



$$I(J^P) = \frac{1}{2}(\frac{1}{2}^+) \text{ Status: } ***$$

Neither of J or P has actually been measured.

Ξ_c^+ MASS

The fit uses the Ξ_c^+ and Ξ_c^0 mass and mass-difference measurements.

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
2467.71 ± 0.23 OUR FIT	Error includes scale factor of 1.3.			
2467.95 ± 0.19 OUR AVERAGE				
2467.97 ± 0.14 ± 0.17	3.8k	¹ AAIJ	14Z	LHCB pp at 7, 8 TeV
2468.00 ± 0.18 ± 0.51	5.1k	AALTONEN	14B	CDF $p\bar{p}$ at 1.96 TeV
2468.1 ± 0.4 ⁺ 0.2 - 1.4	4.9k	² LESIAK	05	BELL e^+e^- , $\Upsilon(4S)$
2465.8 ± 1.9 ± 2.5	90	FRABETTI	98	E687 γ Be, $\bar{E}_\gamma = 220$ GeV
2467.0 ± 1.6 ± 2.0	147	EDWARDS	96	CLE2 $e^+e^- \approx \Upsilon(4S)$
2465.1 ± 3.6 ± 1.9	30	ALBRECHT	90F	ARG e^+e^- at $\Upsilon(4S)$
2467 ± 3 ± 4	23	ALAM	89	CLEO e^+e^- 10.6 GeV
2466.5 ± 2.7 ± 1.2	5	BARLAG	89C	ACCM π^- Cu 230 GeV
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
2464.4 ± 2.0 ± 1.4	30	FRABETTI	93B	E687 See FRABETTI 98
2459 ± 5 ± 30	56	³ COTEUS	87	SPEC $nA \simeq 600$ GeV
2460 ± 25	82	BIAGI	83	SPEC Σ^- Be 135 GeV

¹AAIJ 14Z systematic error includes in quadrature the 0.14 MeV uncertainty from the $m(\Lambda_c^+)$ mass value.

²The systematic error was (wrongly) given the other way round in LESIAK 05; see the erratum.

³Although COTEUS 87 claims to agree well with BIAGI 83 on the mass and width, there appears to be a discrepancy between the two experiments. BIAGI 83 sees a single peak (stated significance about 6 standard deviations) in the $\Lambda K^- \pi^+ \pi^+$ mass spectrum. COTEUS 87 sees *two* peaks in the same spectrum, one at the Ξ_c^+ mass, the other 75 MeV lower. The latter is attributed to $\Xi_c^+ \rightarrow \Sigma^0 K^- \pi^+ \pi^+ \rightarrow (\Lambda \gamma) K^- \pi^+ \pi^+$, with the γ unseen. The *combined* significance of the double peak is stated to be 5.5 standard deviations. But the absence of any trace of a lower peak in BIAGI 83 seems to us to throw into question the interpretation of the lower peak of COTEUS 87.

Ξ_c^+ MEAN LIFE

VALUE (10^{-15} s)	EVTS	DOCUMENT ID	TECN	COMMENT
456 ± 5 OUR AVERAGE				
457 ± 5 ± 3	56k	¹ AAIJ	19AG	LHCB $\Xi_c^+ \rightarrow p K^- \pi^+$
503 ± 47 ± 18	250	MAHMOOD	02	CLE2 $e^+e^- \approx \Upsilon(4S)$
439 ± 22 ± 9	532	LINK	01D	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
340 ⁺ 70 - 50 ± 20	56	FRABETTI	98	E687 γ Be, $\bar{E}_\gamma = 220$ GeV
400 ⁺ 180 - 120 ± 100	102	COTEUS	87	SPEC $nA \simeq 600$ GeV
480 ⁺ 210 + 200 - 150 - 100	53	BIAGI	85C	SPEC Σ^- Be 135 GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

$410_{-80}^{+110} \pm 20$	30	FRABETTI	93B E687	See FRABETTI 98
200_{-60}^{+110}	6	BARLAG	89C ACCM	$\pi^- (K^-)$ Cu 230 GeV

¹AAIJ 19AG reports $[\Xi_C^+ \text{ MEAN LIFE}] / [D^\pm \text{ MEAN LIFE}] = 0.4392 \pm 0.0034 \pm 0.0028$
 which we multiply by our best value $D^\pm \text{ MEAN LIFE} = (1.040 \pm 0.007) \times 10^{-12} \text{ s}$.
 Our first error is their experiment's error and our second error is the systematic error from using our best value.

Ξ_c^+ DECAY MODES

Branching fractions marked with a footnote, e.g. [a], have been corrected for decay modes not observed in the experiments. For example, the sub-mode fraction $\Xi_c^+ \rightarrow \Sigma^+ \bar{K}^*(892)^0$ seen in $\Xi_c^+ \rightarrow \Sigma^+ K^- \pi^+$ has been multiplied up to include $\bar{K}^*(892)^0 \rightarrow \bar{K}^0 \pi^0$ decays.

Mode	Fraction (Γ_i/Γ)	Scale factor/ Confidence level
Cabibbo-favored ($S = -2$) decays		
Γ_1 $p 2K_S^0$	$(2.5 \pm 1.3) \times 10^{-3}$	
Γ_2 $\Lambda \bar{K}^0 \pi^+$	—	
Γ_3 $\Sigma(1385)^+ \bar{K}^0$	[a] $(2.9 \pm 2.0) \%$	
Γ_4 $\Lambda K^- 2\pi^+$	$(9 \pm 4) \times 10^{-3}$	
Γ_5 $\Lambda \bar{K}^*(892)^0 \pi^+$	[a] $< 5 \times 10^{-3}$	CL=90%
Γ_6 $\Sigma(1385)^+ K^- \pi^+$	[a] $< 6 \times 10^{-3}$	CL=90%
Γ_7 $\Sigma^+ K^- \pi^+$	$(2.7 \pm 1.2) \%$	
Γ_8 $\Sigma^+ \bar{K}^*(892)^0$	[a] $(2.3 \pm 1.1) \%$	
Γ_9 $\Sigma^0 K^- 2\pi^+$	$(8 \pm 5) \times 10^{-3}$	
Γ_{10} $\Xi^0 \pi^+$	$(1.6 \pm 0.8) \%$	
Γ_{11} $\Xi^- 2\pi^+$	$(2.9 \pm 1.3) \%$	
Γ_{12} $\Xi(1530)^0 \pi^+$	[a] $< 2.9 \times 10^{-3}$	CL=90%
Γ_{13} $\Xi(1620)^0 \pi^+$	seen	
Γ_{14} $\Xi(1690)^0 \pi^+$	seen	
Γ_{15} $\Xi^0 \pi^+ \pi^0$	$(6.7 \pm 3.5) \%$	
Γ_{16} $\Xi^0 \pi^- 2\pi^+$	$(5.0 \pm 2.6) \%$	
Γ_{17} $\Xi^0 e^+ \nu_e$	$(7 \pm 4) \%$	
Γ_{18} $\Omega^- K^+ \pi^+$	$(2.0 \pm 1.5) \times 10^{-3}$	
Cabibbo-suppressed decays		
Γ_{19} $p K^- \pi^+$	$(6.2 \pm 3.0) \times 10^{-3}$	S=1.5
Γ_{20} $p \bar{K}^*(892)^0$	[a] $(3.3 \pm 1.7) \times 10^{-3}$	
Γ_{21} $\Sigma^+ \pi^+ \pi^-$	$(1.4 \pm 0.8) \%$	
Γ_{22} $\Sigma^- 2\pi^+$	$(5.1 \pm 3.4) \times 10^{-3}$	
Γ_{23} $\Sigma^+ K^+ K^-$	$(4.3 \pm 2.5) \times 10^{-3}$	
Γ_{24} $\Sigma^+ \phi$	[a] $< 3.2 \times 10^{-3}$	CL=90%

$$\Gamma_{25} \quad \Xi(1690)^0 K^+, \Xi^0 \rightarrow \Sigma^+ K^- \quad < 1.3 \quad \times 10^{-3} \quad \text{CL}=90\%$$

$$\Gamma_{26} \quad p\phi(1020) \quad (1.2 \pm 0.6) \times 10^{-4}$$

[a] This branching fraction includes all the decay modes of the final-state resonance.

Ξ_c^+ BRANCHING RATIOS

———— Cabibbo-favored ($S = -2$) decays ————

$$\Gamma(p2K_S^0)/\Gamma(\Xi^- 2\pi^+) \quad \Gamma_1/\Gamma_{11}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.087±0.016±0.014	168 ± 27	LESLIAK	05	BELL $e^+e^-, \Upsilon(4S)$

$$\Gamma(\Sigma(1385)^+ \bar{K}^0)/\Gamma(\Xi^- 2\pi^+) \quad \Gamma_3/\Gamma_{11}$$

Unseen decay modes of the $\Sigma(1385)^+$ are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.00±0.49±0.24	20	LINK	03E	FOCS < 1.72, 90% CL

$$\Gamma(\Lambda K^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+) \quad \Gamma_4/\Gamma_{11}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.323±0.033 OUR AVERAGE				
0.32 ± 0.03 ± 0.02	1177 ± 55	LESLIAK	05	BELL $e^+e^-, \Upsilon(4S)$
0.28 ± 0.06 ± 0.06	58	LINK	03E	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
0.58 ± 0.16 ± 0.07	61	BERGFELD	96	CLE2 $e^+e^- \approx \Upsilon(4S)$

$$\Gamma(\Lambda \bar{K}^*(892)^0 \pi^+)/\Gamma(\Lambda K^- 2\pi^+) \quad \Gamma_5/\Gamma_4$$

Unseen decay modes of the $\bar{K}^*(892)^0$ are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.5	90	BERGFELD	96	CLE2 $e^+e^- \approx \Upsilon(4S)$

$$\Gamma(\Sigma(1385)^+ K^- \pi^+)/\Gamma(\Lambda K^- 2\pi^+) \quad \Gamma_6/\Gamma_4$$

Unseen decay modes of the $\Sigma(1385)^+$ are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.7	90	BERGFELD	96	CLE2 $e^+e^- \approx \Upsilon(4S)$

$$\Gamma(\Sigma^+ K^- \pi^+)/\Gamma(\Xi^- 2\pi^+) \quad \Gamma_7/\Gamma_{11}$$

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.94±0.10 OUR AVERAGE				
0.91±0.11±0.04	251	LINK	03E	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
0.92±0.20±0.07		¹ JUN	00	SELX Σ^- nucleus, 600 GeV
1.18±0.26±0.17	119	BERGFELD	96	CLE2 $e^+e^- \approx \Upsilon(4S)$

¹ This JUN 00 result is redundant with other results given below.

$$\Gamma(\Sigma^+ \bar{K}^*(892)^0)/\Gamma(\Xi^- 2\pi^+) \quad \Gamma_8/\Gamma_{11}$$

Unseen decay modes of the $\bar{K}^*(892)^0$ are included.

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.81±0.15 OUR AVERAGE				
0.78±0.16±0.06	119	LINK	03E	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV
0.92±0.27±0.14	61	BERGFELD	96	CLE2 $e^+e^- \approx \Upsilon(4S)$

$\Gamma(\Sigma^0 K^- 2\pi^+)/\Gamma(\Lambda K^- 2\pi^+)$ Γ_9/Γ_4

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.84±0.36	47	¹ COTEUS	87	SPEC $nA \simeq 600$ GeV

¹ See, however, the note on the COTEUS 87 Ξ_c^+ mass measurement.

$\Gamma(\Xi^0 \pi^+)/\Gamma(\Xi^- 2\pi^+)$ Γ_{10}/Γ_{11}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
0.55±0.13±0.09	39	EDWARDS	96	CLE2 $e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Xi^- 2\pi^+)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
2.86±1.21±0.38	24	¹ LI	19C	BELL $e^+ e^- \approx \Upsilon(4S)$

• • • We do not use the following data for averages, fits, limits, etc. • • •

seen	131	BERGFELD	96	CLE2 $e^+ e^- \approx \Upsilon(4S)$
seen	160	AVERY	95	CLE2 $e^+ e^- \approx \Upsilon(4S)$
seen	30	FRABETTI	93B	E687 γ Be, $\bar{E}_\gamma = 220$ GeV
seen	30	ALBRECHT	90F	ARG $e^+ e^-$ at $\Upsilon(4S)$
seen	23	ALAM	89	CLEO $e^+ e^-$ 10.6 GeV

¹ LI 19C report a significance of 6.8 σ for the observation of this decay mode, observed in Ξ_c^+ from $B^0 \rightarrow \bar{\Lambda}_c^- \Xi_c^+$.

$\Gamma(\Xi(1530)^0 \pi^+)/\Gamma(\Xi^- 2\pi^+)$ Γ_{12}/Γ_{11}

Unseen decay modes of the $\Xi(1530)^0$ are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.1	90	LINK	03E	FOCS γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

• • • We do not use the following data for averages, fits, limits, etc. • • •

<0.2	90	BERGFELD	96	CLE2 $e^+ e^- \approx \Upsilon(4S)$
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$\Gamma(\Xi(1620)^0 \pi^+)/\Gamma_{\text{total}}$ Γ_{13}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	SUMIHAMA 19	BELL	$e^+ e^-$ mostly at $\Upsilon(4S)$

$\Gamma(\Xi(1690)^0 \pi^+)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
seen	SUMIHAMA 19	BELL	$e^+ e^-$ mostly at $\Upsilon(4S)$

$\Gamma(\Xi^0 \pi^+ \pi^0)/\Gamma(\Xi^- 2\pi^+)$ Γ_{15}/Γ_{11}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
2.34±0.57±0.37	81	EDWARDS	96	CLE2 $e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Xi(1530)^0 \pi^+)/\Gamma(\Xi^0 \pi^+ \pi^0)$ Γ_{12}/Γ_{15}

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.3	90	EDWARDS	96	CLE2 $e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Xi^0 \pi^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+)$ Γ_{16}/Γ_{11}

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
1.74±0.42±0.27	57	EDWARDS	96	CLE2 $e^+ e^- \approx \Upsilon(4S)$

$\Gamma(\Xi^0 e^+ \nu_e)/\Gamma(\Xi^- 2\pi^+)$					Γ_{17}/Γ_{11}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
$2.3 \pm 0.6^{+0.3}_{-0.6}$	41	ALEXANDER	95B CLE2	$e^+ e^- \approx \gamma(4S)$	

$\Gamma(\Omega^- K^+ \pi^+)/\Gamma(\Xi^- 2\pi^+)$					Γ_{18}/Γ_{11}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
$0.07 \pm 0.03 \pm 0.03$	14	LINK	03E FOCS	< 0.12, 90% CL	

$\Gamma(p K^- \pi^+)/\Gamma_{\text{total}}$					Γ_{19}/Γ
VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT	
6.2 ± 3.0 OUR AVERAGE	Error	includes scale factor of 1.5.			
$11.35 \pm 0.02 \pm 3.87$	1.6M	¹ AAIJ	20AH LHCB	pp at 13 TeV	
$4.5 \pm 2.1 \pm 0.7$	24	² LI	19C BELL	$e^+ e^- \approx \gamma(4S)$	

¹AAIJ 20AH extracts $B(\Xi_c^+ \rightarrow p K^- \pi^+)$ assuming production fraction ratios $f_{\Xi_c^0}/f_{\Lambda_c^+} = (9.7 \pm 0.9 \pm 3.1) \times 10^{-2}$ (from AAJ 19AB plus heavy quark symmetry arguments) as well as $f_{\Xi_c^0}/f_{\Xi_c^+} = 1.00 \pm 0.01$, and uses the input $B(\Lambda_c^+ \rightarrow p K^- \pi^+) = (6.23 \pm 0.33) \times 10^{-2}$. Its correlation with $B(\Xi_c^0 \rightarrow \Lambda_c^+ \pi^-)$, as measured in AAJ 20AH, is 0.414.

²LI 19C report a significance of 4.4σ for the observation of this decay mode, observed in Ξ_c^+ from $\bar{B}^0 \rightarrow \bar{\Lambda}_c^+ \Xi_c^+$.

Cabibbo-suppressed decays

$\Gamma(p K^- \pi^+)/\Gamma(\Xi^- 2\pi^+)$					Γ_{19}/Γ_{11}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.21 ± 0.04 OUR AVERAGE					
0.194 ± 0.054	47 ± 11	VAZQUEZ-JA..08	SELX	Σ^- nucleus, 600 GeV	
$0.234 \pm 0.047 \pm 0.022$	202	LINK	01B FOCS	γ nucleus	
• • • We do not use the following data for averages, fits, limits, etc. • • •					
$0.20 \pm 0.04 \pm 0.02$	76	JUN	00 SELX	See VAZQUEZ-JAUREGUI 08	

$\Gamma(p \bar{K}^*(892)^0)/\Gamma(p K^- \pi^+)$					Γ_{20}/Γ_{19}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
Unseen decay modes of the $\bar{K}^*(892)^0$ are included.					
$0.54 \pm 0.09 \pm 0.05$		LINK	01B FOCS	γ nucleus	

$\Gamma(\Sigma^+ \pi^+ \pi^-)/\Gamma(\Xi^- 2\pi^+)$					Γ_{21}/Γ_{11}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.48 ± 0.20	21 ± 8	VAZQUEZ-JA..08	SELX	Σ^- nucleus, 600 GeV	

$\Gamma(\Sigma^- 2\pi^+)/\Gamma(\Xi^- 2\pi^+)$					Γ_{22}/Γ_{11}
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
0.18 ± 0.09	10 ± 4	VAZQUEZ-JA..08	SELX	Σ^- nucleus, 600 GeV	

$\Gamma(\Sigma^+ K^+ K^-)/\Gamma(\Sigma^+ K^- \pi^+)$					Γ_{23}/Γ_7
VALUE	EVTS	DOCUMENT ID	TECN	COMMENT	
$0.16 \pm 0.06 \pm 0.01$	17	LINK	03E FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV	

$\Gamma(\Sigma^+\phi)/\Gamma(\Sigma^+K^-\pi^+)$ Γ_{24}/Γ_7 Unseen decay modes of the ϕ are included.

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.12	90	LINK	03E FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

 $\Gamma(p\phi(1020))/\Gamma(pK^-\pi^+)$ Γ_{26}/Γ_{19}

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$19.8 \pm 0.7 \pm 0.9 \pm 0.2$	3.4k	¹ AAIJ	19I LHCb	pp at 8 TeV

¹ The last uncertainty is due to the uncertainty in the $\phi \rightarrow K^+K^-$ branching fraction. $\Gamma(\Xi(1690)^0 K^+ \times B(\Xi(1690)^0 \rightarrow \Sigma^+ K^-))/\Gamma(\Sigma^+ K^-\pi^+)$ Γ_{25}/Γ_7

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<0.05	90	LINK	03E FOCS	γ nucleus, $\bar{E}_\gamma \approx 180$ GeV

 Ξ_c^+ REFERENCES

AAIJ	20AH	PR D102 071101	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	19AB	PR D99 052006	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	19AG	PR D100 032001	R. Aaij <i>et al.</i>	(LHCb Collab.)
AAIJ	19I	JHEP 1904 084	R. Aaij <i>et al.</i>	(LHCb Collab.)
LI	19C	PR D100 031101	Y.B. Li <i>et al.</i>	(BELLE Collab.)
SUMIHAMA	19	PRL 122 072501	M. Sumihama <i>et al.</i>	(BELLE Collab.)
AAIJ	14Z	PRL 113 032001	R. Aaij <i>et al.</i>	(LHCb Collab.)
AALTONEN	14B	PR D89 072014	T. Aaltonen <i>et al.</i>	(CDF Collab.)
VAZQUEZ-JA...	08	PL B666 299	E. Vazquez-Jauregui <i>et al.</i>	(SELEX Collab.)
LESIK	05	PL B605 237	T. Lesiak <i>et al.</i>	(BELLE Collab.)
Also		PL B617 198 (errat.)	T. Lesiak <i>et al.</i>	(BELLE Collab.)
LINK	03E	PL B571 139	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
MAHMOOD	02	PR D65 031102	A.H. Mahmood <i>et al.</i>	(CLEO Collab.)
LINK	01B	PL B512 277	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
LINK	01D	PL B523 53	J.M. Link <i>et al.</i>	(FNAL FOCUS Collab.)
JUN	00	PRL 84 1857	S.Y. Jun <i>et al.</i>	(FNAL SELEX Collab.)
FRABETTI	98	PL B427 211	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
BERGFELD	96	PL B365 431	T. Bergfeld <i>et al.</i>	(CLEO Collab.)
EDWARDS	96	PL B373 261	K.W. Edwards <i>et al.</i>	(CLEO Collab.)
ALEXANDER	95B	PRL 74 3113	J. Alexander <i>et al.</i>	(CLEO Collab.)
Also		PRL 75 4155 (erratum)	J. Alexander <i>et al.</i>	(CLEO Collab.)
AVERY	95	PRL 75 4364	P. Avery <i>et al.</i>	(CLEO Collab.)
FRABETTI	93B	PRL 70 1381	P.L. Frabetti <i>et al.</i>	(FNAL E687 Collab.)
ALBRECHT	90F	PL B247 121	H. Albrecht <i>et al.</i>	(ARGUS Collab.)
ALAM	89	PL B226 401	M.S. Alam <i>et al.</i>	(CLEO Collab.)
BARLAG	89C	PL B233 522	S. Barlag <i>et al.</i>	(ACCMOR Collab.)
COTEUS	87	PRL 59 1530	P. Coteus <i>et al.</i>	(FNAL E400 Collab.)
BIAGI	85C	PL 150B 230	S.F. Biagi <i>et al.</i>	(CERN WA62 Collab.)
BIAGI	83	PL 122B 455	S.F. Biagi <i>et al.</i>	(CERN WA62 Collab.)