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 not confirmed; $\frac{1}{2}$ 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
$c\tau = 61.8\ \mu$m

Decay asymmetry parameters

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

Λ_c^+ DECAY MODES		Fraction (Γ_i/Γ)	Scale factor/ Confidence level	p (MeV/c)
Hadronic modes with a p and one $\overline{K}$				
$p\overline{K}^0$		$(2.2 \pm 0.4)\%$		872
$pK^-\pi^+$		$(4.4 \pm 0.6)\%$		822
$p\overline{K}^*(892)^0$	[k]	$(1.6 \pm 0.4)\%$		681
$\Delta(1232)^{++}K^-$		$(7 \pm 4) \times 10^{-3}$		709
$\Lambda(1520)\pi^+$	[k]	$(4.0\ ^{+\ 2.0}_{-\ 1.7}) \times 10^{-3}$		626
$pK^-\pi^+$ nonresonant		$(2.5\ ^{+\ 0.5}_{-\ 0.6})\%$		822
$p\overline{K}^0\eta$		$(1.10 \pm 0.29)\%$		567
$p\overline{K}^0\pi^+\pi^-$		$(2.1 \pm 0.8)\%$		753
$pK^-\pi^+\pi^0$		seen		758
$pK^*(892)^-\pi^+$	[k]	$(9 \pm 5) \times 10^{-3}$		579
$p(K^-\pi^+)_{\text{nonresonant}}\pi^0$		$(3.2 \pm 0.7)\%$		758
$\Delta(1232)\overline{K}^*(892)$		seen		416
$pK^-\pi^+\pi^+\pi^-$		$(10 \pm 7) \times 10^{-4}$		670
$pK^-\pi^+\pi^0\pi^0$		$(7.0 \pm 3.5) \times 10^{-3}$		676
$pK^-\pi^+\pi^0\pi^0\pi^0$		$(4.4 \pm 2.8) \times 10^{-3}$		573

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

$p\pi^+\pi^-$		$(3.0 \pm 1.6) \times 10^{-3}$		926
$p f_0(980)$	[k]	$(2.4 \pm 1.6) \times 10^{-3}$		621
$p\pi^+\pi^+\pi^-\pi^-$		$(1.6 \pm 1.0) \times 10^{-3}$		851
pK^+K^-		$(2.0 \pm 0.6) \times 10^{-3}$		615
$p\phi$	[k]	$(1.06 \pm 0.33) \times 10^{-3}$		589

Hadronic modes with a hyperon

$\Lambda\pi^+$		$(7.9 \pm 1.8) \times 10^{-3}$		863
$\Lambda\pi^+\pi^0$		(3.2 ± 0.9) %		843
$\Lambda\rho^0$		< 4 %	CL=95%	638
$\Lambda\pi^+\pi^+\pi^-$		(2.9 ± 0.6) %		806
$\Lambda\pi^+\eta$		(1.5 ± 0.4) %		690
$\Sigma(1385)^+\eta$	[k]	$(7.5 \pm 2.4) \times 10^{-3}$		569
$\Lambda K^+\overline{K}^0$		$(5.3 \pm 1.4) \times 10^{-3}$		441
$\Sigma^0\pi^+$		$(8.8 \pm 2.0) \times 10^{-3}$		824
$\Sigma^+\pi^0$		$(8.8 \pm 2.2) \times 10^{-3}$		826
$\Sigma^+\eta$		$(4.8 \pm 1.7) \times 10^{-3}$		712
$\Sigma^+\pi^+\pi^-$		(3.0 ± 0.6) %		803
$\Sigma^+\rho^0$		< 1.2 %	CL=95%	578
$\Sigma^-\pi^+\pi^+$		(1.6 ± 0.6) %		798
$\Sigma^0\pi^+\pi^0$		(1.6 ± 0.6) %		802
$\Sigma^0\pi^+\pi^+\pi^-$		$(9.2 \pm 3.4) \times 10^{-3}$		762
$\Sigma^+\pi^+\pi^-\pi^0$				766
$\Sigma^+\omega$	[k]	(2.4 ± 0.7) %		568
$\Sigma^+\pi^+\pi^+\pi^-\pi^-$		$(2.6\ ^{+3.5}_{-1.8}) \times 10^{-3}$		707
$\Sigma^+K^+K^-$		$(3.1 \pm 0.8) \times 10^{-3}$		346
$\Sigma^+\phi$	[k]	$(3.0 \pm 1.3) \times 10^{-3}$		292
$\Sigma^+K^+\pi^-$		$(5.7\ ^{+5.3}_{-3.2}) \times 10^{-3}$		668
Ξ^0K^+		$(3.4 \pm 0.9) \times 10^{-3}$		652
$\Xi^-K^+\pi^+$		$(4.3 \pm 1.1) \times 10^{-3}$		564
$\Xi(1530)^0K^+$	[k]	$(2.3 \pm 0.7) \times 10^{-3}$		471

Semileptonic modes

$\Lambda\ell^+\nu_\ell$	[l]	(2.3 ± 0.5) %		–
e^+ anything		(4.5 ± 1.7) %		–
pe^+ anything		(1.8 ± 0.9) %		–
Λe^+ anything		(1.6 ± 0.6) %		–
$\Lambda\mu^+$ anything		(1.5 ± 0.9) %		–

Inclusive modes

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	[m]	(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

$\boxed{\Lambda_c(2593)^+}$

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

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

Mass $m = 2593.6 \pm 1.0$ MeV (S = 1.2)
$m - m_{\Lambda_c^+} = 308.6 \pm 0.8$ MeV (S = 1.3)
Full width $\Gamma = 3.9^{+2.4}_{-1.6}$ MeV

$\Lambda_c^+ \pi\pi$ and $\Sigma_c(2455)\pi$ — the latter just barely — are the only strong decays allowed to an excited Λ_c^+ having this mass; and the $\Lambda_c^+ \pi^+ \pi^-$ mode seems to be largely via $\Sigma_c^{++} \pi^-$ or $\Sigma_c^0 \pi^+$.

$\Lambda_c(2593)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \pi^+ \pi^-$	seen	124
$\Sigma_c(2455)^{++} \pi^-$	large	17
$\Sigma_c(2455)^0 \pi^+$	large	23
$\Lambda_c^+ \pi^+ \pi^-$ 3-body	small	124
$\Lambda_c^+ \pi^0$	not seen	261
$\Lambda_c^+ \gamma$	not seen	290

$\Lambda_c(2625)^+$

$I(J^P) = 0(?^?)$

J^P is expected to be $3/2^-$.

Mass $m = 2626.4 \pm 0.9$ MeV (S = 1.3)
$m - m_{\Lambda_c^+} = 341.5 \pm 0.8$ MeV (S = 1.9)
Full width $\Gamma < 1.9$ MeV, CL = 90%

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

$\Lambda_c(2625)^+$ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda_c^+ \pi^+ \pi^-$	seen	184
$\Sigma_c(2455)^{++} \pi^-$	small	100
$\Sigma_c(2455)^0 \pi^+$	small	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 not confirmed; $\frac{1}{2}^+$ is the quark model prediction.

$\Sigma_c(2455)^{++}$ mass $m = 2452.9 \pm 0.6$ MeV
$\Sigma_c(2455)^+$ mass $m = 2453.5 \pm 0.9$ MeV
$\Sigma_c(2455)^0$ mass $m = 2452.1 \pm 0.7$ MeV
$m_{\Sigma_c^{++}} - m_{\Lambda_c^+} = 167.95 \pm 0.25$ MeV
$m_{\Sigma_c^+} - m_{\Lambda_c^+} = 168.5 \pm 0.7$ MeV (S = 1.1)
$m_{\Sigma_c^0} - m_{\Lambda_c^+} = 167.2 \pm 0.4$ MeV (S = 1.1)
$m_{\Sigma_c^{++}} - m_{\Sigma_c^0} = 0.79 \pm 0.33$ MeV (S = 1.2)
$m_{\Sigma_c^+} - m_{\Sigma_c^0} = 1.4 \pm 0.6$ 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

Ξ_c^+

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

$I(J^P)$ not confirmed; $\frac{1}{2}(\frac{1}{2}^+)$ is the quark model prediction.

Mass $m = 2465.6 \pm 1.4$ MeV
Mean life $\tau = (0.35^{+0.07}_{-0.04}) \times 10^{-12}$ s
$c\tau = 106$ μm

Ξ_c^+ DECAY MODES	Fraction (Γ_i/Γ)	p (MeV/c)
$\Lambda K^- \pi^+ \pi^+$	seen	784
$\Lambda \overline{K}^*(892)^0 \pi^+$	not seen	601
$\Sigma(1385)^+ K^- \pi^+$	not seen	676
$\Sigma^+ K^- \pi^+$	seen	808
$\Sigma^+ \overline{K}^*(892)^0$	seen	653
$\Sigma^0 K^- \pi^+ \pi^+$	seen	733
$\Xi^0 \pi^+$	seen	875
$\Xi^- \pi^+ \pi^+$	seen	850
$\Xi(1530)^0 \pi^+$	not seen	748
$\Xi^0 \pi^+ \pi^0$	seen	854
$\Xi^0 \pi^+ \pi^+ \pi^-$	seen	817
$\Xi^0 e^+ \nu_e$	seen	882

Ξ_c^0

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

$I(J^P)$ not confirmed; $\frac{1}{2}(\frac{1}{2}^+)$ is the quark model prediction.

Mass $m = 2470.3 \pm 1.8$ MeV (S = 1.3)
$m_{\Xi_c^0} - m_{\Xi_c^+} = 4.7 \pm 2.1$ MeV (S = 1.2)
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	864
$\Xi^- \pi^+$	seen	875
$\Xi^- \pi^+ \pi^+ \pi^-$	seen	816
$p K^- \overline{K}^*(892)^0$	seen	406
$\Omega^- K^+$	seen	522
$\Xi^- e^+ \nu_e$	seen	882
$\Xi^- \ell^+$ anything	seen	–

$\Xi_c(2645)$

$I(J^P) = ?(?^?)$

Mass $m = 2643.8 \pm 1.8$ MeV
$m_{\Xi_c(2645)^0} - m_{\Xi_c^+} = 178.2 \pm 1.1$ MeV
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)
$\Xi_c^+ \pi^-$	seen	107

Ω_c^0

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

$I(J^P)$ not confirmed; $0(\frac{1}{2}^+)$ 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