

HLbL analytic: discussion

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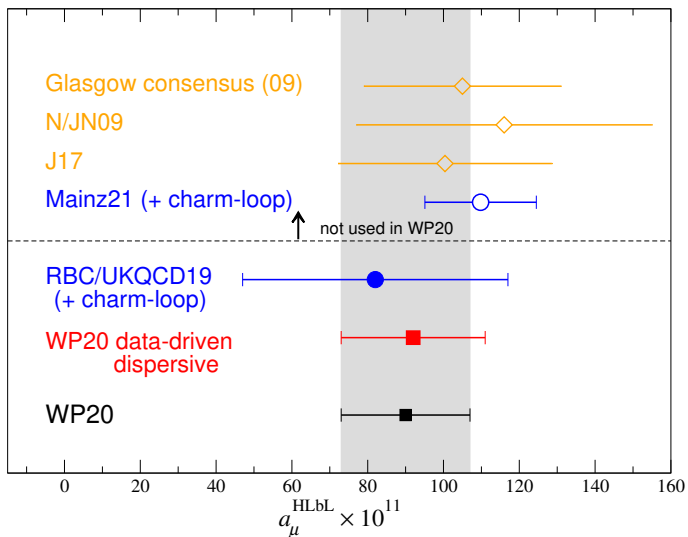
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HLbL table in the WP

Contribution	PdRV(09) <i>Glasgow consensus</i>	N/JN(09)	J(17)	WP(20)
π^0, η, η' -poles	114(13)	99(16)	95.45(12.40)	93.8(4.0)
π, K -loops/boxes	-19(19)	-19(13)	-20(5)	-16.4(2)
S-wave $\pi\pi$ rescattering	-7(7)	-7(2)	-5.98(1.20)	-8(1)
subtotal	88(24)	73(21)	69.5(13.4)	69.4(4.1)
scalars	-	-	-	} - 1(3)
tensors	-	-	1.1(1)	
axial vectors	15(10)	22(5)	7.55(2.71)	
u, d, s -loops / short-distance	-	21(3)	20(4)	15(10)
c-loop	2.3	-	2.3(2)	3(1)
total	105(26)	116(39)	100.4(28.2)	92(19)

Situation for HLbL



Discussion items

- ▶ Short-distance constraints: Longitudinal and Transverse.
Consensus? Prospects for relevant progress?
- ▶ Scalar resonances recently revisited Danilkin, Hoferichter, Stoffer (21)
Subject closed or any new ideas?
- ▶ D-wave resonances: not yet known how to treat them.
Any promising research direction? talk by Jan Lüdtk
- ▶ Axial-vector resonances: still wide range of estimates.
Linked to SDCs. hQCD provided a better understanding of
the link \Rightarrow large contributions(?)
More work is needed for a model-independent estimate,
but will take time.

Comments on the contribution of axial vectors

- ▶ like all resonances besides pseudoscalars, axial vectors affected by basis ambiguity
- ▶ model calculations: large spread, \Rightarrow axial-vector contributions might potentially be large (**transverse SDC**)

	$a_{\mu}^{\text{axials}}[a_1, f_1, f_1']$
– Melnikov, Vainshtein (04)	$22(5) \times 10^{-11}$
– Pauk, Vanderhaeghen (14)(only f_1, f_1')	$6.4(2.0) \times 10^{-11}$
– Jegerlehner (17)	$7.6(2.7) \times 10^{-11}$
– Roig, Sánchez-Puertas (20)	$0.8^{(+3.5)}_{(-0.8)} \times 10^{-11}$
– hQCD models (contribution only to T amplitudes)	
Leutgeb, Rebhan (19,21)	$\sim 17 \times 10^{-11}$
Cappiello et al. (20)	$\sim 14 \times 10^{-11}$

Recent work on axial-vector contributions

- ▶ New basis free of kinematic singularities for axials

GC, Hagelstein, Hoferichter, Laub, Stoffer (21)

- ▶ Asymptotic behaviour of TFF of axial vectors

Hoferichter, Stoffer (20)

- ▶ Analysis of phenomenological and asymptotic constraints on a VMD model for TFF of axial vectors

Zanke, Hoferichter and Kubis (21)

- ▶ hQCD models with $m_q \neq 0$, including phenomenological and asymptotic constraints

Leutgeb, Rebhan (21)

Large contributions confirmed. hQCD models successful so far
⇒ **this needs to be understood**