

Teach a physicist

Lorenzo Cotrozzi

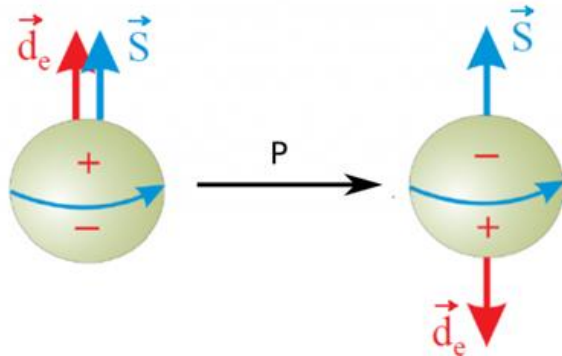
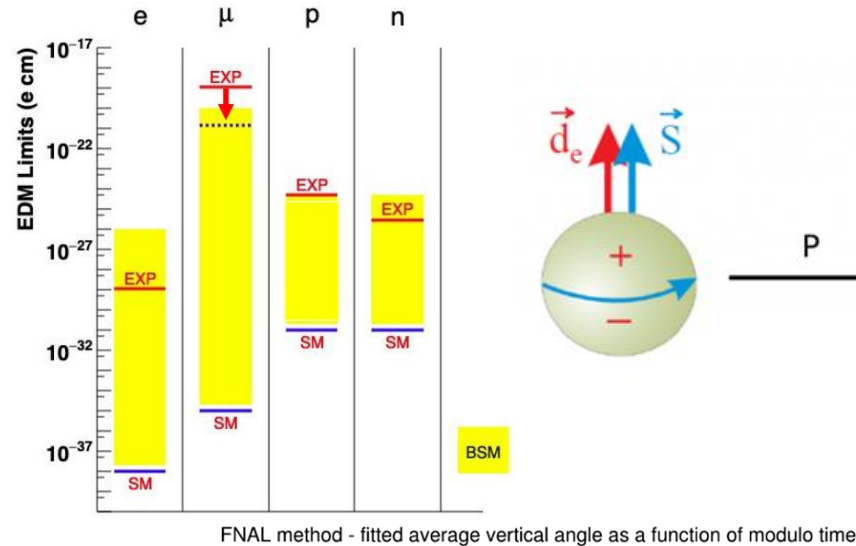
Katherine Ferraby

17/09/2025 – Leverhulme Retreat in Wales

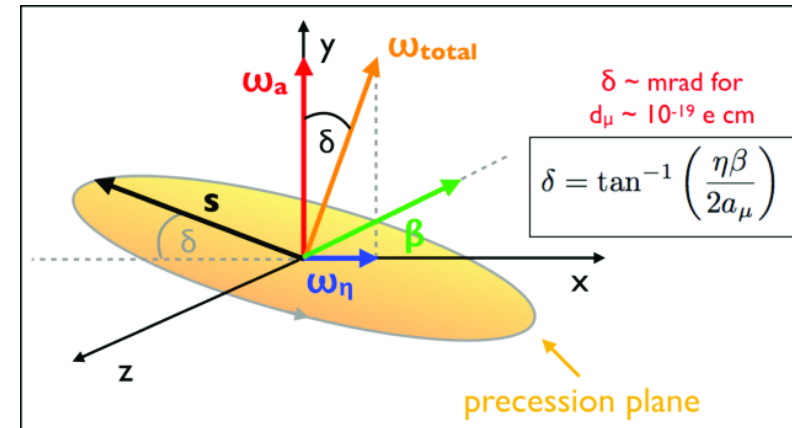
LEVERHULME
TRUST _____

Katie taught me: EDM @ FNAL

1. Search for a muon EDM signal → New source of CP-violation!



2. EDM → tilt of precession plane by angle δ

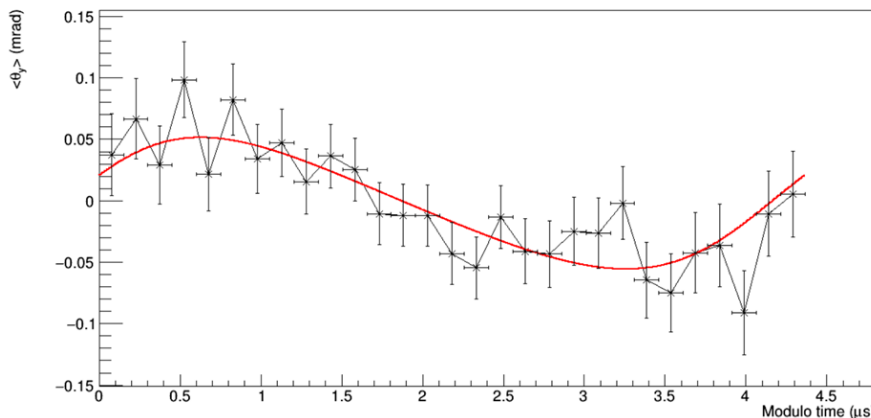


EDM:

$$\vec{d} = \eta \frac{Qe}{2mc} \vec{S}$$

3. Measurement principle: e^+ are emitted towards muon spin → measure average vertical angle vs time

4. Current limit: $\sim 1.8 \times 10^{-19} \text{ e} \cdot \text{cm}$



Lorenzo taught me: PrecisionSM database

STRONG2020 → RadioMonteCarLow2:

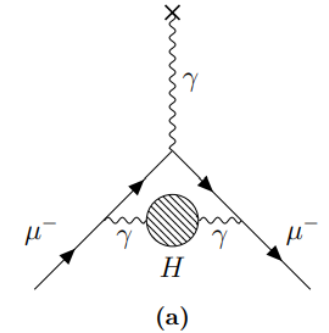
A sub-goal is to make a database with easy to find results and data for users to do their own analysis

Database:

- The name of the experiment, the channel analysed, the published papers, the tables from the papers with plotting tools
- Superceded data is also stored

Database for $e^+e^- \rightarrow \pi^+\pi^-$ channels

Experiment	Year	Reference (link to INSPIRE-HEP)	Link to Hepdata	Details	Status
BESIII (BEPC, Beijing)	2016	Phys.Lett.B 753(2016) 629-638 [errata: Phys.Lett.B 812 (2021) 135982]	ins1385603	details	Finalized
BaBar (SLAC, Stanford U.)	2012	Phys.Rev.D 86 (2012) 032013	ins1114155	details	Finalized



The database contains the $e^+e^- \rightarrow \text{hadrons}$ experiments, these contribute to the SM calculation of $g-2$

The SM HVP calculation is done by integrating the cross section of $e^+e^- \rightarrow \text{hadrons}$ * kernel factor (as a function of centre of mass energy, s)

Hide Publication Information

Measurement of the $e^+e^- \rightarrow \pi^+\pi^-$ Cross Section between 600 and 900 MeV Using Initial State Radiation

The BESIII collaboration

Ablikim, M., Achasov, M.N., Adlarson, P., Ai, X.C., Albayrak, O., Ahmed, S., Albrecht, M., Ambrose, D.J., Aliberti, R., Amoroso, A.

Phys.Lett.B 753 (2016) 629-638, 2016.

<https://doi.org/10.17182/hepdata.73898.v4>

Journal INSPIRE Resources

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Bare Cross Section

10.17182/hepdata.73898.v4/t1
Bare cross section $\sigma^{\text{bare}}(e^+e^- \rightarrow \pi^+\pi^- (\gamma_{\text{FSR}}))$ of the process $e^+e^- \rightarrow \pi^+\pi^-$ measured using the initial state radiation method. The data is corrected concerning...

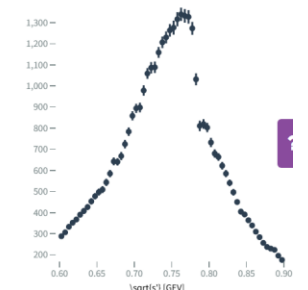
Covariance Matrix of the Bare Cross

Showing 50 of 60 values

Show All 60 values

RE	$E+ E- \rightarrow \pi^+\pi^-$
\sqrt{s} [GeV]	$\sigma^{\text{bare}}(e^+e^- \rightarrow \pi^+\pi^- (\gamma_{\text{FSR}}))$ [nb]
0.6 - 0.605	$288.3 \pm 11.4 \text{ stat} \pm 2.6 \text{ sys}$
0.605 - 0.61	$306.6 \pm 10.8 \text{ stat} \pm 2.8 \text{ sys}$
0.61 - 0.615	$332.8 \pm 11.8 \text{ stat} \pm 3.0 \text{ sys}$
0.615 - 0.62	$352.5 \pm 12.4 \text{ stat} \pm 3.2 \text{ sys}$
0.62 - 0.625	$367.7 \pm 12.1 \text{ stat} \pm 3.3 \text{ sys}$
0.625 - 0.63	$390.1 \pm 12.7 \text{ stat} \pm 3.5 \text{ sys}$
0.63 - 0.635	$408.0 \pm 13.6 \text{ stat} \pm 3.7 \text{ sys}$

Visualize



Sum errors ☒ Log Scale (X) ☐