Precision Measurements at the Intensity Frontier

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About Me
Background


- Born 1985 in Piacenza, Italy

- Grew up and studied in Pisa

  - MSc (2010) and PhD (2014) at University of Pisa

  - MEG experiment (PSI)

- Postdoc at University of Melbourne (2015-2018)

  - Belle/Belle II experiments

- DESY Fellow since April 2018
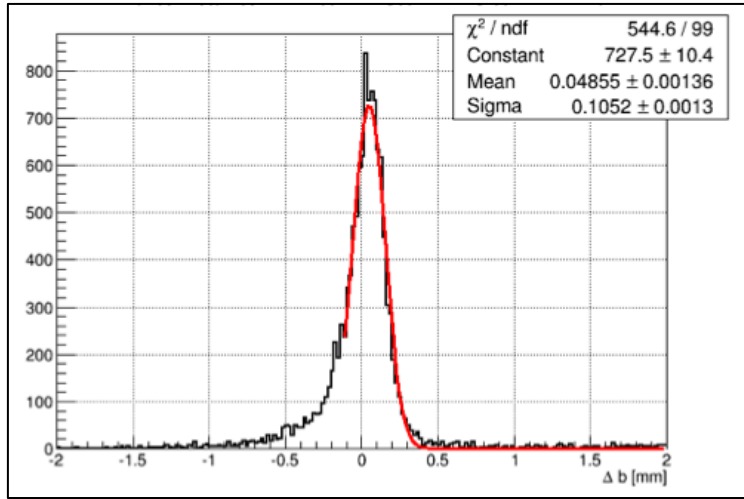
About Me

Past work: MEG (Univ. of Pisa and PSI)

- LFV search for μ→eγ with high intensity muon beam (≈10^8 μ+/sec @ 28 MeV/c) at PSI

- Very good resolution and energy scale stability required to suppress background

  - MSc: LXe detector calibration

  - PhD: MVA approaches to photon reconstruction

- BR(μ→eγ) < 4.2x10^{-13} at 90% CL (best limit so far)
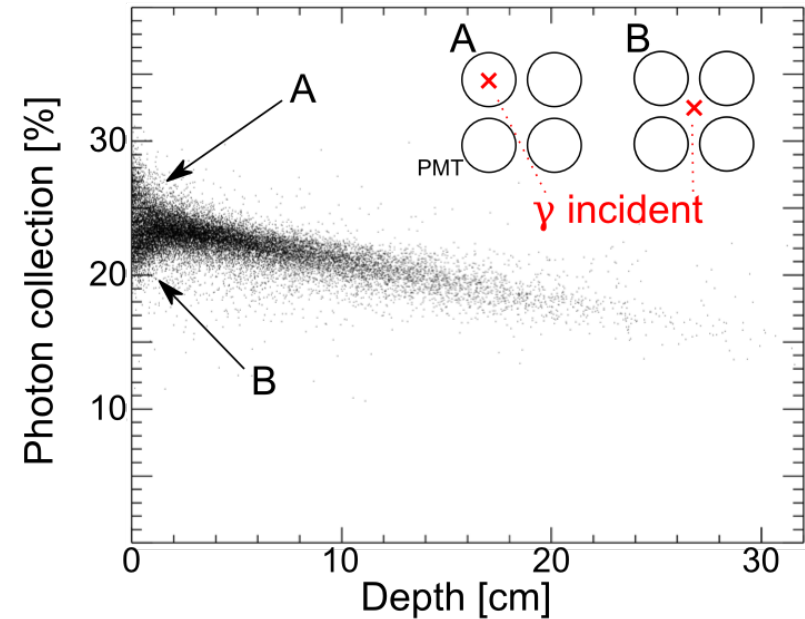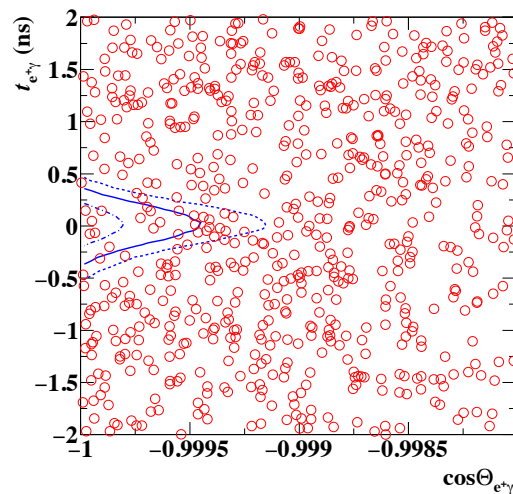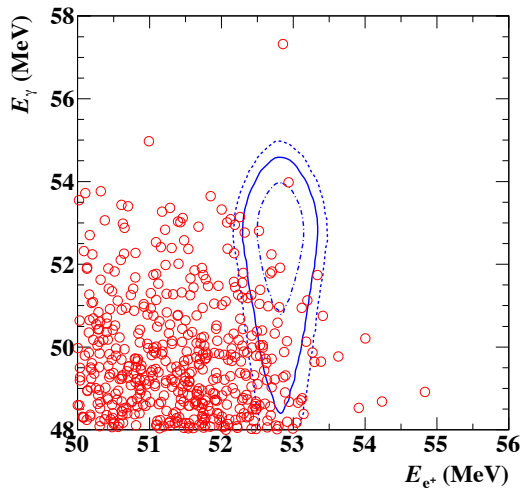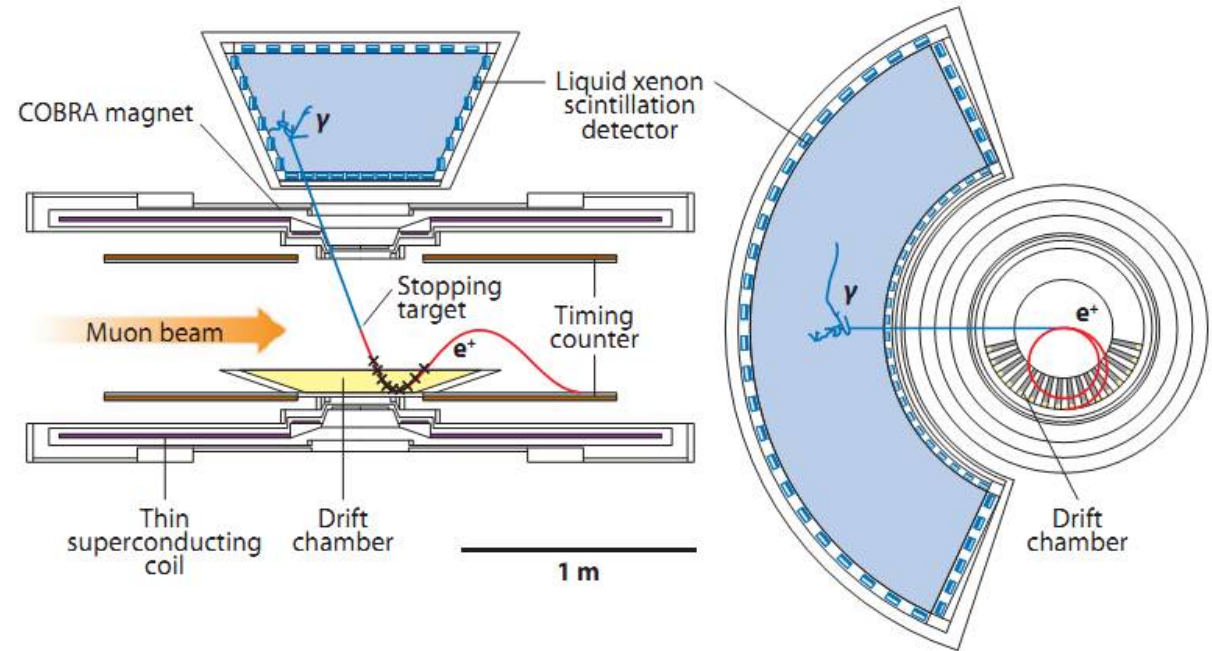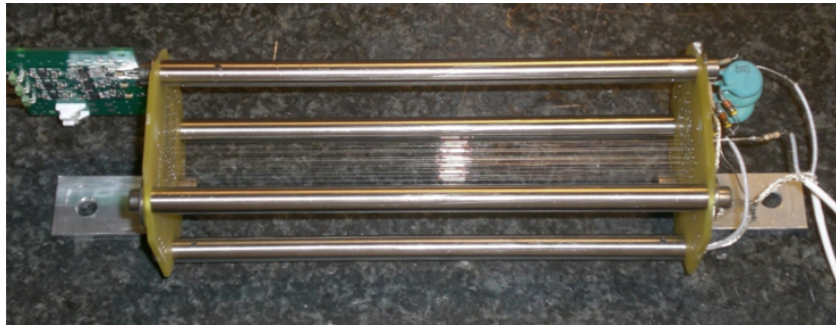

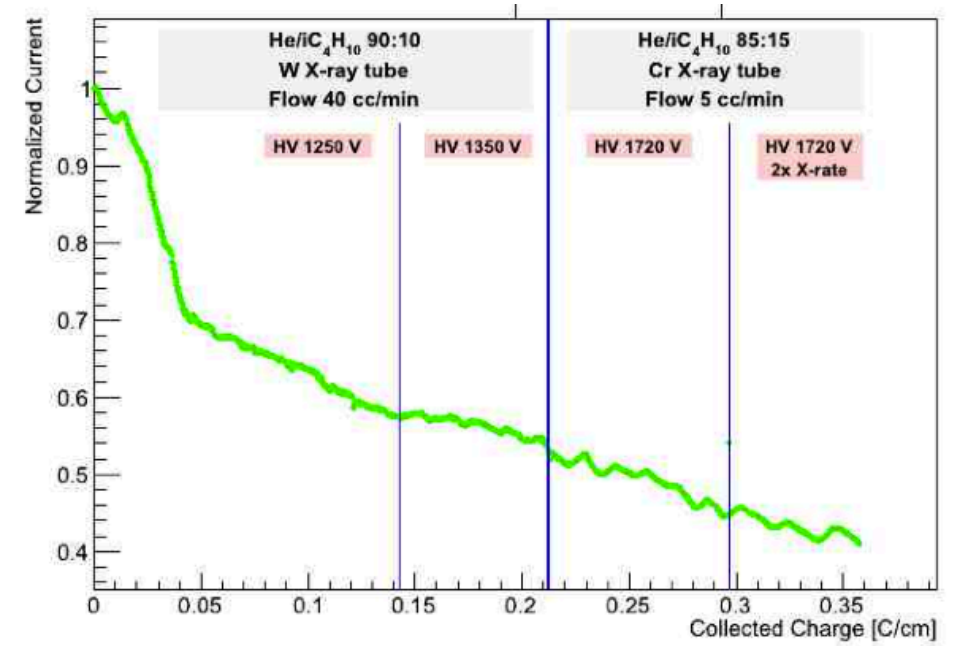Eur.Phys.J. C76 (2016) no.8, 434

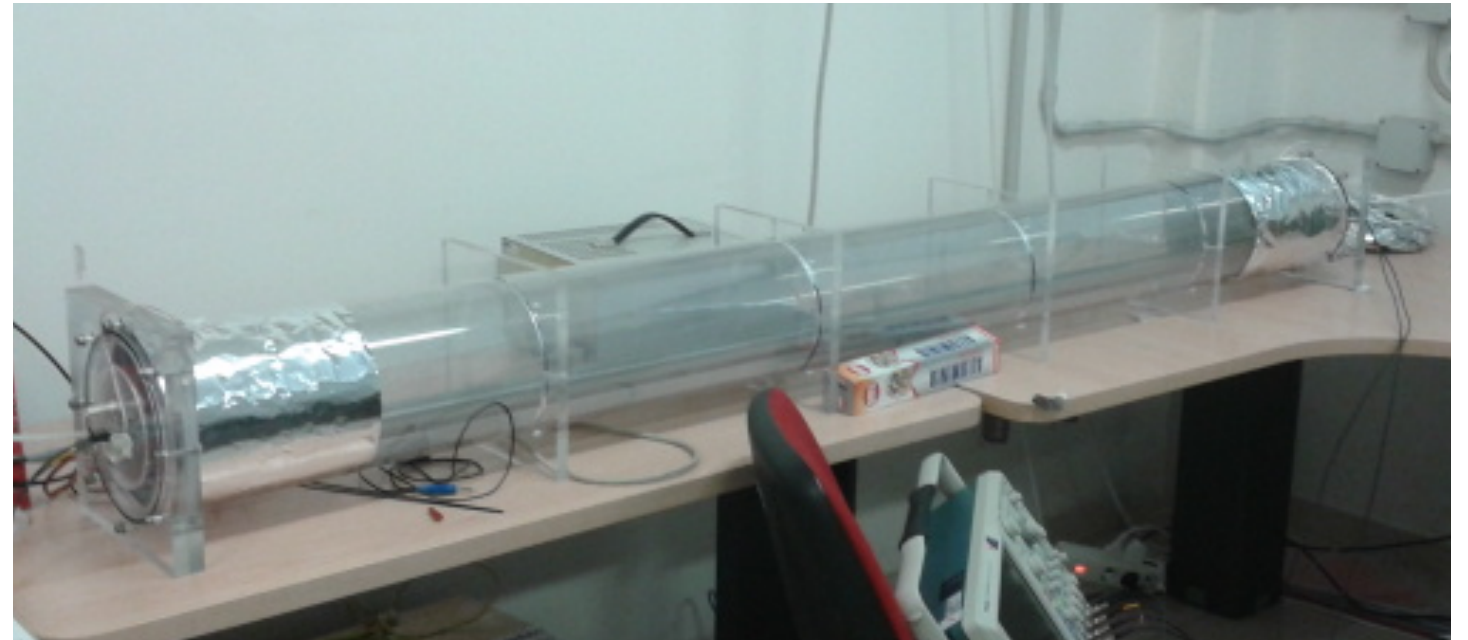# About Me

Past work: MEG Tracking Upgrade R&D

Ageing Tests
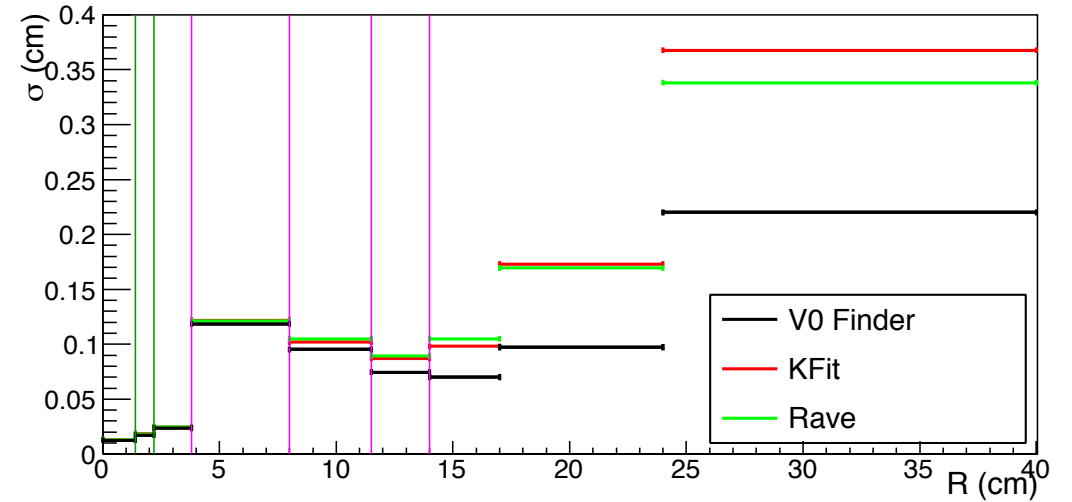

Resolution Measurements

Full Length Prototypes

About Me

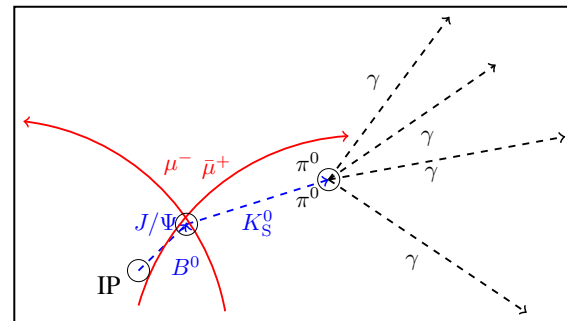## Past work: Belle/Belle II (Univ. of Melbourne and KEK)
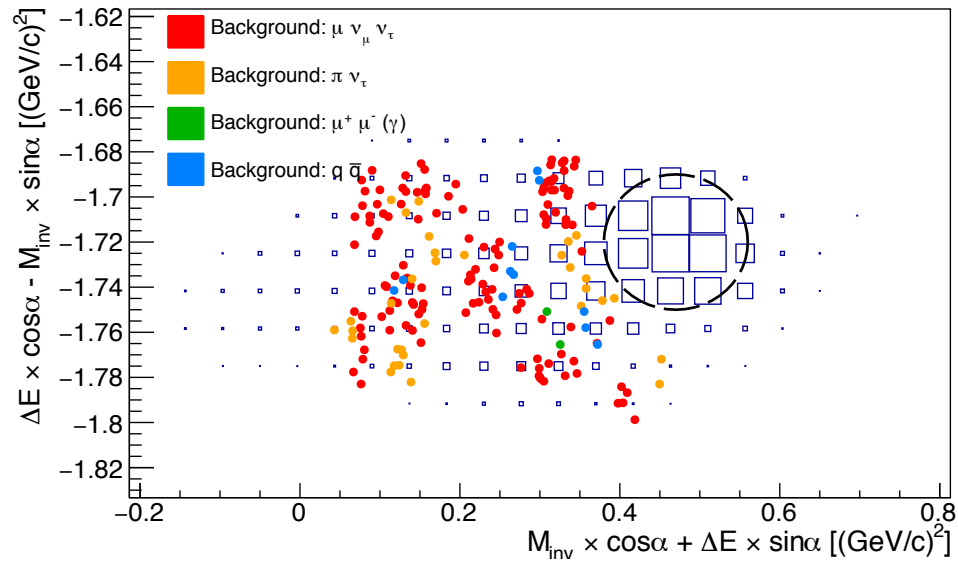
▸ Performance studies and projections for Belle II

  ▸ Vertex reconstruction

  ▸ Particle identification } coordination

  ▸ LFV sensitivity studies

▸ Software development for Belle II framework

  ▸ TreeFitter for simultaneous vertex fitting

My Current Work
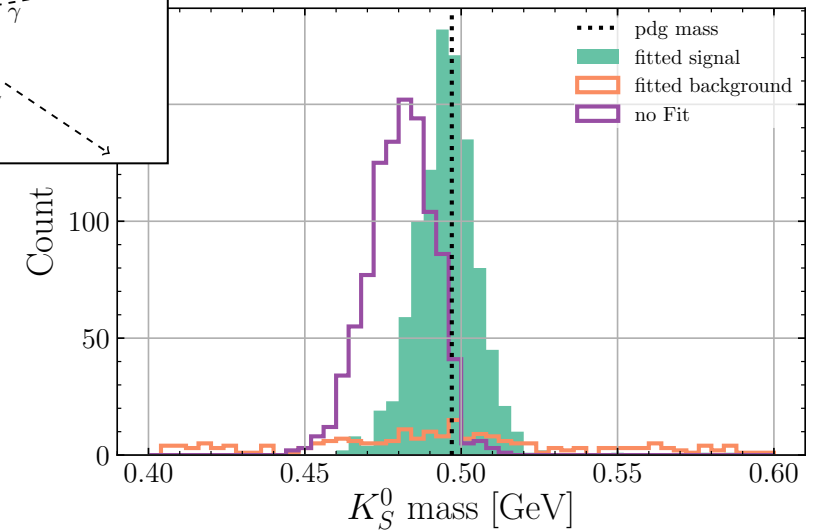
**Inclusive Vub measurement with hadronic tag**

- ▸ Discrepancy between sum-of-exclusives and inclusive measurements → ongoing puzzle!

  - ▸ Inclusive is difficult due to large underlying background: $\Gamma(B{\to}Xc\,\ell v) \sim 50x\ \Gamma(B{\to}Xu\,\ell v)$

  - ▸ Heavy cuts on phase space → become sensitive to modeling...

  - ▸ Find ways to be as inclusive as possible

- ▸ Analysis of full Belle dataset with Belle to Belle II (B2BII) conversion package

  - ▸ Exploit improved B tagging (x2.5 eff. vs old Belle FR)

  - ▸ Research model-agnostic techniques to extend endpoint measurements (Kaon counting, etc.)

- ▸ Set up for future Vub/Vcb analyses in Belle II

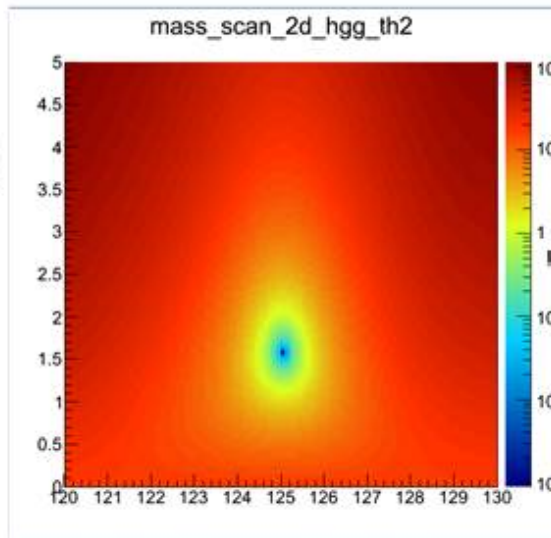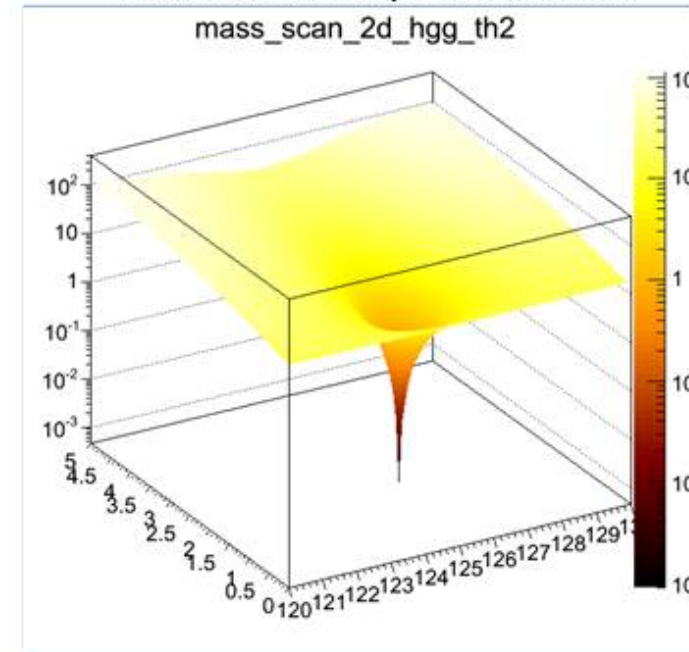# My Favourite Plot

https://root.cern.ch/rainbow-color-map
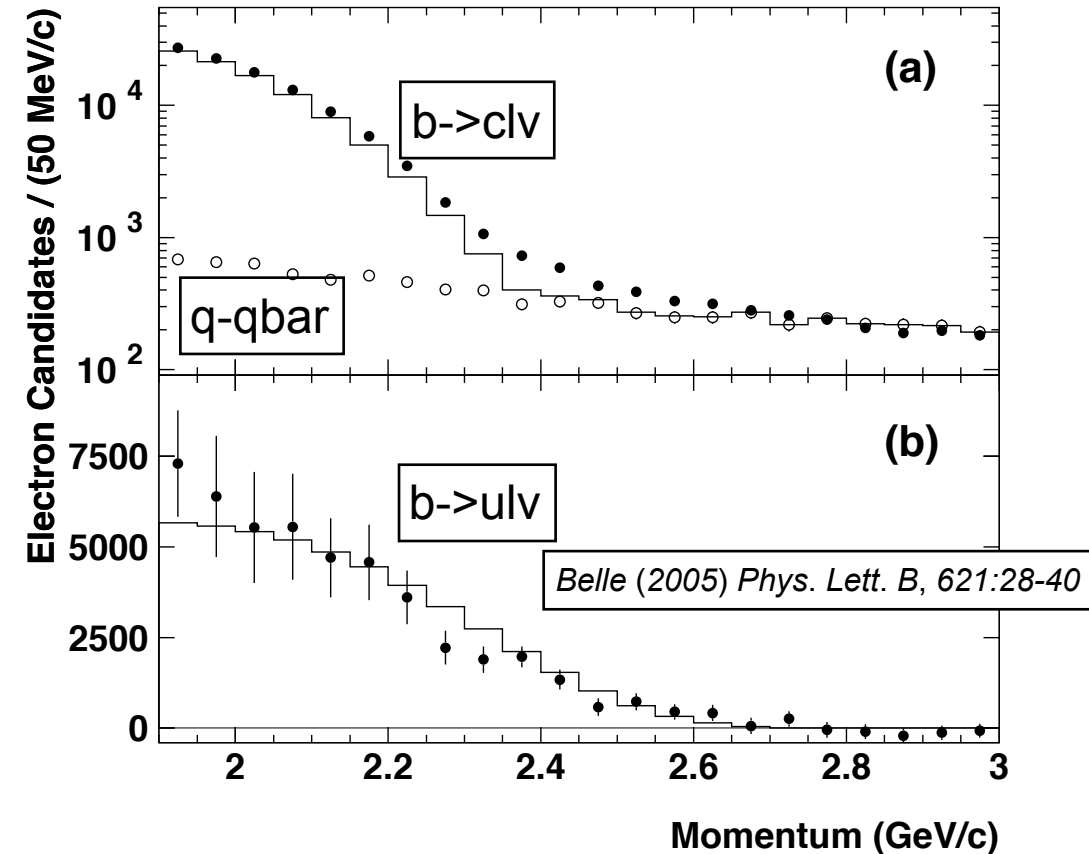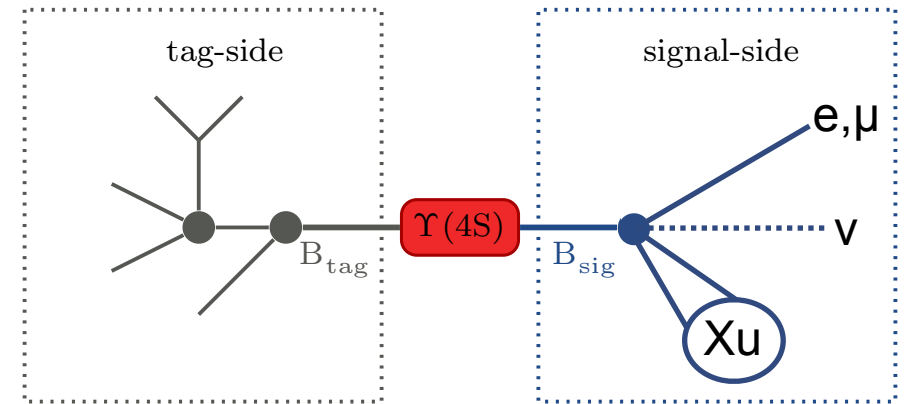
Original Visual Representation
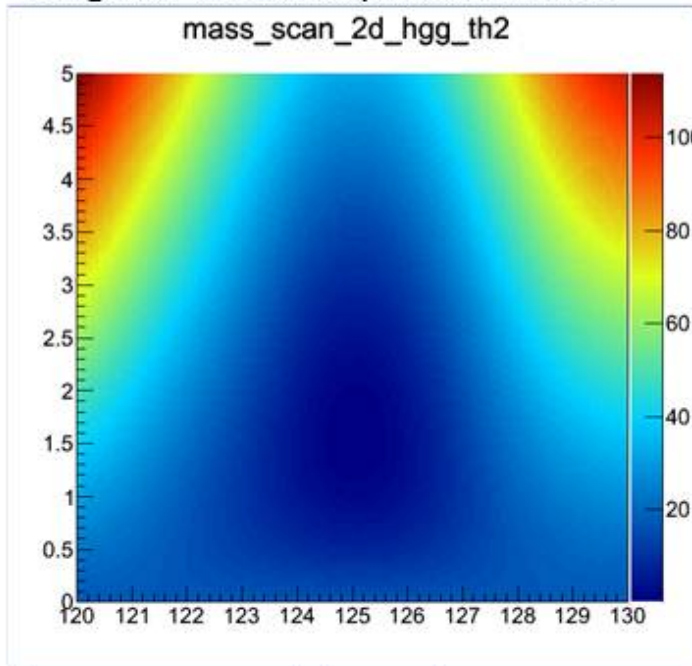
Step 1: Rainbow Colormap

Step 2: Log transform data

Step 3: Perceptual Colormap

Step 4: Create a surface

Final Visual Representation