

Introduction

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Future $\mu \rightarrow e\gamma$ Meeting, PSI, Oct. 2nd, 2024

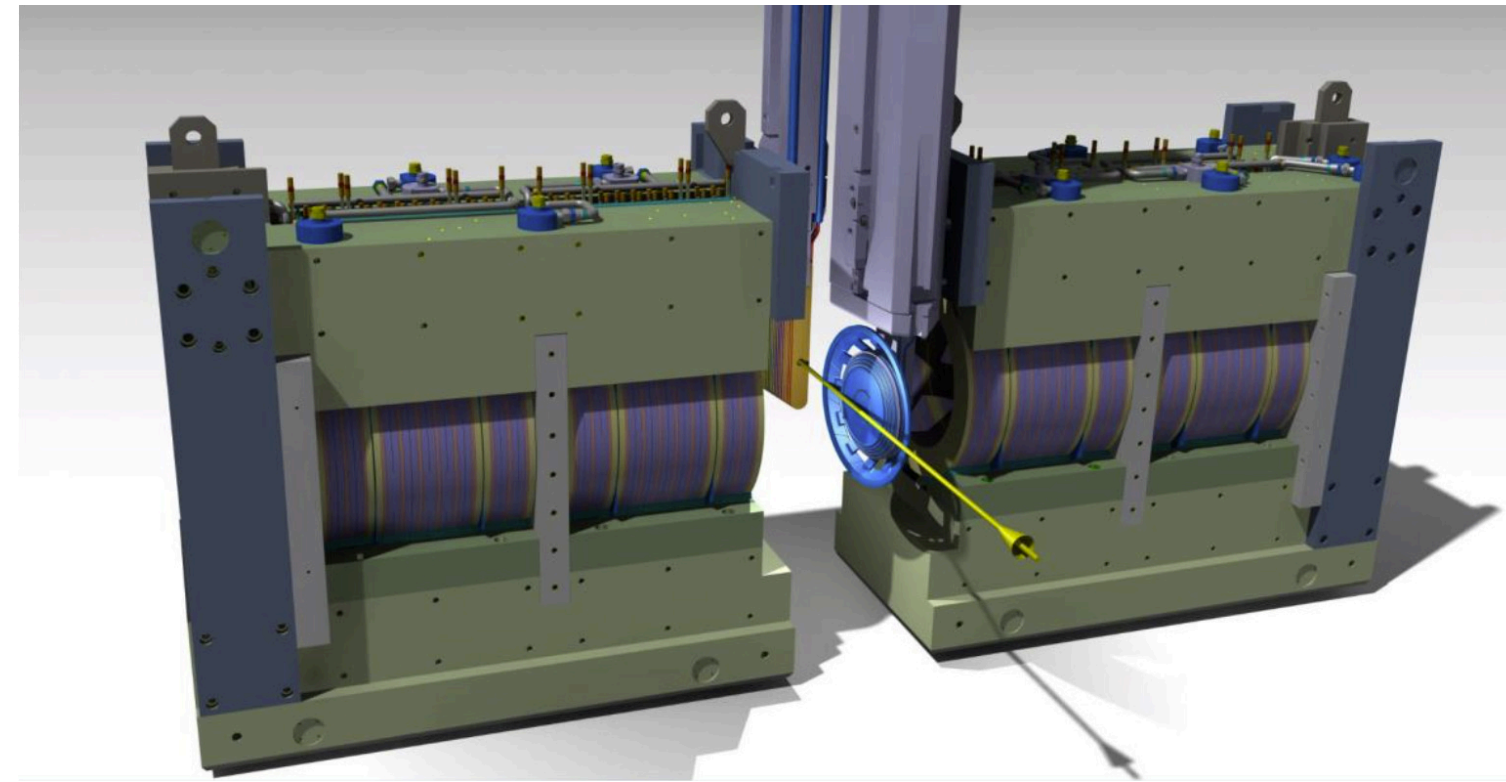
New $\mu \rightarrow e\gamma$ Experiment with HIMB

•High-Intensity Muon Beam (HIMB)

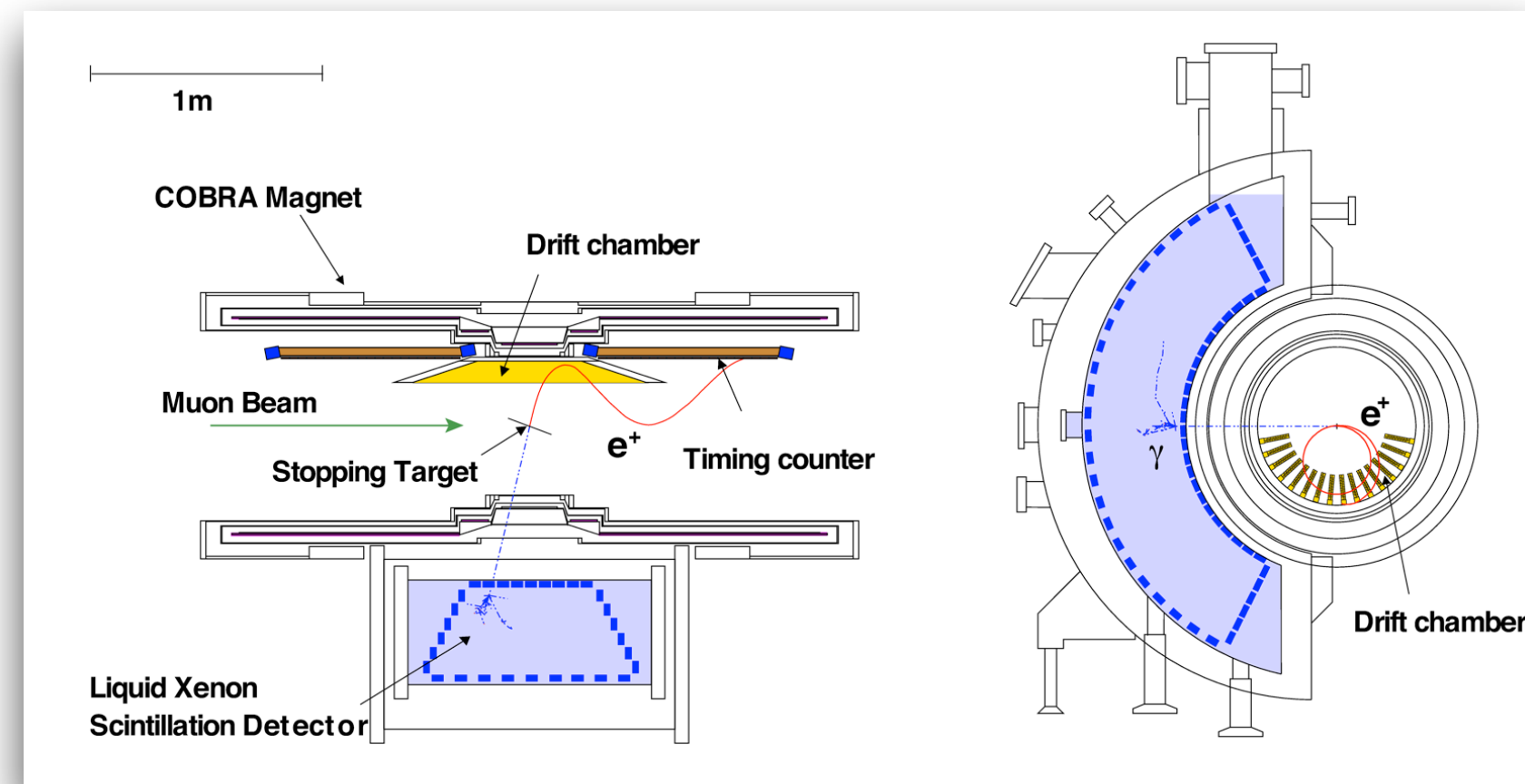
- $\mathcal{O}(10^8) \mu^+/\text{sec} \Rightarrow \mathcal{O}(10^{10}) \mu^+/\text{sec}$
- To be implemented in 2027-2028

•New $\mu \rightarrow e\gamma$ experiment with HIMB?

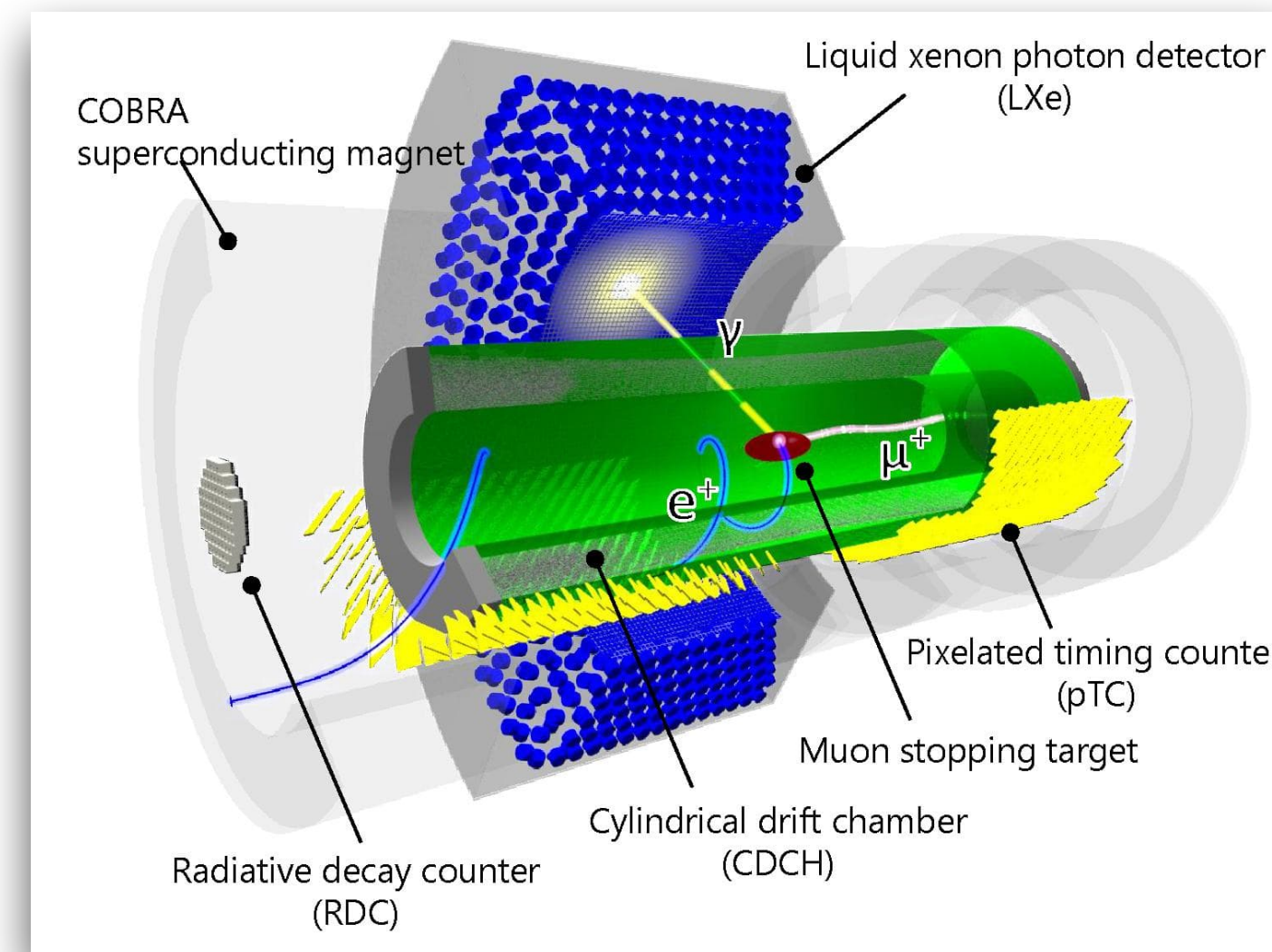
- How to Reach $\mathcal{O}(10^{-15})$ Sensitivity?
- Difficult with the MEG concept
- Need a totally different approach



MEG



MEG II

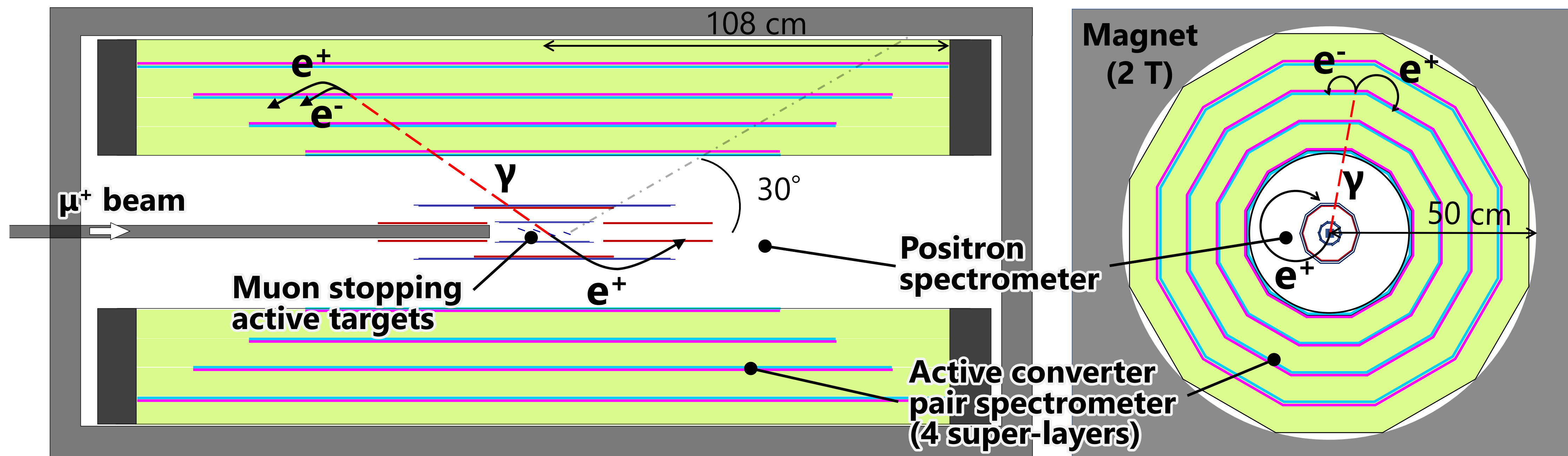


Study Group for Future $\mu \rightarrow e\gamma$ Search Experiment

- Set up to follow-up the discussions in HIMB Physics Case Workshop (April 2021) and the write-up (<https://doi.org/10.48550/arXiv.2111.05788>) and to devise more solid experimental concepts for future $\mu \rightarrow e\gamma$ search
 - Open discussions on designs and technologies for future experiments. Not limited to a specific design
 - Mostly from MEG II and Mu3e. Always welcoming new participants.
 - Meetings held a few times a year
- **Ongoing activities**
 - Photon
 - Conversion spectrometer
 - Scintillator + gaseous tracker (W. Ootani, F. Renga)
 - Silicon (A. Schöning)
 - Calorimeter (A. Papa)
 - Positron
 - Gaseous detector (F. Renga)
 - Silicon (A. Schöning)
 - Simulation framework

Experimental Design under Consideration

- Experimental design based on photon pair spectrometer
 - **Photon spectrometer with active converter** → higher resolutions (energy, timing, position), angle measurement
 - **Positron spectrometer based on Si detector** (a la Mu3e) → high rate capability, concurrent search for $\mu \rightarrow eee$
 - **Separate active targets** → higher vertex resolution, further BG suppression
 - **Significantly improved acceptance**, especially for zenith-angle → angular distribution measurement after discovery



Inputs for discussion

- It was proposed to produce a Letter of Intent for a future $\mu \rightarrow e\gamma$ experiment, to be submitted to PSI at one of the next BVR meetings
- Some discussions by mail indicate that BVR 2025 is too early
 - not enough time, given the commitments of people in the ongoing experiments
- BVR 2026 could be fine
- What about an intermediate document to be produced by the beginning of 2025?
 - I have to produce something like this, in any case, for a European project on muon physics (aMUSE)
 - It would motivate us not to postpone these activities excessively
 - Document on arXiv? Conference contribution? Regular paper?
- Please subscribe to our mailing list

<https://lists.infn.it/sympa/info/future-meg>

Upcoming Strategy Discussions

- We should be well-represented in the upcoming strategy discussions
- **European Strategy Update**
 - Document for future $\mu \rightarrow e\gamma$ experiments to be submitted?
 - Submission deadline: end of March 2025
 - To be discussed by Francesco
- **Strategy update in Japan**
 - Committee for Future Planning in Japan (CFP) leads the community discussion to update the strategy for future projects in particle physics
 - Plan to submit a Letter of Interest (LOI) for future $\mu \rightarrow e\gamma$ experiment
 - Submission deadline: end of Feb. 2025
- **Connection to ECFA-DRD/CPAD-RDC**
 - Possible synergies in detector R&D

Today's Agenda

14:00	→ 14:30	Future $\mu \rightarrow e\gamma$ experiments: Introduction	🕒 30m	✎
		Speaker: Wataru Ootani (Univ. of Tokyo)		
14:30	→ 15:00	Summary of Heidelberg R&D activities ¶	🕒 30m	
		Speaker: Andre Schoening (University Heidelberg, Institute of Physics)		
15:00	→ 15:30	R&D on an active photon converter	🕒 30m	
		Speaker: Rei Sakakibara (the University of Tokyo)		
15:30	→ 16:00	An e^+e^- tracker for the reconstruction of converted photons	🕒 30m	
		Speaker: Francesco Renga (INFN Roma)		
16:00	→ 16:30	R&D on gas TPCs for the e^+e^- tracker	🕒 30m	
		Speaker: Susanna Scarpellini		
16:30	→ 17:00	Coffee Break	🕒 30m	
17:00	→ 17:30	Proposals for a software framework	🕒 30m	
		Speaker: Lukas Gerritzen (University of Tokyo)		
17:30	→ 18:00	Future $\mu \rightarrow e\gamma$ experiments and the European Strategy	🕒 30m	
		Speaker: Francesco Renga (INFN Roma)		
18:00	→ 18:30	Discussion on documents to be written	🕒 30m	

See also [Mini-workshop at PSI \(Monday and Tuesday this week\)](#)