



Istituto Nazionale di Fisica Nucleare
SEZIONE DI TORINO

~~*Bottomonium*~~

Bottomonium and hyperons WG

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INFN - Sezione di Torino

Overview

Change of mandate

bottomonium → bottomonium and hyperons

63 available analysis topics:

<https://confluence.desy.de/display/BI/Physics+Bottomonium+and+Hyperons>

7 institutions actively involved

(Torino, PNNL, Luther, Beijing, Melbourne, DESY, Vienna)

Little but constant activity (everybody is working 99% on detector & performances)

Goals: Finalize the $Y(3S)$ and $Y(6S)$ notes by the end of the year.

Start the about the data taking schedule at the February 2019 B2GM

Phase II

We have been asked to provide MC studies for $\Upsilon(6S)$ in phase II (sic!)

Topic	Phase / dataset	Sector / field	who's working on this?
$\Upsilon(6S) \rightarrow \pi\pi\Upsilon(1S, 2S)$ exclusive	Phase 2 / Phase 3 Y(6S)	Exotica	@ Bryan Fulsom, @ Todd Pedlar
$\Upsilon(6S) \rightarrow \eta\Upsilon(1S, 2S)$ exclusive	Phase 2 / Phase 3 Y(6S)	NRQCD	@ Suxian Li
$\Upsilon(6S) \rightarrow \eta'\Upsilon(1S, 2S)$ exclusive	Phase 2 / Phase 3 Y(6S)	NRQCD	@ Stefano Spataro
$\Upsilon(6S) \rightarrow \pi^+\pi^- X$ inclusive	Phase 2 / Phase 3 Y(6S)	Exotica	@ Bryan Fulsom, @ Todd Pedlar
$\Upsilon(6S) \rightarrow \pi^+\pi^- B^{(*)}\bar{B}^{(*)}$ (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	
$\Upsilon(6S) \rightarrow \gamma X$ inclusive (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	
$\Upsilon(6S) \rightarrow \gamma B^{(*)}\bar{B}^{(*)}$ (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	
$\Upsilon(6S) \rightarrow \pi^\pm\pi^0 X$ inclusive (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	
$\Upsilon(6S) \rightarrow \pi^\pm\pi^0 W_b \rightarrow \pi^\pm\pi^0\rho^\mp\Upsilon(1S)$ (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	
$\Upsilon(6S) \rightarrow \pi^\pm\pi^\mp W_b \rightarrow \pi^\pm\pi^\mp\rho^0\Upsilon(1S)$ (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	
$\Upsilon(6S) \rightarrow \gamma W_b \rightarrow \gamma\rho^0\Upsilon(1S)$ (search for W_b)	Phase 2 / Phase 3 Y(6S)	Exotica	@ Xing-Yu Zhou
$\Upsilon(6S) \rightarrow \eta X$ inclusive (search for $\Upsilon(2D)$)	Phase 2 / Phase 3 Y(6S)	Spectroscopy, new states	@ Umberto Tamponi (already partially done)
$\Upsilon(6S) \rightarrow \omega X$ inclusive (focus on $\eta_b(1S)$)	Phase 2 / Phase 3 Y(6S)	Spectroscopy, new states	@ Wencheng Yan
$\Upsilon(6S) \rightarrow \omega + \chi_{bJ} \rightarrow \omega + \gamma + \Upsilon(1S)$	Phase 2 / Phase 3 Y(6S)	Spectroscopy, new states	@ Junhao Yin @ Wencheng Yan
$\Upsilon(6S) \rightarrow \phi + \chi_{bJ} \rightarrow \phi + \gamma + \Upsilon(1S)$	Phase 2 / Phase 3 Y(6S)	Spectroscopy, new states	@ Xuyang Gao
$\Upsilon(6S) \rightarrow \phi + anything$	Phase 2 / Phase 3 Y(6S)	Spectroscopy	@ Xuyang Gao
Leptonic widths of $\Upsilon(nS)$ using ISR cross section (LUV-sensitive)	Phase 2 / Phase 3 Any	Precision QCD / QED / new physics	
Sensitivity of a mini-scan at 10.750 GeV	Phase 2	Exotica	@ Bryan Fulsom, @ Umberto Tamponi

Other analyses

Light Higgs in $\Upsilon(1S, 2S, 3S) \rightarrow \gamma l^+ l^-$	Phase 3 Y(3S)	New Physics	@ Sen Jia
LFV in $\Upsilon(1S, 2S, 3S) \rightarrow \mu\tau, e\tau, e\mu$	Phase 3 Y(3S)	New Physics	
LUV in $\Upsilon(3S) \rightarrow \pi\pi\Upsilon(1S) \rightarrow \pi\pi\mu\mu, \pi\pi ee, \pi\pi\tau\tau$	Phase 3 Y(3S)	New Physics	
Light Higgs in $h_b(1P) \rightarrow \gamma l^+ l^-$ with eta tag	Phase 3 Y(4S)	New Physics	
Light Higgs in $h_b(1P) \rightarrow \gamma l^+ l^-$ with di-pion tag	Phase 3 Y(5S)	New Physics	
$h_b(1P) \rightarrow l^+ l^-$ with eta tag	Phase 3 Y(4S)	New Physics	
$h_b(1P) \rightarrow l^+ l^-$ with di-pion tag	Phase 3 Y(5S)	New Physics	
H di-baryon in $\Upsilon(3S) \rightarrow \Lambda\Lambda + X$	Phase 3 Y(3S)	Light exotica	@ Bianca Scavino
Hyperon cross sections and spectra in $\Upsilon(3S) \rightarrow \Lambda + X$	Phase 3 Y(3S)	QCD, fragmentation	
$\Lambda\Lambda$ correlation functions in $\Upsilon(3S)$ annihilations	Phase 3 Y(3S)	QCD, Astro-ph	
$\Omega\Omega$ correlation functions in $\Upsilon(3S)$ annihilations	Phase 3 Y(3S)	QCD, Astro-ph	
$\Xi\Xi$ correlation functions in $\Upsilon(3S)$ annihilations	Phase 3 Y(3S)	QCD, Astro-ph	
$\Lambda(1405)$ production in $\Upsilon(3S)$ annihilations	Phase 3 Y(3S)	QCD, Hyperons	
Search for new Hyperons	Phase 3 Y(3S)	Hyperon spectroscopy, new particles	
Gluon fragmentation functions with $\Upsilon(3S) \rightarrow \gamma gg$	Phase 3 Y(3S)	QCD, fragmentation	
Gluon VS quark fragmentation using $\Upsilon(3S) \rightarrow ggg$	Phase 3 Y(3S) / continuum	QCD, fragmentation	
anti-deuteron spectrum in $\Upsilon(3S) \rightarrow \bar{d} + X$	Phase 3 Y(3S)	QCD, Astro-ph	@ Umberto Tamponi
Search for anti-Helium in $\Upsilon(3S) \rightarrow \bar{3}\bar{H}e + X$	Phase 3 Y(3S)	QCD, hypernuclear physics	
Associated deuteron production $\Upsilon(3S) \rightarrow d\bar{d} + X$	Phase 3 Y(3S)	QCD, Astro-ph	
Pion scattering length in $\Upsilon(3S) \rightarrow \pi\pi\Upsilon(2S)$	Phase 3 Y(3S)	QCD	
Hypernuclei in $\Upsilon(3S)$	Phase 3 Y(3S)	QCD, Astro-ph	
Inclusive J/psi and psi' in $\Upsilon(3S)$	Phase 3 Y(3S)	QCD	
Inclusive chi_c in $\Upsilon(3S)$	Phase 3 Y(3S)	QCD	
Inclusive exotic charmonia in $\Upsilon(3S)$	Phase 3 Y(3S)	QCD	

$\eta_b(1S) \rightarrow \gamma\gamma$ from Y(5S) with di-pion tag	Phase 3 Y(5S)	Precision test of NRQCD	
$\eta_b(1S) \rightarrow \gamma\gamma$ from Y(4S) with eta tag	Phase 3 Y(4S)	Precision test of NRQCD	
$\Upsilon(1D)$ triplet masses in $\Upsilon(5S) \rightarrow \eta\Upsilon(1D) \rightarrow exclusive$	Phase 3 Y(5S)	Spectroscopy	@ Sen Jia
$\Upsilon(1D)$ triplet masses in $\Upsilon(3S) \rightarrow \gamma\gamma\Upsilon(1D) \rightarrow exclusive$	Phase 3 Y(3S)	Spectroscopy	@ Todd Pedlar
Precision measurement of the Z_b masses	Phase 3 Y(5S)	Exotica	
$Z_b \rightarrow B^{(*)}\bar{B}^{(*)}$	Phase 3 Y(5S)	Exotica	
$\Upsilon(3S) \rightarrow \pi\pi\Upsilon(1S, 2S)$ exclusive	Phase 3 Y(3S)	NRQCD, Exotica	
$\Upsilon(3S) \rightarrow \pi\pi(b\bar{b})$ inclusive, search for $\Upsilon(3S) \rightarrow \pi\pi h_b(1P)$	Phase 3 Y(3S)	NRQCD, Exotica	
$\Upsilon(3S) \rightarrow \eta, \pi^0\Upsilon(1S)$	Phase 3 Y(3S)	NRQCD	@ Yateng Zhang
$\Upsilon(3S) \rightarrow \pi^0 h_b(1P)$	Phase 3 Y(3S)	Isospin violation in QCD	@ Longke Li
$\Upsilon(3S) \rightarrow \gamma\chi_b(2P) \rightarrow \gamma\eta\eta_b(1S)$	Phase 3 Y(3S)	NRQCD	
$\Upsilon(3S) \rightarrow \gamma\eta_b(1S, 2S)$	Phase 3 Y(3S)	NRQCD, Precision spectroscopy	
$\Upsilon(3S) \rightarrow \gamma\chi_b(2P) \rightarrow \gamma\gamma h_b(1P)$ Hindered transition	Phase 3 Y(3S)	NRQCD, Exotica	@ Todd Pedlar
$\Upsilon(5S) \rightarrow \pi\pi h_b(nP) \rightarrow \pi\pi\gamma\chi_b(1P)$ Hindered transition	Phase 3 Y(5S)	NRQCD, Exotica	
Direct scan of the $\Upsilon(2D)$	Phase 3	Spectroscopy	
Search for the F-wave states	Phase 3 Y(4S, 5S)	Spectroscopy, new states	
$\Upsilon(3S) \rightarrow \gamma\chi_{b0}(1P, 2P) \rightarrow \gamma\tau^+\tau^-$	Phase 3 Y(3S)	New Physics	@ Umberto Tamponi
$\Upsilon(3S) \rightarrow \gamma\chi_{b0}(1P, 2P) \rightarrow \gamma\mu^+\mu^-$	Phase 3 Y(3S)	New Physics	@ YuHu
$\Upsilon(1S, 2S) \rightarrow invisible$	Phase 3 Y(3S)	New Physics	
Dark photon in $\Upsilon(1S, 2S, 3S)$	Phase 3 Y(3S)	New Physics	@ Torben Ferber, @ Christopher Hearty