

COLLABORATION AGREEMENT

IN2P3 - COPIN

I. Identification of the laboratories

Partner	COPIN
IN2P3 laboratories	IJCLab
Partner laboratories	Cracovie (IFJ PAN)

II. Identification of the collaboration

Title of the collaboration	Phenomenological analyses of high precision B and D decay data and tests of the Standard Model
Number of the collaboration	23-155
IN2P3 spokesperson	E. Kou
COPIN spokesperson	R. KAMINSKI
Scientific Domain	Hadronic and Particle Physics

Status of the collaboration

Status	The collaboration is new for the period January 1st - December 31st, 2023
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IV. New collaboration for 2023

IV.1 Proposed scientific program

Description

Phenomenological analyses of high precision rare and semi-leptonic B and D decay data measured by LHCb and Belle II collaborations should give constraints to the Standard Model parameters. Furthermore the Dalitz plot data can also offer a better determination of the strong interaction meson-meson amplitudes. Our approach will follow from our recent works based either on application of QCD factorization [1] or on weak effective theory with Hamiltonian expressed in terms of left-handed and right-handed vector currents [2].

In view of further amplitude analyses, we derive [3], within a quasi two-body QCD factorization framework, the $B \rightarrow K_S^0 K^+ K^-$ decay amplitude in terms of unitary final-state meson-meson form factors which describe the final state two-body resonances and their interferences. Our model can predict if some CP asymmetry is present in the Dalitz plot. Within our approach we plan to perform an amplitude analysis of the $B_{\pm} \rightarrow K^+ K^- \pi^{\pm}$ decay available data. Together with several charmless three-body decays of B mesons, a better knowledge of these processes should allow a more accurate extraction of the CKM phase γ through Dalitz-plot amplitude analyses [4].

In a recent work [2] E. Kou with other authors have proposed to do an un-binned angular analysis of $B \rightarrow D^0 \pi^0$ to measure the Wilson coefficient CVR of the right-handed vector current. Such measurements are expected to be done at future B physics experiments such as Belle II with large statistics. We will next explore the possible tensor and scalar new physics contributions in these decay channels. This type of new physics contributions are becoming interesting in the context of the so-called B anomaly.

[1] J.-P. Dedonder, R. Kamin ński, L. Le ński and B. Loiseau, Phys. Rev. D 103, 114028 (2021), Dalitz plot studies of $D^0 \rightarrow KS^0K+K^-$ decays in a factorization approach; arXiv:2105.03355 [hep-ph].

[2] Zhuo-Ran Huang, Emi Kou, Cai-Dian Lu, Ru-Ying Tang, Unbinned Angular Analysis of $B \rightarrow D^0(\pi^0)\nu\ell$ and CVR ; arXiv:2204.06814 [hep-ph].

[3] J.-P. Dedonder, R. Kamin ński, B. Moussallam, L. Le ński, B. Loiseau and P. Z ięnczykowski, Amplitude analysis of the $B^0 \rightarrow KS^0K+K^-$ decays in a quasi-two-body QCD factorization approach, in preparation.

[4] Emilie Bertholet, Eli Ben-Haim, Bhubanjyoti Bhattacharya, Matthew Charles, and David London, Extraction of the CKM phase γ using charm- less three-body decays of B mesons, Phys. Rev. D 99, 114011 (2019); arXiv:1812.06194.

IV.2 Estimated duration for IN2P3 scientists in COPIN	
Total time requested for 2023	15
List of scientists	1. E. Kou (8 days) 2. B. Loiseau (7 days)
IV.3 Estimated duration for COPIN scientists in France	
Total time requested for 2023	15
List of scientists	1. R Kaminski (8 days) 2. L. Lesniak (7 days)

Comment Validation	
Unity Director	Fadi IBRAHIM (IJCLab) - 2022-10-11 11:11:35