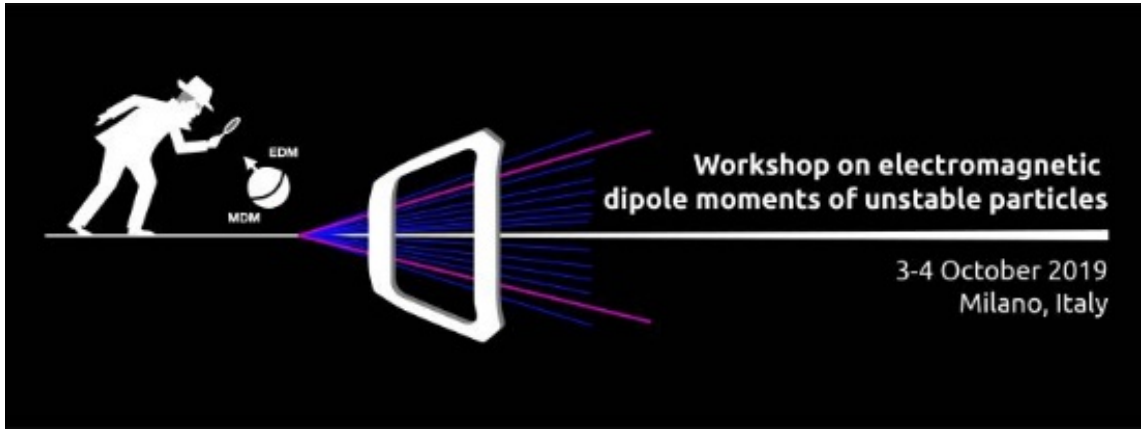
DIPOLE-b @ LHCb

What's next?

F. Martínez Vidal, IFIC-Valencia



IFIC INSTITUT DE FÍSICA CORPUSCULAR
CSIC
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DIPOLE-b

DI-b

DIrect

Probe

Of

short-**L**ived particle

Electromagnetic dipole moments

at LHC**b**

From last LHCb review

Bent crystals: FITPAN main recommendations

1. The panel considers that the MDM sensitivity makes this proposal a valuable physics programme with MDM measurements as likely main physics output.
2. The panel considers that the precision on EDMs can at best demonstrate the feasibility of this elegant and novel EDM measurement method which is a highly worthwhile goal that could lay the foundation of future experiments in this field.
3. The panel reiterates the recommendation to propose operational schemes that minimize the effect of the programme on LHCb and to work closely with the LHC machine to ensure the feasibility of these.
4. The panel reiterates the comment that the interaction with and possible involvement of the UA9 community should be better clarified.
5. The community is encouraged to continue its R&D on the project.
6. The panel would be happy to consider the proposal again after sufficient progress is made on
   i. feasibility of operation in the LHC
   ii. updated proposals for the model of data-taking
   iii. demonstration of the operation of large bending angle crystals in a test beam.

22/05/18 TM - Recommendations of FITPAN G. Passaleva 7

FITPAN recommendations

✓ feasibility of operation in the LHC

D. Mirarchi's talk

✓ demonstration of the operation of **large bending** angle **crystals** in a test beam

A. Sytov's & M. Romagnoni talks

? updated proposals for the **model of data-taking**

? updated proposals for the model of data-taking

- Proton flux $\approx 10^6$ s^{-1}
- **Pilep ν** and **Λc rate** for W+Ge (15 mrad, 5 cm)

✓ 0.5 cm W	ν ≈ 0.008	≈ 250 Λc/year
✓ 2.5 cm W	ν ≈ 0.015	≈ 1300 Λc/year
✓ Thicker W?		

ν=7.6 for pp collisions, upgrade conditions

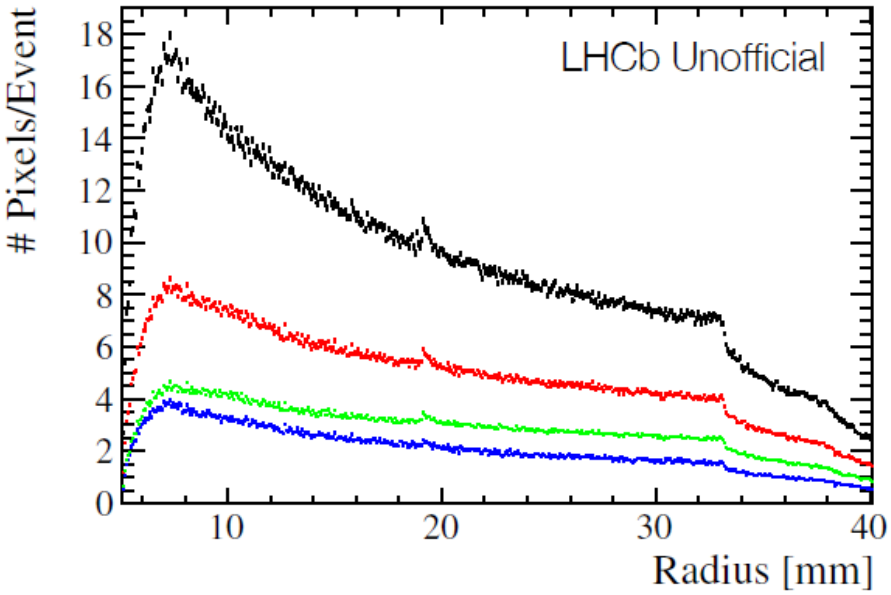
1 year = 4×10^6 s

✓ Updated proposals for the model of data-taking

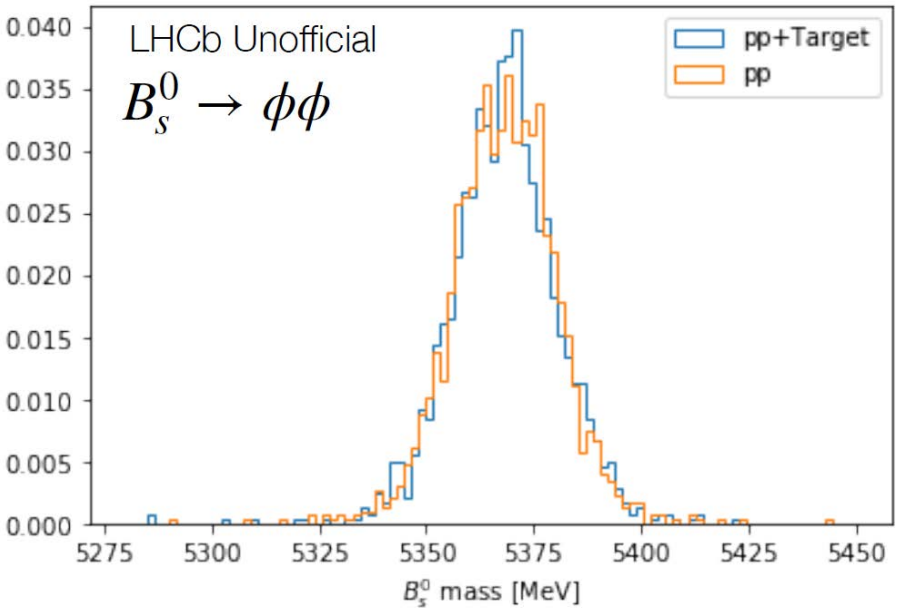
A. Merli's talk

- **Synergetic operation** of the detector seems feasible

VELO occupancy ν = 0.81



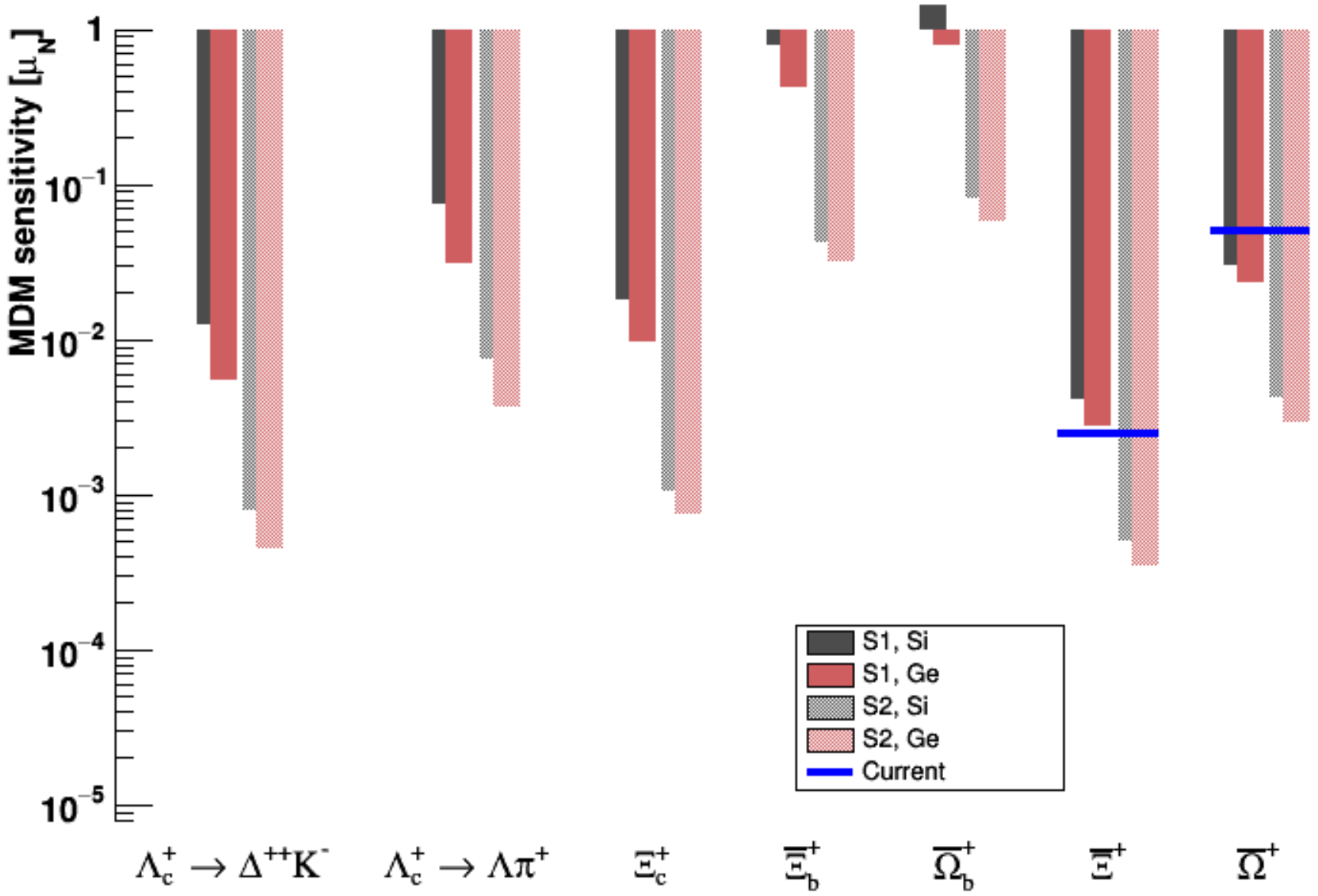
pp + pW (1 PV)



- Reconstruction efficiency and resolutions stable **up to 10^9 p/s**
- Need to assess final (optimal) **target thickness**

Sensitivities

0.5 cm W at 10^6 p/s (2×10^{13} PoT/y), 5 y



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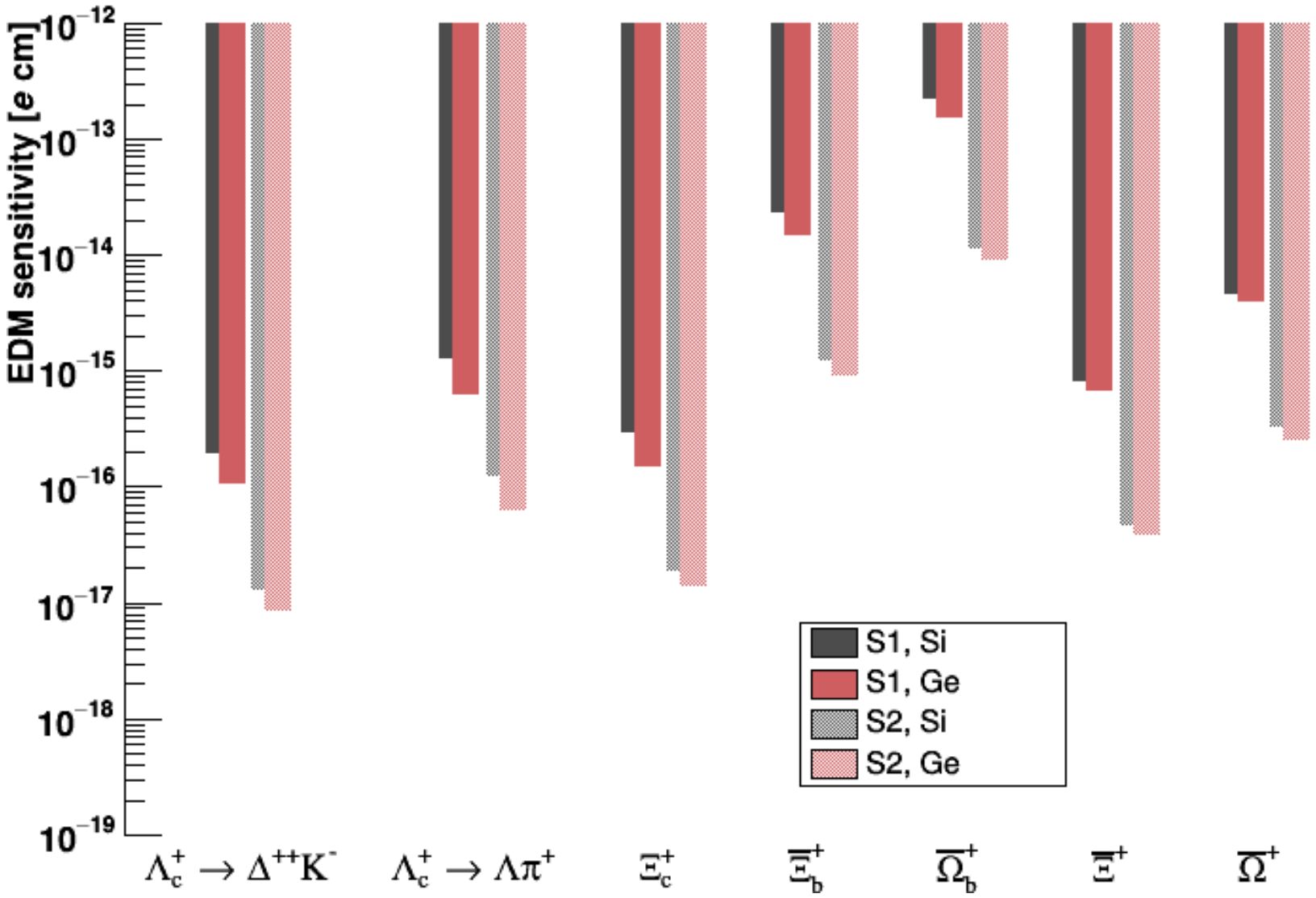


What's next

A. Pilloni's & D. Marangotto 's talks

- Precise (and correct!) **Λc→pKpi amplitude model**, needed for Λc polarization measurement in FT

E. Neil 's talk

- **Λc initial polarization** in SMOG data (~300 Λc→pKpi)

- We have a unique **physics case**, but could be enhanced
  - ✓Standard fixed target (QCD studies, different x regime)
  - ✓Pentaquark studies
  - ✓B0s (and perhaps D0) mesons oscillations in baryonic matter
  - ✓Prepare for longer term:
    - o b-baryons
    - o τ (Ds production xsection & spectrum, Ds → τν reconstruction,…)

A. Fomi's & J. Ruiz Vidal's talks

  - ✓…

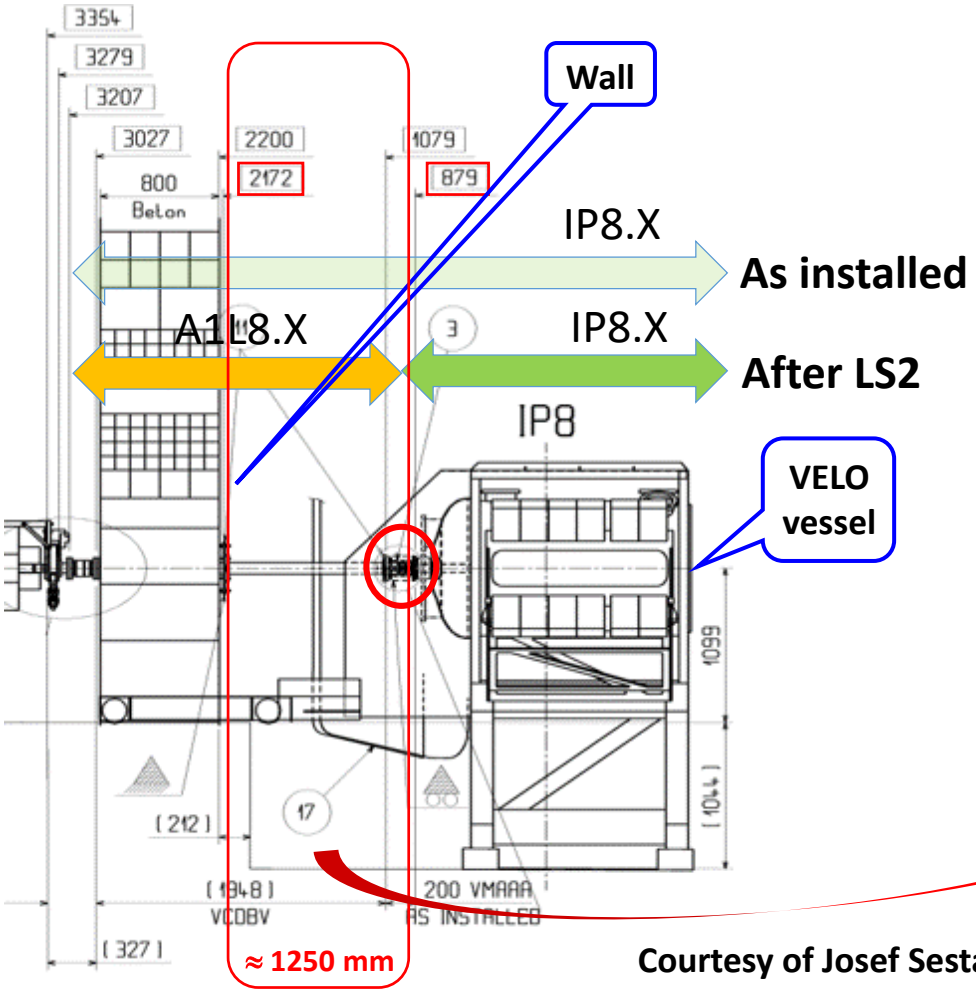
What's next

- **Next FITFAN**: the week of the 18th or 25th Nov
  - ✓LHCb Collab. Meeting (Dec), LHCC
  - ✓Run 3 EYETS (additional valve in LS2)
  - ✓Collaboration framework
    - Different communities, strength & define collaboration
    - Within LHCb Collaboration
  - ✓**LOI**
- Engineering **design**
- **Funding**, sharing of **responsibilities**
- Next PBC General Meeting, 5-6 Nov
  - ✓⇒ ES Physics Briefing Book

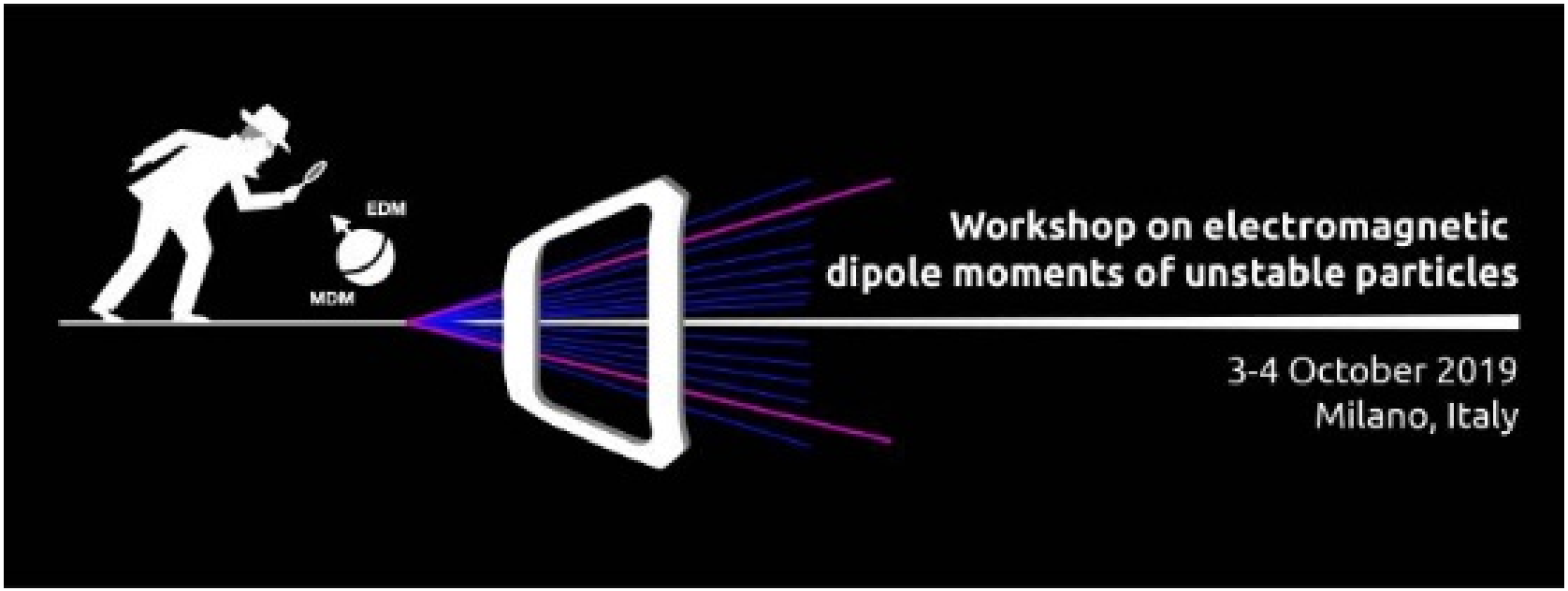
• • •

Additional valve

- To allow installation/maintenance of required instrumentation without breaking the VELO beam vacuum, a new vacuum valve will be installed during LS2



Courtesy of Josef Sestak, CERN



Thanks Nicola
Thanks Noemi

Backup

Pileup vs proton flux & W thickness

- ν for **W** /

  W+Si, **W+Ge**

ν=7.6 for pp collisions, upgrade conditions

Proton flux (s^{-1}) / T (cm)	10^6	10^7	10^8	10^9
0.5	0.002 / 0.007, 0.008	0.02 / 0.07, 0.08	0.18 / 0.70, 0.81	1.82 / 6.99, 8.11
1.0	0.004 / 0.009, 0.010	0.04 / 0.09, 0.10	0.35 / 0.87, 0.98	3.54 / 8.72, 9.84
1.5	0.005 / 0.010, 0.011	0.05 / 0.10, 0.12	0.52 / 1.04, 1.15	5.19 / 10.36, 11.48
2.0	0.007 / 0.012, 0.013	0.07 / 0.12, 0.13	0.68 / 1.19, 1.30	6.75 / 11.93, 13.04
2.5	0.008 / 0.013, 0.015	0.08 / 0.13, 0.15	0.82 / 1.34, 1.45	8.24 / 13.41, 14.53

≈ 50% occupancy wrt generic $b\bar{b}$ events

- 10^7 with $T \approx 2.0$ cm is the upper limit for parallel running (<10% occupancy)

PoT vs operation scheme

- Two possible data taking options:
  - ✓ Dedicated: 2 weeks/year × 1/3 efficiency × 3 years = 1.21×10^6 s
  - ✓ Parallel: 4×10^6 s/year × 3 years = 1.20×10^7 s
- Shown are the number of reconstructed $\Lambda_c^+ \to pK^-\pi^+$ for dedicated scheme, for **Si** and **Ge.** For parallel running just ×10 higher

[neglecting multiple interactions]

	10^6	10^7	10^8	10^9
0.5	2.0×10^1, 7.5×10^1	2.0×10^2, 7.5×10^2	2.0×10^3, 7.5×10^3	2.0×10^4, 7.5×10^4
1.0	4.0×10^1, 1.5×10^2	4.0×10^2, 1.5×10^3	4.0×10^3, 1.5×10^4	4.0×10^4, 1.5×10^5
1.5	6.0×10^1, 2.3×10^2	6.0×10^2, 2.3×10^3	6.0×10^3, 2.3×10^4	6.0×10^4, 2.3×10^5
2.0	8.0×10^1, 3.0×10^2	8.0×10^2, 3.0×10^3	8.0×10^3, 3.0×10^4	8.0×10^4, 3.0×10^5
2.5	1.0×10^2, 3.8×10^2	1.0×10^3, 3.8×10^3	1.0×10^4, 3.8×10^4	1.0×10^5, 3.8×10^5

Parallel

Dedicated

- 10^{15} PoT, 0.5 cm target ≡ 1.7×10^4, 6.2×10^4 reconstructed $\Lambda_c^+ \to pK^-\pi^+$