

50th SLAC Summer Institute (SSI 2022)

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SLAC



Book of Abstracts

Contents

Connecting the B anomalies with the hierarchy problem	1
Introduction	1
Introductory Overview	1
Neutrinos I (Theory)	1
Neutrinos II (Experiment)	1
CP Violation & Matter/Anti-matter Asymmetry I (Theory)	1
Neutrinos III (Theory)	2
CP Violation & Matter/Anti-matter Asymmetry II (Experiment)	2
Compositeness I (Theory)	2
Neutrinos IV (Experiment)	2
CP Violation & Matter/Anti-matter Asymmetry III (Theory)	2
Project Kickoff & Team Assignments	2
Projects	2
Compositeness II (Theory)	3
Fermion Generations I (Theory)	3
CP Violation & Matter/Anti-matter Asymmetry IV (Experiment)	3
Compositeness III (Experiment)	3
Fermion Generations II (Experiment)	3
Fermion Generations III (Theory)	3
Dark Matter I (Theory)	3
Dark Matter II (Experiment)	4
Parity Violation I (Theory)	4
Hubble Tension III	4

Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	9
Q & A	10
Dark Matter III (Theory)	10
Q & A	10
Dark Matter IV (Experiment)	10
Q & A	10
Parity Violation II (Experiment)	10
Q & A	10
SSI History - II	10
Q & A	11

Poster Social / 3**Connecting the B anomalies with the hierarchy problem****Author:** Yi Chung¹¹ *Max-Planck-Institut für Kernphysik***Corresponding Author:** yichungphys@gmail.com

Intriguing hints for lepton flavor universality violation have emerged from the measurement of B meson decays by LHCb. These B anomalies point to the new physics at the low TeV scale, exactly where we expect a solution to the hierarchy problem! One possible candidate to explain the neutral current B anomalies is a new TeV-scale Z' boson. In this poster, I will show some key features for a Z' boson to explain the anomalies and also discuss how a composite Higgs solution to the hierarchy problem can naturally generate an expected spectrum (light Higgs \rightarrow TeV Z' \rightarrow other heavy resonances). Two (or maybe more) concrete models will be briefly presented. The models connect the energy scales of the EWSB and the B anomalies, which makes them very predictive.

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Lectures / 13

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Projects / 14

Project Kickoff & Team Assignments

Projects / 15

Projects

Lectures / 16

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Lectures / 24

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Lectures / 26

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Lectures / 28

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Lectures / 29

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Lectures / 31

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Lectures / 32

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Lectures / 33

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Lectures / 34

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35

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36

Study of the $\Lambda_b^0 \rightarrow D^0 p K^-$ decay for a future measurement of CKM angle γ

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A study of the Λ_b^0 baryon decaying into $D^0 p K^-$ is presented based on a proton-proton collision data sample corresponding to an integrated luminosity of 9fb^{-1} collected with the LHCb detector. The decays considered are $\Lambda_b^0 \rightarrow D^0 p K^-$ with $D^0 \rightarrow K^- \pi^+$, $D^0 \rightarrow K^- K^+$ and $D^0 \rightarrow \pi^- \pi^+$. The first process is expected to be the most favoured with respect to the last two, which have a suppression of the order of λ . The performance of a Boosted Decision Tree (BDT) able to discriminate two typologies of background is tested in order to reduce the highly contaminating charmless background of this analysis, i.e. the Λ_b^0 four-body decays $\Lambda_b^0 \rightarrow phhh$, with $h = K, \pi$.

37

Commissioning of the LHCb Scintillating Fibre Tracker

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The LHCb detector underwent a major upgrade in the past years. The modifications enable the detector to operate at an increased instantaneous luminosity and to read out data at the LHC bunch crossing rate of 40MHz. The new operating conditions require the replacement of the complete tracking system. The main tracking stations are replaced by the SciFi Tracker, a large high granular scintillating fibre tracker readout by arrays of silicon photomultipliers (SiPMs). A custom ASIC is used to digitise the SiPM signals at 40MHz. Further digital electronics perform clustering and data-compression before the data is sent via optical links to the DAQ system.

The detector modules together with the readout electronics and all services are mounted on so-called C-Frames. The serial assembly and installation of frames in the experimental cavern has concluded in early 2022, and the detector is currently being commissioned for Run 3 of the LHC.

38

Hints of New Physics in rare beauty-hadron decays

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Does the Standard Model (SM) start to show its shortcomings? The LHCb experiment at CERN sees hints of different behaviour between electrons, muons and tau leptons, which could hint at possible new particles or interactions beyond the Standard Model. Multiple recent LHCb analyses studying this 'lepton- flavour universality' see tensions with the SM predictions. $b \rightarrow s \ell \ell$ decays occur only very sparsely in the SM, and provide an excellent opportunity to further study these so-called "flavour anomalies". This poster provides a short introduction to, and an overview of the search for the violation of electron/muon universality at LHCb.

Lectures / 42

Q & A

Lectures / 43

Q & A

Lectures / 44

Q & A

Lectures / 45

Q & A

Lectures / 46

Q & A

Lectures / 47

Q & A

Lectures / 48

Q & A

Lectures / 49

Q & A

Lectures / 50

Q & A

Lectures / 51

Q & A

Lectures / 52

Q & A

Lectures / 53

Q & A

Lectures / 54

Q & A

Lectures / 55

Q & A

Lectures / 56

Q & A

Lectures / 57

Q & A

Lectures / 58

Q & A

Lectures / 59

Q & A

Lectures / 60

Q & A

Lectures / 61

Q & A

Lectures / 62

Q & A

Lectures / 63

Q & A

Lectures / 64

Q & A

Lectures / 65

Q & A

Lectures / 66

Q & A

Lectures / 67

Q & A

Lectures / 68

Q & A

Lectures / 69

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Lectures / 70

Q & A

Lectures / 71

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Lectures / 72

Q & A

Lectures / 73

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Lectures / 74

Q & A

Lectures / 75

SSI History - II

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76

Q & A