

**$P_c(4457)^+$** 

Status: \*

was  $P_c(4450)$ 

A resonance seen in  $\Lambda_b^0 \rightarrow P_c^+ K^-$ , then  $P_c \rightarrow J/\psi p$ , with a significance of 12 standard deviations. The  $J/\psi p$  quark content is  $uudc\bar{c}$ , a pentaquark. See also the  $P_c(4380)^+$ . In the best amplitude fit, the two states have opposite parity, one having  $J = 3/2$ , the other  $J = 5/2$ .

Extraction of the pentaquark signals requires some understanding of the dominant  $K^- p$  background. AAIJ 15P used a model-dependent approach. AAIJ 16AG reanalyzed the data making minimal assumptions about the  $K^- p$  background, and thus confirmed the strong significance of the pentaquark signals.

 **$P_c(4457)^+$  MASS**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b><math>4457.3 \pm 0.6^{+4.1}_{-1.7}</math></b>	AAIJ	19W	LHCB $pp$ at 7, 8, 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$4449.8 \pm 1.7 \pm 2.5$	<sup>1</sup> AAIJ	15P	LHCB Repl. by AAIJ 19W
<sup>1</sup> Considering $P_c(4440)$ and $P_c(4457)$ as a single resonance.			

 **$P_c(4457)^+$  WIDTH**

VALUE (MeV)	DOCUMENT ID	TECN	COMMENT
<b><math>6.4 \pm 2.0^{+5.7}_{-1.9}</math></b>	AAIJ	19W	LHCB $pp$ at 7, 8, 13 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
$39 \pm 5 \pm 19$	<sup>1</sup> AAIJ	15P	LHCB Repl. by AAIJ 19W
<sup>1</sup> Considering $P_c(4440)$ and $P_c(4457)$ as a single resonance.			

 **$P_c(4457)^+$  DECAY MODES**

Mode	Fraction ( $\Gamma_i/\Gamma$ )
$\Gamma_1$ $J/\psi p$	seen

 **$P_c(4457)^+$  BRANCHING RATIOS**

$\Gamma(J/\psi p)/\Gamma_{\text{total}}$				$\Gamma_1/\Gamma$
VALUE	DOCUMENT ID	TECN	COMMENT	
seen	<sup>1</sup> POPOV	21	D0	$p\bar{p}$ at 1.96 TeV
seen	AAIJ	19W	LHCB	$pp$ at 7, 8, 13 TeV

seen

AAIJ

15P LHCb  $pp$  at 7, 8 TeV

<sup>1</sup>Search for  $J/\psi$  inclusive production in association with a charged particle, assumed to be a proton. POPOV 21 observes a resonant signal consistent with a superposition of the  $P_c(4440)^+$  and  $P_c(4457)^+$ , using masses and widths measured by AAIJ 19W, at significance of  $3\sigma$ .

---

### $P_c(4457)^+$ REFERENCES

POPOV	21	PAN 83 1383	A.V. Popov <i>et al.</i>	(D0 Collab.)
AAIJ	19W	PRL 122 222001	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	16AG	PRL 117 082002	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	15P	PRL 115 072001	R. Aaij <i>et al.</i>	(LHCb Collab.)

---