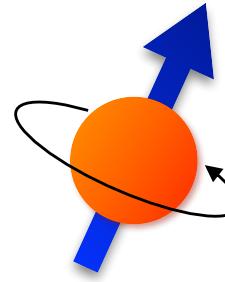


# White Paper discussion and Closing

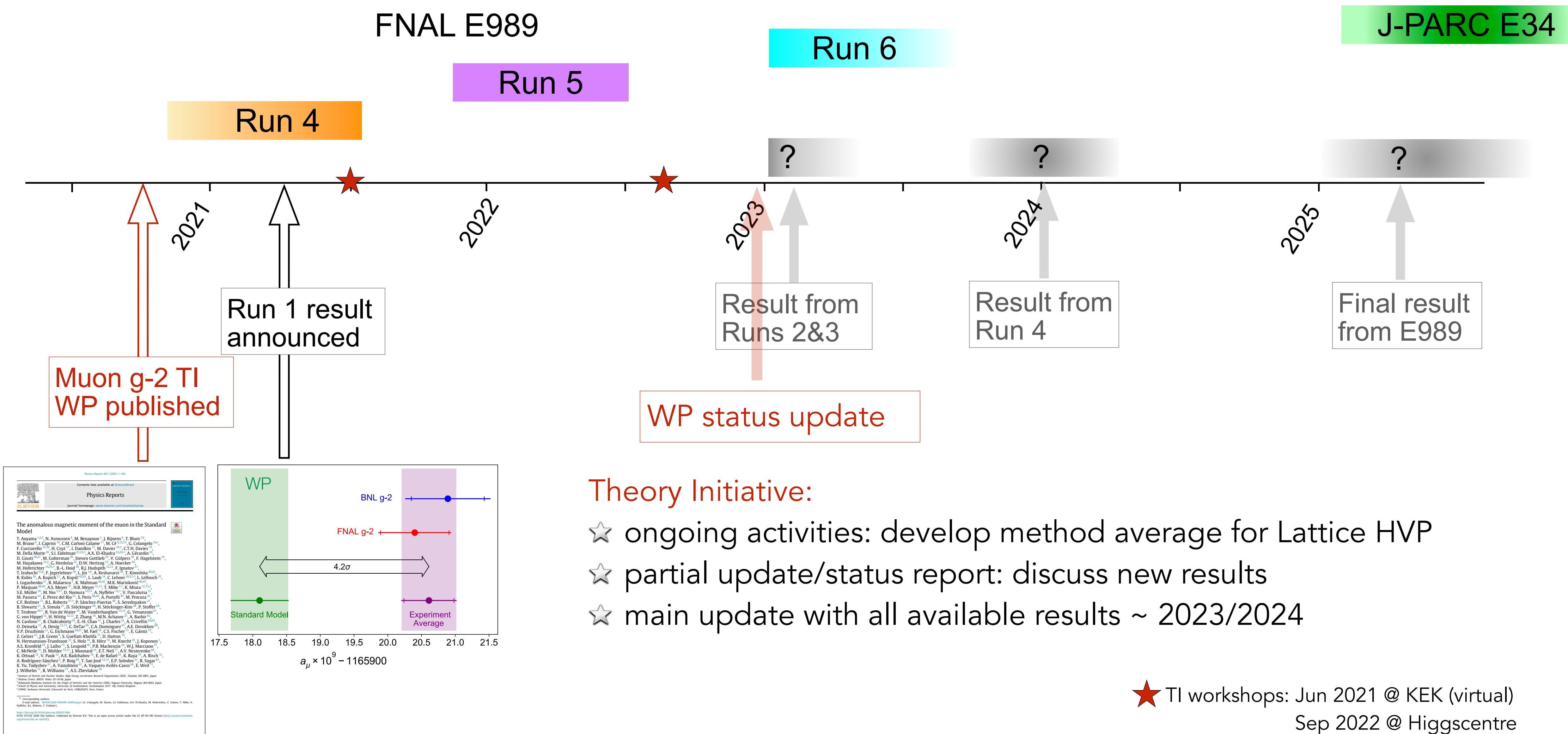


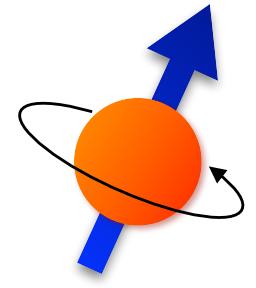
## Muon g-2 Theory Initiative Steering Committee

- Gilberto Colangelo (Bern)
- Michel Davier (Orsay) co-chair
- Aida El-Khadra (UIUC & Fermilab) chair
- Martin Hoferichter (Bern)
- Christoph Lehner (Regensburg University & BNL) co-chair
- Laurent Lellouch (Marseille)
- Tsutomu Mibe (KEK)  
J-PARC Muon g-2/EDM experiment
- Lee Roberts (Boston)  
Fermilab Muon g-2 experiment
- Thomas Teubner (Liverpool)
- Hartmut Wittig (Mainz)

<https://muon-gm2-theory.illinois.edu>

# Timeline



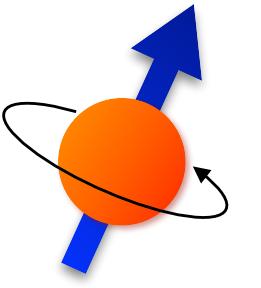


# WP status update

## Goal

Provide a short (<30 pages) summary of current status of muon g-2 SM theory, including new results.

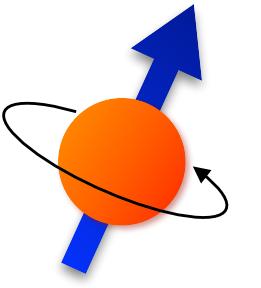
- Fermilab experiment expects to announce run 2&3 result in early 2023
- goal is to provide update **before** announcement, submit to arXiv by  
**31 January 2023**
- Proposed deadline (guaranteed inclusion if submitted to arXiv) for **essential inputs**:  
**30 November 2022**  
guaranteed inclusion if submitted to arXiv)
- only papers submitted with the intent to publish in a refereed journal will be considered for essential inputs. (excludes proceedings)



# WP status update

## Lattice HVP

- Summary of new results, particularly for windows
- criteria for quality assessment
- decide if and how to combine lattice results.
- If yes, develop a “method average”  
use a conservative procedure to capture tensions/unresolved uncertainties
- separation scheme recommendation
- interpretation of new results and assessment of limitations



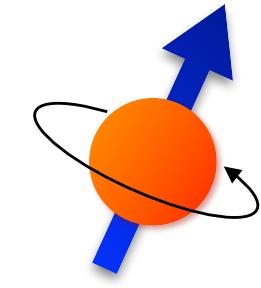
# WP status update

## Data-driven HVP

- experimental updates and impact on HVP
- theoretical developments (RC, MC generators)
- FAQ section to discuss recurring questions

### Comparison goal for data-driven vs lattice:

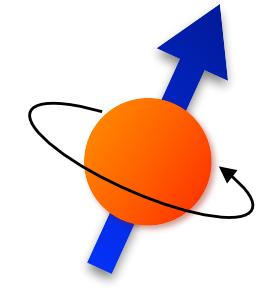
- compare results for intermediate window  $a_\mu^W$
- using method average of lattice HVP results including all contributions
- using merging procedure for data-driven evaluation



# WP status update

## Analytic HLbL

- update on short-distance constraints
- axial-vectors contribution (updates from both the model-independent approach and hQCD)
- heavy scalar mesons experimental updates and their impact
- decide whether to give an updated result for  $a_\mu^{\text{HLbL}}$
- .

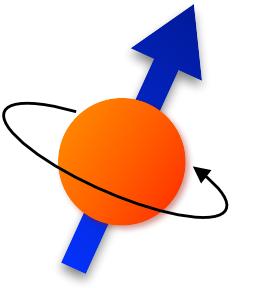


# WP status update

## Lattice HLbL

- Updates on direct calculations
- Develop method average for the two direct lattice HLbL results and use to provide a result for  $a_\mu^{\text{HLbL}}$
- Updates on lattice inputs to disp. evaluation (eta, eta', ..)

Decide whether to provide an updated HLbL average (combining new evaluations of analytic and lattice HLbL)

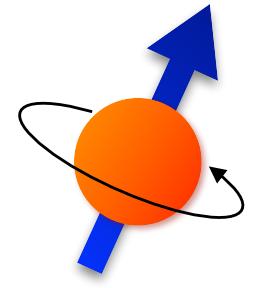


# WP status update

## FAQ section

### 1. Do lattice and $e^+e^-$ really measure the same thing?

- Treatment of higher-order radiative effects, as included in the photon-inclusive cross section, in particular, matching this convention on the lattice (this goes back to diagram (f) F in Fig. 42 of the WP).
- Removal of one-particle-reducible contributions via the subtraction of vacuum-polarization corrections (this is where the rho-gamma-mixing confusion enters).
- Both of these points are not spelled out in too much detail in the WP, and could benefit from more detailed explanations.

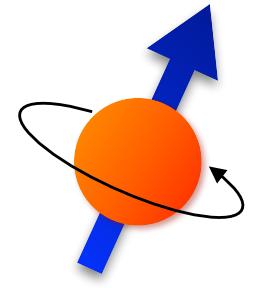


# WP status update

## FAQ section

### 2. Can we trust radiative corrections/MC generators?

- One question here concerns the use of scalar QED and higher-order radiative corrections. Sometimes the question is combined with observations that the cross sections differ for energy-scan and ISR experiments at different primary center-of-mass energies, i.e., along the pattern ISR (1 GeV, KLOE) < ISR (4 GeV, BESIII) < direct scan (Novosibirsk) < ISR (10.5 GeV, BaBar), the suggestion being that radiative corrections could account for this pattern.
- Clarify that FsQED is used, describe it, and describe its tests.
- Describe the extent to which the experiments rely on MC generators, and the interplay with how radiative corrections are computed.



# WP status update

## FAQ section

### 3. What about the tau data, don't they give a value much closer to BMWc?

- This is, in principle, already in the WP. If there were news from the lattice in time, one could use this repeat the main points why in the WP tau data are not included, and which prospects exist to turn the tau data into a viable cross check.

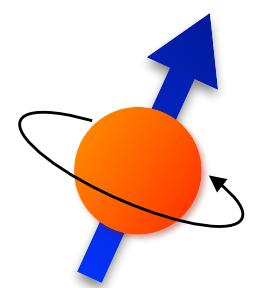
# Working Groups

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If you would like to contribute to the writing of the WP update, please sign up for a working group on the google sheet:

[https://docs.google.com/spreadsheets/d/  
15j7BpRqzPRaODhPVbccVH\\_R9-L7Ma\\_7XpXd190JZuzw/edit?  
usp=sharing](https://docs.google.com/spreadsheets/d/15j7BpRqzPRaODhPVbccVH_R9-L7Ma_7XpXd190JZuzw/edit?usp=sharing)

**Deadline: 30 September 2022**



# Muon g-2 Theory Initiative workshops

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- ⦿ [First plenary workshop @ Fermilab: 3-6 June 2017](#)
- [HVP workshop @ KEK: 12-14 February 2018](#)
- [HLbL workshop @ U Connecticut: 12-14 March 2018](#)
- [Second plenary workshop @ HIM \(Mainz\): 18-22 June 2018](#)
- [Third plenary workshop @ INT \(Seattle\): 9-13 September 2019](#)
- [Lattice HVP at high precision workshop \(virtual\): 16-20 November 2020](#)
- [Fourth plenary workshop @ KEK \(virtual\): 28 June - 02 July 2021](#)
- [Fifth plenary workshop @ Higgs Centre \(Edinburgh\): 5-9 September 2022](#)
  
- ⦿ 2023: University of Bern, exact dates TBA
- ⦿ 2024: KEK, Japan, exact dates TBA
- ⦿ 2025: exploring possibilities for having the workshop hosted in the US  
proposals are welcome!

# Fifth Plenary Workshop of the Muon g-2 Theory Initiative

5 – 9 September 2022

Higgs Centre for Theoretical Physics



Local Organising Committee:  
Luigi Del Debbio  
Felix Erben  
Vera Gülpers  
Max Hansen  
Antonin Portelli

Thank you !



| epcc |

STRONG  
2020

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