

References

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Table 1: Summary of Λ_c^+ , Σ_c families of charmed baryon excited states. With the exception of the $\Lambda_c^+(2880)$, the J^P assignments are made from theoretical models based on the masses, widths and decay patterns observed

Charmed Baryon Excited State	Mode	Mass (MeV/c ²)	Natural Width (MeV/c ²)	J^P	Status and Comments
$\Lambda_c(2595)^+$	$\Lambda_c^+ \pi^+ \pi^-$, $\Sigma_c \pi$	2592.25 ± 0.28	$2.59 \pm 0.30 \pm 0.47$	$1/2^-$	well established, most precise measurement by CDF [1]
$\Lambda_c(2625)^+$	$\Lambda_c^+ \pi^+ \pi^-$	2628.11 ± 0.19	< 1.9	$3/2^-$	well established, most precise measurements by CDF [1]
$\Lambda_c(2765)^+$	$\Lambda_c^+ \pi^+ \pi^-$, $\Sigma_c \pi$	2766.6 ± 2.4	50	??	discovered by CLEO, seen by Belle, but parameters not measured [2]
$\Lambda_c(2860)^+$	$D^0 p$, $\Sigma_c \pi$,	$2856.1_{-1.7}^{+2.0} \pm 0.5_{-5.6}^{+1.1}$	$67.6_{-8.1}^{+10.1} \pm 1.4_{-20.0}^{+5.9}$	$3/2^+$	Found by LHCb using an amplitude analysis [3]
$\Lambda_c(2880)^+$	$\Lambda_c^+ \pi^+ \pi^-$, $\Sigma_c \pi$,	2881.53 ± 0.35	5.8 ± 1.1	$5/2^+$	well established and seen in more than one mode [2, 4, 5]
$\Lambda_c(2940)^+$	$D^0 p$, $\Sigma_c \pi$	$2939.3_{-1.5}^{+1.4}$	17_{-6}^{+8}	??	Seen by both BaBar [5] and Belle [4]
$\Sigma_c(2455)^{++}$	$\Lambda_c^+ \pi^+$	167.510 ± 0.17	$1.89_{-0.18}^{+0.09}$	$1/2^+$	well established, most precise measurements by Belle [6]
$\Sigma_c(2455)^+$	$\Lambda_c^+ \pi^+$	166.4 ± 0.4	< 4.6 @ 90% CL	$1/2^+$	well established, but parameters not measured precisely
$\Sigma_c(2455)^0$	$\Lambda_c^+ \pi^+$	167.29 ± 0.17	$1.83_{-0.19}^{+0.11}$	$1/2^+$	well established, most precise measurements by Belle [6]
$\Sigma_c(2520)^{++}$	$\Lambda_c^+ \pi^+$	$231.95_{-0.12}^{+0.17}$	$14.78 \pm 0.30_{-0.40}$	$3/2^+$	well established, most precise measurements by Belle [6]
$\Sigma_c(2520)^+$	$\Lambda_c^+ \pi^+$	231.0 ± 2.3	< 17 @ 90% CL	$3/2^+$	fairly well established, awaits precise measurement
$\Sigma_c(2520)^0$	$\Lambda_c^+ \pi^+$	$232.02_{-0.14}^{+0.15}$	$15.3_{-0.5}^{+0.4}$	$3/2^+$	well established, most precise measurements by Belle [6]
$\Sigma_c(2800)^{++}$	$\Lambda_c^+ \pi^+$	514_{-6}^{+4}	$75_{-13}^{+18+12}_{-11}$	tentatively identified	observed by Belle [7] - should be confirmed
$\Sigma_c(2800)^+$	$\Lambda_c^+ \pi^0$	505_{-5}^{+15}	$62_{-23}^{+37+52}_{-38}$	as members of the predicted	same states as that below?
$\Sigma_c(2800)^0$	$\Lambda_c^+ \pi^-$	519_{-7}^{+5}	72_{-15}^{+22}	$\Sigma_{c2} 3/2^-$ isospin triplet?	seen by Babar [8] in resonant substructure of B decays - needs confirmation
	$\Lambda_c^+ \pi^-$	$560 \pm 8 \pm 10$	86_{-22}^{+33}		

Table 2: Summary of the Ξ_c and Ω_c^0 families of charmed baryon excited states. The J^P assignments are made from theoretical models based on the masses, widths and decay patterns observed

Charmed Baryon Excited State	Mode	Mass or Mass Difference (MeV/c ²)	Natural Width (MeV/c ²)	J^P	Status and Comments
$\Xi_c^{'+}$	$\Xi_c^+ \gamma$	110.5 ± 0.4		$1/2^+$	well established
Ξ_c^0	$\Xi_c^0 \gamma$	108.3 ± 0.4		$1/2^+$	well established
$\Xi_c(2645)^+$	$\Xi_c^0 \pi^+$	178.5 ± 0.1	2.1 ± 0.2	$3/2^+$	well established, widths measured by Belle [9]
$\Xi_c(2645)^0$	$\Xi_c^+ \pi^-$	174.7 ± 0.1	2.4 ± 0.2	$3/2^+$	
$\Xi_c(2790)^+$	$\Xi_c^0 \pi^+$	320.7 ± 0.5	9 ± 1	$1/2^-$	well established, widths measured by Belle [9]
$\Xi_c(2790)^0$	$\Xi_c^+ \pi^-$	323.8 ± 0.5	10 ± 1	$1/2^-$	
$\Xi_c(2815)^+$	$\Xi_c(2645)^0 \pi^+, \Xi_c^0 \pi^+$	348.8 ± 0.1	2.43 ± 0.23	$3/2^-$	well established, widths measured by Belle [9]
$\Xi_c(2815)^0$	$\Xi_c(2645)^+ \pi^-, \Xi_c^+ \pi^-, \Xi_c^0 \gamma$	349.4 ± 0.1	2.54 ± 0.23	$3/2^-$	electromagnetic decays recently seen [10]
$\Xi_c(2923)^0$	$\Lambda_c^+ K^-$	2923.04 ± 0.35	7.1 ± 2.0		large signal seen by LHCb [11]
$\Xi_c(2930)^+$	$\Lambda_c^+ K_S^0$	$2942.3 \pm 4.4 \pm 1.5$	$14.8 \pm 8.8 \pm 2.5$??	“evidence” recently reported by Belle [12]
$\Xi_c(2930)^0$	$\Lambda_c^+ K^-$	$2928.9 \pm 3.0^{+0.9}_{-12.0}$	$19.5 \pm 8.4^{+5.9}_{-7.9}$??	originally reported by BaBar [14], confirmed by Belle [13] possibly comprising an overlap of $\Xi_c(2923)$ and $\Xi_c(2939)$
$\Xi_c(2939)^0$	$\Lambda_c^+ K^-$	2938.55 ± 0.30	10.2 ± 1.4		large signal seen by LHCb [11]
$\Xi_c(2939)^0$	$\Lambda_c^+ K^-$	2964.88 ± 0.33	14.1 ± 1.6		large signal seen by LHCb [11]
$\Xi_c(2970)^+$	$\Lambda_c^+ K^- \pi^+, \Sigma_c^{++} K^-, \Xi_c(2645)^0 \pi^+$	2967.2 ± 0.8	21 ± 3	??	well established, but parameters in different modes and experiments differ.
$\Xi_c(2970)^0$	$\Xi_c(2645)^+ \pi^-$	2970.4 ± 0.8	28 ± 3	??	mass very close to $\Xi_c(2965)$
$\Xi_c(3055)^+$	$\Sigma_c^{++} K^-, AD$	3055.7 ± 0.4	8.0 ± 1.9	??	seen by Belle and BaBar [15–17]
$\Xi_c(3055)^0$	AD	3059.0 ± 0.8	6.2 ± 2.4	??	observed by Belle [17]
$\Xi_c(3080)^+$	$\Lambda_c^+ K^- \pi^+, \Sigma_c^{++} K^-, \Sigma_c(2520)^{++} K^-, AD$	3077.8 ± 0.3	3.6 ± 0.7	??	seen by Belle and BaBar [15–18]
$\Xi_c(3080)^0$	$\Lambda_c^+ K_S^0 \pi^-, \Sigma_c^0 K_S^0, \Sigma_c(2520)^0 K_S^0$	3079.9 ± 1.0	5.6 ± 2.2	??	seen by Belle and BaBar [15, 17, 18]
$\Omega_c(2770)^0$	$\Omega_c^0 \gamma$	2765.9 ± 2.0	0	$3/2^+$	seen by BaBar [19] and Belle [20]
$\Omega_c(3000)^0$	$\Xi_c^+ K^-$	$3000.4 \pm 0.2 \pm 0.1^{+0.3}_{-0.5}$	$4.5 \pm 0.6 \pm 0.3$??	Found by LHCb [21]
$\Omega_c(3050)^0$	$\Xi_c^+ K^-$	$3050.2 \pm 0.1 \pm 0.1^{+0.3}_{-0.5}$	$< 1.2, 95\%CL$??	Found by LHCb [21]
$\Omega_c(3066)^0$	$\Xi_c^+ K^-$	$3065.6 \pm 0.1 \pm 0.3^{+0.3}_{-0.5}$	$3.5 \pm 0.4 \pm 0.2$??	Found by LHCb [21]
$\Omega_c(3090)^0$	$\Xi_c^+ K^-$	$3090.2 \pm 0.3 \pm 0.5^{+0.3}_{-0.5}$	$8.7 \pm 1.0 \pm 0.8$??	Found by LHCb [21]
$\Omega_c(3119)^0$	$\Xi_c^+ K^-$	$3119.1 \pm 0.3 \pm 0.9^{+0.3}_{-0.5}$	$1.1 \pm 0.8 \pm 0.4$??	Found by LHCb [21]
$\Omega_c(3118)^0$	$\Xi_c^+ K^-$	$3188 \pm 5 \pm 13$	$60 \pm 15 \pm 11$??	Reported by LHCb [21] but requires confirmation