

¹ Supplementary material for LHCb-PAPER-2021-032

² Summary of theory predictions

³ Theory predictions for the mass of the ground isoscalar $J^P = 1^+$ tetraquark T_{cc}^+ state are
⁴ summarised in Fig. S1.

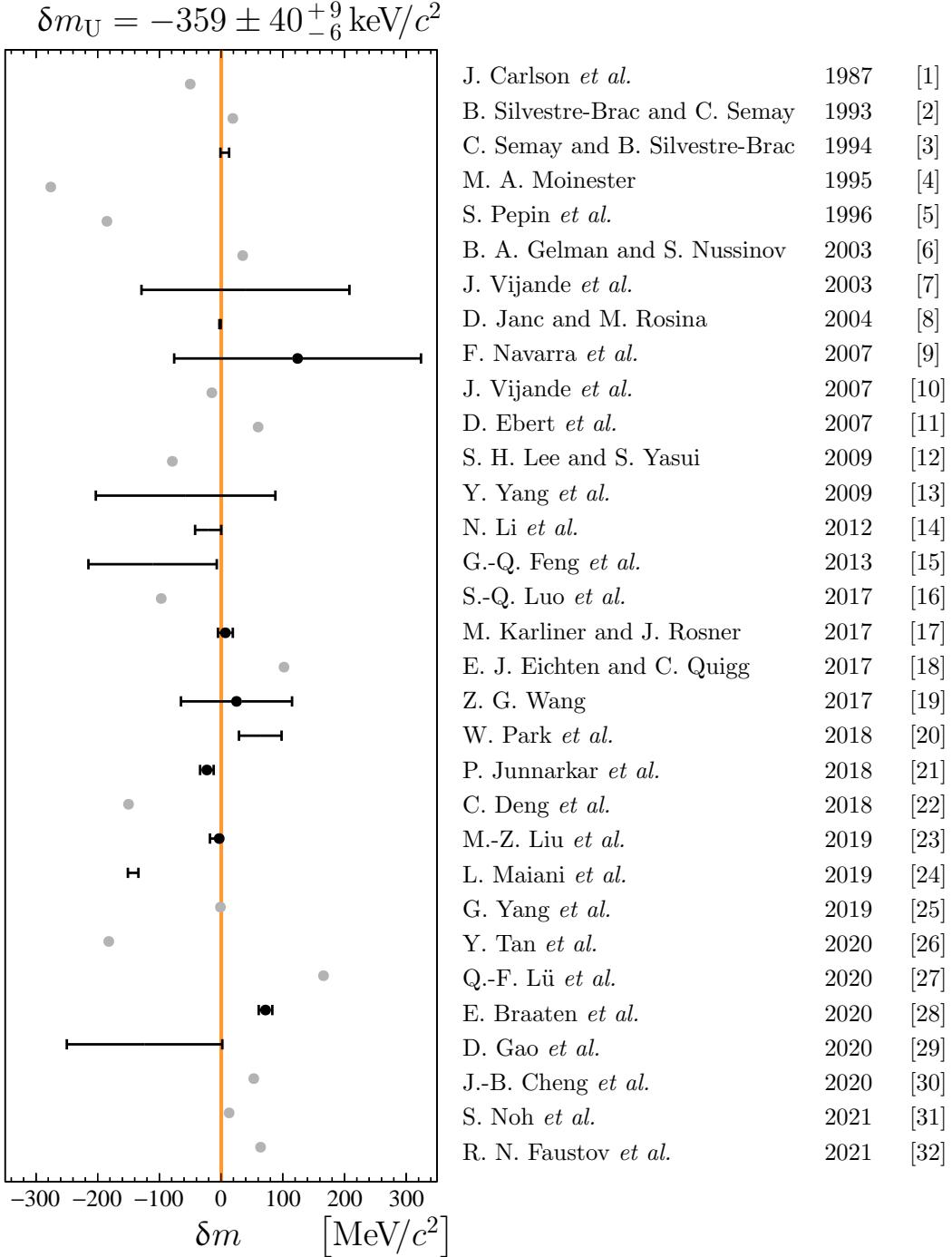


Figure S1: Theory predictions for the mass of the isoscalar $J^P = 1^+$ $cc\bar{u}\bar{d}$ tetraquark T_{cc}^+ ground state [1–32]. Masses are shown relative to the $D^{*+}D^0$ mass threshold.

5 References

- [1] J. Carlson, L. Heller, and J. A. Tjon, *Stability of dimesons*, Phys. Rev. **D37** (1988) 744.
- [2] B. Silvestre-Brac and C. Semay, *Systematics of $L = 0$ $q^2\bar{q}^2$ systems*, Z. Phys. **C57** (1993) 273.
- [3] C. Semay and B. Silvestre-Brac, *Diquonia and potential models*, Z. Phys. **C61** (1994) 271.
- [4] M. A. Moinester, *How to search for doubly charmed baryons and tetraquarks*, Z. Phys. **A355** (1996) 349, [arXiv:hep-ph/9506405](#).
- [5] S. Pepin, F. Stancu, M. Genovese, and J. M. Richard, *Tetraquarks with color blind forces in chiral quark models*, Phys. Lett. **B393** (1997) 119, [arXiv:hep-ph/9609348](#).
- [6] B. A. Gelman and S. Nussinov, *Does a narrow tetraquark $cc\bar{u}\bar{d}$ state exist?*, Phys. Lett. **B551** (2003) 296.
- [7] J. Vijande, F. Fernandez, A. Valcarce, and B. Silvestre-Brac, *Tetraquarks in a chiral constituent quark model*, Eur. Phys. J. **A19** (2004) 383, [arXiv:hep-ph/0310007](#).
- [8] D. Janc and M. Rosina, *The $T_{cc} = DD^*$ molecular state*, Few Body Syst. **35** (2004) 175, [arXiv:hep-ph/0405208](#).
- [9] F. S. Navarra, M. Nielsen, and S. H. Lee, *QCD sum rules study of $QQ - \bar{u}\bar{d}$ mesons*, Phys. Lett. **B649** (2007) 166, [arXiv:hep-ph/0703071](#).
- [10] J. Vijande, E. Weissman, A. Valcarce, and N. Barnea, *Are there compact heavy four-quark bound states?*, Phys. Rev. **D76** (2007) 094027, [arXiv:0710.2516](#).
- [11] D. Ebert, R. N. Faustov, V. O. Galkin, and W. Lucha, *Masses of tetraquarks with two heavy quarks in the relativistic quark model*, Phys. Rev. **D76** (2007) 114015, [arXiv:0706.3853](#).
- [12] S. H. Lee and S. Yasui, *Stable multiquark states with heavy quarks in a diquark model*, Eur. Phys. J. **C64** (2009) 283, [arXiv:0901.2977](#).
- [13] Y. Yang, C. Deng, J. Ping, and T. Goldman, *S-wave $QQ\bar{q}\bar{q}$ state in the constituent quark model*, Phys. Rev. **D80** (2009) 114023.
- [14] N. Li, Z.-F. Sun, X. Liu, and S.-L. Zhu, *Coupled-channel analysis of the possible $D^{(*)}D^{(*)}$, $\bar{B}^{(*)}\bar{B}^{(*)}$ and $D^{(*)}\bar{B}^{(*)}$ molecular states*, Phys. Rev. **D88** (2013) 114008, [arXiv:1211.5007](#).
- [15] G.-Q. Feng, X.-H. Guo, and B.-S. Zou, *$QQ'\bar{u}\bar{d}$ bound state in the Bethe-Salpeter equation approach*, [arXiv:1309.7813](#).
- [16] S.-Q. Luo *et al.*, *Exotic tetraquark states with the $qq\bar{Q}\bar{Q}$ configuration*, Eur. Phys. J. **C77** (2017) 709, [arXiv:1707.01180](#).

- [17] M. Karliner and J. L. Rosner, *Discovery of doubly-charmed Ξ_{cc} baryon implies a stable $bb\bar{u}\bar{d}$ tetraquark*, Phys. Rev. Lett. **119** (2017) 202001, [arXiv:1707.07666](#).
- [18] E. J. Eichten and C. Quigg, *Heavy-quark symmetry implies stable heavy tetraquark mesons $Q_i Q_j \bar{q}_k \bar{q}_l$* , Phys. Rev. Lett. **119** (2017) 202002, [arXiv:1707.09575](#).
- [19] Z.-G. Wang, *Analysis of the axialvector doubly heavy tetraquark states with QCD sum rules*, Acta Phys. Polon. **B49** (2018) 1781, [arXiv:1708.04545](#).
- [20] W. Park, S. Noh, and S. H. Lee, *Masses of the doubly heavy tetraquarks in a constituent quark model*, Acta Phys. Polon. **B50** (2019) 1151, [arXiv:1809.05257](#).
- [21] P. Junnarkar, N. Mathur, and M. Padmanath, *Study of doubly heavy tetraquarks in lattice QCD*, Phys. Rev. **D99** (2019) 034507, [arXiv:1810.12285](#).
- [22] C. Deng, H. Chen, and J. Ping, *Systematical investigation on the stability of doubly heavy tetraquark states*, Eur. Phys. J. **A56** (2020) 9, [arXiv:1811.06462](#).
- [23] M.-Z. Liu *et al.*, *Heavy-quark spin and flavor symmetry partners of the X(3872) revisited: What can we learn from the one boson exchange model?*, Phys. Rev. **D99** (2019) 094018, [arXiv:1902.03044](#).
- [24] L. Maiani, A. D. Polosa, and V. Riquer, *Hydrogen bond of QCD in doubly heavy baryons and tetraquarks*, Phys. Rev. **D100** (2019) 074002, [arXiv:1908.03244](#).
- [25] G. Yang, J. Ping, and J. Segovia, *Doubly-heavy tetraquarks*, Phys. Rev. **D101** (2020) 014001, [arXiv:1911.00215](#).
- [26] Y. Tan, W. Lu, and J. Ping, *$QQ\bar{q}\bar{q}$ in a chiral constituent quark model*, Eur. Phys. J. Plus **135** (2020) 716, [arXiv:2004.02106](#).
- [27] Q.-F. Lü, D.-Y. Chen, and Y.-B. Dong, *Masses of doubly heavy tetraquarks $T_{QQ'}$ in a relativized quark model*, Phys. Rev. **D102** (2020) 034012, [arXiv:2006.08087](#).
- [28] E. Braaten, L.-P. He, and A. Mohapatra, *Masses of doubly heavy tetraquarks with error bars*, Phys. Rev. **D103** (2021) 016001, [arXiv:2006.08650](#).
- [29] D. Gao *et al.*, *Masses of doubly heavy tetraquark states with isospin = $\frac{1}{2}$ and 1 and spin-parity $1^{+\pm}$* , [arXiv:2007.15213](#).
- [30] J.-B. Cheng *et al.*, *Double-heavy tetraquark states with heavy diquark-antiquark symmetry*, Chin. Phys. **C45** (2021) 043102, [arXiv:2008.00737](#).
- [31] S. Noh, W. Park, and S. H. Lee, *The doubly-heavy tetraquarks, $qq'\bar{Q}\bar{Q}'$, in a constituent quark model with a complete set of harmonic oscillator bases*, Phys. Rev. **D103** (2021) 114009, [arXiv:2102.09614](#).
- [32] R. N. Faustov, V. O. Galkin, and E. M. Savchenko, *Heavy tetraquarks in the relativistic quark model*, Universe **7** (2021) 94, [arXiv:2103.01763](#).