

# Experimental prospects at Belle II

Based on:

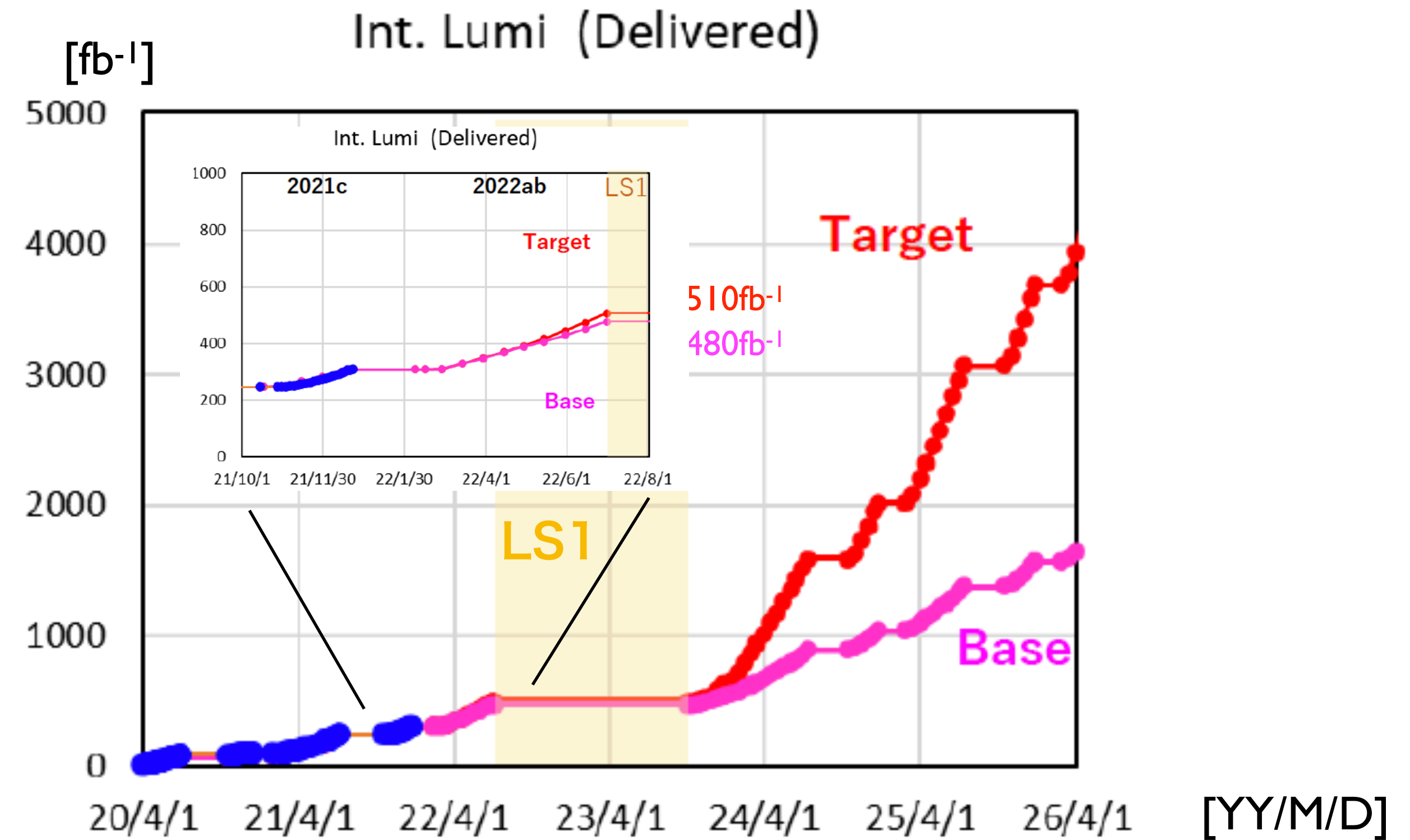
Snowmass white paper “Belle II physics reach and plans for the next decade and beyond”  
<https://www.slac.stanford.edu/~mpeskin/Snowmass2021/BelleIIPhysicsforSnowmass.pdf>

Challenges in Semileptonic B Decays, April 19-23, 2022, Barolo (IT)

# Projection of integrated luminosity delivered by SuperKEKB to Belle II

Target scenario: extrapolation from 2021 run including expected improvements.

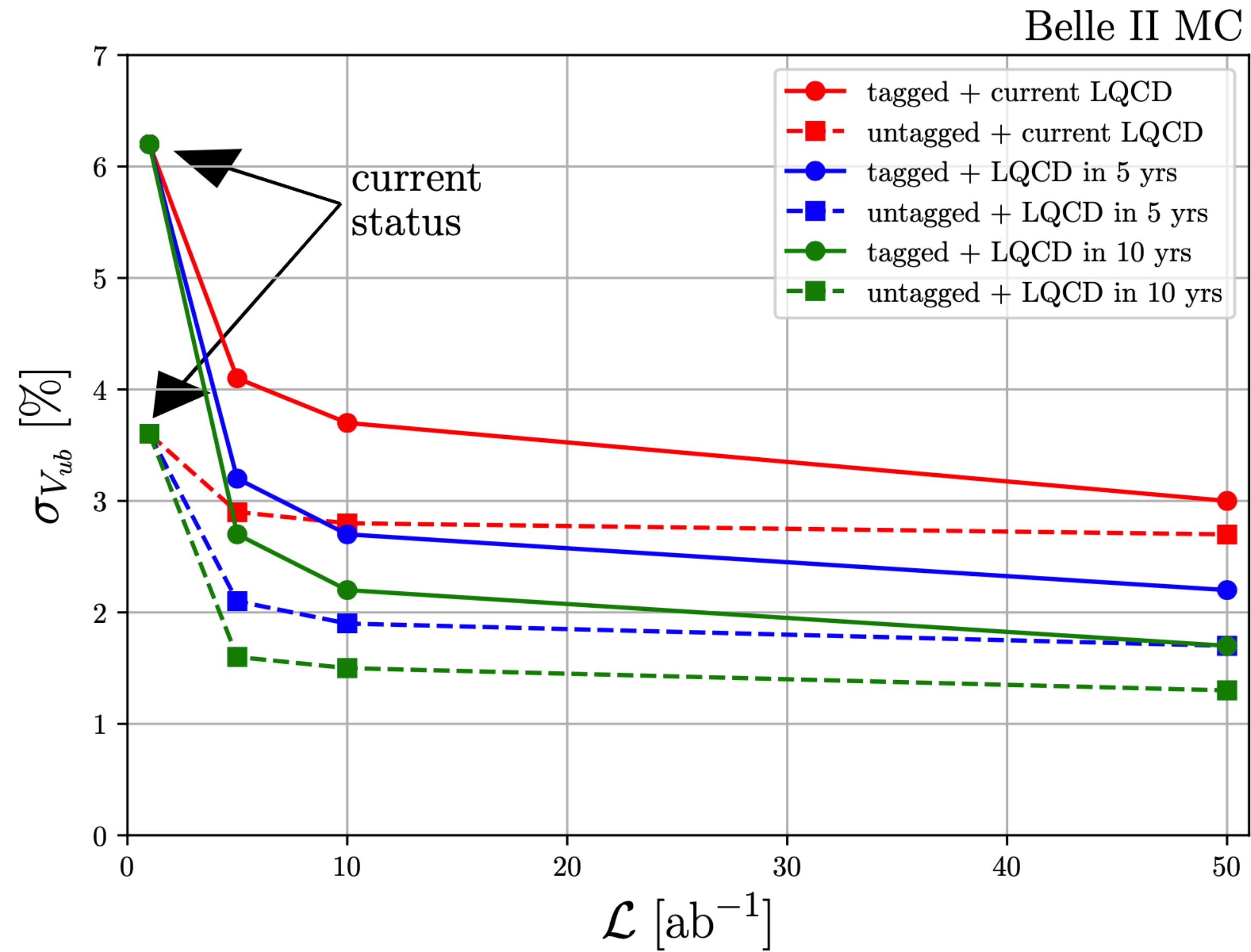
Base scenario: conservative extrapolation of SuperKEKB parameters from 2021 run



- We start long shutdown I (LSI) from summer 2022 for 15 months to replace VXD. There will be other maintenance/improvement works of machine and detector.
- We resume physics running from Fall 2023.
- A SuperKEKB International Taskforce (aiming to conclude in summer 2022) is discussing additional improvements.
- An LS2 for machine improvements could happen on the time frame of 2026-2027

# Exclusive $|V_{ub}|$

$$B \rightarrow \pi \ell \nu$$

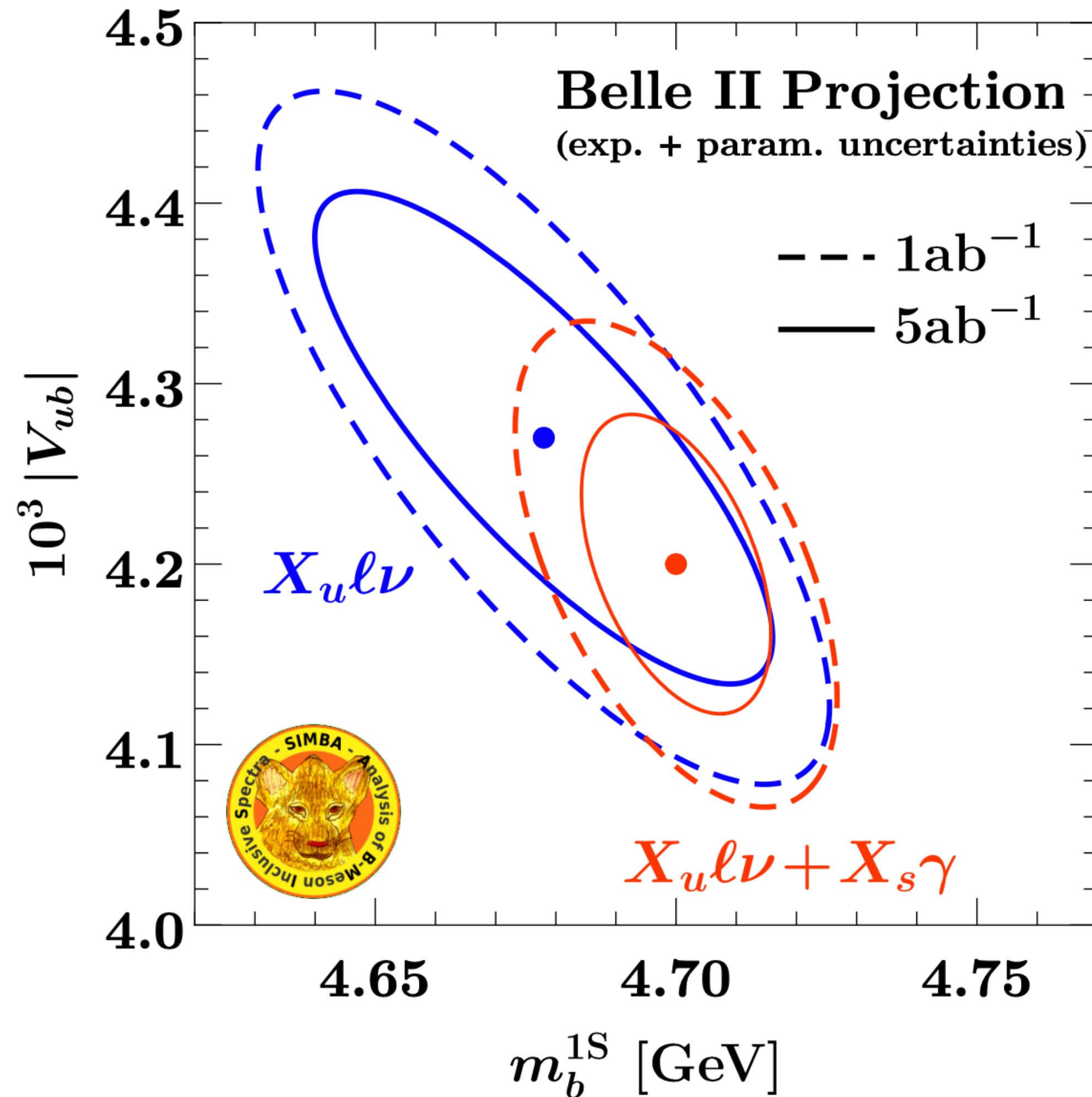


# $|V_{ub}|$ inclusive

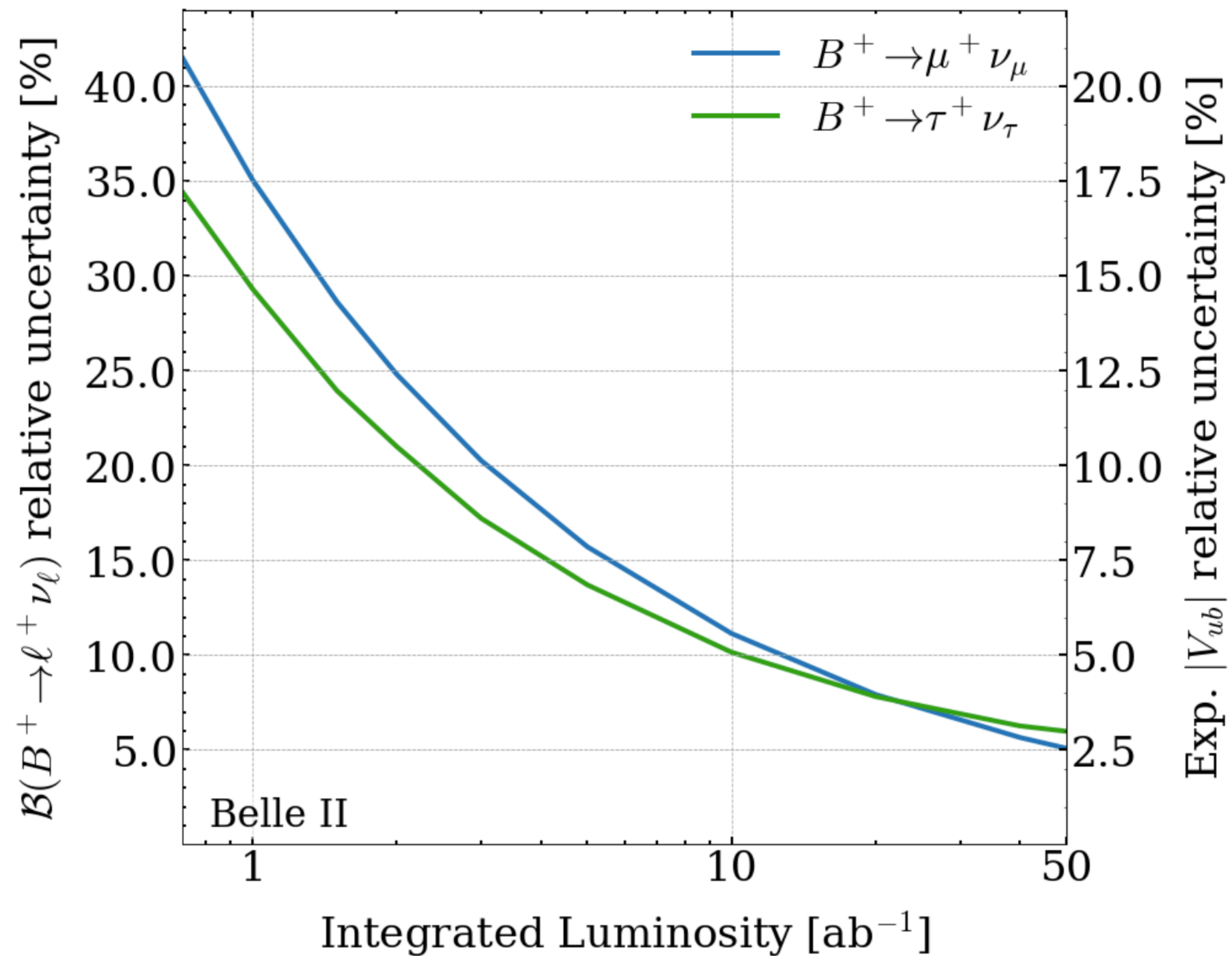
	Statistical	Systematic (reducible, irreducible)	Total expt.	Theory	Total
$1 \text{ ab}^{-1}$	2.5	(2.9, 1.6)	4.1	2.5 – 4.5	4.8 – 6.1
$5 \text{ ab}^{-1}$	1.1	(1.3, 1.6)	2.3	2.5 – 4.5	3.4 – 5.1
$50 \text{ ab}^{-1}$	0.4	(0.4, 1.6)	1.7	2.5 – 4.5	3.0 – 4.8

# $|V_{ub}|$ inclusive

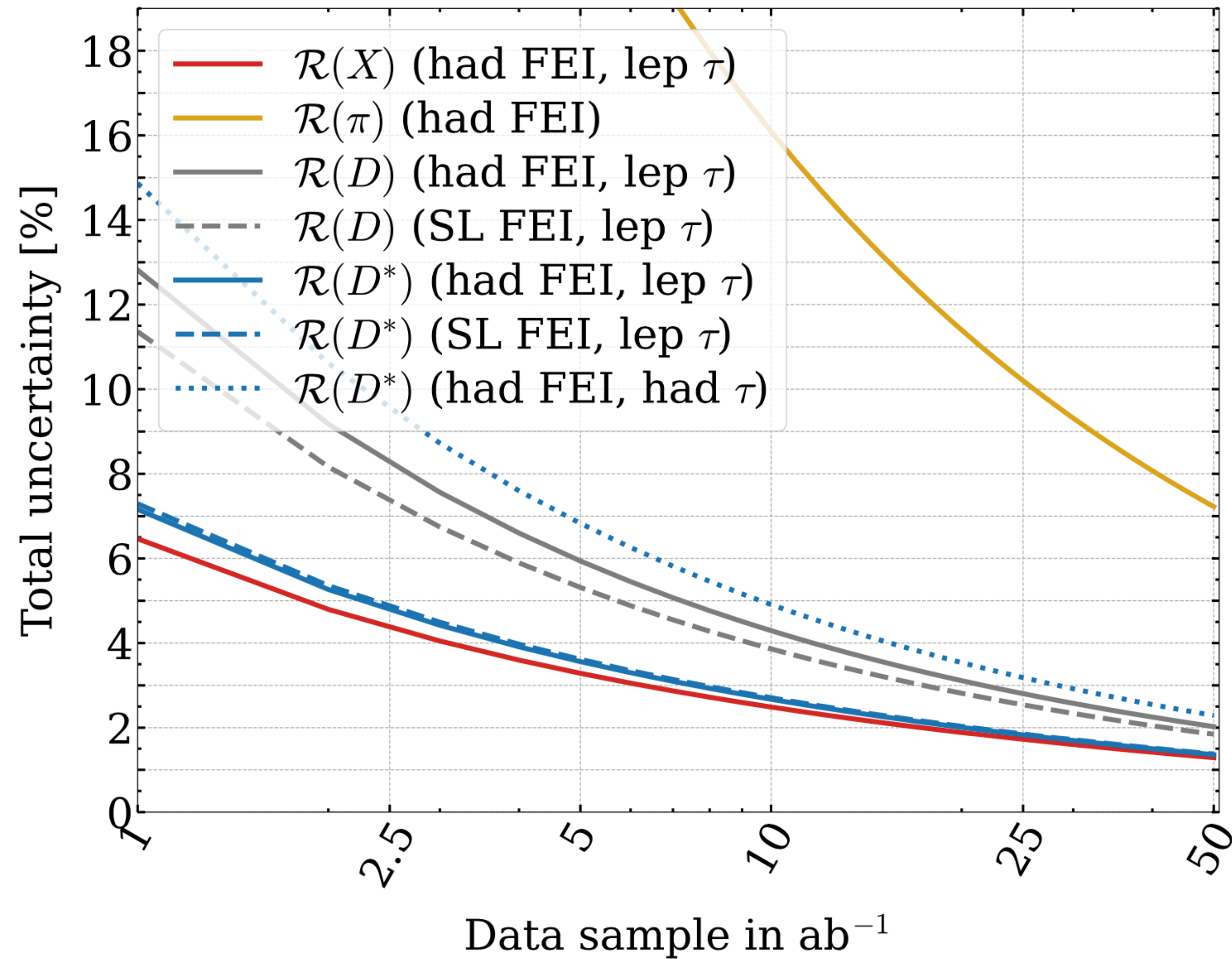
- Global fit using two one-dimensional differential spectra of hadronic mass and lepton energy for  $B \rightarrow X_u \ell \nu$  and a photon energy spectrum of  $B \rightarrow X_s \gamma$



# $|V_{ub}|$ from $B \rightarrow \ell \nu$



# $R(D^{(*)})$ and friends



# General comment

- Most of these projections tend to flatten out in a region between  $5/\text{ab}$  and  $10/\text{ab}$
- It would be important to sharpen the program for semileptonic B decays towards the ultimate Belle II dataset ( $50/\text{ab}$ )