

# $T_{cc}^+$ & BEYOND

(CLOSING REMARKS)

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*Mini-workshop on “ $T_{cc}^+$  and Beyond”*  
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# THE ROAD TO THE MINI-WORKSHOP

- “Observation of the doubly charmed baryon  $\Xi_{cc}^{++}$ ” [[arXiv: 1707.01621](#)]
- “Physics case for an LHCb Upgrade II - Opportunities in flavour physics, and beyond, in the HL-LHC era” [[arXiv: 1808.08865](#)]
  - ✓ Prompt production
  - ✓ b-hadron decays: (e.g.)  $B_c^+ \rightarrow D_s^+ D^0$  anti- $D^0$

## 9.2.2 Doubly charmed tetraquarks

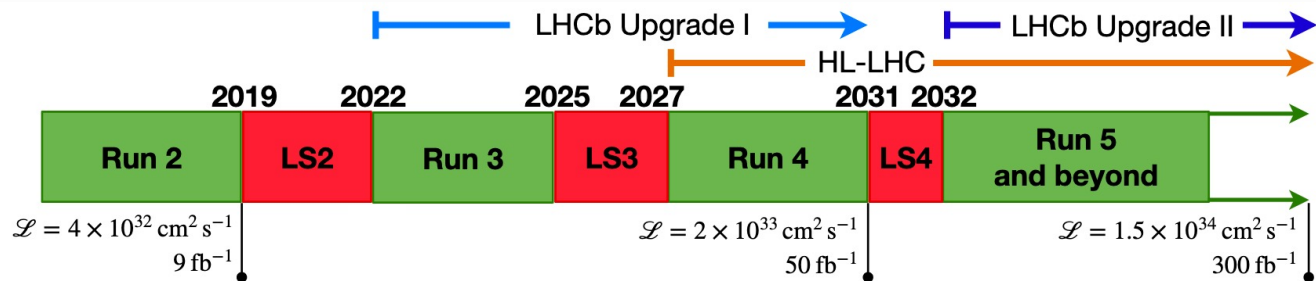
The history of  $X(3872)$  studies illustrates well the difficulty of distinguishing between exotic and conventional explanations for a hidden-charm state. Therefore it is appealing to search for states with an uncontroversial exotic signature. A good candidate in this category would be a  $T_{cc}$  doubly charmed tetraquark [466, 487-503], being a meson with constituent quark content  $cc\bar{q}\bar{q}'$ , where the light quarks  $q$  and  $q'$  could be  $u$ ,  $d$  or  $s$ .

- Observation of an exotic narrow doubly charmed tetraquark [[arXiv: 2109.01038](#)]
- Study of the doubly charmed tetraquark  $T_{cc}^+$  [[arXiv: 2109.01056](#)]
- Mini-workshop: “ $T_{cc}^+$  and Beyond” (50 -- 80 participants)

# $T_{cc}^+$ AND BEYOND

- *Mass just below the  $D^0 D^{*+}$  threshold*
  - ✓ Is it just a coincidence? Or not-yet understood underlying physics effect?
- *Data support isoscalar  $T_{cc}$  with  $J^P = 1^+$* 
  - ✓ What about the predicted “excited”  $T_{cc}$ ? Would they be enough narrow to be observed in prompt production? Would the observation of  $\Xi_{cc}^{**}$  help to calibrate the  $T_{cc}^{**}$  spectrum? What about  $T_{ccs}$  or  $T_{ccss}$ ?
- *Enhancement of  $T_{cc}$  production vs track mult.*
  - ✓ Driven by DPS? Can deuteron production provide an insight? Any narrow peak in  $m(T_{cc}^+ \pi^+)$ ?

# $T_{cc}^+$ AND BEYOND



- The large data set collected in the HL-LHC era, together with upgraded detectors, will boost sensitivity in searches for heavy hadrons with small production cross sections and/or small decay rates
  - ✓ Dalitz analysis of  $T_{cc}^+ \rightarrow D^0 D^0 \pi^+$
  - ✓  $T_{bc}^0$ : potential for discovery of such states in Run 3 & 4 in various modes
  - ✓  $T_{bb}^-$ : Exclusive modes seem challenging but inclusive  $B_c$  search could signal  $bb$  hadrons

- LHCb Implications Workshop: 19-22 October 2021  
<https://indico.cern.ch/event/1055778/timetable/>  
Registration open  
<https://indico.cern.ch/event/1055780/registrations/74324/>