

# Discussion III

En-Hung Chao  
Avital Dery  
Martin Hoferichter  
Andreas Jüttner  
+ YOU

## **Theory on $K_L \rightarrow \mu^+ \mu^-$**

- Q: What are the SM theory uncertainty and predictions ?
- Q: How does this relate to  $K_S \rightarrow \mu^+ \mu^-$ ?
- Q: How can the “sign” of LD be determined ?

## **Theory on KL->pi0 II**

- Q: what is the role here of Lattice calculations ?  
[AP]: Lattice can in principle predict the KS decay amplitude. This is hugely challenging the process is related to the emission of a photon from a neutral meson, which is very suppressed. This is why the focus was so far mainly on the K+ decay. Generally, measurement for the K+ decays produces data for the KS as well, but we only saw noise for the latter. Maybe increased precision will help, or a specific strategy designed to reduce noise in the KS channel. This is non-trivial, and would need to be motivated by a positive answer to the previous question.

- What is the time scale for a lattice computation with controlled (and sufficiently small) errors?
- Complementarity to LHCb:  
Encouraging prospects of a LHCb measurement of the  $K_S \rightarrow \pi^0 \ell^+ \ell^-$  spectrum crucial input for  $K_L \rightarrow \pi^0 \ell^+ \ell^-$

- Importance of perspective of future Kaon-physics program: there are many possible improvements from the theory side (new lattice calculations and data-driven approaches), but they will only be done/funded if there are realistic prospects for experimental improvements.

e.g.  $K_S \rightarrow \mu^+ \mu^-$ : one could certainly improve the current prediction if there were realistic prospects to reach the SM level in experiment.

→ What are the experimental prospects for

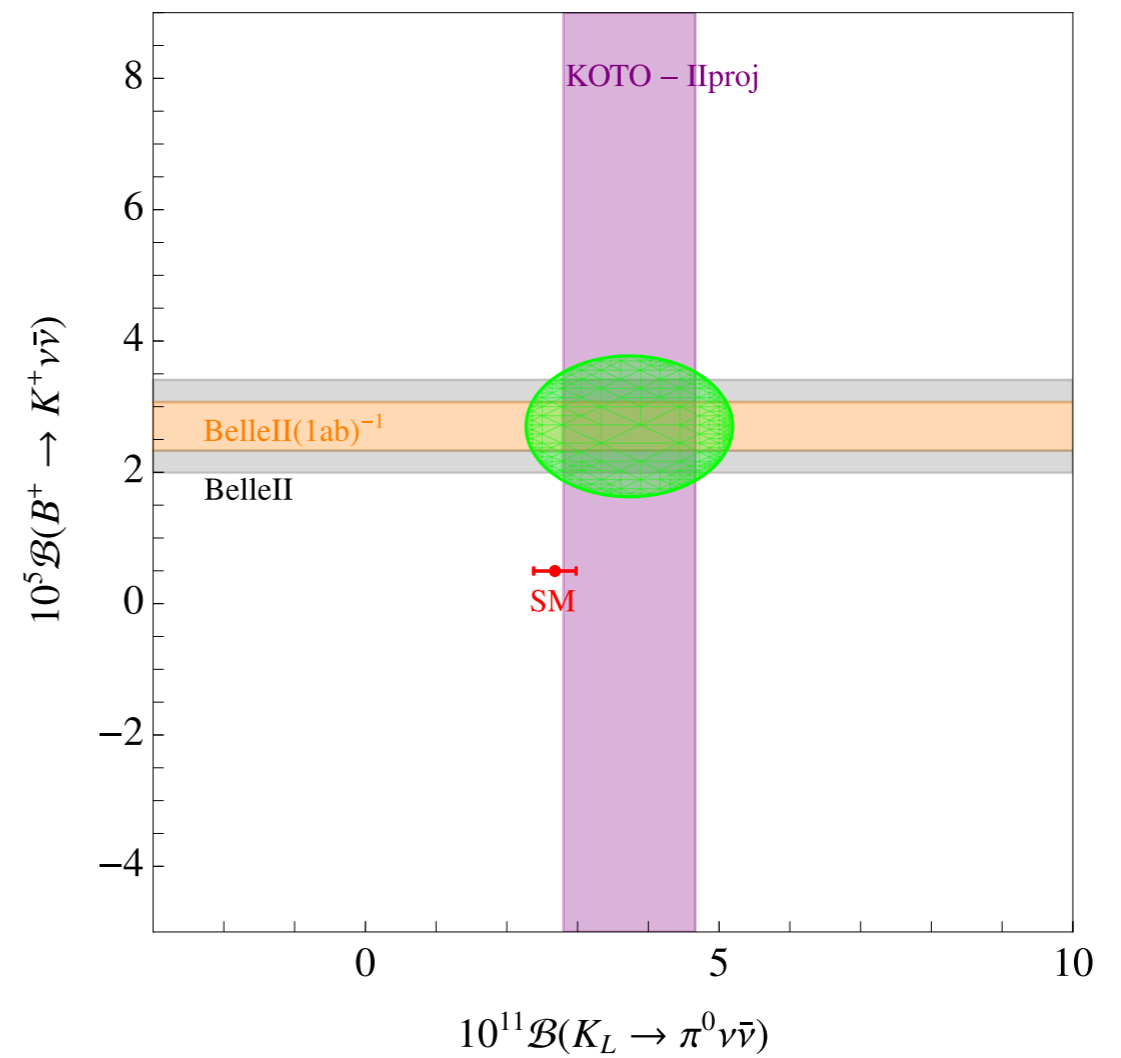
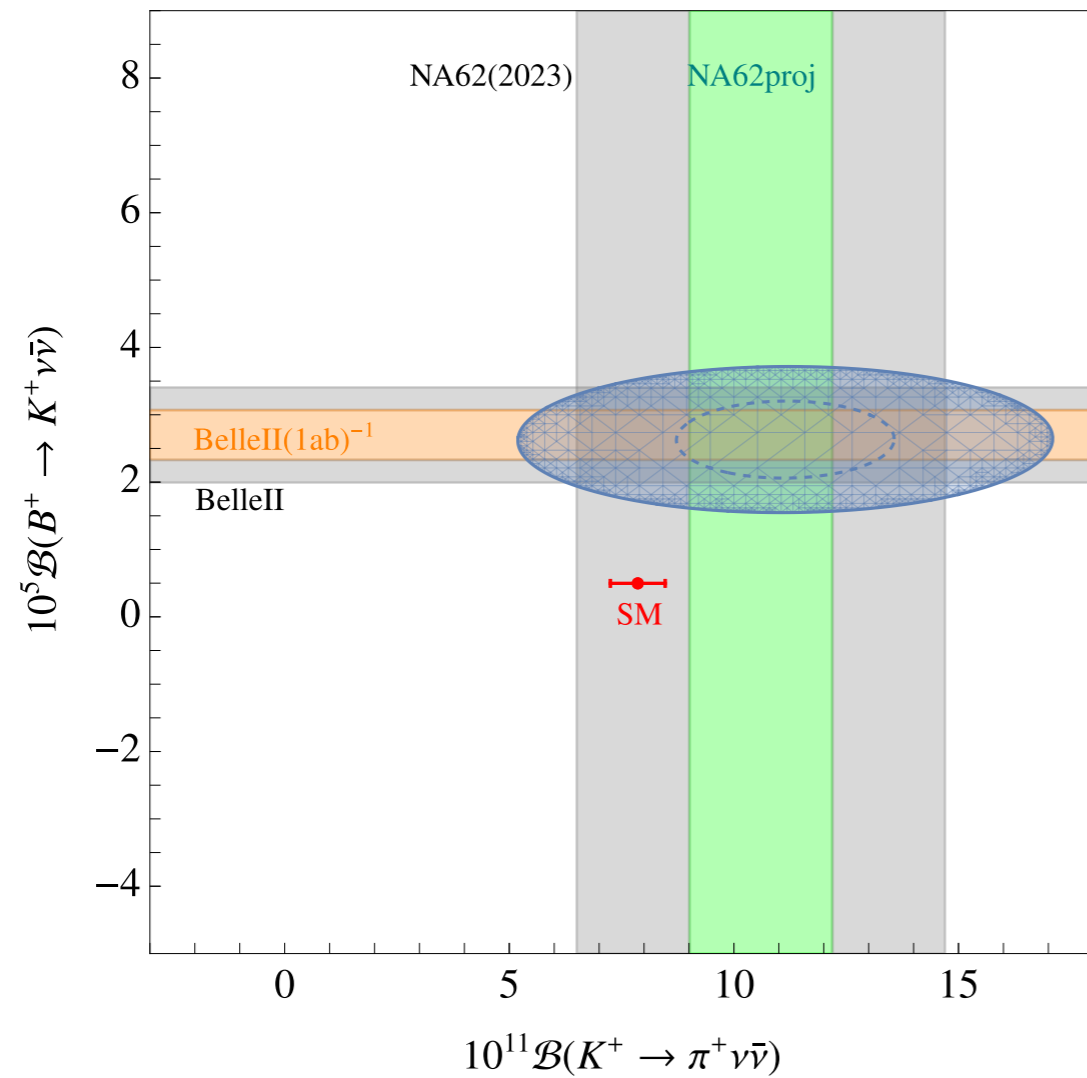
- $K_L \rightarrow \mu^+ \mu^-$  ?
- interference  $K_L - K_S$  ?

- Which other  $K_L$  decays should/can be considered for KOTO-II?  
 $K_L \rightarrow l^+l^-\gamma$ ,  $K_L \rightarrow \pi^+\pi^-\gamma$ ,  $K_L \rightarrow \pi^0\gamma\gamma$

Not necessarily relevant for NP searches but for low-energy QCD

- importance of revisiting with new experimental and data-analysis techniques, sometimes data from older experiments no longer available
- lattice/ChiPT/dispersion theory

# $B$ vs. $K$ decays — correlations



plots by M. Bordone