

The latest Global Fit of New Physics in $b \rightarrow s$ transition

Fanrong Xu

Jinan University

Collaborated with Qiaoyi Wen

Work to appear

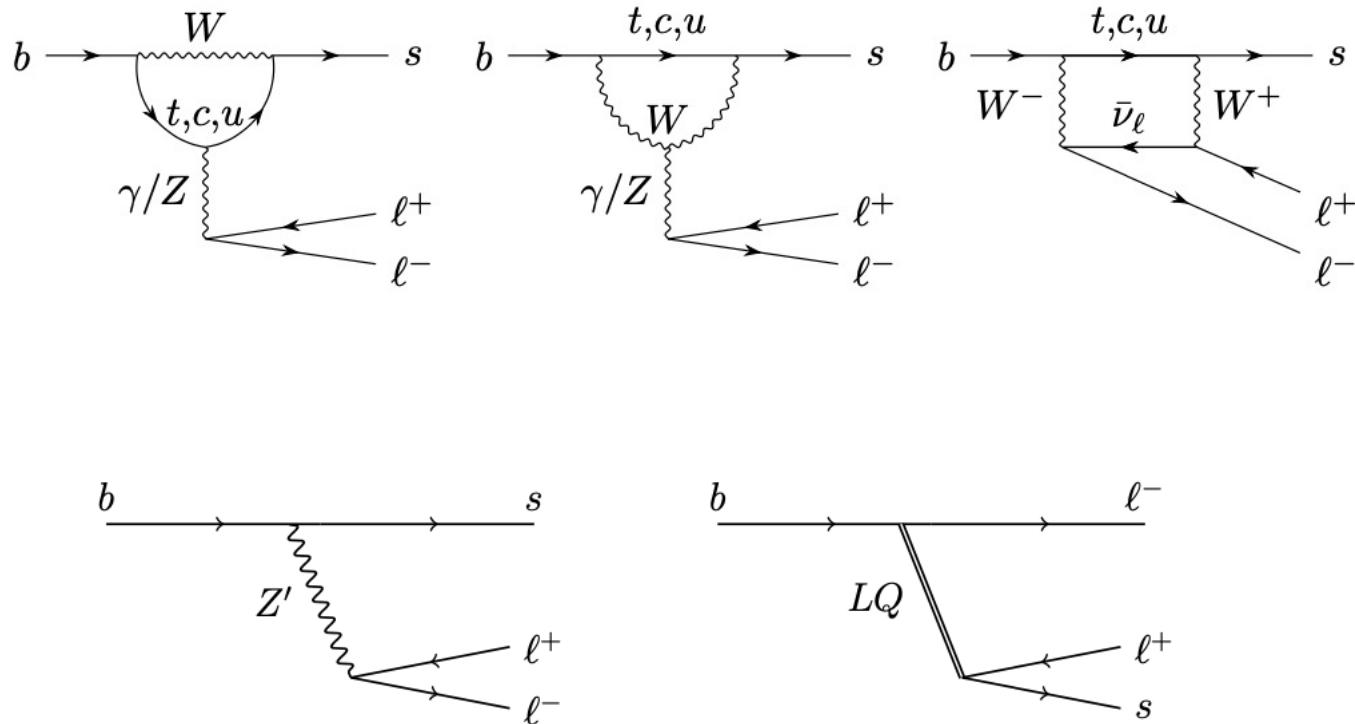
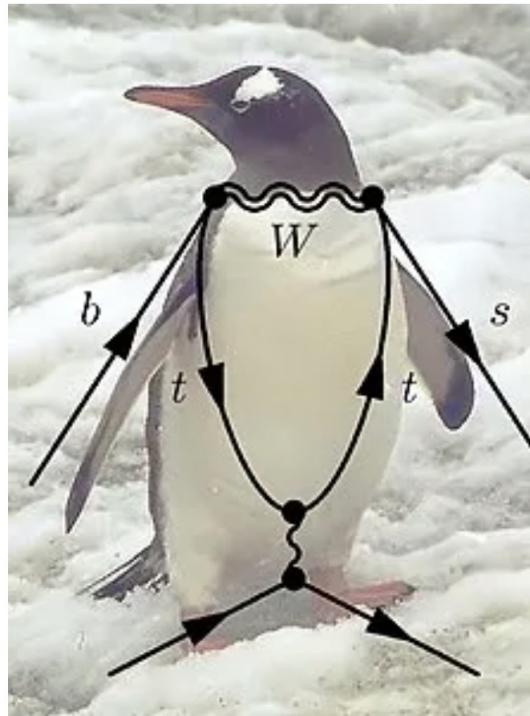
2023/04/22, Wuhan



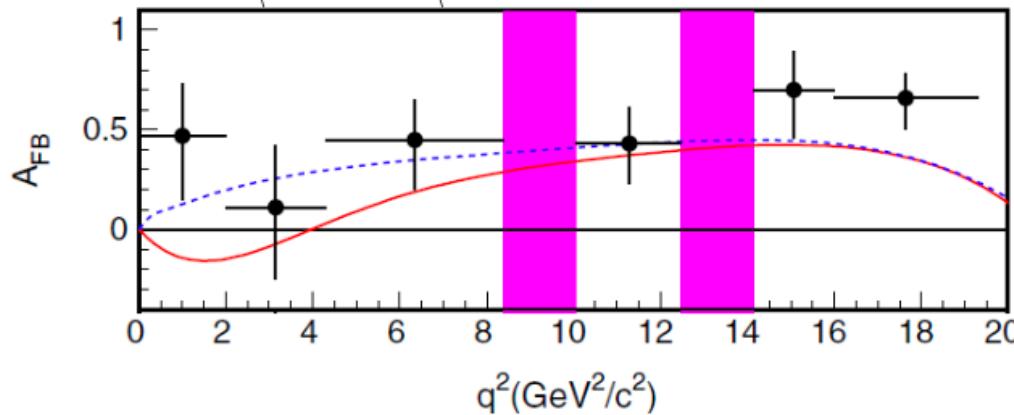
Outline

- Introduction
- Fitting schemes and results
- Summary

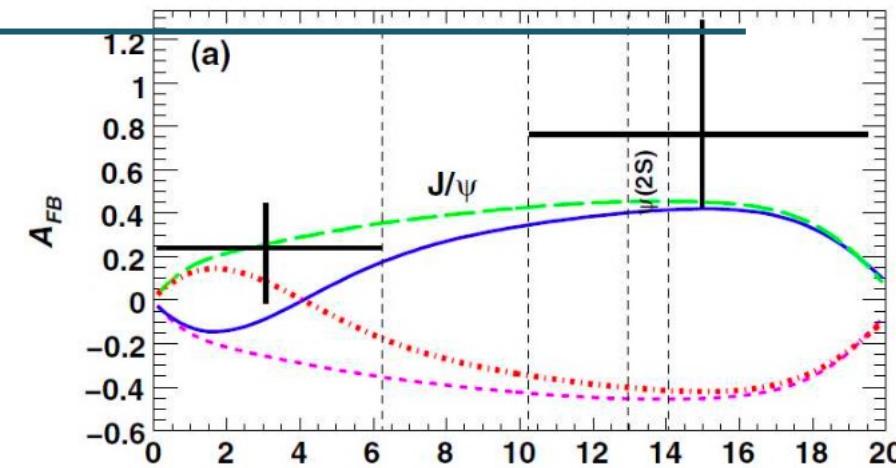
Introduction: $b \rightarrow s$ FCNC as a NP probe



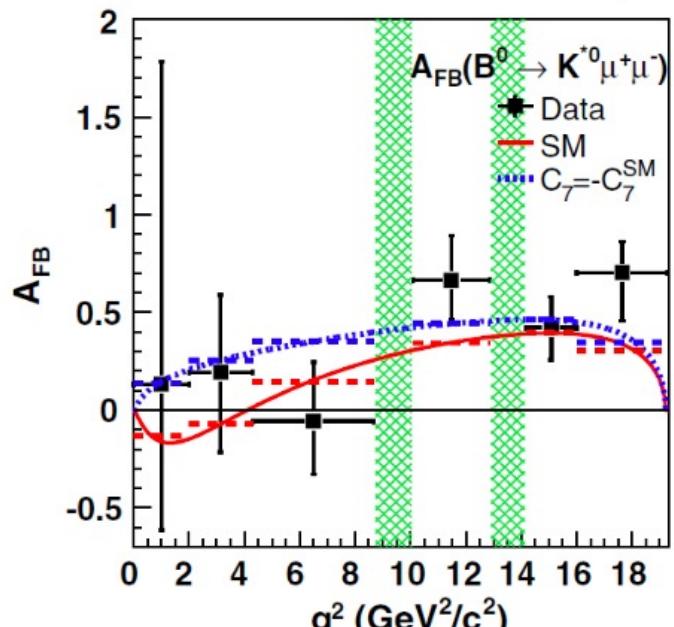
The story before 2012



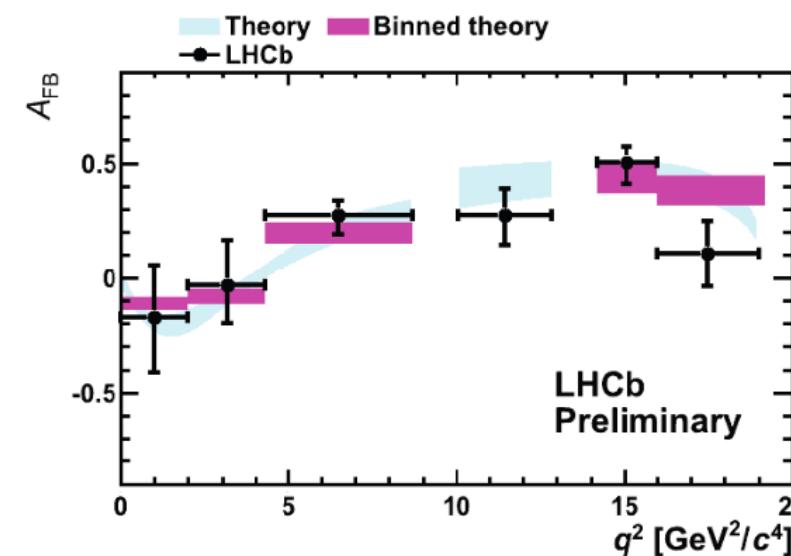
Belle, PRL 103, 171801 (2009)



BaBar, PRD 79, 031102(R) (2009)

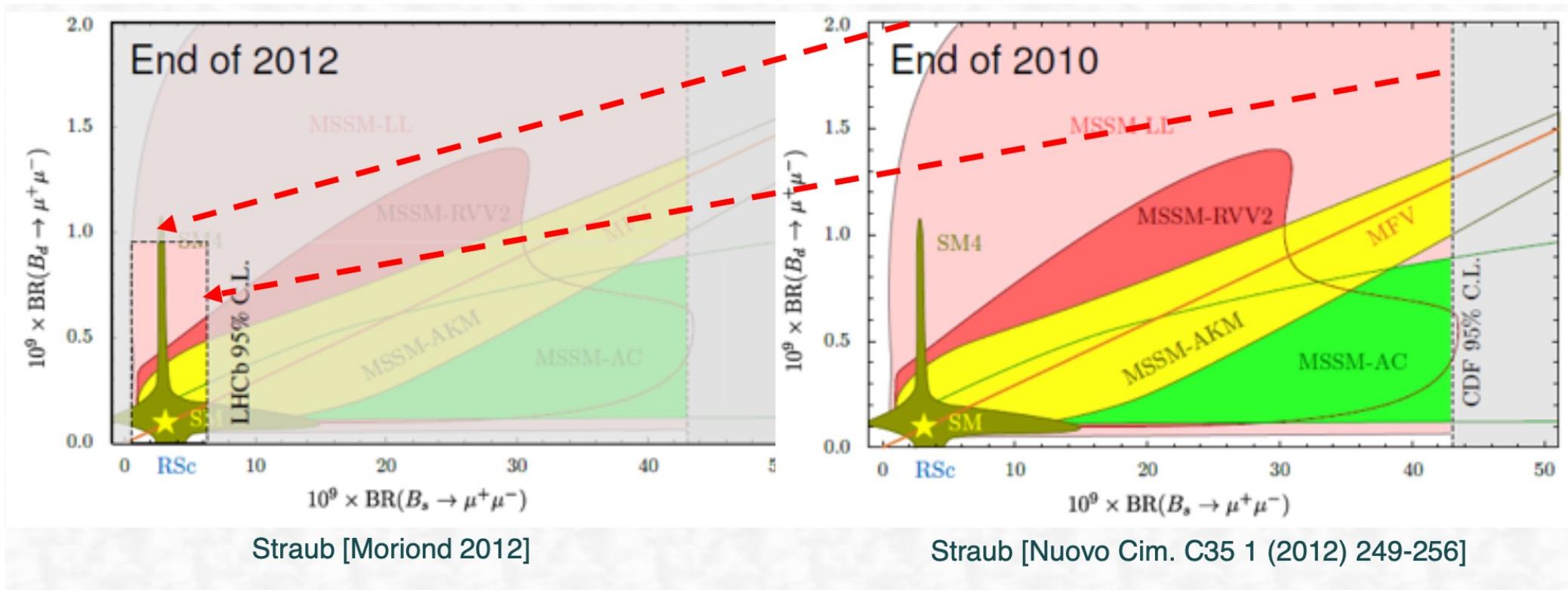


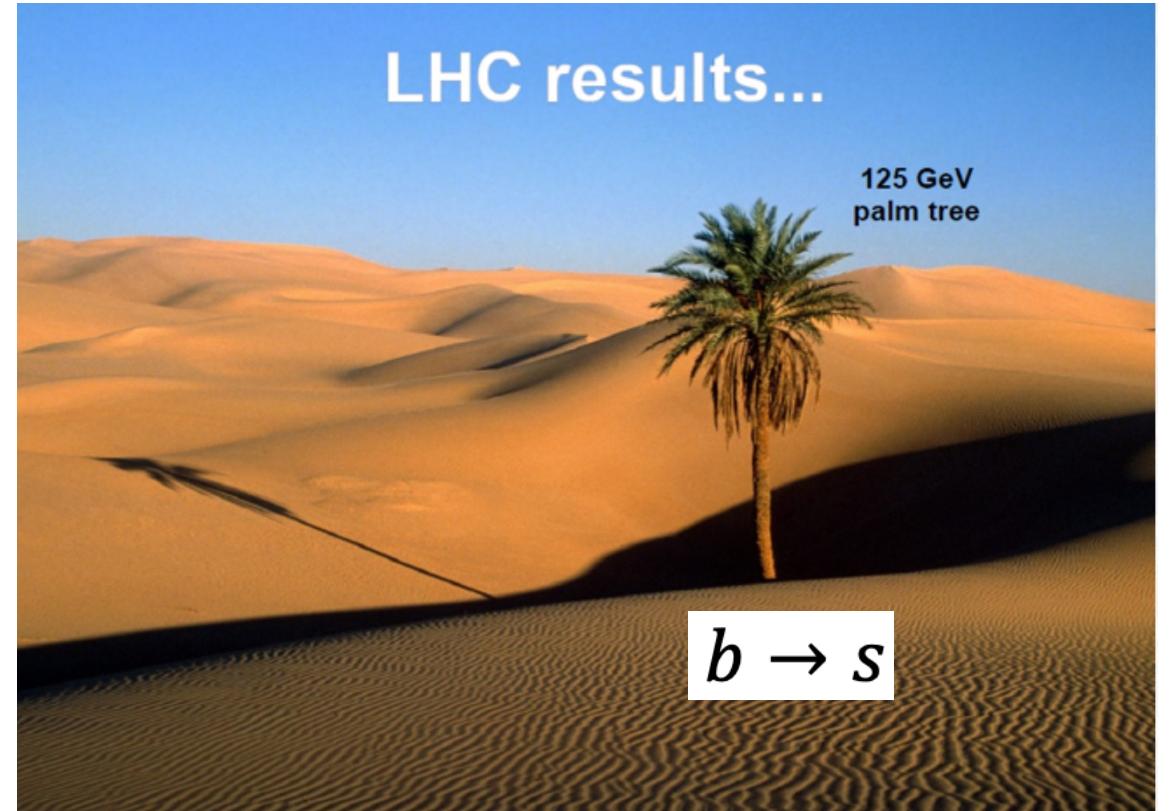
CDF, PRL 106, 161801(2011)



309pb^{-1} data, M. Patel, LHCb@EPS-HEP2011

The story before 2012

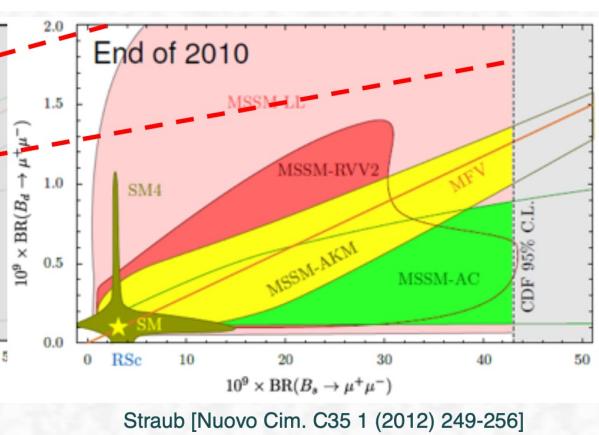
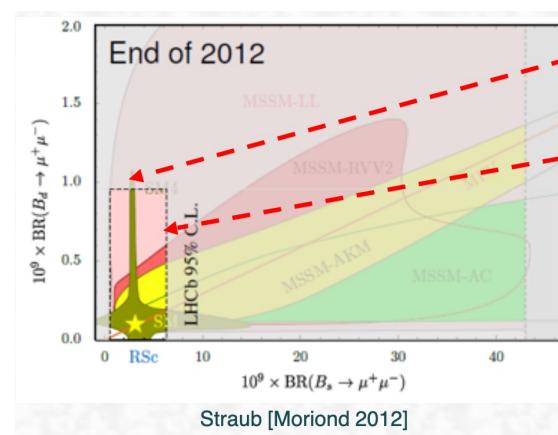
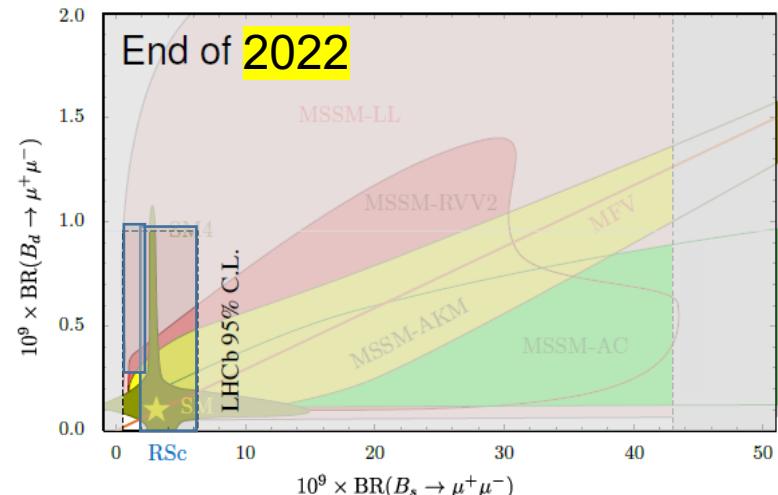
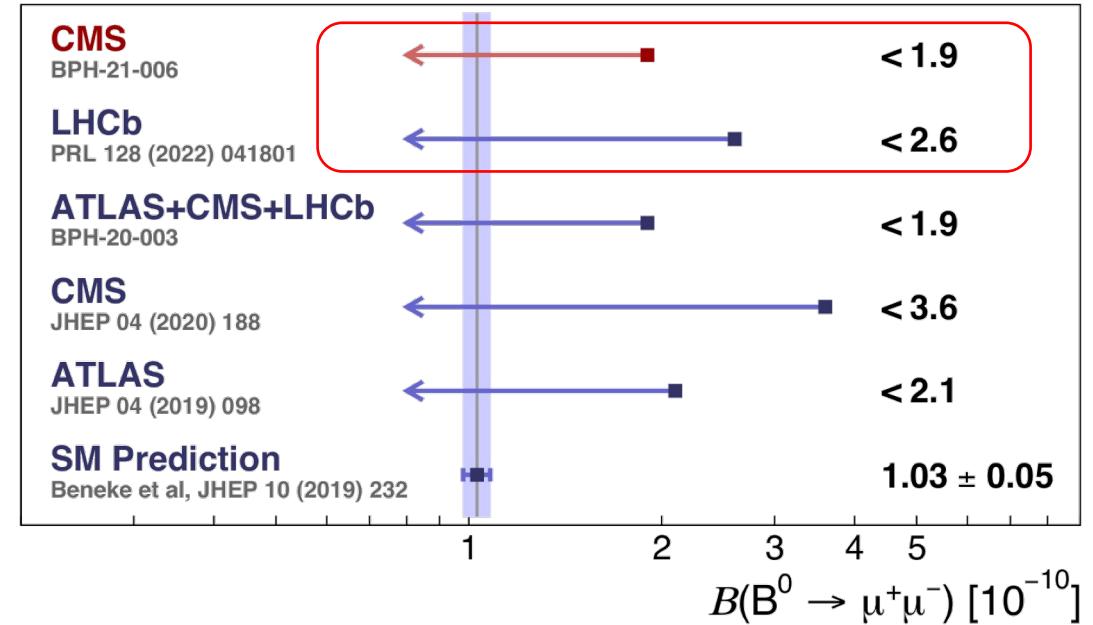
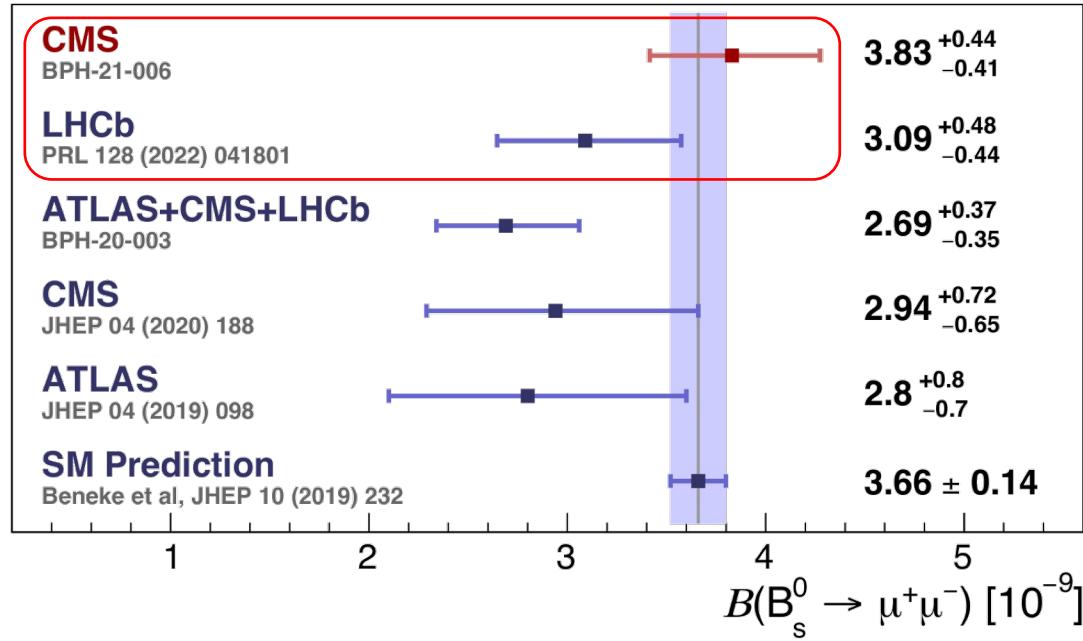




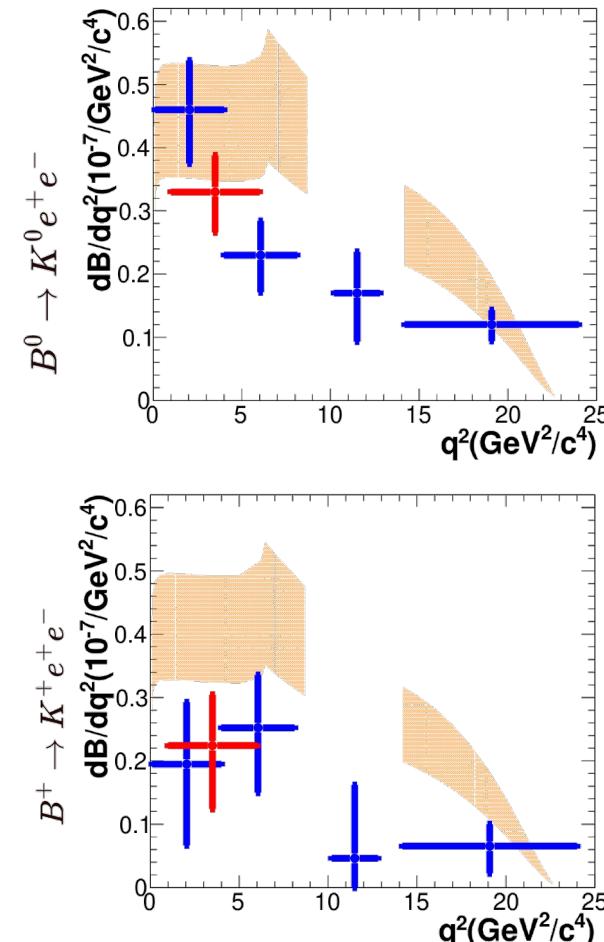
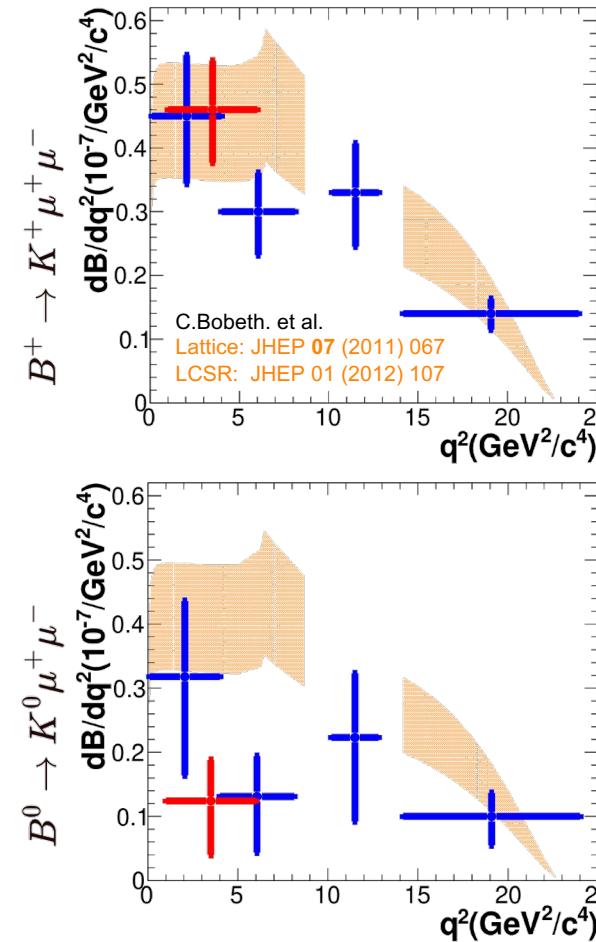
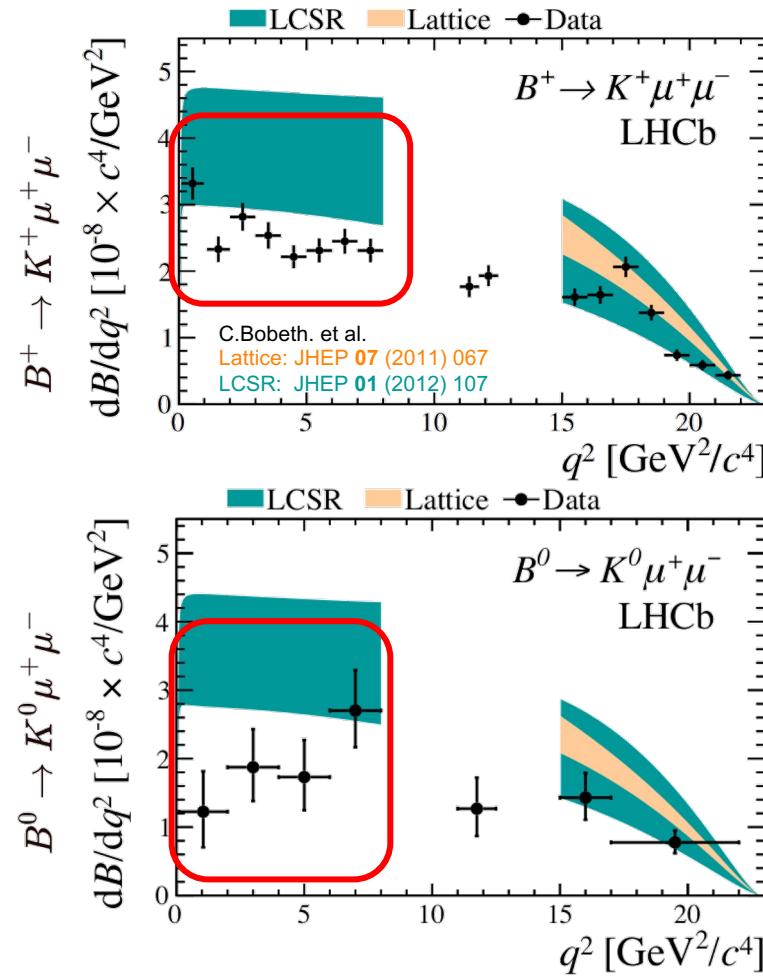
Then...

Leptonic decay

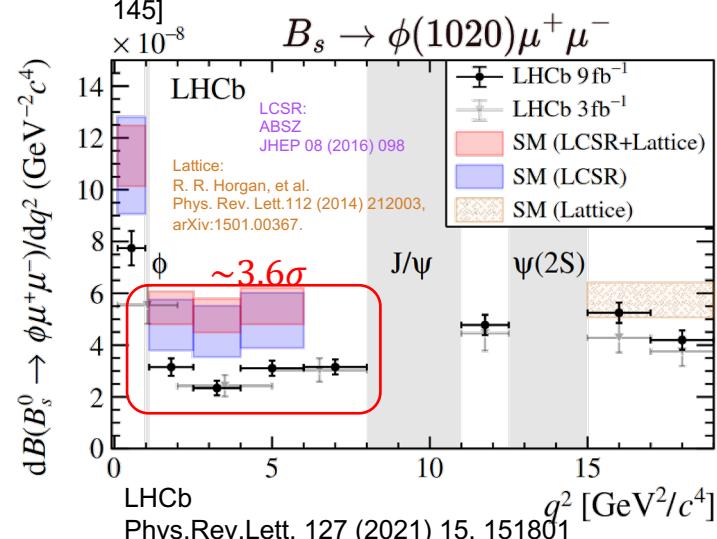
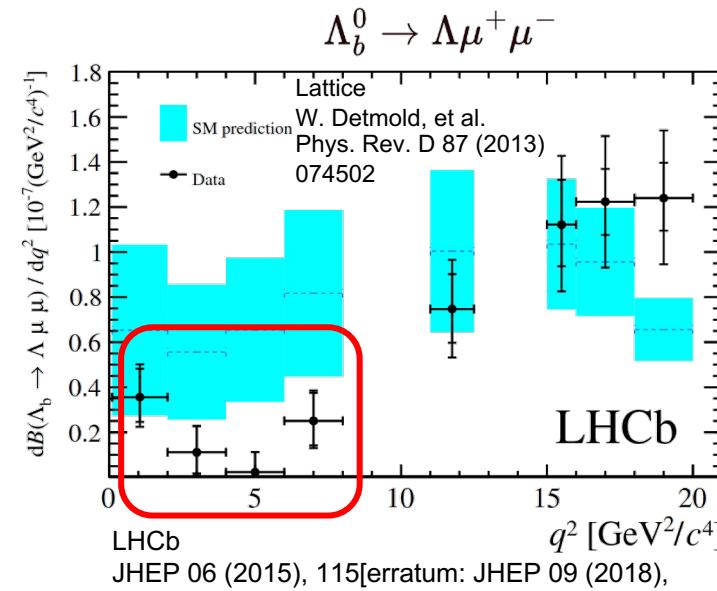
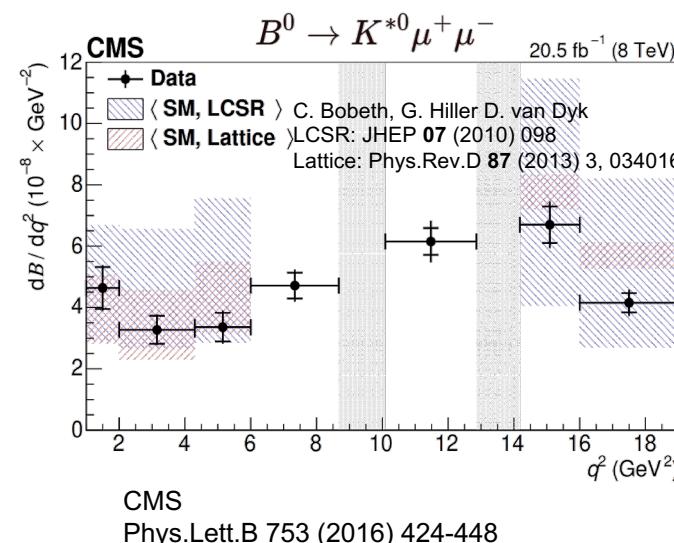
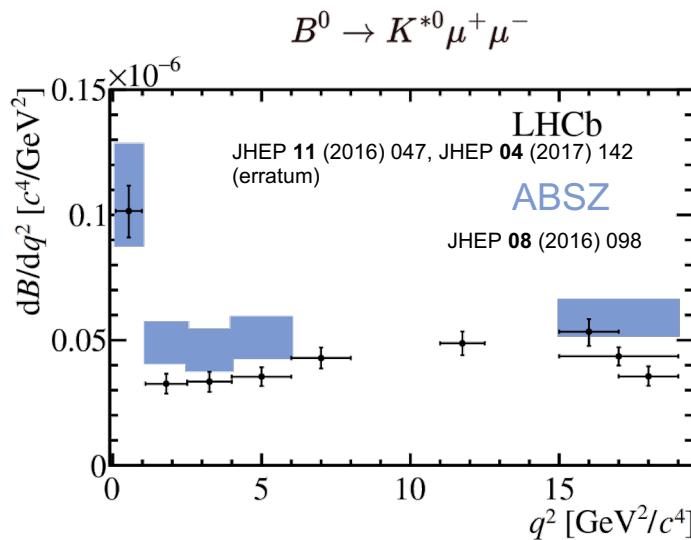
Alessio Boletti(CMS), ICHEP 2022
<https://agenda.infn.it/event/28874/contributions/169340/>



Semileptonic decay: Branching fractions



Semileptonic decay: Branching fractions

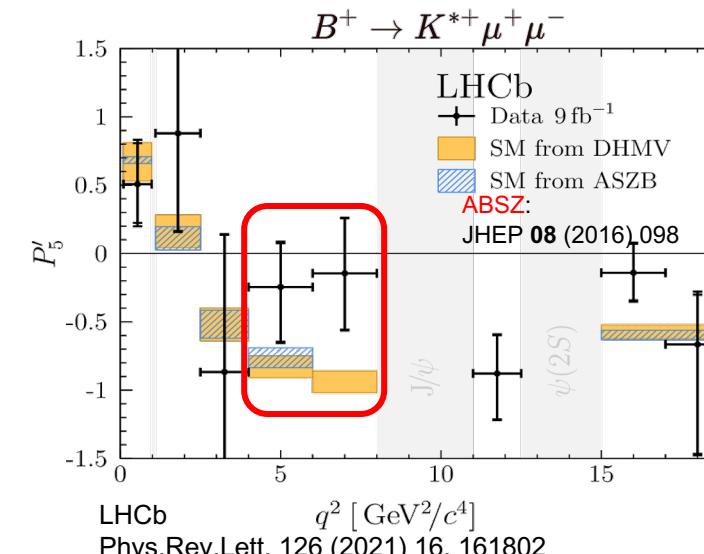
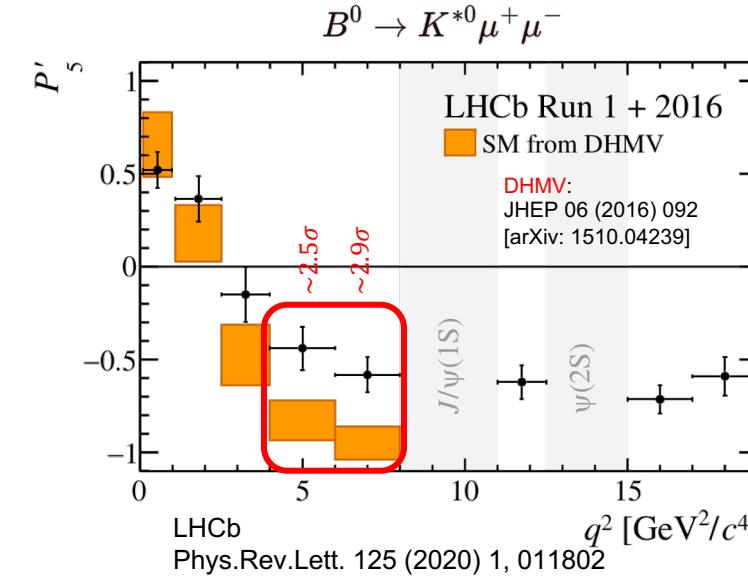
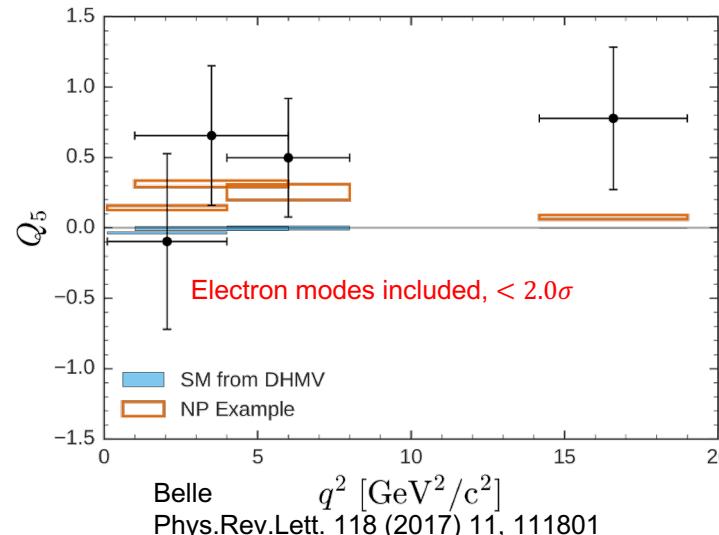
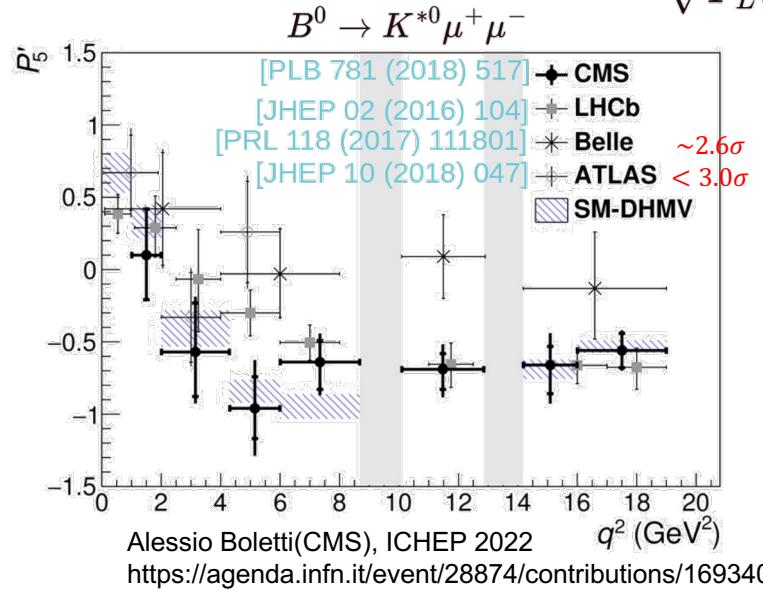


Angular analysis refers to:
LHCb, JHEP 09 (2018), 146

Angular analysis could be found in:
LHCb, JHEP 11 (2021) 043
arXiv: 2107.13428

Semileptonic decay: Angular distribution

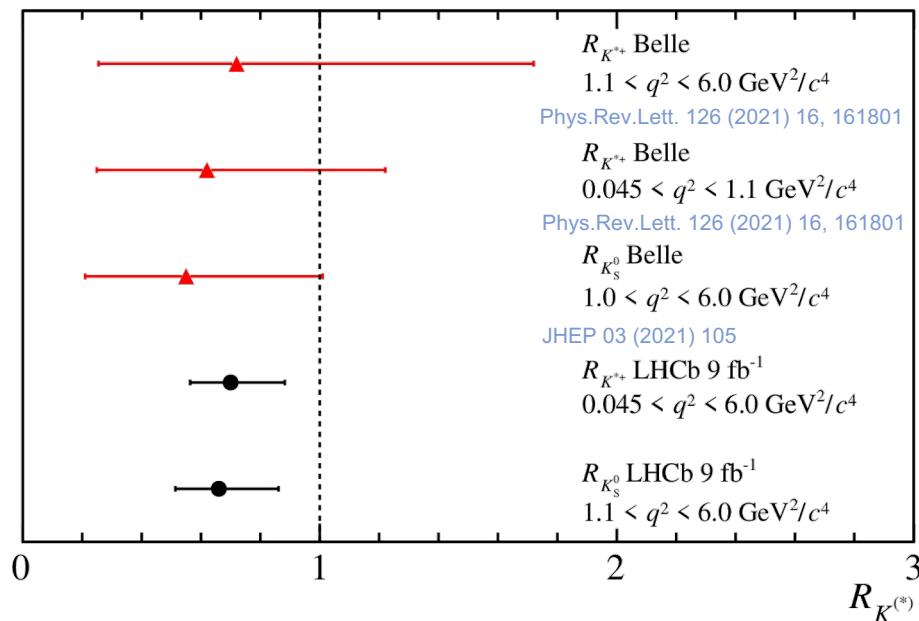
$$P'_5 = \frac{S_5}{\sqrt{F_L(1 - F_L)}} \quad Q_5 = P'_i{}^\mu - P'_i{}^e$$



Semileptonic decay: Lepton Universality

Old **Before Dec. 2022**

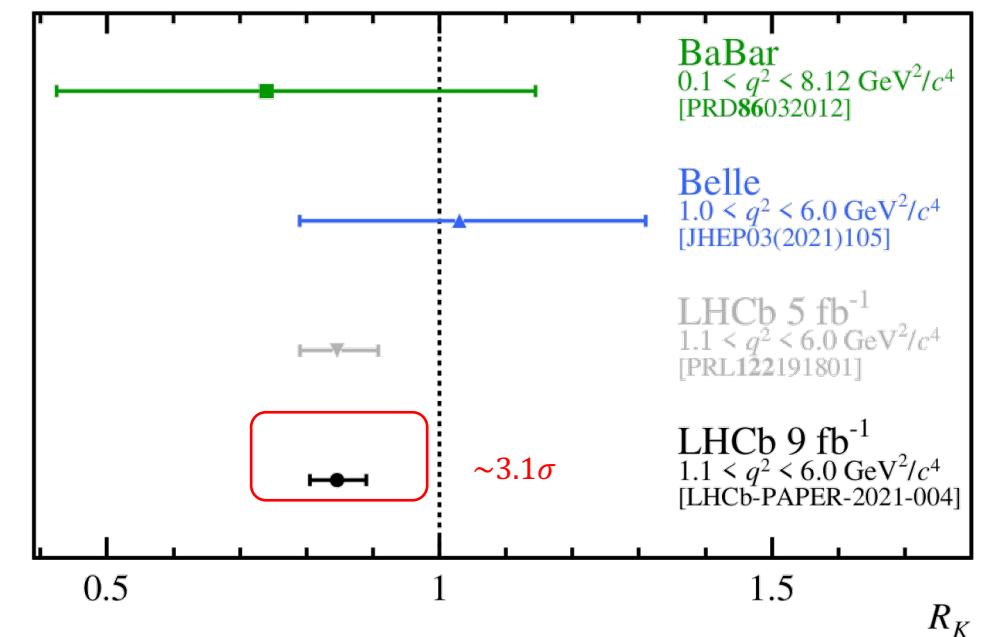
$$R_{K^*} = \frac{BR(B \rightarrow K^* \mu^+ \mu^-)}{BR(B \rightarrow K^* e^+ e^-)}$$



LHCb, Phys.Rev.Lett. 128 (2022) 19, 191802

$$R_K = \frac{BR(B \rightarrow K \mu^+ \mu^-)}{BR(B \rightarrow K e^+ e^-)}$$

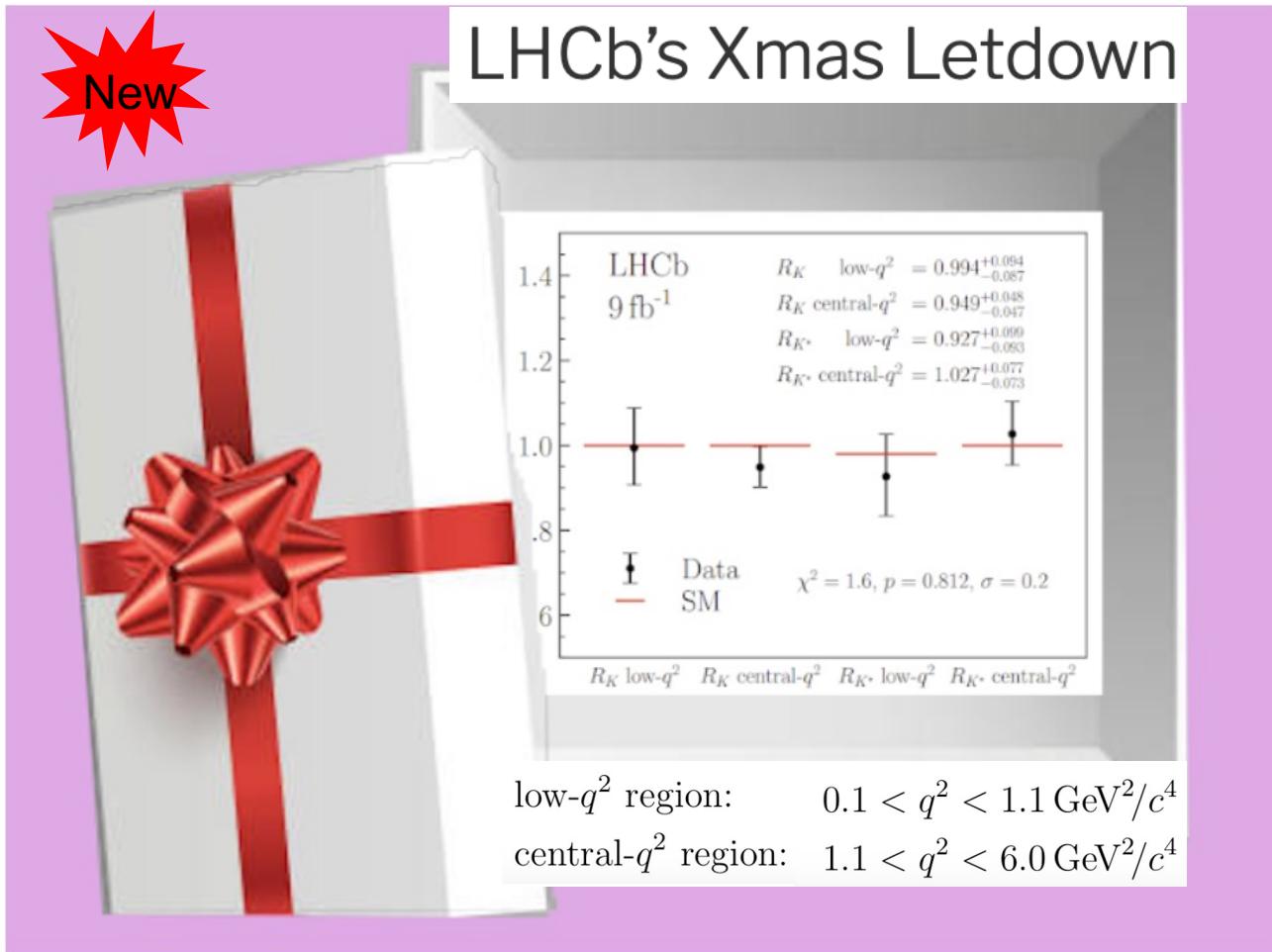
G. Hiller, F. Kruger
hep-ph/0310219



LHCb, Nature Physics 18, (2022) 277-282

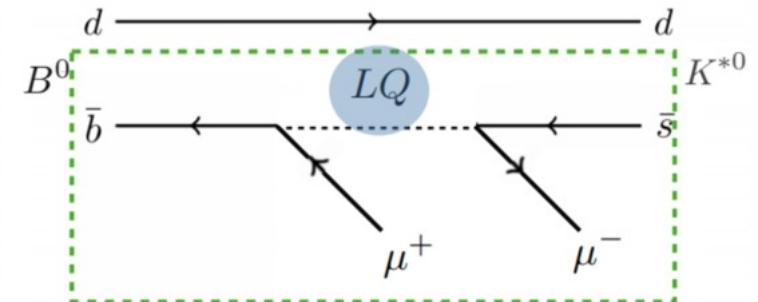
Semileptonic decay: Lepton Universality

The R(K) anomaly fades away ! ?

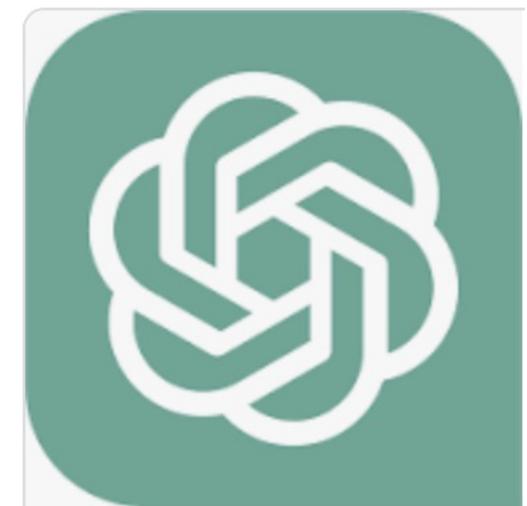


LHCb , arXiv: 2212.09153V1

New physics scenario



信达雅



Theoretical description of NP

$$\mathcal{H} = -\frac{4G_F}{\sqrt{2}} V_{tb} V_{ts}^* \frac{e^2}{16\pi^2} \sum_i (C_i \mathcal{O}_i + C'_i \mathcal{O}'_i) + h.c.$$

$\mathcal{O}_7 = \frac{m_b}{e} (\bar{s}\sigma_{\mu\nu} P_R b) F^{\mu\nu},$	$\mathcal{O}'_7 = \frac{m_b}{e} (\bar{s}\sigma_{\mu\nu} P_L b) F^{\mu\nu},$
$\mathcal{O}_8 = \frac{g_s m_b}{e^2} (\bar{s}\sigma_{\mu\nu} T^a P_R b) G_a^{\mu\nu},$	$\mathcal{O}'_8 = \frac{g_s m_b}{e^2} (\bar{s}\sigma_{\mu\nu} T^a P_L b) G_a^{\mu\nu},$
$\mathcal{O}_9 = (\bar{s}\gamma_\mu P_L b)(\bar{\ell}\gamma^\mu \ell),$	$\mathcal{O}'_9 = (\bar{s}\gamma_\mu P_R b)(\bar{\ell}\gamma^\mu \ell),$
$\mathcal{O}_{10} = (\bar{s}\gamma_\mu P_L b)(\bar{\ell}\gamma^\mu \gamma_5 \ell),$	$\mathcal{O}'_{10} = (\bar{s}\gamma_\mu P_R b)(\bar{\ell}\gamma^\mu \gamma_5 \ell),$
$\mathcal{O}_S = m_b (\bar{s}P_R b)(\bar{\ell}\ell),$	$\mathcal{O}'_S = m_b (\bar{s}P_L b)(\bar{\ell}\ell),$
$\mathcal{O}_P = m_b (\bar{s}P_R b)(\bar{\ell}\gamma_5 \ell),$	$\mathcal{O}'_P = m_b (\bar{s}P_L b)(\bar{\ell}\gamma_5 \ell).$

New Physics

$$C_i^{(\prime)\ell} = C_i^{(\prime)\ell;SM} + \Delta C_i^{(\prime)\ell;NP} = C_i^{(\prime)\ell;SM} + \boxed{\Delta C_i^{(\prime)\ell}}$$

Scenario I:

$$\Delta C_{9,10,S,P}^{(\prime)e} = 0$$

Scenario II:

$$\Delta C_{9,10,S,P}^{(\prime)\mu} = \Delta C_{9,10,S,P}^{(\prime)e}$$

Scenario III:

all parameters are taken

Scenario IV:

all parameters are taken except C7.

Fit input 1: Theoretical side

Taking $B \rightarrow K^* \ell^+ \ell^-$ as an illustration

$$\frac{d^4\Gamma^\ell}{dq^2 \, d\cos\theta_\ell \, d\cos\theta_{K^*} \, d\phi} = \frac{9}{32\pi} J^\ell(q^2, \theta_\ell, \theta_{K^*}, \phi)$$

$$\begin{aligned} J^\ell(q^2, \theta_\ell, \theta_{K^*}, \phi) = & J_{1;s}^\ell \sin^2 \theta_{K^*} + J_{1;c}^\ell \cos^2 \theta_{K^*} + (J_{2;s}^\ell \sin^2 \theta_{K^*} + J_{2;c}^\ell \cos^2 \theta_{K^*}) \cos 2\theta_\ell \\ & + J_3^\ell \sin^2 \theta_{K^*} \sin^2 \theta_\ell \cos 2\phi + J_4^\ell \sin 2\theta_{K^*} \sin 2\theta_\ell \cos \phi \\ & + J_5^\ell \sin 2\theta_{K^*} \sin \theta_\ell \cos \phi \\ & + (J_{6;s}^\ell \sin^2 \theta_{K^*} + J_{6;c}^\ell \cos^2 \theta_{K^*}) \cos \theta_\ell + J_7^\ell \sin 2\theta_{K^*} \sin \theta_\ell \sin \phi \\ & + J_8^\ell \sin 2\theta_{K^*} \sin 2\theta_\ell \sin \phi + J_9^\ell \sin^2 \theta_{K^*} \sin^2 \theta_\ell \sin 2\phi \end{aligned}$$

$$A_{\perp;\ell}^{L,R} = N_0^\ell \sqrt{2} \lambda M_B^2 \left[\left[(C_9^\ell + C_9'^\ell) \mp (C_{10}^\ell + C_{10}'^\ell) \right] \frac{V(q^2)}{M_B + M_{K^*}} \right. \\ \left. + \frac{2m_b}{q^2} (C_7^\ell + C_7'^\ell) T_1(q^2) \right] + \Delta A_{\perp}^{L,R},$$

$$A_{\parallel;\ell}^{L,R} = -N_0^\ell \sqrt{2} (M_B^2 - M_{K^*}^2) \left[\left[(C_9^\ell - C_9'^\ell) \mp (C_{10}^\ell - C_{10}'^\ell) \right] \frac{A_1(q^2)}{M_B - M_{K^*}} \right. \\ \left. + \frac{2m_b}{q^2} (C_7^\ell - C_7'^\ell) T_2(q^2) \right] + \Delta A_{\parallel}^{L,R},$$

[24] W. Altmannshofer, P. Ball, A. Bharucha, A. J. Buras, D. M. Straub, and M. Wick, *JHEP* **01**, 019 (2009), arXiv:0811.1214 [hep-ph].

$$\begin{aligned} J_{1;s}^\ell &= \frac{(2 + \beta_\ell^2)}{4} [|A_{\perp;\ell}^L|^2 + |A_{\parallel;\ell}^L|^2 + (\text{L} \rightarrow \text{R})] + \frac{4m_\ell^2}{q^2} \Re(A_{\perp;\ell}^L A_{\perp;\ell}^{R*} + A_{\parallel;\ell}^L A_{\parallel;\ell}^{R*}), \\ J_{1;c}^\ell &= |A_{0;\ell}^L|^2 + |A_{0;\ell}^R|^2 + \frac{4m_\ell^2}{q^2} [|A_{t;\ell}^L|^2 + 2\Re(A_{0;\ell}^L A_{0;\ell}^{R*})] + \beta_\ell^2 |A_{S;\ell}|^2, \\ J_{2;s}^\ell &= \frac{\beta_\ell^2}{4} [|A_{\perp;\ell}^L|^2 + |A_{\parallel;\ell}^L|^2 + (\text{L} \rightarrow \text{R})], \quad J_{2;c}^\ell = -\beta_\ell^2 [|A_{0;\ell}^L|^2 + (\text{L} \rightarrow \text{R})], \\ J_3^\ell &= \frac{1}{2} \beta_\ell^2 [|A_{\perp;\ell}^L|^2 - |A_{\parallel;\ell}^L|^2 + (\text{L} \rightarrow \text{R})], \quad J_4^\ell = \frac{1}{\sqrt{2}} \beta_\ell^2 [\Re(A_{0;\ell}^L A_{\parallel;\ell}^{L*}) + (\text{L} \rightarrow \text{R})], \\ J_5^\ell &= \sqrt{2} \beta_\ell \left[\Re(A_{0;\ell}^L A_{\perp;\ell}^{L*}) - (\text{L} \rightarrow \text{R}) - \frac{m_\ell}{\sqrt{q^2}} \Re(A_{\parallel;\ell}^L A_{S;\ell}^* + A_{\parallel;\ell}^R A_{S;\ell}^*) \right], \end{aligned}$$

$$\boxed{\mathcal{T}_a = \xi_a C_a + \frac{\pi^2}{N_c} \frac{f_B f_{V,a}}{MB} \Xi_a \sum_{\pm} \int_0^\infty \frac{d\omega}{\omega} \Phi_{B,\pm}(\omega) \int_0^1 du \Phi_{K^*,a}(u) T_{a,\pm}(u, \omega)}$$

[60] M. Beneke, T. Feldmann, and D. Seidel, *Eur. Phys. J. C* **41**, 173 (2005), arXiv:hep-ph/0412400.

[61] M. Beneke, T. Feldmann, and D. Seidel, *Nucl. Phys. B* **612**, 25 (2001), arXiv:hep-ph/0106067.

Fit input 2: Experimental side

1. $B_{s,d} \rightarrow \ell\ell$ Branching fraction
2. $B \rightarrow V\ell^+\ell^-$ Branching fraction, angular observables, RK, Q4, Q5
3. $B \rightarrow P\ell^+\ell^-$ Branching fraction, angular observables, RK*, Q4, Q5
4. $B \rightarrow X_s\ell^+\ell^-$ Branching fraction
5. $\Lambda_b \rightarrow \Lambda\ell^+\ell^-$ Branching fraction

196 observables

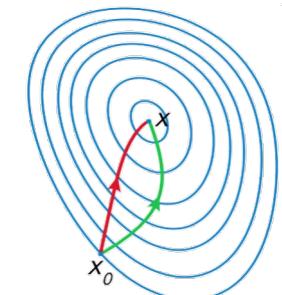
LHCb ($B^0 \rightarrow K^{*0}\mu^+\mu^-$) [12]		
	[0.10, 0.98]	$1.016^{+0.067}_{-0.073} \pm 0.029 \pm 0.069$
	[1.1, 2.5]	$0.326^{+0.032}_{-0.031} \pm 0.01 \pm 0.022$
$\frac{d\mathcal{B}(B^0 \rightarrow K^{*0}\mu^+\mu^-)}{dq^2} \times 10^7$	[2.5, 4.0]	$0.334^{+0.031}_{-0.033} \pm 0.009 \pm 0.023$
	[4.0, 6.0]	$0.354^{+0.027}_{-0.026} \pm 0.009 \pm 0.024$
	[1.0, 6.0]	$0.342^{+0.017}_{-0.017} \pm 0.009 \pm 0.023$

CMS ($B^0 \rightarrow K^{*0}\mu^+\mu^-$) [17]		
	[1.0, 2.0]	$4.6^{+0.7}_{-0.7} \pm 0.30$
$\frac{d\mathcal{B}(B^0 \rightarrow K^{*0}\mu^+\mu^-)}{dq^2} \times 10^8$	[2.0, 4.30]	$3.3^{+0.5}_{-0.5} \pm 0.2$
	[4.30, 6.00]	$3.4^{+0.5}_{-0.5} \pm 0.3$
	[1.0, 6.0]	$3.6^{+0.3}_{-0.3} \pm 0.2$

$$\chi^2(\vec{\theta}) = (\mathcal{O}_{\text{theo.}}(\vec{\theta}) - \mathcal{O}_{\text{expt.}})^\top (V_{\text{expt.}} + V_{\text{theo.}})^{-1} (\mathcal{O}_{\text{theo.}}(\vec{\theta}) - \mathcal{O}_{\text{expt.}})$$

$$\vec{\theta} = (\Delta C_7, \Delta C'_7, \Delta C_8, \Delta C'_8, \Delta C_9^\ell, \Delta C_9'^\ell, \Delta C_{10}^\ell, \Delta C_{10}'^\ell, \Delta C_S^\ell, \Delta C_S'^\ell, \Delta C_P^\ell, \Delta C_P'^\ell)$$

iminuit



The existed fits before Xmas 2022

$b \rightarrow s\ell^+\ell^-$ Global Fits after R_{K_S} and $R_{K^{*+}}$

Marcel Algueró^{a,b,*}, Bernat Capdevila^c, Sébastien Descotes-Genon^d, Joaquim Matias^{a,b}, Martín Novoa-Brunet^{d,e}

^aGrup de Física Teòrica (Departament de Física), Universitat Autònoma de Barcelona, E-08193 Bellaterra (Barcelona), Catalunya.

^bInstitut de Física d'Altes Energies (IFAE), The Barcelona Institute of Science and Technology, Campus UAB, E-08193 Bellaterra (Barcelona), Catalunya.

^cUniversità di Torino and INFN Sezione di Torino, Via P. Giuria 1, Torino I-10125, Italy.

^dUniversité Paris-Saclay, CNRS/IN2P3, IJCLab, 91405 Orsay, France.

^eIstituto Nazionale di Fisica Nucleare, Sezione di Bari, Via Orabona 4, I-70126 Bari, Italy

Λ CDMN, 2104.08921

New Physics in Rare B Decays after Moriond 2021

Wolfgang Altmannshofer^a, Peter Stangl^b

^a Department of Physics and Santa Cruz Institute for Particle Physics, University of California, Santa Cruz, 1156 High Street, Santa Cruz, CA 95064, United States

^b Albert Einstein Center for Fundamental Physics, Institute for Theoretical Physics, University of Bern, Sidlerstrasse 5, CH-3012 Bern, Switzerland

AS, 2103.13370

Implications of new evidence for lepton-universality violation in $b \rightarrow s\ell^+\ell^-$ decays

Li-Sheng Geng,^{1,2} Benjamín Grinstein,³ Sebastian Jäger,⁴ Shuang-Yi Li,⁵ Jorge Martín Camalich,^{6,7} and Rui-Xiang Shi⁵

¹School of Physics & Beijing Key Laboratory of Advanced Nuclear Materials and Physics, Beihang University, Beijing 102206, China

²School of Physics and Microelectronics, Zhengzhou University, Zhengzhou, Henan 450001, China

³Department of Physics, University of California, San Diego, La Jolla, California, 92093, USA

⁴Department of Physics and Astronomy, University of Sussex, Brighton BN1 9QH, United Kingdom

⁵School of Physics, Beihang University, Beijing 102206, China

⁶Instituto de Astrofísica de Canarias, C/ Via Lactea, s/n E38205 - La Laguna (Tenerife), Spain

⁷Universidad de La Laguna, Departamento de Astrofísica, La Laguna, Tenerife E-38205, Spain

GGJLCS, 2103.12378

Neutral current B -decay anomalies

T. Hurth^a, F. Mahmoudi^{b,c}, D. Martínez Santos^d, S. Neshatpour^e

^aPRISMA+ Cluster of Excellence and Institute for Physics (THEP), Johannes Gutenberg University, D-55099 Mainz, Germany

^bUniversité de Lyon, Université Claude Bernard Lyon 1, CNRS/IN2P3, Institut de Physique des 2 Infinis de Lyon, UMR 5822, F-69622, Villeurbanne, France

^cCERN, Theoretical Physics Department, CH-1211 Geneva 23, Switzerland,

^dInstituto Galego de Física de Altas Enerxías, Universidade de Santiago de Compostela, Spain

^eINFN-Sezione di Napoli, Complesso Universitario di Monte S. Angelo, Via Cintia Edificio 6, 80126 Napoli, Italy

HMMN, 2210.07221

A test: a comparison based on old data

Params	S-I'	S-II'	S-III'	S-IV'	ACDMN[20]	AS[21]	HMMN[22]	GGJLCS [23]
χ^2_{\min}	114.14	127.47	106.35	108.17	260.66		179.1	96.88
ΔC_7	$-0.006^{+0.017}_{-0.017}$	$-0.001^{+0.018}_{-0.018}$	$0.001^{+0.019}_{-0.019}$	-	$0.00^{+0.01}_{-0.02}$	-	$0.06^{+0.03}_{-0.03}$	-
$\Delta C'_7$	$0.019^{+0.030}_{-0.030}$	$0.054^{+0.038}_{-0.038}$	$0.053^{+0.037}_{-0.037}$	-	$+0.00^{+0.02}_{-0.01}$	-	$-0.01^{+0.01}_{-0.01}$	-
ΔC_8	$-0.646^{+0.812}_{-0.812}$	$-0.560^{+0.504}_{-0.504}$	$-0.542^{+0.510}_{-0.510}$	$-0.649^{+0.459}_{-0.459}$	-	-	$-0.80^{+0.40}_{-0.40}$	-
$\Delta C'_8$	$0.019^{+1.112}_{-1.112}$	$0.063^{+1.203}_{-1.203}$	$0.045^{+1.311}_{-1.311}$	$0.001^{+1.304}_{-1.304}$	-	-	$-0.30^{+1.30}_{-1.30}$	-
ΔC_9^μ	$-0.858^{+0.449}_{-0.449}$	$-1.027^{+0.243}_{-0.243}$	$-1.074^{+0.239}_{-0.239}$	$-0.906^{+0.196}_{-0.196}$	$-1.08^{+0.18}_{-0.17}$	$-0.82^{+0.23}_{-0.23}$	$-1.14^{+0.19}_{-0.19}$	$-1.07^{+0.29}_{-0.29}$
$\Delta C'_9^\mu$	$0.545^{+0.803}_{-0.803}$	$0.195^{+0.386}_{-0.386}$	$0.139^{+0.376}_{-0.376}$	$0.301^{+0.363}_{-0.363}$	$0.16^{+0.37}_{-0.36}$	$-0.10^{+0.34}_{-0.34}$	$0.05^{+0.32}_{-0.32}$	$0.32^{+0.21}_{-0.21}$
ΔC_{10}^μ	$0.485^{+0.482}_{-0.482}$	$0.477^{+0.196}_{-0.196}$	$0.543^{+0.185}_{-0.185}$	$0.616^{+0.185}_{-0.185}$	$0.15^{+0.13}_{-0.13}$	$+0.14^{+0.23}_{-0.23}$	$0.21^{+0.20}_{-0.20}$	$0.21^{+0.14}_{-0.14}$
$\Delta C'_{10}^\mu$	$0.028^{+0.563}_{-0.563}$	$0.046^{+0.198}_{-0.198}$	$0.054^{+0.186}_{-0.186}$	$0.072^{+0.195}_{-0.195}$	$-0.18^{+0.20}_{-0.18}$	$-0.33^{+0.23}_{-0.23}$	$-0.03^{+0.19}_{-0.19}$	$-0.26^{+0.14}_{-0.14}$
ΔC_S^μ	$-0.001^{+0.008}_{-0.008}$	$0.022^{+0.015}_{-0.015}$	$0.001^{+0.014}_{-0.014}$	$-0.012^{+0.012}_{-0.012}$	-	-	$0.01^{+0.05}_{-0.05}$	-
$\Delta C'_S^\mu$	$0.025^{+0.021}_{-0.021}$	$-0.007^{+0.014}_{-0.014}$	$0.026^{+0.016}_{-0.016}$	$0.012^{+0.026}_{-0.026}$	-	-	$-0.01^{+0.05}_{-0.05}$	-
ΔC_P^μ	$0.008^{+0.016}_{-0.016}$	$0.011^{+0.019}_{-0.019}$	$0.004^{+0.013}_{-0.013}$	$0.003^{+0.013}_{-0.013}$	-	-	$-0.04^{+0.02}_{-0.02}$	-
$\Delta C'_P^\mu$	$-0.005^{+0.038}_{-0.038}$	$-0.007^{+0.068}_{-0.068}$	$-0.006^{+0.026}_{-0.026}$	$-0.007^{+0.033}_{-0.033}$	-	-	$-0.04^{+0.02}_{-0.02}$	-
ΔC_9^e	-	ΔC_9^μ	$-0.118^{+0.713}_{-0.713}$	$0.079^{+0.793}_{-0.793}$	-	$-0.24^{+1.17}_{-1.17}$	$-6.50^{+1.90}_{-1.90}$	-
$\Delta C'_9^e$	-	$\Delta C'_9^\mu$	$-0.144^{+0.876}_{-0.876}$	$-0.250^{+0.894}_{-0.894}$	-	-	$1.40^{+2.30}_{-2.30}$	-
ΔC_{10}^e	-	ΔC_{10}^μ	$0.221^{+0.716}_{-0.716}$	$0.308^{+0.693}_{-0.693}$	-	$-0.24^{+0.78}_{-0.78}$	~ 0	-
ΔC_{10}^e	-	$\Delta C'_{10}^\mu$	$0.535^{+0.810}_{-0.810}$	$0.347^{+0.853}_{-0.853}$	-	-	~ 0	-
ΔC_S^e	-	ΔC_S^μ	$1.700^{+4.839}_{-4.839}$	$1.516^{+4.469}_{-4.469}$	-	-	$-0.38^{+0.41}_{-0.41}$	-
$\Delta C'_S^e$	-	$\Delta C'_S^\mu$	$1.700^{+4.832}_{-4.832}$	$1.515^{+4.499}_{-4.499}$	-	-	$-0.36^{+0.50}_{-0.50}$	-
ΔC_P^e	-	ΔC_P^μ	$-2.277^{+6.713}_{-6.713}$	$-2.518^{+5.008}_{-5.008}$	-	-	$-0.98^{+0.21}_{-0.21}$	-
$\Delta C'_P^e$	-	$\Delta C'_P^\mu$	$-2.275^{+6.893}_{-6.893}$	$-2.518^{+5.179}_{-5.179}$	-	-	$-0.95^{+0.29}_{-0.29}$	-

- Results are consistent with other groups within errors.
- NP mainly appears via ΔC_9^μ , with scenario dependence.
- In some scenarios, NP can be contained in ΔC_{10}^μ .
- Electron-type WCs are with large uncertainties.

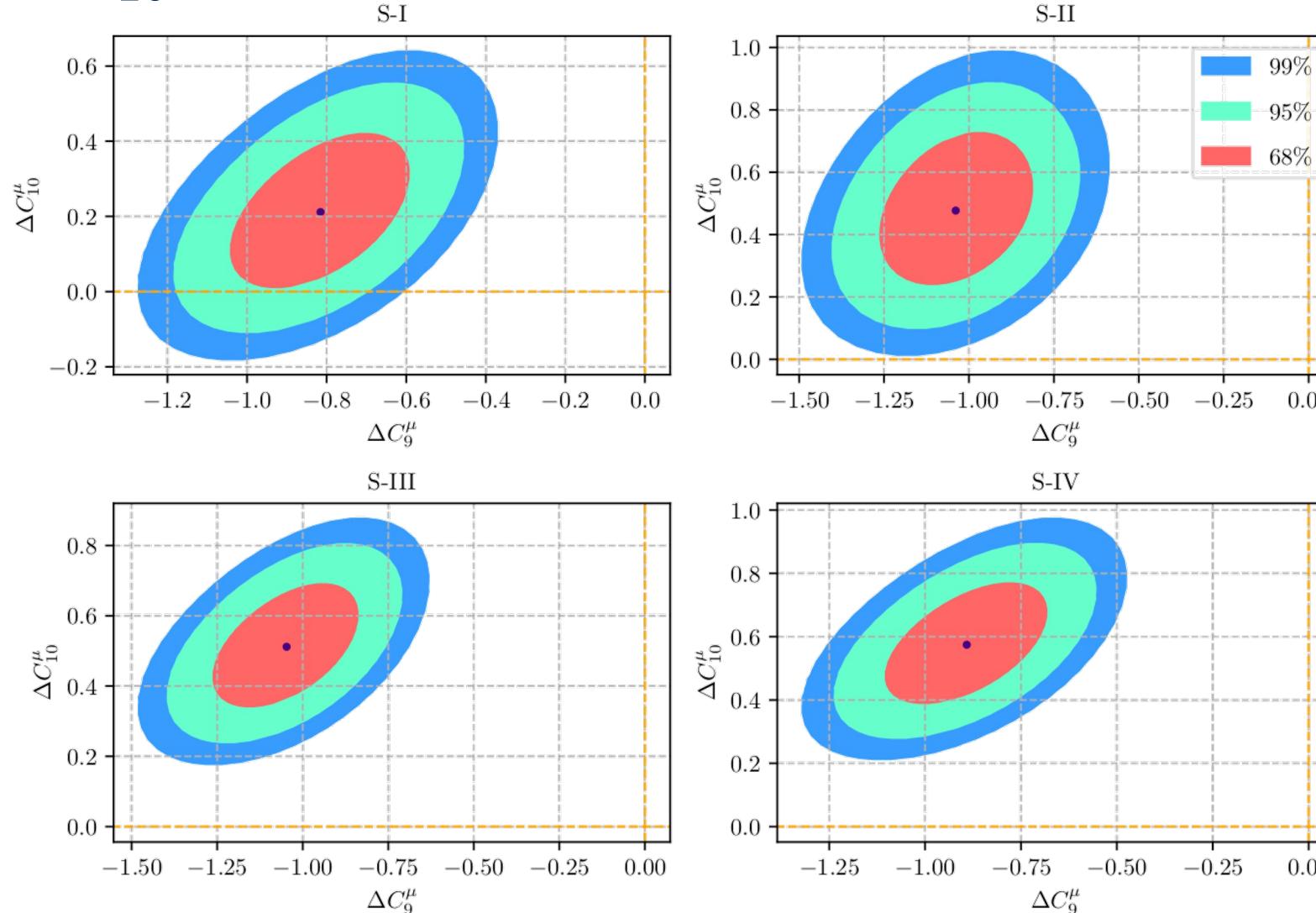
Our fit after Xmas 2022

Preliminary

Params	S-I	S-II	S-III	S-IV	S-I'	S-II'	S-III'	S-IV'	ACDMN[20]	AS[21]	HMMN[22]	GGJLCS [23]
χ^2_{\min}	127.091	113.211	108.027	109.741	114.14	127.47	106.35	108.17	260.66	-	179.1	96.88
ΔC_7	$-0.005^{+0.009}_{-0.009}$	$-0.001^{+0.014}_{-0.014}$	$0.^{+0.007}_{-0.007}$	-	$-0.006^{+0.017}_{-0.017}$	$-0.001^{+0.018}_{-0.018}$	$0.001^{+0.019}_{-0.019}$	-	$0.00^{+0.01}_{-0.02}$	-	$0.06^{+0.03}_{-0.03}$	-
$\Delta C'_7$	$0.027^{+0.013}_{-0.013}$	$0.054^{+0.031}_{-0.031}$	$0.052^{+0.015}_{-0.015}$	-	$0.019^{+0.030}_{-0.030}$	$0.054^{+0.038}_{-0.038}$	$0.053^{+0.037}_{-0.037}$	-	$+0.00^{+0.02}_{-0.01}$	-	$-0.01^{+0.01}_{-0.01}$	-
ΔC_8	$-0.874^{-2.275}_{+2.275}$	$-0.563^{+0.386}_{-0.386}$	$-0.566^{-0.171}_{+0.171}$	$-0.688^{+0.403}_{-0.403}$	$-0.646^{+0.812}_{-0.812}$	$-0.560^{+0.504}_{-0.504}$	$-0.542^{+0.510}_{-0.510}$	$-0.649^{+0.459}_{-0.459}$	-	-	$-0.80^{+0.40}_{-0.40}$	-
$\Delta C'_8$	$0.023^{-0.393}_{+0.393}$	$0.044^{+1.821}_{-1.821}$	$0.042^{+0.624}_{-0.624}$	$-0.1215^{+1.215}_{-1.215}$	$0.019^{+1.112}_{-1.112}$	$0.063^{+1.203}_{-1.203}$	$0.045^{+1.311}_{-1.311}$	$0.001^{+1.304}_{-1.304}$	-	-	$-0.30^{+1.30}_{-1.30}$	-
ΔC_9^μ	$-0.815^{+0.136}_{-0.136}$	$-1.039^{+0.184}_{-0.184}$	$-1.047^{+0.060}_{-0.060}$	$-0.891^{+0.168}_{-0.168}$	$-0.858^{+0.449}_{-0.449}$	$-1.027^{+0.243}_{-0.243}$	$-1.074^{+0.239}_{-0.239}$	$-0.906^{+0.196}_{-0.196}$	$-1.08^{+0.18}_{-0.17}$	$-0.82^{+0.23}_{-0.23}$	$-1.14^{+0.19}_{-0.19}$	$-1.07^{+0.29}_{-0.29}$
$\Delta C''_9^\mu$	$0.496^{+0.084}_{-0.084}$	$0.176^{+0.301}_{-0.301}$	$0.140^{+0.090}_{-0.090}$	$0.309^{+0.285}_{-0.285}$	$0.545^{+0.803}_{-0.803}$	$0.195^{+0.386}_{-0.386}$	$0.139^{+0.376}_{-0.376}$	$0.301^{+0.363}_{-0.363}$	$0.16^{+0.37}_{-0.36}$	$-0.10^{+0.34}_{-0.34}$	$0.05^{+0.32}_{-0.32}$	$0.32^{+0.21}_{-0.21}$
$\Delta C''_{10}^\mu$	$0.212^{+0.045}_{-0.045}$	$0.477^{+0.160}_{-0.160}$	$0.512^{+0.114}_{-0.114}$	$0.575^{+0.154}_{-0.154}$	$0.485^{+0.482}_{-0.482}$	$0.477^{+0.196}_{-0.196}$	$0.543^{+0.185}_{-0.185}$	$0.616^{+0.185}_{-0.185}$	$0.15^{+0.13}_{-0.13}$	$+0.14^{+0.23}_{-0.23}$	$0.21^{+0.20}_{-0.20}$	$0.21^{+0.14}_{-0.14}$
$\Delta C''_{10}^\mu$	$-0.002^{+0.043}_{-0.043}$	$0.043^{+0.147}_{-0.147}$	$0.047^{+0.108}_{-0.108}$	$0.069^{+0.157}_{-0.157}$	$0.028^{+0.563}_{-0.563}$	$0.046^{+0.198}_{-0.198}$	$0.054^{+0.186}_{-0.186}$	$0.072^{+0.195}_{-0.195}$	$-0.18^{+0.20}_{-0.18}$	$-0.33^{+0.23}_{-0.23}$	$-0.03^{+0.19}_{-0.19}$	$-0.26^{+0.14}_{-0.14}$
ΔC_S^μ	$-0.022^{+0.016}_{-0.016}$	$0.370^{+0.029}_{-0.029}$	$-0.103^{+0.103}_{-0.103}$	$-0.010^{+0.008}_{-0.008}$	$-0.001^{+0.008}_{-0.008}$	$0.022^{+0.015}_{-0.015}$	$0.001^{+0.014}_{-0.014}$	$-0.012^{+0.012}_{-0.012}$	-	-	$0.01^{+0.05}_{-0.05}$	-
$\Delta C_S'^\mu$	$0.010^{+0.003}_{-0.003}$	$0.401^{+0.010}_{-0.010}$	$-0.303^{+0.303}_{-0.303}$	$0.013^{+0.009}_{-0.009}$	$0.025^{+0.021}_{-0.021}$	$-0.007^{+0.014}_{-0.014}$	$0.026^{+0.016}_{-0.016}$	$0.012^{+0.026}_{-0.026}$	-	-	$-0.01^{+0.05}_{-0.05}$	-
ΔC_P^μ	$0.013^{+0.010}_{-0.010}$	$0.013^{+0.023}_{-0.023}$	$0.1007^{+0.007}_{-0.007}$	$0.001^{+0.008}_{-0.008}$	$0.008^{+0.016}_{-0.016}$	$0.011^{+0.019}_{-0.019}$	$0.004^{+0.013}_{-0.013}$	$0.003^{+0.013}_{-0.013}$	-	-	$-0.04^{+0.02}_{-0.02}$	-
$\Delta C_P'^\mu$	$-0.017^{+0.015}_{-0.015}$	$-0.010^{+0.074}_{-0.074}$	$-0.0007^{+0.007}_{-0.009}$	$-0.005^{+0.038}_{-0.038}$	$-0.007^{+0.068}_{-0.068}$	$-0.006^{+0.026}_{-0.026}$	$-0.007^{+0.033}_{-0.033}$	-	-	-	$-0.04^{+0.02}_{-0.02}$	-
ΔC_9^e	-	ΔC_9^μ	$-0.578^{+0.096}_{-0.096}$	$-0.319^{+0.507}_{-0.507}$	-	ΔC_9^μ	$-0.118^{+0.713}_{-0.713}$	$0.079^{+0.793}_{-0.793}$	-	$-0.24^{+1.17}_{-1.17}$	$-6.50^{+1.90}_{-1.90}$	-
ΔC_9^{te}	-	$\Delta C_9'^\mu$	$0.051^{+0.097}_{-0.097}$	$0.126^{+0.529}_{-0.529}$	-	$\Delta C_9'^\mu$	$-0.144^{+0.876}_{-0.876}$	$-0.250^{+0.894}_{-0.894}$	-	-	$1.40^{+2.30}_{-2.30}$	-
ΔC_{10}^e	-	ΔC_{10}^μ	$0.684^{+0.077}_{-0.077}$	$0.834^{+0.425}_{-0.425}$	-	ΔC_{10}^μ	$0.221^{+0.716}_{-0.716}$	$0.308^{+0.693}_{-0.693}$	-	$-0.24^{+0.78}_{-0.78}$	~ 0	-
ΔC_{10}^{te}	-	$\Delta C_{10}'^\mu$	$0.134^{+0.081}_{-0.081}$	$0.133^{+0.466}_{-0.466}$	-	$\Delta C_{10}'^\mu$	$0.535^{+0.810}_{-0.810}$	$0.347^{+0.853}_{-0.853}$	-	-	~ 0	-
ΔC_S^e	-	ΔC_S^μ	$1.659^{+0.472}_{-0.472}$	$1.071^{+8.566}_{-8.566}$	-	ΔC_S^μ	$1.700^{+4.839}_{-4.839}$	$1.516^{+4.469}_{-4.469}$	-	-	$-0.38^{+0.41}_{-0.41}$	-
ΔC_S^{te}	-	$\Delta C_S'^\mu$	$1.637^{+0.472}_{-0.472}$	$1.072^{+8.769}_{-8.769}$	-	$\Delta C_S'^\mu$	$1.700^{+4.832}_{-4.832}$	$1.515^{+4.499}_{-4.499}$	-	-	$-0.36^{+0.50}_{-0.50}$	-
ΔC_P^e	-	ΔC_P^μ	$-2.657^{+0.410}_{-0.410}$	$-3.196^{+4.368}_{-4.368}$	-	ΔC_P^μ	$-2.277^{+6.713}_{-6.713}$	$-2.518^{+5.008}_{-5.008}$	-	-	$-0.98^{+0.21}_{-0.21}$	-
ΔC_P^{te}	-	$\Delta C_P'^\mu$	$-2.637^{+0.523}_{-0.523}$	$-3.203^{+3.870}_{-3.870}$	-	$\Delta C_P'^\mu$	$-2.275^{+6.893}_{-6.893}$	$-2.518^{+5.179}_{-5.179}$	-	-	$-0.95^{+0.29}_{-0.29}$	-

New Results

$C_9^\mu - C_{10}^\mu$ correlation in different scenarios



Summary

- Lepton flavor non-universalities R_K and R_{K^*} fade away.
- Deviations from SM in branching fractions and angular distribution observables haven't been exculded.
- Implications from the updated fits with a consideration of the faded R_K & R_{K^*} :
 - Wilson coefficients differ slightly in different hypothesis;
 - In all the 4 scenarios, C_9^μ still deviates SM by more than 5σ ;
 - In scenario III & IV, C_{10}^μ deviates SM by more than 3σ ;
 - The deviations of $C_{9,10}^e$ are hypothesis dependent;
 - Errors decreases in electron-type scalar operator $C_{S,P}^{(\prime)e}$, indicating a NP opportunity.