Search for a Light Higgs Boson Decaying to Long-Lived Weakly Interacting Particles in Proton-Proton Collisions at $\sqrt{s} = 7$ TeV with the ATLAS Detector

G. Aad *et al.**

(ATLAS Collaboration)

(Received 6 March 2012; published 19 June 2012)

A search for the decay of a light Higgs boson (120–140 GeV) to a pair of weakly interacting, long-lived particles in 1.94 fb^{-1} of proton-proton collisions at $\sqrt{s} = 7$ TeV recorded in 2011 by the ATLAS detector is presented. The search strategy requires that both long-lived particles decay inside the muon spectrometer. No excess of events is observed above the expected background and limits on the Higgs boson production times branching ratio to weakly interacting, long-lived particles are derived as a function of the particle proper decay length.

DOI: 10.1103/PhysRevLett.108.251801 PACS numbers: 14.80.Ec, 12.60.−i, 13.85.Rm

A Higgs boson [1–3] below 140 GeV is particularly sensitive to new physics. Many extensions of the standard model (SM) include neutral, weakly coupled particles that can be long lived [4,5] and to which the Higgs boson may decay. These long-lived particles occur in many models, including gauge-mediated extensions of the minimal supersymmetric standard model [6], minimal supersymmetric standard model with R-parity violation [7], inelastic dark matter [8], and the hidden valley (HV) scenario [9].

This Letter presents the first ATLAS search for the Higgs boson decay, $h^0 \to \pi_v \pi_v$, to two identical neutral particles (π_v) that have a displaced decay to fermion-antifermion pairs. As a benchmark, we take a HV model [9] in which the SM is weakly coupled, by a heavy communicator particle, to a hidden sector that includes a pseudoscalar, the π_v. Because of the helicity suppression of pseudoscalar decays to low-mass $f\bar{f}$ pairs, the π_v decays predominantly to heavy fermions, $b\bar{b}$, $c\bar{c}$, and $\tau^+\tau^-$ in the ratio 85:5:8%. The weak coupling between the two sectors leads the π_v to have a long lifetime. Other, non-HV, models with the identical signature, where the π_v is replaced with another weakly interacting scalar or pseudoscalar particle, are discussed in Refs. [4,10]. Both Tevatron experiments, CDF and D0, performed similar searches for displaced decays in their respective tracking volumes, which limited the proper decay length range they could explore to a few hundred millimeters [11,12].

In many of these beyond-the-SM scenarios, the lifetime of the neutral states is not specified and can have a very large range. The current search covers a range of expected proper decay lengths extending to about 20 m by exploiting the size and layout of the ATLAS muon spectrometer. Consequently the experimental challenge is to develop signature-driven triggers to select displaced decays throughout the ATLAS detector volume [13].

This analysis requires both π_v decays to occur near the outer radius of the hadronic calorimeter ($r \sim 4$ m) or in the muon spectrometer (MS). Such decays give a (η, ϕ) cluster of charged and neutral hadrons in the MS. Requiring both π_v's to have this decay topology improves background rejection. The analysis uses specialized tracking and vertex reconstruction algorithms, described below, to reconstruct vertices in the MS. The analysis strategy takes advantage of the kinematics of the gluon fusion production mechanism and subsequent two-body decay, $h^0 \to \pi_v \pi_v$, which results in events with back-to-back π_v's, by requiring two well-separated vertices [$\Delta R \equiv \sqrt{(\Delta\eta)^2 + (\Delta\phi)^2} > 2$] [14] in the MS.

The data used in this analysis were collected in the first half of 2011 with the LHC operating at 7 TeV. Applying beam, detector, and data quality requirements resulted in a total integrated luminosity of 1.94 fb^{-1}. The integrated luminosity has a relative uncertainty of 3.7% [15,16].

Signal Monte Carlo (MC) samples were generated using PYTHIA [17,18] to simulate gluon fusion production ($gg \to h^0$) and the decay of the Higgs boson ($h^0 \to \pi_v \pi_v$). Four samples were generated: $m_{h^0} = 120$ and 140 GeV and for each m_{h^0}, two π_v masses of 20 and 40 GeV. The predicted Higgs boson production cross sections [19] are $\sigma(m_{h^0} = 120\text{ GeV}) = 16.6^{+3.3}_{-2.5}$ pb and $\sigma(m_{h^0} = 140\text{ GeV}) = 12.1^{+2.3}_{-1.8}$ pb, and the branching ratio (BR) for $h^0 \to \pi_v \pi_v$ is assumed to be 100%. The response of the ATLAS detector was modeled with GEANT4 [20,21]. The effect of multiple pp collisions occurring during the same bunch crossing (pileup) was simulated by superimposing several minimum bias events on the signal event. The MC events were weighted so that the pileup in the simulation agrees with pileup conditions found in data.

ATLAS is a multipurpose detector [22] consisting of an inner tracking detector (ID) surrounded by a superconducting

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

solenoid that provides a 2 T field, electromagnetic and hadronic calorimeters and a MS with a toroidal magnetic field. The ID, consisting of silicon pixel and strip detectors and a straw tube tracker, provides precision tracking of charged particles for $|\eta| \leq 2.5$. The calorimeter system covers $|\eta| \leq 4.9$ and has 9.7 interaction lengths at $\eta = 0$. The MS consists of a barrel and two forward spectrometers, each with 16 ϕ sectors instrumented with detectors for first level triggering and precision tracking detectors for muon momentum measurement. Each spectrometer has three stations along the muon flight path: inner, middle, and outer. In the barrel, the stations are located at radii of ~4.5, 7, and 10 m, while in the forward MS, they are located at $|z| \sim 7.5$, 14, and 20 m. This analysis uses muon tracking for $|\eta| \leq 2.4$, where each station is instrumented with two multilayers of precision tracking chambers, monitored drift tubes (MDTs). It also utilizes level 1 [23] (L1) muon triggering in the barrel MS ($|\eta| \leq 1$). The trigger chambers are located in the middle and outer stations. The L1 muon trigger requires hits in the middle station to create a low p_T muon region of interest (RoI) or hits in both the middle and outer stations for a high p_T RoI. The muon RoIs have a spacial extent of 0.2×0.2 in $\Delta\eta \times \Delta\phi$ and are limited to two RoIs per sector.

A dedicated, signature-driven trigger, the muon RoI cluster trigger [13], was developed to trigger on events with a π_v decaying in the MS. It selects events with a cluster of three or more muon RoIs in a $\Delta R = 0.4$ cone in the MS barrel trigger chambers. This trigger configuration implies that one π_v must decay in the barrel spectrometer, while the second π_v may decay either in the barrel or the forward spectrometer. With this trigger, it is possible to trigger on π_v decays at the outer radius of the hadronic calorimeter and in the MS with high efficiency. The backgrounds of punch-through jets [24] and muon bremsstrahlung are suppressed by requiring no calorimeter jets with $E_T \geq 30$ GeV in a cone of $\Delta R = 0.7$ and no ID tracks with $p_T \geq 5$ GeV within a region of $\Delta\eta \times \Delta\phi = 0.2 \times 0.2$ around the RoI cluster center. These isolation criteria result in a negligible loss in the simulated signal while significantly reducing the backgrounds.

As depicted in Fig. 1(a) [25], MC studies show the RoI cluster trigger is ~30%–50% efficient in the region from 4 to 7 m. The π_v's that decay beyond a radius of ~7 m do not leave hits in the trigger chambers located at ~7 m, while the π_v decays that occur before $r \sim 4$ m are located in the calorimeter and do not produce sufficient activity in the MS to pass the muon RoI cluster trigger. The $m_{h^0} = 120$ GeV and $m_{\pi_v} = 40$ GeV sample has a relatively lower efficiency because the π_v's have a lower boost and arrive later at the MS. As a result, the trigger signal may be associated with the incorrect bunch crossing, in which case the event is lost.

The systematic uncertainty of the muon RoI cluster trigger efficiency is evaluated on data using a sample of events containing a punch-through jet. This sample of events is similar to signal events as it contains both low energy photons and charged hadrons in a localized region of the MS. These punch-through jets are selected to be in the barrel calorimeter ($|\eta| \leq 1.4$), have $E_T \geq 20$ GeV, have at least four tracks in the ID, each with $p_T \geq 1$ GeV, and have at least 20 GeV of missing transverse momentum aligned with the jet. To ensure significant activity in the MS, the jet is required to contain at least 300 MDT hits in a cone of $\Delta R = 0.6$, centered around the jet axis [26]. The muon RoI cluster trigger algorithm was run in the vicinity of the punch-through jet for both data and MC events. The distribution of RoIs contained in the cluster for data and MC events, normalized to the number of data events, is shown in Fig. 2. The shapes of the distribution match well between data and MC events. A horizontal line fit to the ratio, as a function of $N_{\text{RoI}} \geq 1$, yields 1.14 ± 0.09, and 14% is taken as the systematic uncertainty. The effects of uncertainties in the jet energy scale (JES) [27], in the initial state radiation (ISR) spectrum [28], and in the amount of pileup were found to be

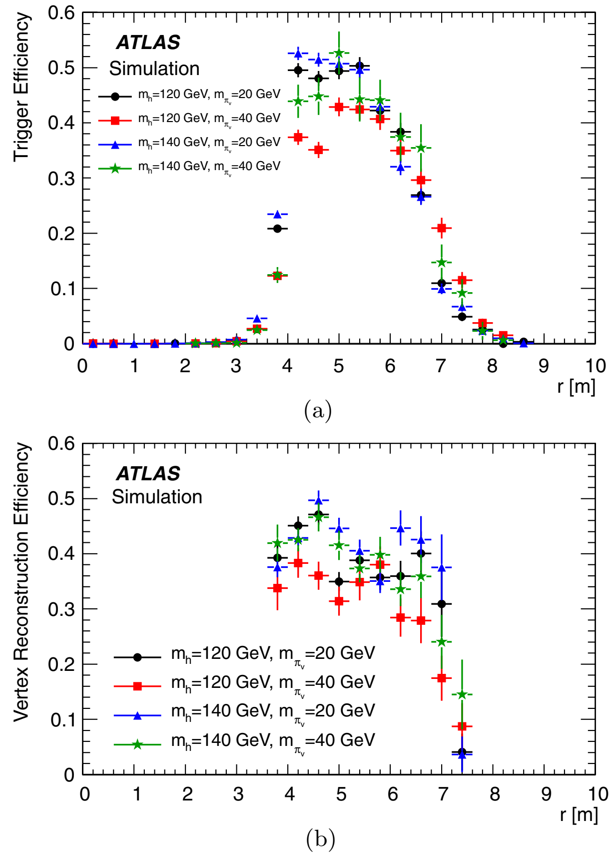

FIG. 1 (color online). (a) Efficiency of the trigger, as a function of the radial decay position (r) of the π_v. (b) The vertex reconstruction efficiency for π_v decays in the barrel for events that pass the muon RoI cluster trigger as a function of the radial decay distance. The error bars represent the statistical uncertainty on the efficiencies.

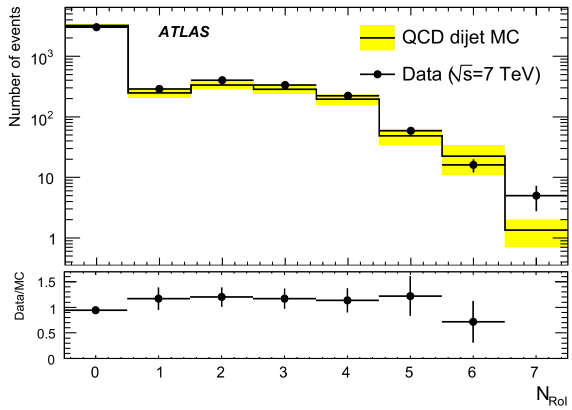

FIG. 2 (color online). Distribution of number of events vs number of muon RoIs from punch-through jets contained in the muon RoI cluster for both data and MC events. The error bands on the QCD dijet MC histogram represent the 1σ statistical uncertainty.

negligible when varying these quantities by their uncertainties.

A specialized tracking and vertex reconstruction algorithm was developed to identify π_v's that decay inside the MS. The decay of a π_v results in a high multiplicity of low p_T particles ($1 \leq p_T \leq 5$ GeV) containing $\sim$10 charged particles and $\sim$5 π^0's clustered in a small ΔR region of the spectrometer. The π_v's that decay before the last sampling layer of the hadronic calorimeter do not produce a significant number of tracks in the MS. Thus, detectable decay vertices must be located in the region between the outer radius of the hadronic calorimeter and the middle station of the MS. Over a wide range of acceptance in the barrel MS, the total amount of material traversed is roughly 1.3 radiation lengths [22]; therefore, as a consequence of the $\sim$5 π^0's produced in signal events, large electromagnetic showers accompany the $\sim$10 charged particles from π_v decays. The resulting MS environment contains, on average, approximately 800 MDT hits, of which $\sim$75% are from the electromagnetic showers.

The design of the muon chambers [22] is exploited in order to reconstruct tracks in this busy environment. The separation of the two multilayers inside a single muon chamber provides a powerful tool for track pattern recognition. This separation provides enough of a lever arm to allow, in the barrel, a momentum measurement with acceptable resolution for tracks up to approximately 10 GeV [29]. In the forward spectrometers, the muon chambers are outside the magnetic field region; therefore, it is not possible to measure the track momentum inside of a single chamber. In both cases, the tracklets used in the vertex reconstruction are formed using hits in single muon chambers.

The MS vertex algorithm begins by grouping the tracklets using a simple cone algorithm with $\Delta R = 0.6$. In the barrel, the tracklets are extrapolated through the magnetic field, and the vertex position is reconstructed as the point in (r, z) that uses the largest number of tracklets to reconstruct a vertex with a χ^2 probability greater than 5%. In the forward spectrometer, the reconstructed tracklets do not have a measurement of the momentum; therefore, the vertex is found using a least squares regression that assumes the tracklets are straight lines. Vertices are required to be reconstructed using at least three tracklets, point back to the interaction point (IP) [30] and have $|\eta| \leq 2.2$. After requiring the MS vertex to be separated from ID tracks with $p_T \geq 5$ GeV and jets with $E_T \geq 15$ GeV by $\Delta R = 0.4$ and $\Delta R = 0.7$, respectively, the algorithm has an efficiency of $\sim$40% in signal MC events throughout the barrel region ($4 \leq r \leq 7.5$ m) and a resolution of 20 cm in z, 32 cm in r, and 50 mrad in ϕ. In the forward spectrometer, the algorithm is $\sim$40% efficient in the region $8 \leq |z| \leq 14$ m. Figure 1(b) [25] shows the vertex reconstruction efficiency for the barrel reconstruction algorithm in MC signal events that passed the muon RoI cluster trigger.

The MC description of hadrons and photons in the MS was validated on the same sample of events containing a punch-through jet used to evaluate the trigger performance. The fraction of these jets that produce a MS vertex was compared in data and QCD dijet MC events. Table I shows the fraction of punch-through jets that produce a vertex in data and MC events as a function of the number of MDT hits in a cone of $\Delta R = 0.6$ around the jet axis. The data-to-MC ratio is fit to a flat distribution that yields a ratio consistent with unity with a 15% statistical uncertainty, which is taken to be the systematic uncertainty in the vertex reconstruction efficiency. The systematic uncertainties arising from the JES, ISR spectrum, and the amount of pileup were estimated by varying these quantities by their uncertainties and calculating the change in the vertex reconstruction efficiency. The total systematic uncertainty of 16% for the efficiency of reconstructing a vertex is the sum in quadrature of the uncertainties in the efficiency of the isolation criteria due to varying the JES, ISR, and pileup (3%, 3%, and 2%, respectively) and the uncertainty in the comparison of data and MC events (15%).

The final event selection requires two good MS vertices separated by $\Delta R > 2$. The background due to events with two jets, both of which punch through the calorimeter, is a negligible contribution to the total background due to the tight isolation criteria applied to each vertex. The background is calculated using a fully data-driven method by

TABLE I. Fraction of punch-through jets that have a reconstructed vertex in the muon spectrometer for varying numbers of MDT hits for data and QCD Monte Carlo events.

Number of MDT hits	QCD dijet Monte Carlo	Data
$300 \leq N_{\mathrm{MDT}} < 400$	$10.1 \pm 2.2\%$	$9.1 \pm 0.5\%$
$400 \leq N_{\mathrm{MDT}} < 500$	$9.2 \pm 2.8\%$	$10.5 \pm 0.7\%$
$500 \leq N_{\mathrm{MDT}} < 600$	$13.1 \pm 5.4\%$	$13.0 \pm 0.9\%$
$N_{\mathrm{MDT}} \geq 600$	$16.5 \pm 4.5\%$	$16.7 \pm 0.7\%$

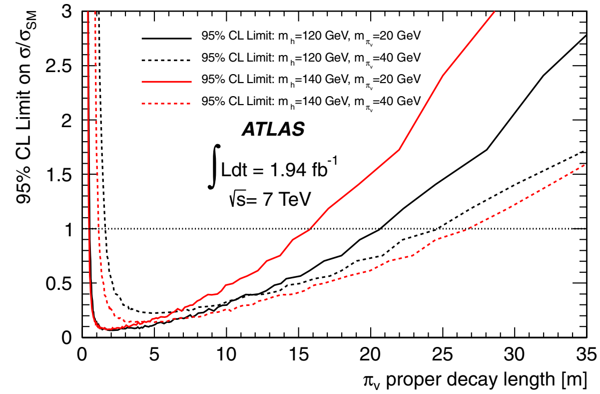

FIG. 3 (color online). Observed 95% upper limits on the process $h^0 \to \pi_v \pi_v$, vs the π_v proper decay length, expressed as a multiple of the SM cross section for Higgs boson production. Exclusion limits assume 100% branching ratio for the Higgs boson decaying to π_v's.

measuring the probability for a random event to contain an MS vertex ($P_{\rm vertex}$) and the probability of reconstructing a vertex given that the event passed the RoI cluster trigger ($P_{\rm reco}$). Because $P_{\rm vertex}$ and $P_{\rm reco}$ are measured in data, they incorporate backgrounds from cosmic showers, beam halo, and detector noise. The background is calculated as

$$N_{\rm fake}(2\text{ MS vertex}) = N(\text{MS vertex, } 1\text{ trig})P_{\rm vertex} + N(\text{MS vertex, } 2\text{ trig})P_{\rm reco}.$$

N(MS vertex, 1 trig) is the number of events with a single muon RoI cluster trigger object and an isolated MS vertex. N(MS vertex, 2 trig) is the number of events with an isolated vertex and a second RoI cluster trigger object. The first term in the equation is the expected number of background events with one vertex that randomly contain a second vertex. $P_{\rm reco}$ is the probability to reconstruct a vertex given there was an RoI cluster trigger; thus, the second term in the equation is the expected number of events with two RoI clusters that have two vertices in the MS. $P_{\rm vertex}$ was measured using zero bias data [31] to be $(9.7 \pm 6.9) \times 10^{-7}$, and $P_{\rm reco}$ was measured using the events that pass the muon RoI cluster trigger to be $(1.11 \pm 0.01) \times 10^{-2}$. The expected signal would cause, at most, a relative change in $P_{\rm reco}$ of $\sim$1%. $P_{\rm reco}$ was also measured using a sample of events recorded when there were no collisions. In this sample of noncollision background events, $P_{\rm reco}$ was measured to be $(7.0 \pm 0.6) \times 10^{-3}$. For calculating the background, the larger value of $P_{\rm reco}$ (1.11×10^{-2}) is taken since it gives a conservative estimate of the background. N(MS vertex, 1 trig) and N(MS vertex, 2 trig) are 15 543 and 1, respectively. Therefore, the background is calculated to be 0.03 ± 0.02 events.

No events in the data sample pass the selection requiring two isolated, back-to-back vertices in the muon spectrometer. Since no significant excess over the background prediction is found, exclusion limits for $\sigma_{h^0} \times \text{BR}(h^0 \to \pi_v \pi_v)$ are set by rejecting the signal hypothesis at the 95% confidence level (CL) using the CLs procedure [32]. Figure 3 shows the 95% CL upper limit on $\sigma_{h^0} \times \text{BR}(h^0 \to \pi_v \pi_v)/\sigma_{\rm SM}$ as a function of the π_v proper decay length ($c\tau$) in multiples of the SM Higgs boson cross section, $\sigma_{\rm SM}$. As expected, the Higgs boson and π_v mass combinations with the largest boosts leading to larger $\beta\gamma c\tau$ have the smallest exclusion limits.

TABLE II. The excluded proper decay lengths ($c\tau$) of the π_v, at 95% CL, for each of the signal samples, assuming 100% branching ratio for the channel $h^0 \to \pi_v \pi_v$.

m_{h^0}(GeV)	m_{π_v}(GeV)	Excluded region
120	20	$0.50 < c\tau < 20.65$ m
120	40	$1.60 < c\tau < 24.65$ m
140	20	$0.45 < c\tau < 15.8$ m
140	40	$1.10 < c\tau < 26.75$ m

In 1.94 fb^{-1} of pp collision data at a center-of-mass energy of 7 TeV, there is no evidence of an excess of events containing two isolated, back-to-back vertices in the ATLAS muon spectrometer. Using the model of a light Higgs boson decaying to weakly interacting, long-lived pseudoscalars, limits have been placed on the pseudoscalar proper decay length. Table II shows the broad range of π_v proper decay lengths that have been excluded at the 95% CL, assuming 100% branching ratio for $h^0 \to \pi_v \pi_v$. These limits also apply to models in which the Higgs boson decays to a pair of weakly interacting scalars that, in turn, decay to heavy quark pairs.

We thank CERN for the very successful operation of the LHC, 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; MSMT CR, MPO CR and VSC CR, 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, U.S. 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.

[1] F. Englert and R. Brout, Phys. Rev. Lett. **13**, 321 (1964).
[2] P. Higgs, Phys. Lett. **12**, 132 (1964).
[3] C. H. G. S. Guralnik and T. Kibble, Phys. Rev. Lett. **13**, 585 (1964).
[4] M. J. Strassler and K. M. Zurek, Phys. Lett. B **661**, 263 (2008).
[5] S. Chang, R. Dermisek, J. F. Gunion, and N. Weiner, Annu. Rev. Nucl. Part. Sci. **58**, 75 (2008).
[6] S. Dimopoulos, M. Dine, S. Raby, and S. Thomas, Phys. Rev. Lett. **76**, 3494 (1996).
[7] R. Barbier, C. Bérat, M. Besançon, M. Chemtob, A. Deandrea, E. Dudas, P. Fayet, S. Lavignac, G. Moreau, E. Perez, and Y. Sirois, Phys. Rep. **420**, 1 (2005).
[8] D. Smith and N. Weiner, Phys. Rev. D **64**, 043502 (2001).
[9] M. J. Strassler and K. M. Zurek, Phys. Lett. B **651**, 374 (2007).
[10] S. Chang, P. Fox, and N. Weiner, J. High Energy Phys. 08 (2006) 068.
[11] T. Aaltonen *et al.* (CDF Collaboration) Phys. Rev. D **85**, 012007 (2012).
[12] V. Abazov *et al.* (D0 Collaboration) Phys. Rev. Lett. **103**, 071801 (2009).
[13] The ATLAS Collaboration, Report No. ATL-PHYS-PUB-2009-082, 2009.
[14] The ATLAS Collaboration uses a right-handed coordinate system with its origin at the nominal IP in the center of the detector and the z axis coinciding with the beam pipe. The x axis points from the IP to the center of the LHC ring, and the y axis points upward. Cylindrical coordinates (r, ϕ) are used in the transverse plane, with ϕ being the azimuthal angle around the beam pipe. The pseudorapidity is defined in terms of the polar angle θ as $\eta = -\ln\tan(\theta/2)$.
[15] ATLAS Collaboration, Eur. Phys. J. C **71**, 1630 (2011).
[16] The ATLAS Collaboration, Report No. ATLAS-CONF-2011-116, 2011.
[17] T. Sjostrand, S. Mareena, and P. Skands, J. High Energy Phys. 05 (2006) 026.
[18] The simulation was done in PYTHIA 6, with color connections on. This leads to some quarks from the π_v decays being connected via a gluon string to partons at the IP. These events with a macroscopic color string were removed from the MC sample and the remaining events reweighted to preserve the proper branching fractions.
[19] LHC Higgs Cross Section Working Group, S. Dittmaier, C. Mariotti, G. Passarino, and R. Tanaka (Eds.), Report No. CERN-2011-002 (CERN, Geneva, 2011).
[20] S. Agostinelli *et al.*, Nucl. Instrum. Methods Phys. Res., Sect. A **506**, 250 (2003).
[21] The ATLAS Collaboration, Eur. Phys. J. C **70**, 823 (2010).
[22] The ATLAS Collaboration, JINST **3**, S08003 (2008).
[23] The ATLAS Collaboration, Eur. Phys. J. C **72**, 1849 (2012).
[24] A punch-through jet occurs when particles from a jet, or from a shower in the calorimeter, escape the calorimeter volume.
[25] The fluctuations of the trigger and vertex algorithm efficiencies as a function of r reflect the material distribution in the MS and the dependence of the opening angle of the π_v decay products on the π_v mass.
[26] For comparison a single, minimum-ionizing track in the barrel MS has about 20 to 25 MDT hits.
[27] The ATLAS Collaboration, arXiv:1112.6426v1 [Eur. Phys. J. C (to be published)].
[28] D. de Florian, G. Ferrera, M. Grazzini, and D. Tommasini, arXiv:1109.2109v1.
[29] The momentum resolution for tracklets reconstructed using single MDT chambers in the barrel MS is in the range: $\frac{\delta p}{|p|} \sim [0.06 - 0.09] \times |p| /\mathrm{GeV}$.
[30] The sum of p_z of all tracklets used in the vertex fit is required to point back toward the IP.
[31] The zero bias trigger uses a random generator in coincidence with the bunch crossing to select events.
[32] A. Read, J. Phys. G **28**, 2693 (2002).

G. Aad,[47] B. Abbott,[110] J. Abdallah,[11] A. A. Abdelalim,[48] A. Abdesselam,[117] O. Abdinov,[10] B. Abi,[111] M. Abolins,[87] O. S. AbouZeid,[157] H. Abramowicz,[152] H. Abreu,[114] E. Acerbi,[88a,88b] B. S. Acharya,[163a,163b] L. Adamczyk,[37] D. L. Adams,[24] T. N. Addy,[55] J. Adelman,[174] M. Aderholz,[98] S. Adomeit,[97] P. Adragna,[74] T. Adye,[128] S. Aefsky,[22] J. A. Aguilar-Saavedra,[123b,b] M. Aharrouche,[80] S. P. Ahlen,[21] F. Ahles,[47] A. Ahmad,[147] M. Ahsan,[40] G. Aielli,[132a,132b] T. Akdogan,[18a] T. P. A. Åkesson,[78] G. Akimoto,[154] A. V. Akimov,[93] A. Akiyama,[66] M. S. Alam,[1] M. A. Alam,[75] J. Albert,[168] S. Albrand,[54] M. Aleksa,[29] I. N. Aleksandrov,[64] F. Alessandria,[88a] C. Alexa,[25a] G. Alexander,[152] G. Alexandre,[48] T. Alexopoulos,[9] M. Alhroob,[20] M. Aliev,[15] G. Alimonti,[88a] J. Alison,[119] M. Aliyev,[10] P. P. Allport,[72] S. E. Allwood-Spiers,[52] J. Almond,[81] A. Aloisio,[101a,101b] R. Alon,[170] A. Alonso,[78] B. Alvarez Gonzalez,[87] M. G. Alviggi,[101a,101b] K. Amako,[65] P. Amaral,[29] C. Amelung,[22] V. V. Ammosov,[127] A. Amorim,[123a,c] G. Amorós,[166] N. Amram,[152] C. Anastopoulos,[29] L. S. Ancu,[16] N. Andari,[114] T. Andeen,[34] C. F. Anders,[20] G. Anders,[57a] K. J. Anderson,[30] A. Andreazza,[88a,88b] V. Andrei,[57a] M-L. Andrieux,[54] X. S. Anduaga,[69] A. Angerami,[34] F. Anghinolfi,[29] A. Anisenkov,[106] N. Anjos,[123a] A. Annovi,[46] A. Antonaki,[8]

M. Antonelli,[46] A. Antonov,[95] J. Antos,[143b] F. Anulli,[131a] S. Aoun,[82] L. Aperio Bella,[4] R. Apolle,[117,d] G. Arabidze,[87] I. Aracena,[142] Y. Arai,[65] A. T. H. Arce,[44] J. P. Archambault,[28] S. Arfaoui,[147] J-F. Arguin,[14] E. Arik,[18a,a] M. Arik,[18a] A. J. Armbruster,[86] O. Arnaez,[80] C. Arnault,[114] A. Artamonov,[94] G. Artoni,[131a,131b] D. Arutinov,[20] S. Asai,[154] R. Asfandiyarov,[171] S. Ask,[27] B. Åsman,[145a,145b] L. Asquith,[5] K. Assamagan,[24] A. Astbury,[168] A. Astvatsatourov,[51] B. Aubert,[4] E. Auge,[114] K. Augsten,[126] M. Aurousseau,[144a] G. Avolio,[162] R. Avramidou,[9] D. Axen,[167] C. Ay,[53] G. Azuelos,[92,e] Y. Azuma,[154] M. A. Baak,[29] G. Baccaglioni,[88a] C. Bacci,[133a,133b] A. M. Bach,[14] H. Bachacou,[135] K. Bachas,[29] G. Bachy,[29] M. Backes,[48] M. Backhaus,[20] E. Badescu,[25a] P. Bagnaia,[131a,131b] S. Bahinipati,[2] Y. Bai,[32a] D. C. Bailey,[157] T. Bain,[157] J. T. Baines,[128] O. K. Baker,[174] M. D. Baker,[24] S. Baker,[76] E. Banas,[38] P. Banerjee,[92] Sw. Banerjee,[171] D. Banfi,[29] A. Bangert,[149] V. Bansal,[168] H. S. Bansil,[17] L. Barak,[170] S. P. Baranov,[93] A. Barashkou,[64] A. Barbaro Galtieri,[14] T. Barber,[47] E. L. Barberio,[85] D. Barberis,[49a,49b] M. Barbero,[20] D. Y. Bardin,[64] T. Barillari,[98] M. Barisonzi,[173] T. Barklow,[142] N. Barlow,[27] B. M. Barnett,[128] R. M. Barnett,[14] A. Baroncelli,[133a] G. Barone,[48] A. J. Barr,[117] F. Barreiro,[79] J. Barreiro Guimarães da Costa,[56] P. Barrillon,[114] R. Bartoldus,[142] A. E. Barton,[70] V. Bartsch,[148] R. L. Bates,[52] L. Batkova,[143a] J. R. Batley,[27] A. Battaglia,[16] M. Battistin,[29] F. Bauer,[135] H. S. Bawa,[142,f] S. Beale,[97] B. Beare,[157] T. Beau,[77] P. H. Beauchemin,[160] R. Beccherle,[49a] P. Bechtle,[20] H. P. Beck,[16] S. Becker,[97] M. Beckingham,[137] K. H. Becks,[173] A. J. Beddall,[18c] A. Beddall,[18c] S. Bedikian,[174] V. A. Bednyakov,[64] C. P. Bee,[82] M. Begel,[24] S. Behar Harpaz,[151] P. K. Behera,[62] M. Beimforde,[98] C. Belanger-Champagne,[84] P. J. Bell,[48] W. H. Bell,[48] G. Bella,[152] L. Bellagamba,[19a] F. Bellina,[29] M. Bellomo,[29] A. Belloni,[56] O. Beloborodova,[106,g] K. Belotskiy,[95] O. Beltramello,[29] S. Ben Ami,[151] O. Benary,[152] D. Benchekroun,[134a] C. Benchouk,[82] M. Bendel,[80] N. Benekos,[164] Y. Benhammou,[152] E. Benhar Noccioli,[48] J. A. Benitez Garcia,[158b] D. P. Benjamin,[44] M. Benoit,[114] J. R. Bensinger,[22] K. Benslama,[129] S. Bentvelsen,[104] D. Berge,[29] E. Bergeaas Kuutmann,[41] N. Berger,[4] F. Berghaus,[168] E. Berglund,[104] J. Beringer,[14] P. Bernat,[76] R. Bernhard,[47] C. Bernius,[24] T. Berry,[75] C. Bertella,[82] A. Bertin,[19a,19b] F. Bertinelli,[29] F. Bertolucci,[121a,121b] M. I. Besana,[88a,88b] N. Besson,[135] S. Bethke,[98] W. Bhimji,[45] R. M. Bianchi,[29] M. Bianco,[71a,71b] O. Biebel,[97] S. P. Bieniek,[76] K. Bierwagen,[53] J. Biesiada,[14] M. Biglietti,[133a] H. Bilokon,[46] M. Bindi,[19a,19b] S. Binet,[114] A. Bingul,[18c] C. Bini,[131a,131b] C. Biscarat,[176] U. Bitenc,[47] K. M. Black,[21] R. E. Blair,[5] J.-B. Blanchard,[135] G. Blanchot,[29] T. Blazek,[143a] C. Blocker,[22] J. Blocki,[38] A. Blondel,[48] W. Blum,[80] U. Blumenschein,[53] G. J. Bobbink,[104] V. B. Bobrovnikov,[106] S. S. Bocchetta,[78] A. Bocci,[44] C. R. Boddy,[117] M. Boehler,[41] J. Boek,[173] N. Boelaert,[35] S. Böser,[76] J. A. Bogaerts,[29] A. Bogdanchikov,[106] A. Bogouch,[89,a] C. Bohm,[145a] V. Boisvert,[75] T. Bold,[37] V. Boldea,[25a] N. M. Bolnet,[135] M. Bona,[74] V. G. Bondarenko,[95] M. Bondioli,[162] M. Boonekamp,[135] G. Boorman,[75] C. N. Booth,[138] S. Bordoni,[77] C. Borer,[16] A. Borisov,[127] G. Borissov,[70] I. Borjanovic,[12a] S. Borroni,[86] K. Bos,[104] D. Boscherini,[19a] M. Bosman,[11] H. Boterenbrood,[104] D. Botterill,[128] J. Bouchami,[92] J. Boudreau,[122] E. V. Bouhova-Thacker,[70] D. Boumediene,[33] C. Bourdarios,[114] N. Bousson,[82] A. Boveia,[30] J. Boyd,[29] I. R. Boyko,[64] N. I. Bozhko,[127] I. Bozovic-Jelisavcic,[12b] J. Bracinik,[17] A. Braem,[29] P. Branchini,[133a] G. W. Brandenburg,[56] A. Brandt,[7] G. Brandt,[117] O. Brandt,[53] U. Bratzler,[155] B. Brau,[83] J. E. Brau,[113] H. M. Braun,[173] B. Brelier,[157] J. Bremer,[29] R. Brenner,[165] S. Bressler,[170] D. Breton,[114] D. Britton,[52] F. M. Brochu,[27] I. Brock,[20] R. Brock,[87] T. J. Brodbeck,[70] E. Brodet,[152] F. Broggi,[88a] C. Bromberg,[87] J. Bronner,[98] G. Brooijmans,[34] W. K. Brooks,[31b] G. Brown,[81] H. Brown,[7] P. A. Bruckman de Renstrom,[38] D. Bruncko,[143b] R. Bruneliere,[47] S. Brunet,[60] A. Bruni,[19a] G. Bruni,[19a] M. Bruschi,[19a] T. Buanes,[13] Q. Buat,[54] F. Bucci,[48] J. Buchanan,[117] N. J. Buchanan,[2] P. Buchholz,[140] R. M. Buckingham,[117] A. G. Buckley,[45] S. I. Buda,[25a] I. A. Budagov,[64] B. Budick,[107] V. Büscher,[80] L. Bugge,[116] O. Bulekov,[95] M. Bunse,[42] T. Buran,[116] H. Burckhart,[29] S. Burdin,[72] T. Burgess,[13] S. Burke,[128] E. Busato,[33] P. Bussey,[52] C. P. Buszello,[165] F. Butin,[29] B. Butler,[142] J. M. Butler,[21] C. M. Buttar,[52] J. M. Butterworth,[76] W. Buttinger,[27] S. Cabrera Urbán,[166] D. Caforio,[19a,19b] O. Cakir,[3a] P. Calafiura,[14] G. Calderini,[77] P. Calfayan,[97] R. Calkins,[105] L. P. Caloba,[23a] R. Caloi,[131a,131b] D. Calvet,[33] S. Calvet,[33] R. Camacho Toro,[33] P. Camarri,[132a,132b] M. Cambiaghi,[118a,118b] D. Cameron,[116] L. M. Caminada,[14] S. Campana,[29] M. Campanelli,[76] V. Canale,[101a,101b] F. Canelli,[30,h] A. Canepa,[158a] J. Cantero,[79] L. Capasso,[101a,101b] M. D. M. Capeans Garrido,[29] I. Caprini,[25a] M. Caprini,[25a] D. Capriotti,[98] M. Capua,[36a,36b] R. Caputo,[80] C. Caramarcu,[24] R. Cardarelli,[132a] T. Carli,[29] G. Carlino,[101a] L. Carminati,[88a,88b] B. Caron,[84] S. Caron,[103] G. D. Carrillo Montoya,[171] A. A. Carter,[74] J. R. Carter,[27] J. Carvalho,[123a,i] D. Casadei,[107] M. P. Casado,[11] M. Cascella,[121a,121b] C. Caso,[49a,49b,a] A. M. Castaneda Hernandez,[171] E. Castaneda-Miranda,[171] V. Castillo Gimenez,[166] N. F. Castro,[123a] G. Cataldi,[71a] F. Cataneo,[29] A. Catinaccio,[29] J. R. Catmore,[29] A. Cattai,[29] G. Cattani,[132a,132b] S. Caughron,[87] D. Cauz,[163a,163c] P. Cavalleri,[77] D. Cavalli,[88a] M. Cavalli-Sforza,[11] V. Cavasinni,[121a,121b] F. Ceradini,[133a,133b] A. S. Cerqueira,[23b] A. Cerri,[29] L. Cerrito,[74] F. Cerutti,[46] S. A. Cetin,[18b]

F. Cevenini,[101a,101b] A. Chafaq,[134a] D. Chakraborty,[105] K. Chan,[2] B. Chapleau,[84] J. D. Chapman,[27] J. W. Chapman,[86] E. Chareyre,[77] D. G. Charlton,[17] V. Chavda,[81] C. A. Chavez Barajas,[29] S. Cheatham,[84] S. Chekanov,[5] S. V. Chekulaev,[158a] G. A. Chelkov,[64] M. A. Chelstowska,[103] C. Chen,[63] H. Chen,[24] S. Chen,[32c] T. Chen,[32c] X. Chen,[171] S. Cheng,[32a] A. Cheplakov,[64] V. F. Chepurnov,[64] R. Cherkaoui El Moursli,[134e] V. Chernyatin,[24] E. Cheu,[6] S. L. Cheung,[157] L. Chevalier,[135] G. Chiefari,[101a,101b] L. Chikovani,[50a] J. T. Childers,[29] A. Chilingarov,[70] G. Chiodini,[71a] M. V. Chizhov,[64] G. Choudalakis,[30] S. Chouridou,[136] I. A. Christidi,[76] A. Christov,[47] D. Chromek-Burckhart,[29] M. L. Chu,[150] J. Chudoba,[124] G. Ciapetti,[131a,131b] K. Ciba,[37] A. K. Ciftci,[3a] R. Ciftci,[3a] D. Cinca,[33] V. Cindro,[73] M. D. Ciobotaru,[162] C. Ciocca,[19a] A. Ciocio,[14] M. Cirilli,[86] M. Citterio,[88a] M. Ciubancan,[25a] A. Clark,[48] P. J. Clark,[45] W. Cleland,[122] J. C. Clemens,[82] B. Clement,[54] C. Clement,[145a,145b] R. W. Clifft,[128] Y. Coadou,[82] M. Cobal,[163a,163c] A. Coccaro,[171] J. Cochran,[63] P. Coe,[117] J. G. Cogan,[142] J. Coggeshall,[164] E. Cogneras,[176] J. Colas,[4] A. P. Colijn,[104] N. J. Collins,[17] C. Collins-Tooth,[52] J. Collot,[54] G. Colon,[83] P. Conde Muiño,[123a] E. Coniavitis,[117] M. C. Conidi,[11] M. Consonni,[103] V. Consorti,[47] S. Constantinescu,[25a] C. Conta,[118a,118b] F. Conventi,[101a,j] J. Cook,[29] M. Cooke,[14] B. D. Cooper,[76] A. M. Cooper-Sarkar,[117] K. Copic,[14] T. Cornelissen,[173] M. Corradi,[19a] F. Corriveau,[84,k] A. Cortes-Gonzalez,[164] G. Cortiana,[98] G. Costa,[88a] M. J. Costa,[166] D. Costanzo,[138] T. Costin,[30] D. Côté,[29] R. Coura Torres,[23a] L. Courneyea,[168] G. Cowan,[75] C. Cowden,[27] B. E. Cox,[81] K. Cranmer,[107] F. Crescioli,[121a,121b] M. Cristinziani,[20] G. Crosetti,[36a,36b] R. Crupi,[71a,71b] S. Crépé-Renaudin,[54] C.-M. Cuciuc,[25a] C. Cuenca Almenar,[174] T. Cuhadar Donszelmann,[138] M. Curatolo,[46] C. J. Curtis,[17] C. Cuthbert,[149] P. Cwetanski,[60] H. Czirr,[140] P. Czodrowski,[43] Z. Czyczula,[174] S. D'Auria,[52] M. D'Onofrio,[72] A. D'Orazio,[131a,131b] P. V. M. Da Silva,[23a] C. Da Via,[81] W. Dabrowski,[37] T. Dai,[86] C. Dallapiccola,[83] M. Dam,[35] M. Dameri,[49a,49b] D. S. Damiani,[136] H. O. Danielsson,[29] D. Dannheim,[98] V. Dao,[48] G. Darbo,[49a] G. L. Darlea,[25b] C. Daum,[104] W. Davey,[20] T. Davidek,[125] N. Davidson,[85] R. Davidson,[70] E. Davies,[117,d] M. Davies,[92] A. R. Davison,[76] Y. Davygora,[57a] E. Dawe,[141] I. Dawson,[138,a] J. W. Dawson,[5,a] R. K. Daya-Ishmukhametova,[22] K. De,[7] R. de Asmundis,[101a] S. De Castro,[19a,19b] P. E. De Castro Faria Salgado,[24] S. De Cecco,[77] J. de Graat,[97] N. De Groot,[103] P. de Jong,[104] C. De La Taille,[114] H. De la Torre,[79] B. De Lotto,[163a,163c] L. de Mora,[70] L. De Nooij,[104] D. De Pedis,[131a] A. De Salvo,[131a] U. De Sanctis,[163a,163c] A. De Santo,[148] J. B. De Vivie De Regie,[114] S. Dean,[76] W. J. Dearnaley,[70] R. Debbe,[24] C. Debenedetti,[45] D. V. Dedovich,[64] J. Degenhardt,[119] M. Dehchar,[117] C. Del Papa,[163a,163c] J. Del Peso,[79] T. Del Prete,[121a,121b] T. Delemontex,[54] M. Deliyergiyev,[73] A. Dell'Acqua,[29] L. Dell'Asta,[21] M. Della Pietra,[101a,j] D. della Volpe,[101a,101b] M. Delmastro,[4] N. Delruelle,[29] P. A. Delsart,[54] C. Deluca,[147] S. Demers,[174] M. Demichev,[64] B. Demirkoz,[11,l] J. Deng,[162] S. P. Denisov,[127] D. Derendarz,[38] J. E. Derkaoui,[134d] F. Derue,[77] P. Dervan,[72] K. Desch,[20] E. Devetak,[147] P. O. Deviveiros,[104] A. Dewhurst,[128] B. DeWilde,[147] S. Dhaliwal,[157] R. Dhullipudi,[24,m] A. Di Ciaccio,[132a,132b] L. Di Ciaccio,[4] A. Di Girolamo,[29] B. Di Girolamo,[29] S. Di Luise,[133a,133b] A. Di Mattia,[171] B. Di Micco,[29] R. Di Nardo,[46] A. Di Simone,[132a,132b] R. Di Sipio,[19a,19b] M. A. Diaz,[31a] F. Diblen,[18c] E. B. Diehl,[86] J. Dietrich,[41] T. A. Dietzsch,[57a] S. Diglio,[85] K. Dindar Yagci,[39] J. Dingfelder,[20] C. Dionisi,[131a,131b] P. Dita,[25a] S. Dita,[25a] F. Dittus,[29] F. Djama,[82] T. Djobava,[50b] M. A. B. do Vale,[23c] A. Do Valle Wemans,[123a] T. K. O. Doan,[4] M. Dobbs,[84] R. Dobinson,[29,a] D. Dobos,[29] E. Dobson,[29,n] J. Dodd,[34] C. Doglioni,[48] T. Doherty,[52] Y. Doi,[65,a] J. Dolejsi,[125] I. Dolenc,[73] Z. Dolezal,[125] B. A. Dolgoshein,[95,a] T. Dohmae,[154] M. Donadelli,[23d] M. Donega,[119] J. Donini,[33] J. Dopke,[29] A. Doria,[101a] A. Dos Anjos,[171] M. Dosil,[11] A. Dotti,[121a,121b] M. T. Dova,[69] J. D. Dowell,[17] A. D. Doxiadis,[104] A. T. Doyle,[52] Z. Drasal,[125] J. Drees,[173] N. Dressnandt,[119] H. Drevermann,[29] C. Driouichi,[35] M. Dris,[9] J. Dubbert,[98] S. Dube,[14] E. Duchovni,[170] G. Duckeck,[97] A. Dudarev,[29] F. Dudziak,[63] M. Dührssen,[29] I. P. Duerdoth,[81] L. Duflot,[114] M-A. Dufour,[84] M. Dunford,[29] H. Duran Yildiz,[3a] R. Duxfield,[138] M. Dwuznik,[37] F. Dydak,[29] M. Düren,[51] W. L. Ebenstein,[44] J. Ebke,[97] S. Eckweiler,[80] K. Edmonds,[80] C. A. Edwards,[75] N. C. Edwards,[52] W. Ehrenfeld,[41] T. Ehrich,[98] T. Eifert,[142] G. Eigen,[13] K. Einsweiler,[14] E. Eisenhandler,[74] T. Ekelof,[165] M. El Kacimi,[134c] M. Ellert,[165] S. Elles,[4] F. Ellinghaus,[80] K. Ellis,[74] N. Ellis,[29] J. Elmsheuser,[97] M. Elsing,[29] D. Emeliyanov,[128] R. Engelmann,[147] A. Engl,[97] B. Epp,[61] A. Eppig,[86] J. Erdmann,[53] A. Ereditato,[16] D. Eriksson,[145a] J. Ernst,[1] M. Ernst,[24] J. Ernwein,[135] D. Errede,[164] S. Errede,[164] E. Ertel,[80] M. Escalier,[114] C. Escobar,[122] X. Espinal Curull,[11] B. Esposito,[46] F. Etienne,[82] A. I. Etienvre,[135] E. Etzion,[152] D. Evangelakou,[53] H. Evans,[60] L. Fabbri,[19a,19b] C. Fabre,[29] R. M. Fakhrutdinov,[127] S. Falciano,[131a] Y. Fang,[171] M. Fanti,[88a,88b] A. Farbin,[7] A. Farilla,[133a] J. Farley,[147] T. Farooque,[157] S. M. Farrington,[117] P. Farthouat,[29] P. Fassnacht,[29] D. Fassouliotis,[8] B. Fatholahzadeh,[157] A. Favareto,[88a,88b] L. Fayard,[114] S. Fazio,[36a,36b] R. Febbraro,[33] P. Federic,[143a] O. L. Fedin,[120] W. Fedorko,[87] M. Fehling-Kaschek,[47] L. Feligioni,[82] D. Fellmann,[5] C. Feng,[32d] E. J. Feng,[30] A. B. Fenyuk,[127] J. Ferencei,[143b] J. Ferland,[92] W. Fernando,[108]

S. Ferrag,[52] J. Ferrando,[52] V. Ferrara,[41] A. Ferrari,[165] P. Ferrari,[104] R. Ferrari,[118a] A. Ferrer,[166] M. L. Ferrer,[46] D. Ferrere,[48] C. Ferretti,[86] A. Ferretto Parodi,[49a,49b] M. Fiascaris,[30] F. Fiedler,[80] A. Filipčič,[73] A. Filippas,[9] F. Filthaut,[103] M. Fincke-Keeler,[168] M. C. N. Fiolhais,[123a,i] L. Fiorini,[166] A. Firan,[39] G. Fischer,[41] P. Fischer,[20] M. J. Fisher,[108] M. Flechl,[47] I. Fleck,[140] J. Fleckner,[80] P. Fleischmann,[172] S. Fleischmann,[173] T. Flick,[173] L. R. Flores Castillo,[171] M. J. Flowerdew,[98] M. Fokitis,[9] T. Fonseca Martin,[16] D. A. Forbush,[137] A. Formica,[135] A. Forti,[81] D. Fortin,[158a] J. M. Foster,[81] D. Fournier,[114] A. Foussat,[29] A. J. Fowler,[44] K. Fowler,[136] H. Fox,[70] P. Francavilla,[11] S. Franchino,[118a,118b] D. Francis,[29] T. Frank,[170] M. Franklin,[56] S. Franz,[29] M. Fraternali,[118a,118b] S. Fratina,[119] S. T. French,[27] F. Friedrich,[43] R. Froeschl,[29] D. Froidevaux,[29] J. A. Frost,[27] C. Fukunaga,[155] E. Fullana Torregrosa,[29] J. Fuster,[166] C. Gabaldon,[29] O. Gabizon,[170] T. Gadfort,[24] S. Gadomski,[48] G. Gagliardi,[49a,49b] P. Gagnon,[60] C. Galea,[97] E. J. Gallas,[117] V. Gallo,[16] B. J. Gallop,[128] P. Gallus,[124] K. K. Gan,[108] Y. S. Gao,[142,f] V. A. Gapienko,[127] A. Gaponenko,[14] F. Garberson,[174] M. Garcia-Sciveres,[14] C. García,[166] J. E. García Navarro,[166] R. W. Gardner,[30] N. Garelli,[29] H. Garitaonandia,[104] V. Garonne,[29] J. Garvey,[17] C. Gatti,[46] G. Gaudio,[118a] O. Gaumer,[48] B. Gaur,[140] L. Gauthier,[135] I. L. Gavrilenko,[93] C. Gay,[167] G. Gaycken,[20] J-C. Gayde,[29] E. N. Gazis,[9] P. Ge,[32d] C. N. P. Gee,[128] D. A. A. Geerts,[104] Ch. Geich-Gimbel,[20] K. Gellerstedt,[145a,145b] C. Gemme,[49a] A. Gemmell,[52] M. H. Genest,[54] S. Gentile,[131a,131b] M. George,[53] S. George,[75] P. Gerlach,[173] A. Gershon,[152] C. Geweniger,[57a] H. Ghazlane,[134b] N. Ghodbane,[33] B. Giacobbe,[19a] S. Giagu,[131a,131b] V. Giakoumopoulou,[8] V. Giangiobbe,[11] F. Gianotti,[29] B. Gibbard,[24] A. Gibson,[157] S. M. Gibson,[29] L. M. Gilbert,[117] V. Gilewsky,[90] D. Gillberg,[28] A. R. Gillman,[128] D. M. Gingrich,[2,e] J. Ginzburg,[152] N. Giokaris,[8] M. P. Giordani,[163c] R. Giordano,[101a,101b] F. M. Giorgi,[15] P. Giovannini,[98] P. F. Giraud,[135] D. Giugni,[88a] M. Giunta,[92] P. Giusti,[19a] B. K. Gjelsten,[116] L. K. Gladilin,[96] C. Glasman,[79] J. Glatzer,[47] A. Glazov,[41] K. W. Glitza,[173] G. L. Glonti,[64] J. R. Goddard,[74] J. Godfrey,[141] J. Godlewski,[29] M. Goebel,[41] T. Göpfert,[43] C. Goeringer,[80] C. Gössling,[42] T. Göttfert,[98] S. Goldfarb,[86] T. Golling,[174] S. N. Golovnia,[127] A. Gomes,[123a,c] L. S. Gomez Fajardo,[41] R. Gonçalo,[75] J. Goncalves Pinto Firmino Da Costa,[41] L. Gonella,[20] A. Gonidec,[29] S. Gonzalez,[171] S. González de la Hoz,[166] G. Gonzalez Parra,[11] M. L. Gonzalez Silva,[26] S. Gonzalez-Sevilla,[48] J. J. Goodson,[147] L. Goossens,[29] P. A. Gorbounov,[94] H. A. Gordon,[24] I. Gorelov,[102] G. Gorfine,[173] B. Gorini,[29] E. Gorini,[71a,71b] A. Gorišek,[73] E. Gornicki,[38] S. A. Gorokhov,[127] V. N. Goryachev,[127] B. Gosdzik,[41] M. Gosselink,[104] M. I. Gostkin,[64] I. Gough Eschrich,[162] M. Gouighri,[134a] D. Goujdami,[134c] M. P. Goulette,[48] A. G. Goussiou,[137] C. Goy,[4] S. Gozpinar,[22] I. Grabowska-Bold,[37] P. Grafström,[29] K-J. Grahn,[41] F. Grancagnolo,[71a] S. Grancagnolo,[15] V. Grassi,[147] V. Gratchev,[120] N. Grau,[34] H. M. Gray,[29] J. A. Gray,[147] E. Graziani,[133a] O. G. Grebenyuk,[120] T. Greenshaw,[72] Z. D. Greenwood,[24,m] K. Gregersen,[35] I. M. Gregor,[41] P. Grenier,[142] J. Griffiths,[137] N. Grigalashvili,[64] A. A. Grillo,[136] S. Grinstein,[11] Y. V. Grishkevich,[96] J.-F. Grivaz,[114] M. Groh,[98] E. Gross,[170] J. Grosse-Knetter,[53] J. Groth-Jensen,[170] K. Grybel,[140] V. J. Guarino,[5] D. Guest,[174] C. Guicheney,[33] A. Guida,[71a,71b] S. Guindon,[53] H. Guler,[84,o] J. Gunther,[124] B. Guo,[157] J. Guo,[34] A. Gupta,[30] Y. Gusakov,[64] V. N. Gushchin,[127] A. Gutierrez,[92] P. Gutierrez,[110] N. Guttman,[152] O. Gutzwiller,[171] C. Guyot,[135] C. Gwenlan,[117] C. B. Gwilliam,[72] A. Haas,[142] S. Haas,[29] C. Haber,[14] H. K. Hadavand,[39] D. R. Hadley,[17] P. Haefner,[98] F. Hahn,[29] S. Haider,[29] Z. Hajduk,[38] H. Hakobyan,[175] D. Hall,[117] J. Haller,[53] K. Hamacher,[173] P. Hamal,[112] M. Hamer,[53] A. Hamilton,[144b,p] S. Hamilton,[160] H. Han,[32a] L. Han,[32b] K. Hanagaki,[115] K. Hanawa,[159] M. Hance,[14] C. Handel,[80] P. Hanke,[57a] J. R. Hansen,[35] J. B. Hansen,[35] J. D. Hansen,[35] P. H. Hansen,[35] P. Hansson,[142] K. Hara,[159] G. A. Hare,[136] T. Harenberg,[173] S. Harkusha,[89] D. Harper,[86] R. D. Harrington,[45] O. M. Harris,[137] K. Harrison,[17] J. Hartert,[47] F. Hartjes,[104] T. Haruyama,[65] A. Harvey,[55] S. Hasegawa,[100] Y. Hasegawa,[139] S. Hassani,[135] M. Hatch,[29] D. Hauff,[98] S. Haug,[16] M. Hauschild,[29] R. Hauser,[87] M. Havranek,[20] B. M. Hawes,[117] C. M. Hawkes,[17] R. J. Hawkings,[29] A. D. Hawkins,[78] D. Hawkins,[162] T. Hayakawa,[66] T. Hayashi,[159] D. Hayden,[75] H. S. Hayward,[72] S. J. Haywood,[128] E. Hazen,[21] M. He,[32d] S. J. Head,[17] V. Hedberg,[78] L. Heelan,[7] S. Heim,[87] B. Heinemann,[14] S. Heisterkamp,[35] L. Helary,[4] C. Heller,[97] M. Heller,[29] S. Hellman,[145a,145b] D. Hellmich,[20] C. Helsens,[11] R. C. W. Henderson,[70] M. Henke,[57a] A. Henrichs,[53] A. M. Henriques Correia,[29] S. Henrot-Versille,[114] F. Henry-Couannier,[82] C. Hensel,[53] T. Henß,[173] C. M. Hernandez,[7] Y. Hernández Jiménez,[166] R. Herrberg,[15] A. D. Hershenhorn,[151] G. Herten,[47] R. Hertenberger,[97] L. Hervas,[29] N. P. Hessey,[104] E. Higón-Rodriguez,[166] D. Hill,[5,a] J. C. Hill,[27] N. Hill,[5] K. H. Hiller,[41] S. Hillert,[20] S. J. Hillier,[17] I. Hinchliffe,[14] E. Hines,[119] M. Hirose,[115] F. Hirsch,[42] D. Hirschbuehl,[173] J. Hobbs,[147] N. Hod,[152] M. C. Hodgkinson,[138] P. Hodgson,[138] A. Hoecker,[29] M. R. Hoeferkamp,[102] J. Hoffman,[39] D. Hoffmann,[82] M. Hohlfeld,[80] M. Holder,[140] S. O. Holmgren,[145a] T. Holy,[126] J. L. Holzbauer,[87] Y. Homma,[66] T. M. Hong,[119] L. Hooft van Huysduynen,[107] T. Horazdovsky,[126] C. Horn,[142] S. Horner,[47] J-Y. Hostachy,[54] S. Hou,[150]

M. A. Houlden,[72] A. Hoummada,[134a] J. Howarth,[81] D. F. Howell,[117] I. Hristova,[15] J. Hrivnac,[114] I. Hruska,[124] T. Hryn'ova,[4] P. J. Hsu,[80] S.-C. Hsu,[14] G. S. Huang,[110] Z. Hubacek,[126] F. Hubaut,[82] F. Huegging,[20] A. Huettmann,[41] T. B. Huffman,[117] E. W. Hughes,[34] G. Hughes,[70] R. E. Hughes-Jones,[81] M. Huhtinen,[29] P. Hurst,[56] M. Hurwitz,[14] U. Husemann,[41] N. Huseynov,[64,q] J. Huston,[87] J. Huth,[56] G. Iacobucci,[48] G. Iakovidis,[9] M. Ibbotson,[81] I. Ibragimov,[140] R. Ichimiya,[66] L. Iconomidou-Fayard,[114] J. Idarraga,[114] P. Iengo,[101a] O. Igonkina,[104] Y. Ikegami,[65] M. Ikeno,[65] Y. Ilchenko,[39] D. Iliadis,[153] N. Ilic,[157] D. Imbault,[77] M. Imori,[154] T. Ince,[20] J. Inigo-Golfin,[29] P. Ioannou,[8] M. Iodice,[133a] V. Ippolito,[131a,131b] A. Irles Quiles,[166] C. Isaksson,[165] A. Ishikawa,[66] M. Ishino,[67] R. Ishmukhametov,[39] C. Issever,[117] S. Istin,[18a] A. V. Ivashin,[127] W. Iwanski,[38] H. Iwasaki,[65] J. M. Izen,[40] V. Izzo,[101a] B. Jackson,[119] J. N. Jackson,[72] P. Jackson,[142] M. R. Jaekel,[29] V. Jain,[60] K. Jakobs,[47] S. Jakobsen,[35] J. Jakubek,[126] D. K. Jana,[110] E. Jankowski,[157] E. Jansen,[76] H. Jansen,[29] A. Jantsch,[98] M. Janus,[20] G. Jarlskog,[78] L. Jeanty,[56] K. Jelen,[37] I. Jen-La Plante,[30] P. Jenni,[29] A. Jeremie,[4] P. Jež,[35] S. Jézéquel,[4] M. K. Jha,[19a] H. Ji,[171] W. Ji,[80] J. Jia,[147] Y. Jiang,[32b] M. Jimenez Belenguer,[41] G. Jin,[32b] S. Jin,[32a] O. Jinnouchi,[156] M. D. Joergensen,[35] D. Joffe,[39] L. G. Johansen,[13] M. Johansen,[145a,145b] K. E. Johansson,[145a] P. Johansson,[138] S. Johnert,[41] K. A. Johns,[6] K. Jon-And,[145a,145b] G. Jones,[81] R. W. L. Jones,[70] T. W. Jones,[76] T. J. Jones,[72] O. Jonsson,[29] C. Joram,[29] P. M. Jorge,[123a] J. Joseph,[14] T. Jovin,[12b] X. Ju,[171] C. A. Jung,[42] R. M. Jungst,[29] V. Juranek,[124] P. Jussel,[61] A. Juste Rozas,[11] V. V. Kabachenko,[127] S. Kabana,[16] M. Kaci,[166] A. Kaczmarska,[38] P. Kadlecik,[35] M. Kado,[114] H. Kagan,[108] M. Kagan,[56] S. Kaiser,[98] E. Kajomovitz,[151] S. Kalinin,[173] L. V. Kalinovskaya,[64] S. Kama,[39] N. Kanaya,[154] M. Kaneda,[29] S. Kaneti,[27] T. Kanno,[156] V. A. Kantserov,[95] J. Kanzaki,[65] B. Kaplan,[174] A. Kapliy,[30] J. Kaplon,[29] D. Kar,[43] M. Karagounis,[20] M. Karagoz,[117] M. Karnevskiy,[41] K. Karr,[5] V. Kartvelishvili,[70] A. N. Karyukhin,[127] L. Kashif,[171] G. Kasieczka,[57b] R. D. Kass,[108] A. Kastanas,[13] M. Kataoka,[4] Y. Kataoka,[154] E. Katsoufis,[9] J. Katzy,[41] V. Kaushik,[6] K. Kawagoe,[66] T. Kawamoto,[154] G. Kawamura,[80] M. S. Kayl,[104] V. A. Kazanin,[106] M. Y. Kazarinov,[64] R. Keeler,[168] R. Kehoe,[39] M. Keil,[53] G. D. Kekelidze,[64] J. Kennedy,[97] C. J. Kenney,[142] M. Kenyon,[52] O. Kepka,[124] N. Kerschen,[29] B. P. Kerševan,[73] S. Kersten,[173] K. Kessoku,[154] J. Keung,[157] F. Khalil-zada,[10] H. Khandanyan,[164] A. Khanov,[111] D. Kharchenko,[64] A. Khodinov,[95] A. G. Kholodenko,[127] A. Khomich,[57a] T. J. Khoo,[27] G. Khoriauli,[20] A. Khoroshilov,[173] N. Khovanskiy,[64] V. Khovanskiy,[94] E. Khramov,[64] J. Khubua,[50b] H. Kim,[145a,145b] M. S. Kim,[2] P. C. Kim,[142] S. H. Kim,[159] N. Kimura,[169] O. Kind,[15] B. T. King,[72] M. King,[66] R. S. B. King,[117] J. Kirk,[128] L. E. Kirsch,[22] A. E. Kiryunin,[98] T. Kishimoto,[66] D. Kisielewska,[37] T. Kittelmann,[122] A. M. Kiver,[127] E. Kladiva,[143b] J. Klaiber-Lodewigs,[42] M. Klein,[72] U. Klein,[72] K. Kleinknecht,[80] M. Klemetti,[84] A. Klier,[170] P. Klimek,[145a,145b] A. Klimentov,[24] R. Klingenberg,[42] E. B. Klinkby,[35] T. Klioutchnikova,[29] P. F. Klok,[103] S. Klous,[104] E.-E. Kluge,[57a] T. Kluge,[72] P. Kluit,[104] S. Kluth,[98] N. S. Knecht,[157] E. Kneringer,[61] J. Knobloch,[29] E. B. F. G. Knoops,[82] A. Knue,[53] B. R. Ko,[44] T. Kobayashi,[154] M. Kobel,[43] M. Kocian,[142] P. Kodys,[125] K. Köneke,[29] A. C. König,[103] S. Koenig,[80] L. Köpke,[80] F. Koetsveld,[103] P. Koevesarki,[20] T. Koffas,[28] E. Koffeman,[104] L. A. Kogan,[117] F. Kohn,[53] Z. Kohout,[126] T. Kohriki,[65] T. Koi,[142] T. Kokott,[20] G. M. Kolachev,[106] H. Kolanoski,[15] V. Kolesnikov,[64] I. Koletsou,[88a] J. Koll,[87] D. Kollar,[29] M. Kollefrath,[47] S. D. Kolya,[81] A. A. Komar,[93] Y. Komori,[154] T. Kondo,[65] T. Kono,[41,r] A. I. Kononov,[47] R. Konoplich,[107,s] N. Konstantinidis,[76] A. Kootz,[173] S. Koperny,[37] K. Korcyl,[38] K. Kordas,[153] V. Koreshev,[127] A. Korn,[117] A. Korol,[106] I. Korolkov,[11] E. V. Korolkova,[138] V. A. Korotkov,[127] O. Kortner,[98] S. Kortner,[98] V. V. Kostyukhin,[20] M. J. Kotamäki,[29] S. Kotov,[98] V. M. Kotov,[64] A. Kotwal,[44] C. Kourkoumelis,[8] V. Kouskoura,[153] A. Koutsman,[158a] R. Kowalewski,[168] T. Z. Kowalski,[37] W. Kozanecki,[135] A. S. Kozhin,[127] V. Kral,[126] V. A. Kramarenko,[96] G. Kramberger,[73] M. W. Krasny,[77] A. Krasznahorkay,[107] J. Kraus,[87] J. K. Kraus,[20] A. Kreisel,[152] F. Krejci,[126] J. Kretzschmar,[72] N. Krieger,[53] P. Krieger,[157] K. Kroeninger,[53] H. Kroha,[98] J. Kroll,[119] J. Kroseberg,[20] J. Krstic,[12a] U. Kruchonak,[64] H. Krüger,[20] T. Kruker,[16] N. Krumnack,[63] Z. V. Krumshteyn,[64] A. Kruth,[20] T. Kubota,[85] S. Kuehn,[47] A. Kugel,[57c] T. Kuhl,[41] D. Kuhn,[61] V. Kukhtin,[64] Y. Kulchitsky,[89] S. Kuleshov,[31b] C. Kummer,[97] M. Kuna,[77] N. Kundu,[117] J. Kunkle,[119] A. Kupco,[124] H. Kurashige,[66] M. Kurata,[159] Y. A. Kurochkin,[89] V. Kus,[124] E. S. Kuwertz,[146] M. Kuze,[156] J. Kvita,[141] R. Kwee,[15] A. La Rosa,[48] L. La Rotonda,[36a,36b] L. Labarga,[79] J. Labbe,[4] S. Lablak,[134a] C. Lacasta,[166] F. Lacava,[131a,131b] H. Lacker,[15] D. Lacour,[77] V. R. Lacuesta,[166] E. Ladygin,[64] R. Lafaye,[4] B. Laforge,[77] T. Lagouri,[79] S. Lai,[47] E. Laisne,[54] M. Lamanna,[29] C. L. Lampen,[6] W. Lampl,[6] E. Lancon,[135] U. Landgraf,[47] M. P. J. Landon,[74] H. Landsman,[151] J. L. Lane,[81] C. Lange,[41] A. J. Lankford,[162] F. Lanni,[24] K. Lantzsch,[173] S. Laplace,[77] C. Lapoire,[20] J. F. Laporte,[135] T. Lari,[88a] A. V. Larionov,[127] A. Larner,[117] C. Lasseur,[29] M. Lassnig,[29] P. Laurelli,[46] W. Lavrijsen,[14] P. Laycock,[72] A. B. Lazarev,[64] O. Le Dortz,[77] E. Le Guirriec,[82] C. Le Maner,[157] E. Le Menedeu,[9] C. Lebel,[92] T. LeCompte,[5] F. Ledroit-Guillon,[54] H. Lee,[104]

J. S. H. Lee,[115] S. C. Lee,[150] L. Lee,[174] M. Lefebvre,[168] M. Legendre,[135] A. Leger,[48] B. C. LeGeyt,[119] F. Legger,[97] C. Leggett,[14] M. Lehmacher,[20] G. Lehmann Miotto,[29] X. Lei,[6] M. A. L. Leite,[23d] R. Leitner,[125] D. Lellouch,[170] M. Leltchouk,[34] B. Lemmer,[53] V. Lendermann,[57a] K. J. C. Leney,[144b] T. Lenz,[104] G. Lenzen,[173] B. Lenzi,[29] K. Leonhardt,[43] S. Leontsinis,[9] C. Leroy,[92] J-R. Lessard,[168] J. Lesser,[145a] C. G. Lester,[27] A. Leung Fook Cheong,[171] J. Levêque,[4] D. Levin,[86] L. J. Levinson,[170] M. S. Levitski,[127] A. Lewis,[117] G. H. Lewis,[107] A. M. Leyko,[20] M. Leyton,[15] B. Li,[82] H. Li,[171,t] S. Li,[32b,u] X. Li,[86] Z. Liang,[117,v] H. Liao,[33] B. Liberti,[132a] P. Lichard,[29] M. Lichtnecker,[97] K. Lie,[164] W. Liebig,[13] R. Lifshitz,[151] C. Limbach,[20] A. Limosani,[85] M. Limper,[62] S. C. Lin,[150,w] F. Linde,[104] J. T. Linnemann,[87] E. Lipeles,[119] L. Lipinsky,[124] A. Lipniacka,[13] T. M. Liss,[164] D. Lissauer,[24] A. Lister,[48] A. M. Litke,[136] C. Liu,[28] D. Liu,[150] H. Liu,[86] J. B. Liu,[86] M. Liu,[32b] S. Liu,[2] Y. Liu,[32b] M. Livan,[118a,118b] S. S. A. Livermore,[117] A. Lleres,[54] J. Llorente Merino,[79] S. L. Lloyd,[74] E. Lobodzinska,[41] P. Loch,[6] W. S. Lockman,[136] T. Loddenkoetter,[20] F. K. Loebinger,[81] A. Loginov,[174] C. W. Loh,[167] T. Lohse,[15] K. Lohwasser,[47] M. Lokajicek,[124] J. Loken,[117] V. P. Lombardo,[4] R. E. Long,[70] L. Lopes,[123a,c] D. Lopez Mateos,[56] J. Lorenz,[97] M. Losada,[161] P. Loscutoff,[14] F. Lo Sterzo,[131a,131b] M. J. Losty,[158a] X. Lou,[40] A. Lounis,[114] K. F. Loureiro,[161] J. Love,[21] P. A. Love,[70] A. J. Lowe,[142,f] F. Lu,[32a] H. J. Lubatti,[137] C. Luci,[131a,131b] A. Lucotte,[54] A. Ludwig,[43] D. Ludwig,[41] I. Ludwig,[47] J. Ludwig,[47] F. Luehring,[60] G. Luijckx,[104] D. Lumb,[47] L. Luminari,[131a] E. Lund,[116] B. Lund-Jensen,[146] B. Lundberg,[78] J. Lundberg,[145a,145b] J. Lundquist,[35] M. Lungwitz,[80] G. Lutz,[98] D. Lynn,[24] J. Lys,[14] E. Lytken,[78] H. Ma,[24] L. L. Ma,[171] J. A. Macana Goia,[92] G. Maccarrone,[46] A. Macchiolo,[98] B. Maček,[73] J. Machado Miguens,[123a] R. Mackeprang,[35] R. J. Madaras,[14] W. F. Mader,[43] R. Maenner,[57c] T. Maeno,[24] P. Mättig,[173] S. Mättig,[41] L. Magnoni,[29] E. Magradze,[53] Y. Mahalalel,[152] K. Mahboubi,[47] G. Mahout,[17] C. Maiani,[131a,131b] C. Maidantchik,[23a] A. Maio,[123a,c] S. Majewski,[24] Y. Makida,[65] N. Makovec,[114] P. Mal,[135] B. Malaescu,[29] Pa. Malecki,[38] P. Malecki,[38] V. P. Maleev,[120] F. Malek,[54] U. Mallik,[62] D. Malon,[5] C. Malone,[142] S. Maltezos,[9] V. Malyshev,[106] S. Malyukov,[29] R. Mameghani,[97] J. Mamuzic,[12b] A. Manabe,[65] L. Mandelli,[88a] I. Mandić,[73] R. Mandrysch,[15] J. Maneira,[123a] P. S. Mangeard,[87] L. Manhaes de Andrade Filho,[23a] I. D. Manjavidze,[64] A. Mann,[53] P. M. Manning,[136] A. Manousakis-Katsikakis,[8] B. Mansoulie,[135] A. Manz,[98] A. Mapelli,[29] L. Mapelli,[29] L. March,[79] J. F. Marchand,[28] F. Marchese,[132a,132b] G. Marchiori,[77] M. Marcisovsky,[124] A. Marin,[21,a] C. P. Marino,[168,a] F. Marroquim,[23a] R. Marshall,[81] Z. Marshall,[29] F. K. Martens,[157] S. Marti-Garcia,[166] A. J. Martin,[174] B. Martin,[29] B. Martin,[87] F. F. Martin,[119] J. P. Martin,[92] Ph. Martin,[54] T. A. Martin,[17] V. J. Martin,[45] B. Martin dit Latour,[48] S. Martin-Haugh,[148] M. Martinez,[11] V. Martinez Outschoorn,[56] A. C. Martyniuk,[168] M. Marx,[81] F. Marzano,[131a] A. Marzin,[110] L. Masetti,[80] T. Mashimo,[154] R. Mashinistov,[93] J. Masik,[81] A. L. Maslennikov,[106] I. Massa,[19a,19b] G. Massaro,[104] N. Massol,[4] P. Mastrandrea,[131a,131b] A. Mastroberardino,[36a,36b] T. Masubuchi,[154] M. Mathes,[20] P. Matricon,[114] H. Matsumoto,[154] H. Matsunaga,[154] T. Matsushita,[66] C. Mattravers,[117,d] J. M. Maugain,[29] J. Maurer,[82] S. J. Maxfield,[72] D. A. Maximov,[106,g] E. N. May,[5] A. Mayne,[138] R. Mazini,[150] M. Mazur,[20] M. Mazzanti,[88a] E. Mazzoni,[121a,121b] S. P. Mc Kee,[86] A. McCarn,[164] R. L. McCarthy,[147] T. G. McCarthy,[28] N. A. McCubbin,[128] K. W. McFarlane,[55] J. A. Mcfayden,[138] H. McGlone,[52] G. Mchedlidze,[50b] R. A. McLaren,[29] T. Mclaughlan,[17] S. J. McMahon,[128] R. A. McPherson,[168,k] A. Meade,[83] J. Mechnich,[104] M. Mechtel,[173] M. Medinnis,[41] R. Meera-Lebbai,[110] T. Meguro,[115] R. Mehdiyev,[92] S. Mehlhase,[35] A. Mehta,[72] K. Meier,[57a] B. Meirose,[78] C. Melachrinos,[30] B. R. Mellado Garcia,[171] L. Mendoza Navas,[161] Z. Meng,[150,t] A. Mengarelli,[19a,19b] S. Menke,[98] C. Menot,[29] E. Meoni,[11] K. M. Mercurio,[56] P. Mermod,[48] L. Merola,[101a,101b] C. Meroni,[88a] F. S. Merritt,[30] A. Messina,[29] J. Metcalfe,[102] A. S. Mete,[63] C. Meyer,[80] C. Meyer,[30] J-P. Meyer,[135] J. Meyer,[172] J. Meyer,[53] T. C. Meyer,[29] W. T. Meyer,[63] J. Miao,[32d] S. Michal,[29] L. Micu,[25a] R. P. Middleton,[128] S. Migas,[72] L. Mijović,[41] G. Mikenberg,[170] M. Mikestikova,[124] M. Mikuž,[73] D. W. Miller,[30] R. J. Miller,[87] W. J. Mills,[167] C. Mills,[56] A. Milov,[170] D. A. Milstead,[145a,145b] D. Milstein,[170] A. A. Minaenko,[127] M. Miñano Moya,[166] I. A. Minashvili,[64] A. I. Mincer,[107] B. Mindur,[37] M. Mineev,[64] Y. Ming,[171] L. M. Mir,[11] G. Mirabelli,[131a] L. Miralles Verge,[11] A. Misiejuk,[75] J. Mitrevski,[136] G. Y. Mitrofanov,[127] V. A. Mitsou,[166] S. Mitsui,[65] P. S. Miyagawa,[138] K. Miyazaki,[66] J. U. Mjörnmark,[78] T. Moa,[145a,145b] P. Mockett,[137] S. Moed,[56] V. Moeller,[27] K. Mönig,[41] N. Möser,[20] S. Mohapatra,[147] W. Mohr,[47] S. Mohrdieck-Möck,[98] A. M. Moisseev,[127,a] R. Moles-Valls,[166] J. Molina-Perez,[29] J. Monk,[76] E. Monnier,[82] S. Montesano,[88a,88b] F. Monticelli,[69] S. Monzani,[19a,19b] R. W. Moore,[2] G. F. Moorhead,[85] C. Mora Herrera,[48] A. Moraes,[52] N. Morange,[135] J. Morel,[53] G. Morello,[36a,36b] D. Moreno,[80] M. Moreno Llácer,[166] P. Morettini,[49a] M. Morii,[56] J. Morin,[74] A. K. Morley,[29] G. Mornacchi,[29] S. V. Morozov,[95] J. D. Morris,[74] L. Morvaj,[100] H. G. Moser,[98] M. Mosidze,[50b] J. Moss,[108] R. Mount,[142] E. Mountricha,[9,x] S. V. Mouraviev,[93] E. J. W. Moyse,[83] M. Mudrinic,[12b] F. Mueller,[57a] J. Mueller,[122]

K. Mueller,[20] T. A. Müller,[97] T. Mueller,[80] D. Muenstermann,[29] A. Muir,[167] Y. Munwes,[152] W. J. Murray,[128] I. Mussche,[104] E. Musto,[101a,101b] A. G. Myagkov,[127] M. Myska,[124] J. Nadal,[11] K. Nagai,[159] K. Nagano,[65] Y. Nagasaka,[59] M. Nagel,[98] A. M. Nairz,[29] Y. Nakahama,[29] K. Nakamura,[154] T. Nakamura,[154] I. Nakano,[109] G. Nanava,[20] A. Napier,[160] R. Narayan,[57b] M. Nash,[76,d] N. R. Nation,[21] T. Nattermann,[20] T. Naumann,[41] G. Navarro,[161] H. A. Neal,[86] E. Nebot,[79] P. Yu. Nechaeva,[93] A. Negri,[118a,118b] G. Negri,[29] S. Nektarijevic,[48] A. Nelson,[162] S. Nelson,[142] T. K. Nelson,[142] S. Nemecek,[124] P. Nemethy,[107] A. A. Nepomuceno,[23a] M. Nessi,[29,y] M. S. Neubauer,[164] A. Neusiedl,[80] R. M. Neves,[107] P. Nevski,[24] P. R. Newman,[17] V. Nguyen Thi Hong,[135] R. B. Nickerson,[117] R. Nicolaidou,[135] L. Nicolas,[138] B. Nicquevert,[29] F. Niedercorn,[114] J. Nielsen,[136] T. Niinikoski,[29] N. Nikiforou,[34] A. Nikiforov,[15] V. Nikolaenko,[127] K. Nikolaev,[64] I. Nikolic-Audit,[77] K. Nikolics,[48] K. Nikolopoulos,[24] H. Nilsen,[47] P. Nilsson,[7] Y. Ninomiya,[154] A. Nisati,[131a] T. Nishiyama,[66] R. Nisius,[98] L. Nodulman,[5] M. Nomachi,[115] I. Nomidis,[153] M. Nordberg,[29] B. Nordkvist,[145a,145b] P. R. Norton,[128] J. Novakova,[125] M. Nozaki,[65] L. Nozka,[112] I. M. Nugent,[158a] A.-E. Nuncio-Quiroz,[20] G. Nunes Hanninger,[85] T. Nunnemann,[97] E. Nurse,[76] T. Nyman,[29] B. J. O'Brien,[45] S. W. O'Neale,[17,a] D. C. O'Neil,[141] V. O'Shea,[52] L. B. Oakes,[97] F. G. Oakham,[28,e] H. Oberlack,[98] J. Ocariz,[77] A. Ochi,[66] S. Oda,[154] S. Odaka,[65] J. Odier,[82] H. Ogren,[60] A. Oh,[81] S. H. Oh,[44] C. C. Ohm,[145a,145b] T. Ohshima,[100] H. Ohshita,[139] T. Ohsugi,[58] S. Okada,[66] H. Okawa,[162] Y. Okumura,[100] T. Okuyama,[154] A. Olariu,[25a] M. Olcese,[49a] A. G. Olchevski,[64] M. Oliveira,[123a,i] D. Oliveira Damazio,[24] E. Oliver Garcia,[166] D. Olivito,[119] A. Olszewski,[38] J. Olszowska,[38] C. Omachi,[66] A. Onofre,[123a,z] P. U. E. Onyisi,[30] C. J. Oram,[158a] M. J. Oreglia,[30] Y. Oren,[152] D. Orestano,[133a,133b] I. Orlov,[106] C. Oropeza Barrera,[52] R. S. Orr,[157] B. Osculati,[49a,49b] R. Ospanov,[119] C. Osuna,[11] G. Otero y Garzon,[26] J. P. Ottersbach,[104] M. Ouchrif,[134d] E. A. Ouellette,[168] F. Ould-Saada,[116] A. Ouraou,[135] Q. Ouyang,[32a] A. Ovcharova,[14] M. Owen,[81] S. Owen,[138] V. E. Ozcan,[18a] N. Ozturk,[7] A. Pacheco Pages,[11] C. Padilla Aranda,[11] S. Pagan Griso,[14] E. Paganis,[138] F. Paige,[24] P. Pais,[83] K. Pajchel,[116] G. Palacino,[158b] C. P. Paleari,[6] S. Palestini,[29] D. Pallin,[33] A. Palma,[123a] J. D. Palmer,[17] Y. B. Pan,[171] E. Panagiotopoulou,[9] B. Panes,[31a] N. Panikashvili,[86] S. Panitkin,[24] D. Pantea,[25a] M. Panuskova,[124] V. Paolone,[122] A. Papadelis,[145a] Th. D. Papadopoulou,[9] A. Paramonov,[5] W. Park,[24,aa] M. A. Parker,[27] F. Parodi,[49a,49b] J. A. Parsons,[34] U. Parzefall,[47] E. Pasqualucci,[131a] S. Passaggio,[49a] A. Passeri,[133a] F. Pastore,[133a,133b] Fr. Pastore,[75] G. Pásztor,[48,bb] S. Pataraia,[173] N. Patel,[149] J. R. Pater,[81] S. Patricelli,[101a,101b] T. Pauly,[29] M. Pecsy,[143a] M. I. Pedraza Morales,[171] S. V. Peleganchuk,[106] H. Peng,[32b] R. Pengo,[29] A. Penson,[34] J. Penwell,[60] M. Perantoni,[23a] K. Perez,[34,cc] T. Perez Cavalcanti,[41] E. Perez Codina,[11] M. T. Pérez García-Estañ,[166] V. Perez Reale,[34] L. Perini,[88a,88b] H. Pernegger,[29] R. Perrino,[71a] P. Perrodo,[4] S. Persembe,[3a] A. Perus,[114] V. D. Peshekhonov,[64] K. Peters,[29] B. A. Petersen,[29] J. Petersen,[29] T. C. Petersen,[35] E. Petit,[4] A. Petridis,[153] C. Petridou,[153] E. Petrolo,[131a] F. Petrucci,[133a,133b] D. Petschull,[41] M. Petteni,[141] R. Pezoa,[31b] A. Phan,[85] P. W. Phillips,[128] G. Piacquadio,[29] E. Piccaro,[74] M. Piccinini,[19a,19b] S. M. Piec,[41] R. Piegaia,[26] D. T. Pignotti,[108] J. E. Pilcher,[30] A. D. Pilkington,[81] J. Pina,[123a,c] M. Pinamonti,[163a,163c] A. Pinder,[117] J. L. Pinfold,[2] J. Ping,[32c] B. Pinto,[123a,c] O. Pirotte,[29] C. Pizio,[88a,88b] M. Plamondon,[168] M.-A. Pleier,[24] A. V. Pleskach,[127] A. Poblaguev,[24] S. Poddar,[57a] F. Podlyski,[33] L. Poggioli,[114] T. Poghosyan,[20] M. Pohl,[48] F. Polci,[54] G. Polesello,[118a] A. Policicchio,[36a,36b] A. Polini,[19a] J. Poll,[74] V. Polychronakos,[24] D. M. Pomarede,[135] D. Pomeroy,[22] K. Pommès,[29] L. Pontecorvo,[131a] B. G. Pope,[87] G. A. Popeneciu,[25a] D. S. Popovic,[12a] A. Poppleton,[29] X. Portell Bueso,[29] C. Posch,[21] G. E. Pospelov,[98] S. Pospisil,[126] I. N. Potrap,[98] C. J. Potter,[148] C. T. Potter,[113] G. Poulard,[29] J. Poveda,[171] R. Prabhu,[76] P. Pralavorio,[82] A. Pranko,[14] S. Prasad,[56] R. Pravahan,[7] S. Prell,[63] K. Pretzl,[16] L. Pribyl,[29] D. Price,[60] J. Price,[72] L. E. Price,[5] M. J. Price,[29] D. Prieur,[122] M. Primavera,[71a] K. Prokofiev,[107] F. Prokoshin,[31b] S. Protopopescu,[24] J. Proudfoot,[5] X. Prudent,[43] M. Przybycien,[37] H. Przysiezniak,[4] S. Psoroulas,[20] E. Ptacek,[113] E. Pueschel,[83] J. Purdham,[86] M. Purohit,[24,aa] P. Puzo,[114] Y. Pylypchenko,[62] J. Qian,[86] Z. Qian,[82] Z. Qin,[41] A. Quadt,[53] D. R. Quarrie,[14] W. B. Quayle,[171] F. Quinonez,[31a] M. Raas,[103] V. Radescu,[57b] B. Radics,[20] P. Radloff,[113] T. Rador,[18a] F. Ragusa,[88a,88b] G. Rahal,[176] A. M. Rahimi,[108] D. Rahm,[24] S. Rajagopalan,[24] M. Rammensee,[47] M. Rammes,[140] A. S. Randle-Conde,[39] K. Randrianarivony,[28] P. N. Ratoff,[70] F. Rauscher,[97] M. Raymond,[29] A. L. Read,[116] D. M. Rebuzzi,[118a,118b] A. Redelbach,[172] G. Redlinger,[24] R. Reece,[119] K. Reeves,[40] A. Reichold,[104] E. Reinherz-Aronis,[152] A. Reinsch,[113] I. Reisinger,[42] D. Reljic,[12a] C. Rembser,[29] Z. L. Ren,[150] A. Renaud,[114] P. Renkel,[39] M. Rescigno,[131a] S. Resconi,[88a] B. Resende,[135] P. Reznicek,[97] R. Rezvani,[157] A. Richards,[76] R. Richter,[98] E. Richter-Was,[4,dd] M. Ridel,[77] M. Rijpstra,[104] M. Rijssenbeek,[147] A. Rimoldi,[118a,118b] L. Rinaldi,[19a] R. R. Rios,[39] I. Riu,[11] G. Rivoltella,[88a,88b] F. Rizatdinova,[111] E. Rizvi,[74] S. H. Robertson,[84,k] A. Robichaud-Veronneau,[117] D. Robinson,[27] J. E. M. Robinson,[76] M. Robinson,[113] A. Robson,[52] J. G. Rocha de Lima,[105] C. Roda,[121a,121b] D. Roda Dos Santos,[29] D. Rodriguez,[161]

A. Roe,[53] S. Roe,[29] O. Røhne,[116] V. Rojo,[1] S. Rolli,[160] A. Romaniouk,[95] M. Romano,[19a,19b] V. M. Romanov,[64] G. Romeo,[26] E. Romero Adam,[166] L. Roos,[77] E. Ros,[166] S. Rosati,[131a] K. Rosbach,[48] A. Rose,[148] M. Rose,[75] G. A. Rosenbaum,[157] E. I. Rosenberg,[63] P. L. Rosendahl,[13] O. Rosenthal,[140] L. Rosselet,[48] V. Rossetti,[11] E. Rossi,[131a,131b] L. P. Rossi,[49a] M. Rotaru,[25a] I. Roth,[170] J. Rothberg,[137] D. Rousseau,[114] C. R. Royon,[135] A. Rozanov,[82] Y. Rozen,[151] X. Ruan,[114,ee] I. Rubinskiy,[41] B. Ruckert,[97] N. Ruckstuhl,[104] V. I. Rud,[96] C. Rudolph,[43] G. Rudolph,[61] F. Rühr,[6] F. Ruggieri,[133a,133b] A. Ruiz-Martinez,[63] V. Rumiantsev,[90,a] L. Rumyantsev,[64] K. Runge,[47] Z. Rurikova,[47] N. A. Rusakovich,[64] D. R. Rust,[60] J. P. Rutherfoord,[6] C. Ruwiedel,[14] P. Ruzicka,[124] Y. F. Ryabov,[120] V. Ryadovikov,[127] P. Ryan,[87] M. Rybar,[125] G. Rybkin,[114] N. C. Ryder,[117] S. Rzaeva,[10] A. F. Saavedra,[149] I. Sadeh,[152] H. F-W. Sadrozinski,[136] R. Sadykov,[64] F. Safai Tehrani,[131a] H. Sakamoto,[154] G. Salamanna,[74] A. Salamon,[132a] M. Saleem,[110] D. Salihagic,[98] A. Salnikov,[142] J. Salt,[166] B. M. Salvachua Ferrando,[5] D. Salvatore,[36a,36b] F. Salvatore,[148] A. Salvucci,[103] A. Salzburger,[29] D. Sampsonidis,[153] B. H. Samset,[116] A. Sanchez,[101a,101b] H. Sandaker,[13] H. G. Sander,[80] M. P. Sanders,[97] M. Sandhoff,[173] T. Sandoval,[27] C. Sandoval,[161] R. Sandstroem,[98] S. Sandvoss,[173] D. P. C. Sankey,[128] A. Sansoni,[46] C. Santamarina Rios,[84] C. Santoni,[33] R. Santonico,[132a,132b] H. Santos,[123a] J. G. Saraiva,[123a] T. Sarangi,[171] E. Sarkisyan-Grinbaum,[7] F. Sarri,[121a,121b] G. Sartisohn,[173] O. Sasaki,[65] N. Sasao,[67] I. Satsounkevitch,[89] G. Sauvage,[4] E. Sauvan,[4] J. B. Sauvan,[114] P. Savard,[157,e] V. Savinov,[122] D. O. Savu,[29] L. Sawyer,[24,m] D. H. Saxon,[52] L. P. Says,[33] C. Sbarra,[19a] A. Sbrizzi,[19a,19b] O. Scallon,[92] D. A. Scannicchio,[162] M. Scarcella,[149] J. Schaarschmidt,[114] P. Schacht,[98] U. Schäfer,[80] S. Schaepe,[20] S. Schaetzel,[57b] A. C. Schaffer,[114] D. Schaile,[97] R. D. Schamberger,[147] A. G. Schamov,[106] V. Scharf,[57a] V. A. Schegelsky,[120] D. Scheirich,[86] M. Schernau,[162] M. I. Scherzer,[34] C. Schiavi,[49a,49b] J. Schieck,[97] M. Schioppa,[36a,36b] S. Schlenker,[29] J. L. Schlereth,[5] E. Schmidt,[47] K. Schmieden,[20] C. Schmitt,[80] S. Schmitt,[57b] M. Schmitz,[20] A. Schöning,[57b] M. Schott,[29] D. Schouten,[158a] J. Schovancova,[124] M. Schram,[84] C. Schroeder,[80] N. Schroer,[57c] S. Schuh,[29] G. Schuler,[29] J. Schultes,[173] H.-C. Schultz-Coulon,[57a] H. Schulz,[15] J. W. Schumacher,[20] M. Schumacher,[47] B. A. Schumm,[136] Ph. Schune,[135] C. Schwanenberger,[81] A. Schwartzman,[142] Ph. Schwemling,[77] R. Schwienhorst,[87] R. Schwierz,[43] J. Schwindling,[135] T. Schwindt,[20] M. Schwoerer,[4] W. G. Scott,[128] J. Searcy,[113] G. Sedov,[41] E. Sedykh,[120] E. Segura,[11] S. C. Seidel,[102] A. Seiden,[136] F. Seifert,[43] J. M. Seixas,[23a] G. Sekhniaidze,[101a] K. E. Selbach,[45] D. M. Seliverstov,[120] B. Sellden,[145a] G. Sellers,[72] M. Seman,[143b] N. Semprini-Cesari,[19a,19b] C. Serfon,[97] L. Serin,[114] R. Seuster,[98] H. Severini,[110] M. E. Sevior,[85] A. Sfyrla,[29] E. Shabalina,[53] M. Shamim,[113] L. Y. Shan,[32a] J. T. Shank,[21] Q. T. Shao,[85] M. Shapiro,[14] P. B. Shatalov,[94] L. Shaver,[6] K. Shaw,[163a,163c] D. Sherman,[174] P. Sherwood,[76] A. Shibata,[107] H. Shichi,[100] S. Shimizu,[29] M. Shimojima,[99] T. Shin,[55] M. Shiyakova,[64] A. Shmeleva,[93] M. J. Shochet,[30] D. Short,[117] S. Shrestha,[63] M. A. Shupe,[6] P. Sicho,[124] A. Sidoti,[131a] F. Siegert,[47] Dj. Sijacki,[12a] O. Silbert,[170] J. Silva,[123a,c] Y. Silver,[152] D. Silverstein,[142] S. B. Silverstein,[145a] V. Simak,[126] O. Simard,[135] Lj. Simic,[12a] S. Simion,[114] B. Simmons,[76] M. Simonyan,[35] P. Sinervo,[157] N. B. Sinev,[113] V. Sipica,[140] G. Siragusa,[172] A. Sircar,[24] A. N. Sisakyan,[64] S. Yu. Sivoklokov,[96] J. Sjölin,[145a,145b] T. B. Sjursen,[13] L. A. Skinnari,[14] H. P. Skottowe,[56] K. Skovpen,[106] P. Skubic,[110] N. Skvorodnev,[22] M. Slater,[17] T. Slavicek,[126] K. Sliwa,[160] J. Sloper,[29] V. Smakhtin,[170] S. Yu. Smirnov,[95] L. N. Smirnova,[96] O. Smirnova,[78] B. C. Smith,[56] D. Smith,[142] K. M. Smith,[52] M. Smizanska,[70] K. Smolek,[126] A. A. Snesarev,[93] S. W. Snow,[81] J. Snow,[110] J. Snuverink,[104] S. Snyder,[24] M. Soares,[123a] R. Sobie,[168,k] J. Sodomka,[126] A. Soffer,[152] C. A. Solans,[166] M. Solar,[126] J. Solc,[126] E. Soldatov,[95] U. Soldevila,[166] E. Solfaroli Camillocci,[131a,131b] A. A. Solodkov,[127] O. V. Solovyanov,[127] N. Soni,[2] V. Sopko,[126] B. Sopko,[126] M. Sosebee,[7] R. Soualah,[163a,163c] A. Soukharev,[106] S. Spagnolo,[71a,71b] F. Spanò,[75] R. Spighi,[19a] G. Spigo,[29] F. Spila,[131a,131b] R. Spiwoks,[29] M. Spousta,[125] T. Spreitzer,[157] B. Spurlock,[7] R. D. St. Denis,[52] T. Stahl,[140] J. Stahlman,[119] R. Stamen,[57a] E. Stanecka,[38] R. W. Stanek,[5] C. Stanescu,[133a] S. Stapnes,[116] E. A. Starchenko,[127] J. Stark,[54] P. Staroba,[124] P. Starovoitov,[90] A. Staude,[97] P. Stavina,[143a] G. Stavropoulos,[14] G. Steele,[52] P. Steinbach,[43] P. Steinberg,[24] I. Stekl,[126] B. Stelzer,[141] H. J. Stelzer,[87] O. Stelzer-Chilton,[158a] H. Stenzel,[51] S. Stern,[98] K. Stevenson,[74] G. A. Stewart,[29] J. A. Stillings,[20] M. C. Stockton,[84] K. Stoerig,[47] G. Stoicea,[25a] S. Stonjek,[98] P. Strachota,[125] A. R. Stradling,[7] A. Straessner,[43] J. Strandberg,[146] S. Strandberg,[145a,145b] A. Strandlie,[116] M. Strang,[108] E. Strauss,[142] M. Strauss,[110] P. Strizenec,[143b] R. Ströhmer,[172] D. M. Strom,[113] J. A. Strong,[75,a] R. Stroynowski,[39] J. Strube,[128] B. Stugu,[13] I. Stumer,[24,a] J. Stupak,[147] P. Sturm,[173] N. A. Styles,[41] D. A. Soh,[150,v] D. Su,[142] HS. Subramania,[2] A. Succurro,[11] Y. Sugaya,[115] T. Sugimoto,[100] C. Suhr,[105] K. Suita,[66] M. Suk,[125] V. V. Sulin,[93] S. Sultansoy,[3d] T. Sumida,[67] X. Sun,[54] J. E. Sundermann,[47] K. Suruliz,[138] S. Sushkov,[11] G. Susinno,[36a,36b] M. R. Sutton,[148] Y. Suzuki,[65] Y. Suzuki,[66] M. Svatos,[124] Yu. M. Sviridov,[127] S. Swedish,[167] I. Sykora,[143a] T. Sykora,[125] B. Szeless,[29] J. Sánchez,[166] D. Ta,[104] K. Tackmann,[41] A. Taffard,[162] R. Tafirout,[158a]

N. Taiblum,[152] Y. Takahashi,[100] H. Takai,[24] R. Takashima,[68] H. Takeda,[66] T. Takeshita,[139] Y. Takubo,[65] M. Talby,[82] A. Talyshev,[106,g] M. C. Tamsett,[24] J. Tanaka,[154] R. Tanaka,[114] S. Tanaka,[130] S. Tanaka,[65] Y. Tanaka,[99] A. J. Tanasijczuk,[141] K. Tani,[66] N. Tannoury,[82] G. P. Tappern,[29] S. Tapprogge,[80] D. Tardif,[157] S. Tarem,[151] F. Tarrade,[28] G. F. Tartarelli,[88a] P. Tas,[125] M. Tasevsky,[124] E. Tassi,[36a,36b] M. Tatarkhanov,[14] Y. Tayalati,[134d] C. Taylor,[76] F. E. Taylor,[91] G. N. Taylor,[85] W. Taylor,[158b] M. Teinturier,[114] M. Teixeira Dias Castanheira,[74] P. Teixeira-Dias,[75] K. K. Temming,[47] H. Ten Kate,[29] P. K. Teng,[150] S. Terada,[65] K. Terashi,[154] J. Terron,[79] M. Testa,[46] R. J. Teuscher,[157,k] J. Thadome,[173] J. Therhaag,[20] T. Theveneaux-Pelzer,[77] M. Thioye,[174] S. Thoma,[47] J. P. Thomas,[17] E. N. Thompson,[34] P. D. Thompson,[17] P. D. Thompson,[157] A. S. Thompson,[52] E. Thomson,[119] M. Thomson,[27] R. P. Thun,[86] F. Tian,[34] M. J. Tibbetts,[14] T. Tic,[124] V. O. Tikhomirov,[93] Y. A. Tikhonov,[106,g] S. Timoshenko,[95] P. Tipton,[174] F. J. Tique Aires Viegas,[29] S. Tisserant,[82] B. Toczek,[37] T. Todorov,[4] S. Todorova-Nova,[160] B. Toggerson,[162] J. Tojo,[65] S. Tokár,[143a] K. Tokunaga,[66] K. Tokushuku,[65] K. Tollefson,[87] M. Tomoto,[100] L. Tompkins,[30] K. Toms,[102] G. Tong,[32a] A. Tonoyan,[13] C. Topfel,[16] N. D. Topilin,[64] I. Torchiani,[29] E. Torrence,[113] H. Torres,[77] E. Torró Pastor,[166] J. Toth,[82,bb] F. Touchard,[82] D. R. Tovey,[138] T. Trefzger,[172] L. Tremblet,[29] A. Tricoli,[29] I. M. Trigger,[158a] S. Trincaz-Duvoid,[77] T. N. Trinh,[77] M. F. Tripiana,[69] W. Trischuk,[157] A. Trivedi,[24,aa] B. Trocmé,[54] C. Troncon,[88a] M. Trottier-McDonald,[141] M. Trzebinski,[38] A. Trzupek,[38] C. Tsarouchas,[29] J. C-L. Tseng,[117] M. Tsiakiris,[104] P. V. Tsiareshka,[89] D. Tsionou,[4,ff] G. Tsipolitis,[9] V. Tsiskaridze,[47] E. G. Tskhadadze,[50a] I. I. Tsukerman,[94] V. Tsulaia,[14] J.-W. Tsung,[20] S. Tsuno,[65] D. Tsybychev,[147] A. Tua,[138] A. Tudorache,[25a] V. Tudorache,[25a] J. M. Tuggle,[30] M. Turala,[38] D. Turecek,[126] I. Turk Cakir,[3e] E. Turlay,[104] R. Turra,[88a,88b] P. M. Tuts,[34] A. Tykhonov,[73] M. Tylmad,[145a,145b] M. Tyndel,[128] G. Tzanakos,[8] K. Uchida,[20] I. Ueda,[154] R. Ueno,[28] M. Ugland,[13] M. Uhlenbrock,[20] M. Uhrmacher,[53] F. Ukegawa,[159] G. Unal,[29] D. G. Underwood,[5] A. Undrus,[24] G. Unel,[162] Y. Unno,[65] D. Urbaniec,[34] G. Usai,[7] M. Uslenghi,[118a,118b] L. Vacavant,[82] V. Vacek,[126] B. Vachon,[84] S. Vahsen,[14] J. Valenta,[124] P. Valente,[131a] S. Valentinetti,[19a,19b] S. Valkar,[125] E. Valladolid Gallego,[166] S. Vallecorsa,[151] J. A. Valls Ferrer,[166] H. van der Graaf,[104] E. van der Kraaij,[104] R. Van Der Leeuw,[104] E. van der Poel,[104] D. van der Ster,[29] N. van Eldik,[83] P. van Gemmeren,[5] Z. van Kesteren,[104] I. van Vulpen,[104] M. Vanadia,[98] W. Vandelli,[29] G. Vandoni,[29] A. Vaniachine,[5] P. Vankov,[41] F. Vannucci,[77] F. Varela Rodriguez,[29] R. Vari,[131a] E. W. Varnes,[6] D. Varouchas,[14] A. Vartapetian,[7] K. E. Varvell,[149] V. I. Vassilakopoulos,[55] F. Vazeille,[33] G. Vegni,[88a,88b] J. J. Veillet,[114] C. Vellidis,[8] F. Veloso,[123a] R. Veness,[29] S. Veneziano,[131a] A. Ventura,[71a,71b] D. Ventura,[137] M. Venturi,[47] N. Venturi,[157] V. Vercesi,[118a] M. Verducci,[137] W. Verkerke,[104] J. C. Vermeulen,[104] A. Vest,[43] M. C. Vetterli,[141,e] I. Vichou,[164] T. Vickey,[144b,gg] O. E. Vickey Boeriu,[144b] G. H. A. Viehhauser,[117] S. Viel,[167] M. Villa,[19a,19b] M. Villaplana Perez,[166] E. Vilucchi,[46] M. G. Vincter,[28] E. Vinek,[29] V. B. Vinogradov,[64] M. Virchaux,[135,a] J. Virzi,[14] O. Vitells,[170] M. Viti,[41] I. Vivarelli,[47] F. Vives Vaque,[2] S. Vlachos,[9] D. Vladoiu,[97] M. Vlasak,[126] N. Vlasov,[20] A. Vogel,[20] P. Vokac,[126] G. Volpi,[46] M. Volpi,[85] G. Volpini,[88a] H. von der Schmitt,[98] J. von Loeben,[98] H. von Radziewski,[47] E. von Toerne,[20] V. Vorobel,[125] A. P. Vorobiev,[127] V. Vorwerk,[11] M. Vos,[166] R. Voss,[29] T. T. Voss,[173] J. H. Vossebeld,[72] N. Vranjes,[12a] M. Vranjes Milosavljevic,[104] V. Vrba,[124] M. Vreeswijk,[104] T. Vu Anh,[80] R. Vuillermet,[29] I. Vukotic,[114] W. Wagner,[173] P. Wagner,[119] H. Wahlen,[173] J. Wakabayashi,[100] J. Walbersloh,[42] S. Walch,[86] J. Walder,[70] R. Walker,[97] W. Walkowiak,[140] R. Wall,[174] P. Waller,[72] C. Wang,[44] H. Wang,[171] H. Wang,[32b,hh] J. Wang,[150] J. Wang,[54] J. C. Wang,[137] R. Wang,[102] S. M. Wang,[150] A. Warburton,[84] C. P. Ward,[27] M. Warsinsky,[47] P. M. Watkins,[17] A. T. Watson,[17] I. J. Watson,[149] M. F. Watson,[17] G. Watts,[137] S. Watts,[81] A. T. Waugh,[149] B. M. Waugh,[76] M. Weber,[128] M. S. Weber,[16] P. Weber,[53] A. R. Weidberg,[117] P. Weigell,[98] J. Weingarten,[53] C. Weiser,[47] H. Wellenstein,[22] P. S. Wells,[29] M. Wen,[46] T. Wenaus,[24] S. Wendler,[122] Z. Weng,[150,v] T. Wengler,[29] S. Wenig,[29] N. Wermes,[20] M. Werner,[47] P. Werner,[29] M. Werth,[162] M. Wessels,[57a] C. Weydert,[54] K. Whalen,[28] S. J. Wheeler-Ellis,[162] S. P. Whitaker,[21] A. White,[7] M. J. White,[85] S. R. Whitehead,[117] D. Whiteson,[162] D. Whittington,[60] F. Wicek,[114] D. Wicke,[173] F. J. Wickens,[128] W. Wiedenmann,[171] M. Wielers,[128] P. Wienemann,[20] C. Wiglesworth,[74] L. A. M. Wiik-Fuchs,[47] P. A. Wijeratne,[76] A. Wildauer,[166] M. A. Wildt,[41,r] I. Wilhelm,[125] H. G. Wilkens,[29] J. Z. Will,[97] E. Williams,[34] H. H. Williams,[119] W. Willis,[34] S. Willocq,[83] J. A. Wilson,[17] M. G. Wilson,[142] A. Wilson,[86] I. Wingerter-Seez,[4] S. Winkelmann,[47] F. Winklmeier,[29] M. Wittgen,[142] M. W. Wolter,[38] H. Wolters,[123a,i] W. C. Wong,[40] G. Wooden,[86] B. K. Wosiek,[38] J. Wotschack,[29] M. J. Woudstra,[83] K. W. Wozniak,[38] K. Wraight,[52] C. Wright,[52] M. Wright,[52] B. Wrona,[72] S. L. Wu,[171] X. Wu,[48] Y. Wu,[32b,ii] E. Wulf,[34] R. Wunstorf,[42] B. M. Wynne,[45] S. Xella,[35] M. Xiao,[135] S. Xie,[47] Y. Xie,[32a] C. Xu,[32b,x] D. Xu,[138] G. Xu,[32a] B. Yabsley,[149] S. Yacoob,[144b] M. Yamada,[65] H. Yamaguchi,[154] A. Yamamoto,[65] K. Yamamoto,[63] S. Yamamoto,[154] T. Yamamura,[154] T. Yamanaka,[154] J. Yamaoka,[44] T. Yamazaki,[154] Y. Yamazaki,[66] Z. Yan,[21] H. Yang,[86] U. K. Yang,[81]

Y. Yang,[60] Y. Yang,[32a] Z. Yang,[145a,145b] S. Yanush,[90] Y. Yao,[14] Y. Yasu,[65] G. V. Ybeles Smit,[129] J. Ye,[39] S. Ye,[24] M. Yilmaz,[3c] R. Yoosoofmiya,[122] K. Yorita,[169] R. Yoshida,[5] C. Young,[142] S. Youssef,[21] D. Yu,[24] J. Yu,[7] J. Yu,[111] L. Yuan,[32a,jj] A. Yurkewicz,[105] B. Zabinski,[38] V. G. Zaets,[127] R. Zaidan,[62] A. M. Zaitsev,[127] Z. Zajacova,[29] L. Zanello,[131a,131b] P. Zarzhitsky,[39] A. Zaytsev,[106] C. Zeitnitz,[173] M. Zeller,[174] M. Zeman,[124] A. Zemla,[38] C. Zendler,[20] O. Zenin,[127] T. Ženiš,[143a] Z. Zinonos,[121a,121b] S. Zenz,[14] D. Zerwas,[114] G. Zevi della Porta,[56] Z. Zhan,[32d] D. Zhang,[32b,ff] H. Zhang,[87] J. Zhang,[5] X. Zhang,[32d] Z. Zhang,[114] L. Zhao,[107] T. Zhao,[137] Z. Zhao,[32b] A. Zhemchugov,[64] S. Zheng,[32a] J. Zhong,[117] B. Zhou,[86] N. Zhou,[162] Y. Zhou,[150] C. G. Zhu,[32d] H. Zhu,[41] J. Zhu,[86] Y. Zhu,[32b] X. Zhuang,[97] V. Zhuravlov,[98] D. Zieminska,[60] R. Zimmermann,[20] S. Zimmermann,[20] S. Zimmermann,[47] M. Ziolkowski,[140] R. Zitoun,[4] L. Živković,[34] V. V. Zmouchko,[127,a] G. Zobernig,[171] A. Zoccoli,[19a,19b] Y. Zolnierowski,[4] A. Zsenei,[29] M. zur Nedden,[15] V. Zutshi,[105] and L. Zwalinski[29]

(ATLAS Collaboration)

[1]*University at Albany, Albany, New York, USA*
[2]*Department of Physics, University of Alberta, Edmonton, Alberta, Canada*
[3a]*Department of Physics, Ankara University, Ankara, Turkey*
[3b]*Department of Physics, Dumlupinar University, Kutahya, Turkey*
[3c]*Department of Physics, Gazi University, Ankara, Turkey*
[3d]*Division of Physics, TOBB University of Economics and Technology, Ankara, Turkey*
[3e]*Turkish Atomic Energy Authority, Ankara, Turkey*
[4]*LAPP, CNRS/IN2P3 and Université de Savoie, Annecy-le-Vieux, France*
[5]*High Energy Physics Division, Argonne National Laboratory, Argonne, Illinois, USA*
[6]*Department of Physics, University of Arizona, Tucson, Arizona, USA*
[7]*Department of Physics, The University of Texas at Arlington, Arlington, Texas, USA*
[8]*Physics Department, University of Athens, Athens, Greece*
[9]*Physics Department, National Technical University of Athens, Zografou, Greece*
[10]*Institute of Physics, Azerbaijan Academy of Sciences, Baku, Azerbaijan*
[11]*Institut de Física d'Altes Energies and Departament de Física de la Universitat Autònoma de Barcelona and ICREA, Barcelona, Spain*
[12a]*Institute of Physics, University of Belgrade, Belgrade, Serbia*
[12b]*Vinca Institute of Nuclear Sciences, University of Belgrade, Belgrade, Serbia*
[13]*Department for Physics and Technology, University of Bergen, Bergen, Norway*
[14]*Physics Division, Lawrence Berkeley National Laboratory and University of California, Berkeley, California, USA*
[15]*Department of Physics, Humboldt University, Berlin, Germany*
[16]*Albert Einstein Center for Fundamental Physics and Laboratory for High Energy Physics, University of Bern, Bern, Switzerland*
[17]*School of Physics and Astronomy, University of Birmingham, Birmingham, United Kingdom*
[18a]*Department of Physics, Bogazici University, Istanbul, Turkey*
[18b]*Division of Physics, Dogus University, Istanbul, Turkey*
[18c]*Department of Physics Engineering, Gaziantep University, Gaziantep, Turkey*
[18d]*Department of Physics, Istanbul Technical University, Istanbul, Turkey*
[19a]*INFN Sezione di Bologna, Italy*
[19b]*Dipartimento di Fisica, Università di Bologna, Bologna, Italy*
[20]*Physikalisches Institut, University of Bonn, Bonn, Germany*
[21]*Department of Physics, Boston University, Boston, Massachusetts, USA*
[22]*Department of Physics, Brandeis University, Waltham, Massachusetts, USA*
[23a]*Universidade Federal do Rio De Janeiro COPPE/EE/IF, Rio de Janeiro, Brazil*
[23b]*Federal University of Juiz de Fora (UFJF), Juiz de Fora, Brazil*
[23c]*Federal University of Sao Joao del Rei (UFSJ), Sao Joao del Rei, Brazil*
[23d]*Instituto de Fisica, Universidade de Sao Paulo, Sao Paulo, Brazil*
[24]*Physics Department, Brookhaven National Laboratory, Upton, New York, USA*
[25a]*National Institute of Physics and Nuclear Engineering, Bucharest, Romania*
[25b]*University Politehnica Bucharest, Bucharest, Romania*
[25c]*West University in Timisoara, Timisoara, Romania*
[26]*Departamento de Física, Universidad de Buenos Aires, Buenos Aires, Argentina*
[27]*Cavendish Laboratory, University of Cambridge, Cambridge, United Kingdom*
[28]*Department of Physics, Carleton University, Ottawa, Ontario, Canada*
[29]*CERN, Geneva, Switzerland*
[30]*Enrico Fermi Institute, University of Chicago, Chicago, Illinois, USA*

[31a]Departamento de Fisica, Pontificia Universidad Católica de Chile, Santiago, Chile
[31b]Departamento de Física, Universidad Técnica Federico Santa María, Valparaíso, Chile
[32a]Institute of High Energy Physics, Chinese Academy of Sciences, Beijing, China
[32b]Department of Modern Physics, University of Science and Technology of China, Anhui, China
[32c]Department of Physics, Nanjing University, Jiangsu, China
[32d]School of Physics, Shandong University, Shandong, China
[33]Laboratoire de Physique Corpusculaire, Clermont Université and Université Blaise Pascal and CNRS/IN2P3, Aubiere Cedex, France
[34]Nevis Laboratory, Columbia University, Irvington, New York, USA
[35]Niels Bohr Institute, University of Copenhagen, Kobenhavn, Denmark
[36a]INFN Gruppo Collegato di Cosenza, Italy
[36b]Dipartimento di Fisica, Università della Calabria, Arcavata di Rende, Italy
[37]AGH University of Science and Technology, Faculty of Physics and Applied Computer Science, Krakow, Poland
[38]The Henryk Niewodniczanski Institute of Nuclear Physics, Polish Academy of Sciences, Krakow, Poland
[39]Physics Department, Southern Methodist University, Dallas, Texas, USA
[40]Physics Department, University of Texas at Dallas, Richardson, Texas, USA
[41]DESY, Hamburg and Zeuthen, Germany
[42]Institut für Experimentelle Physik IV, Technische Universität Dortmund, Dortmund, Germany
[43]Institut für Kern- und Teilchenphysik, Technical University Dresden, Dresden, Germany
[44]Department of Physics, Duke University, Durham, North Carolina, USA
[45]SUPA-School of Physics and Astronomy, University of Edinburgh, Edinburgh, United Kingdom
[46]INFN Laboratori Nazionali di Frascati, Frascati, Italy
[47]Fakultät für Mathematik und Physik, Albert-Ludwigs-Universität, Freiburg i.Br., Germany
[48]Section de Physique, Université de Genève, Geneva, Switzerland
[49a]INFN Sezione di Genova, Italy
[49b]Dipartimento di Fisica, Università di Genova, Genova, Italy
[50a]E. Andronikashvili Institute of Physics, Tbilisi State University, Tbilisi, Georgia
[50b]High Energy Physics Institute, Tbilisi State University, Tbilisi, Georgia
[51]II Physikalisches Institut, Justus-Liebig-Universität Giessen, Giessen, Germany
[52]SUPA-School of Physics and Astronomy, University of Glasgow, Glasgow, United Kingdom
[53]II Physikalisches Institut, Georg-August-Universität, Göttingen, Germany
[54]Laboratoire de Physique Subatomique et de Cosmologie, Université Joseph Fourier and CNRS/IN2P3 and Institut National Polytechnique de Grenoble, Grenoble, France
[55]Department of Physics, Hampton University, Hampton, Virginia, USA
[56]Laboratory for Particle Physics and Cosmology, Harvard University, Cambridge, Massachusetts, USA
[57a]Kirchhoff-Institut für Physik, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany
[57b]Physikalisches Institut, Ruprecht-Karls-Universität Heidelberg, Heidelberg, Germany
[57c]ZITI Institut für technische Informatik, Ruprecht-Karls-Universität Heidelberg, Mannheim, Germany
[58]Faculty of Science, Hiroshima University, Hiroshima, Japan
[59]Faculty of Applied Information Science, Hiroshima Institute of Technology, Hiroshima, Japan
[60]Department of Physics, Indiana University, Bloomington, Indiana, USA
[61]Institut für Astro- und Teilchenphysik, Leopold-Franzens-Universität, Innsbruck, Austria
[62]University of Iowa, Iowa City, Iowa, USA
[63]Department of Physics and Astronomy, Iowa State University, Ames, Iowa, USA
[64]Joint Institute for Nuclear Research, JINR Dubna, Dubna, Russia
[65]KEK, High Energy Accelerator Research Organization, Tsukuba, Japan
[66]Graduate School of Science, Kobe University, Kobe, Japan
[67]Faculty of Science, Kyoto University, Kyoto, Japan
[68]Kyoto University of Education, Kyoto, Japan
[69]Instituto de Física La Plata, Universidad Nacional de La Plata and CONICET, La Plata, Argentina
[70]Physics Department, Lancaster University, Lancaster, United Kingdom
[71a]INFN Sezione di Lecce, Italy
[71b]Dipartimento di Fisica, Università del Salento, Lecce, Italy
[72]Oliver Lodge Laboratory, University of Liverpool, Liverpool, United Kingdom
[73]Department of Physics, Jožef Stefan Institute and University of Ljubljana, Ljubljana, Slovenia
[74]School of Physics and Astronomy, Queen Mary University of London, London, United Kingdom
[75]Department of Physics, Royal Holloway University of London, Surrey, United Kingdom
[76]Department of Physics and Astronomy, University College London, London, United Kingdom
[77]Laboratoire de Physique Nucléaire et de Hautes Energies, UPMC and Université Paris-Diderot and CNRS/IN2P3, Paris, France
[78]Fysiska institutionen, Lunds universitet, Lund, Sweden
[79]Departamento de Fisica Teorica C-15, Universidad Autonoma de Madrid, Madrid, Spain
[80]Institut für Physik, Universität Mainz, Mainz, Germany

[81]*School of Physics and Astronomy, University of Manchester, Manchester, United Kingdom*
[82]*CPPM, Aix-Marseille Université and CNRS/IN2P3, Marseille, France*
[83]*Department of Physics, University of Massachusetts, Amherst, Massachusetts, USA*
[84]*Department of Physics, McGill University, Montreal, Quebec, Canada*
[85]*School of Physics, University of Melbourne, Victoria, Australia*
[86]*Department of Physics, The University of Michigan, Ann Arbor, Michigan, USA*
[87]*Department of Physics and Astronomy, Michigan State University, East Lansing, Michigan, USA*
[88a]*INFN Sezione di Milano, Italy*
[88b]*Dipartimento di Fisica, Università di Milano, Milano, Italy*
[89]*B. I. Stepanov Institute of Physics, National Academy of Sciences of Belarus, Minsk, Republic of Belarus*
[90]*National Scientific and Educational Centre for Particle and High Energy Physics, Minsk, Republic of Belarus*
[91]*Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA*
[92]*Group of Particle Physics, University of Montreal, Montreal, Quebec, Canada*
[93]*P.N. Lebedev Institute of Physics, Academy of Sciences, Moscow, Russia*
[94]*Institute for Theoretical and Experimental Physics (ITEP), Moscow, Russia*
[95]*Moscow Engineering and Physics Institute (MEPhI), Moscow, Russia*
[96]*Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University, Moscow, Russia*
[97]*Fakultät für Physik, Ludwig-Maximilians-Universität München, München, Germany*
[98]*Max-Planck-Institut für Physik (Werner-Heisenberg-Institut), München, Germany*
[99]*Nagasaki Institute of Applied Science, Nagasaki, Japan*
[100]*Graduate School of Science, Nagoya University, Nagoya, Japan*
[101a]*INFN Sezione di Napoli, Italy*
[101b]*Dipartimento di Scienze Fisiche, Università di Napoli, Napoli, Italy*
[102]*Department of Physics and Astronomy, University of New Mexico, Albuquerque, New Mexico, USA*
[103]*Institute for Mathematics, Astrophysics and Particle Physics, Radboud University Nijmegen/Nikhef, Nijmegen, Netherlands*
[104]*Nikhef National Institute for Subatomic Physics and University of Amsterdam, Amsterdam, Netherlands*
[105]*Department of Physics, Northern Illinois University, DeKalb, Illinois, USA*
[106]*Budker Institute of Nuclear Physics, SB RAS, Novosibirsk, Russia*
[107]*Department of Physics, New York University, New York, New York, USA*
[108]*Ohio State University, Columbus, Ohio, USA*
[109]*Faculty of Science, Okayama University, Okayama, Japan*
[110]*Homer L. Dodge Department of Physics and Astronomy, University of Oklahoma, Norman, Oklahoma, USA*
[111]*Department of Physics, Oklahoma State University, Stillwater, Oklahoma, USA*
[112]*Palacký University, RCPTM, Olomouc, Czech Republic*
[113]*Center for High Energy Physics, University of Oregon, Eugene, Oregon, USA*
[114]*LAL, Univ. Paris-Sud and CNRS/IN2P3, Orsay, France*
[115]*Graduate School of Science, Osaka University, Osaka, Japan*
[116]*Department of Physics, University of Oslo, Oslo, Norway*
[117]*Department of Physics, Oxford University, Oxford, United Kingdom*
[118a]*INFN Sezione di Pavia, Italy*
[118b]*Dipartimento di Fisica, Università di Pavia, Pavia, Italy*
[119]*Department of Physics, University of Pennsylvania, Philadelphia, Pennsylvania, USA*
[120]*Petersburg Nuclear Physics Institute, Gatchina, Russia*
[121a]*INFN Sezione di Pisa, Italy*
[121b]*Dipartimento di Fisica E. Fermi, Università di Pisa, Pisa, Italy*
[122]*Department of Physics and Astronomy, University of Pittsburgh, Pittsburgh, Pennsylvania, USA*
[123a]*Laboratorio de Instrumentacao e Fisica Experimental de Particulas-LIP, Lisboa, Portugal*
[123b]*Departamento de Fisica Teorica y del Cosmos and CAFPE, Universidad de Granada, Granada, Spain*
[124]*Institute of Physics, Academy of Sciences of the Czech Republic, Praha, Czech Republic*
[125]*Faculty of Mathematics and Physics, Charles University in Prague, Praha, Czech Republic*
[126]*Czech Technical University in Prague, Praha, Czech Republic*
[127]*State Research Center Institute for High Energy Physics, Protvino, Russia*
[128]*Particle Physics Department, Rutherford Appleton Laboratory, Didcot, United Kingdom*
[129]*Physics Department, University of Regina, Regina, Saskatchewan, Canada*
[130]*Ritsumeikan University, Kusatsu, Shiga, Japan*
[131a]*INFN Sezione di Roma I, Italy*
[131b]*Dipartimento di Fisica, Università La Sapienza, Roma, Italy*
[132a]*INFN Sezione di Roma Tor Vergata, Italy*
[132b]*Dipartimento di Fisica, Università di Roma Tor Vergata, Roma, Italy*
[133a]*INFN Sezione di Roma Tre, Italy*
[133b]*Dipartimento di Fisica, Università Roma Tre, Roma, Italy*

[134a]*Faculté des Sciences Ain Chock, Réseau Universitaire de Physique des Hautes Energies-Université Hassan II, Casablanca, Morocco*
[134b]*Centre National de l'Energie des Sciences Techniques Nucleaires, Rabat, Morocco*
[134c]*Faculté des Sciences Semlalia, Université Cadi Ayyad, LPHEA-Marrakech, Morocco*
[134d]*Faculté des Sciences, Université Mohamed Premier and LPTPM, Oujda, Morocco*
[134e]*Faculté des Sciences, Université Mohammed V- Agdal, Rabat, Morocco*
[135]*DSM/IRFU (Institut de Recherches sur les Lois Fondamentales de l'Univers), CEA Saclay (Commissariat a l'Energie Atomique), Gif-sur-Yvette, France*
[136]*Santa Cruz Institute for Particle Physics, University of California Santa Cruz, Santa Cruz, California, USA*
[137]*Department of Physics, University of Washington, Seattle, Washington, USA*
[138]*Department of Physics and Astronomy, University of Sheffield, Sheffield, United Kingdom*
[139]*Department of Physics, Shinshu University, Nagano, Japan*
[140]*Fachbereich Physik, Universität Siegen, Siegen, Germany*
[141]*Department of Physics, Simon Fraser University, Burnaby, British Columbia, Canada*
[142]*SLAC National Accelerator Laboratory, Stanford, California, USA*
[143a]*Faculty of Mathematics, Physics & Informatics, Comenius University, Bratislava, Slovak Republic*
[143b]*Department of Subnuclear Physics, Institute of Experimental Physics of the Slovak Academy of Sciences, Kosice, Slovak Republic*
[144a]*Department of Physics, University of Johannesburg, Johannesburg, South Africa*
[144b]*School of Physics, University of the Witwatersrand, Johannesburg, South Africa*
[145a]*Department of Physics, Stockholm University, Sweden*
[145b]*The Oskar Klein Centre, Stockholm, Sweden*
[146]*Physics Department, Royal Institute of Technology, Stockholm, Sweden*
[147]*Departments of Physics & Astronomy and Chemistry, Stony Brook University, Stony Brook, New York, USA*
[148]*Department of Physics and Astronomy, University of Sussex, Brighton, United Kingdom*
[149]*School of Physics, University of Sydney, Sydney, Australia*
[150]*Institute of Physics, Academia Sinica, Taipei, Taiwan*
[151]*Department of Physics, Technion: Israel Inst. of Technology, Haifa, Israel*
[152]*Raymond and Beverly Sackler School of Physics and Astronomy, Tel Aviv University, Tel Aviv, Israel*
[153]*Department of Physics, Aristotle University of Thessaloniki, Thessaloniki, Greece*
[154]*International Center for Elementary Particle Physics and Department of Physics, The University of Tokyo, Tokyo, Japan*
[155]*Graduate School of Science and Technology, Tokyo Metropolitan University, Tokyo, Japan*
[156]*Department of Physics, Tokyo Institute of Technology, Tokyo, Japan*
[157]*Department of Physics, University of Toronto, Toronto ON, Canada*
[158a]*TRIUMF, Vancouver, British Columbia, Canada*
[158b]*Department of Physics and Astronomy, York University, Toronto, Ontario, Canada*
[159]*Institute of Pure and Applied Sciences, University of Tsukuba, 1-1-1 Tennodai, Tsukuba, Ibaraki 305-8571, Japan*
[160]*Science and Technology Center, Tufts University, Medford, Massachusetts, USA*
[161]*Centro de Investigaciones, Universidad Antonio Narino, Bogota, Colombia*
[162]*Department of Physics and Astronomy, University of California Irvine, Irvine, California, USA*
[163a]*INFN Gruppo Collegato di Udine, Italy*
[163b]*ICTP, Trieste, Italy*
[163c]*Dipartimento di Chimica, Fisica e Ambiente, Università di Udine, Udine, Italy*
[164]*Department of Physics, University of Illinois, Urbana, Illinois, USA*
[165]*Department of Physics and Astronomy, University of Uppsala, Uppsala, Sweden*
[166]*Instituto de Física Corpuscular (IFIC) and Departamento de Física Atómica, Molecular y Nuclear and Departamento de Ingeniería Electrónica and Instituto de Microelectrónica de Barcelona (IMB-CNM), University of Valencia and CSIC, Valencia, Spain*
[167]*Department of Physics, University of British Columbia, Vancouver, British Columbia, Canada*
[168]*Department of Physics and Astronomy, University of Victoria, Victoria, British Columbia, Canada*
[169]*Waseda University, Tokyo, Japan*
[170]*Department of Particle Physics, The Weizmann Institute of Science, Rehovot, Israel*
[171]*Department of Physics, University of Wisconsin, Madison Wisconsin, USA*
[172]*Fakultät für Physik und Astronomie, Julius-Maximilians-Universität, Würzburg, Germany*
[173]*Fachbereich C Physik, Bergische Universität Wuppertal, Wuppertal, Germany*
[174]*Department of Physics, Yale University, New Haven, Connecticut, USA*
[175]*Yerevan Physics Institute, Yerevan, Armenia*
[176]*Domaine scientifique de la Doua, Centre de Calcul CNRS/IN2P3, Villeurbanne Cedex, France*

[a]Deceased.
[b]Also at Laboratorio de Instrumentacao e Fisica Experimental de Particulas-LIP, Lisboa, Portugal.
[c]Also at Faculdade de Ciencias and CFNUL, Universidade de Lisboa, Lisboa, Portugal.
[d]Also at Particle Physics Department, Rutherford Appleton Laboratory, Didcot, United Kingdom.

[e]Also at TRIUMF, Vancouver BC, Canada.
[f]Also at Department of Physics, California State University, Fresno CA, USA.
[g]Also at Novosibirsk State University, Novosibirsk, Russia.
[h]Also at Fermilab, Batavia IL, USA.
[i]Also at Department of Physics, University of Coimbra, Coimbra, Portugal.
[j]Also at Università di Napoli Parthenope, Napoli, Italy.
[k]Also at Institute of Particle Physics (IPP), Canada.
[l]Also at Department of Physics, Middle East Technical University, Ankara, Turkey.
[m]Also at Louisiana Tech University, Ruston LA, USA.
[n]Also at Department of Physics and Astronomy, University College London, London, United Kingdom.
[o]Also at Group of Particle Physics, University of Montreal, Montreal QC, Canada.
[p]Also at Department of Physics, University of Cape Town, Cape Town, South Africa.
[q]Also at Institute of Physics, Azerbaijan Academy of Sciences, Baku, Azerbaijan.
[r]Also at Institut für Experimentalphysik, Universität Hamburg, Hamburg, Germany.
[s]Also at Manhattan College, New York NY, USA.
[t]Also at School of Physics, Shandong University, Shandong, China.
[u]Also at CPPM, Aix-Marseille Université and CNRS/IN2P3, Marseille, France.
[v]Also at School of Physics and Engineering, Sun Yat-sen University, Guanzhou, China.
[w]Also at Academia Sinica Grid Computing, Institute of Physics, Academia Sinica, Taipei, Taiwan.
[x]Also at DSM/IRFU (Institut de Recherches sur les Lois Fondamentales de l'Univers), CEA Saclay (Commissariat a l'Energie Atomique), Gif-sur-Yvette, France.
[y]Also at Section de Physique, Université de Genève, Geneva, Switzerland.
[z]Also at Departamento de Fisica, Universidade de Minho, Braga, Portugal.
[aa]Also at Department of Physics and Astronomy, University of South Carolina, Columbia SC, USA.
[bb]Also at Institute for Particle and Nuclear Physics, Wigner Research Centre for Physics, Budapest, Hungary.
[cc]Also at California Institute of Technology, Pasadena CA, USA.
[dd]Also at Institute of Physics, Jagiellonian University, Krakow, Poland.
[ee]Also at Institute of High Energy Physics, Chinese Academy of Sciences, Beijing, China.
[ff]Also at Department of Physics and Astronomy, University of Sheffield, Sheffield, United Kingdom.
[gg]Also at Department of Physics, Oxford University, Oxford, United Kingdom.
[hh]Also at Institute of Physics, Academia Sinica, Taipei, Taiwan.
[ii]Also at Department of Physics, The University of Michigan, Ann Arbor MI, USA.
[jj]Also at Laboratoire de Physique Nucléaire et de Hautes Energies, UPMC and Université Paris-Diderot and CNRS/IN2P3, Paris, France.