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Research Area 2

Decays of bottom, charm, and strange quarks

Cluster Board + (Extended) PI meeting

December 1st, 2025

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Thomas Mannel

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Research Area 2

Reminder

Key Researchers	Albrecht, Bell, Bernlochner, Dingfelder, Feldmann, Hanhart, Hiller, Huber, Kilian, Kubis, Lenz, Mannel, Meißner, Mitzel, Prim, Stamou, Stefkova, Witzel
Coop. Partners	Humair, Jüttner, Ligeti, Peláez, Schune, Urquijo, Vos, Wilkinson
Objectives	• Search for new phenomena in weak decays, in close collaboration with hadronic structure investigations in RA1. • Clarify the origin of the flavor anomalies. • Combine theoretical and experimental efforts for stringent tests of the SM to identify new phenomena in bottom and charm decays.
Cluster Professors	W2 Flavor Physics at LHCb (EXP) W3 BSM Phenomenology (TH), together with RA3

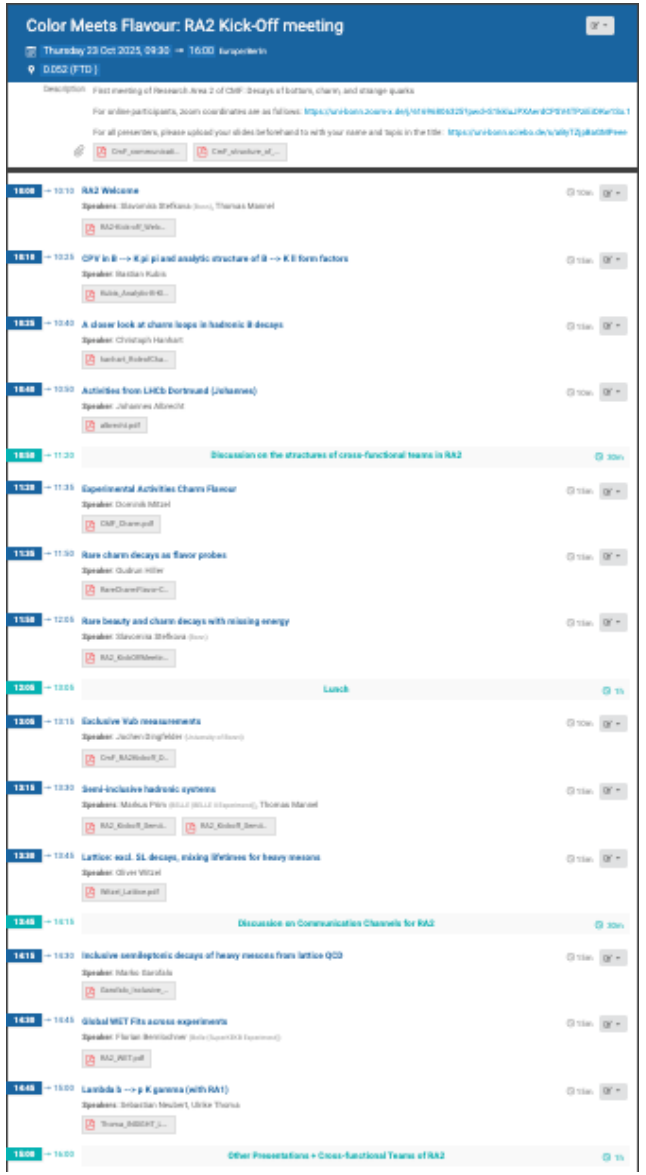
with work program divided into 7 areas…

- Anomalies 1: Lepton Flavor Universality in CC decays
- Anomalies 2: Rates and Angular Distributions In FCNC decays
- Anomalies 3: Inclusive vs. Exclusive
- Mixing, Lifetimes and CPV in Bottom Hadrons
- Hadronic Decays of Bottom Hadrons
- Charm- and Strange-Quark Physics: CP violation, mixing, rare decays
- QED Radiative Corrections

RA2 kick-off meeting

RA2 kick-off meeting:

- Took place on 23.10.2025 in FTD in Bonn
- 12 topical presentations: indico link
- + discussions sessions: structures of cross-functional teams, communication within CmF, forming of the cross-functional teams



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RA2 kick-off meeting

Pictures from Philip Bechtle

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Goals of the RA2 Kick-off Meeting

1. **Discuss the overall work program in RA2**
    - Identify current and future projects
2. **Discuss the cross-functional teams for the projects**
    - Discuss the format of the cross functional teams
    - Discuss the complementarity to other RA, TA
    - Set up the first round of cross functional teams
3. **Discuss communication platform for RA2**

I will now report on the outcome and discussion of the meeting

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Structures of cross-functional teams

- **Team Composition with CFT:**
  - Teams may vary in size but should operate at a minimum of pairs, including at least two perspectives (e.g., two experimental groups, an experiment-theory mix, or a theory-theory collaboration)
  - Whenever possible, teams should span multiple sites (Bonn, Jülich, Siegen, Dortmund)
  - Cross-research area projects (with RA1, RA2) are highly encouraged
  - The bridge to TA1 and TA2 is vital
- **Role of ECRs:** see back-up
- **(Inter)national partners:** see back-up
- **Cluster visibility:** see back-up
- **Theory & experiment paper authorship:** see back-up

Communication in RA2

Mailing lists:

- **RA2 mailing list:** please put your name in this sheet if you are interested in any topic in RA2. General RA2 mailing list will be created by CmF and we will add you there. We are aware that we do not have everyone on the mailing list for RA2 emails, so if you see your colleagues missing just share the link with him/her/them.
- **CFTs mailing lists:** CFT leads will be responsible for creating these

(Online) meetings for CFTs and RA2:

- **CFTs:** Depending on the project stage / theory- experiment interplay the CFT leads should decide on the intensity. We plan to create an RA2 Indico category where CFTs within RA2 will be listed as subcategories.
- **RA2 monthly meeting:** discuss general progress (conveners+CFT leads) to understand/monitor progress of different CFTs.

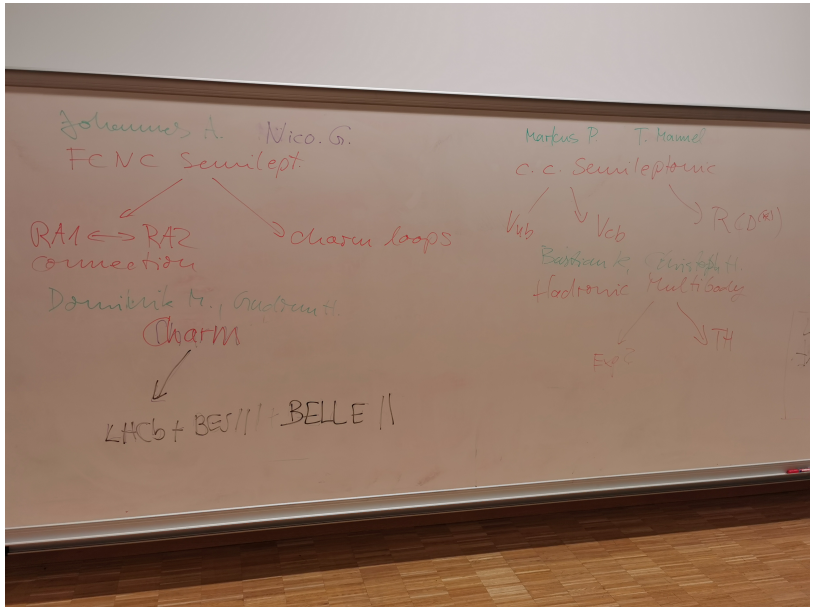
In-person meetings for RA2 (once a semester?):

- Discussion remains open, but it would be useful to link these meetings to the official CmF meetings. Options include booking a half-day either before or after the CmF meetings to review project status if the general CmF meetings already do not have this on agenda

RA2 cross-functional teams proposals

Mix of collaborations that are already ongoing (more mature stage) + new initiatives with proposed CFT leads

1. **FCNC SL(charm loops; connection with RA1):** Albrecht, Gubernari
2. **Charm physics (hadronic + SL):** Hiller, Mitzel
3. **CC SL decays (Vub Vcb, R(D(*))):** Mannel, Prim
4. **Hadronic Multi-body (theory, experiment (Tim Gershon)?):** Kubis, Hanhart
5. **Light NP (connection with RA4):** Stamou, Stefkova
6. **WET EFT Fits:** Kroninger, Hiller, Feldmann, Bechtle



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RA2 project descriptions

We received 18 different projects together with expected starting date (A/B):

RA2-1: B Decays with multi-hadron final states (Hanhart, Kubis, Mannel) A
RA2-2: Excited Lambda spectrum in rare B decays (Albrecht, Thoma) A
RA2-3: Unraveling the D** (Hanhart, Kubis, Neubert, Prim) A
RA2-4: QED Corrections in Bottom decays (Albrecht, Mannel) B
RA2-5: Charming Darwin (Albrecht, Bernlochner, Lenz) A/B
RA2-6: Combined BelleII and LHCb Wilson Coefficient analysis (for CC semileptonics) (Albrecht, Bernlochner, Prim) A
RA2-7: Phenomenology of Bs to 4 leptons (Albrecht, Stamou) ?
RA2-8: Vxb (Bernlochner, Dingfelder) A
RA2-9: Light Cone distribution amplitudes of B hadrons (Feldmann, Gubernari) ?
RA2-10: Analytic Properties of the charm contribution in b to s ll (Gubernari, Kubis) A
RA2-11: Semi-inclusive semileptonic B decays (Mannel, Prim) A/B
RA2-12: CPV in hadronic D decays (Feldmann, Hiller, Lenz, Mitzel) B?
RA2-13: Constraining NP in rare semileptonic charm decays (Hiller, Mitzel) A
RA2-14: R(D*) with semileptonic tagging (Prim) A
RA2-15: Charm decays with invisibles (Hiller, Stefkova) A/B
RA2-16: Inclusive Semileptonic decay rates of B and Bs mesons (Garofolo, Gross, Ubrach) ?
RA2-17: Flavor Structure in Axion models and generic extension with light NP (Feldmann, Stamou, Stefkova) A
RA2-18: Beyond the Standard Model effects in tree-level B decays (Albrecht, Lenz) A

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RA2 Allocation of projects to topics

1. **FCNC SL: RA2-2, RA2-10, RA2-7**
2. **Charm physics: RA2-5, RA-12, RA2-13, RA2-15**
3. **CC SL decays: RA2-3, RA2-8, RA2-11, RA2-14, RA2-16, RA2-9?, RA2-4?**
4. Hadronic Multi-body: RA2-1, RA2-18
5. Light NP: RA2-17 (Merge?)
6. WET EFT Fits: RA2-6 (Merge?)

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Backup

Structures Discussion

Role of ECRs: ECR are central to the CmF projects. We discussed that each team could include an ECR as the lead of the CmF team to ensure visibility, development opportunities, and ownership. ECRs should not be solely responsible for project success; senior team members will provide support and mentorship to maintain workload balance and team stability. The group also discussed adopting Agile methods and organizing dedicated training. A workshop on Agile collaboration practices was suggested to be planned, ideally with an industry-experienced trainer (expertise from CERN is useful). As a reference, see the University of Bonn's "Sprint" meeting on Agile methods: link.

(Inter)national partners: International partners should be involved as early as possible to ensure meaningful integration into CmF activities. Once cross-functional teams are formed, it is the responsibility of the team to contact them. Limited funding support may be considered when strategically necessary (e.g., BESIII involvement in the hadronic charm program since we do not have BESIII PIs internally), but internally funded projects remain the highest priority. Joint PhD supervision, with (inter)national colleagues as secondary advisors, provides a path for long-term, sustainable collaboration without transferring explicit funds externally.

Cluster visibility: To further differentiate/make the cluster as successful as possible, the focus should be on high-impact publications, including work suitable for journals such as *Nature Physics*. Cross–research area projects are expected to support this goal. Furthermore, we should make branding (Decays of bottom, charm and strange (CmF)), to be discussed.

Theory & experiment paper authorship: It is notoriously not so easy to publish theory + experimental collaboration work. We need to further develop the ties with the experimental collaboration's management and find a way forward. One way that was discussed is open data/likelihoods.