Uncertainties in *b* to *sℓℓ* decays due to the form factors

GETTING TO GRIPS WITH QCD

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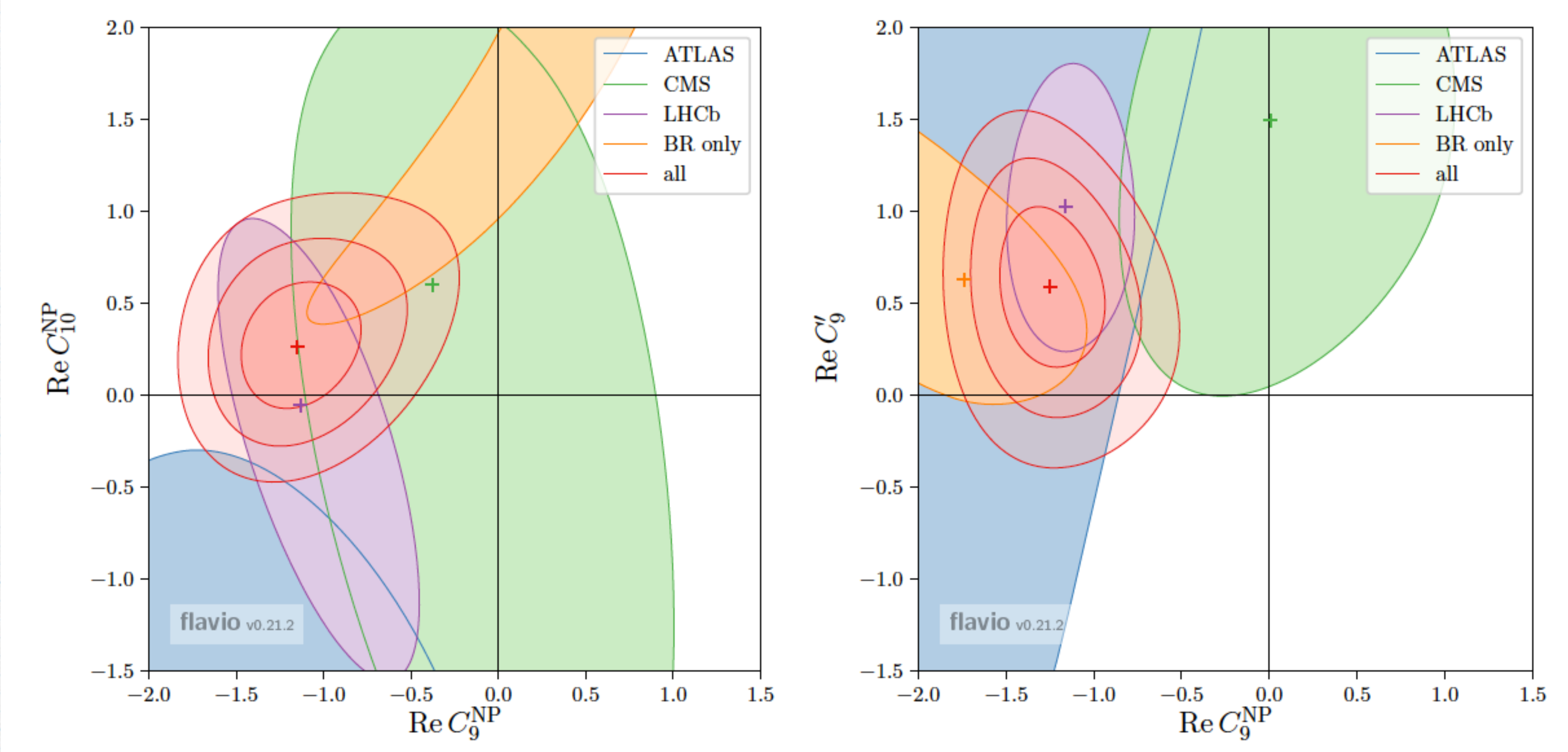
Aoife Bharucha,
CPT Marseille

Anomalies in *b* to *sℓℓ* transitions

Status of the B to K*mu+mu- anomaly after Moriond 2017, By Wolfgang Altmannshofer, Christoph Niehoff, Peter Stangl, David M. Straub, arXiv:1703.09189 [hep-ph], Eur.Phys.J. C77 (2017) no.6, 377



Constraints in plane of NP contributions to real parts of the Wilson coefficients C_9 and C_{10} (left) or C_9 and C'_9 (right), assuming all other WCs to be SM-like. Show constraints from the *B* to *K*ll* and B_s to *φ ll* angular observables from individual experiments as well as constraints from BRs of all experiments ("BR only"), 1σ contours, while for the global fit ("all"), 1, 2, and 3 contours.

In this talk will discuss FF calculation in LCSR, concentrating on:

- the origin of FF uncertainties
- the effect of FF uncertainties on Fit.

Form Factor Definitions

Express hadronic matrix elements via:

$$\langle K^*(p)|\bar{s}\gamma^\mu(1\mp\gamma_5)b|\bar{B}(p_B)\rangle = P_1^\mu\,\mathcal{V}_1(q^2) \pm P_{2,3}^\mu\,\mathcal{V}_{2,3}(q^2) \pm P_P^\mu\mathcal{V}_P(q^2)$$

$$\langle K^*(p)|\bar{s}iq_\nu\sigma^{\mu\nu}(1\pm\gamma_5)b|\bar{B}(p_B)\rangle = P_1^\mu\,T_1(q^2) \pm P_{2,3}^\mu\,T_{2,3}(q^2)$$

where the Lorentz structures P_i^μ are

$$\begin{aligned}
P_P^\mu &= i(\eta^*\cdot q)q^\mu\,,\\
P_1^\mu &= 2\epsilon^\mu{}_{\alpha\beta\gamma}\eta^{*\alpha}p^\beta q^\gamma\,,\\
P_2^\mu &= i\{(m_B^2-m_{K^*}^2)\eta^{*\mu}-(\eta^*\cdot q)(p+p_B)^\mu\}\,,\\
P_3^\mu &= i(\eta^*\cdot q)\{q^\mu-\frac{q^2}{m_B^2-m_{K^*}^2}(p+p_B)^\mu\}
\end{aligned}$$

- Bjorken & Drell convention for the Levi-Civita tensor $\epsilon_{0123}=+1$
- η is the polarization of K^*
- Only 7 independent FFs

Motivation for updating form factors for exclusive *B* to *Vll*

B to Vll in the Standard Model from light-cone sum rules, Aoife Bharucha, David M. Straub, Roman Zwicky, arXiv:1503.05534 [hep-ph], JHEP 1608 (2016) 098.

Largest uncertainty in calculation is from form factors:

- non-perturbative quantities
- LCSR[6] at low q^2, Lattice[7] at high q^2
- Best coverage in q^2: fit to LCSR and Lattice using e.g. series expansion, coefficients satisfy dispersive bounds.[8]
- Many people resorting to using soft form factors with
- corrections in order to include correlations[9]
- Aim: make correlations available

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[6] see e.g. P. Ball and R. Zwicky, Phys. Rev. D 71 (2005) 014015 [arXiv:hep-ph/0406232] and Phys. Rev. D 71 (2005) 014029 [arXiv:hep-ph/0412079]

[7] see e.g. A. Al-Haydari et al. [QCDSF Collaboration], Eur. Phys. J. A 43, 107 (2010) [arXiv:0903.1664 [hep-lat]]

[8] AB, T. Feldmann, M. Wick, JHEP 1009 (2010) 090 [arXiv:1004.3249 [hep-ph]]

[9] e.g. S. Descotes-Genon, T. Hurth, J. Matias and J. Virto, JHEP 1305 (2013) 137 [arXiv:1303.5794 [hep-ph]], S. Jaeger and J. Martin Camalich, JHEP 1305 (2013) 043 [arXiv:1212.2263 [hep-ph]].

The LCSR approach

In physical region, correlator dominated by B pole:

$$\Pi_\mu = i\, m_b \int d^D x e^{-i\, p_B\cdot x} \langle \pi(p) | T\{\bar{u}(0)\gamma_\mu b(0) \bar{b}(x) i \gamma_5 d(x)\} | 0 \rangle,$$

$$= (p_B + p)_\mu \Pi_+(p_B^2, q^2) + (p_B - p)_\mu \Pi_-(p_B^2, q^2).$$

into

$B \to \pi$ transition $(f_+(q^2))$

$\langle \pi(p) | \bar{u}\gamma_\mu b | B(p_B)\rangle = (p_B + p)_\mu f_+(q^2) + (p_B - p)_\mu f_-(q^2)$

B meson decay (f_B)

$m_b \langle 0 | \bar{d} i \gamma_5 b | B \rangle = m_B^2 f_B$

$$\Pi_+(p_B^2, q^2) = f_B m_B^2 \frac{f_+(q^2)}{m_B^2 - p_B^2} + \int_{s > m_B^2} ds \frac{\rho_{\rm had}}{s - p_B^2},$$

In Euclidean region ($p_B^2 - m_B^2$ is large and negative): light-cone expand about $x^2 = 0^2$

$$\Pi_+(p_B^2, q^2) = \sum_n \int du\, T_+^{(n)}(u, p_B^2, q^2, \mu^2) \phi^{(n)}(u, \mu^2) = \int ds \frac{\rho_{\rm LC}}{s - p_B^2},$$

Sum rule for $f_+(q^2)$

$$f_+(q^2) = \frac{1}{f_B m_B^2} \int_{m_b^2}^{s_0} ds\, \rho_{\rm LC}\, e^{-(s - m_B^2)/M^2},$$

The equation of motion

Starting from

$$i\partial^\nu(\bar{s}i\sigma_{\mu\nu}(\gamma_5)b) \quad = -(m_s \pm m_b)\bar{s}\gamma_\mu(\gamma_5)b + i\partial_\mu(\bar{s}(\gamma_5)b) - 2\bar{s}i\overleftarrow{D}_\mu(\gamma_5)b\,,$$

We obtain the four equation of motion relations:

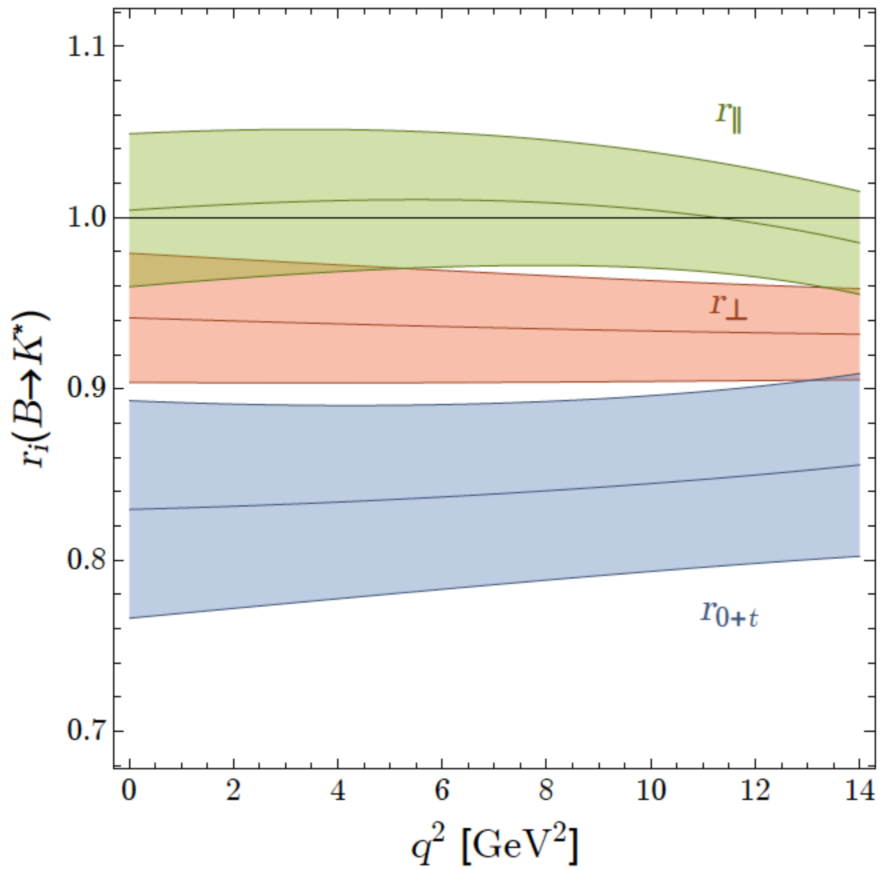
$$\begin{aligned} T_1(q^2) + (m_b + m_s)\mathcal{V}_1(q^2) + \mathcal{D}_1(q^2) &= 0\,, \\ T_2(q^2) + (m_b - m_s)\mathcal{V}_2(q^2) + \mathcal{D}_2(q^2) &= 0\,, \\ T_3(q^2) + (m_b - m_s)\mathcal{V}_3(q^2) + \mathcal{D}_3(q^2) &= 0\,, \\ (m_b - m_s)\mathcal{V}_P(q^2) + \left(\mathcal{D}_P(q^2) - \frac{q^2}{m_b + m_s}\mathcal{V}_P(q^2)\right) &= 0\,. \end{aligned}$$

where the $\mathcal{D}_\iota$s are defined via

$$\langle K^*(p,\eta)|\bar{s}(2i\overleftarrow{D})^\mu(1\pm\gamma_5)b|\bar{B}(p_B)\rangle = P_1^\mu\,\mathcal{D}_1(q^2) \pm P_{2,3}^\mu\,\mathcal{D}_{2,3}(q^2) \pm P_P^\mu\mathcal{D}_P(q^2)$$

- Isgur-Wise relations at low recoil follow from $\mathcal{D}_\iota/(\mathcal{V}_\iota \text{ or } T_\iota) \sim \mathcal{O}(\Lambda_{\text{QCD}}/m_b)$
- Are certain combinations of $\mathcal{D}_\iota$'s small at large recoil?
- $\iota = 1, 2$ are direct candidates, but $\iota = 3, P$ more tricky

Quantifying the EOM



$$, r_\perp(q^2) = -\frac{(m_b + m_s)\mathcal{V}_1(q^2)}{T_1(q^2)},$$

$$r_\parallel(q^2) = -\frac{(m_b - m_s)\mathcal{V}_2(q^2)}{T_2(q^2)},$$

$$r_{0+t}(q^2) = -\frac{(m_b - m_s)(\mathcal{V}_2(q^2) - c_{23}(q^2)(\mathcal{V}_3(q^2) + \mathcal{V}_P(q^2)))}{T_2(q^2) - c_{23}(q^2)\,T_3(q^2)}$$

$$= -\frac{(m_b - m_s)(\mathcal{V}_0(q^2) - c_{23}\mathcal{V}_P(q^2))}{T_0(q^2)},$$

Deviation from unity measures relative size of derivative FF wrt V/T. Error bands from varying s_0 over entire physical range.

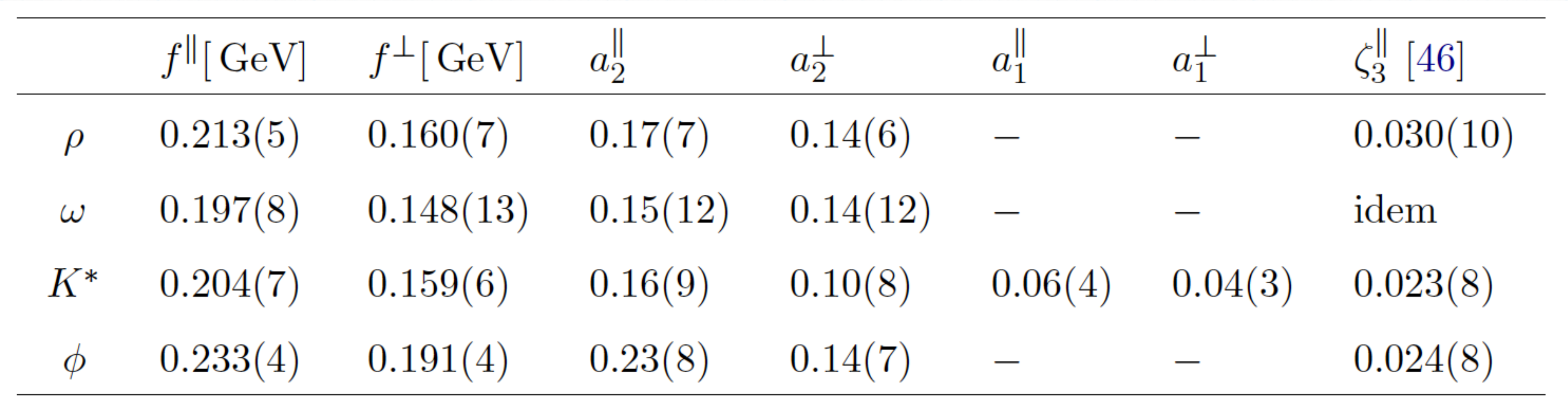
In order to fulfil the EOM, V_1, T_1 and D_1 should have same continuum thresholds s_0. As D_1 small, difficult to compensate different s_0^{T1} and s_0^{V1} via s_0^{D1}. For s_0^{T1}= s_0^{V1}±0.5 GeV^2, a 5 GeV^2 change in s_0^{D1} is required.

Therefore correlation between s_0^{V1} and s_0^{T1} seems reasonable, allowing a maximum difference of 1 GeV^2 between them. A larger difference between A_{12} and T_{23} is allowed due to the larger deviation from unity of r_{0+t}

$$\mathrm{corr}(s_0^{T_1}, s_0^{V}) = 7/8\,, \quad \mathrm{corr}(s_0^{T_2}, s_0^{A_1}) = 7/8\,, \quad \mathrm{corr}(s_0^{A_{12}}, s_0^{T_{23}}) = 1/2\,,$$

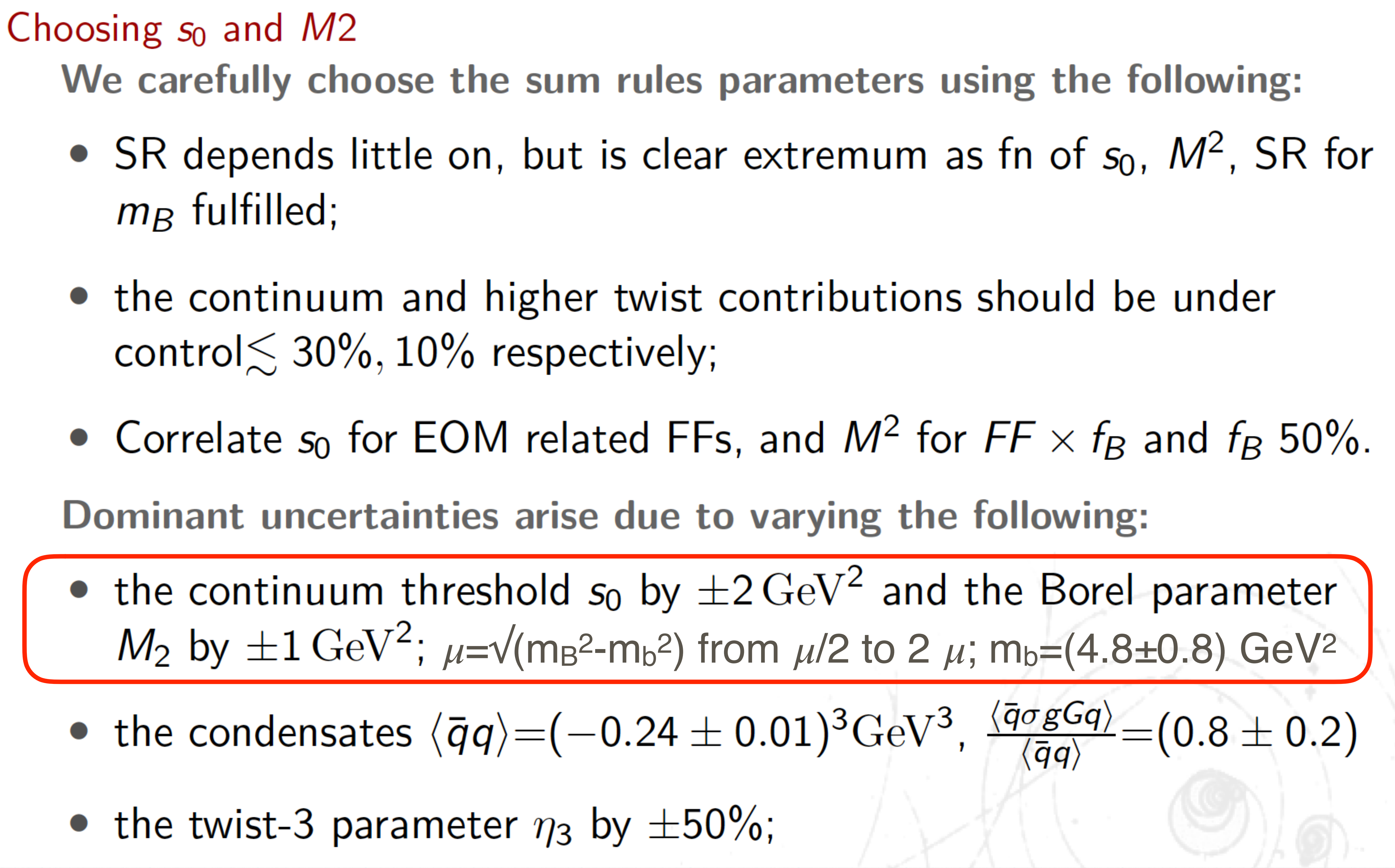
Other improvements in the calculation

- computation of full twist-4 (+partial twist-5) 2-particle DA contribution to FFs, plus determination of certain so-far unknown twist-5 DAs in the asymptotic limit
- discussion of non-resonant background for vector meson final states,
- determination and usage of updated hadronic parameters, specifically the decay constants
- fits with full error correlation matrix for the z-expansion coefficients, as well as an interpolation to the most recent lattice computation.



	$f^{\parallel}$[GeV]	$f^{\perp}$[GeV]	$a_2^{\parallel}$	$a_2^{\perp}$	$a_1^{\parallel}$	$a_1^{\perp}$	$\zeta_3^{\parallel}$ [46]
ρ	0.213(5)	0.160(7)	0.17(7)	0.14(6)	–	–	0.030(10)
ω	0.197(8)	0.148(13)	0.15(12)	0.14(12)	–	–	idem
K^*	0.204(7)	0.159(6)	0.16(9)	0.10(8)	0.06(4)	0.04(3)	0.023(8)
ϕ	0.233(4)	0.191(4)	0.23(8)	0.14(7)	–	–	0.024(8)

Parameters and uncertainties



Choosing s_0 and $M2$

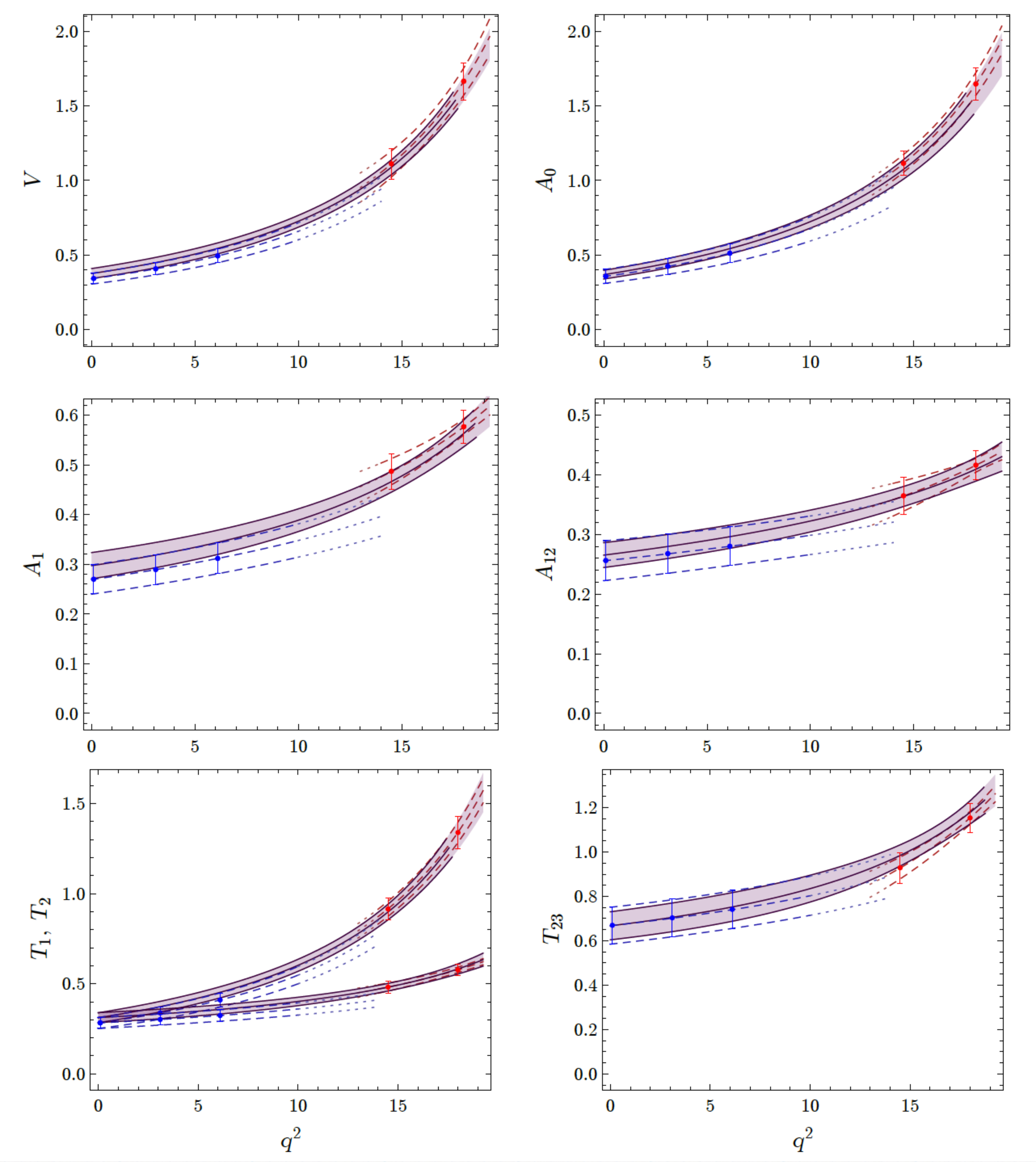
We carefully choose the sum rules parameters using the following:

- SR depends little on, but is clear extremum as fn of s_0, M^2, SR for m_B fulfilled;
- the continuum and higher twist contributions should be under control$\lesssim 30\%, 10\%$ respectively;
- Correlate s_0 for EOM related FFs, and M^2 for $FF \times f_B$ and f_B 50%.

Dominant uncertainties arise due to varying the following:

- the continuum threshold s_0 by $\pm 2\,\mathrm{GeV}^2$ and the Borel parameter M_2 by $\pm 1\,\mathrm{GeV}^2$; $\mu=\sqrt{(m_B^2-m_b^2)}$ from $\mu/2$ to 2 μ; $m_b=(4.8\pm0.8)$ GeV^2
- the condensates $\langle\bar{q}q\rangle=(-0.24\pm0.01)^3\mathrm{GeV}^3$, $\frac{\langle\bar{q}\sigma gGq\rangle}{\langle\bar{q}q\rangle}=(0.8\pm0.2)$
- the twist-3 parameter η_3 by $\pm 50\%$;

Results for the B to K* form factors



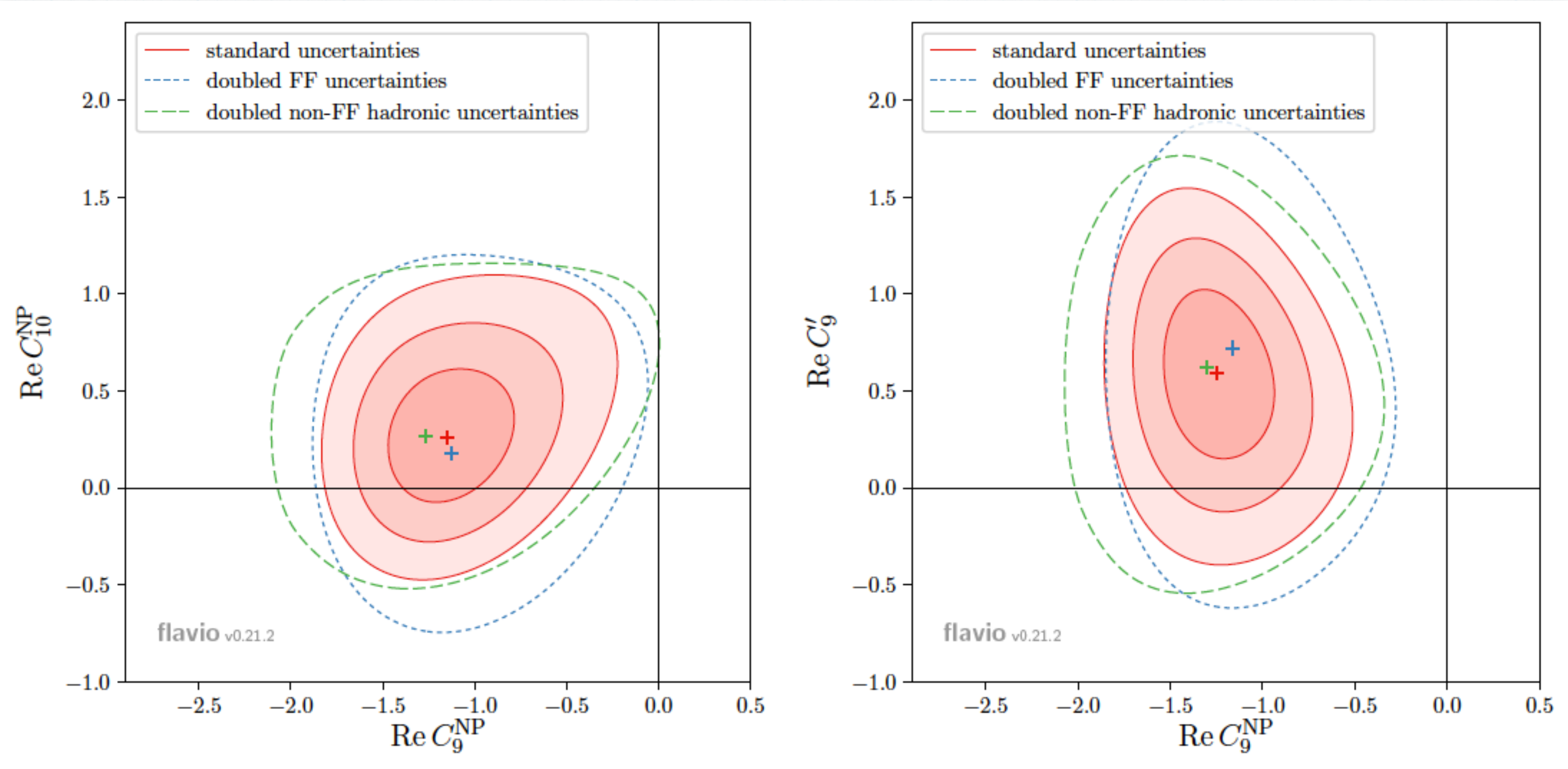
An overview of the b to sll fits

Group	Form factor description	Soft+factorizable corrections	Comments
Altmannshofer, Niehoff, Stangl, Straub	BSZ	✘	
Descotes-Genon, Hofer, Matias, Virto	KMPW	$\Delta F^{\Lambda}(q^2) = \hat{a}_F + \hat{b}_F \frac{q^2}{m_B^2} + \hat{c}_F \frac{q^4}{m_B^4}$,	Obtain central values from LCSR and allow error of 10% of FF
Jaeger, Camalich	BZ+KMPW+ IKKR	$F(q^2) = F^{\infty}(q^2) + a_F + b_F q^2/m_B^2 + \mathcal{O}([q^2/m_B^2]^2)$.	Set soft FFs at $q^2=0$ and scaling by combining existing calculations.

IKKR=M. A. Ivanov, J. G. Korner, S. G. Kovalenko and C. D. Roberts, Phys. Rev. D 76, 034018 (2007) [nucl-th/0703094].

Altmannshofer, Niehoff, Stangl, Straub

e.g. Interpreting Hints for Lepton Flavor Universality Violation, Wolfgang Altmannshofer, Peter Stangl, David M. Straub, arXiv:1704.05435 [hep-ph], Phys.Rev. D96 (2017) no.5, 055008.



In red the 1, 2, and 3 σ best fit regions with nominal hadronic uncertainties. The green dashed and blue short-dashed contours correspond to the 3 σ regions in scenarios with doubled uncertainties from non-factorizable corrections and doubled form factor uncertainties, respectively.

Jaeger, Camalich

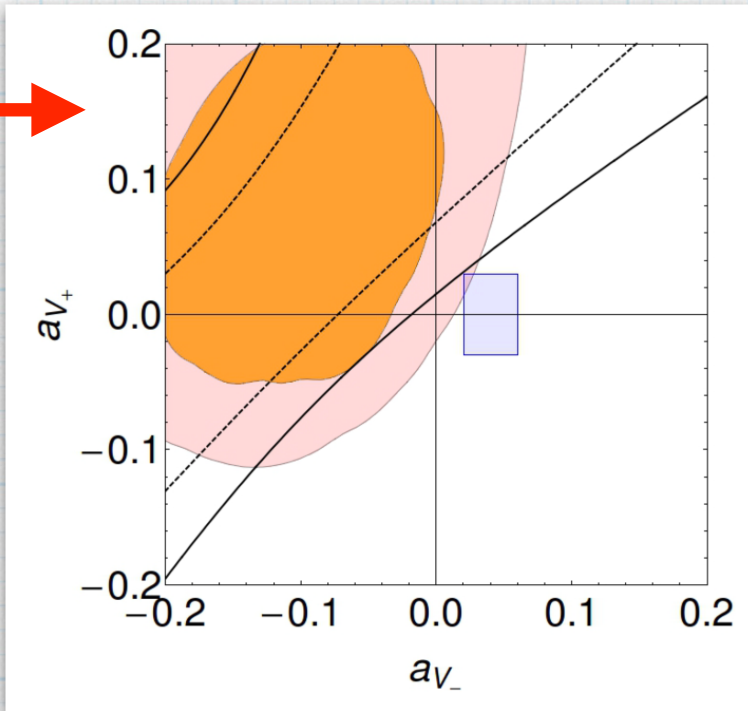
e.g. Reassessing the discovery potential of the B to K* l+l- decays in the large-recoil region: SM challenges and BSM opportunities, Sebastian Jäger, Jorge Martin Camalich, arXiv:1412.3183 [hep-ph], Phys.Rev. D93 (2016) no.1, 014028.

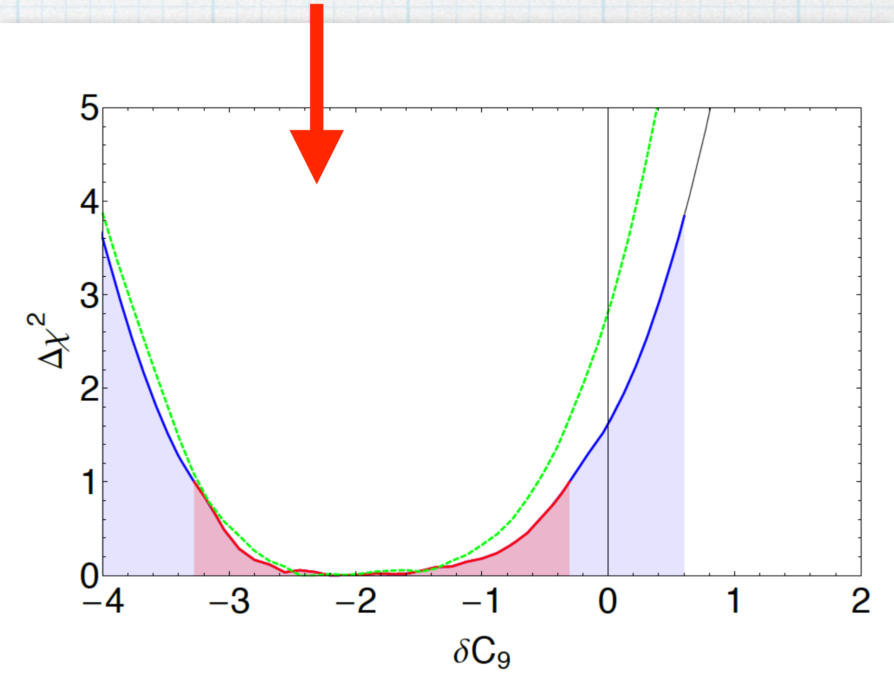
$$P_5' = P_5'|_\infty \Bigg(1 + \frac{a_{V_-} - a_{T_-}}{\xi_\perp} \frac{m_B}{|\vec{k}|} \frac{m_B^2}{q^2} C_7^{\rm eff} \frac{C_{9,\perp} C_{9,\parallel} - C_{10}^2}{(C_{9,\perp}^2 + C_{10}^2)(C_{9,\perp} + C_{9,\parallel})} + \frac{a_{V_0} - a_{T_0}}{\xi_\parallel} 2\, C_7^{\rm eff} \frac{C_{9,\perp} C_{9,\parallel} - C_{10}^2}{(C_{9,\parallel}^2 + C_{10}^2)(C_{9,\perp} + C_{9,\parallel})} + 8\pi^2 \frac{\tilde{h}_-}{\xi_\perp} \frac{m_B}{|\vec{k}|} \frac{m_B^2}{q^2} \frac{C_{9,\perp} C_{9,\parallel} - C_{10}^2}{C_{9,\perp} + C_{9,\parallel}} + \text{further terms} \Bigg)$$

Expression for P'$_5$ showing the dependence on the power corrections to the form factors

Profile χ^2 including only P$_i$ observables in bin [1,6] GeV^2 as function of BSM contribution to C$_9$ (all other WCs are SM-like). The red and blue shades indicate the limits for the 68% and 95% CL. Fit favours value of a$_{V-}$, negative but correction in LCSR is positive.

68% and 95% CL bounds in the parameter space of the power corrections a$_{V-}$/a$_{V+}$ for a fit in the SM, including P$_i$ observables in [1,6] GeV^2 bin. small blue box=LCSR. Black contours are P$_5$'.



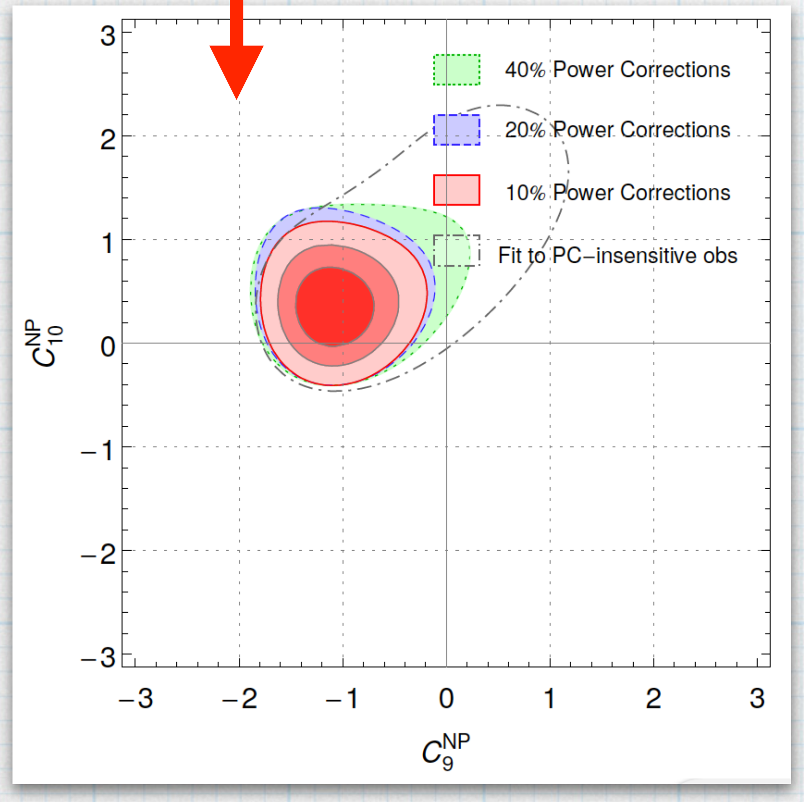


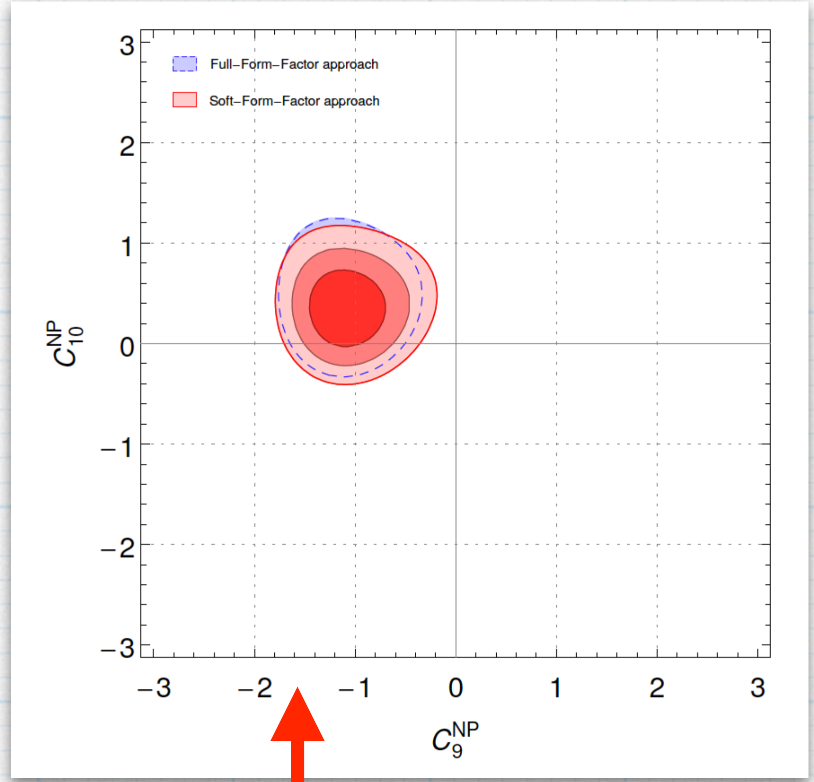
$$V_\pm = \frac{1}{2}\left(\left(1 + \frac{m_K^*}{m_B}\right) A_1 \mp \frac{\sqrt{\lambda}}{m_B(m_B + m_K^*)} V\right)$$

Capdevila, Descotes-Genon, Hofer, Matias, Virto

e.g. Assessing lepton-flavour non-universality from Bto K*ll angular analyses, Bernat Capdevila, Sebastien Descotes-Genon, Joaquim Matias, Javier Virto, arXiv:1605.03156 [hep-ph], JHEP 1610 (2016) 075.

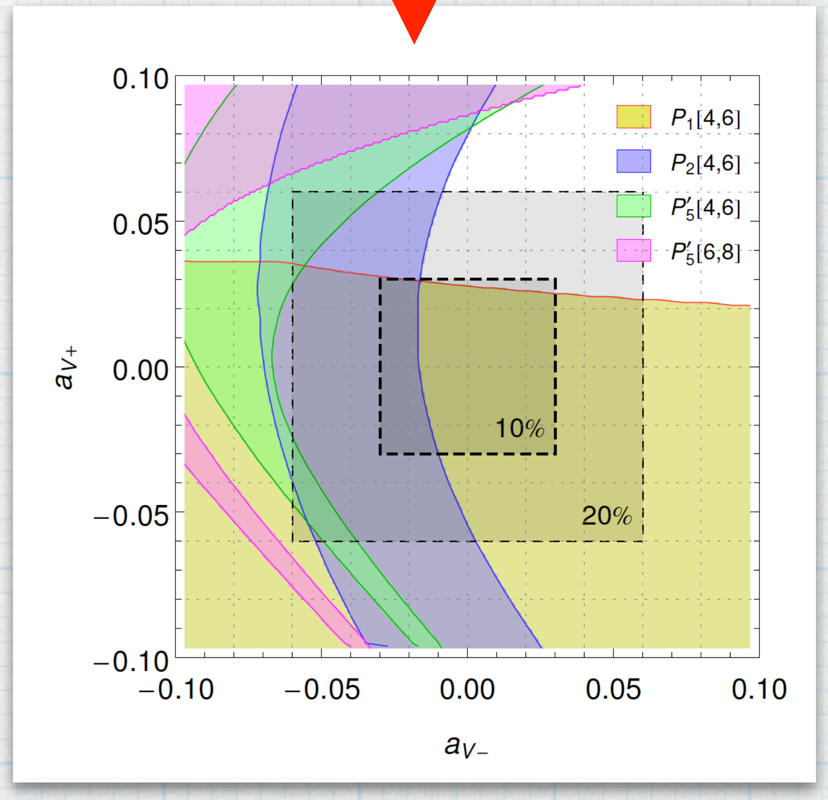
3 σ regions for 40 % power corrections, 20 % and 10 %. Also 3 σ region from the fit to power-correction-insensitive observables (mostly low recoil)



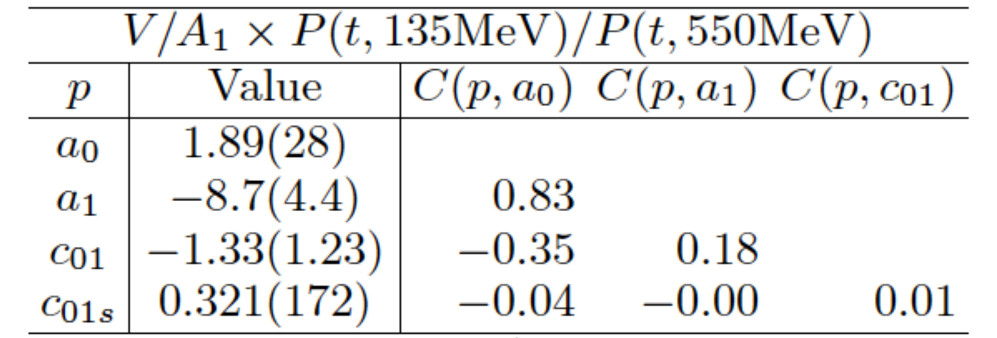


3 σ regions allowed using full FFs (long-dashed blue) compared to reference soft Bfs (red, with 1,2,3 σ contours).

Power corrections a_{V-} / a_{V+} to obtain agreement between SM and exp. Shows correlations hinder this agreement when other observables are considered



Investigating Form factor ratios



$V/A_1 \times P(t, 135\text{MeV})/P(t, 550\text{MeV})$				
p	Value	$C(p, a_0)$	$C(p, a_1)$	$C(p, c_{01})$
a_0	1.89(28)			
a_1	−8.7(4.4)	0.83		
c_{01}	−1.33(1.23)	−0.35	0.18	
c_{01s}	0.321(172)	−0.04	−0.00	0.01

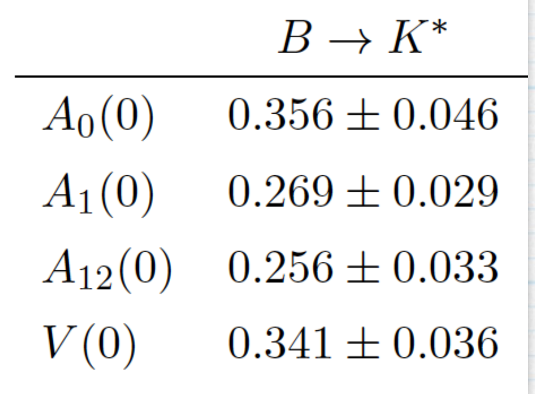
Horgan, Liu, Meinel, Wingate. arXiv:1310.3722 [hep-lat]

$$\left.\frac{V(0)}{A_1(0)}\right|_{\text{LEL}} = 1.37 \pm 0.40\,.$$

Hambrock, Hiller, Schacht, Zwicky, arXiv:1308.4379 [hep-ph]

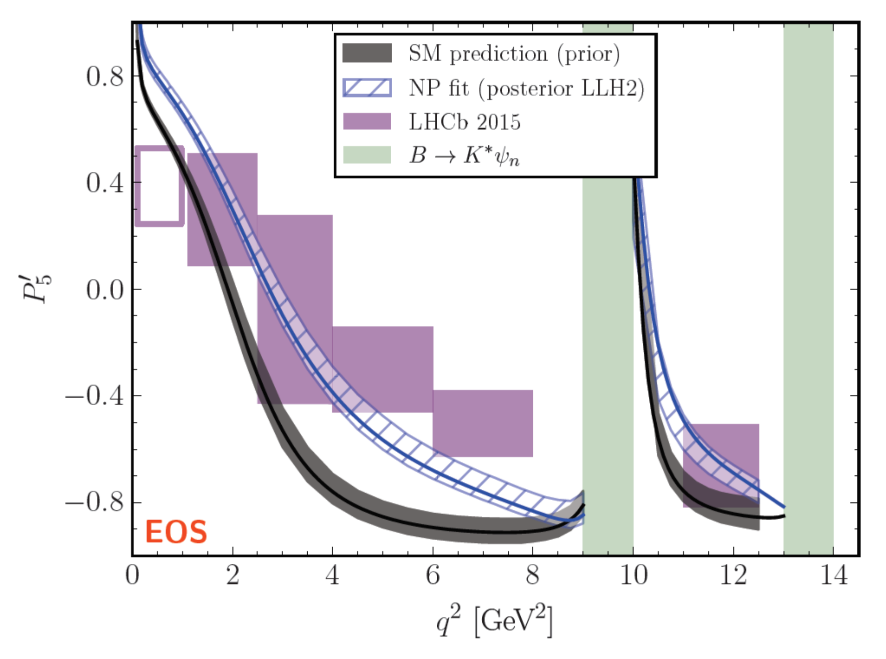
Bharucha, Straub, Zwicky, arXiv:1503.05534 [hep-ph]

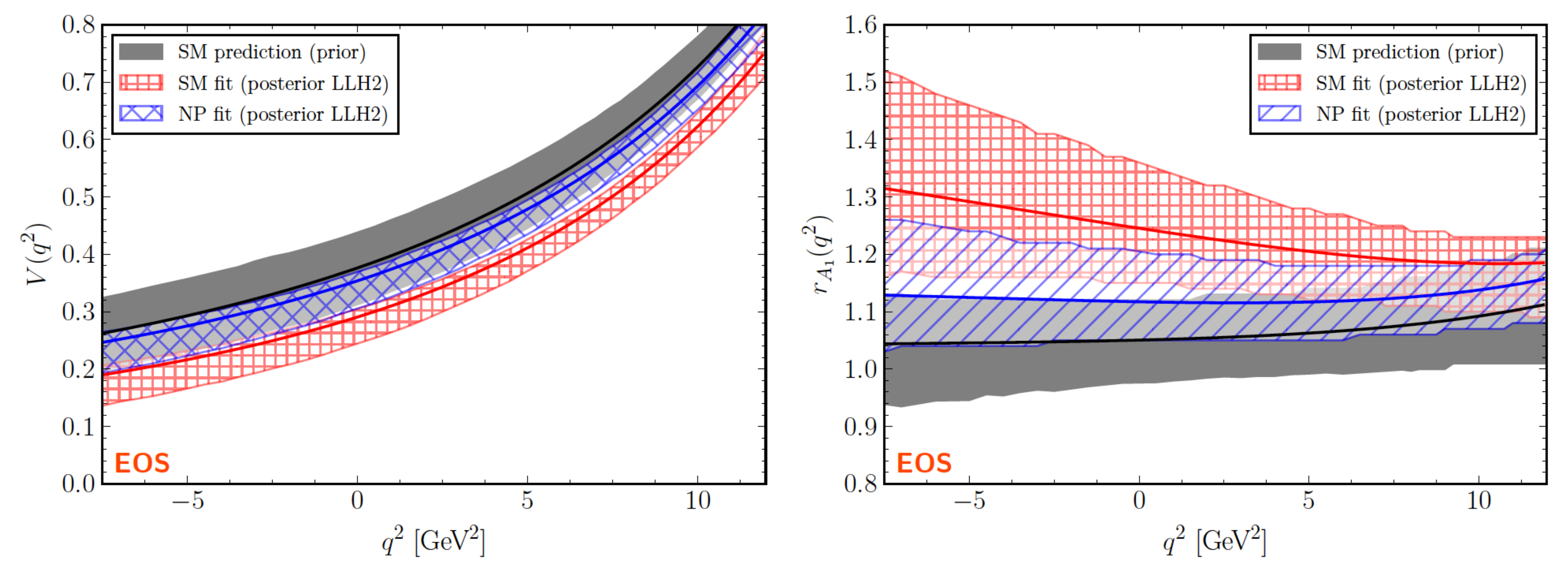
V(0)/A₁(0)=1.263



	$B \to K^*$
$A_0(0)$	0.356 ± 0.046
$A_1(0)$	0.269 ± 0.029
$A_{12}(0)$	0.256 ± 0.033
$V(0)$	0.341 ± 0.036

$$r_{A_1}(q^2) \equiv \frac{(M_B + M_{K^*})^2}{2M_B E_{K^*}(q^2)} \frac{A_1(q^2)}{V(q^2)}$$





Bobeth, Chrzaszcz, van Dyk, Virto, arXiv:1707.07305 [hep-ph].

Summary

Anomalies in B to K*ll angular observables: NP in $C_{9/10}$ or underestimated hadronic uncertainties?

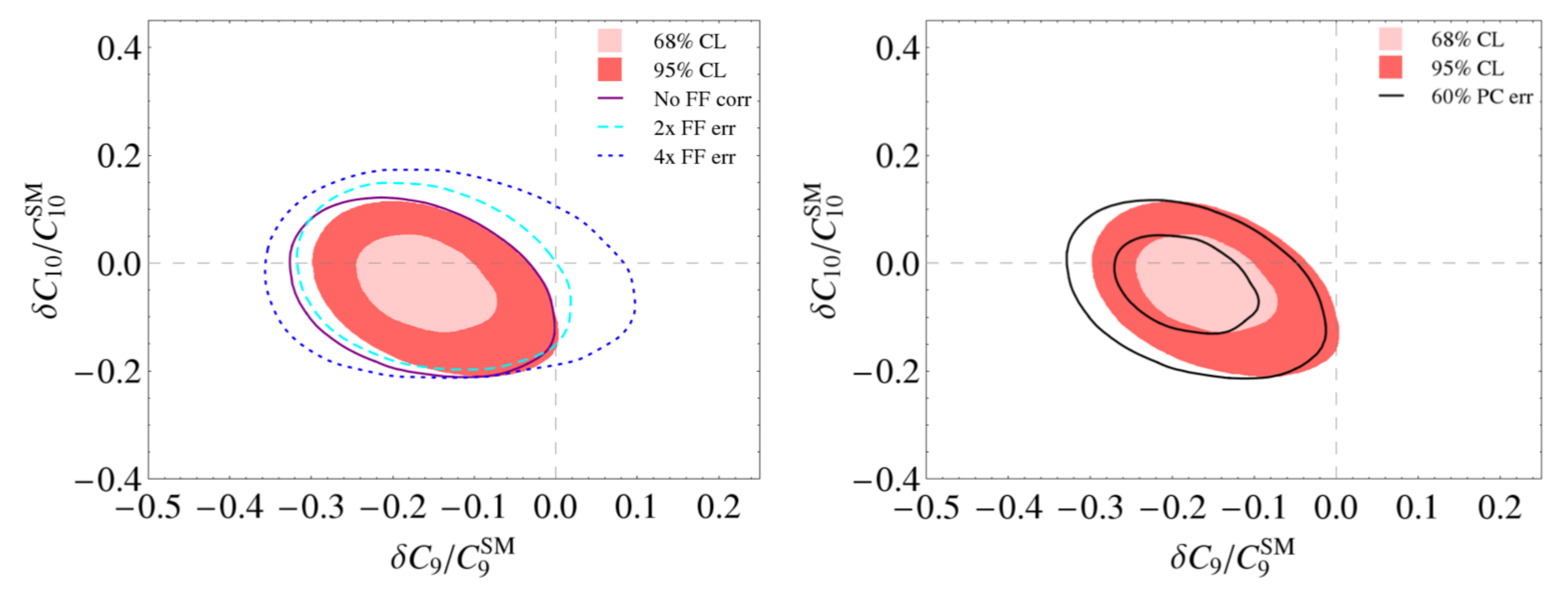
- Updated LCSR calculation:
  - Prevent community from resorting to soft form factors by providing full correlated errors and fit with Lattice using various parameterizations
  - Latest input parameters and use of equation of motion to constrain sum rule parameters

- Dependence of fits to b to s ll data on form factors:
  - Full vs soft form factors produce similar results
  - Doubling form factor errors doesn't have too much effect
  - Increasing uncertainties in order to obtain agreement between SM and experiment is non-trivial, as different observables require different modifications to the form factors

Hurth, Mahmoudi, Neshatpour

On the anomalies in the latest LHCb data, T. Hurth, F. Mahmoudi, S. Neshatpour., arXiv:1603.00865 [hep-ph], Nucl.Phys. B909 (2016) 737-777.

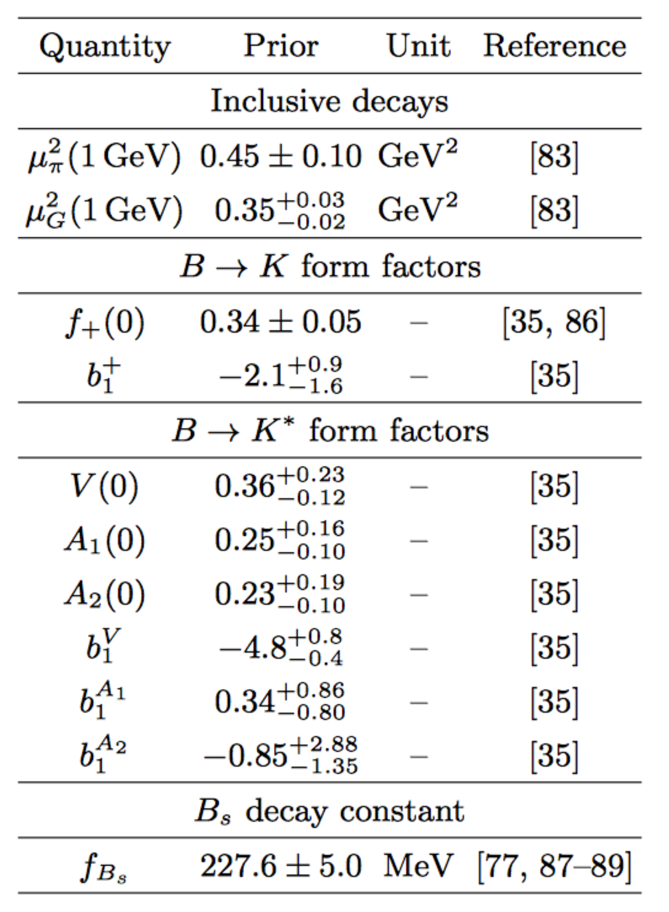
- For the soft FF approach the power corrections affect both factorisable and non-factorisable parts, while in the full FF approach only the non-factorisable part is affected. With both, for power corrections up to 20%, the SM is disfavoured at more than 2σ.
- Global fit results for C_9 , C_{10} with full form factors, with x^2 method and 10% power correction error: SM pull of 2.6σ (meaning that the SM value is in 2.6σ tension with the best fit values of C9 and C10). Doubling (quadrupling) the error decreases the tension from 2.6σ to 2.1σ (1.4σ).
- Removing the form factor correlations does not have a significant impact.
- Assuming a 60% power correction error in the global fit has not a big impact either.



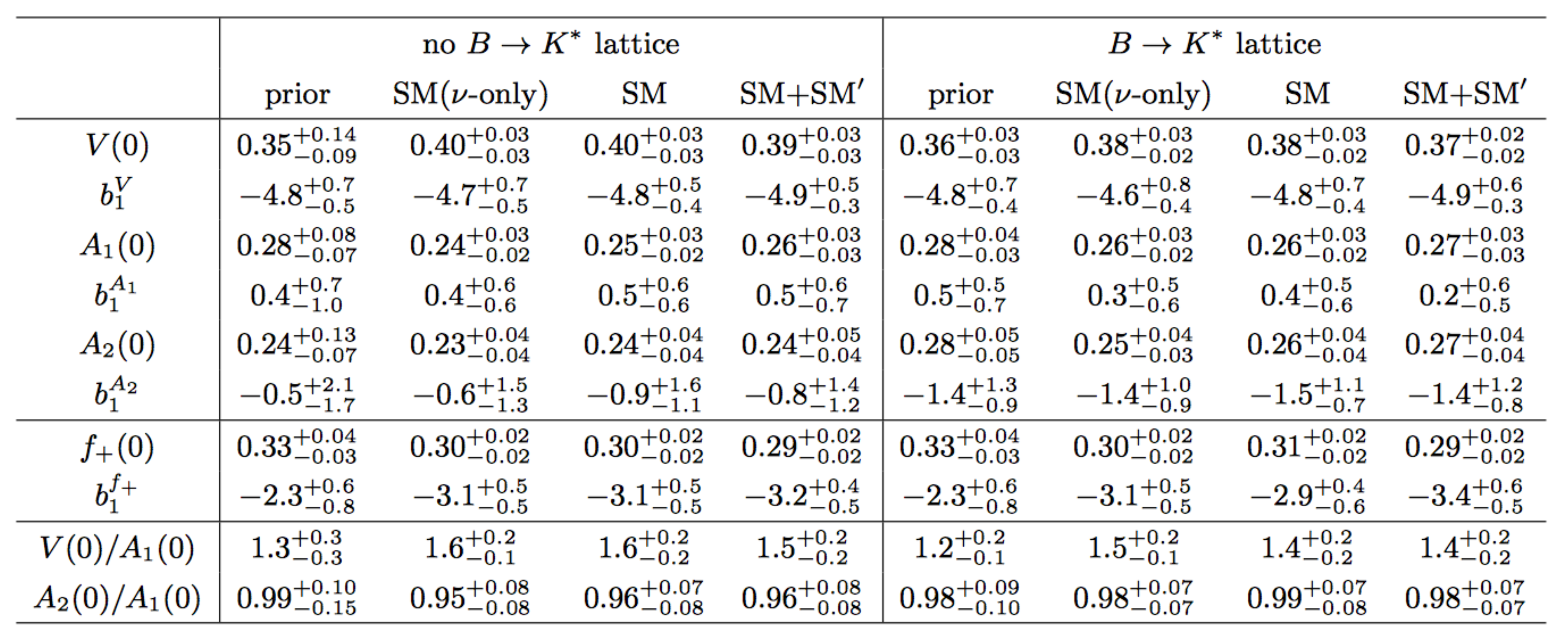
Beaujean, Bobeth, van Dyk

Comprehensive Bayesian analysis of rare (semi)leptonic and radiative B decays, Frederik Beaujean, Christoph Bobeth, Danny van Dyk, arXiv:1310.2478 [hep-ph], Eur.Phys.J. C74 (2014) 2897

Nuisance parameters:
prior distributions



Quantity	Prior	Unit	Reference
	Inclusive decays		
$\mu_\pi^2(1\,\mathrm{GeV})$	0.45 ± 0.10	GeV^2	[83]
$\mu_G^2(1\,\mathrm{GeV})$	$0.35^{+0.03}_{-0.02}$	GeV^2	[83]
	$B \to K$ form factors		
$f_+(0)$	0.34 ± 0.05	–	[35, 86]
b_1^+	$-2.1^{+0.9}_{-1.6}$	–	[35]
	$B \to K^*$ form factors		
$V(0)$	$0.36^{+0.23}_{-0.12}$	–	[35]
$A_1(0)$	$0.25^{+0.16}_{-0.10}$	–	[35]
$A_2(0)$	$0.23^{+0.19}_{-0.10}$	–	[35]
b_1^V	$-4.8^{+0.8}_{-0.4}$	–	[35]
$b_1^{A_1}$	$0.34^{+0.86}_{-0.80}$	–	[35]
$b_1^{A_2}$	$-0.85^{+2.88}_{-1.35}$	–	[35]
	B_s decay constant		
f_{B_s}	227.6 ± 5.0	MeV	[77, 87–89]



	no $B \to K^*$ lattice				$B \to K^*$ lattice			
	prior	SM(ν-only)	SM	SM+SM$'$	prior	SM(ν-only)	SM	SM+SM$'$
$V(0)$	$0.35^{+0.14}_{-0.09}$	$0.40^{+0.03}_{-0.03}$	$0.40^{+0.03}_{-0.03}$	$0.39^{+0.03}_{-0.03}$	$0.36^{+0.03}_{-0.03}$	$0.38^{+0.03}_{-0.02}$	$0.38^{+0.03}_{-0.02}$	$0.37^{+0.02}_{-0.02}$
b_1^V	$-4.8^{+0.7}_{-0.5}$	$-4.7^{+0.7}_{-0.5}$	$-4.8^{+0.5}_{-0.4}$	$-4.9^{+0.5}_{-0.3}$	$-4.8^{+0.7}_{-0.4}$	$-4.6^{+0.8}_{-0.4}$	$-4.8^{+0.7}_{-0.4}$	$-4.9^{+0.6}_{-0.3}$
$A_1(0)$	$0.28^{+0.08}_{-0.07}$	$0.24^{+0.03}_{-0.02}$	$0.25^{+0.03}_{-0.02}$	$0.26^{+0.03}_{-0.03}$	$0.28^{+0.04}_{-0.03}$	$0.26^{+0.03}_{-0.02}$	$0.26^{+0.03}_{-0.02}$	$0.27^{+0.03}_{-0.03}$
$b_1^{A_1}$	$0.4^{+0.7}_{-1.0}$	$0.4^{+0.6}_{-0.6}$	$0.5^{+0.6}_{-0.6}$	$0.5^{+0.6}_{-0.7}$	$0.5^{+0.5}_{-0.7}$	$0.3^{+0.5}_{-0.6}$	$0.4^{+0.5}_{-0.6}$	$0.2^{+0.6}_{-0.5}$
$A_2(0)$	$0.24^{+0.13}_{-0.07}$	$0.23^{+0.04}_{-0.04}$	$0.24^{+0.04}_{-0.04}$	$0.24^{+0.05}_{-0.04}$	$0.28^{+0.05}_{-0.05}$	$0.25^{+0.04}_{-0.03}$	$0.26^{+0.04}_{-0.04}$	$0.27^{+0.04}_{-0.04}$
$b_1^{A_2}$	$-0.5^{+2.1}_{-1.7}$	$-0.6^{+1.5}_{-1.3}$	$-0.9^{+1.6}_{-1.1}$	$-0.8^{+1.4}_{-1.2}$	$-1.4^{+1.3}_{-0.9}$	$-1.4^{+1.0}_{-0.9}$	$-1.5^{+1.1}_{-0.7}$	$-1.4^{+1.2}_{-0.8}$
$f_+(0)$	$0.33^{+0.04}_{-0.03}$	$0.30^{+0.02}_{-0.02}$	$0.30^{+0.02}_{-0.02}$	$0.29^{+0.02}_{-0.02}$	$0.33^{+0.04}_{-0.03}$	$0.30^{+0.02}_{-0.02}$	$0.31^{+0.02}_{-0.02}$	$0.29^{+0.02}_{-0.02}$
b_1^{f+}	$-2.3^{+0.6}_{-0.8}$	$-3.1^{+0.5}_{-0.5}$	$-3.1^{+0.5}_{-0.5}$	$-3.2^{+0.4}_{-0.5}$	$-2.3^{+0.6}_{-0.8}$	$-3.1^{+0.5}_{-0.5}$	$-2.9^{+0.4}_{-0.6}$	$-3.4^{+0.6}_{-0.5}$
$V(0)/A_1(0)$	$1.3^{+0.3}_{-0.3}$	$1.6^{+0.2}_{-0.1}$	$1.6^{+0.2}_{-0.2}$	$1.5^{+0.2}_{-0.2}$	$1.2^{+0.2}_{-0.1}$	$1.5^{+0.2}_{-0.1}$	$1.4^{+0.2}_{-0.2}$	$1.4^{+0.2}_{-0.2}$
$A_2(0)/A_1(0)$	$0.99^{+0.10}_{-0.15}$	$0.95^{+0.08}_{-0.08}$	$0.96^{+0.07}_{-0.08}$	$0.96^{+0.08}_{-0.08}$	$0.98^{+0.09}_{-0.10}$	$0.98^{+0.07}_{-0.07}$	$0.99^{+0.07}_{-0.08}$	$0.98^{+0.07}_{-0.07}$

1D-marginalized posterior results at 68% probability in comparison to the prior inputs.

Comprehensive Bayesian analysis of rare (semi)leptonic and radiative B decays, Frederik Beaujean, Christoph Bobeth, Danny van Dyk. arXiv:1310.2478 [hep-ph]. Eur.Phys.J. C74 (2014) 2897, Erratum: Eur.Phys.J. C74 (2014) 3179.