

Dortmund Celebration of Charm

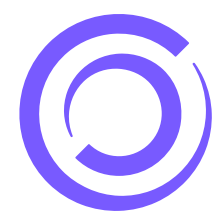
Celebrating 50 years of
experimental charm physics

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7th March 2024, Session T 88.6

DPG Spring Meeting 2024, Karlsruhe

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What is charm?

- ▶ Charm is the second-heaviest *up-type quark* in the Standard Model (SM)
- ▶ Discovery in 1974 cemented much of the SM as we know it
 - Confirmation of *quark* model of hadronic physics
 - Paved way for discovery of electroweak unification
- ▶ Probe for BSM physics in the up-type sector
 - CKM elements, CP violating parameters
 - Null tests of heavily suppressed decays
 - Gateway between light and heavy flavour physics

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Charming hypotheses

First proposed by Bjorken and Glashow

1964



Charming hypotheses

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Glashow, Iliopoulos and Maiani then proposed "charmness"

⇒ GIM mechanism required 4th quark to unify
electromagnetic and weak forces

¹⁹⁷⁰



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Charming hypotheses

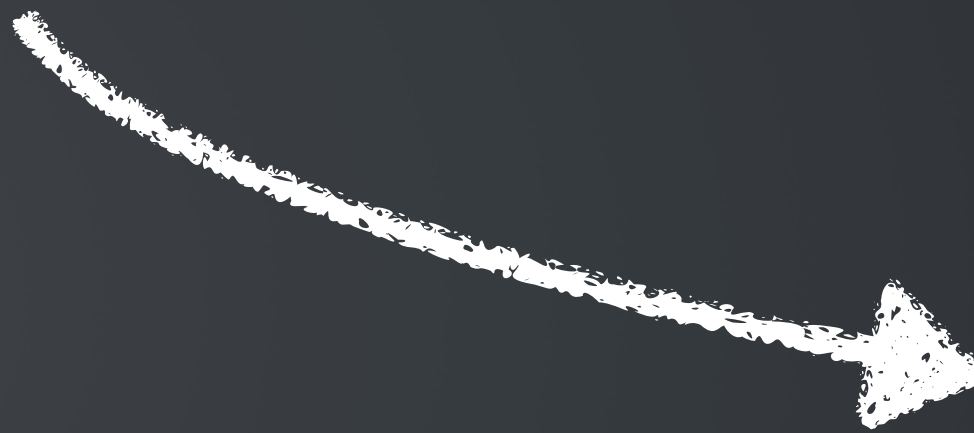
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1970



1979

Electroweak unification

Glashow, Salam and Weinberg

Charming hypotheses

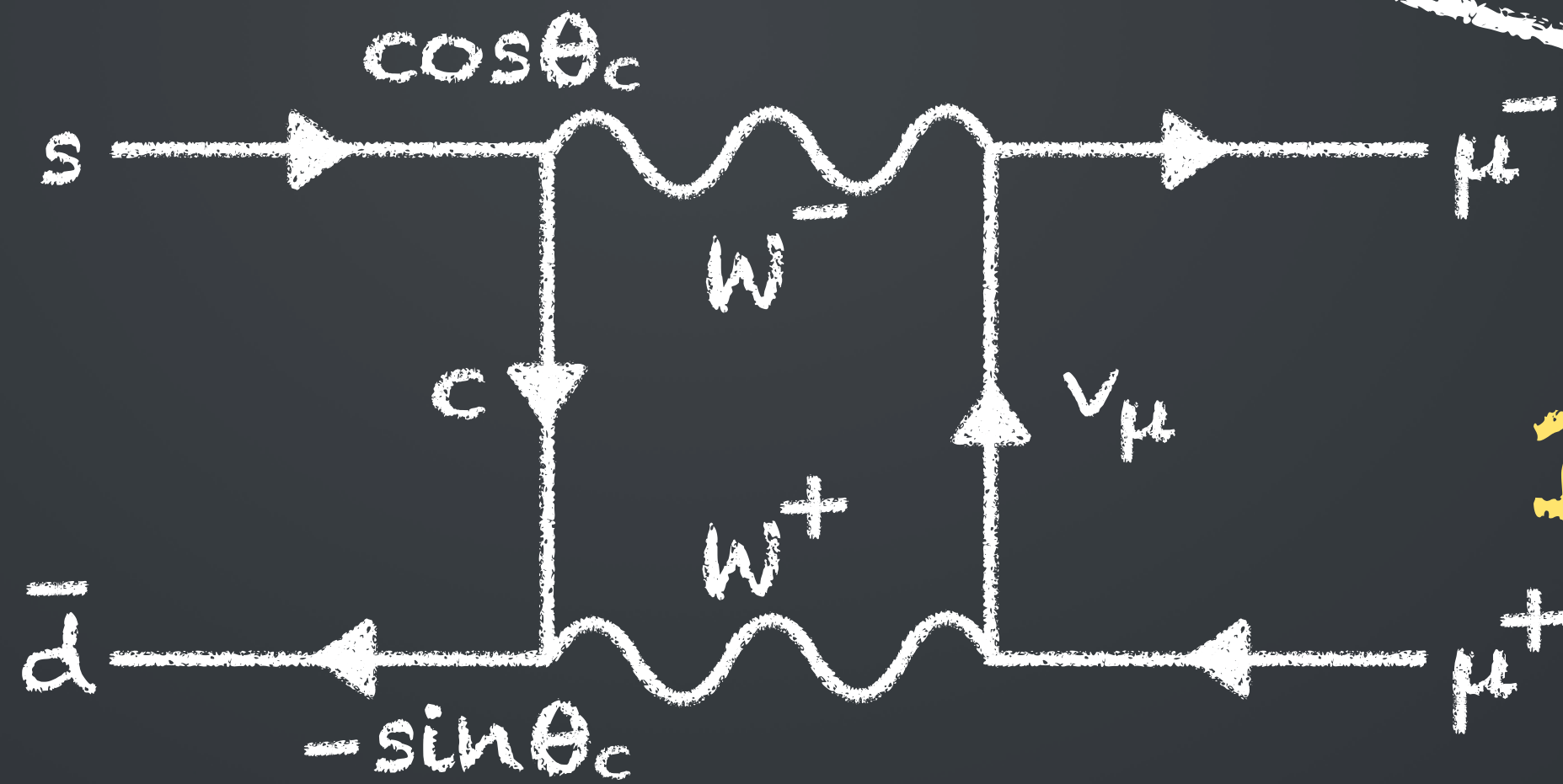
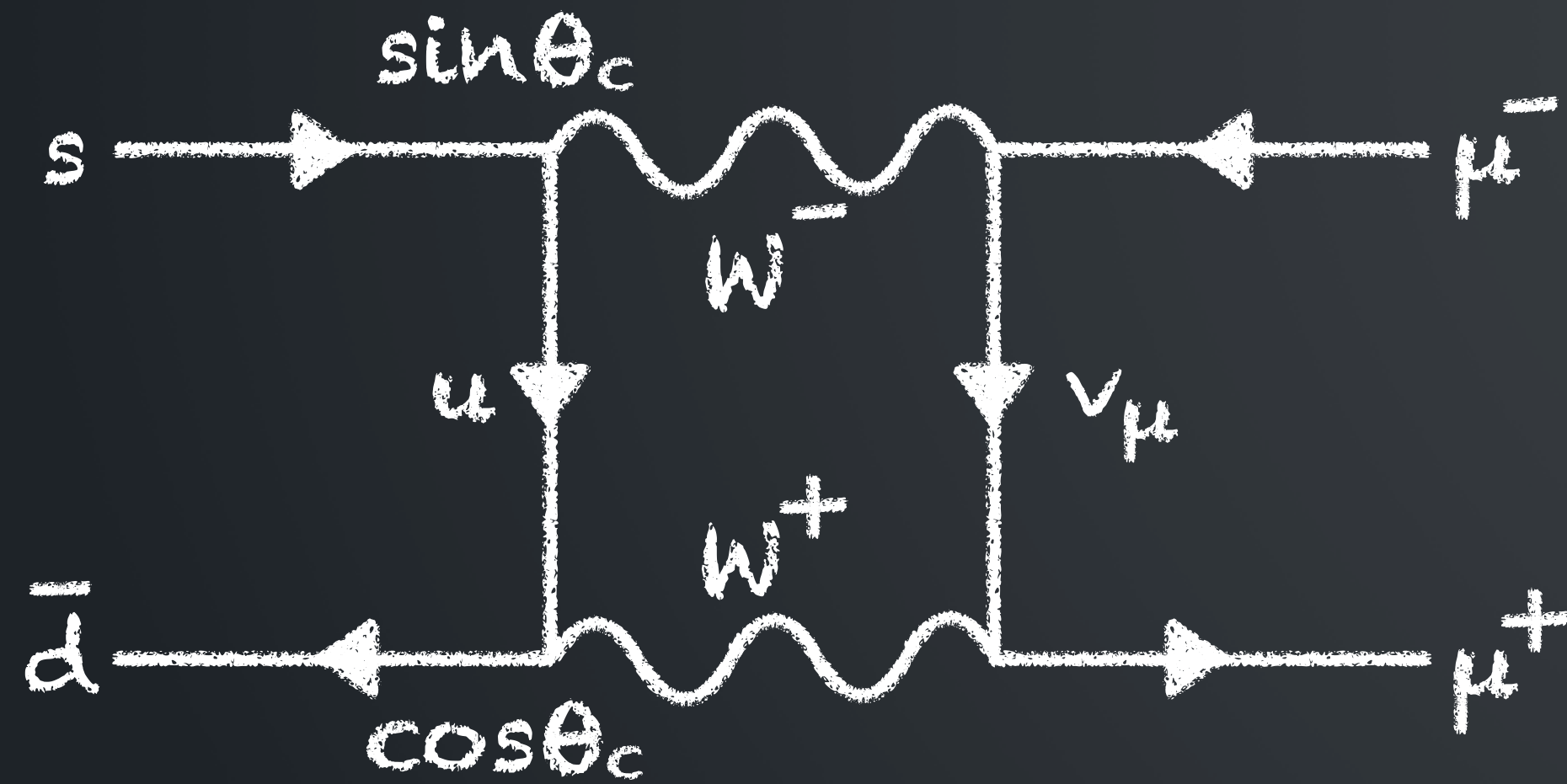
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Suppression as $\sin\theta_c \cos\theta_c$ and $-\sin\theta_c \cos\theta_c$ terms cancel!



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Charming hypotheses

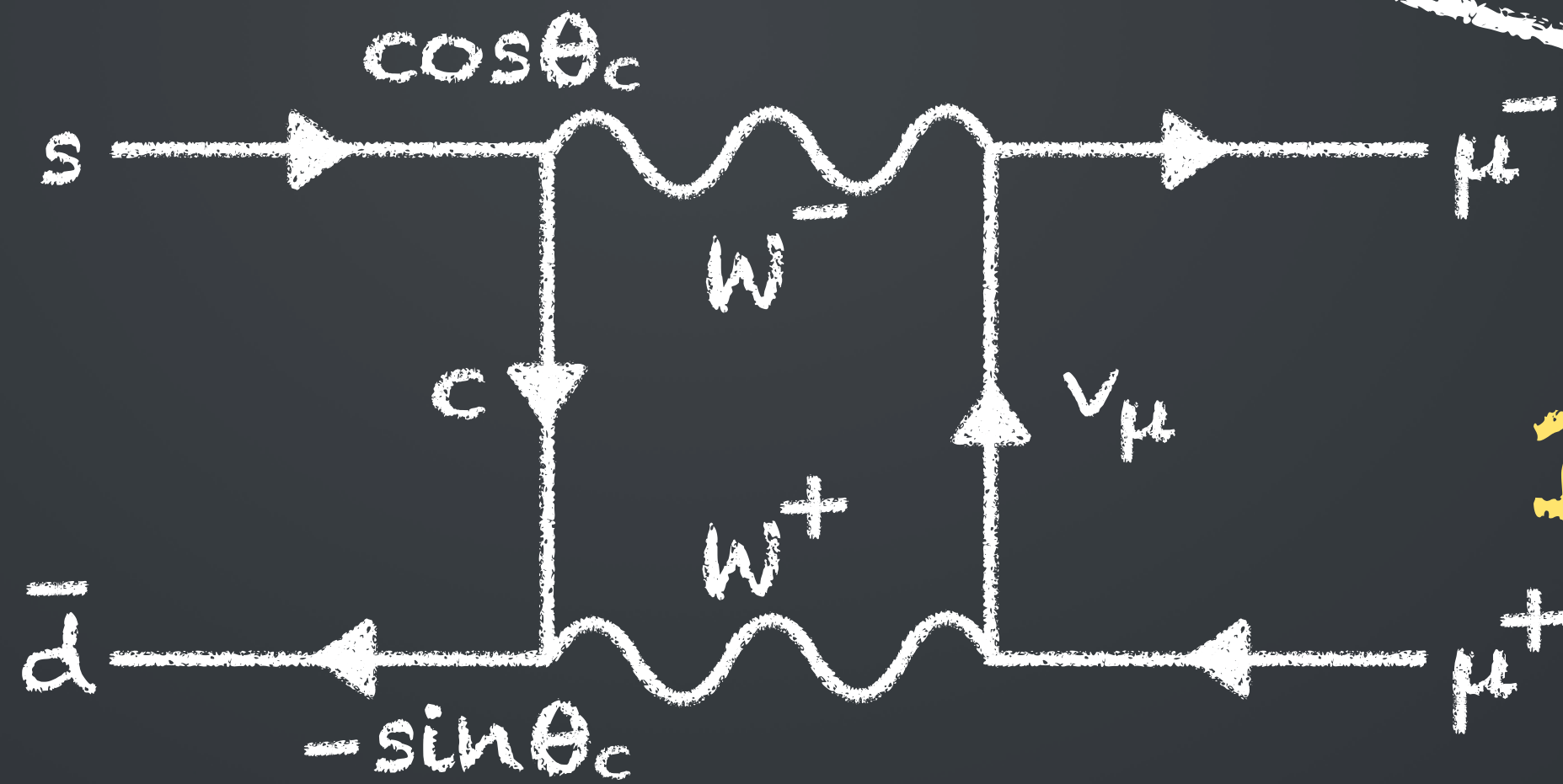
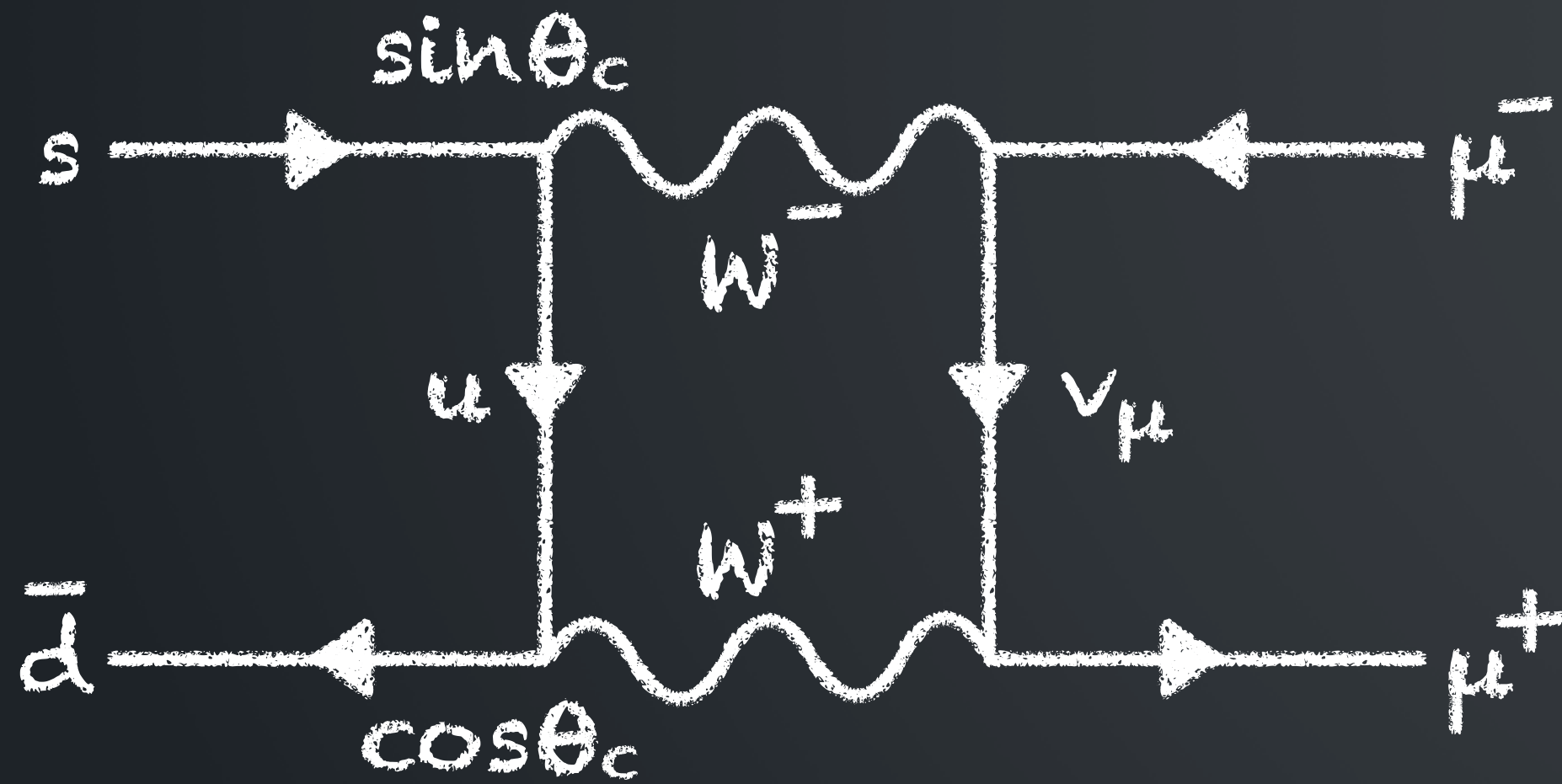
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1979

Electroweak unification

Glashow, Salam and Weinberg

If there is a 4th quark, can it form particles?

The hunt is on...

Discovering charm

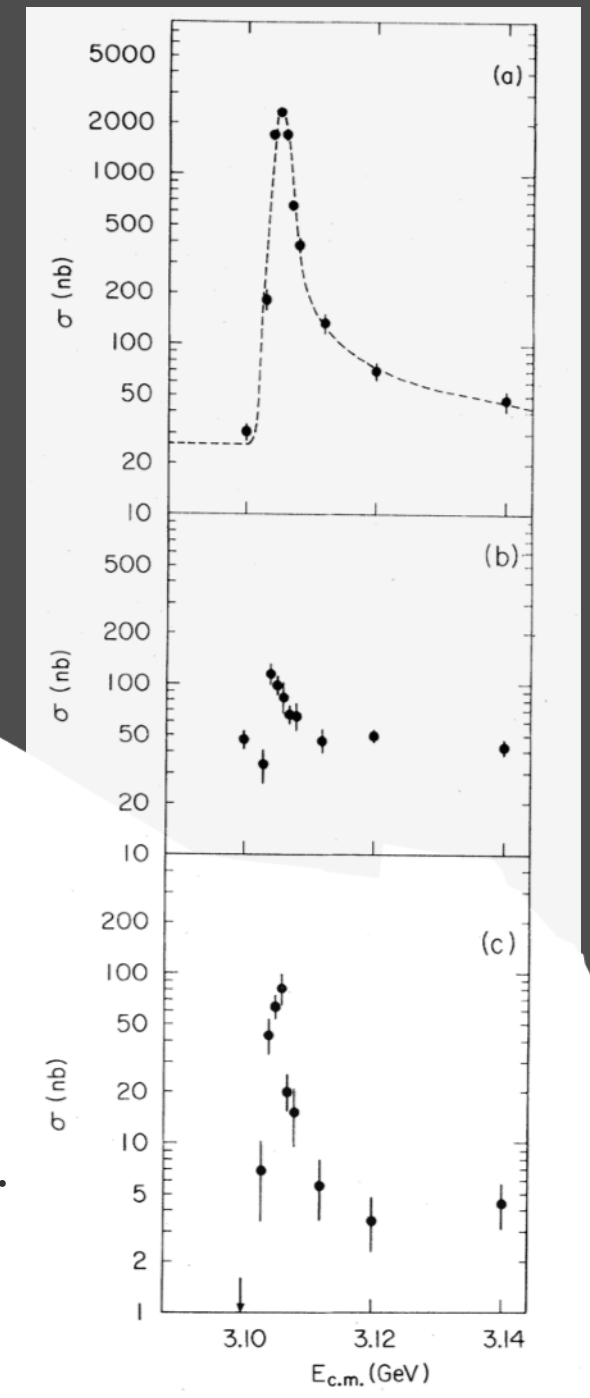
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Richter



Stanford

$$e^+e^- \rightarrow \text{hadrons}, e^+e^-, \mu^+\mu^-$$



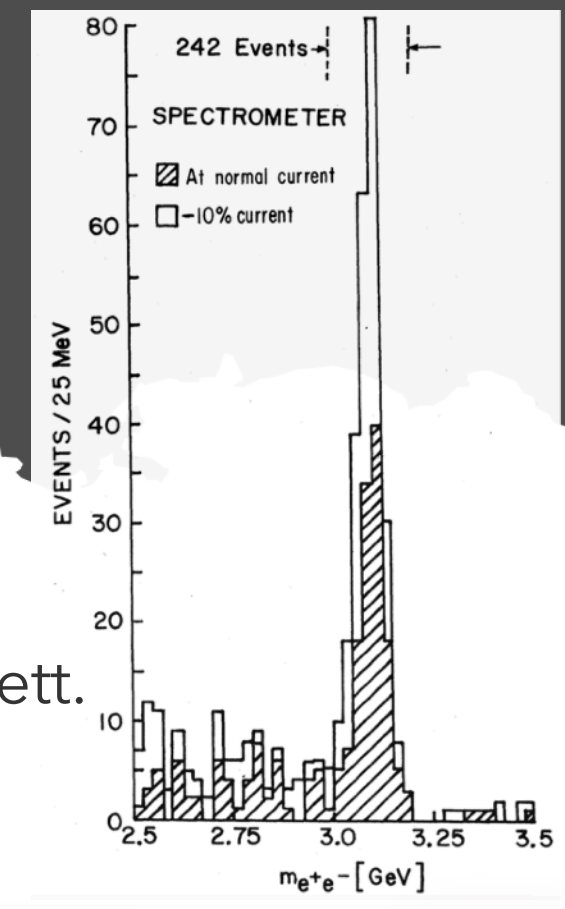
[Phys. Rev. Lett. 33, 1406]

Brookhaven

$$p + \text{Be} \rightarrow e^+ + e^- + x$$



Ting

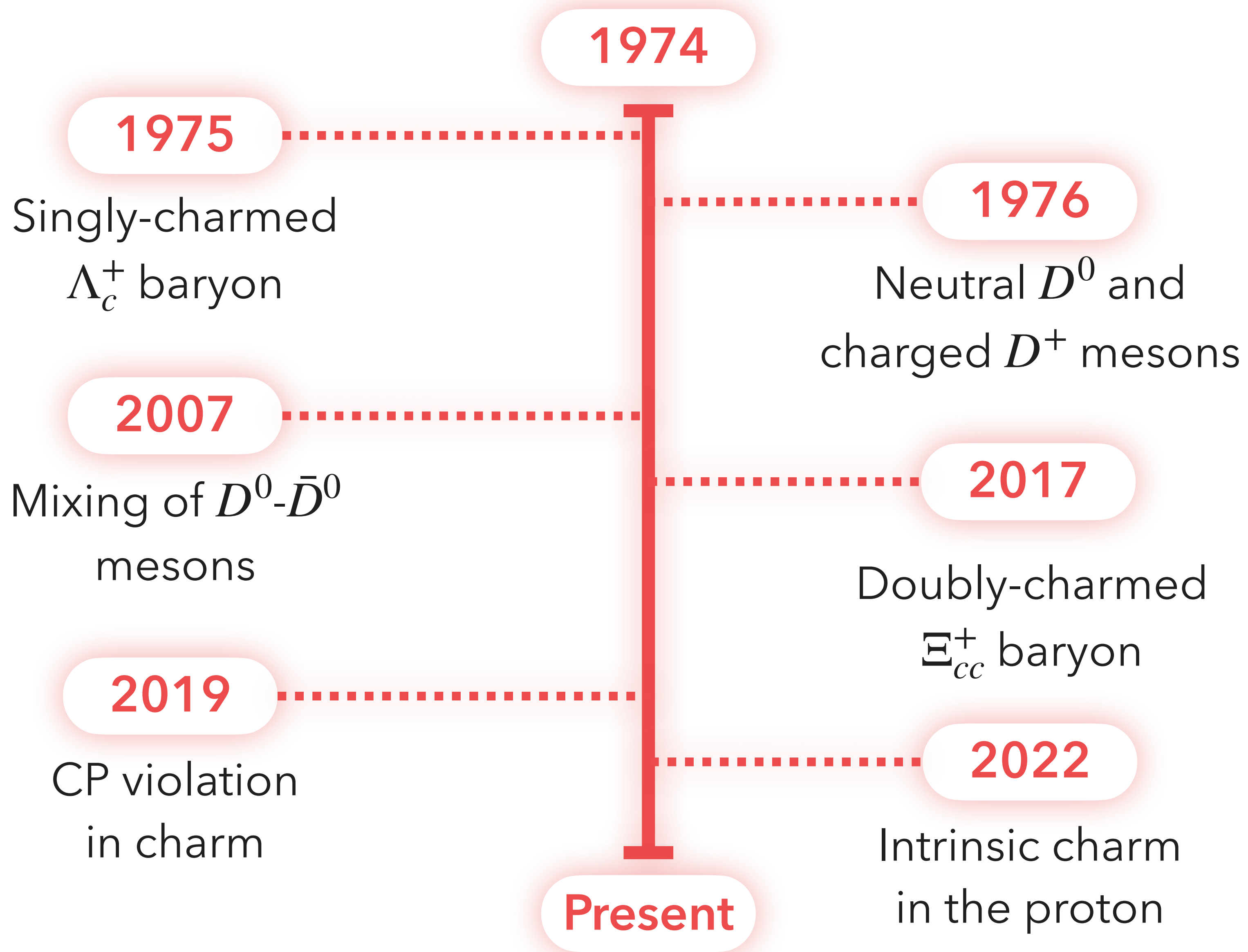


[Phys. Rev. Lett. 33, 1404]



1974: the J/ψ meson is discovered \rightarrow **the charm quark is found**

50 years of experimental charm



Charm at TU Dortmund

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► Experiment:

- Junior Research Group lead by Dominik Mitzel
 - Measurements in charm hadron decays at LHCb



► Theory:

- Working Group lead by Gudrun Hiller
 - Studies of BSM models and symmetries for rare semi-leptonic/radiative decays of b and c quarks
- Junior Research Group lead by Emmanuel Stamou
 - BSM phenomenology, including in heavy flavour (b and c) interactions

Celebrating 50 years of charm

- ▶ Holding the “Dortmund Celebration of Charm” this year
 - String of outreach events dedicated to charm anniversary
- ▶ Many activities in the works
 - Aim to reach a broad range of audiences
 - General public
 - Local school students
 - University community (within and outside of HEP)
 - Events planned to coincide with anniversary in November
 - Public lecture planned as *main event*
 - Smaller activities in run-up also being planned
 - Social media strategy supporting events

A circular logo with a white border and a red center. The text "Dortmund celebration of charm" is written in white, with "Dortmund" in a larger font and "celebration of charm" in a smaller font below it.

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of charm

Planned events

- ▶ Plan to hold most events in November, around anniversary date
- ▶ Core event → public lecture:
 - Either on campus or in Dortmund, depending on level of interest
 - Would like to also involve key figure in charm history (TBC)
- ▶ Possible peripheral events:
 - Stand at university open day (Tag der offenen Tür)
 - Tie-in with masterclasses

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Social media strategy

- ▶ Ramped up social media presence in past months
 - Accounts on X (formerly Twitter) and Instagram refreshed
 - Visual identity updated; unique visual identity for the charm celebration
 - Regular cross-platform posting
- ▶ Currently playing back the last 50 years in each post

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Conclusion

- ▶ 50 year anniversary as good a time as ever to celebrate rich charm history
- ▶ Charm is a key part of the Dortmund particle physics research programme
- ▶ Outreach programme planned to celebrate anniversary
 - Direct activities planned for November
 - Indirect activities (e.g., social media) already underway

Thank you for your attention

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