CHARMED BARYONS ($C = +1$)

$\Lambda_c^+ = u\,d\,c$, $\Sigma_c^{++} = u\,u\,c$, $\Sigma_c^+ = u\,d\,c$, $\Sigma_c^0 = d\,d\,c$,
$\Xi_c^+ = u\,s\,c$, $\Xi_c^0 = d\,s\,c$, $\Omega_c^0 = s\,s\,c$

Λ_c^+

$I(J^P) = 0(\frac{1}{2}^+)$

J is not well measured; $\frac{1}{2}$ is the quark-model prediction.

Mass $m = 2284.9 \pm 0.6$ MeV
Mean life $\tau = (0.206 \pm 0.012) \times 10^{-12}$ s
$c\tau = 61.8$ μm

Decay asymmetry parameters

$\Lambda\pi^+$	$\alpha = -0.98 \pm 0.19$
$\Sigma^+\pi^0$	$\alpha = -0.45 \pm 0.32$
$\Lambda\ell^+\nu_\ell$	$\alpha = -0.82^{+0.11}_{-0.07}$

Nearly all branching fractions of the Λ_c^+ are measured relative to the $pK^-\pi^+$ mode, but there are no model-independent measurements of this branching fraction. We explain how we arrive at our value of B($\Lambda_c^+ \to pK^-\pi^+$) in a Note at the beginning of the branching-ratio measurements in the Listings. When this branching fraction is eventually well determined, all the other branching fractions will slide up or down proportionally as the true value differs from the value we use here.

Λ_c^+ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Hadronic modes with a p and one $\overline{K}$				
$p\overline{K}^0$		(2.3 ± 0.6) %		872
$pK^-\pi^+$	[l]	(5.0 ± 1.3) %		822
$p\overline{K}^*(892)^0$	[m]	(1.6 ± 0.5) %		681
$\Delta(1232)^{++}K^-$		$(8.6 \pm 3.0) \times 10^{-3}$		709
$\Lambda(1520)\pi^+$	[m]	$(5.9 \pm 2.1) \times 10^{-3}$		626
$pK^-\pi^+$ nonresonant		(2.8 ± 0.8) %		822
$p\overline{K}^0\pi^0$		(3.3 ± 1.0) %		822
$p\overline{K}^0\eta$		(1.2 ± 0.4) %		567

$p\overline{K}^0\pi^+\pi^-$		$(2.6 \pm 0.7)\%$		753
$pK^-\pi^+\pi^0$		$(3.4 \pm 1.0)\%$		758
$pK^*(892)^-\pi^+$	[m]	$(1.1 \pm 0.5)\%$		579
$p(K^-\pi^+)_{\text{nonresonant}}\pi^0$		$(3.6 \pm 1.2)\%$		758
$\Delta(1232)\overline{K}^*(892)$		seen		416
$pK^-\pi^+\pi^+\pi^-$		$(1.1 \pm 0.8)\times 10^{-3}$		670
$pK^-\pi^+\pi^0\pi^0$		$(8 \pm 4)\times 10^{-3}$		676
$pK^-\pi^+\pi^0\pi^0\pi^0$		$(5.0 \pm 3.4)\times 10^{-3}$		573

Hadronic modes with a p and zero or two K's

$p\pi^+\pi^-$		$(3.5 \pm 2.0)\times 10^{-3}$		926
$pf_0(980)$	[m]	$(2.8 \pm 1.9)\times 10^{-3}$		621
$p\pi^+\pi^+\pi^-\pi^-$		$(1.8 \pm 1.2)\times 10^{-3}$		851
pK^+K^-		$(2.3 \pm 0.9)\times 10^{-3}$		615
$p\phi$	[m]	$(1.2 \pm 0.5)\times 10^{-3}$		589

Hadronic modes with a hyperon

$\Lambda\pi^+$		$(9.0 \pm 2.8)\times 10^{-3}$		863
$\Lambda\pi^+\pi^0$		$(3.6 \pm 1.3)\%$		843
$\Lambda\rho^+$		$< 5\%$	CL=95%	638
$\Lambda\pi^+\pi^+\pi^-$		$(3.3 \pm 1.0)\%$		806
$\Lambda\pi^+\eta$		$(1.8 \pm 0.6)\%$		690
$\Sigma(1385)^+\eta$	[m]	$(8.5 \pm 3.3)\times 10^{-3}$		569
$\Lambda K^+\overline{K}^0$		$(6.0 \pm 2.1)\times 10^{-3}$		441
$\Sigma^0\pi^+$		$(9.9 \pm 3.2)\times 10^{-3}$		824
$\Sigma^+\pi^0$		$(1.00 \pm 0.34)\%$		826
$\Sigma^+\eta$		$(5.5 \pm 2.3)\times 10^{-3}$		712
$\Sigma^+\pi^+\pi^-$		$(3.4 \pm 1.0)\%$		803
$\Sigma^+\rho^0$		$< 1.4\%$	CL=95%	578
$\Sigma^-\pi^+\pi^+$		$(1.8 \pm 0.8)\%$		798
$\Sigma^0\pi^+\pi^0$		$(1.8 \pm 0.8)\%$		802
$\Sigma^0\pi^+\pi^+\pi^-$		$(1.1 \pm 0.4)\%$		762
$\Sigma^+\pi^+\pi^-\pi^0$		—		766
$\Sigma^+\omega$	[m]	$(2.7 \pm 1.0)\%$		568
$\Sigma^+\pi^+\pi^+\pi^-\pi^-$		$(3.0^{+4.1}_{-2.1})\times 10^{-3}$		707
$\Sigma^+K^+K^-$		$(3.5 \pm 1.2)\times 10^{-3}$		346
$\Sigma^+\phi$	[m]	$(3.5 \pm 1.7)\times 10^{-3}$		292
$\Sigma^+K^+\pi^-$		$(7^{+6}_{-4})\times 10^{-3}$		668
Ξ^0K^+		$(3.9 \pm 1.4)\times 10^{-3}$		652
$\Xi^-K^+\pi^+$		$(4.9 \pm 1.7)\times 10^{-3}$		564
$\Xi(1530)^0K^+$	[m]	$(2.6 \pm 1.0)\times 10^{-3}$		471

Semileptonic modes				
$\Lambda \ell^+ \nu_\ell$	[n]	(2.0 ± 0.6) %		–
$\Lambda e^+ \nu_e$		(2.1 ± 0.6) %		870
$\Lambda \mu^+ \nu_\mu$		(2.0 ± 0.7) %		866
Inclusive modes				
e^+ anything		(4.5 ± 1.7) %		–
$p e^+$ anything		(1.8 ± 0.9) %		–
p anything		(50 ±16) %		–
p anything (no Λ)		(12 ±19) %		–
n anything		(50 ±16) %		–
n anything (no Λ)		(29 ±17) %		–
Λ anything		(35 ±11) %	S=1.4	–
$\Sigma^\pm$ anything	[o]	(10 ± 5) %		–
$\Delta C = 1$ weak neutral current (*C1*) modes, or Lepton number (*L*) violating modes				
$p \mu^+ \mu^-$	*C1*	$< 3.4 \times 10^{-4}$	CL=90%	936
$\Sigma^- \mu^+ \mu^+$	*L*	$< 7.0 \times 10^{-4}$	CL=90%	811

$\Lambda_c(2593)^+$

$I(J^P) = 0(\frac{1}{2}^-)$

The spin-parity follows from the fact that $\Sigma_c(2455)\pi$ decays, with little available phase space, are dominant.

Mass $m = 2593.9 \pm 0.8$ MeV

$m - m_{\Lambda_c^+} = 308.9 \pm 0.6$ MeV (S = 1.1)

Full width $\Gamma = 3.6^{+2.0}_{-1.3}$ MeV

$\Lambda_c^+ \pi\pi$ and its submode $\Sigma_c(2455)\pi$ — the latter just barely — are the only strong decays allowed to an excited Λ_c^+ having this mass; and the submode seems to dominate.

$\Lambda_c(2593)^+$ DECAY MODES		Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \pi^+ \pi^-$	[p]	≈ 67 %	124
$\Sigma_c(2455)^{++} \pi^-$		24 ± 7 %	17
$\Sigma_c(2455)^0 \pi^+$		24 ± 7 %	23
$\Lambda_c^+ \pi^+ \pi^-$ 3-body		18 ± 10 %	124
$\Lambda_c^+ \pi^0$		not seen	261
$\Lambda_c^+ \gamma$		not seen	290

$\Lambda_c(2625)^+$

$I(J^P) = 0(\frac{3}{2}^-)$

J^P has not been measured; $\frac{3}{2}^-$ is the quark-model prediction.

Mass $m = 2626.6 \pm 0.8$ MeV (S = 1.2)
$m - m_{\Lambda_c^+} = 341.7 \pm 0.6$ MeV (S = 1.6)
Full width $\Gamma < 1.9$ MeV, CL = 90%

$\Lambda_c^+ \pi\pi$ and its submode $\Sigma(2455)\pi$ are the only strong decays allowed to an excited Λ_c^+ having this mass.

$\Lambda_c(2625)^+$ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda_c^+ \pi^+ \pi^-$	[p]	$\approx 67\%$		184
$\Sigma_c(2455)^{++} \pi^-$		<5	90%	100
$\Sigma_c(2455)^0 \pi^+$		<5	90%	101
$\Lambda_c^+ \pi^+ \pi^-$ 3-body		large		184
$\Lambda_c^+ \pi^0$		not seen		293
$\Lambda_c^+ \gamma$		not seen		319

$\Sigma_c(2455)$

$I(J^P) = 1(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

$\Sigma_c(2455)^{++}$ mass $m = 2452.8 \pm 0.6$ MeV
$\Sigma_c(2455)^{+}$ mass $m = 2453.6 \pm 0.9$ MeV
$\Sigma_c(2455)^{0}$ mass $m = 2452.2 \pm 0.6$ MeV
$m_{\Sigma_c^{++}} - m_{\Lambda_c^+} = 167.87 \pm 0.19$ MeV
$m_{\Sigma_c^{+}} - m_{\Lambda_c^+} = 168.7 \pm 0.6$ MeV
$m_{\Sigma_c^{0}} - m_{\Lambda_c^+} = 167.30 \pm 0.20$ MeV
$m_{\Sigma_c^{++}} - m_{\Sigma_c^0} = 0.57 \pm 0.23$ MeV
$m_{\Sigma_c^{+}} - m_{\Sigma_c^0} = 1.4 \pm 0.6$ MeV

$\Lambda_c^+ \pi$ is the only strong decay allowed to a Σ_c having this mass.

$\Sigma_c(2455)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \pi$	≈ 100 %	90

$\Sigma_c(2520)$

$I(J^P) = 1(\frac{3}{2}^+)$

J^P has not been measured; $\frac{3}{2}^+$ is the quark-model prediction.

$\Sigma_c(2520)^{++}$ mass $m = 2519.4 \pm 1.5$ MeV
$\Sigma_c(2520)^0$ mass $m = 2517.5 \pm 1.4$ MeV
$m_{\Sigma_c(2520)^{++}} - m_{\Lambda_c^+} = 234.5 \pm 1.4$ MeV
$m_{\Sigma_c(2520)^0} - m_{\Lambda_c^+} = 232.6 \pm 1.3$ MeV
$m_{\Sigma_c(2520)^{++}} - m_{\Sigma_c(2520)^0} = 1.9 \pm 1.7$ MeV
$\Sigma_c(2520)^{++}$ full width $\Gamma = 18 \pm 5$ MeV
$\Sigma_c(2520)^0$ full width $\Gamma = 13 \pm 5$ MeV

$\Lambda_c^+ \pi$ is the only strong decay allowed to a Σ_c having this mass.

$\Sigma_c(2520)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \pi$	≈ 100 %	180

Ξ_c^+

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2466.3 \pm 1.4$ MeV
Mean life $\tau = (0.33^{+0.06}_{-0.04}) \times 10^{-12}$ s
$c\tau = 98$ μm

No absolute branching fractions have been measured. The following are branching *ratios* relative to $\Xi^- \pi^+ \pi^+$.

Ξ_c^+ DECAY MODES		Fraction (Γ_i/Γ)	Confidence level	p (MeV/c)
$\Lambda K^- \pi^+ \pi^+$	[q]	0.58 ± 0.18		785
$\Lambda \overline{K}^*(892)^0 \pi^+$	[m,q]	<0.29	90%	603
$\Sigma(1385)^+ K^- \pi^+$	[m,q]	<0.41	90%	677
$\Sigma^+ K^- \pi^+$	[q]	1.18 ± 0.31		809
$\Sigma^+ \overline{K}^*(892)^0$	[m,q]	0.92 ± 0.30		654
$\Sigma^0 K^- \pi^+ \pi^+$	[q]	0.49 ± 0.26		734

$\Xi^0 \pi^+$	[q]	0.55 ± 0.16		876
$\Xi^- \pi^+ \pi^+$	[q]	$\equiv 1.0$		850
$\quad\Xi(1530)^0 \pi^+$	[m,q]	<0.2	90%	749
$\Xi^0 \pi^+ \pi^0$	[q]	2.34 ± 0.68		855
$\Xi^0 \pi^+ \pi^+ \pi^-$	[q]	1.74 ± 0.50		817
$\Xi^0 e^+ \nu_e$	[q]	$2.3\ ^{+0.7}_{-0.9}$		883
$p K^- \pi^+$	[q]	0.20 ± 0.05		–

Ξ_c^0

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2471.8 \pm 1.4$ MeV

$m_{\Xi_c^0} - m_{\Xi_c^+} = 5.5 \pm 1.8$ MeV

Mean life $\tau = (0.098^{+0.023}_{-0.015}) \times 10^{-12}$ s

$c\tau = 29$ μm

Ξ_c^0 DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda \overline{K}^0$	seen	907
$\Lambda \overline{K}^0 \pi^+ \pi^-$	seen	788
$\Lambda K^- \pi^+ \pi^+ \pi^-$	seen	704
$\Xi^- \pi^+$	seen	876
$\Xi^- \pi^+ \pi^+ \pi^-$	seen	817
$p K^- \overline{K}^*(892)^0$	seen	408
$\Omega^- K^+$	seen	523
$\Xi^- e^+ \nu_e$	seen	883
$\Xi^- \ell^+$ anything	seen	–

$\Xi_c^{\prime +}$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2574.1 \pm 3.3$ MeV

$m_{\Xi_c^{\prime +}} - m_{\Xi_c^+} = 107.8 \pm 3.0$ MeV

The $\Xi_c^{\prime +}$–Ξ_c^+ mass difference is too small for any strong decay to occur.

$\Xi_c^{\prime +}$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^+ \gamma$	seen	106

$\Xi_c'^0$

$I(J^P) = \frac{1}{2}(\frac{1}{2}^+)$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2578.8 \pm 3.2$ MeV
$m_{\Xi_c'^0} - m_{\Xi_c^0} = 107.0 \pm 2.9$ MeV

The $\Xi_c'^0 - \Xi_c^0$ mass difference is too small for any strong decay to occur.

$\Xi_c'^0$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^0 \gamma$	seen	105

$\Xi_c(2645)$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^+)$

J^P has not been measured; $\frac{3}{2}^+$ is the quark-model prediction.

$\Xi_c(2645)^+$ mass $m = 2647.4 \pm 2.0$ MeV (S = 1.2)
$\Xi_c(2645)^0$ mass $m = 2644.5 \pm 1.8$ MeV
$m_{\Xi_c(2645)^+} - m_{\Xi_c^0} = 175.6 \pm 1.4$ MeV (S = 1.7)
$m_{\Xi_c(2645)^0} - m_{\Xi_c^+} = 178.2 \pm 1.1$ MeV
$\Xi_c(2645)^+$ full width $\Gamma < 3.1$ MeV, CL = 90%
$\Xi_c(2645)^0$ full width $\Gamma < 5.5$ MeV, CL = 90%

$\Xi_c \pi$ is the only strong decay allowed to a Ξ_c resonance having this mass.

$\Xi_c(2645)$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^0 \pi^+$	seen	103
$\Xi_c^+ \pi^-$	seen	107

$\Xi_c(2815)$

$I(J^P) = \frac{1}{2}(\frac{3}{2}^-)$

J^P has not been measured; $\frac{3}{2}^-$ is the quark-model prediction.

$\Xi_c(2815)^+$ mass $m = 2814.9 \pm 1.8$ MeV
$\Xi_c(2815)^0$ mass $m = 2819.0 \pm 2.5$ MeV
$m_{\Xi_c(2815)^+} - m_{\Xi_c^+} = 348.6 \pm 1.2$ MeV
$m_{\Xi_c(2815)^0} - m_{\Xi_c^0} = 347.2 \pm 2.1$ MeV
$\Xi_c(2815)^+$ full width $\Gamma < 3.5$ MeV, CL = 90%
$\Xi_c(2815)^0$ full width $\Gamma < 6.5$ MeV, CL = 90%

The $\Xi_c \pi\pi$ modes are consistent with being entirely via $\Xi_c(2645)\pi$.

Ξ_c(2815) DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Xi_c^+ \pi^+ \pi^-$	seen	196
$\Xi_c^0 \pi^+ \pi^-$	seen	193

Ω_c^0

$$I(J^P) = 0(\tfrac{1}{2}^+)$$

J^P has not been measured; $\frac{1}{2}^+$ is the quark-model prediction.

Mass $m = 2704 \pm 4$ MeV (S = 1.8)
Mean life $\tau = (0.064 \pm 0.020) \times 10^{-12}$ s
$c\tau = 19$ μm

Ω_c^0 DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Sigma^+ K^- K^- \pi^+$	seen	697
$\Xi^- K^- \pi^+ \pi^+$	seen	838
$\Omega^- \pi^+$	seen	827
$\Omega^- \pi^- \pi^+ \pi^+$	seen	759