

# Summary Tables encoding tips

**Piotr Zyla**

Physics Division  
Lawrence Berkeley National Laboratory

November 5, 2020

- Compact summaries of the listings;
- Included in the web, book, booklet, and pdgLive (to certain extent) editions;
- Typical entries:
  - Mass;
  - Full width;
  - Decay modes fractions;
- Other quantities:
  - Decay parameters;
  - Form factors;
  - Asymmetries;
  - Etc...

## Summary Table

**$\eta_c(2S)$**

$$J^{PC} = 0^{+(0^{-+})}$$

Quantum numbers are quark model predictions.

$$\text{Mass } m = 3637.5 \pm 1.1 \text{ MeV} \quad (S = 1.2)$$

$$\text{Full width } \Gamma = 11.3^{+3.2}_{-2.9} \text{ MeV}$$

$\eta_c(2S)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$\rho$ (MeV/c)
hadrons	not seen		–
$K \bar{K} \pi$	( 1.9±1.2 ) %		1729
$K \bar{K} \eta$	( 5 ±4 ) × 10 <sup>-3</sup>		1637
$2\pi^+ 2\pi^-$	not seen		1792
$\rho^0 \rho^0$	not seen		1645
$3\pi^+ 3\pi^-$	not seen		1749
$K^+ K^- \pi^+ \pi^-$	not seen		1700
$K^{*0} \bar{K}^{*0}$	not seen		1585
$K^+ K^- \pi^+ \pi^- \pi^0$	( 1.4±1.0 ) %		1667
$K^+ K^- 2\pi^+ 2\pi^-$	not seen		1627
$K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$	seen		1666
$2K^+ 2K^-$	not seen		1470
$\phi \phi$	not seen		1506
$p \bar{p}$	seen		1558
$p \bar{p} \pi^+ \pi^-$	seen		1461
$\gamma \gamma$	( 1.9±1.3 ) × 10 <sup>-4</sup>		1819
$\gamma J/\psi(1S)$	< 1.4 %	90%	500
$\pi^+ \pi^- \eta$	not seen		1766
$\pi^+ \pi^- \eta'$	not seen		1680
$\pi^+ \pi^- \eta_c(1S)$	< 25 %	90%	537

## Listings

Summaries come from listings;

- Directly from measurement nodes of:
  - Mass;
  - Width;
  - Other quantities;
- From decay modes fractions;
- Not from branching ratio measurement nodes;

$\eta_c(2S)$

$I^G(J^{PC}) = 0^+(0^{-+})$

Quantum numbers are quark model predictions.

---

### $\eta_c(2S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3637.5±1.1 OUR AVERAGE</b>				Error includes scale factor of 1.2.
3635.1±3.7±2.9	106	XU	18 BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
3633.6±1.7±0.6	106	<sup>1</sup> AAIJ	17ADLHCB	$D\bar{D} \rightarrow B^+X \rightarrow D\bar{D}K^+X$

---

### $\eta_c(2S)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
<b>11.3<sup>+3.2</sup><sub>-2.9</sub> OUR AVERAGE</b>					
9.9± 4.8±2.9		57 ± 17	ABLIKIM	13k BES3	$\psi(2S) \rightarrow \sim K^0 K^\pm \pi^\mp \pi^+ \pi^-$

---

### $\eta_c(2S)$ DECAY MODES

Mode	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level
$\Gamma_1$ hadrons	not seen	
$\Gamma_2$ $K\bar{K}\pi$	( 1.9±1.2 ) %	
$\Gamma_3$ $K\bar{K}\eta$	( 5 ± 4 ) × 10 <sup>-3</sup>	

---

### $\eta_c(2S)$ BRANCHING RATIOS

#### $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$

VALUE	DOCUMENT ID	TECN	COMMENT
<b>not seen</b>	ABREU	980 DLPH	$e^+e^- \rightarrow e^+e^- + \text{hadrons}$
seen	<sup>28</sup> EDWARDS	82C CBAL	$e^+e^- \rightarrow \gamma X$

<sup>28</sup> For a mass value of 3594 ± 5 MeV

#### $\Gamma_1/\Gamma$

---

#### $\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$

VALUE (units 10 <sup>-2</sup> )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.9±0.4±1.1</b>	59 ± 12	<sup>29</sup> AUBERT	08AB BABR	$B \rightarrow \eta_c(2S) K \rightarrow K\bar{K}\pi K$

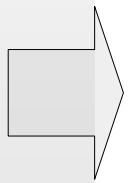
#### $\Gamma_2/\Gamma$

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

# Default Summaries

Averaging of measurements creates summaries (mostly);

- Multiple measurements average;



**$\eta_c(2S)$**   $I^G(J^{PC}) = 0^+(0^{-+})$

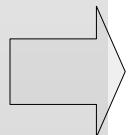
Quantum numbers are quark model predictions.

---

**$\eta_c(2S)$  MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3637.5±1.1 OUR AVERAGE</b>				Error includes scale factor of 1.2.
3635.1±3.7±2.9	106	XU	18 BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
3633.6±1.7±0.6	106	<sup>1</sup> AAIJ	17ADLHCB	$\rho\rho \rightarrow B^+X \rightarrow \rho\bar{\rho}K^+X$
3636.4±4.1±0.7	365	<sup>2</sup> AAIJ	17BBLHCB	$\rho\rho \rightarrow b\bar{b}X \rightarrow 2(K^+K^-)X$

- Single measurement “average”;



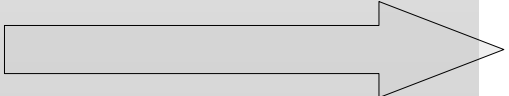
**$\Gamma(K\bar{K}\pi)/\Gamma_{total}$**   $\Gamma_2/\Gamma$

VALUE (units $10^{-2}$ )	EVTS	DOCUMENT ID	TECN	COMMENT
<b>1.9±0.4±1.1</b>	59 ± 12	<sup>29</sup> AUBERT	08AB BABR	$B \rightarrow \eta_c(2S)K \rightarrow K\bar{K}\pi K$
• • • We do not use the following data for averages, fits, limits, etc. • • •				

**$\Gamma(\pi^+\pi^-\eta_c(1S))/\Gamma(K\bar{K}\pi)$**   $\Gamma_{20}/\Gamma_2$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
<b>&lt;3.33</b>	90	<sup>36</sup> LEES	12AE BABR	$e^+e^- \rightarrow e^+e^-\pi^+\pi^-\eta_c$

- Single best limit;



- Decay mode fractions from averages of branching ratio measurement nodes;

Many exceptions to defaults especially in the searches sections;

If more than one best value is presented in measurement node:

- Our evaluation / Our limit (“by hand” entry) – first priority;
- Fit value – second priority;
- Average value – default;

Values in the listings are printed in this priority order;

$$\Gamma(D^*(2010)^- \ell^+ \nu_\ell) / \Gamma_{\text{total}} \qquad \Gamma_6 / \Gamma$$

“OUR EVALUATION” is an average using rescaled values of the data listed below. The average and rescaling were performed by the Heavy Flavor Averaging Group (HFLAV) and are described at <https://hflav.web.cern.ch/>. The averaging/rescaling procedure takes into account correlations between the measurements.

VALUE (%)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>5.05 ± 0.02 ± 0.14 OUR EVALUATION</b>				This value assumes isospin symmetry.
<b>5.08 ± 0.17 OUR FIT</b>				Error includes scale factor of 1.4.
<b>5.09 ± 0.17 OUR AVERAGE</b>				Error includes scale factor of 1.4. See the ideogram below.
4.90 ± 0.02 ± 0.16		<sup>1</sup> WAHEED 19	BELL	$e^+ e^- \rightarrow \Upsilon(4S)$
5.49 ± 0.16 ± 0.25		<sup>2</sup> AUBERT 08Q	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
4.69 ± 0.04 ± 0.34		<sup>3</sup> AUBERT 08R	BABR	$e^+ e^- \rightarrow \Upsilon(4S)$
5.90 ± 0.22 ± 0.50		<sup>4</sup> ABDALLAH 04D	DLPH	$e^+ e^- \rightarrow Z^0$
6.09 ± 0.19 ± 0.40		<sup>5</sup> ADAM 03	CLE2	$e^+ e^- \rightarrow \Upsilon(4S)$
4.70 ± 0.13 <sup>+0.36</sup> <sub>-0.31</sub>		<sup>6</sup> ABREU 01H	DLPH	$e^+ e^- \rightarrow Z$
5.26 ± 0.20 ± 0.46		<sup>7</sup> ABBIENDI 00Q	OPAL	$e^+ e^- \rightarrow Z$
5.53 ± 0.26 ± 0.52		<sup>8</sup> BUSKULIC 97	ALEP	$e^+ e^- \rightarrow Z$

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

## Listings

<b>B<sup>0</sup> DECAY MODES</b>	Fraction ( $\Gamma_i / \Gamma$ )	Scale factor/ Confidence level	$\rho$ (MeV/c)
$\ell^+ \nu_\ell X$	[III] ( 10.33 ± 0.28 ) %		–
$e^+ \nu_e X_C$	( 10.1 ± 0.4 ) %		–
$D \ell^+ \nu_\ell X$	( 9.4 ± 0.9 ) %		–
$D^- \ell^+ \nu_\ell$	[III] ( 2.31 ± 0.10 ) %		2309
$D^- \tau^+ \nu_\tau$	( 1.08 ± 0.23 ) %		1909
<b><math>D^*(2010)^- \ell^+ \nu_\ell</math></b>	[III] ( 5.05 ± 0.14 ) %		2257
$D^*(2010)^- \tau^+ \nu_\tau$	( 1.57 ± 0.09 ) %	S=1.1	1838
$\overline{D}^0 \pi^- \ell^+ \nu_\ell$	( 4.1 ± 0.5 ) × 10 <sup>-3</sup>		2308
$D_0^*(2300)^- \ell^+ \nu_\ell, D_0^{*-} \rightarrow$	( 3.0 ± 1.2 ) × 10 <sup>-3</sup>	S=1.8	–
$\overline{D}^0 \pi^-$			
$D_2^*(2460)^- \ell^+ \nu_\ell, D_2^{*-} \rightarrow$	( 1.21 ± 0.33 ) × 10 <sup>-3</sup>	S=1.8	2065

## Summary Table

Natural moment for addressing summaries is when including a new measurement from a publication:

- New measurement in the context of existing data:
  - Used / Not used / best Limit;
  - Move existing measurements to Not used ;
  - Delete, i.e. hide, some old measurements;
- Run average/fit with the new encoding;
- Inclusion of a newly created node in a fit;

Massaging system requests – faster turnaround time;

New measurement in the context of existing data (“review & sign off” tab):

reference details | add measurements | toolbox | **review & sign off** | return to task list

evaluate macros    
 show additional fields

**Reference details**

Authors	Collaboration	Verifier	Physics area (for verification) <sup>?</sup>
R. Aaij, et al.	LHCb Collab.	KREPS	Baryons

**New Measurements**

Node	Document ID	Used?	Value (units)	EVTS	CL%	TECN	Comment	avg, fit, PDF
1) S040A01	AAIJ 2020O <sup>1</sup>	U	-0.022 <sup>+0.027</sup> / <sub>-0.026</sub>			LHCB	pp at 7, 8, 13 TeV	edit/del S040A01 S040

1(Linkage=C): Extracted using a Bayesian analysis. The most probable value is given as -0.022, with a 68% credibility interval [-0.048, 0.005]. Transverse polarizations of  $\Lambda_b^0$  of -0.004 (68% credibility interval [-0.064, 0.051]), 0.001 (68% credibility interval [-0.035, 0.045]), and 0.032 (68% credibility interval [-0.011, 0.065]) are also reported at 7 TeV, 8 TeV and 13 TeV, respectively.

**Updated Measurements**

Node	Document ID	Used?	Value (units)	EVTS	CL%	TECN	Comment	edit / del
1) S040A01	AAIJ 2013AG <sup>1</sup>	N	0.05 ±0.17 ±0.07			LHCB	Repl. by AAIJ 2020O	S040A01 S040

PDG workspace

**$\alpha$  decay parameter for  $\Lambda_b \rightarrow J/\psi \Lambda$**

VALUE	DOCUMENT ID	TECN	COMMENT
<b>-0.017 ± 0.026</b>	<b>OUR AVERAGE</b>		
-0.022 <sup>+0.027</sup> / <sub>-0.026</sub>	1 AAIJ 2020O	LHCB	pp at 7, 8, 13 TeV
-0.14 ±0.14 ±0.10	2 SIRUNYAN 2018R	CMS	pp at 7, 8 TeV
0.30 ±0.16 ±0.06	3 AAD 2014L	ATLS	pp at 7 TeV
0.05 ±0.17 ±0.07	4 AAIJ 2013AG	LHCB	Repl. by AAIJ 2020O

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

<sup>1</sup> Extracted using a Bayesian analysis. The most probable value is given as -0.022, with a 68% credibility interval [-0.048, 0.005]. Transverse polarizations of  $\Lambda_b^0$  of -0.004 (68% credibility interval [-0.064, 0.051]), 0.001 (68% credibility interval [-0.035, 0.045]), and 0.032 (68% credibility interval [-0.011, 0.065]) are also reported at 7 TeV, 8 TeV and 13 TeV, respectively.

<sup>2</sup> An angular analysis of  $\Lambda_b \rightarrow J/\psi \Lambda$  decay is performed. Note that the sign of  $\alpha$  in CMS definition is the opposite to that used by AAIJ 2013AG and AAD 2014L.  $\Lambda_b$  transverse production polarization of  $0.00 \pm 0.06 \pm 0.06$  is also reported, as well as squares of the helicity amplitudes.

<sup>3</sup> An angular analysis of  $\Lambda_b \rightarrow J/\psi \Lambda$  decay is performed and magnitudes of all helicity amplitudes are also reported.

<sup>4</sup> An angular analysis of  $\Lambda_b \Lambda$  decay is performed and a  $\Lambda_b$  transverse production polarization of  $0.06 \pm 0.07 \pm 0.02$  is also reported.

document.pdf (1 page) — Locked

**$\alpha$  decay parameter for  $\Lambda_b \rightarrow J/\psi \Lambda$**

VALUE	DOCUMENT ID	TECN	COMMENT
<b>-0.017 ± 0.026</b>	<b>OUR AVERAGE</b>		
[0.07 ± 0.13 OUR 2020 AVERAGE Scale factor = 1.3]			
-0.022 <sup>+0.027</sup> / <sub>-0.026</sub>	1 AAIJ 200	LHCB	pp at 7, 8, 13 TeV
-0.14 ± 0.14 ± 0.10	2 SIRUNYAN 18R	CMS	pp at 7, 8 TeV
0.30 ± 0.16 ± 0.06	3 AAD 14L	ATLS	pp at 7 TeV
• • • We do not use the following data for averages, fits, limits, etc. • • •			
0.05 ± 0.17 ± 0.07	4 AAIJ 13AG	LHCB	Repl. by AAIJ 200

Access full data block for updates (“add measurements” tab):

AAIJ 2020 (JHEP 2006 110) [ S040 ] messages

reference details **add measurements** toolbox review & sign off return to task list

---

**Add New Measurement** show additional fields ?

\* Node ?  Document ID AAIJ 2020 \* Used? ? select... Value ?  EVTS ? CL% ? TECN ?

Comment: ?

[preview comment](#)

Footnote: ?

[preview footnote](#)  
[Link to existing footnote\(s\)](#)

---

**Datablock Browser**   evaluate macros ?

Node	VALUE	DOCUMENT ID	TECN	COMMENT	Action
<b>S040 - Lambda(b){0}</b>					
$\alpha$ decay parameter for $\Lambda_b \rightarrow J/\psi \Lambda$					
$\Lambda_b^0$ MASS					
S040M $m_{\Lambda_b^0}$	-0.017+0.026	OUR AVERAGE			
S040DM $m_{\Lambda_b^0} - m_{p^0}$	-0.022 +0.027-0.026	1 AAIJ	2020O	LHCB	#r(p p) at 7, 8, 13 TeV
S040DM2 $m_{\Lambda_b^0} - m_{B^+}$	-0.14 + -0.14 + 0.10	2 SIRUNYAN	2018R	CMS	#r(p p) at 7, 8 TeV
S040T $\Lambda_b^0$ MEAN LIFE	0.30 +-0.16 +-0.06	3 AAD	2014L	ATLS	#r(p p) at 7 TeV
S040DT $\tau_{\Lambda_b^0} / \tau_{p^0}$	0.05 +-0.17 +-0.07	4 AAIJ	2013AG	LHCB	Repl. by #ref(AAIJ 2020O)
$\tau_{\Lambda_b^0} / \tau_{p^0}$ MEAN LIFE RATIO	<p>... We do not use the following data for averages, fits, limits, etc. ...</p> <p>1 Extracted using a Bayesian analysis. The most probable value is given as -0.022, with a 68% credibility interval [-0.048, 0.005]. Transverse polarizations of #p(Lambda_b){0} of -0.004 (68% credibility interval [-0.064, 0.051]), 0.001 (68% credibility interval [-0.035, 0.045]), and 0.032 (68% credibility interval [-0.011, 0.065]) are also reported at 7 TeV, 8 TeV and 13 TeV, respectively.</p> <p>2 An angular analysis of #d(Lambda_b -&gt; J/psi Lambda) decay is performed. Note that the sign of #p(alpha) in CMS definition is the opposite to that used by #ref(AAIJ 2013AG) and #ref(AAD 2014L). #p(Lambda_b) transverse production polarization of #n(0.00 +-0.06 +-0.06) is also reported, as well as squares of the helicity amplitudes.</p> <p>3 An angular analysis of #r(Lambda_b -&gt; J/psi Lambda) decay is performed and magnitudes of all helicity amplitudes are also reported.</p> <p>4 An angular analysis of #d(Lambda_b -&gt; J/psi Lambda) decay is performed and a #p(Lambda_b) transverse production polarization of #n(0.06 +-0.07 +-0.02) is also reported.</p>				
S040TR $\tau_{\Lambda_b^0} / \tau_{p^0}$ (direct measurements)					
<b><math>\Lambda_b^0</math> BRANCHING RATIOS</b>					
S040R3 $\Gamma(\Lambda_b^0 \rightarrow J/\psi(1S)\Lambda) \times B(b \rightarrow \Lambda_b^0) / \Gamma_{total}$					
S040R31 $\Gamma(\Lambda_b^0 \rightarrow \psi(2S)\Lambda) / \Gamma(\Lambda_b^0 \rightarrow$					



- Summary Table access, including pdf file;
- Listings access, including pdf file;
- Update “by hand” entries;

PDG workspace Encodings Reviews Responsibilities pdgLive (prod) **Summary Tables** Christoph Hanhart Settings Help Log out

Summary Table Editor [reset to defaults](#)

Show

Use pencil icon to edit the hand entered summary values and footnotes.

M059	$\eta_c(2S)$	M059	$\eta_c(2S)$ <a href="#">(see PDF summary)</a> <a href="#">(see PDF listings)</a>
M071	$\psi(2S)$	M059M	Mass $m = 3637.5 \pm 1.1$ MeV ( $S = 1.2$ )
M053	$\psi(3770)$	M059W	$\eta_c(2S)$ WIDTH = $11.3^{+3.2}_{-2.9}$ MeV
M212	$\psi_2(3823)$		
M241	$\psi_3(3842)$		
M237	$\chi_{c0}(3860)$		
M176	$\chi_{c1}(3872)$		
M210	$Z_c(3900)$		
M159	$X(3915)$		
M050	$\chi_{c2}(3930)$		
M029	$X(3940)$		
M213	$X(4020)^\pm$		
M072	$\psi(4040)$		
M191	$X(4050)^\pm$		
M223	$X(4055)^\pm$		
M240	$X(4100)^\pm$		
M193	$\chi_{c1}(4140)$		
M025	$\psi(4160)$		
M190	$X(4160)$		
M231	$Z_c(4200)$		
M222	$\psi(4230)$		

$\eta_c(2S)$	DECAY MODES	Fraction ( $\Gamma_i / \Gamma$ )	Scale Factor/ Conf. Level
Desig = 1	$\Gamma_1$ hadrons	not seen	
Desig = 4	$\Gamma_2$ $K\bar{K}\pi$	$(1.9 \pm 1.2)\%$	
Desig = 20	$\Gamma_3$ $K\bar{K}\eta$	$(5 \pm 4) \times 10^{-3}$	
Desig = 5	$\Gamma_4$ $2\pi^+2\pi^-$	not seen	
Desig = 16	$\Gamma_5$ $\rho^0\rho^0$	not seen	
Desig = 8	$\Gamma_6$ $3\pi^+3\pi^-$	not seen	
Desig = 6	$\Gamma_7$ $K^+K^-\pi^+\pi^-$	not seen	
Desig = 17	$\Gamma_8$ $K^{*0}\bar{K}^{*0}$	not seen	
Desig = 9	$\Gamma_9$ $K^+K^-\pi^+\pi^-\pi^0$	$(1.4 \pm 1.0)\%$	
Desig = 10	$\Gamma_{10}$ $K^+K^-2\pi^+2\pi^-$	not seen	
Desig = 11	$\Gamma_{11}$ $K_S^0 K^- 2\pi^+\pi^- + c.c.$	seen	
Desig = 7	$\Gamma_{12}$ $2K^+2K^-$	not seen	
Desig = 18	$\Gamma_{13}$ $\phi\phi$	not seen	
Desig = 3	$\Gamma_{14}$ $p\bar{p}$	seen	
Desig = 22	$\Gamma_{15}$ $p\bar{p}\pi^+\pi^-$	seen	
Desig = 2	$\Gamma_{16}$ $\gamma\gamma$	$(1.9 \pm 1.3) \times 10^{-4}$	
Desig = 21	$\Gamma_{17}$ $\gamma J/\psi(1S)$	$< 1.4\%$	CL=90%
Desig = 12	$\Gamma_{18}$ $\pi^+\pi^-\eta$	not seen	
Desig = 13	$\Gamma_{19}$ $\pi^+\pi^-\eta'$	not seen	
Desig = 15	$\Gamma_{20}$ $\pi^+\pi^-\eta_c(1S)$	$< 25\%$	CL=90%

**Summary Table Editor** reset to defaults

Show  ▼

Use pencil icon to edit the hand entered summary values and footnotes.

M059	$\eta_c(2S)$	M059	$\eta_c(2S)$ (see PDF summary) (see PDF listings)	NODE=M059
M071	$\psi(2S)$	M059M	Mass $m = 3637.5 \pm 1.1$	NODE=M059M; DTYPE=M

**$\eta_c(2S)$**      $J^{PC} = 0^+(0^-+)$     NODE=M059

Quantum numbers are quark model predictions.

Mass  $m = 3637.5 \pm 1.1$  MeV (S = 1.2)  
Full width  $\Gamma = 11.3^{+3.2}_{-2.9}$  MeV

NODE=M059M; DTYPE=M  
NODE=M059W; DTYPE=G

$\eta_c(2S)$ DECAY MODES	Fraction ( $\Gamma_i/\Gamma$ )	Confidence level	$\frac{p}{\text{MeV}/c}$
hadrons	not seen		—
$K\bar{K}\pi$	(1.9 ± 1.2) %		1729
$K\bar{K}\eta$	(5 ± 4) × 10 <sup>-3</sup>		1637
$2\pi^+2\pi^-$	not seen		1792
$\rho^0\rho^0$	not seen		1645
$3\pi^+3\pi^-$	not seen		1749
$K^+K^- \pi^+ \pi^-$	not seen		1700
$K^+K^- \pi^0$	not seen		1585
$K^+K^- \pi^+ \pi^- \pi^0$	(1.4 ± 1.0) %		1667
$K^+K^- 2\pi^+ 2\pi^-$	not seen		1627
$K_S^0 K^- 2\pi^+ \pi^- + c.c.$	seen		1666
$2K^+ 2K^-$	not seen		1470
$\phi\phi$	not seen		1506
$p\bar{p}$	seen		1558
$p\bar{p}\pi^+\pi^-$	seen		1461
$\gamma\gamma$	(1.9 ± 1.3) × 10 <sup>-4</sup>		1819
$\gamma J/\psi(1S)$	< 1.4 %	90%	500
$\pi^+\pi^-\eta$	not seen		1766
$\pi^+\pi^-\eta'$	not seen		1680
$\pi^+\pi^-\eta_c(1S)$	< 25 %	90%	537

**$\eta_c(2S)$**      $J^{PC} = 0^+(0^-+)$     NODE=M059

Quantum numbers are quark model predictions.

**$\eta_c(2S)$  MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3637.5 ± 1.1 OUR AVERAGE</b>				Error includes scale factor of 1.2.
3635.1 ± 3.7 ± 2.9	106	XU	18 BELL	$e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
3633.6 ± 1.7 ± 0.6	106	1 AAIJ	17AD LHC	$pp \rightarrow B^+X \rightarrow p\bar{p}K^+X$
3636.4 ± 4.1 ± 0.7	365	2 AAIJ	17BB LHC	$pp \rightarrow b\bar{b}X \rightarrow$

**$\eta_c(2S)$  MASS**

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
<b>3637.5 ± 1.1 OUR AVERAGE</b>				Error includes scale factor of 1.2.
3637.0 ± 5.7 ± 3.4	178	3, 4 LEES	2014E	BABR $\gamma\gamma \rightarrow K^+K^-\pi^0$
3635.1 ± 5.8 ± 2.1	47	3, 5 LEES	2014E	BABR $\gamma\gamma \rightarrow K^+K^-\eta$
3646.9 ± 1.6 ± 3.6	57 ± 17	ABLIKIM	2013K	BES3 $\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^\pm \pi^\mp$
3637.6 ± 2.9 ± 2.9	106	XU	2018	BELL $e^+e^- \rightarrow e^+e^-\eta'\pi^+\pi^-$
3633.6 ± 1.7 ± 0.6	106	1 AAIJ	2017AD	LHC $pp \rightarrow B^+X \rightarrow p\bar{p}K^+X$
3638.5 ± 1.5 ± 0.6	365	2 AAIJ	2017BB	LHC $pp \rightarrow b\bar{b}X \rightarrow 2(K^+K^-)X$
3640.5 ± 3.2 ± 3.4	178	3, 4 LEES	2014E	BABR $\gamma\gamma \rightarrow K^+K^-\pi^0$
3636.1 ± 3.9 ± 4.2	47	3, 5 LEES	2014E	BABR $\gamma\gamma \rightarrow K^+K^-\eta$
3626 ± 5 ± 3.6	127 ± 18	ABLIKIM	2012G	BES3 $\psi(2S) \rightarrow \gamma K^0 K^\pm \pi^\mp \pi^\pm \pi^\mp$
3645.0 ± 5.5 ± 1.6	624	3 DEL-AMO-SANCH..	2011M	BABR $\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
3642.9 ± 3.1 ± 2.5	1201	3 DEL-AMO-SANCH..	2011M	BABR $\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
3639 ± 7	128	7 VINOKUROVA	2011	BELL $B^\pm \rightarrow K^\pm (K_S^0 K^\pm \pi^\mp)$
3630.8 ± 3.4 ± 6	311	8 ABE	2007	BELL $e^+e^- \rightarrow J/\psi(c\bar{c})$
3654 ± 6 ± 7.8	121 ± 27	AUBERT	2005C	BABR $e^+e^- \rightarrow J/\psi c\bar{c}$
3594 ± 5	61	ASNER	2004	CLEO $\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
1 AAIJ 17AD value $m_{\psi(2S)}$	98 ± 52	9 AUBERT	2006E	BABR $B^\pm \rightarrow K^\pm X_{c\bar{c}}$
From a fit	112 ± 24	10 AUBERT	2004D	BABR $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K\bar{K}\pi$
(1.9)	39 ± 11	11 CHOI	2002	BELL $B \rightarrow KK_S K^\pm \pi^\mp$
not s	39 ± 11	12 EDWARDS	1982C	CBAL $e^+e^- \rightarrow \gamma X$
not s				
< 25%				

M223	$X(4055)^\pm$	Desig = 18	$\Gamma_{13}$	$\phi\phi$
M240	$X(4100)^\pm$	Desig = 3	$\Gamma_{14}$	$p\bar{p}$
M193	$\chi_{c1}(4140)$	Desig = 22	$\Gamma_{15}$	$p\bar{p}\pi^+\pi^-$
M025	$\psi(4160)$	Desig = 2	$\Gamma_{16}$	$\gamma\gamma$
M190	$X(4160)$	Desig = 21	$\Gamma_{17}$	$\gamma J/\psi(1S)$
M231	$Z_c(4200)$	Desig = 12	$\Gamma_{18}$	$\pi^+\pi^-\eta$
M222	$\psi(4230)$	Desig = 13	$\Gamma_{19}$	$\pi^+\pi^-\eta'$
		Desig = 15	$\Gamma_{20}$	$\pi^+\pi^-\eta_c(1S)$

- Any summary correction creates summary “cleanup task”;

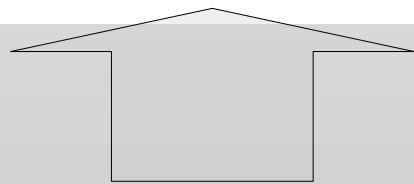
**Task Filters** [reset to defaults](#)

Show Pending Tasks for user Hanhart

**Task List - 3 total**  
[edit encoder/overseer assignment](#)

Task	Paper	C	V	Particle	Status	Encoder	Overseer	Note	#Msg
HANHART	2020A			CLEANUP 2020-11-03 18:12	Released	HANHART	unassigned	Cleanup task for M059 summary	
LU	2020		D	EPJ C80 436	Encoded	GUTSCHE	HANHART	M(T) a_0 (980) in photon-photon scattering	
SAKAI	2020A		E	PR D101 054030	Encoded	MIKHASENKO	HANHART	M(T),B- -> K-pi0X	

[add your own new encoding](#) / [add new cleanup task](#) [contact support](#)



- “Cleanup task” can also be created for listings only;

HANHART 2020A (CLEANUP 2020-11-03 18:12) [ M059 ]

[messages](#)

[return to task list](#)

[edit measurements](#) [edit summary tables](#) [review & sign off](#)

evaluate macros  [?](#)  
 show additional fields  [?](#)

### Reference details

#### Cleanup task

Started by C. Hanhart at 2020-11-03 18:12

#### Comment

Cleanup task for M059 summary

### Updated Summary Table Values

Node	Title	Value (units)		
1) <a href="#">M059</a> <a href="#">Desig=8</a>	$\eta_c(2S) \rightarrow 3 \pi^+ 3 \pi^-$	seen	<a href="#">edit</a>	<a href="#">M059</a>

Sign off M059 (empty)

[contact support](#)

- The usual task cycle: Encoded / Overseen / Completed;
- “Cleanup task” can only modify existing entries;
- For new measurements one needs to open a task associated with a relevant paper (use “Tasks for paper” filter);

- Most efficient to address Summary Tables defaults during encodings;
- Use “Summary Tables” editor;
- Request changes via “messages” for faster turnaround time;

