Visible (+Invisible) Dark Photon sessions

10:00 → 12:00 Visible Dark Photon Searches: Session 3 (Almanor -- SUSB 3rd floor)

Conveners: Maxim Perelstein (Cornell) , Maxim Perelstein , James Alexander (Cornell Un

10:00 **VEPP-3 (remote speaker)**
Speaker: Igor Rachek (Budker Institute, Novosibirsk)
dsw16_vepp3.pdf

10:30 **ATLAS (remote speaker)**
Speaker: James Beacham (Ohio State University (US))
Beacham_ATLAS_D...

11:00 **Belle II**
Speaker: Christopher Hearty (University of British Columbia)
Dark photons Belle I...

3:30 → 15:00 Visible Dark Photon Searches: Session 4 (Almanor -- SUSB 3rd floor)

Conveners: Maxim Perelstein , James Alexander (Cornell University (US)) , Maxim Perelstein (Cornell)

13:30 **5th Force**
Speaker: Flip Tanedo (UC Irvine)
Flip_SLAC_DarkSect...

13:50 **KLOE-2**
Speaker: Enrico Graziani (INFN - Sezione Roma III)
graziani-kloe.pdf graziani-kloe.pptx

14:10 **SeaQuest**
Speaker: Susan Gardner (University of Kentucky)

14:30 **Dark Pion Theory**
Speaker: Keisuke Harigaya (k)
2016SLAC.pdf

15:15 → 17:30 Joint Visible/Accelerators Session: Session 1 (Kavli Auditorium)

Conveners: James Alexander (Cornell University (US)) , Maxim Perelstein , Gordan Kr
Eder Izaguirre , Marco Andrea Battaglieri (Universita e INFN (IT)) , Richard Van de Wa

15:15 **NA64**
Speaker: Dipanwita Banerjee
SLAC_Talk.pdf

15:35 **Comments about Missing Momentum Experiments**
Speaker: Natalia Toro (SLAC)
missing momentum...

15:40 **LDMX -- Light Dark Matter eXperiment**
Speaker: Jeremy Mans (University of Minnesota (US))
DarkSectors_LDMX...

16:00 **Discussion**

16:20 **Cornell Experiment**
Speaker: Jim Alexander (Cornell)
SLAC-MMAPS-alex... SLAC-MMAPS-alex...

16:40 **LNF Experiment**
Speaker: Mauro Raggi (LNF INFN)
RaggiDarkSector20... RaggiDarkSector20...

17:00 **Discussion**

Dark Sectors at ATLAS

ATLAS UEH: Unconventional Signatures and Exotic Higgs

Unconventional signatures as a window to dark / hidden sectors

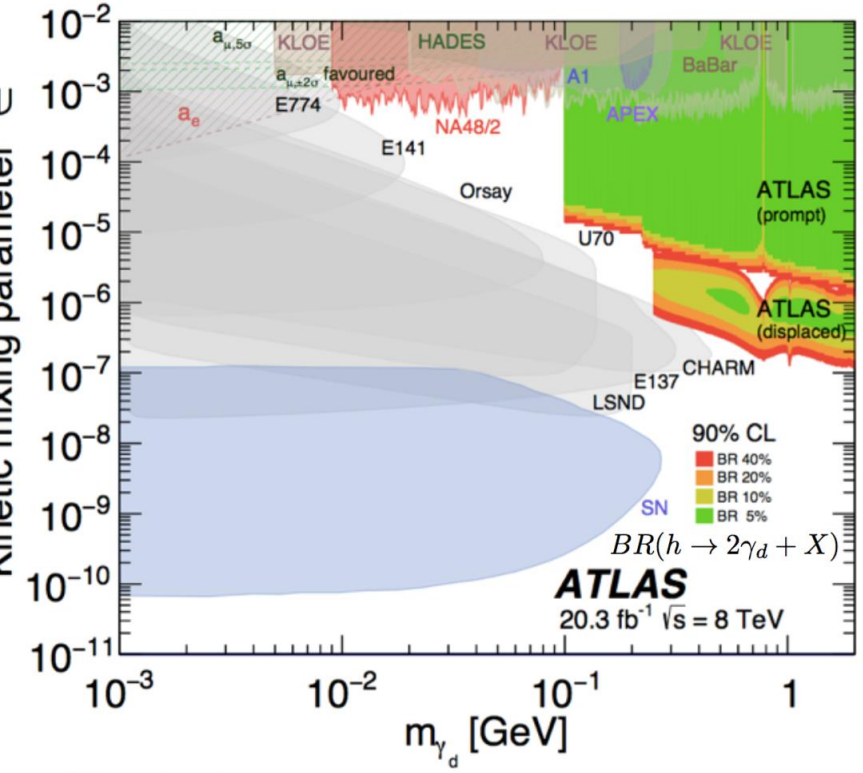
- Prompt and displaced lepton-jets via dark photons
- Displaced, non-collimated leptons via dark photons and dark Zs
- Higgs-to-four-leptons via Z_{dark}
- Higgs-to-four-SM particles via intermediate (pseudo)scalars with prompt decays
- Displaced vertices / hadronic jets
- Emerging jets
- Long-lived, heavy neutral leptons
- Multi-charged particles

ATLAS searches not covered here:

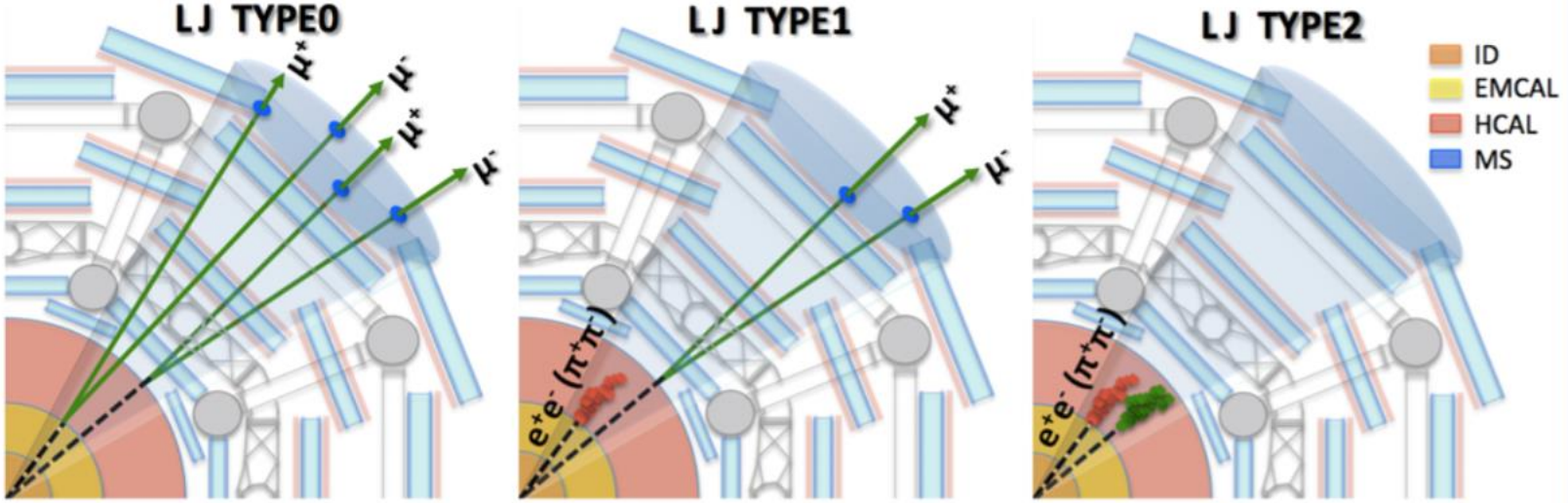
- SUSY R-parity-violating scenarios that yield long-lived particles
- Dark matter / mono-X searches

Dark Sectors at ATLAS

Prompt and displaced lepton-



un 1: JHEP 11 (2014) 088
JHEP 1602 (2016) 062



Displaced:

- Expect to exceed Run 1 sensitivity with 3-4 fb^{-1} at 13 TeV
- New narrow-scan muon triggers greatly improve signal efficiency
- Recover muon reconstruction efficiency for nearby muons and extend mass reach higher
- Investigate non-prompt electron LJs reconstructed as converted photons

Prompt:

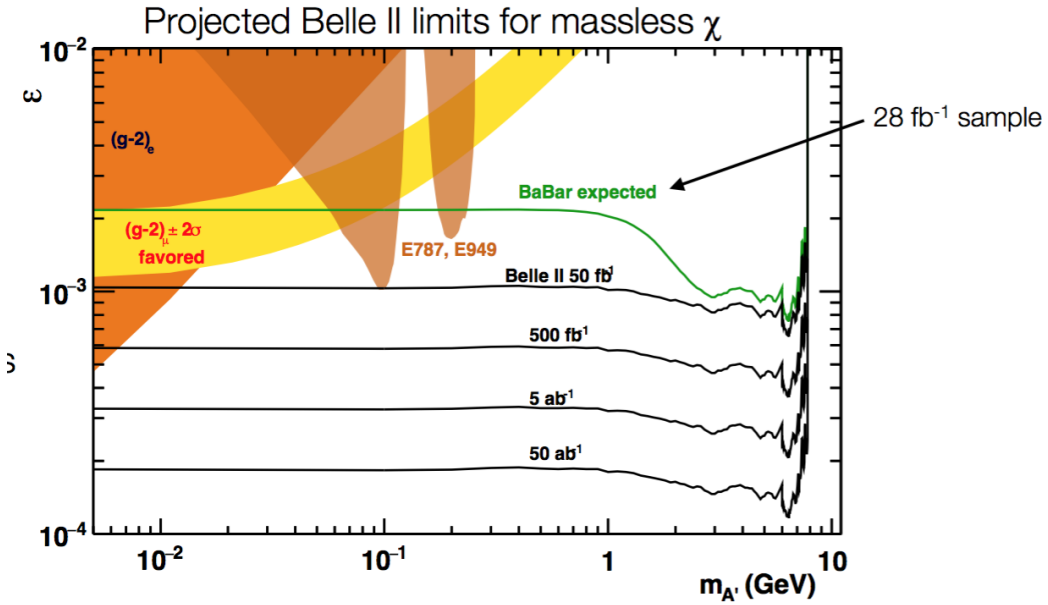
- Focus on larger dataset for an end-of-2016 result

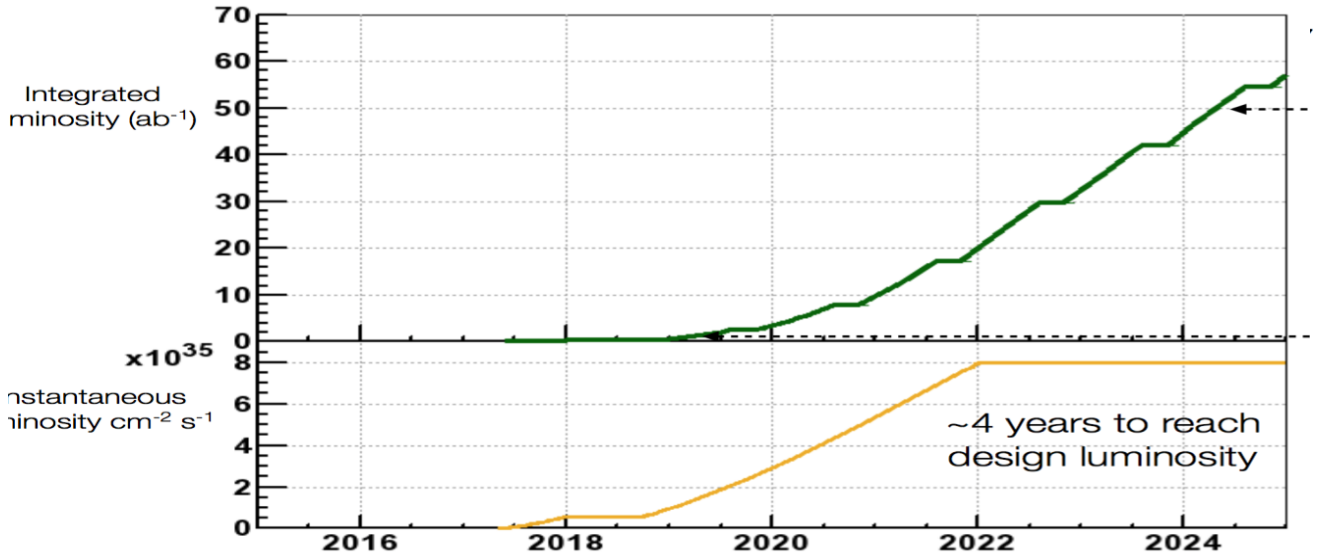
Invisible A' Searches at Belle II

Summary

- Goal is that the search for dark photon decaying invisibly will be one of the earliest Belle II measurements, possibly even during Phase 2 running starting in late 2017.
- The Belle II calorimeter and tracking are improvements over BaBar.
- Wider range of event generators (wrt BaBar) helps with projections.
- Our current focus is on developing the triggers to enable hese measurements.

Rough extrapolation from Babar results





Dark forces at KLOE: summary and conclusions

❑ KLOE searched for a dark gauge U boson in six different processes:

• ϕ meson decay: $\Phi \to \eta U$ with $U \to e^+e^-$, $\eta \to \pi\pi\pi$	**Phys.Lett. B720 (2013) 111**
• $U\gamma$ associate production: $e^+e^- \to U\gamma \to \mu^+\mu^-\gamma$	**Phys.Lett. B736 (2014) 459**
• $U\gamma$ associate production: $e^+e^- \to U\gamma \to e^+e^-\gamma$	**Phys.Lett. B750 (2015) 633**
• $U\gamma$ associate production: $e^+e^- \to U\gamma \to \pi^+\pi^-\gamma$	**arXiv:1603.06086, accepted by PLB**
• Higgsstrahlung: $e^+e^- \to Uh' \to \mu^+\mu^-$ + missing energy	**Phys.Lett. B747 (2015) 365**

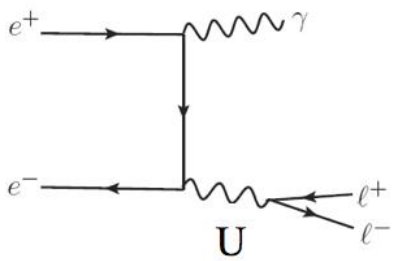
❑ We found no evidence and set upper limits on the mixing parameter ε^2 ($\alpha_D\varepsilon^2$), as a function of the U (and h′) mass, in the range $10^{-5} \div 10^{-7}$, depending on the process.

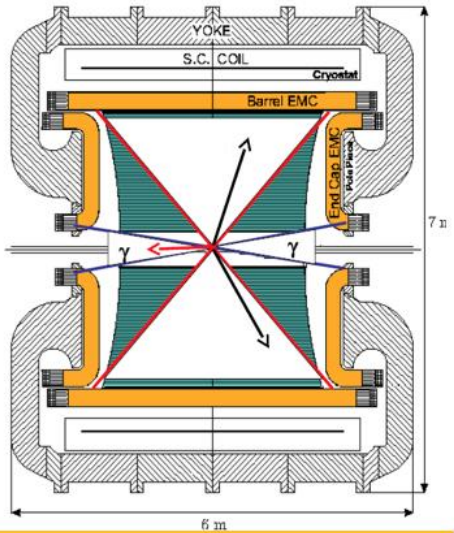
❑ All these measurements, performed with the KLOE data set, are statistically dominated, so…

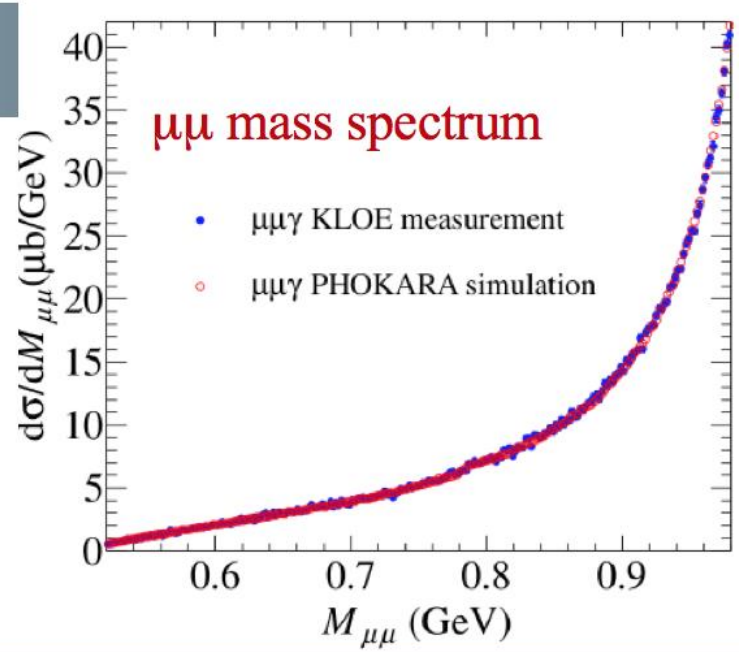
❑ … the increased DAϕNE-2 delivered luminosity and the presence of the new detectors in KLOE-2 are expected to improve these limits by a factor ~2 or better .

❑ New KLOE-2 run is well in progress. Stay tuned!

U boson search in $e^+e^- \to \mu^+\mu^-\gamma$







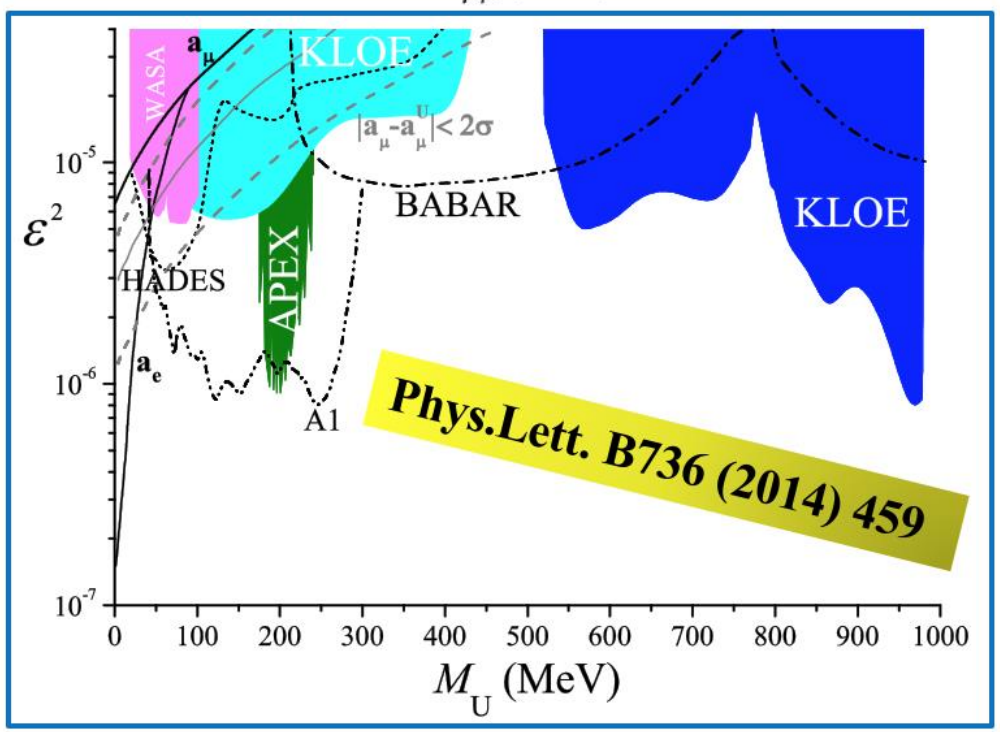
- undetected small angle photon θ_γ<15°, θ_γ>165°
- two opposite sign charged tracks 50°<θ_μ<130°

CL_S technique

Results based on only 240 pb^{-1}

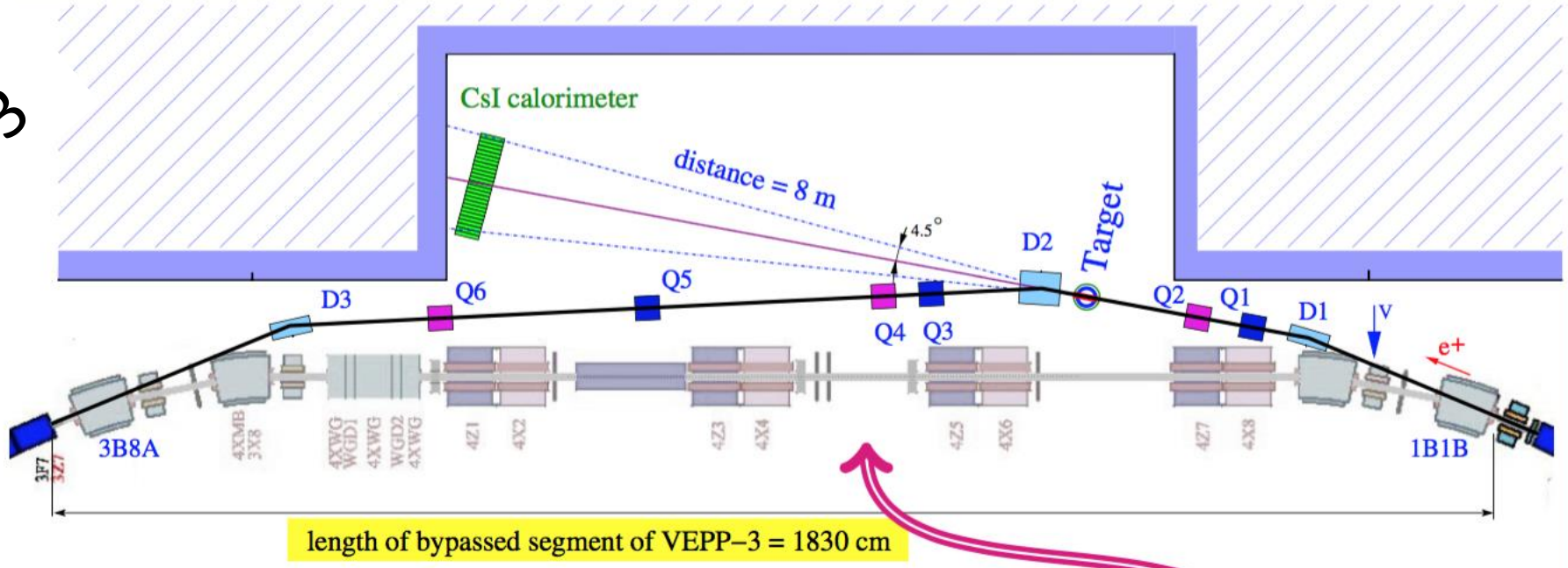
Using the 2.5 fb^{-1} full KLOE data set improves the sensitivity by a factor ~ 3

A further factor 2 in sensitivity expected from KLOE-2 experiment



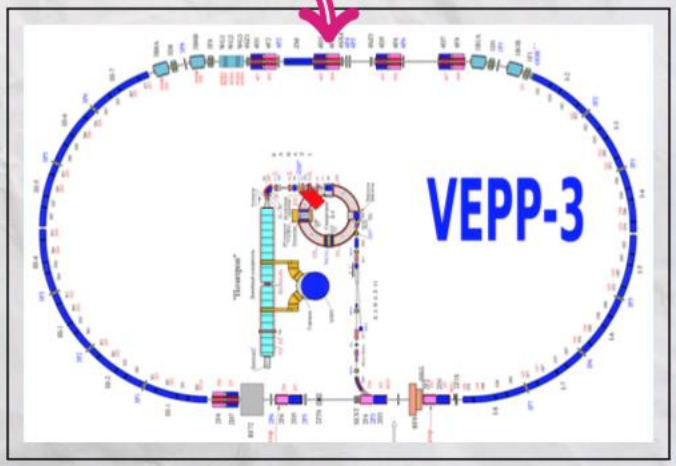
Missing mass dark photon search at VEPP-3

2nd configuration: The ByPass at VEPP–3

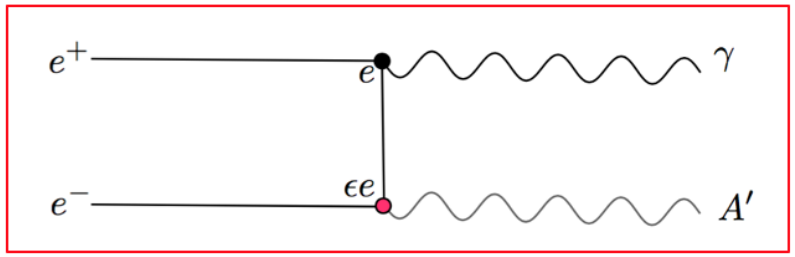


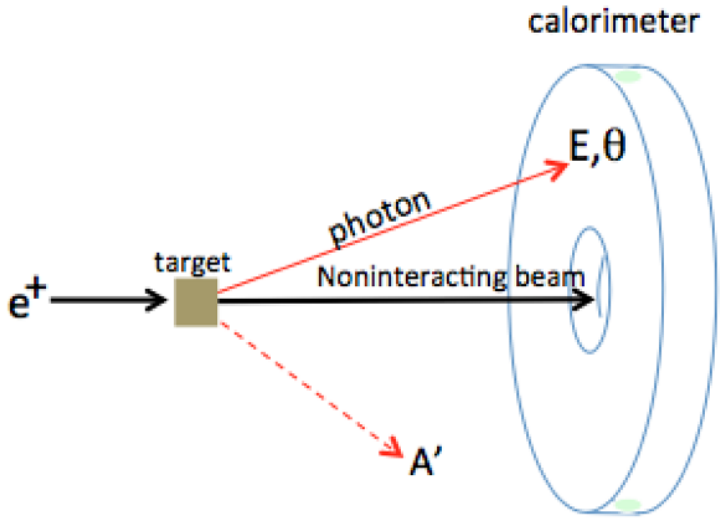
BYPASS along the 4th straight section of VEPP–3 – *where the FEL was previously situated*

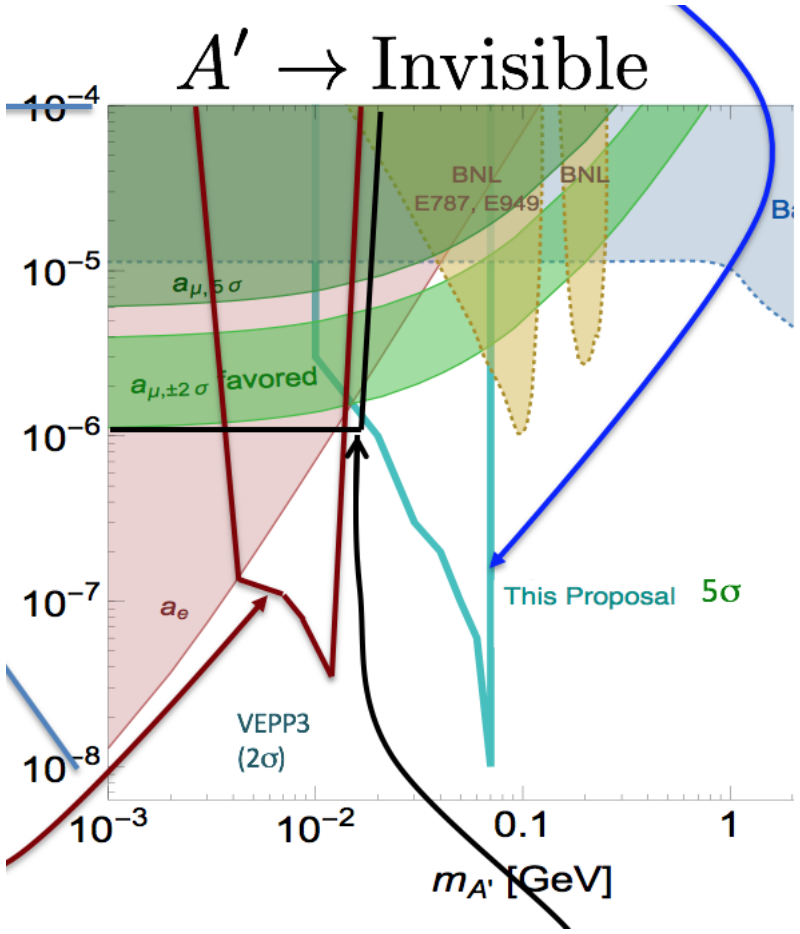
- vacuum chamber with pumping system
- 3 dipole magnets
- 6 quadrupoles
- elements of beam diagnostics



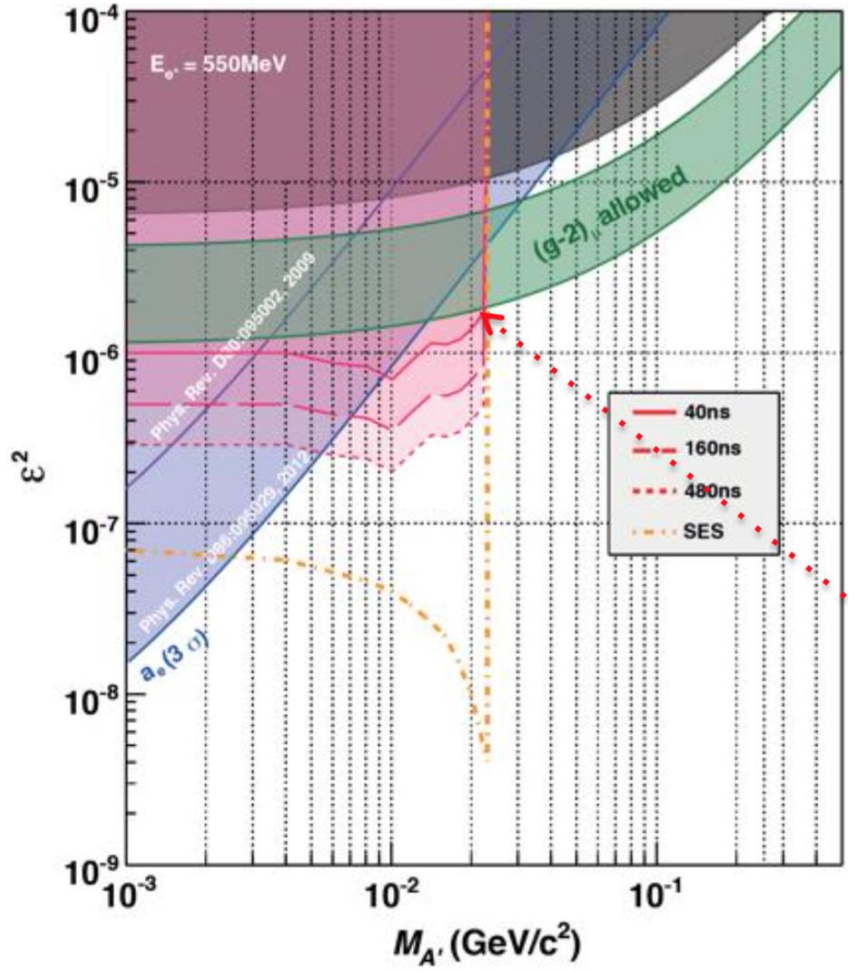
Missing mass dark photon search at Cornell

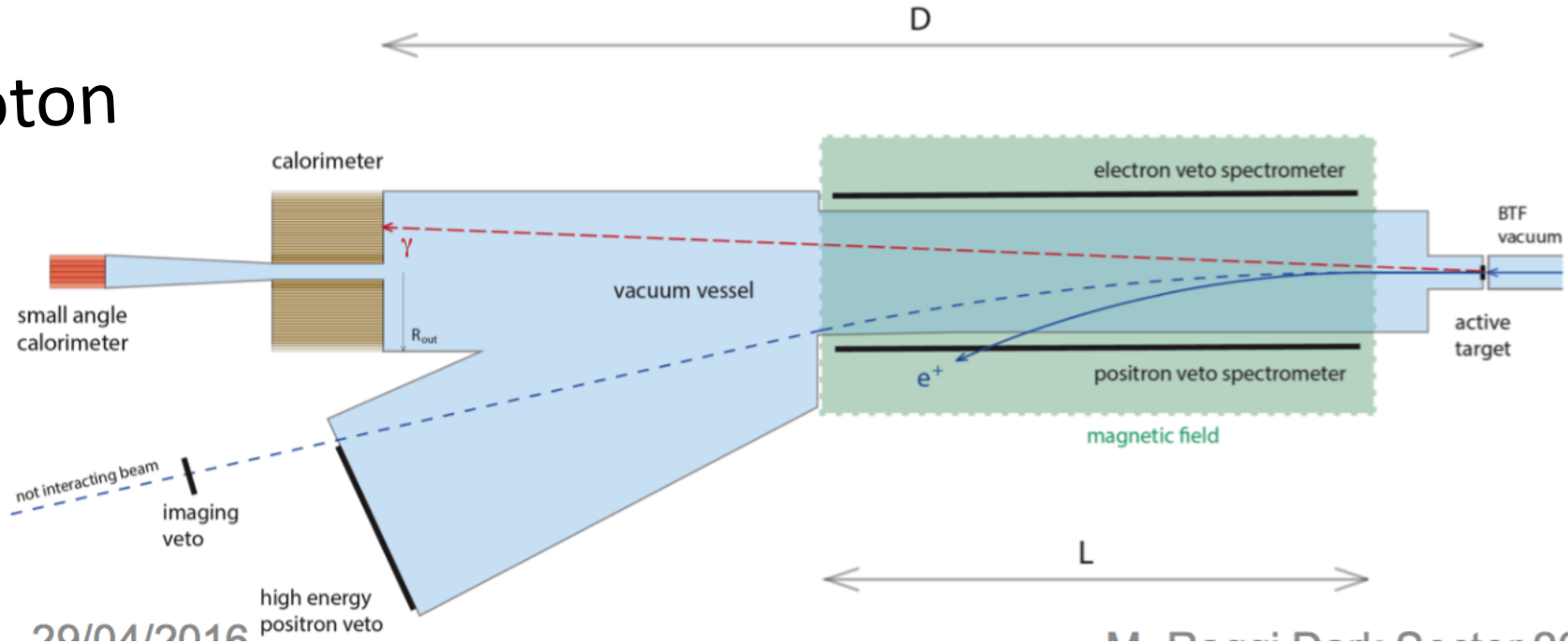






Missing mass dark photon search at Frascati





- The PADME experiment has been endorsed from LNF scientific committee in early 2015
- The PADME experiment has been approved from INFN at the end of 2015
- The PADME experiment is financed by the "What Next" INFN program with 1.35M€ (2016-2018)
- The collaboration aims at completing the detector assembly by the end of 2017 and to accumulate 1E13 e^+ on target by the end of 2018