

Reference = HE 14; PRL 113 142001
Verifier code = BELLE

PLEASE READ NOW

*PLEASE
REPLY
WITHIN
ONE WEEK*

Normally we send all verifications for one experiment to one person, usually the spokesperson or data-analysis coordinator, who then distributes them to the appropriate people. Please tell us if we should send the verifications for your experiment to someone else.

Karim Trabelsi

EMAIL: karim.trabelsi@kek.jp

July 21, 2016

Dear Colleague,

- (1) Please check the results of your experiment carefully. They are marked.
- (2) Please reply within one week.
- (3) Please reply even if everything is correct.
- (4) IMPORTANT!! Please tell WHICH papers you are verifying. We have lots of requests out.
- (5) Feel free to make comments on our treatment of any of the results (not just yours) you see.

Thank you for helping us make the Review accurate and useful.

Sincerely,

Simon Eidelman
BINP, Budker Inst. of Nuclear Physics
Prospekt Lavrent'eva 11
RU-630090 Novosibirsk
Russian Federation

EMAIL: simon.eidelman@cern.ch

$b\bar{b}$ MESONS

 $\Upsilon(10860)$

$$J^{PC} = 0^{-}(1^{-}-)$$

NODE=MXXX030

NODE=M092

$\Upsilon(10860)$ BRANCHING RATIOS

“OUR EVALUATION” is obtained based on averages of rescaled data listed below. The averages and rescaling were performed by the Heavy Flavor Averaging Group (HFAG) and are described at <http://www.slac.stanford.edu/xorg/hfag/>.

NODE=M092230

NODE=M092230

 $\Gamma(\chi_{b0}(1P)\pi^+\pi^-\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{23}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<6.3 \times 10^{-3}$	90	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R36
 NODE=M092R36

 $\Gamma(\chi_{b0}(1P)\omega)/\Gamma_{\text{total}} \quad \Gamma_{24}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<3.9 \times 10^{-3}$	90	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R37
 NODE=M092R37

 $\Gamma(\chi_{b0}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega})/\Gamma_{\text{total}} \quad \Gamma_{25}/\Gamma$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4.8 \times 10^{-3}$	90	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R38
 NODE=M092R38

 $\Gamma(\chi_{b1}(1P)\pi^+\pi^-\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{26}/\Gamma$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.85 \pm 0.23 \pm 0.23$	80	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R39
 NODE=M092R39

 $\Gamma(\chi_{b1}(1P)\omega)/\Gamma_{\text{total}} \quad \Gamma_{27}/\Gamma$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.57 \pm 0.22 \pm 0.21$	60	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R40
 NODE=M092R40

 $\Gamma(\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega})/\Gamma_{\text{total}} \quad \Gamma_{28}/\Gamma$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$0.52 \pm 0.15 \pm 0.11$	24	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R41
 NODE=M092R41

 $\Gamma(\chi_{b2}(1P)\pi^+\pi^-\pi^0)/\Gamma_{\text{total}} \quad \Gamma_{29}/\Gamma$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.17 \pm 0.27 \pm 0.14$	29	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R42
 NODE=M092R42

 $\Gamma(\chi_{b2}(1P)\omega)/\Gamma_{\text{total}} \quad \Gamma_{30}/\Gamma$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$0.60 \pm 0.23 \pm 0.15$	13	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R43
 NODE=M092R43

 $\Gamma(\chi_{b2}(1P)\omega)/\Gamma(\chi_{b1}(1P)\omega) \quad \Gamma_{30}/\Gamma_{27}$

VALUE	DOCUMENT ID	TECN	COMMENT
$0.38 \pm 0.16 \pm 0.09$	32 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R44
 NODE=M092R44

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

 $\Gamma(\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega})/\Gamma_{\text{total}} \quad \Gamma_{31}/\Gamma$

VALUE (units 10^{-3})	EVTS	DOCUMENT ID	TECN	COMMENT
$0.61 \pm 0.22 \pm 0.28$	16	31 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R45
 NODE=M092R45

 $\Gamma(\chi_{b2}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega})/\Gamma(\chi_{b1}(1P)(\pi^+\pi^-\pi^0)_{\text{non-}\omega}) \quad \Gamma_{31}/\Gamma_{28}$

VALUE	DOCUMENT ID	TECN	COMMENT
$1.20 \pm 0.55 \pm 0.65$	32 HE	14 BELL	$\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

 NODE=M092R46
 NODE=M092R46

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

YOUR DATA $1.20 \pm 0.55 \pm 0.65$ 32 HE 14 BELL $\Upsilon(5S) \rightarrow \pi^+\pi^-\pi^0\gamma \Upsilon(1S)$

$\Gamma(\gamma X_b \rightarrow \gamma \Upsilon(1S)\omega)/\Gamma_{\text{total}}$					Γ_{32}/Γ	
VALUE	CL%	DOCUMENT ID		TECN	COMMENT	
YOUR DATA	$<3.8 \times 10^{-5}$	90	33 HE	14	BELL	$\Upsilon(5S) \rightarrow \pi^+ \pi^- \pi^0 \gamma \Upsilon(1S)$
YOUR NOTE	31 Assuming that all the $b\bar{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\bar{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14.					
YOUR NOTE	32 Accounting for correlated systematics.					
YOUR NOTE	33 Assuming that all the $b\bar{b}$ events are from $\Upsilon(5S)$ resonance decays and using $\sigma(e^+e^- \rightarrow b\bar{b}) = 0.340 \pm 0.016$ nb from ESEN 13. Correlated with other results from HE 14. For a state X_b with mass between $10.55 \text{ GeV}/c^2$ and $10.65 \text{ GeV}/c^2$, the obtained 90% upper limit as a function of m_{X_b} varies from 2.6×10^{-5} to 3.8×10^{-5} .					

NODE=M092R47
NODE=M092R47

NODE=M092R36;LINKAGE=A

NODE=M092R44;LINKAGE=A
NODE=M092R47;LINKAGE=A

$\Upsilon(10860)$ REFERENCES

YOUR PAPER	HE	14	PRL 113 142001	X.H. He <i>et al.</i>	(BELLE Collab.)
	ESEN	13	PR D87 031101	S. Esen <i>et al.</i>	(BELLE Collab.)

NODE=M092

REFID=55927
REFID=54894