Supplementary material for LHCb-PAPER-2022-002

The supplementary material reports the parameters of the default amplitude model, Table 2 and of the alternative models, Tables 3–19. Uncertainties are the 1σ standard deviations returned by amplitude fit.

The naming conventions for the default model parameters are detailed in the following. Resonant states are indicated as L (Λ), D (Δ), K (K^* nonzero spin) and K0 (K^* spin zero) followed by their mass identification according to Ref. [1].

The Breit–Wigner mass and width are indicated as M or G, respectively, expressed in GeV. The γ parameter driving the exponential form factors of Bugg lineshapes is indicated as gamma, expressed in GeV^{-2}.

Each complex coupling is introduced in the amplitude fit via two fit parameters representing its real, Ar, and imaginary, Ai, parts. The number after the resonance specification labels the coupling for specific resonance and proton helicities, as described in Table 1.

Spin-orbit (LS) couplings $H_{L,S}$, used for the alternative model reported in Table 19, can be expressed in terms of helicity ones for a two-body decay $A \to BC$ via

$$\mathcal{H}_{\lambda_B,\bar{\lambda}_C} = \sum_{L,S} \sqrt{\frac{2L+1}{2J_A+1}} H_{L,S} \left(\begin{array}{cc|c} J_B & J_C & S \\ \lambda_B & \bar{\lambda}_C & \lambda_B + \bar{\lambda}_C \end{array} \right) \left(\begin{array}{cc|c} L & S & J_A \\ 0 & \lambda_B + \bar{\lambda}_C & \lambda_B + \bar{\lambda}_C \end{array} \right), \tag{1}$$

where the expressions in parentheses are Wigner $3j$ symbols, depending on total angular momenta J and helicities λ.

Table 1: Definition of helicity and spin-orbit (LS) couplings for different resonance and proton helicities, λ_R and λ_p, as defined for the specific decay channel (*e.g.* for K^* resonances is the opposite helicity $\bar{\lambda}_{K^*}$ defined in Appendix A of the main paper). Helicity couplings for baryonic resonances Λ and Δ do not depend on proton helicities for parity conservation in their decay.

Resonance type	Coupling number	λ_R	λ_p	L	S
Λ, Δ	1	1/2		$S-1/2$	S
	2	-1/2		$S+1/2$	S
K^*, $S \geq 1$	1	0	1/2	0	1/2
	2	-1	1/2	1	1/2
	3	1	-1/2	1	3/2
	4	0	-1/2	2	3/2
K^*, $S = 0$	1		-1/2	0	1/2
	2		1/2	1	1/2

Table 2: Default amplitude model.

Parameter	Central value	Uncertainty
gammaK0(700)	0.941060	0.042406
ArK0(700)1	0.068908	0.122603
AiK0(700)1	2.521444	0.084235
ArK0(700)2	-2.685630	0.124151
AiK0(700)2	0.038490	0.123867
ArK(892)2	1.192614	0.066524
AiK(892)2	-1.025814	0.041453
ArK(892)3	-3.141446	0.092448
AiK(892)3	-3.293410	0.206014
ArK(892)4	-0.727145	0.181956
AiK(892)4	-4.155027	0.119153
gammaK0(1430)	0.020981	0.011062
ArK0(1430)1	-6.715160	0.602836
AiK0(1430)1	10.479411	0.267895
ArK0(1430)2	0.219754	0.381936
AiK0(1430)2	8.741196	0.250855
ArL(1405)1	-4.572486	0.231833
AiL(1405)1	3.190144	0.169851
ArL(1405)2	10.446080	0.128799
AiL(1405)2	2.787441	0.607833
ML(1520)	1.518467	0.000100
GL(1520)	0.015195	0.000265
ArL(1520)1	0.293998	0.012158
AiL(1520)1	0.044324	0.022276
ArL(1520)2	-0.160687	0.075604
AiL(1520)2	1.498833	0.032468
ArL(1600)1	4.840649	0.080342
AiL(1600)1	3.082786	0.313304
ArL(1600)2	-6.971233	0.180278
AiL(1600)2	0.842435	0.300438
ArL(1670)1	-0.339585	0.013871
AiL(1670)1	-0.144678	0.022591
ArL(1670)2	-0.570978	0.059400
AiL(1670)2	1.011833	0.017816
ArL(1690)1	-0.385772	0.046657
AiL(1690)1	-0.110235	0.045896
ArL(1690)2	-2.730592	0.052811
AiL(1690)2	-0.353613	0.136240
ML(2000)	1.988190	0.000911
GL(2000)	0.179260	0.002766
ArL(2000)1	-8.014857	0.267813
AiL(2000)1	-7.614006	0.529630
ArL(2000)2	-4.336255	0.137963
AiL(2000)2	-3.796192	0.285036
ArD(1232)1	-6.778191	0.268436
AiD(1232)1	3.051805	0.264359
ArD(1232)2	-12.987193	0.433180
AiD(1232)2	4.528336	0.493430
ArD(1600)1	11.401585	0.437580
AiD(1600)1	-3.125511	0.473191
ArD(1600)2	6.729211	0.283501
AiD(1600)2	-1.002383	0.331137
ArD(1700)1	10.378280	0.253080
AiD(1700)1	1.434872	0.485532
ArD(1700)2	12.874102	0.233827
AiD(1700)2	2.105570	0.644916

Table 3: Alternative amplitude model with $K^*(892)$ with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.979206	0.029926
ArK0(700)1	-0.172866	0.169819
AiK0(700)1	2.704617	0.154115
ArK0(700)2	-2.867440	0.176016
AiK0(700)2	-0.173008	0.166487
MK(892)	0.894262	0.000220
GK(892)	0.045548	0.000464
ArK(892)2	1.256591	0.082629
AiK(892)2	-0.961626	0.073051
ArK(892)3	-3.051419	0.243241
AiK(892)3	-3.550773	0.240794
ArK(892)4	-0.477608	0.234991
AiK(892)4	-4.309917	0.211342
gammaK0(1430)	0.013442	0.008768
ArK0(1430)1	-7.623008	0.695014
AiK0(1430)1	10.659428	0.676680
ArK0(1430)2	0.070474	0.517914
AiK0(1430)2	9.232267	0.483421
ArL(1405)1	-4.803554	0.291350
AiL(1405)1	3.345284	0.300704
ArL(1405)2	11.081209	0.589328
AiL(1405)2	3.433091	0.703625
ML(1520)	1.518521	0.000073
GL(1520)	0.015321	0.000307
ArL(1520)1	0.295599	0.024293
AiL(1520)1	0.066946	0.029078
ArL(1520)2	-0.303600	0.094485
AiL(1520)2	1.593037	0.087940
ArL(1600)1	4.853708	0.335374
AiL(1600)1	3.589134	0.384890
ArL(1600)2	-7.454595	0.384407
AiL(1600)2	0.364087	0.436442
ArL(1670)1	-0.346038	0.017070
AiL(1670)1	-0.155222	0.022148
ArL(1670)2	-0.676886	0.068655
AiL(1670)2	1.024249	0.064593
ArL(1690)1	-0.406504	0.049906
AiL(1690)1	-0.166295	0.047519
ArL(1690)2	-2.877193	0.143120
AiL(1690)2	-0.505867	0.164248
ML(2000)	1.987204	0.000962
GL(2000)	0.180647	0.001905
ArL(2000)1	-8.153499	0.623337
AiL(2000)1	-8.466388	0.605063
ArL(2000)2	-4.440215	0.356779
AiL(2000)2	-4.345002	0.348020
ArD(1232)1	-7.346946	0.395237
AiD(1232)1	2.523705	0.421066
ArD(1232)2	-14.024923	0.712383
AiD(1232)2	3.944177	0.777973
ArD(1600)1	12.653213	0.680913
AiD(1600)1	-2.595411	0.743945
ArD(1600)2	7.617624	0.534547
AiD(1600)2	-0.347803	0.495848
ArD(1700)1	10.598530	0.618298
AiD(1700)1	2.137527	0.617740
ArD(1700)2	13.575967	0.792409
AiD(1700)2	3.625141	0.844290

Table 4: Alternative amplitude model with $\Lambda(1670)$ with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.931224	0.027146
ArK0(700)1	0.104999	0.132084
AiK0(700)1	2.550341	0.082331
ArK0(700)2	-2.680007	0.091156
AiK0(700)2	0.066910	0.142798
ArK(892)2	1.181558	0.042422
AiK(892)2	-1.046885	0.068658
ArK(892)3	-3.159878	0.227798
AiK(892)3	-3.296591	0.063905
ArK(892)4	-0.735495	0.192316
AiK(892)4	-4.167493	0.084823
gammaK0(1430)	0.015803	0.007288
ArK0(1430)1	-6.617803	0.341431
AiK0(1430)1	10.649207	0.582432
ArK0(1430)2	0.398512	0.462661
AiK0(1430)2	8.831185	0.227581
ArL(1405)1	-4.527740	0.145118
AiL(1405)1	3.274871	0.281274
ArL(1405)2	10.406658	0.395947
AiL(1405)2	2.617288	0.474647
ML(1520)	1.518422	0.000130
GL(1520)	0.015145	0.000343
ArL(1520)1	0.292227	0.007909
AiL(1520)1	0.039435	0.018343
ArL(1520)2	-0.131156	0.074057
AiL(1520)2	1.506901	0.051886
ArL(1600)1	4.853613	0.271693
AiL(1600)1	3.038570	0.184491
ArL(1600)2	-6.904670	0.187138
AiL(1600)2	0.945895	0.372292
ML(1670)	1.671225	0.000501
GL(1670)	0.033118	0.001248
ArL(1670)1	-0.371124	0.031753
AiL(1670)1	-0.179791	0.029699
ArL(1670)2	-0.674482	0.054658
AiL(1670)2	1.063042	0.071367
ArL(1690)1	-0.353108	0.033933
AiL(1690)1	-0.111803	0.026556
ArL(1690)2	-2.741542	0.088948
AiL(1690)2	-0.365152	0.123143
ML(2000)	1.987384	0.000835
GL(2000)	0.179791	0.001741
ArL(2000)1	-8.215415	0.572748
AiL(2000)1	-7.556390	0.233964
ArL(2000)2	-4.486753	0.312147
AiL(2000)2	-3.687655	0.161887
ArD(1232)1	-6.789666	0.095830
AiD(1232)1	3.098280	0.367309
ArD(1232)2	-13.008854	0.175973
AiD(1232)2	4.641417	0.694158
ArD(1600)1	11.254499	0.237932
AiD(1600)1	-3.181172	0.639540
ArD(1600)2	6.759316	0.240687
AiD(1600)2	-0.911182	0.377845
ArD(1700)1	10.436469	0.360223
AiD(1700)1	1.403313	0.537243
ArD(1700)2	13.022957	0.474631
AiD(1700)2	1.981198	0.569500

Table 5: Alternative amplitude model with $\Lambda(1690)$ with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.941693	0.027900
ArK0(700)1	0.235301	0.151182
AiK0(700)1	2.617633	0.123157
ArK0(700)2	-2.637704	0.137561
AiK0(700)2	0.232068	0.158025
ArK(892)2	1.188494	0.074087
AiK(892)2	-1.064647	0.074399
ArK(892)3	-3.225409	0.235333
AiK(892)3	-3.243287	0.209467
ArK(892)4	-0.823814	0.216549
AiK(892)4	-4.143030	0.187736
gammaK0(1430)	0.011083	0.006892
ArK0(1430)1	-6.318610	0.589444
AiK0(1430)1	10.634797	0.611342
ArK0(1430)2	0.720164	0.495065
AiK0(1430)2	8.651308	0.379169
ArL(1405)1	-4.438453	0.238323
AiL(1405)1	3.400645	0.294682
ArL(1405)2	10.603083	0.501544
AiL(1405)2	2.468517	0.606209
ML(1520)	1.518304	0.000144
GL(1520)	0.015001	0.000482
ArL(1520)1	0.293460	0.024564
AiL(1520)1	0.027366	0.028136
ArL(1520)2	-0.070759	0.083333
AiL(1520)2	1.509838	0.078132
ArL(1600)1	4.985161	0.289528
AiL(1600)1	2.960452	0.339269
ArL(1600)2	-7.062379	0.322005
AiL(1600)2	1.391393	0.423046
ArL(1670)1	-0.343888	0.017767
AiL(1670)1	-0.122270	0.019908
ArL(1670)2	-0.554003	0.062269
AiL(1670)2	1.054215	0.062275
ML(1690)	1.704233	0.001956
GL(1690)	0.080103	0.001011
ArL(1690)1	-0.486576	0.058133
AiL(1690)1	-0.155656	0.053014
ArL(1690)2	-2.873073	0.140066
AiL(1690)2	-1.080145	0.182254
ML(2000)	1.987831	0.000837
GL(2000)	0.177506	0.001970
ArL(2000)1	-8.208706	0.584764
AiL(2000)1	-7.275124	0.507152
ArL(2000)2	-4.533152	0.328092
AiL(2000)2	-3.645276	0.281560
ArD(1232)1	-6.801588	0.336713
AiD(1232)1	3.392680	0.390102
ArD(1232)2	-13.047199	0.574007
AiD(1232)2	4.724667	0.726138
ArD(1600)1	11.112191	0.540042
AiD(1600)1	-3.600778	0.667295
ArD(1600)2	6.564965	0.477710
AiD(1600)2	-1.671060	0.440635
ArD(1700)1	10.339426	0.502442
AiD(1700)1	0.848406	0.599711
ArD(1700)2	12.825594	0.671808
AiD(1700)2	1.522785	0.722947

Table 6: Alternative amplitude model with $\Delta^{++}(1232)$ with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.862213	0.037889
ArK0(700)1	-0.058420	0.165556
AiK0(700)1	3.245526	0.188081
ArK0(700)2	-3.052966	0.192255
AiK0(700)2	0.448280	0.165059
ArK(892)2	1.316403	0.082737
AiK(892)2	-0.981707	0.078162
ArK(892)3	-3.102638	0.237331
AiK(892)3	-3.524093	0.226744
ArK(892)4	-0.600424	0.208990
AiK(892)4	-4.340942	0.221140
gammaK0(1430)	-0.000808	0.009261
ArK0(1430)1	-6.023863	0.603487
AiK0(1430)1	11.673504	0.697359
ArK0(1430)2	0.439749	0.482248
AiK0(1430)2	9.192080	0.465594
ArL(1405)1	-4.311990	0.273925
AiL(1405)1	3.394898	0.283385
ArL(1405)2	10.878538	0.563218
AiL(1405)2	2.550106	0.605541
ML(1520)	1.518329	0.000141
GL(1520)	0.015038	0.000442
ArL(1520)1	0.272623	0.023214
AiL(1520)1	0.040904	0.024110
ArL(1520)2	-0.098882	0.082151
AiL(1520)2	1.575655	0.086769
ArL(1600)1	5.479766	0.341048
AiL(1600)1	2.785101	0.345928
ArL(1600)2	-7.402132	0.373852
AiL(1600)2	1.084110	0.396234
ArL(1670)1	-0.277686	0.031437
AiL(1670)1	-0.125870	0.020935
ArL(1670)2	-0.593018	0.063265
AiL(1670)2	1.094967	0.066888
ArL(1690)1	-0.534285	0.029514
AiL(1690)1	0.028276	0.058393
ArL(1690)2	-2.679008	0.128034
AiL(1690)2	-0.241186	0.138195
ML(2000)	1.990371	0.000946
GL(2000)	0.178285	0.002366
ArL(2000)1	-7.515210	0.595310
AiL(2000)1	-8.493874	0.527933
ArL(2000)2	-4.222160	0.353790
AiL(2000)2	-4.710304	0.328325
MD(1232)	1.241349	0.000726
GD(1232)	0.122084	0.002105
ArD(1232)1	-7.913454	0.431139
AiD(1232)1	2.468312	0.399099
ArD(1232)2	-13.990674	0.733443
AiD(1232)2	5.519206	0.733672
ArD(1600)1	11.119866	0.594976
AiD(1600)1	-3.101455	0.614107
ArD(1600)2	7.561649	0.506562
AiD(1600)2	-0.703400	0.436001
ArD(1700)1	11.160177	0.628154
AiD(1700)1	0.810239	0.596754
ArD(1700)2	13.452967	0.760700
AiD(1700)2	2.391401	0.706637

Table 7: Alternative amplitude model with $\Lambda(1600)$, $\Delta(1600)^{++}$, $\Delta(1700)^{++}$ with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.930361	0.042917
ArK0(700)1	-0.295479	0.159250
AiK0(700)1	2.973306	0.129842
ArK0(700)2	-2.858500	0.144929
AiK0(700)2	-0.330782	0.163328
ArK(892)2	1.336661	0.083917
AiK(892)2	-0.959295	0.067402
ArK(892)3	-2.761572	0.106633
AiK(892)3	-3.598880	0.220996
ArK(892)4	-0.284618	0.196509
AiK(892)4	-4.250430	0.135808
gammaK0(1430)	0.001940	0.011045
ArK0(1430)1	-7.987826	0.681783
AiK0(1430)1	9.803146	0.294698
ArK0(1430)2	-0.593331	0.415975
AiK0(1430)2	9.324588	0.309701
ArL(1405)1	-4.555433	0.298588
AiL(1405)1	2.763267	0.218122
ArL(1405)2	9.625044	0.246670
AiL(1405)2	3.611149	0.613333
ML(1520)	1.518356	0.000201
GL(1520)	0.013888	0.000468
ArL(1520)1	0.311090	0.030219
AiL(1520)1	0.097119	0.035055
ArL(1520)2	-0.290387	0.075721
AiL(1520)2	1.329605	0.045707
ML(1600)	1.641907	0.003978
GL(1600)	0.280442	0.012658
ArL(1600)1	4.414414	0.185704
AiL(1600)1	4.820363	0.531981
ArL(1600)2	-8.100483	0.399640
AiL(1600)2	-1.077598	0.497833
ArL(1670)1	-0.357416	0.017074
AiL(1670)1	-0.211263	0.037984
ArL(1670)2	-0.645125	0.064380
AiL(1670)2	0.973070	0.024447
ArL(1690)1	-0.469216	0.074886
AiL(1690)1	-0.072329	0.069308
ArL(1690)2	-2.749269	0.083246
AiL(1690)2	-0.571594	0.146788
ML(2000)	1.988627	0.001395
GL(2000)	0.185432	0.003371
ArL(2000)1	-7.191096	0.301981
AiL(2000)1	-9.143200	0.583267
ArL(2000)2	-3.983316	0.160931
AiL(2000)2	-4.282048	0.323373
ArD(1232)1	-6.978590	0.304846
AiD(1232)1	2.387086	0.300128
ArD(1232)2	-13.689222	0.484052
AiD(1232)2	2.851832	0.534940
MD(1600)	1.653725	0.005556
GD(1600)	0.399996	0.041473
ArD(1600)1	15.672601	0.796079
AiD(1600)1	-3.902558	0.805891
ArD(1600)2	7.749456	0.597435
AiD(1600)2	-1.530633	0.559362
MD(1700)	1.760812	0.009728
GD(1700)	0.580378	0.042305
ArD(1700)1	11.181365	0.540593
AiD(1700)1	6.588973	0.743188
ArD(1700)2	13.910511	0.658205
AiD(1700)2	8.140582	0.906997

Table 8: Alternative amplitude model with free $\Lambda(1405)$ Flatté widths, indicated as G1 (pK channel) and G2 ($\Sigma\pi$).

Parameter	Central value	Uncertainty
gammaK0(700)	1.046003	0.045155
ArK0(700)1	0.008133	0.114784
AiK0(700)1	1.988397	0.122308
ArK0(700)2	-2.240970	0.138751
AiK0(700)2	-0.085452	0.130463
ArK(892)2	1.146258	0.079080
AiK(892)2	-0.954003	0.067668
ArK(892)3	-3.072364	0.215610
AiK(892)3	-3.136817	0.213343
ArK(892)4	-0.637844	0.206690
AiK(892)4	-4.026840	0.191988
gammaK0(1430)	-0.009898	0.011343
ArK0(1430)1	-5.216333	0.567929
AiK0(1430)1	9.975627	0.584259
ArK0(1430)2	1.462918	0.499231
AiK0(1430)2	8.721736	0.432555
G1L(1405)	0.036126	0.005923
G2L(1405)	0.099914	0.000202
ArL(1405)1	-5.874996	0.391042
AiL(1405)1	4.574277	0.413604
ArL(1405)2	12.197520	0.675524
AiL(1405)2	6.501119	0.873095
ML(1520)	1.518521	0.000052
GL(1520)	0.015532	0.000279
ArL(1520)1	0.281301	0.018746
AiL(1520)1	0.013697	0.026710
ArL(1520)2	-0.147613	0.076595
AiL(1520)2	1.442291	0.074050
ArL(1600)1	4.157093	0.270841
AiL(1600)1	2.657058	0.305277
ArL(1600)2	-6.901756	0.336119
AiL(1600)2	1.200985	0.393966
ArL(1670)1	-0.336580	0.028390
AiL(1670)1	-0.016768	0.031871
ArL(1670)2	-0.533891	0.055274
AiL(1670)2	0.899021	0.053906
ArL(1690)1	-0.241208	0.027406
AiL(1690)1	-0.095257	0.042068
ArL(1690)2	-2.550386	0.110661
AiL(1690)2	-0.365502	0.138869
ML(2000)	1.981461	0.000983
GL(2000)	0.167141	0.002551
ArL(2000)1	-7.597159	0.496023
AiL(2000)1	-5.992964	0.469847
ArL(2000)2	-3.540111	0.278466
AiL(2000)2	-3.103670	0.244369
ArD(1232)1	-6.453502	0.335951
AiD(1232)1	2.913677	0.349109
ArD(1232)2	-12.390391	0.585280
AiD(1232)2	4.188960	0.662337
ArD(1600)1	10.119430	0.519567
AiD(1600)1	-2.250105	0.576355
ArD(1600)2	6.880920	0.436212
AiD(1600)2	-0.268431	0.431312
ArD(1700)1	9.153693	0.516650
AiD(1700)1	1.094454	0.519789
ArD(1700)2	11.665897	0.613543
AiD(1700)2	1.484256	0.646875

Table 9: Alternative amplitude model with $\Lambda(1800)$ contribution added with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.820824	0.061113
ArK0(700)1	0.479870	0.143496
AiK0(700)1	2.669157	0.135086
ArK0(700)2	-2.407747	0.139734
AiK0(700)2	0.249972	0.126638
ArK(892)2	1.180456	0.078060
AiK(892)2	-1.129548	0.048703
ArK(892)3	-3.113975	0.094314
AiK(892)3	-3.273000	0.190359
ArK(892)4	-0.591144	0.170935
AiK(892)4	-4.143304	0.101200
gammaK0(1430)	-0.069727	0.011389
ArK0(1430)1	-5.153340	0.665962
AiK0(1430)1	12.169831	0.274137
ArK0(1430)2	2.375445	0.489785
AiK0(1430)2	10.360149	0.341598
ArL(1405)1	-3.718964	0.229158
AiL(1405)1	3.509241	0.252699
ArL(1405)2	8.312918	0.209008
AiL(1405)2	1.057133	0.550655
ML(1520)	1.518230	0.000142
GL(1520)	0.014972	0.000422
ArL(1520)1	0.269194	0.008633
AiL(1520)1	-0.027929	0.024573
ArL(1520)2	0.003638	0.068741
AiL(1520)2	1.456617	0.040032
ArL(1600)1	4.392282	0.069629
AiL(1600)1	2.623712	0.281504
ArL(1600)2	-6.779570	0.208083
AiL(1600)2	1.601388	0.293209
ArL(1670)1	-0.229983	0.029811
AiL(1670)1	0.079729	0.024070
ArL(1670)2	-0.510516	0.051790
AiL(1670)2	0.867892	0.022265
ArL(1690)1	-0.157931	0.057406
AiL(1690)1	-0.171170	0.035648
ArL(1690)2	-2.643447	0.060018
AiL(1690)2	-0.438738	0.131131
ML(1800)	1.719993	0.000857
GL(1800)	0.399984	0.002649
ArL(1800)1	-2.896177	0.507260
AiL(1800)1	-4.187938	0.474559
ArL(1800)2	-5.771801	0.380095
AiL(1800)2	2.443076	0.439612
ML(2000)	1.967001	0.001551
GL(2000)	0.172887	0.003175
ArL(2000)1	-10.400572	0.257214
AiL(2000)1	-4.340623	0.625761
ArL(2000)2	-4.045572	0.215202
AiL(2000)2	-0.810151	0.270126
ArD(1232)1	-6.673128	0.251509
AiD(1232)1	2.914234	0.261509
ArD(1232)2	-12.821318	0.397412
AiD(1232)2	4.739651	0.455128
ArD(1600)1	9.039262	0.390506
AiD(1600)1	-2.404412	0.400807
ArD(1600)2	6.015778	0.268655
AiD(1600)2	0.059000	0.365925
ArD(1700)1	9.902492	0.266514
AiD(1700)1	1.343926	0.460351
ArD(1700)2	12.627807	0.266730
AiD(1700)2	0.711202	0.639078

Table 10: Alternative amplitude model with $\Lambda(1810)$ contribution added with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.857489	0.032897
ArK0(700)1	-0.572430	0.197184
AiK0(700)1	3.044079	0.176577
ArK0(700)2	-2.602233	0.158901
AiK0(700)2	-0.081926	0.166331
ArK(892)2	1.290163	0.093389
AiK(892)2	-1.030455	0.085781
ArK(892)3	-2.579611	0.274888
AiK(892)3	-4.177200	0.265670
ArK(892)4	0.049088	0.251030
AiK(892)4	-4.431232	0.233394
gammaK0(1430)	-0.031674	0.010323
ArK0(1430)1	-9.784174	0.807011
AiK0(1430)1	10.939005	0.840139
ArK0(1430)2	2.646623	0.686782
AiK0(1430)2	9.852476	0.572181
ArL(1405)1	-4.002134	0.370269
AiL(1405)1	4.238902	0.386727
ArL(1405)2	10.358069	0.574145
AiL(1405)2	3.506165	0.671668
ML(1520)	1.518547	0.000162
GL(1520)	0.014146	0.000425
ArL(1520)1	0.275812	0.021723
AiL(1520)1	0.009175	0.031735
ArL(1520)2	-0.362697	0.089972
AiL(1520)2	1.475039	0.086305
ArL(1600)1	2.580068	0.334961
AiL(1600)1	2.837320	0.357071
ArL(1600)2	-9.079671	0.513260
AiL(1600)2	0.423339	0.540299
ArL(1670)1	-0.301217	0.029938
AiL(1670)1	-0.187261	0.026203
ArL(1670)2	-0.728133	0.068346
AiL(1670)2	0.990152	0.069921
ArL(1690)1	-0.203612	0.063126
AiL(1690)1	-0.408917	0.057318
ArL(1690)2	-2.545942	0.133344
AiL(1690)2	-0.375079	0.153121
ML(1810)	1.849944	0.006531
GL(1810)	0.360737	0.039132
ArL(1810)1	-0.865366	0.368650
AiL(1810)1	4.993321	0.804440
ArL(1810)2	1.179995	0.417286
AiL(1810)2	4.413438	0.671013
ML(2000)	1.987175	0.001062
GL(2000)	0.195047	0.002990
ArL(2000)1	-8.611831	0.744395
AiL(2000)1	-9.236148	0.685392
ArL(2000)2	-4.787412	0.444759
AiL(2000)2	-5.304151	0.410633
ArD(1232)1	-7.201427	0.400492
AiD(1232)1	2.135874	0.431609
ArD(1232)2	-14.198953	0.744335
AiD(1232)2	3.591562	0.831119
ArD(1600)1	11.858852	0.630511
AiD(1600)1	-1.695016	0.718071
ArD(1600)2	7.296466	0.566022
AiD(1600)2	-0.821533	0.463677
ArD(1700)1	11.715153	0.677549
AiD(1700)1	2.313153	0.688942
ArD(1700)2	15.153234	0.889049
AiD(1700)2	3.476165	0.888907

Table 11: Alternative amplitude model with $\Delta(1620)^{++}$ contribution added with free mass and width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.594082	0.036813
ArK0(700)1	-0.508291	0.255719
AiK0(700)1	3.557874	0.234730
ArK0(700)2	-4.728087	0.330109
AiK0(700)2	-1.300166	0.339730
ArK(892)2	1.509464	0.112060
AiK(892)2	-0.869546	0.111472
ArK(892)3	-2.660499	0.371969
AiK(892)3	-5.012650	0.362007
ArK(892)4	0.752416	0.348229
AiK(892)4	-5.048965	0.314350
gammaK0(1430)	0.021594	0.011807
ArK0(1430)1	-9.412194	0.900786
AiK0(1430)1	10.581979	0.967109
ArK0(1430)2	0.943281	0.596987
AiK0(1430)2	8.773476	0.571852
ArL(1405)1	-3.911511	0.333627
AiL(1405)1	3.225850	0.367578
ArL(1405)2	10.898158	0.786576
AiL(1405)2	5.380447	0.870842
ML(1520)	1.519114	0.000184
GL(1520)	0.015990	0.000488
ArL(1520)1	0.345083	0.021906
AiL(1520)1	0.043400	0.029742
ArL(1520)2	-0.845828	0.128042
AiL(1520)2	1.646280	0.124651
ArL(1600)1	5.451808	0.457087
AiL(1600)1	4.103115	0.504741
ArL(1600)2	-5.406690	0.390713
AiL(1600)2	-0.015048	0.387662
ArL(1670)1	-0.345424	0.029988
AiL(1670)1	-0.125875	0.039196
ArL(1670)2	-0.743300	0.090313
AiL(1670)2	1.137941	0.091154
ArL(1690)1	-0.200663	0.058090
AiL(1690)1	-0.341098	0.046833
ArL(1690)2	-2.685756	0.171732
AiL(1690)2	-0.902816	0.195988
ML(2000)	1.985654	0.001071
GL(2000)	0.175286	0.002955
ArL(2000)1	-6.796212	0.843828
AiL(2000)1	-10.099423	0.754626
ArL(2000)2	-4.628941	0.496023
AiL(2000)2	-5.442093	0.464947
ArD(1232)1	-8.643292	0.547830
AiD(1232)1	1.905427	0.578079
ArD(1232)2	-16.316906	1.004805
AiD(1232)2	2.335320	1.059623
ArD(1600)1	14.631039	0.934341
AiD(1600)1	-2.695902	1.036508
ArD(1600)2	10.375705	0.800934
AiD(1600)2	1.121209	0.805173
MD(1620)	1.589956	0.000728
GD(1620)	0.149998	0.001744
ArD(1620)1	0.348943	0.231875
AiD(1620)1	3.210361	0.238051
ArD(1620)2	0.414536	0.095090
AiD(1620)2	-0.460853	0.099753
ArD(1700)1	13.761142	0.949363
AiD(1700)1	2.271050	0.961864
ArD(1700)2	17.298070	1.182873
AiD(1700)2	4.165149	1.264982

Table 12: Alternative amplitude model in which a Relativistic Breit–Wigner is used for the $K^*(700)$ contribution.

Parameter	Central value	Uncertainty
ArK0(700)1	0.744669	0.204785
AiK0(700)1	3.738385	0.197228
ArK0(700)2	-4.473014	0.236293
AiK0(700)2	0.062890	0.243306
ArK(892)2	1.237381	0.073566
AiK(892)2	-0.951157	0.070328
ArK(892)3	-2.666654	0.207025
AiK(892)3	-3.347478	0.198699
ArK(892)4	-0.408230	0.195261
AiK(892)4	-3.962939	0.179727
gammaK0(1430)	0.004153	0.011079
ArK0(1430)1	-6.453339	0.561823
AiK0(1430)1	9.691872	0.590122
ArK0(1430)2	-0.525731	0.481791
AiK0(1430)2	9.490585	0.436026
ArL(1405)1	-4.858058	0.250360
AiL(1405)1	2.514306	0.279303
ArL(1405)2	8.705111	0.454020
AiL(1405)2	4.247092	0.522711
ML(1520)	1.518283	0.000165
GL(1520)	0.014670	0.000439
ArL(1520)1	0.275313	0.014173
AiL(1520)1	0.028308	0.026051
ArL(1520)2	-0.262939	0.072402
AiL(1520)2	1.345020	0.070998
ArL(1600)1	4.629762	0.279056
AiL(1600)1	3.123136	0.322211
ArL(1600)2	-5.922504	0.278060
AiL(1600)2	-0.050362	0.315279
ArL(1670)1	-0.331331	0.022512
AiL(1670)1	-0.217612	0.021152
ArL(1670)2	-0.617724	0.056150
AiL(1670)2	0.911542	0.054531
ArL(1690)1	-0.379944	0.036943
AiL(1690)1	-0.039842	0.038749
ArL(1690)2	-2.423437	0.107110
AiL(1690)2	-0.621704	0.129221
ML(2000)	1.992322	0.001042
GL(2000)	0.183796	0.002503
ArL(2000)1	-7.138184	0.541724
AiL(2000)1	-7.743513	0.490606
ArL(2000)2	-4.218316	0.333047
AiL(2000)2	-4.439730	0.298101
ArD(1232)1	-6.548804	0.324398
AiD(1232)1	2.849460	0.340050
ArD(1232)2	-12.388771	0.555301
AiD(1232)2	3.973618	0.634680
ArD(1600)1	10.926697	0.518948
AiD(1600)1	-2.157619	0.589066
ArD(1600)2	6.388424	0.422591
AiD(1600)2	-0.917458	0.395387
ArD(1700)1	10.146557	0.536077
AiD(1700)1	2.905844	0.541731
ArD(1700)2	11.987531	0.604477
AiD(1700)2	2.058147	0.653879

Table 13: Alternative amplitude model with $K^*(700)$ with free mass and width.

Parameter	Central value	Uncertainty
MK0(700)	0.832039	0.006076
GK0(700)	0.649995	0.051001
gammaK0(700)	1.293655	0.065049
ArK0(700)1	-0.117095	0.177157
AiK0(700)1	2.704896	0.059553
ArK0(700)2	-3.035274	0.115554
AiK0(700)2	0.085415	0.129952
ArK(892)2	1.221242	0.041782
AiK(892)2	-1.047306	0.038072
ArK(892)3	-3.393584	0.075103
AiK(892)3	-3.286426	0.071765
ArK(892)4	-0.885464	0.057722
AiK(892)4	-4.262787	0.066235
gammaK0(1430)	0.020145	0.007399
ArK0(1430)1	-6.628059	0.228040
AiK0(1430)1	11.289175	0.177019
ArK0(1430)2	0.267170	0.209239
AiK0(1430)2	9.038425	0.142729
ArL(1405)1	-4.509067	0.154996
AiL(1405)1	3.264372	0.177433
ArL(1405)2	11.106135	0.204230
AiL(1405)2	2.179375	0.281816
ML(1520)	1.518427	0.000057
GL(1520)	0.015407	0.000278
ArL(1520)1	0.303906	0.011574
AiL(1520)1	0.027372	0.012679
ArL(1520)2	-0.087241	0.035113
AiL(1520)2	1.589856	0.036747
ArL(1600)1	5.099857	0.118261
AiL(1600)1	3.112247	0.143722
ArL(1600)2	-7.299315	0.153331
AiL(1600)2	1.248635	0.165507
ArL(1670)1	-0.345269	0.018726
AiL(1670)1	-0.127501	0.021951
ArL(1670)2	-0.540961	0.029420
AiL(1670)2	1.074781	0.016984
ArL(1690)1	-0.363644	0.036703
AiL(1690)1	-0.120825	0.025074
ArL(1690)2	-2.802881	0.073307
AiL(1690)2	-0.258627	0.065393
ML(2000)	1.988258	0.000773
GL(2000)	0.177437	0.002181
ArL(2000)1	-8.407101	0.203855
AiL(2000)1	-7.595600	0.182119
ArL(2000)2	-4.442971	0.170001
AiL(2000)2	-3.628276	0.153057
ArD(1232)1	-6.884150	0.140261
AiD(1232)1	3.334478	0.160836
ArD(1232)2	-13.240869	0.229208
AiD(1232)2	5.135798	0.202758
ArD(1600)1	11.573845	0.258889
AiD(1600)1	-3.609929	0.209670
ArD(1600)2	7.337382	0.261163
AiD(1600)2	-1.292572	0.205303
ArD(1700)1	10.938816	0.188411
AiD(1700)1	0.829034	0.246461
ArD(1700)2	13.471328	0.269478
AiD(1700)2	1.841069	0.276973

Table 14: Alternative amplitude model with $K^*(1410)$ contribution added with mass and width from Ref. [1].

Parameter	Central value	Uncertainty
gammaK0(700)	0.610031	0.056464
ArK0(700)1	0.998014	0.157706
AiK0(700)1	2.643169	0.153535
ArK0(700)2	-3.741166	0.195130
AiK0(700)2	0.101409	0.182576
ArK(892)2	1.029002	0.090867
AiK(892)2	-1.250462	0.046933
ArK(892)3	-3.514216	0.144181
AiK(892)3	-3.039751	0.246634
ArK(892)4	-0.888357	0.187292
AiK(892)4	-4.162778	0.180947
ArK(1410)1	-3.369750	0.633205
AiK(1410)1	-5.812831	0.514088
ArK(1410)2	0.042694	0.616992
AiK(1410)2	-4.840691	0.585265
ArK(1410)3	1.047327	0.726056
AiK(1410)3	10.518265	0.647184
ArK(1410)4	1.162940	0.655989
AiK(1410)4	5.379877	0.493524
gammaK0(1430)	0.060253	0.008710
ArK0(1430)1	-4.256320	0.657069
AiK0(1430)1	11.004596	0.346773
ArK0(1430)2	-1.690209	0.354505
AiK0(1430)2	7.147499	0.235006
ArL(1405)1	-2.791128	0.309384
AiL(1405)1	0.493229	0.287053
ArL(1405)2	9.262813	0.370295
AiL(1405)2	4.356569	0.674237
ML(1520)	1.518607	0.000142
GL(1520)	0.015031	0.000384
ArL(1520)1	0.417944	0.028169
AiL(1520)1	-0.018029	0.032573
ArL(1520)2	-0.105559	0.078261
AiL(1520)2	1.418640	0.065934
ArL(1600)1	4.362129	0.189634
AiL(1600)1	0.788888	0.312739
ArL(1600)2	-5.849669	0.264203
AiL(1600)2	-0.108307	0.307052
ArL(1670)1	-0.329187	0.017050
AiL(1670)1	-0.074728	0.022863
ArL(1670)2	-0.468199	0.065919
AiL(1670)2	1.068614	0.032767
ArL(1690)1	-0.313354	0.061185
AiL(1690)1	0.024271	0.042523
ArL(1690)2	-2.858095	0.111173
AiL(1690)2	-0.189057	0.149630
ML(2000)	1.986826	0.000838
GL(2000)	0.165625	0.002330
ArL(2000)1	-7.883216	0.319571
AiL(2000)1	-5.719668	0.524428
ArL(2000)2	-4.506034	0.210123
AiL(2000)2	-3.979352	0.319542
ArD(1232)1	-6.218167	0.381939
AiD(1232)1	4.474333	0.280400
ArD(1232)2	-12.917498	0.610768
AiD(1232)2	5.437437	0.534321
ArD(1600)1	10.165113	0.564503
AiD(1600)1	-3.600791	0.490655
ArD(1600)2	6.766681	0.440858
AiD(1600)2	-1.857974	0.412110
ArD(1700)1	11.547894	0.510295
AiD(1700)1	-0.725114	0.555047
ArD(1700)2	14.379176	0.607255
AiD(1700)2	-0.231568	0.722400

Table 15: Alternative amplitude model in which a Relativistic Breit–Wigner is used for the $K^*(1430)$ contribution.

Parameter	Central value	Uncertainty
gammaK0(700)	0.922900	0.034353
ArK0(700)1	-0.088452	0.076269
AiK0(700)1	2.500931	0.056046
ArK0(700)2	-2.807752	0.095853
AiK0(700)2	0.080287	0.066974
ArK(892)2	1.183000	0.035495
AiK(892)2	-0.998802	0.025785
ArK(892)3	-3.064230	0.052505
AiK(892)3	-3.325429	0.092621
ArK(892)4	-0.649206	0.079108
AiK(892)4	-4.162340	0.058969
ArK0(1430)1	-5.924213	0.298956
AiK0(1430)1	12.061420	0.176774
ArK0(1430)2	1.113085	0.151442
AiK0(1430)2	9.448335	0.156062
ArL(1405)1	-4.646145	0.119962
AiL(1405)1	3.163520	0.134807
ArL(1405)2	10.157843	0.114911
AiL(1405)2	3.125226	0.261682
ML(1520)	1.518487	0.000104
GL(1520)	0.015100	0.000359
ArL(1520)1	0.287645	0.015118
AiL(1520)1	0.050185	0.011685
ArL(1520)2	-0.183290	0.026418
AiL(1520)2	1.485069	0.017384
ArL(1600)1	4.819150	0.061052
AiL(1600)1	3.088826	0.157117
ArL(1600)2	-6.811956	0.119153
AiL(1600)2	0.728666	0.176591
ArL(1670)1	-0.342254	0.006441
AiL(1670)1	-0.149415	0.009928
ArL(1670)2	-0.587154	0.034787
AiL(1670)2	0.998388	0.009583
ArL(1690)1	-0.409085	0.014973
AiL(1690)1	-0.084963	0.024157
ArL(1690)2	-2.715615	0.036386
AiL(1690)2	-0.413649	0.077262
ML(2000)	1.988876	0.000632
GL(2000)	0.183567	0.002289
ArL(2000)1	-8.097512	0.172579
AiL(2000)1	-7.959637	0.250642
ArL(2000)2	-4.396961	0.087357
AiL(2000)2	-4.040855	0.167722
ArD(1232)1	-6.802897	0.137427
AiD(1232)1	2.979103	0.156005
ArD(1232)2	-12.973008	0.203687
AiD(1232)2	4.438833	0.222923
ArD(1600)1	11.405535	0.233336
AiD(1600)1	-3.002764	0.257261
ArD(1600)2	6.867872	0.225361
AiD(1600)2	-0.936850	0.189987
ArD(1700)1	10.226676	0.192975
AiD(1700)1	1.616693	0.275900
ArD(1700)2	12.952162	0.178677
AiD(1700)2	2.237971	0.381360

Table 16: Alternative amplitude model with $K^*(1430)$ with free width.

Parameter	Central value	Uncertainty
gammaK0(700)	0.934183	0.035840
ArK0(700)1	-0.025733	0.068373
AiK0(700)1	2.555225	0.056446
ArK0(700)2	-2.749931	0.079619
AiK0(700)2	0.068425	0.080909
ArK(892)2	1.196976	0.035795
AiK(892)2	-1.014281	0.027525
ArK(892)3	-3.115952	0.045253
AiK(892)3	-3.342337	0.052285
ArK(892)4	-0.682157	0.049104
AiK(892)4	-4.190488	0.031710
GK0(1430)	0.359999	0.012478
gammaK0(1430)	0.353942	0.012437
ArK0(1430)1	-6.369001	0.226267
AiK0(1430)1	11.341841	0.219290
ArK0(1430)2	0.675587	0.249770
AiK0(1430)2	9.152291	0.153840
ArL(1405)1	-4.641171	0.123808
AiL(1405)1	3.199043	0.164343
ArL(1405)2	10.366257	0.153619
AiL(1405)2	3.040880	0.252193
ML(1520)	1.518472	0.000096
GL(1520)	0.015161	0.000142
ArL(1520)1	0.291519	0.005953
AiL(1520)1	0.048765	0.007794
ArL(1520)2	-0.176055	0.029575
AiL(1520)2	1.503093	0.013972
ArL(1600)1	4.852188	0.069968
AiL(1600)1	3.132230	0.135834
ArL(1600)2	-6.938257	0.121886
AiL(1600)2	0.770042	0.130365
ArL(1670)1	-0.343306	0.006023
AiL(1670)1	-0.147703	0.009329
ArL(1670)2	-0.585196	0.024116
AiL(1670)2	1.009963	0.006880
ArL(1690)1	-0.396095	0.025097
AiL(1690)1	-0.100006	0.015263
ArL(1690)2	-2.742605	0.040421
AiL(1690)2	-0.388296	0.059445
ML(2000)	1.988368	0.000911
GL(2000)	0.181734	0.001988
ArL(2000)1	-8.127146	0.171276
AiL(2000)1	-7.849932	0.133223
ArL(2000)2	-4.421548	0.105964
AiL(2000)2	-3.936428	0.140305
ArD(1232)1	-6.848011	0.097194
AiD(1232)1	3.013414	0.142968
ArD(1232)2	-13.083422	0.115693
AiD(1232)2	4.476747	0.150077
ArD(1600)1	11.488845	0.171805
AiD(1600)1	-3.052145	0.199702
ArD(1600)2	6.858418	0.148709
AiD(1600)2	-0.970904	0.167293
ArD(1700)1	10.351110	0.160519
AiD(1700)1	1.540701	0.253220
ArD(1700)2	12.985398	0.110004
AiD(1700)2	2.228074	0.258859

Table 17: Alternative amplitude model with an additional overall exponential form factor $\exp(-\alpha q^2)$ multiplying Bugg lineshapes. The exponential parameter is indicated as "alpha".

Parameter	Central value	Uncertainty
gammaK0(700)	0.822411	0.057208
alphaK0(700)	-0.444257	0.293332
ArK0(700)1	0.500932	0.083523
AiK0(700)1	2.316935	0.405634
ArK0(700)2	-2.019108	0.371593
AiK0(700)2	0.057298	0.076454
ArK(892)2	1.160997	0.042539
AiK(892)2	-1.055468	0.044142
ArK(892)3	-3.153039	0.089038
AiK(892)3	-3.266216	0.052409
ArK(892)4	-0.748458	0.083256
AiK(892)4	-4.079399	0.043196
gammaK0(1430)	-0.098783	0.023220
alphaK0(1430)	0.320379	0.200884
ArK0(1430)1	-7.871384	0.349934
AiK0(1430)1	12.706526	0.494652
ArK0(1430)2	1.519764	0.524396
AiK0(1430)2	10.457474	0.377571
ArL(1405)1	-4.154905	0.183111
AiL(1405)1	3.102126	0.212742
ArL(1405)2	10.612403	0.204058
AiL(1405)2	2.444264	0.295423
ML(1520)	1.518409	0.000135
GL(1520)	0.014958	0.000471
ArL(1520)1	0.299140	0.010063
AiL(1520)1	0.016007	0.012966
ArL(1520)2	-0.149552	0.037814
AiL(1520)2	1.454957	0.036239
ArL(1600)1	4.873289	0.098121
AiL(1600)1	2.976170	0.141205
ArL(1600)2	-7.056025	0.151698
AiL(1600)2	0.638883	0.172244
ArL(1670)1	-0.319250	0.008947
AiL(1670)1	-0.141422	0.013713
ArL(1670)2	-0.555152	0.026316
AiL(1670)2	1.016211	0.020910
ArL(1690)1	-0.330284	0.027874
AiL(1690)1	-0.209158	0.026284
ArL(1690)2	-2.620128	0.057680
AiL(1690)2	-0.357478	0.079165
ML(2000)	1.986670	0.000836
GL(2000)	0.169498	0.002847
ArL(2000)1	-7.209116	0.273563
AiL(2000)1	-6.814298	0.187355
ArL(2000)2	-4.031724	0.166622
AiL(2000)2	-3.121371	0.169532
ArD(1232)1	-6.505562	0.097783
AiD(1232)1	3.218948	0.180801
ArD(1232)2	-12.821674	0.115891
AiD(1232)2	4.717166	0.273132
ArD(1600)1	11.505975	0.221918
AiD(1600)1	-2.755565	0.289988
ArD(1600)2	6.519839	0.254287
AiD(1600)2	-0.779944	0.258351
ArD(1700)1	10.729935	0.232369
AiD(1700)1	1.565633	0.296713
ArD(1700)2	13.294697	0.257569
AiD(1700)2	2.113176	0.354202

Table 18: Alternative amplitude model with free radial parameter d for the Λ_c^+ resonance, indicated as dLc.

Parameter	Central value	Uncertainty
dLc	4.204442	0.341296
gammaK0(700)	0.922543	0.031137
ArK0(700)1	0.127948	0.149474
AiK0(700)1	2.529633	0.063936
ArK0(700)2	-2.727862	0.088694
AiK0(700)2	0.129667	0.146615
ArK(892)2	1.170114	0.063246
AiK(892)2	-1.027869	0.057527
ArK(892)3	-3.215552	0.159851
AiK(892)3	-3.225086	0.183685
ArK(892)4	-0.800213	0.214926
AiK(892)4	-4.146763	0.071926
gammaK0(1430)	0.020421	0.005911
ArK0(1430)1	-6.490224	0.582215
AiK0(1430)1	10.622156	0.278960
ArK0(1430)2	0.461026	0.446560
AiK0(1430)2	8.726626	0.127359
ArL(1405)1	-4.580370	0.204095
AiL(1405)1	3.210059	0.214052
ArL(1405)2	10.541466	0.162820
AiL(1405)2	2.584296	0.633953
ML(1520)	1.518464	0.000141
GL(1520)	0.015259	0.000369
ArL(1520)1	0.292152	0.013805
AiL(1520)1	0.032693	0.023307
ArL(1520)2	-0.130502	0.085630
AiL(1520)2	1.508702	0.021918
ArL(1600)1	4.957221	0.157697
AiL(1600)1	2.989209	0.314697
ArL(1600)2	-6.880108	0.130076
AiL(1600)2	0.952497	0.375774
ArL(1670)1	-0.339795	0.009563
AiL(1670)1	-0.134046	0.024603
ArL(1670)2	-0.550967	0.059929
AiL(1670)2	1.019503	0.030319
ArL(1690)1	-0.390624	0.029626
AiL(1690)1	-0.093379	0.029199
ArL(1690)2	-2.742302	0.047928
AiL(1690)2	-0.273504	0.156364
ML(2000)	1.987921	0.000493
GL(2000)	0.179272	0.001824
ArL(2000)1	-8.201531	0.389849
AiL(2000)1	-7.392044	0.493271
ArL(2000)2	-4.385238	0.205758
AiL(2000)2	-3.708142	0.264829
ArD(1232)1	-6.689146	0.213299
AiD(1232)1	3.212245	0.337147
ArD(1232)2	-12.871200	0.298883
AiD(1232)2	4.772431	0.644439
ArD(1600)1	11.235201	0.346318
AiD(1600)1	-3.418874	0.611233
ArD(1600)2	6.603461	0.229202
AiD(1600)2	-1.305754	0.406314
ArD(1700)1	10.189830	0.202768
AiD(1700)1	1.183965	0.577030
ArD(1700)2	12.726946	0.210809
AiD(1700)2	1.728984	0.718018

Table 19: Alternative amplitude model obtained using spin-orbit (LS) couplings, in which, for each coupling, the correct L dependence of the lineshape (see Eq. (54) of the main paper) is introduced.

Parameter	Central value	Uncertainty
ArK0(700)1	-0.000167	0.019096
AiK0(700)1	-0.684890	0.026946
ArK0(700)2	-0.631117	0.024065
AiK0(700)2	0.040435	0.023737
ArK(892)2	0.341792	0.007302
AiK(892)2	-0.064047	0.004810
ArK(892)3	-0.755199	0.014376
AiK(892)3	-0.592176	0.014062
ArK(892)4	0.093754	0.007945
AiK(892)4	0.379956	0.005135
ArK0(1430)1	-1.352114	0.098594
AiK0(1430)1	-3.150814	0.057482
ArK0(1430)2	0.598156	0.054311
AiK0(1430)2	-0.955655	0.046918
ArL(1405)1	-1.224670	0.034198
AiL(1405)1	-0.039521	0.052576
ArL(1405)2	-1.811842	0.039381
AiL(1405)2	1.625622	0.034881
ArL(1520)1	0.191708	0.004957
AiL(1520)1	0.167003	0.005131
ArL(1520)2	0.115638	0.006304
AiL(1520)2	0.242542	0.004908
ArL(1600)1	-0.134004	0.032490
AiL(1600)1	-0.628117	0.032433
ArL(1600)2	1.712637	0.029718
AiL(1600)2	-1.128953	0.032192
ArL(1670)1	0.009197	0.004825
AiL(1670)1	-0.200899	0.003052
ArL(1670)2	-0.114543	0.004976
AiL(1670)2	-0.167795	0.005083
ArL(1690)1	-0.378966	0.012153
AiL(1690)1	0.331114	0.009513
ArL(1690)2	-0.286413	0.009060
AiL(1690)2	0.247902	0.011125
ArL(2000)1	2.807070	0.049100
AiL(2000)1	0.071483	0.066689
ArL(2000)2	-0.890941	0.023480
AiL(2000)2	-0.087397	0.028816
ArD(1232)1	-1.499936	0.054859
AiD(1232)1	3.161477	0.040932
ArD(1232)2	-0.586497	0.031930
AiD(1232)2	0.838665	0.019560
ArD(1600)1	1.595876	0.050522
AiD(1600)1	-2.460301	0.074787
ArD(1600)2	-0.432377	0.049114
AiD(1600)2	0.688543	0.027446
ArD(1700)1	3.161722	0.068890
AiD(1700)1	-2.292309	0.099002
ArD(1700)2	0.179027	0.031955
AiD(1700)2	-0.298638	0.021052

References

[1] Particle Data Group, P. A. Zyla *et al.*, *Review of particle physics*, Prog. Theor. Exp. Phys. **2020** (2020) 083C01.