - 18221 Praha 8, Czech Republic
- ¹²⁶ Charles University in Prague, Faculty of Mathematics and Physics, Institute of Particle and Nuclear Physics, V Holesovickach 2, CZ - 18000 Praha 8, Czech Republic
- ¹²⁷ Czech Technical University in Prague, Zikova 4, CZ - 166 35 Praha 6, Czech Republic
- ¹²⁸ State Research Center Institute for High Energy Physics, Moscow Region, 142281, Protvino, Pobeda street, 1, Russia
- ¹²⁹ Rutherford Appleton Laboratory, Science and Technology Facilities Council, Harwell Science and Innovation Campus, Didcot OX11 0QX, United Kingdom
- ¹³⁰ University of Regina, Physics Department, Canada
- ¹³¹ Ritsumeikan University, Noji Higashi 1 chome 1-1, JP - Kusatsu, Shiga 525-8577, Japan
- ¹³² INFN Sezione di Roma I^(a); Università La Sapienza, Dipartimento di Fisica^(b), Piazzale A. Moro 2, IT- 00185 Roma, Italy
- ¹³³ INFN Sezione di Roma Tor Vergata^(a); Università di Roma Tor Vergata, Dipartimento di Fisica^(b), via della Ricerca Scientifica, IT-00133 Roma, Italy
- ¹³⁴ INFN Sezione di Roma Tre^(a); Università Roma Tre, Dipartimento di Fisica^(b), via della Vasca Navale 84, IT-00146 Roma, Italy
- ¹³⁵ Réseau Universitaire de Physique des Hautes Energies (RUPHE): Université Hassan II, Faculté des Sciences Ain Chock^(a), B.P. 5366, MA - Casablanca; Centre National de l'Energie des Sciences Techniques Nucleaires (CNESTEN)^(b), B.P. 1382 R.P. 10001 Rabat 10001; Université Mohamed Premier^(c), LPTPM, Faculté des Sciences, B.P.717. Bd. Mohamed VI, 60000, Oujda ; Université Mohammed V, Faculté des Sciences^(d) 4 Avenue Ibn Battouta, BP 1014 RP, 10000 Rabat, Morocco
- ¹³⁶ CEA, DSM/IRFU, Centre d'Etudes de Saclay, FR - 91191 Gif-sur-Yvette, France
- ¹³⁷ University of California Santa Cruz, Santa Cruz Institute for Particle Physics (SCIPP), Santa Cruz, CA 95064, United States of America
- ¹³⁸ University of Washington, Seattle, Department of Physics, Box 351560, Seattle, WA 98195-1560, United States of America
- ¹³⁹ University of Sheffield, Department of Physics & Astronomy, Hounsfield Road, Sheffield S3 7RH, United Kingdom
- ¹⁴⁰ Shinshu University, Department of Physics, Faculty of Science, 3-1-1 Asahi, Matsumoto-shi, JP - Nagano 390-8621, Japan
- ¹⁴¹ Universität Siegen, Fachbereich Physik, D 57068 Siegen, Germany
- ¹⁴² Simon Fraser University, Department of Physics, 8888 University Drive, CA - Burnaby, BC V5A 1S6, Canada

- ¹⁴³ SLAC National Accelerator Laboratory, Stanford, California 94309, United States of America
- ¹⁴⁴ Comenius University, Faculty of Mathematics, Physics & Informatics^(a), Mlynska dolina F2, SK - 84248 Bratislava; Institute of Experimental Physics of the Slovak Academy of Sciences, Dept. of Subnuclear Physics^(b), Watsonova 47, SK - 04353 Kosice, Slovak Republic
- ¹⁴⁵ (a) University of Johannesburg, Department of Physics, PO Box 524, Auckland Park, Johannesburg 2006; (b) School of Physics, University of the Witwatersrand, Private Bag 3, Wits 2050, Johannesburg, South Africa, South Africa
- ¹⁴⁶ Stockholm University: Department of Physics^(a); The Oskar Klein Centre^(b), AlbaNova, SE - 106 91 Stockholm, Sweden
- ¹⁴⁷ Royal Institute of Technology (KTH), Physics Department, SE - 106 91 Stockholm, Sweden
- ¹⁴⁸ Stony Brook University, Department of Physics and Astronomy, Nicolls Road, Stony Brook, NY 11794-3800, United States of America
- ¹⁴⁹ University of Sussex, Department of Physics and Astronomy Pevensey 2 Building, Falmer, Brighton BN1 9QH, United Kingdom
- ¹⁵⁰ University of Sydney, School of Physics, AU - Sydney NSW 2006, Australia
- ¹⁵¹ Institute of Physics, Academia Sinica, TW - Taipei 11529, Taiwan
- ¹⁵² Technion, Israel Inst. of Technology, Department of Physics, Technion City, IL - Haifa 32000, Israel
- ¹⁵³ Tel Aviv University, Raymond and Beverly Sackler School of Physics and Astronomy, Ramat Aviv, IL - Tel Aviv 69978, Israel
- ¹⁵⁴ Aristotle University of Thessaloniki, Faculty of Science, Department of Physics, Division of Nuclear & Particle Physics, University Campus, GR - 54124, Thessaloniki, Greece
- ¹⁵⁵ The University of Tokyo, International Center for Elementary Particle Physics and Department of Physics, 7-3-1 Hongo, Bunkyo-ku, JP - Tokyo 113-0033, Japan
- ¹⁵⁶ Tokyo Metropolitan University, Graduate School of Science and Technology, 1-1 Minami-Osawa, Hachioji, Tokyo 192-0397, Japan
- ¹⁵⁷ Tokyo Institute of Technology, Department of Physics, 2-12-1 O-Okayama, Meguro, Tokyo 152-8551, Japan
- ¹⁵⁸ University of Toronto, Department of Physics, 60 Saint George Street, Toronto M5S 1A7, Ontario, Canada
- ¹⁵⁹ TRIUMF^(a), 4004 Wesbrook Mall, Vancouver, B.C. V6T 2A3; (b) York University, Department of Physics and Astronomy, 4700 Keele St., Toronto, Ontario, M3J 1P3, Canada
- ¹⁶⁰ University of Tsukuba, Institute of Pure and Applied Sciences, 1-1-1 Tennoudai, Tsukuba-shi, JP - Ibaraki 305-8571, Japan
- ¹⁶¹ Tufts University, Science & Technology Center, 4 Colby Street, Medford, MA 02155, United States of America
- ¹⁶² Universidad Antonio Narino, Centro de Investigaciones, Cra 3 Este No.47A-15, Bogota, Colombia
- ¹⁶³ University of California, Irvine, Department of Physics & Astronomy, CA 92697-4575, United States of America
- ¹⁶⁴ INFN Gruppo Collegato di Udine^(a); ICTP^(b), Strada Costiera 11, IT-34014, Trieste; Università di Udine, Dipartimento di Fisica^(c), via delle Scienze 208, IT - 33100 Udine, Italy
- ¹⁶⁵ University of Illinois, Department of Physics, 1110 West Green Street, Urbana, Illinois 61801, United States of America
- ¹⁶⁶ University of Uppsala, Department of Physics and Astronomy, P.O. Box 516, SE -751 20 Uppsala, Sweden
- ¹⁶⁷ Instituto de Física Corpuscular (IFIC) Centro Mixto UVEG-CSIC, Apdo. 22085 ES-46071 Valencia, Dept. Física At. Mol. y Nuclear; Dept. Ing. Electrónica; Univ. of Valencia, and Inst. de Microelectrónica de Barcelona (IMB-CNM-CSIC) 08193 Bellaterra, Spain
- ¹⁶⁸ University of British Columbia, Department of Physics, 6224 Agricultural Road, CA - Vancouver, B.C. V6T 1Z1, Canada
- ¹⁶⁹ University of Victoria, Department of Physics and Astronomy, P.O. Box 3055, Victoria B.C., V8W 3P6, Canada
- ¹⁷⁰ Waseda University, WISE, 3-4-1 Okubo, Shinjuku-ku, Tokyo, 169-8555, Japan
- ¹⁷¹ The Weizmann Institute of Science, Department of Particle Physics, P.O. Box 26, IL - 76100 Rehovot, Israel
- ¹⁷² University of Wisconsin, Department of Physics, 1150 University Avenue, WI 53706 Madison, Wisconsin, United States of America
- ¹⁷³ Julius-Maximilians-University of Würzburg, Physikalisches Institute, Am Hubland, 97074 Würzburg, Germany
- ¹⁷⁴ Bergische Universität, Fachbereich C, Physik, Postfach 100127, Gauss-Strasse 20, D- 42097 Wuppertal, Germany
- ¹⁷⁵ Yale University, Department of Physics, PO Box 208121, New Haven CT, 06520-8121, United States of America
- ¹⁷⁶ Yerevan Physics Institute, Alikhanian Brothers Street 2, AM - 375036 Yerevan, Armenia
- ¹⁷⁷ Centre de Calcul CNRS/IN2P3, Domaine scientifique de la Doua, 27 bd du 11 Novembre 1918, 69622 Villeurbanne Cedex, France
- ^a Also at LIP, Portugal

- b* Also at Faculdade de Ciencias, Universidade de Lisboa, Portugal
- c* Also at CPPM, Marseille, France.
- d* Also at Centro de Fisica Nuclear da Universidade de Lisboa, Portugal
- e* Also at TRIUMF, Vancouver, Canada
- f* Also at FPACS, AGH-UST, Cracow, Poland
- g* Now at Università dell'Insubria, Dipartimento di Fisica e Matematica
- h* Also at Department of Physics, University of Coimbra, Portugal
- i* Now at CERN
- j* Also at Università di Napoli Parthenope, Napoli, Italy
- k* Also at Institute of Particle Physics (IPP), Canada
- l* Also at Università di Napoli Parthenope, via A. Acton 38, IT - 80133 Napoli, Italy
- m* Louisiana Tech University, 305 Wisteria Street, P.O. Box 3178, Ruston, LA 71272, United States of America
- n* Also at Universidade de Lisboa, Portugal
- o* At California State University, Fresno, USA
- p* Also at TRIUMF, 4004 Wesbrook Mall, Vancouver, B.C. V6T 2A3, Canada
- q* Also at Faculdade de Ciencias, Universidade de Lisboa, Portugal and at Centro de Fisica Nuclear da Universidade de Lisboa, Portugal
- r* Also at FPACS, AGH-UST, Cracow, Poland
- s* Also at California Institute of Technology, Pasadena, USA
- t* Louisiana Tech University, Ruston, USA
- u* Also at University of Montreal, Montreal, Canada
- v* Also at Institut für Experimentalphysik, Universität Hamburg, Hamburg, Germany
- w* Now at Chonnam National University, Chonnam, Korea 500-757
- x* Also at Institut für Experimentalphysik, Universität Hamburg, Luruper Chaussee 149, 22761 Hamburg, Germany
- y* Also at Manhattan College, NY, USA
- z* Also at School of Physics and Engineering, Sun Yat-sen University, China
- aa* Also at Taiwan Tier-1, ASGC, Academia Sinica, Taipei, Taiwan
- ab* Also at School of Physics, Shandong University, Jinan, China
- ac* Also at California Institute of Technology, Pasadena, USA
- ad* Also at Rutherford Appleton Laboratory, Didcot, UK
- ae* Also at school of physics, Shandong University, Jinan
- af* Also at Rutherford Appleton Laboratory, Didcot, UK
- ag* Also at TRIUMF, Vancouver, Canada
- ah* Now at KEK
- ai* Also at Departamento de Fisica, Universidade de Minho, Portugal
- aj* University of South Carolina, Columbia, USA
- ak* Also at KFKI Research Institute for Particle and Nuclear Physics, Budapest, Hungary
- al* University of South Carolina, Dept. of Physics and Astronomy, 700 S. Main St, Columbia, SC 29208, United States of America
- am* Also at Institute of Physics, Jagiellonian University, Cracow, Poland
- an* Louisiana Tech University, Ruston, USA
- ao* University of South Carolina, Columbia, USA
- ap* Transfer to LHCb 31.01.2010
- aq* Also at Oxford University, Department of Physics, Denys Wilkinson Building, Keble Road, Oxford OX1 3RH, United Kingdom
- ar* Also at school of physics and engineering, Sun Yat-sen University, China
- as* Also at CEA
- at* Also at LPNHE, Paris, France
- au* Also at Nanjing University, China
- * Deceased