



## Erratum to: Observation of four-top-quark production in the multilepton final state with the ATLAS detector

ATLAS Collaboration\*

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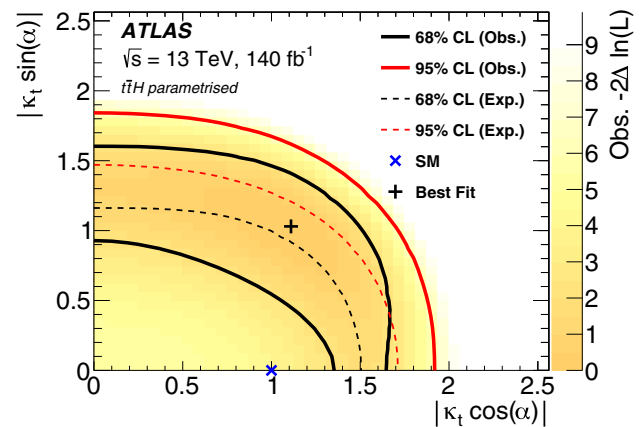
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**Erratum to: Eur. Phys. J. C (2023) 83:496**  
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Corrections to two figures, one table and the corresponding numbers in the text are noted for the paper. Systematic uncertainties arising from the comparison of the nominal  $t\bar{t}t\bar{t}$  simulation with alternative samples generated with SHERPA and with MADGRAPH5\_AMC@NLO+HERWIG7 were not applied when deriving limits on the top-quark Yukawa coupling, Higgs oblique parameter and EFT operators. This affects Figs. 8 and 9, and Table 8.

The changes in the text are noted for Sects. 9.1, 9.2 and 10.

- In Sect. 9.1, for the case when the  $t\bar{t}t\bar{t}$  and  $t\bar{t}H$  yields in each bin of the GNN distribution are parameterised as a function of  $\kappa_t$  and  $\alpha$  and fixing the top-quark Yukawa coupling to be  $CP$ -even only, the observed limit is  $|\kappa_t| < 1.9$  instead of  $|\kappa_t| < 1.8$ . If the  $t\bar{t}H$  background yields are not parameterised, whilst the normalisation of the  $t\bar{t}H$  background is treated as a free parameter of the fit, the observed (expected) limit is  $|\kappa_t| < 2.3$  (1.9) instead of  $|\kappa_t| < 2.2$  (1.8).
- In Sect. 9.2, the upper limits on the absolute values of the coefficients ( $|C_i/\Lambda^2|$ ) of  $O_{QQ}^1$ ,  $O_{Qt}^1$ ,  $O_{tt}^1$  and  $O_{Qt}^8$  assuming only the linear terms are 6.6, 4.0, 2.8 and 10.8  $\text{TeV}^{-2}$ , respectively, at 95% CL instead of 5.3, 3.3, 2.4 and 8.8  $\text{TeV}^{-2}$ .
- In Sect. 9.2, the observed (expected) upper limit on the  $\hat{H}$  parameter is 0.23 (0.11) at 95% CL instead of 0.20 (0.12). The published expected upper limit of 0.12 was a mistake in the text and should have been 0.1 corresponding to the



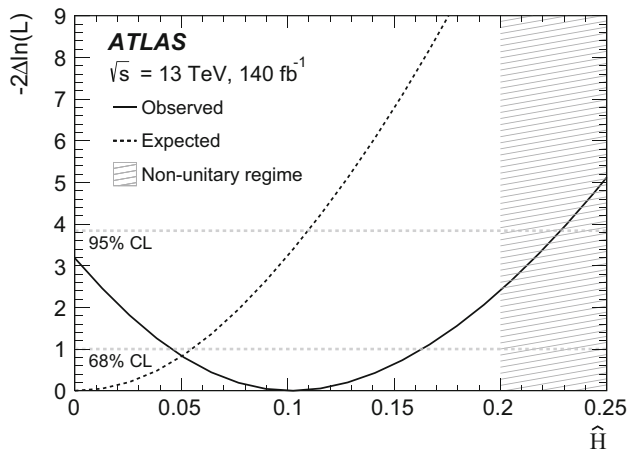
**Fig. 8** Two-dimensional negative log-likelihood contours for  $|\kappa_t \cos(\alpha)|$  versus  $|\kappa_t \sin(\alpha)|$  at 68% and 95%, where  $\kappa_t$  is the top-Higgs Yukawa coupling strength parameter and  $\alpha$  is the mixing angle between the  $CP$ -even and  $CP$ -odd components. The gradient-shaded area represents the observed likelihood value as a function of  $\kappa_t$  and  $\alpha$ . Both the  $t\bar{t}t\bar{t}$  signal and  $t\bar{t}H$  background yields in each fitted bin are parameterised as a function of  $\kappa_t$  and  $\alpha$ . The blue cross shows the SM expectation, while the black cross shows the best fit value

likelihood scan in Fig. 9. The observed limit is weaker than the largest value of this parameter equal to 0.2 that preserves unitarity in the perturbative theory.

- In Sect. 10, assuming a pure  $CP$ -even coupling ( $\alpha = 0$ ), the observed upper limit on  $|\kappa_t| = |y_t/y_t^{\text{SM}}|$  at 95% CL is 1.9 instead of 1.8. Assuming one operator taking effect at a time, the observed constraints on the coefficients ( $C_i/\Lambda^2$ ) of  $O_{QQ}^1$ ,  $O_{Qt}^1$ ,  $O_{tt}^1$  and  $O_{Qt}^8$  are  $[-4.0, 4.5]$ ,  $[-3.8, 3.4]$ ,  $[-1.9, 2.1]$  and  $[-6.9, 7.6]$   $\text{TeV}^{-2}$ , respectively. An observed upper limit at 95% CL of 0.23 is obtained for the Higgs oblique parameter that is weaker than the largest value that preserves unitarity in the perturbative theory.

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**Fig. 9** The negative log-likelihood values as a function of the Higgs oblique parameter  $\hat{H}$ . The solid line represents the observed likelihood while the dashed line corresponds to the expected one. The shaded region shows the non-unitary regime

**Table 8** Expected and observed 95% CL intervals on EFT coupling parameters assuming one EFT parameter variation in the fit

Operators	Expected $C_i/\Lambda^2$ [TeV $^{-2}$ ]	Observed $C_i/\Lambda^2$ [TeV $^{-2}$ ]
$\mathcal{O}_{QQ}^1$	[-2.5, 3.2]	[-4.0, 4.5]
$\mathcal{O}_{Qt}^1$	[-2.6, 2.1]	[-3.8, 3.4]
$\mathcal{O}_n^1$	[-1.2, 1.4]	[-1.9, 2.1]
$\mathcal{O}_{Qt}^8$	[-4.3, 5.1]	[-6.9, 7.6]

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















































































































































































































































































L. Diehl<sup>54</sup>, S. Díez Cornell<sup>48</sup>, C. Díez Pardos<sup>141</sup>, C. Dimitriadi<sup>24,161</sup>, A. Dimitrievska<sup>17a</sup>, J. Dingfelder<sup>24</sup>, I. M. Dinu<sup>27b</sup>, S. J. Dittmeier<sup>63b</sup>, F. Dittus<sup>36</sup>, F. Djama<sup>102</sup>, T. Djobava<sup>149b</sup>, J. I. Djuvsland<sup>16</sup>, C. Doglioni<sup>98,101</sup>, J. Dolejsi<sup>133</sup>, Z. Dolezal<sup>133</sup>, M. Donadelli<sup>83c</sup>, B. Dong<sup>107</sup>, J. Donini<sup>40</sup>, A. D'Onofrio<sup>77a,77b</sup>, M. D'Onofrio<sup>92</sup>, J. Dopke<sup>134</sup>, A. Doria<sup>72a</sup>, N. Dos Santos Fernandes<sup>130a</sup>, M. T. Dova<sup>90</sup>, A. T. Doyle<sup>59</sup>, M. A. Draguet<sup>126</sup>, E. Dreyer<sup>169</sup>, I. Drivas-koulouris<sup>10</sup>, A. S. Drobac<sup>158</sup>, M. Drozdova<sup>56</sup>, D. Du<sup>62a</sup>, T. A. du Pree<sup>114</sup>, F. Dubinin<sup>37</sup>, M. Dubovsky<sup>28a</sup>, E. Duchovni<sup>169</sup>, G. Duckeck<sup>109</sup>, O. A. Ducu<sup>27b</sup>, D. Duda<sup>52</sup>, A. Dudarev<sup>36</sup>, E. R. Duden<sup>26</sup>, M. D'uffizi<sup>101</sup>, L. Duflot<sup>66</sup>, M. Dührssen<sup>36</sup>, C. Dülsen<sup>171</sup>, A. E. Dumitriu<sup>27b</sup>, M. Dunford<sup>63a</sup>, S. Dungs<sup>49</sup>, K. Dunne<sup>47a,47b</sup>, A. Duperrin<sup>102</sup>, H. Duran Yildiz<sup>3a</sup>, M. Düren<sup>58</sup>, A. Durglishvili<sup>149b</sup>, G. P. O. Durieux<sup>8</sup>, B. L. Dwyer<sup>115</sup>, G. I. Dyckes<sup>17a</sup>, M. Dyndal<sup>86a</sup>, S. Dysch<sup>101</sup>, B. S. Dziedzic<sup>87</sup>, Z. O. Earnshaw<sup>146</sup>, G. H. Eberwein<sup>126</sup>, B. Eckerova<sup>28a</sup>, S. Eggebrecht<sup>55</sup>, M. G. Eggleston<sup>51</sup>, E. Egidio Purcino De Souza<sup>127</sup>, L. F. Ehrke<sup>56</sup>, G. Eigen<sup>16</sup>, K. Einsweiler<sup>17a</sup>, T. Ekelof<sup>161</sup>, P. A. Ekman<sup>98</sup>, S. El Farkh<sup>35b</sup>, Y. El Ghazali<sup>35b</sup>, H. El Jarrari<sup>35e,148</sup>, A. El Moussaouy<sup>35a</sup>, V. Ellajosyula<sup>161</sup>, M. Ellert<sup>161</sup>, F. Ellinghaus<sup>171</sup>, A. A. Elliot<sup>94</sup>, N. Ellis<sup>36</sup>, J. Elmsheuser<sup>29</sup>, M. Elsing<sup>36</sup>, D. Emelianov<sup>134</sup>, Y. Enari<sup>153</sup>, I. Ene<sup>17a</sup>, S. Epari<sup>13</sup>, J. Erdmann<sup>49</sup>, P. A. Erland<sup>87</sup>, M. Errenst<sup>171</sup>, M. Escalier<sup>66</sup>, C. Escobar<sup>163</sup>, E. Etzion<sup>151</sup>, G. Evans<sup>130a</sup>, H. Evans<sup>68</sup>, L. S. Evans<sup>95</sup>, M. O. Evans<sup>146</sup>, A. Ezhilov<sup>37</sup>, S. Ezzarqouni<sup>35a</sup>, F. Fabbri<sup>59</sup>, L. Fabbri<sup>23a,23b</sup>, G. Facini<sup>96</sup>, V. Fadeyev<sup>136</sup>, R. M. Fakhruddinov<sup>37</sup>, S. Falciano<sup>75a</sup>, L. F. Falda Ulhoa Coelho<sup>36</sup>, P. J. Falke<sup>24</sup>, J. Faltova<sup>133</sup>, C. Fan<sup>162</sup>, Y. Fan<sup>14a</sup>, Y. Fang<sup>14a,14e</sup>, M. Fanti<sup>71a,71b</sup>, M. Faraj<sup>69a,69b</sup>, Z. Farazpay<sup>97</sup>, A. Farbin<sup>8</sup>, A. Farilla<sup>77a</sup>, T. Farooque<sup>107</sup>, S. M. Farrington<sup>52</sup>, F. Fassi<sup>35e</sup>, D. Fassouliotis<sup>9</sup>, M. Fauci Giannelli<sup>76a,76b</sup>, W. J. Fawcett<sup>32</sup>, L. Fayard<sup>66</sup>, P. Federic<sup>133</sup>, P. Federicova<sup>131</sup>, O. L. Fedin<sup>37a</sup>, G. Fedotov<sup>37</sup>, M. Feickert<sup>170</sup>, L. Feligioni<sup>102</sup>, D. E. Fellers<sup>123</sup>, C. Feng<sup>62b</sup>, M. Feng<sup>14b</sup>, Z. Feng<sup>114</sup>, M. J. Fenton<sup>160</sup>, A. B. Fenyuk<sup>37</sup>, L. Ferencz<sup>48</sup>, R. A. M. Ferguson<sup>91</sup>, S. I. Fernandez Luengo<sup>137f</sup>, M. J. V. Fernoux<sup>102</sup>, J. Ferrando<sup>48</sup>, A. Ferrari<sup>161</sup>, P. Ferrari<sup>113,114</sup>, R. Ferrari<sup>73a</sup>, D. Ferrere<sup>56</sup>, C. Ferretti<sup>106</sup>, F. Fiedler<sup>100</sup>, A. Filipčić<sup>93</sup>, E. K. Filmer<sup>1</sup>, F. Filthaut<sup>113</sup>, M. C. N. Fiolhais<sup>130a,130c,c</sup>, L. Fiorini<sup>163</sup>, W. C. Fisher<sup>107</sup>, T. Fitschen<sup>101</sup>, P. M. Fitzhugh<sup>135</sup>, I. Fleck<sup>141</sup>, P. Fleischmann<sup>106</sup>, T. Flick<sup>171</sup>, L. Flores<sup>128</sup>, M. Flores<sup>33d</sup>, L. R. Flores Castillo<sup>64a</sup>, L. Flores Sanz De Acedo<sup>36</sup>, F. M. Follega<sup>78a,78b</sup>, N. Fomin<sup>16</sup>, J. H. Foo<sup>155</sup>, B. C. Forland<sup>68</sup>, A. Formica<sup>135</sup>, A. C. Forti<sup>101</sup>, E. Fortin<sup>36</sup>, A. W. Fortman<sup>61</sup>, M. G. Foti<sup>17a</sup>, L. Fountas<sup>9</sup>, D. Fournier<sup>66</sup>, H. Fox<sup>91</sup>, P. Francavilla<sup>74a,74b</sup>, S. Francescato<sup>61</sup>, S. Franchellucci<sup>56</sup>, M. Franchini<sup>23a,23b</sup>, S. Franchino<sup>63a</sup>, D. Francis<sup>36</sup>, L. Franco<sup>113</sup>, L. Franconi<sup>48</sup>, M. Franklin<sup>61</sup>, G. Frattari<sup>26</sup>, A. C. Freegard<sup>94</sup>, W. S. Freund<sup>83b</sup>, Y. Y. Frid<sup>151</sup>, N. Fritzsche<sup>50</sup>, A. Froch<sup>54</sup>, D. Froidevaux<sup>36</sup>, J. A. Frost<sup>126</sup>, Y. Fu<sup>62a</sup>, M. Fujimoto<sup>118</sup>, E. Fullana Torregrosa<sup>163,\*</sup>, K. Y. Fung<sup>64a</sup>, E. Furtado De Simas Filho<sup>83b</sup>, M. Furukawa<sup>153</sup>, J. Fuster<sup>163</sup>, A. Gabrielli<sup>23a,23b</sup>, A. Gabrielli<sup>155</sup>, P. Gadov<sup>36</sup>, G. Gagliardi<sup>57a,57b</sup>, L. G. Gagnon<sup>17a</sup>, E. J. Gallas<sup>126</sup>, B. J. Gallop<sup>134</sup>, K. K. Gan<sup>119</sup>, S. Ganguly<sup>153</sup>, J. Gao<sup>62a</sup>, Y. Gao<sup>52</sup>, F. M. Garay Walls<sup>137a,137b</sup>, B. Garcia<sup>29,aj</sup>, C. García<sup>163</sup>, A. Garcia Alonso<sup>114</sup>, A. G. Garcia Caffaro<sup>172</sup>, J. E. García Navarro<sup>163</sup>, M. Garcia-Sciveres<sup>17a</sup>, G. L. Gardner<sup>128</sup>, R. W. Gardner<sup>39</sup>, N. Garelli<sup>158</sup>, D. Garg<sup>80</sup>, R. B. Garg<sup>143</sup>, J. M. Gargan<sup>52</sup>, C. A. Garner<sup>155</sup>, S. J. Gasiorowski<sup>138</sup>, P. Gaspar<sup>83b</sup>, G. Gaudio<sup>73a</sup>, V. Gautam<sup>13</sup>, P. Gauzzi<sup>75a,75b</sup>, I. L. Gavrilenko<sup>37</sup>, A. Gavriluk<sup>37</sup>, C. Gay<sup>164</sup>, G. Gaycken<sup>48</sup>, E. N. Gazis<sup>10</sup>, A. A. Geanta<sup>27b</sup>, C. M. Gee<sup>136</sup>, C. Gemme<sup>57b</sup>, M. H. Genest<sup>60</sup>, S. Gentile<sup>75a,75b</sup>, S. George<sup>95</sup>, W. F. George<sup>20</sup>, T. Gerialis<sup>46</sup>, P. Gessinger-Befurt<sup>36</sup>, M. E. Geyik<sup>171</sup>, M. Ghneimat<sup>141</sup>, K. Ghorbanian<sup>94</sup>, A. Ghosal<sup>141</sup>, A. Ghosh<sup>160</sup>, A. Ghosh<sup>7</sup>, B. Giacobbe<sup>23b</sup>, S. Giagu<sup>75a,75b</sup>, P. Giannetti<sup>74a</sup>, A. Giannini<sup>62a</sup>, S. M. Gibson<sup>95</sup>, M. Gignac<sup>136</sup>, D. T. Gil<sup>86b</sup>, A. K. Gilbert<sup>86a</sup>, B. J. Gilbert<sup>41</sup>, D. Gillberg<sup>34</sup>, G. Gilles<sup>114</sup>, N. E. K. Gillwald<sup>48</sup>, L. Ginabat<sup>127</sup>, D. M. Gingrich<sup>2,ah</sup>, M. P. Giordani<sup>69a,69c</sup>, P. F. Giraud<sup>135</sup>, G. Giugliarelli<sup>69a,69c</sup>, D. Giugni<sup>71a</sup>, F. Giuli<sup>36</sup>, I. Gkialas<sup>9,k</sup>, L. K. Gladilin<sup>37</sup>, C. Glasman<sup>99</sup>, G. R. Gledhill<sup>123</sup>, G. Glemža<sup>48</sup>, M. Glisic<sup>123</sup>, I. Gnesi<sup>43b,f</sup>, Y. Go<sup>29,aj</sup>, M. Goblirsch-Kolb<sup>36</sup>, B. Gocke<sup>49</sup>, D. Godin<sup>108</sup>, B. Gokturk<sup>21a</sup>, S. Goldfarb<sup>105</sup>, T. Golling<sup>56</sup>, M. G. D. Gololo<sup>33g</sup>, D. Golubkov<sup>37</sup>, J. P. Gombas<sup>107</sup>, A. Gomes<sup>130a,130b</sup>, G. Gomes Da Silva<sup>141</sup>, A. J. Gomez Delegido<sup>163</sup>, R. Gonçalves<sup>130a,130c</sup>, G. Gonella<sup>123</sup>, L. Gonella<sup>20</sup>, A. Gongadze<sup>149c</sup>, F. Gonnella<sup>20</sup>, J. L. Gonski<sup>41</sup>, R. Y. González Andana<sup>52</sup>, S. González de la Hoz<sup>163</sup>, S. Gonzalez Fernandez<sup>13</sup>, R. Gonzalez Lopez<sup>92</sup>, C. Gonzalez Renteria<sup>17a</sup>, R. Gonzalez Suarez<sup>161</sup>, S. Gonzalez-Sevilla<sup>56</sup>, G. R. Gonzalvo Rodriguez<sup>163</sup>, L. Goossens<sup>36</sup>, P. A. Gorbounov<sup>37</sup>, B. Gorini<sup>36</sup>, E. Gorini<sup>70a,70b</sup>, A. Gorišek<sup>93</sup>, T. C. Gosart<sup>128</sup>, A. T. Goshaw<sup>51</sup>, M. I. Gostkin<sup>38</sup>, S. Goswami<sup>121</sup>, C. A. Gottardo<sup>36</sup>, M. Gouighri<sup>35b</sup>, V. Goumarre<sup>48</sup>, A. G. Goussiou<sup>138</sup>, N. Govender<sup>33c</sup>, I. Grabowska-Bold<sup>86a</sup>, K. Graham<sup>34</sup>, E. Gramstad<sup>125</sup>, S. Grancagnolo<sup>70a,70b</sup>, M. Grandi<sup>146</sup>, P. M. Gravila<sup>27f</sup>, F. G. Gravili<sup>70a,70b</sup>, H. M. Gray<sup>17a</sup>, M. Greco<sup>70a,70b</sup>, C. Grefe<sup>24</sup>, I. M. Gregor<sup>48</sup>, P. Grenier<sup>143</sup>, C. Grieco<sup>13</sup>, A. A. Grillo<sup>136</sup>, K. Grimm<sup>31</sup>, S. Grinstein<sup>13,w</sup>, J.-F. Grivaz<sup>66</sup>, E. Gross<sup>169</sup>, J. Grosse-Knetter<sup>55</sup>, C. Grud<sup>106</sup>

J. C. Grundy<sup>126</sup>, L. Guan<sup>106</sup>, W. Guan<sup>170</sup>, C. Gubbels<sup>164</sup>, J. G. R. Guerrero Rojas<sup>163</sup>, G. Guerrieri<sup>69a,69c</sup>, F. Guescini<sup>110</sup>, R. Gugel<sup>100</sup>, J. A. M. Guhit<sup>106</sup>, A. Guida<sup>18</sup>, T. Guillemain<sup>4</sup>, E. Guilloton<sup>134,167</sup>, S. Guindon<sup>36</sup>, F. Guo<sup>14a,14e</sup>, J. Guo<sup>62c</sup>, L. Guo<sup>48</sup>, Y. Guo<sup>106</sup>, R. Gupta<sup>48</sup>, S. Gurbuz<sup>24</sup>, S. S. Gurdasani<sup>54</sup>, G. Gustavino<sup>36</sup>, M. Guth<sup>56</sup>, P. Gutierrez<sup>120</sup>, L. F. Gutierrez Zagazeta<sup>128</sup>, C. Gutschow<sup>96</sup>, C. Gwenlan<sup>126</sup>, C. B. Gwilliam<sup>92</sup>, E. S. Haaland<sup>125</sup>, A. Haas<sup>117</sup>, M. Habedank<sup>48</sup>, C. Haber<sup>17a</sup>, H. K. Hadavand<sup>8</sup>, A. Hadeif<sup>100</sup>, S. Hadzic<sup>110</sup>, J. J. Hahn<sup>141</sup>, E. H. Haines<sup>96</sup>, M. Haleem<sup>166</sup>, J. Haley<sup>121</sup>, J. J. Hall<sup>139</sup>, G. D. Hallewell<sup>102</sup>, L. Halser<sup>19</sup>, K. Hamano<sup>165</sup>, H. Hamdaoui<sup>35e</sup>, M. Hamer<sup>24</sup>, G. N. Hamity<sup>52</sup>, E. J. Hampshire<sup>95</sup>, J. Han<sup>62b</sup>, K. Han<sup>62a</sup>, L. Han<sup>14c</sup>, L. Han<sup>62a</sup>, S. Han<sup>17a</sup>, Y. F. Han<sup>155</sup>, K. Hanagaki<sup>84</sup>, M. Hance<sup>136</sup>, D. A. Hangal<sup>41,ae</sup>, H. Hanif<sup>142</sup>, M. D. Hank<sup>128</sup>, R. Hankache<sup>101</sup>, J. B. Hansen<sup>42</sup>, J. D. Hansen<sup>42</sup>, P. H. Hansen<sup>42</sup>, K. Hara<sup>157</sup>, D. Harada<sup>56</sup>, T. Harenberg<sup>171</sup>, S. Harkusha<sup>37</sup>, M. L. Harris<sup>103</sup>, Y. T. Harris<sup>126</sup>, J. Harrison<sup>13</sup>, N. M. Harrison<sup>119</sup>, P. F. Harrison<sup>167</sup>, N. M. Hartman<sup>143</sup>, N. M. Hartmann<sup>109</sup>, Y. Hasegawa<sup>140</sup>, A. Hasib<sup>52</sup>, S. Haug<sup>19</sup>, R. Hauser<sup>107</sup>, C. M. Hawkes<sup>20</sup>, R. J. Hawkins<sup>36</sup>, Y. Hayashi<sup>153</sup>, S. Hayashida<sup>111</sup>, D. Hayden<sup>107</sup>, C. Hayes<sup>106</sup>, R. L. Hayes<sup>114</sup>, C. P. Hays<sup>126</sup>, J. M. Hays<sup>94</sup>, H. S. Hayward<sup>92</sup>, F. He<sup>62a</sup>, M. He<sup>14a,14e</sup>, Y. He<sup>154</sup>, Y. He<sup>127</sup>, N. B. Heatley<sup>94</sup>, V. Hedberg<sup>98</sup>, A. L. Heggelund<sup>125</sup>, N. D. Hehir<sup>94</sup>, C. Heidegger<sup>54</sup>, K. K. Heidegger<sup>54</sup>, W. D. Heidorn<sup>81</sup>, J. Heilman<sup>34</sup>, S. Heim<sup>48</sup>, T. Heim<sup>17a</sup>, J. G. Heinlein<sup>128</sup>, J. J. Heinrich<sup>123</sup>, L. Heinrich<sup>110</sup>, J. Hejbal<sup>131</sup>, L. Helary<sup>48</sup>, A. Held<sup>170</sup>, S. Hellesund<sup>16</sup>, C. M. Helling<sup>164</sup>, S. Hellman<sup>47a,47b</sup>, R. C. W. Henderson<sup>91</sup>, L. Henkelmann<sup>32</sup>, A. M. Henriques Correia<sup>36</sup>, H. Herde<sup>98</sup>, Y. Hernández Jiménez<sup>145</sup>, L. M. Herrmann<sup>24</sup>, T. Herrmann<sup>50</sup>, G. Herten<sup>54</sup>, R. Hertenberger<sup>109</sup>, L. Hervas<sup>36</sup>, M. E. Hespino<sup>100</sup>, N. P. Hessey<sup>156a</sup>, H. Hibi<sup>85</sup>, S. J. Hillier<sup>20</sup>, J. R. Hinds<sup>107</sup>, F. Hinterkeuser<sup>24</sup>, M. Hirose<sup>124</sup>, S. Hirose<sup>157</sup>, D. Hirschbuehl<sup>171</sup>, T. G. Hitchings<sup>101</sup>, B. Hiti<sup>93</sup>, J. Hobbs<sup>145</sup>, R. Hobincu<sup>27e</sup>, N. Hod<sup>169</sup>, M. C. Hodgkinson<sup>139</sup>, B. H. Hodgkinson<sup>32</sup>, A. Hoecker<sup>36</sup>, J. Hofer<sup>48</sup>, T. Holm<sup>24</sup>, M. Holzbock<sup>110</sup>, L. B. A. H. Hommels<sup>32</sup>, B. P. Honan<sup>101</sup>, J. Hong<sup>62c</sup>, T. M. Hong<sup>129</sup>, B. H. Hooberman<sup>162</sup>, W. H. Hopkins<sup>6</sup>, Y. Horii<sup>111</sup>, S. Hou<sup>148</sup>, A. S. Howard<sup>93</sup>, J. Howarth<sup>59</sup>, J. Hoya<sup>6</sup>, M. Hrabovsky<sup>122</sup>, A. Hrynevich<sup>48</sup>, T. Hryn'ova<sup>4</sup>, P. J. Hsu<sup>65</sup>, S.-C. Hsu<sup>138</sup>, Q. Hu<sup>41</sup>, Y. F. Hu<sup>14a,14e</sup>, S. Huang<sup>64b</sup>, X. Huang<sup>14c</sup>, Y. Huang<sup>139,m</sup>, Y. Huang<sup>14a</sup>, Z. Huang<sup>101</sup>, Z. Hubacek<sup>132</sup>, M. Huebner<sup>24</sup>, F. Huegging<sup>24</sup>, T. B. Huffman<sup>126</sup>, C. A. Hugli<sup>48</sup>, M. Huhtinen<sup>36</sup>, S. K. Huiberts<sup>16</sup>, R. Hulskan<sup>104</sup>, N. Huseynov<sup>12,a</sup>, J. Huston<sup>107</sup>, J. Huth<sup>61</sup>, R. Hyneman<sup>143</sup>, G. Iacobucci<sup>56</sup>, G. Iakovidis<sup>29</sup>, I. Ibragimov<sup>141</sup>, L. Iconomidou-Fayard<sup>66</sup>, P. Iengo<sup>72a,72b</sup>, R. Iguchi<sup>153</sup>, T. Iizawa<sup>84</sup>, Y. Ikegami<sup>84</sup>, N. Ilic<sup>155</sup>, H. Imam<sup>35a</sup>, M. Ince Lezki<sup>56</sup>, T. Ingebretsen Carlson<sup>47a,47b</sup>, G. Introzzi<sup>73a,73b</sup>, M. Iodice<sup>77a</sup>, V. Ippolito<sup>75a,75b</sup>, R. K. Irwin<sup>92</sup>, M. Ishino<sup>153</sup>, W. Islam<sup>170</sup>, C. Issever<sup>18,48</sup>, S. Istin<sup>21a</sup>, H. Ito<sup>168</sup>, J. M. Iturbe Ponce<sup>64a</sup>, R. Iuppa<sup>78a,78b</sup>, A. Ivina<sup>169</sup>, J. M. Izen<sup>45</sup>, V. Izzo<sup>72a</sup>, P. Jacka<sup>131,132</sup>, P. Jackson<sup>1</sup>, R. M. Jacobs<sup>48</sup>, B. P. Jaeger<sup>142</sup>, C. S. Jagfeld<sup>109</sup>, P. Jain<sup>54</sup>, G. Jäkel<sup>171</sup>, K. Jakobs<sup>54</sup>, T. Jakoubek<sup>169</sup>, J. Jamieson<sup>59</sup>, K. W. Janas<sup>86a</sup>, A. E. Jaspan<sup>92</sup>, M. Javurkova<sup>103</sup>, F. Jeanneau<sup>135</sup>, L. Jeanty<sup>123</sup>, J. Jejelava<sup>149a,ac</sup>, P. Jenni<sup>54,h</sup>, C. E. Jessiman<sup>34</sup>, S. Jézéquel<sup>4</sup>, C. Jia<sup>62b</sup>, J. Jia<sup>145</sup>, X. Jia<sup>61</sup>, X. Jia<sup>14a,14e</sup>, Z. Jia<sup>14c</sup>, Y. Jiang<sup>62a</sup>, S. Jiggins<sup>48</sup>, J. Jimenez Pena<sup>13</sup>, S. Jin<sup>14c</sup>, A. Jinaru<sup>27b</sup>, O. Jinnouchi<sup>154</sup>, P. Johansson<sup>139</sup>, K. A. Johns<sup>7</sup>, J. W. Johnson<sup>136</sup>, D. M. Jones<sup>32</sup>, E. Jones<sup>48</sup>, P. Jones<sup>32</sup>, R. W. L. Jones<sup>91</sup>, T. J. Jones<sup>92</sup>, R. Joshi<sup>119</sup>, J. Jovicevic<sup>15</sup>, X. Ju<sup>17a</sup>, J. J. Jungeburth<sup>36</sup>, T. Junkermann<sup>63a</sup>, A. Juste Rozas<sup>13,w</sup>, M. K. Juzek<sup>87</sup>, S. Kabana<sup>137e</sup>, A. Kaczmarzka<sup>87</sup>, M. Kado<sup>110</sup>, H. Kagan<sup>119</sup>, M. Kagan<sup>143</sup>, A. Kahn<sup>41</sup>, A. Kahn<sup>128</sup>, C. Kahra<sup>100</sup>, T. Kaji<sup>168</sup>, E. Kajomovitz<sup>150</sup>, N. Kakati<sup>169</sup>, I. Kalaitzidou<sup>54</sup>, C. W. Kalderon<sup>29</sup>, A. Kamenshchikov<sup>155</sup>, S. Kanayama<sup>154</sup>, N. J. Kang<sup>136</sup>, D. Kar<sup>33g</sup>, K. Karava<sup>126</sup>, M. J. Kareem<sup>156b</sup>, E. Karentzos<sup>54</sup>, I. Karkanas<sup>152</sup>, O. Karkout<sup>114</sup>, S. N. Karpov<sup>38</sup>, Z. M. Karpova<sup>38</sup>, V. Kartvelishvili<sup>91</sup>, A. N. Karyukhin<sup>37</sup>, E. Kasimi<sup>152</sup>, J. Katzy<sup>48</sup>, S. Kaur<sup>34</sup>, K. Kawade<sup>140</sup>, M. P. Kawale<sup>120</sup>, T. Kawamoto<sup>135</sup>, E. F. Kay<sup>36</sup>, F. I. Kaya<sup>158</sup>, S. Kazakos<sup>107</sup>, V. F. Kazanin<sup>37</sup>, Y. Ke<sup>145</sup>, J. M. Keaveney<sup>33a</sup>, R. Keeler<sup>165</sup>, G. V. Kehris<sup>61</sup>, J. S. Keller<sup>34</sup>, A. S. Kelly<sup>96</sup>, J. J. Kempster<sup>146</sup>, K. E. Kennedy<sup>41</sup>, P. D. Kennedy<sup>100</sup>, O. Kepka<sup>131</sup>, B. P. Kerridge<sup>167</sup>, S. Kersten<sup>171</sup>, B. P. Kerševan<sup>93</sup>, S. Keshri<sup>66</sup>, L. Keszeghova<sup>28a</sup>, S. Ketabchi Haghighat<sup>155</sup>, M. Khandoga<sup>127</sup>, A. Khanov<sup>121</sup>, A. G. Kharlamov<sup>37</sup>, T. Kharlamova<sup>37</sup>, E. E. Khoda<sup>138</sup>, T. J. Khoo<sup>18</sup>, G. Khoraiuli<sup>166</sup>, J. Khubua<sup>149b</sup>, Y. A. R. Khwaira<sup>66</sup>, A. Kilgallon<sup>123</sup>, D. W. Kim<sup>47a,47b</sup>, Y. K. Kim<sup>39</sup>, N. Kimura<sup>96</sup>, A. Kirchoff<sup>55</sup>, C. Kirfel<sup>24</sup>, F. Kirfel<sup>24</sup>, J. Kirk<sup>134</sup>, A. E. Kiryunin<sup>110</sup>, C. Kitsaki<sup>10</sup>, O. Kivernyk<sup>24</sup>, M. Klassen<sup>63a</sup>, C. Klein<sup>34</sup>, L. Klein<sup>166</sup>, M. H. Klein<sup>106</sup>, M. Klein<sup>92</sup>, S. B. Klein<sup>56</sup>, U. Klein<sup>92</sup>, P. Klimek<sup>36</sup>, A. Klimentov<sup>29</sup>, T. Klioutchnikova<sup>36</sup>, P. Kluit<sup>114</sup>, S. Kluth<sup>110</sup>, E. Kneringer<sup>79</sup>, T. M. Knight<sup>155</sup>, A. Knue<sup>54</sup>, R. Kobayashi<sup>88</sup>, S. F. Koch<sup>126</sup>, M. Kocian<sup>143</sup>, P. Kodyš<sup>133</sup>, D. M. Koeck<sup>123</sup>, P. T. Koenig<sup>24</sup>, T. Koffas<sup>34</sup>, M. Kolb<sup>135</sup>, I. Koletsou<sup>4</sup>, T. Komarek<sup>122</sup>, K. Köneke<sup>54</sup>, A. X. Y. Kong<sup>1</sup>, T. Kono<sup>118</sup>, N. Konstantinidis<sup>96</sup>, B. Konya<sup>98</sup>, R. Kopeliansky<sup>68</sup>

S. Koperny<sup>86a</sup>, K. Korcyl<sup>87</sup>, K. Kordas<sup>152,e</sup>, G. Koren<sup>151</sup>, A. Korn<sup>96</sup>, S. Korn<sup>55</sup>, I. Korolkov<sup>13</sup>, N. Korotkova<sup>37</sup>, B. Kortman<sup>114</sup>, O. Kortner<sup>110</sup>, S. Kortner<sup>110</sup>, W. H. Kostecka<sup>115</sup>, V. V. Kostyukhin<sup>141</sup>, A. Kotsokechagia<sup>135</sup>, A. Kotwal<sup>51</sup>, A. Koulouris<sup>36</sup>, A. Kourkoumeli-Charalampidi<sup>73a,73b</sup>, C. Kourkoumelis<sup>9</sup>, E. Kourlitis<sup>110</sup>, O. Kovanda<sup>146</sup>, R. Kowalewski<sup>165</sup>, W. Kozanecki<sup>135</sup>, A. S. Kozhin<sup>37</sup>, V. A. Kramarenko<sup>37</sup>, G. Kramberger<sup>93</sup>, P. Kramer<sup>100</sup>, M. W. Krasny<sup>127</sup>, A. Krasznahorkay<sup>36</sup>, J. W. Kraus<sup>171</sup>, J. A. Kremer<sup>100</sup>, T. Kresse<sup>50</sup>, J. Kretzschmar<sup>92</sup>, K. Kreul<sup>18</sup>, P. Krieger<sup>155</sup>, S. Krishnamurthy<sup>103</sup>, M. Krivos<sup>133</sup>, K. Krizka<sup>20</sup>, K. Kroeninger<sup>49</sup>, H. Kroha<sup>110</sup>, J. Kroll<sup>131</sup>, J. Kroll<sup>128</sup>, K. S. Krowpman<sup>107</sup>, U. Kruchonak<sup>38</sup>, H. Krüger<sup>24</sup>, N. Krumnack<sup>81</sup>, M. C. Kruse<sup>51</sup>, J. A. Krzysiak<sup>87</sup>, O. Kuchinskaia<sup>37</sup>, S. Kuday<sup>3a</sup>, S. Kuehn<sup>36</sup>, R. Kuesters<sup>54</sup>, T. Kuhl<sup>48</sup>, V. Kukhtin<sup>38</sup>, Y. Kulchitsky<sup>37,a</sup>, S. Kuleshov<sup>137b,137d</sup>, M. Kumar<sup>33g</sup>, N. Kumari<sup>102</sup>, A. Kupco<sup>131</sup>, T. Kupfer<sup>49</sup>, A. Kupich<sup>37</sup>, O. Kuprash<sup>54</sup>, H. Kurashige<sup>85</sup>, L. L. Kurchaninov<sup>156a</sup>, O. Kurdysh<sup>66</sup>, Y. A. Kurochkin<sup>37</sup>, A. Kurova<sup>37</sup>, M. Kuze<sup>154</sup>, A. K. Kvam<sup>103</sup>, J. Kvita<sup>122</sup>, T. Kwan<sup>104</sup>, N. G. Kyriacou<sup>106</sup>, L. A. O. Laatu<sup>102</sup>, C. Lacasta<sup>163</sup>, F. Lacava<sup>75a,75b</sup>, H. Lacker<sup>18</sup>, D. Lacour<sup>127</sup>, N. N. Lad<sup>96</sup>, E. Ladygin<sup>38</sup>, B. Laforge<sup>127</sup>, T. Lagouri<sup>137e</sup>, S. Lai<sup>55</sup>, I. K. Lakomicz<sup>86a</sup>, N. Lalloue<sup>60</sup>, J. E. Lambert<sup>165,n</sup>, S. Lammers<sup>68</sup>, W. Lampl<sup>7</sup>, C. Lampoudis<sup>152,e</sup>, A. N. Lancaster<sup>115</sup>, E. Lançon<sup>29</sup>, U. Landgraf<sup>54</sup>, M. P. J. Landon<sup>94</sup>, V. S. Lang<sup>54</sup>, R. J. Langenberg<sup>103</sup>, O. K. B. Langrekken<sup>125</sup>, A. J. Lankford<sup>160</sup>, F. Lanni<sup>36</sup>, K. Lantzsch<sup>24</sup>, A. Lanza<sup>73a</sup>, A. Lapertosa<sup>57a,57b</sup>, J. F. Laporte<sup>135</sup>, T. Lari<sup>71a</sup>, F. Lasagni Manghi<sup>23b</sup>, M. Lassnig<sup>36</sup>, V. Latonova<sup>131</sup>, A. Laudrain<sup>100</sup>, A. Laurier<sup>150</sup>, S. D. Lawlor<sup>95</sup>, Z. Lawrence<sup>101</sup>, M. Lazzaroni<sup>71a,71b</sup>, B. Le<sup>101</sup>, E. M. Le Boulicaut<sup>51</sup>, B. Leban<sup>93</sup>, A. Lebedev<sup>81</sup>, M. LeBlanc<sup>36</sup>, F. Ledroit-Guillon<sup>60</sup>, A. C. A. Lee<sup>96</sup>, S. C. Lee<sup>148</sup>, S. Lee<sup>47a,47b</sup>, T. F. Lee<sup>92</sup>, T. Lee<sup>17a</sup>, L. L. Leeuw<sup>33c</sup>, H. P. Lefebvre<sup>95</sup>, M. Lefebvre<sup>165</sup>, C. Leggett<sup>17a</sup>, G. Lehmann Miotto<sup>36</sup>, M. Leigh<sup>56</sup>, W. A. Leight<sup>103</sup>, W. Leinonen<sup>113</sup>, A. Leisos<sup>152,v</sup>, M. A. L. Leite<sup>83c</sup>, C. E. Leitgeb<sup>48</sup>, R. Leitner<sup>133</sup>, K. J. C. Leney<sup>44</sup>, T. Lenz<sup>24</sup>, S. Leone<sup>74a</sup>, C. Leonidopoulos<sup>52</sup>, A. Leopold<sup>144</sup>, C. Leroy<sup>108</sup>, R. Les<sup>107</sup>, C. G. Lester<sup>32</sup>, M. Levchenko<sup>37</sup>, J. Levêque<sup>4</sup>, D. Levin<sup>106</sup>, L. J. Levinson<sup>169</sup>, M. P. Lewicki<sup>87</sup>, D. J. Lewis<sup>4</sup>, A. Li<sup>5</sup>, B. Li<sup>62b</sup>, C. Li<sup>62a</sup>, C-Q. Li<sup>62c</sup>, H. Li<sup>62a</sup>, H. Li<sup>62b</sup>, H. Li<sup>14c</sup>, H. Li<sup>62b</sup>, K. Li<sup>138</sup>, L. Li<sup>62c</sup>, M. Li<sup>14a,14e</sup>, Q. Y. Li<sup>62a</sup>, S. Li<sup>14a,14e</sup>, S. Li<sup>62d,62c,d</sup>, T. Li<sup>5,b</sup>, X. Li<sup>104</sup>, Z. Li<sup>126</sup>, Z. Li<sup>104</sup>, Z. Li<sup>92</sup>, Z. Li<sup>14a,14e</sup>, Z. Liang<sup>14a</sup>, M. Liberatore<sup>135,ad</sup>, B. Liberti<sup>76a</sup>, K. Lie<sup>64c</sup>, J. Lieber Marin<sup>83b</sup>, H. Lien<sup>68</sup>, K. Lin<sup>107</sup>, R. E. Lindley<sup>7</sup>, J. H. Lindon<sup>2</sup>, A. Linss<sup>48</sup>, E. Lipeles<sup>128</sup>, A. Lipniacka<sup>16</sup>, A. Lister<sup>164</sup>, J. D. Little<sup>4</sup>, B. Liu<sup>14a</sup>, B. X. Liu<sup>142</sup>, D. Liu<sup>62c,62d</sup>, J. B. Liu<sup>62a</sup>, J. K. K. Liu<sup>32</sup>, K. Liu<sup>62c,62d</sup>, M. Liu<sup>62a</sup>, M. Y. Liu<sup>62a</sup>, P. Liu<sup>14a</sup>, Q. Liu<sup>62c,62d,138</sup>, X. Liu<sup>62a</sup>, Y. Liu<sup>14d,14e</sup>, Y. L. Liu<sup>106</sup>, Y. W. Liu<sup>62a</sup>, J. Llorente Merino<sup>142</sup>, S. L. Lloyd<sup>94</sup>, E. M. Lobodzinska<sup>48</sup>, P. Loch<sup>7</sup>, S. Loffredo<sup>76a,76b</sup>, T. Lohse<sup>18</sup>, K. Lohwasser<sup>139</sup>, E. Loiacono<sup>48</sup>, M. Lokajicek<sup>131</sup>, J. D. Lomas<sup>20</sup>, J. D. Long<sup>162</sup>, I. Longarini<sup>160</sup>, L. Longo<sup>70a,70b</sup>, R. Longo<sup>162</sup>, I. Lopez Paz<sup>67</sup>, A. Lopez Solis<sup>48</sup>, J. Lorenz<sup>109</sup>, N. Lorenzo Martinez<sup>4</sup>, A. M. Lory<sup>109</sup>, O. Loseva<sup>37</sup>, X. Lou<sup>47a,47b</sup>, X. Lou<sup>14a,14e</sup>, A. Lounis<sup>66</sup>, J. Love<sup>6</sup>, P. A. Love<sup>91</sup>, G. Lu<sup>14a,14e</sup>, M. Lu<sup>80</sup>, S. Lu<sup>128</sup>, Y. J. Lu<sup>65</sup>, H. J. Lubatti<sup>138</sup>, C. Luci<sup>75a,75b</sup>, F. L. Lucio Alves<sup>14c</sup>, A. Lucotte<sup>60</sup>, F. Luehring<sup>68</sup>, I. Luise<sup>145</sup>, O. Lukianchuk<sup>66</sup>, O. Lundberg<sup>144</sup>, B. Lund-Jensen<sup>144</sup>, N. A. Luongo<sup>123</sup>, M. S. Lutz<sup>151</sup>, D. Lynn<sup>29</sup>, H. Lyons<sup>92</sup>, R. Lysak<sup>131</sup>, E. Lytken<sup>98</sup>, V. Lyubushkin<sup>38</sup>, T. Lyubushkina<sup>38</sup>, M. M. Lyukova<sup>145</sup>, H. Ma<sup>29</sup>, K. Ma<sup>62a</sup>, L. L. Ma<sup>62b</sup>, Y. Ma<sup>121</sup>, D. M. Mac Donnell<sup>165</sup>, G. Maccarrone<sup>53</sup>, J. C. MacDonald<sup>100</sup>, R. Madar<sup>40</sup>, W. F. Mader<sup>50</sup>, J. Maeda<sup>85</sup>, T. Maeno<sup>29</sup>, M. Maerker<sup>50</sup>, H. Maguire<sup>139</sup>, V. Maiboroda<sup>135</sup>, A. Maio<sup>130a,130b,130d</sup>, K. Maj<sup>86a</sup>, O. Majersky<sup>48</sup>, S. Majewski<sup>123</sup>, N. Makovec<sup>66</sup>, V. Maksimovic<sup>15</sup>, B. Malaescu<sup>127</sup>, Pa. Malecki<sup>87</sup>, V. P. Maleev<sup>37</sup>, F. Malek<sup>60</sup>, M. Mali<sup>93</sup>, D. Malito<sup>95,q</sup>, U. Mallik<sup>80</sup>, S. Maltezos<sup>10</sup>, S. Malyukov<sup>38</sup>, J. Mamuzic<sup>13</sup>, G. Mancini<sup>53</sup>, G. Manco<sup>73a,73b</sup>, J. P. Mandalia<sup>94</sup>, I. Mandić<sup>93</sup>, L. Manhaes de Andrade Filho<sup>83a</sup>, I. M. Maniatis<sup>169</sup>, J. Manjarres Ramos<sup>102</sup>, D. C. Mankad<sup>169</sup>, A. Mann<sup>109</sup>, B. Mansoulie<sup>135</sup>, S. Manzoni<sup>36</sup>, A. Marantis<sup>152</sup>, G. Marchiori<sup>5</sup>, M. Marcisovsky<sup>131</sup>, C. Marcon<sup>71a,71b</sup>, M. Marinescu<sup>20</sup>, M. Marjanovic<sup>120</sup>, E. J. Marshall<sup>91</sup>, Z. Marshall<sup>17a</sup>, S. Marti-Garcia<sup>163</sup>, T. A. Martin<sup>167</sup>, V. J. Martin<sup>52</sup>, B. Martin dit Latour<sup>16</sup>, L. Martinelli<sup>75a,75b</sup>, M. Martinez<sup>13,w</sup>, P. Martinez Agullo<sup>163</sup>, V. I. Martinez Outschoorn<sup>103</sup>, P. Martinez Suarez<sup>13</sup>, S. Martin-Haugh<sup>134</sup>, V. S. Martoiu<sup>27b</sup>, A. C. Martyniuk<sup>96</sup>, A. Marzin<sup>36</sup>, D. Mascione<sup>78a,78b</sup>, L. Masetti<sup>100</sup>, T. Mashimo<sup>153</sup>, J. Masik<sup>101</sup>, A. L. Maslennikov<sup>37</sup>, L. Massa<sup>23b</sup>, P. Massarotti<sup>72a,72b</sup>, P. Mastrandrea<sup>74a,74b</sup>, A. Mastroberardino<sup>43a,43b</sup>, T. Masubuchi<sup>153</sup>, T. Mathisen<sup>161</sup>, J. Matousek<sup>133</sup>, N. Matsuzawa<sup>153</sup>, J. Maurer<sup>27b</sup>, B. Maček<sup>93</sup>, D. A. Maximov<sup>37</sup>, R. Mazini<sup>148</sup>, I. Maznas<sup>152</sup>, M. Mazza<sup>107</sup>, S. M. Mazza<sup>136</sup>, E. Mazzeo<sup>71a,71b</sup>, C. Mc Ginn<sup>29</sup>, J. P. Mc Gowan<sup>104</sup>, S. P. Mc Kee<sup>106</sup>, E. F. McDonald<sup>105</sup>, A. E. McDougall<sup>114</sup>, J. A. McFayden<sup>146</sup>, R. P. McGovern<sup>128</sup>, G. Mchedlidze<sup>149b</sup>, R. P. McKenzie<sup>33g</sup>, T. C. Mclachlan<sup>48</sup>, D. J. McLaughlin<sup>96</sup>, K. D. McLean<sup>165</sup>, S. J. McMahon<sup>134</sup>, P. C. McNamara<sup>105</sup>, C. M. Mcpartland<sup>92</sup>, R. A. McPherson<sup>165,z</sup>





D. A. Pizzi<sup>34</sup> , L. Pizzimento<sup>76a,76b</sup> , A. Pizzini<sup>114</sup> , M.-A. Pleier<sup>29</sup> , V. Plesanovs<sup>54</sup>, V. Pleskot<sup>133</sup> , E. Plotnikova<sup>38</sup>, G. Poddar<sup>4</sup> , R. Poettgen<sup>98</sup> , L. Poggioli<sup>127</sup> , I. Pokharel<sup>55</sup> , S. Polacek<sup>133</sup> , G. Polesello<sup>73a</sup> , A. Poley<sup>142,156a</sup> , R. Polifka<sup>132</sup> , A. Polini<sup>23b</sup> , C. S. Pollard<sup>167</sup> , Z. B. Pollock<sup>119</sup> , V. Polychronakos<sup>29</sup> , E. Pompa Pacchi<sup>75a,75b</sup> , D. Ponomarenko<sup>113</sup> , L. Pontecorvo<sup>36</sup> , S. Popa<sup>27a</sup> , G. A. Popeneciu<sup>27d</sup> , A. Poreba<sup>36</sup> , D. M. Portillo Quintero<sup>156a</sup> , S. Pospisil<sup>132</sup> , M. A. Postill<sup>139</sup> , P. Postolache<sup>27c</sup> , K. Potamianos<sup>167</sup> , P. P. Potepa<sup>86a</sup> , I. N. Potrap<sup>38</sup> , C. J. Potter<sup>32</sup> , H. Potti<sup>1</sup> , T. Poulsen<sup>48</sup> , J. Poveda<sup>163</sup> , M. E. Pozo Astigarraga<sup>36</sup> , A. Prades Ibanez<sup>163</sup> , J. Pretel<sup>54</sup> , D. Price<sup>101</sup> , M. Primavera<sup>70a</sup> , M. A. Principe Martin<sup>99</sup> , R. Privara<sup>122</sup> , T. Procter<sup>59</sup> , M. L. Proffitt<sup>138</sup> , N. Proklova<sup>128</sup> , K. Prokofiev<sup>64c</sup> , G. Proto<sup>110</sup> , S. Protopopescu<sup>29</sup> , J. Proudfoot<sup>6</sup> , M. Przybycien<sup>86a</sup>

, W. W. Przygoda<sup>86b</sup> , J. E. Puddefoot<sup>139</sup> , D. Pudzha<sup>37</sup> , D. Pyatiizbyantseva<sup>37</sup> , J. Qian<sup>106</sup> , D. Qichen<sup>101</sup> , Y. Qin<sup>101</sup> , T. Qiu<sup>52</sup> , A. Quadt<sup>55</sup> , M. Queitsch-Maitland<sup>101</sup> , G. Quetant<sup>56</sup> , G. Rabanal Bolanos<sup>61</sup> , D. Rafanoharana<sup>54</sup> , F. Ragusa<sup>71a,71b</sup> , J. L. Rainbolt<sup>39</sup> , J. A. Raine<sup>56</sup> , S. Rajagopalan<sup>29</sup> , E. Ramakoti<sup>37</sup> , K. Ran<sup>14e,48</sup> , N. P. Rapheeha<sup>33g</sup> , H. Rasheed<sup>27b</sup> , V. Raskina<sup>127</sup> , D. F. Rassloff<sup>63a</sup> , S. Rave<sup>100</sup> , B. Ravina<sup>55</sup> , I. Ravinovich<sup>169</sup> , M. Raymond<sup>36</sup> , A. L. Read<sup>125</sup> , N. P. Readioff<sup>139</sup> , D. M. Rebuzzi<sup>73a,73b</sup> , G. Redlinger<sup>29</sup> , A. S. Reed<sup>110</sup> , K. Reeves<sup>26</sup> , J. A. Reidelsturz<sup>171,u</sup> , D. Reikher<sup>151</sup> , A. Rej<sup>141</sup> , C. Rembser<sup>36</sup> , A. Renardi<sup>48</sup> , M. Renda<sup>27b</sup> , M. B. Rendel<sup>110</sup> , F. Renner<sup>48</sup> , A. G. Rennie<sup>59</sup> , S. Resconi<sup>71a</sup> , M. Ressegotti<sup>57a,57b</sup> , S. Rettie<sup>36</sup> , J. G. Reyes Rivera<sup>107</sup> , B. Reynolds<sup>119</sup> , E. Reynolds<sup>17a</sup> , O. L. Rezanova<sup>37</sup> , P. Reznicek<sup>133</sup>

, N. Ribaric<sup>91</sup> , E. Ricci<sup>78a,78b</sup> , R. Richter<sup>110</sup> , S. Richter<sup>47a,47b</sup> , E. Richter-Was<sup>86b</sup> , M. Ridel<sup>127</sup> , S. Ridouani<sup>35d</sup> , P. Rieck<sup>117</sup> , P. Riedler<sup>36</sup> , M. Rijssenbeek<sup>145</sup> , A. Rimoldi<sup>73a,73b</sup> , M. Rimoldi<sup>48</sup> , L. Rinaldi<sup>23a,23b</sup> , T. T. Rinn<sup>29</sup> , M. P. Rinnagel<sup>109</sup> , G. Ripellino<sup>161</sup> , I. Riu<sup>13</sup> , P. Rivadeneira<sup>48</sup> , J. C. Rivera Vergara<sup>165</sup> , F. Rizatdinova<sup>121</sup> , E. Rizvi<sup>94</sup> , B. A. Roberts<sup>167</sup> , B. R. Roberts<sup>17a</sup> , S. H. Robertson<sup>104,z</sup> , M. Robin<sup>48</sup> , D. Robinson<sup>32</sup> , C. M. Robles Gajardo<sup>137f</sup> , M. Robles Manzano<sup>100</sup> , A. Robson<sup>59</sup> , A. Rocchi<sup>76a,76b</sup> , C. Roda<sup>74a,74b</sup> , S. Rodriguez Bosca<sup>63a</sup> , Y. Rodriguez Garcia<sup>22a</sup> , A. Rodriguez Rodriguez<sup>54</sup> , A. M. Rodríguez Vera<sup>156b</sup> , S. Roe<sup>36</sup> , J. T. Roemer<sup>160</sup> , A. R. Roepe-Gier<sup>136</sup> , J. Roggel<sup>171</sup> , O. Røhne<sup>125</sup> , R. A. Rojas<sup>103</sup> , C. P. A. Roland<sup>68</sup> , J. Roloff<sup>29</sup> , A. Romaniouk<sup>37</sup> , E. Romano<sup>73a,73b</sup> , M. Romano<sup>23b</sup> , A. C. Romero Hernandez<sup>162</sup> , N. Rompotis<sup>92</sup> , L. Roos<sup>127</sup>

, S. Rosati<sup>75a</sup> , B. J. Rosser<sup>39</sup> , E. Rossi<sup>126</sup> , E. Rossi<sup>72a,72b</sup> , L. P. Rossi<sup>57b</sup> , L. Rossini<sup>48</sup> , R. Rosten<sup>119</sup> , M. Rotaru<sup>27b</sup> , B. Rottler<sup>54</sup> , C. Rougier<sup>102</sup> , D. Rousseau<sup>66</sup> , D. Rousso<sup>32</sup> , A. Roy<sup>162</sup> , S. Roy-Garand<sup>155</sup> , A. Rozanov<sup>102</sup> , Y. Rozen<sup>150</sup> , X. Ruan<sup>33g</sup> , A. Rubio Jimenez<sup>163</sup> , A. J. Ruby<sup>92</sup> , V. H. Ruelas Rivera<sup>18</sup> , T. A. Ruggeri<sup>1</sup> , A. Ruggiero<sup>126</sup> , A. Ruiz-Martinez<sup>163</sup> , A. Rummler<sup>36</sup> , Z. Rurikova<sup>54</sup> , N. A. Rusakovich<sup>38</sup> , H. L. Russell<sup>165</sup> , G. Russo<sup>75a,75b</sup> , J. P. Rutherford<sup>7</sup> , S. Rutherford Colmenares<sup>32</sup> , K. Rybacki<sup>91</sup> , M. Rybar<sup>133</sup> , E. B. Rye<sup>125</sup> , A. Ryzhov<sup>44</sup> , J. A. Sabater Iglesias<sup>56</sup> , P. Sabatini<sup>163</sup> , L. Sabetta<sup>75a,75b</sup> , H.F.-W. Sadrozinski<sup>136</sup> , F. Safai Tehrani<sup>75a</sup> , B. Safarzadeh Samani<sup>146</sup> , M. Safdari<sup>143</sup> , S. Saha<sup>165</sup> , M. Sahinsoy<sup>110</sup> , M. Saimpert<sup>135</sup> , M. Saito<sup>153</sup> , T. Saito<sup>153</sup> , D. Salamani<sup>36</sup> , A. Salnikov<sup>143</sup> , J. Salt<sup>163</sup> , A. Salvador Salas<sup>13</sup>

, D. Salvatore<sup>43a,43b</sup> , F. Salvatore<sup>146</sup> , A. Salzburger<sup>36</sup> , D. Sammel<sup>54</sup> , D. Sampsonidis<sup>152,e</sup> , D. Sampsonidou<sup>123</sup> , J. Sánchez<sup>163</sup> , A. Sanchez Pineda<sup>4</sup> , V. Sanchez Sebastian<sup>163</sup> , H. Sandaker<sup>125</sup> , C. O. Sander<sup>48</sup> , J. A. Sandesara<sup>103</sup> , M. Sandhoff<sup>171</sup> , C. Sandoval<sup>22b</sup> , D. P. C. Sankey<sup>134</sup> , T. Sano<sup>88</sup> , A. Sansoni<sup>53</sup> , L. Santi<sup>75a,75b</sup> , C. Santoni<sup>40</sup> , H. Santos<sup>130a,130b</sup> , S. N. Santpur<sup>17a</sup> , A. Santra<sup>169</sup> , K. A. Saoucha<sup>139</sup> , J. G. Saraiva<sup>130a,130d</sup> , J. Sardain<sup>7</sup> , O. Sasaki<sup>84</sup> , K. Sato<sup>157</sup> , C. Sauer<sup>63b</sup> , F. Sauerburger<sup>54</sup> , E. Sauvan<sup>4</sup> , P. Savard<sup>155,ah</sup> , R. Sawada<sup>153</sup> , C. Sawyer<sup>134</sup> , L. Sawyer<sup>97</sup> , I. Sayago Galvan<sup>163</sup> , C. Sbarra<sup>23b</sup> , A. Sbrizzi<sup>23a,23b</sup> , T. Scanlon<sup>96</sup> , J. Schaarschmidt<sup>138</sup> , P. Schacht<sup>110</sup> , D. Schaefer<sup>39</sup> , U. Schäfer<sup>100</sup> , A. C. Schaffer<sup>44,66</sup> , D. Schaile<sup>109</sup> , R. D. Schamberger<sup>145</sup> , C. Scharf<sup>18</sup> , M. M. Schefer<sup>19</sup> , V. A. Schegelsky<sup>37</sup> , D. Scheirich<sup>133</sup> , F.
Schenck<sup>18</sup> , M. Schernau<sup>160</sup> , C. Scheulen<sup>55</sup> , C. Schiavi<sup>57a,57b</sup> , E. J. Schioppa<sup>70a,70b</sup> , M. Schioppa<sup>43a,43b</sup> , B. Schlag<sup>143</sup> , K. E. Schleicher<sup>54</sup> , S. Schlenker<sup>36</sup> , J. Schmeing<sup>171</sup> , M. A. Schmidt<sup>171</sup> , K. Schmieden<sup>100</sup> , C. Schmitt<sup>100</sup> , S. Schmitt<sup>48</sup> , L. Schoeffel<sup>135</sup> , A. Schoening<sup>63b</sup> , P. G. Scholer<sup>54</sup> , E. Schopf<sup>126</sup> , M. Schott<sup>100</sup> , J. Schovancova<sup>36</sup> , S. Schramm<sup>56</sup> , F. Schroeder<sup>171</sup> , T. Schroer<sup>56</sup> , H. C. Schultz-Coulon<sup>63a</sup> , M. Schumacher<sup>54</sup> , B. A. Schumm<sup>136</sup> , Ph. Schune<sup>135</sup> , A. J. Schuy<sup>138</sup> , H. R. Schwartz<sup>136</sup> , A. Schwartzman<sup>143</sup> , T. A. Schwarz<sup>106</sup> , Ph. Schwemling<sup>135</sup> , R. Schwienhorst<sup>107</sup> , A. Sciandra<sup>136</sup> , G. Sciolla<sup>26</sup> , F. Scuri<sup>74a</sup> , C. D. Sebastiani<sup>92</sup>

J. Shlomi<sup>169</sup>, M. J. Shochet<sup>39</sup>, J. Shojaii<sup>105</sup>, D. R. Shope<sup>125</sup>, B. Shrestha<sup>120</sup>, S. Shrestha<sup>119,ak</sup>, E. M. Shrif<sup>33g</sup>, M. J. Shroff<sup>165</sup>, P. Sicho<sup>131</sup>, A. M. Sickles<sup>162</sup>, E. Sideras Haddad<sup>33g</sup>, A. Sidoti<sup>23b</sup>, F. Siegert<sup>50</sup>, Dj. Sijacki<sup>15</sup>, R. Sikora<sup>86a</sup>, F. Sili<sup>90</sup>, J. M. Silva<sup>20</sup>, M. V. Silva Oliveira<sup>29</sup>, S. B. Silverstein<sup>47a</sup>, S. Simion<sup>66</sup>, R. Simoniello<sup>36</sup>, E. L. Simpson<sup>59</sup>, H. Simpson<sup>146</sup>, L. R. Simpson<sup>106</sup>, N. D. Simpson<sup>98</sup>, S. Simsek<sup>82</sup>, S. Sindhu<sup>55</sup>, P. Sinervo<sup>155</sup>, S. Singh<sup>155</sup>, S. Sinha<sup>48</sup>, S. Sinha<sup>101</sup>, M. Sioli<sup>23a,23b</sup>, I. Siral<sup>36</sup>, E. Sitnikova<sup>48</sup>, S. Yu. Sivoklov<sup>37,\*</sup>, J. Sjölin<sup>47a,47b</sup>, A. Skaf<sup>55</sup>, E. Skorda<sup>20,af</sup>, P. Skubic<sup>120</sup>, M. Slawinska<sup>87</sup>, V. Smakhtin<sup>169</sup>, B. H. Smart<sup>134</sup>, J. Smiesko<sup>36</sup>, S. Yu. Smirnov<sup>37</sup>, Y. Smirnov<sup>37</sup>, L. N. Smirnova<sup>37,a</sup>, O. Smirnova<sup>98</sup>, A. C. Smith<sup>41</sup>, E. A. Smith<sup>39</sup>, H. A. Smith<sup>126</sup>, J. L. Smith<sup>92</sup>, R. Smith<sup>143</sup>, M. Smizanska<sup>91</sup>, K. Smolek<sup>132</sup>, A. A. Snesev<sup>37</sup>, S. R. Snider<sup>155</sup>, H. L. Snoek<sup>114</sup>, S. Snyder<sup>29</sup>, R. Sobie<sup>165,z</sup>, A. Soffer<sup>151</sup>, C. A. Solans Sanchez<sup>36</sup>, E. Yu. Soldatov<sup>37</sup>, U. Soldevila<sup>163</sup>, A. A. Solodkov<sup>37</sup>, S. Solomon<sup>26</sup>, A. Soloshenko<sup>38</sup>, K. Solovieva<sup>54</sup>, O. V. Solovyanov<sup>40</sup>, V. Solovyev<sup>37</sup>, P. Sommer<sup>36</sup>, A. Sonay<sup>13</sup>, W. Y. Song<sup>156b</sup>, J. M. Sonneveld<sup>114</sup>, A. Sopczak<sup>132</sup>, A. L. Sopio<sup>96</sup>, F. Sopkova<sup>28b</sup>, V. Sothilingam<sup>63a</sup>, S. Sottocornola<sup>68</sup>, R. Soualah<sup>116b</sup>, Z. Soumami<sup>35e</sup>, D. South<sup>48</sup>, S. Spagnolo<sup>70a,70b</sup>, M. Spalla<sup>110</sup>, D. Sperlich<sup>54</sup>, G. Spigo<sup>36</sup>, M. Spina<sup>146</sup>, S. Spinali<sup>91</sup>, D. P. Spiteri<sup>59</sup>, M. Spousta<sup>133</sup>, E. J. Staats<sup>34</sup>, A. Stabile<sup>71a,71b</sup>, R. Stamen<sup>63a</sup>, M. Stamenkovic<sup>114</sup>, A. Stampekis<sup>20</sup>, M. Standke<sup>24</sup>, E. Stanecka<sup>87</sup>, M. V. Stange<sup>50</sup>, B. Stanislaus<sup>17a</sup>, M. M. Stanitzki<sup>48</sup>, B. Stapf<sup>48</sup>, E. A. Starchenko<sup>37</sup>, G. H. Stark<sup>136</sup>, J. Stark<sup>102</sup>, D. M. Starke<sup>156b</sup>, P. Staroba<sup>131</sup>, P. Starovoitov<sup>63a</sup>, S. Stärz<sup>104</sup>, R. Staszewski<sup>87</sup>, G. Stavropoulos<sup>46</sup>, J. Steentoft<sup>161</sup>, P. Steinberg<sup>29</sup>, B. Stelzer<sup>142,156a</sup>, H. J. Stelzer<sup>129</sup>, O. Stelzer-Chilton<sup>156a</sup>, H. Stenzel<sup>58</sup>, T. J. Stevenson<sup>146</sup>, G. A. Stewart<sup>36</sup>, J. R. Stewart<sup>121</sup>, M. C. Stockton<sup>36</sup>, G. Stoica<sup>27b</sup>, M. Stolarski<sup>130a</sup>, S. Stonjek<sup>110</sup>, A. Straessner<sup>50</sup>, J. Strandberg<sup>144</sup>, S. Strandberg<sup>47a,47b</sup>, M. Strauss<sup>120</sup>, T. Streblner<sup>102</sup>, P. Strizenec<sup>28b</sup>, R. Ströhmer<sup>166</sup>, D. M. Strom<sup>123</sup>, L. R. Strom<sup>48</sup>, R. Stroynowski<sup>44</sup>, A. Strubig<sup>47a,47b</sup>, S. A. Stucci<sup>29</sup>, B. Stugu<sup>16</sup>, J. Stupak<sup>120</sup>, N. A. Styles<sup>48</sup>, D. Su<sup>143</sup>, S. Su<sup>62a</sup>, W. Su<sup>62d</sup>, X. Su<sup>62a,66</sup>, K. Sugizaki<sup>153</sup>, V. V. Sulini<sup>37</sup>, M. J. Sullivan<sup>92</sup>, D. M. S. Sultan<sup>78a,78b</sup>, L. Sultanaliyeva<sup>37</sup>, S. Sultansoy<sup>3b</sup>, T. Sumida<sup>88</sup>, S. Sun<sup>106</sup>, S. Sun<sup>170</sup>, O. Sunneborn Gudnadottir<sup>161</sup>, N. Sur<sup>102</sup>, M. R. Sutton<sup>146</sup>, H. Suzuki<sup>157</sup>, M. Svatos<sup>131</sup>, M. Swiatlowski<sup>156a</sup>, T. Swirski<sup>166</sup>, I. Sykora<sup>28a</sup>, M. Sykora<sup>133</sup>, T. Sykora<sup>133</sup>, D. Ta<sup>100</sup>, K. Tackmann<sup>48,x</sup>, A. Taffard<sup>160</sup>, R. Tafirout<sup>156a</sup>, J. S. Tafuya Vargas<sup>66</sup>, E. P. Takeva<sup>52</sup>, Y. Takubo<sup>84</sup>, M. Talby<sup>102</sup>, A. A. Talyshv<sup>37</sup>, K. C. Tam<sup>64b</sup>, N. M. Tamir<sup>151</sup>, A. Tanaka<sup>153</sup>, J. Tanaka<sup>153</sup>, R. Tanaka<sup>66</sup>, M. Tanasini<sup>57a,57b</sup>, Z. Tao<sup>164</sup>, S. Tapia Araya<sup>137f</sup>, S. Tapprogge<sup>100</sup>, A. Tarek Abouelfadl Mohamed<sup>107</sup>, S. Tarem<sup>150</sup>, K. Tariq<sup>14a</sup>, G. Tarna<sup>27b,102</sup>, G. F. Tartarelli<sup>71a</sup>, P. Tas<sup>133</sup>, M. Tasevsky<sup>131</sup>, E. Tassi<sup>43a,43b</sup>, A. C. Tate<sup>162</sup>, G. Tateno<sup>153</sup>, Y. Tayalati<sup>35e,y</sup>, G. N. Taylor<sup>105</sup>, W. Taylor<sup>156b</sup>, H. Teagle<sup>92</sup>, A. S. Tee<sup>170</sup>, R. Teixeira De Lima<sup>143</sup>, P. Teixeira-Dias<sup>95</sup>, J. J. Teoh<sup>155</sup>, K. Terashi<sup>153</sup>, J. Terron<sup>99</sup>, S. Terzo<sup>13</sup>, M. Testa<sup>53</sup>, R. J. Teuscher<sup>155,z</sup>, A. Thaler<sup>79</sup>, O. Theiner<sup>56</sup>, N. Themistokleous<sup>52</sup>, T. Theveneaux-Pelzer<sup>102</sup>, O. Thielmann<sup>171</sup>, D. W. Thomas<sup>95</sup>, J. P. Thomas<sup>20</sup>, E. A. Thompson<sup>17a</sup>, P. D. Thompson<sup>20</sup>, E. Thomson<sup>128</sup>, Y. Tian<sup>55</sup>, V. Tikhomirov<sup>37,a</sup>, Yu. A. Tikhonov<sup>37</sup>, S. Timoshenko<sup>37</sup>, D. Timoshyn<sup>133</sup>, E. X. L. Ting<sup>1</sup>, P. Tipton<sup>172</sup>, S. H. Tlou<sup>33g</sup>, A. Tmourji<sup>40</sup>, K. Todome<sup>23a,23b</sup>, S. Todorova-Nova<sup>133</sup>, S. Todt<sup>50</sup>, M. Togawa<sup>84</sup>, J. Tojo<sup>89</sup>, S. Tokár<sup>28a</sup>, K. Tokushuku<sup>84</sup>, O. Toldaiev<sup>68</sup>, R. Tombs<sup>32</sup>, M. Tomoto<sup>84,111</sup>, L. Tompkins<sup>143</sup>, K. W. Topolnicki<sup>86b</sup>, E. Torrence<sup>123</sup>, H. Torres<sup>102</sup>, E. Torró Pastor<sup>163</sup>, M. Toscani<sup>30</sup>, C. Toscirri<sup>39</sup>, M. Tost<sup>11</sup>, D. R. Tovey<sup>139</sup>, A. Traeet<sup>16</sup>, I. S. Trandafir<sup>27b</sup>, T. Trefzger<sup>166</sup>, A. Tricoli<sup>29</sup>, I. M. Trigger<sup>156a</sup>, S. Trincz-Duvold<sup>127</sup>, D. A. Trischuk<sup>26</sup>, B. Trocmé<sup>60</sup>, C. Troncon<sup>71a</sup>, L. Truong<sup>33c</sup>, M. Trzebinski<sup>87</sup>, A. Trzupek<sup>87</sup>, F. Tsai<sup>145</sup>, M. Tsai<sup>106</sup>, A. Tsiamis<sup>152,e</sup>, P. V. Tsiarshka<sup>37</sup>, S. Tsigaridas<sup>156a</sup>, A. Tsigotis<sup>152,y</sup>, V. Tsiskaridze<sup>155</sup>, E. G. Tskhadadze<sup>149a</sup>, M. Tsopoulou<sup>152,e</sup>, Y. Tsujikawa<sup>88</sup>, I. I. Tsukerman<sup>37</sup>, V. Tsulaia<sup>17a</sup>, S. Tsuno<sup>84</sup>, O. Tsur<sup>150</sup>, K. Tsurii<sup>118</sup>, D. Tsybychev<sup>145</sup>, Y. Tu<sup>64b</sup>, A. Tudorache<sup>27b</sup>, V. Tudorache<sup>27b</sup>, A. N. Tuna<sup>36</sup>, S. Turchikhin<sup>38</sup>, I. Turk Cakir<sup>3a</sup>, R. Turra<sup>71a</sup>, T. Turtuvshin<sup>38,aa</sup>, P. M. Tuts<sup>41</sup>, S. Tzamarias<sup>152,e</sup>, P. Tzanis<sup>10</sup>, E. Tzovara<sup>100</sup>, K. Uchida<sup>153</sup>, F. Ukegawa<sup>157</sup>, P. A. Ulloa Poblete<sup>137c,137b</sup>, E. N. Umaka<sup>29</sup>, G. Unal<sup>36</sup>, M. Unal<sup>11</sup>, A. Undrus<sup>29</sup>, G. Unel<sup>160</sup>, J. Urban<sup>28b</sup>, P. Urquijo<sup>105</sup>, G. Usai<sup>8</sup>, R. Ushioda<sup>154</sup>, M. Usman<sup>108</sup>, Z. Uysal<sup>21b</sup>, L. Vacavant<sup>102</sup>, V. Vacek<sup>132</sup>, B. Vachon<sup>104</sup>, K. O. H. Vadla<sup>125</sup>, T. Vafeiadis<sup>36</sup>, A. Vaitkus<sup>96</sup>, C. Valderanis<sup>109</sup>, E. Valdes Santurio<sup>47a,47b</sup>, M. Valente<sup>156a</sup>, S. Valentinetti<sup>23a,23b</sup>, A. Valero<sup>163</sup>, E. Valiente Moreno<sup>163</sup>, A. Vallier<sup>102</sup>, J. A. Valls Ferrer<sup>163</sup>, D. R. Van Arneman<sup>114</sup>, T. R. Van Daalen<sup>138</sup>, A. Van Der Graaf<sup>49</sup>, P. Van Gemmeren<sup>6</sup>, M. Van Rijnbach<sup>36,125</sup>, S. Van Stroud<sup>96</sup>, I. Van Vulpen<sup>114</sup>, M. Vanadia<sup>76a,76b</sup>, W. Vandelli<sup>36</sup>, M. Vandenbroucke<sup>135</sup>, E. R. Vandewall<sup>121</sup>, D. Vannicola<sup>151</sup>, L. Vannoli<sup>57a,57b</sup>, R. Vari<sup>75a</sup>, E. W. Varnes<sup>7</sup>, C. Varni<sup>17b</sup>, T. Varol<sup>148</sup>, D. Varouchas<sup>66</sup>, L. Varriale<sup>163</sup>, K. E. Varvell<sup>147</sup>, M. E. Vasile<sup>27b</sup>, L. Vaslin<sup>40</sup>, G. A. Vasquez<sup>165</sup>, F. Vazeille<sup>40</sup>, T. Vazquez Schroeder<sup>36</sup>, J. Veatch<sup>31</sup>, V. Vecchio<sup>101</sup>, M. J. Veen<sup>103</sup>, I. Veliscek<sup>126</sup>, L. M. Veloce<sup>155</sup>

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Wozniowski<sup>55</sup> , K. Wraight<sup>59</sup> , C. Wu<sup>20</sup> , J. Wu<sup>14a,14e</sup> , M. Wu<sup>64a</sup> , M. Wu<sup>113</sup> , S. L. Wu<sup>170</sup> , X. Wu<sup>56</sup> , Y. Wu<sup>62a</sup> , Z. Wu<sup>135</sup> , J. Wuerzinger<sup>110</sup> , T. R. Wyatt<sup>101</sup> , B. M. Wynne<sup>52</sup> , S. Xella<sup>42</sup> , L. Xia<sup>14c</sup> , M. Xia<sup>14b</sup> , J. Xiang<sup>64c</sup> , X. Xiao<sup>106</sup> , M. Xie<sup>62a</sup> , X. Xie<sup>62a</sup> , S. Xin<sup>14a,14e</sup> , J. Xiong<sup>17a</sup> , D. Xu<sup>14a</sup> , H. Xu<sup>62a</sup> , L. Xu<sup>62a</sup> , R. Xu<sup>128</sup> , T. Xu<sup>106</sup> , Y. Xu<sup>14b</sup> , Z. Xu<sup>52</sup> , Z. Xu<sup>14a</sup> , B. Yabsley<sup>147</sup> , S. Yacoub<sup>33a</sup> , N. Yamaguchi<sup>89</sup> , Y. Yamaguchi<sup>154</sup> , E. Yamashita<sup>153</sup> , H. Yamauchi<sup>157</sup> , T. Yamazaki<sup>17a</sup> , Y. Yamazaki<sup>85</sup> , J. Yan<sup>62c</sup> , S. Yan<sup>126</sup> , Z. Yan<sup>25</sup> , H. J. Yang<sup>62c,62d</sup> , H. T. Yang<sup>62a</sup> , S. Yang<sup>62a</sup> , T. Yang<sup>64c</sup> , X. Yang<sup>62a</sup> , X. Yang<sup>14a</sup> , Y. Yang<sup>44</sup> , Y. Yang<sup>62a</sup> , Z. Yang<sup>62a</sup> , W.-M. Yao<sup>17a</sup> , Y. C. Yap<sup>48</sup> , H. Ye<sup>14c</sup> , H. Ye<sup>55</sup> , J. Ye<sup>44</sup> , S. Ye<sup>29</sup> , X. Ye<sup>62a</sup> , Y. Yeh<sup>96</sup> , I. Yeletskikh<sup>38</sup> , B. K. Yeo<sup>17b</sup> , M. R. Yexley<sup>96</sup> , P. Yin<sup>41</sup> , K. Yorita<sup>168</sup> , S. Younas<sup>27b</sup> , C. J. S. Young<sup>36</sup> , C. Young<sup>143</sup> , Y. Yu<sup>62a</sup> , M. Yuan<sup>106</sup> , R. Yuan<sup>62b,1</sup> , L. Yue<sup>96</sup> , M. Zaazoua<sup>62a</sup> , B. Zabinski<sup>87</sup> , E. Zaid<sup>52</sup> , T. Zakareishvili<sup>149b</sup> , N. Zakharchuk<sup>34</sup> , S. Zambito<sup>56</sup> , J. A. Zamora Saa<sup>137d,137b</sup> , J. Zang<sup>153</sup> , D. Zanzi<sup>54</sup> , O. Zaplatilek<sup>132</sup> , C. Zeitnitz<sup>171</sup> , H. Zeng<sup>14a</sup> , J. C. Zeng<sup>162</sup> , D. T. Zenger Jr<sup>26</sup> , O. Zenin<sup>37</sup> , T. Ženiš<sup>28a</sup> , S. Zenz<sup>94</sup> , S. Zerradi<sup>35a</sup> , D. Zerwas<sup>66</sup> , M. Zhai<sup>14a,14e</sup> , B. Zhang<sup>14c</sup> , D. F. Zhang<sup>139</sup> , J. Zhang<sup>62b</sup> , J. Zhang<sup>6</sup> , K. Zhang<sup>14a,14c</sup> , L. Zhang<sup>14c</sup> , P. Zhang<sup>14a,14e</sup> , R. Zhang<sup>170</sup> , S. Zhang<sup>106</sup> , T. Zhang<sup>153</sup> , X. Zhang<sup>62c</sup> , X. Zhang<sup>62b</sup> , Y. Zhang<sup>5,62c</sup> , Y. Zhang<sup>96</sup> , Y. Zhang<sup>62a</sup> , Z. Zhang<sup>17a</sup> , Z. Zhang<sup>66</sup> , H. Zhao<sup>138</sup> , P. Zhao<sup>51</sup> , T. Zhao<sup>62b</sup> , Y. Zhao<sup>136</sup> , Z. Zhao<sup>62a</sup> , A. Zhemchugov<sup>38</sup> , K. Zheng<sup>162</sup> , X. Zheng<sup>62a</sup> , Z. Zheng<sup>143</sup> , D. Zhong<sup>162</sup> , B. Zhou<sup>106</sup> , H. Zhou<sup>7</sup> , N. Zhou<sup>62c</sup> , Y. Zhou<sup>7</sup> , C. G. Zhu<sup>62b</sup> , J. Zhu<sup>106</sup> , Y. Zhu<sup>62c</sup> , Y. Zhu<sup>62a</sup> , X. Zhuang<sup>14a</sup> , K. Zhukov<sup>37</sup> , V. Zhulanov<sup>37</sup> , N. I. Zimine<sup>38</sup> , J. Zinsser<sup>63b</sup> , M. Ziolkowski<sup>141</sup> , L. Živković<sup>15</sup> , A. Zoccoli<sup>23a,23b</sup> , K. Zoch<sup>56</sup> , T. G. Zorbass<sup>139</sup> , O. Zormpa<sup>46</sup> , W. Zou<sup>41</sup> , L. Zwalinski<sup>36</sup> 

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