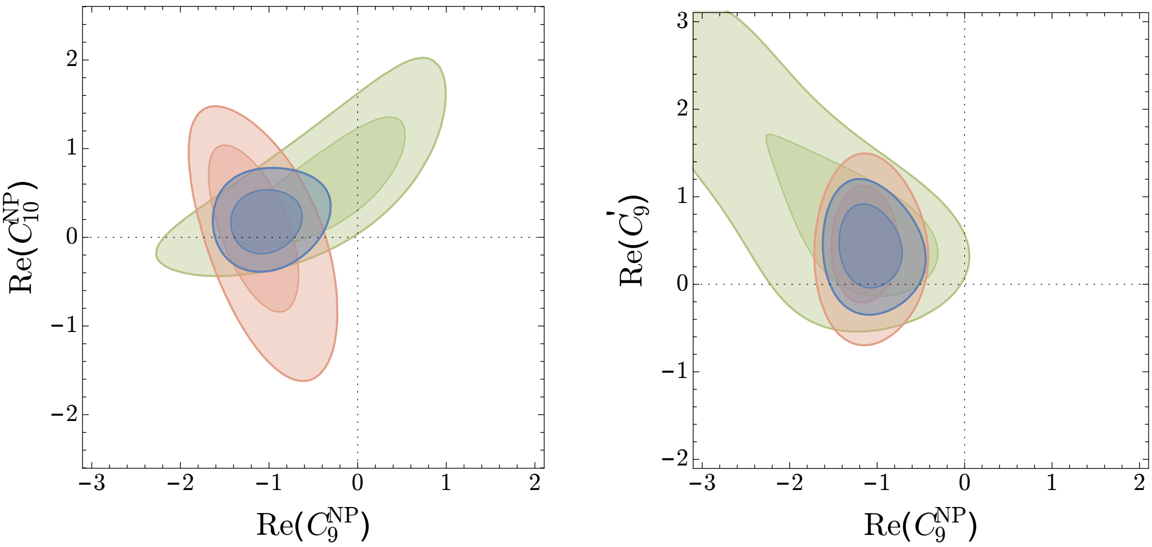

Figure 1 – Allowed regions in the Re($C_9^{\rm NP}$)-Re($C_{10}^{\rm NP}$) plane (left) and the Re($C_9^{\rm NP}$)-Re(C_9') plane (right). The blue contours correspond to the 1 and 2σ best fit regions from the global fit. The green and red contours correspond to the 1 and 2σ regions if only branching ratio data or only data on $B \to K^*\mu^+\mu^-$ angular observables is taken into account.

(including braching ratios and non-LHCb measurements) into sets with data below 2.3 GeV^2, between 2 and 4.3 GeV^2, between 4 and 6 GeV^2, and above 15 GeV^2 (the slight overlap of the bins, caused by changing binning conventions over time, is of no concern as correlations are treated consistently). The resulting 1σ regions are shown in fig. 2 (the fit for the region between 6 and 8 GeV^2 is shown for completeness as well but only as a dashed box because we assume non-perturbative charm effects to be out of control in this region and thus do not include this data in our global fit). We make some qualitative observations, noting that these will have to be made more robust by a dedicated numerical analysis.

- The NP hypothesis requires a q^2 independent shift in C_9. At roughly 1σ, this hypothesis seems to be consistent with the data.
- If the tensions with the data were due to errors in the form factor determinations, naively one should expect the deviations to dominate at one end of the kinematical range where one method of form factor calculation (lattice at high q^2 and LCSR at low q^2) dominates. Instead, if at all, the tensions seem to be more prominent at intermediate q^2 values where both complementary methods are near their domain of validity and in fact give consistent predictions[15].
- There does seem to be a systematic increase of the preferred range for C_9 at q^2 below the J/ψ resonance, increasing as this resonance is approached. Qualitatively, this is the behaviour expected from non-factorizable charm loop contributions. However, the central value of this effect would have to be significantly larger than expected on the basis of existing estimates[20,21,22,23,24], as conjectured earlier[23].

Concerning the last point, it is important to note that a charm loop effect does not have to modify the H_- and H_0 helicity amplitudes[e] in the same way (as a shift in C_9 induced by NP would). Repeating the above exercise and allowing a q^2-dependent shift of C_9 only in one of these amplitudes, one finds that the resulting corrections would have to be huge and of the same sign. It thus seems that, if the tensions are due to a charm loop effect, this must contribute to both the H_- and H_0 helicity amplitude with the same sign as a negative NP contribution to C_9.

[e]The modification of the H_+ amplitude is expected to be suppressed[22,24].