Database project goal

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Disclaimer: In the following I will concentrate to DB for HLO (no HLbL)

Basics facts

$a_\mu^{exp} - a_\mu^{theo,SM} \sim (28 \pm 8) \times 10^{-10}$ $(\sim 3.5\sigma)$ (waiting for TI outcome)

$8 = \sim 4_{HLO} \oplus \sim 3_{HLbL} \oplus 6_{BNL}$

Possible scenario:

- $6_{BNL} \rightarrow$ 1.4 (E989 @ FNAL + E17@JPARC)
- $4_{HLO} \rightarrow$ 2(?) (better data+lattice+spacelike approach)
- $3_{HLbL} \rightarrow$ 2(?)

Depending on the outcome the discrepancy can be > 5σ

We will now focus on $a\mu^{HLO}$ (data driven)

Why we need a DB of e+e- →hadrons

- **a_μ^{HLO}** can become a limiting factor for a improvement in precision
  - although there were huge progress in the recent years in the achieved precision and evaluation of systematic errors, data are not always presented in a clear way (RC?; FSR included? Which model for hadrons in the FS? etc…)
  - Treatment of data not always clear (which data include and how); common bias between different analyser groups?
  - Improve in precision needs an inspection on data to be used for $a_\mu^{HLO}$and a clarification on how to use them
- e+e- data can be useful also for other observables (α_s; $\alpha(MZ0)$; determination of c and b quark masses, etc…) and for lattice

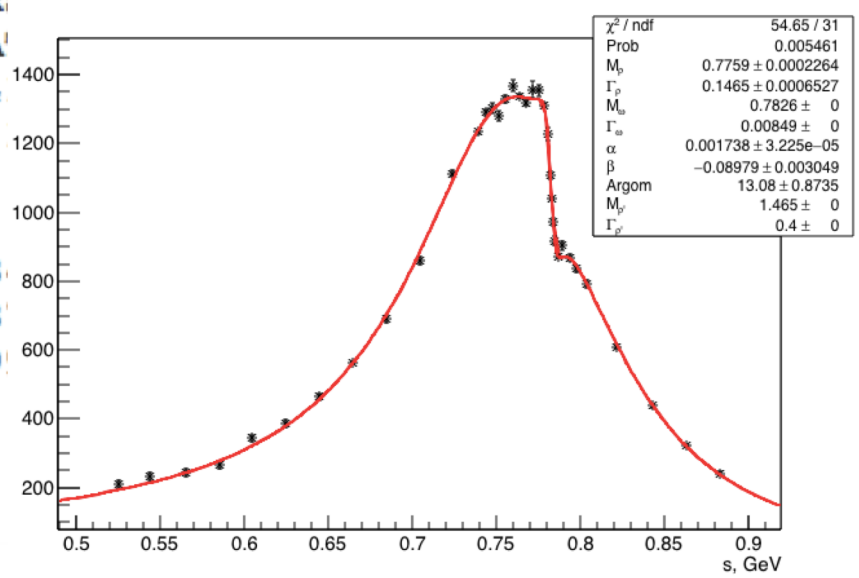
As an example (new SND 2π data):

Dear Andrey,
we have read with much interest your new preprint (https://arxiv.org/abs/2004.00263) and we have a couple of comments:
1) we tried to fit the born cross section with a Gounaris-Sakurai parametrization as described in https://arxiv.org/pdf/hep-ex/0112031.pdf. When fixing the omega mass and width, and rho' mass and width to PDG18 values we found a chi2 worse than in your table (54.65/31), see below the results (and plot attached).

Ndim = 1, Npar = 9
FCN=54.6523 FROM MIGRAD STATUS=CONVERGED 152 CALLS 153 TOTAL
EDM=3.98318e-08 STRATEGY= 1 ERROR MATRIX ACCURATE

EXT	PARAMETER			STEP	FIR
NO.	NAME	VALUE	ERROR	SIZE	DERIVA
1	M_{#rho}	7.75935e-01	2.26404e-04	5.74300e-07	4.744
2	#Gamma_{#rho}	1.46462e-01	6.52692e-04	4.81427e-07	-2.
3	M_{#omega}	7.82650e-01	fixed		
4	#Gamma_{#omega}	8.49000e-03	fixed		
5	#alpha	1.73752e-03	3.22520e-05	1.05515e-07	-1.123
6	#beta	-8.97853e-02	3.04927e-03	2.46888e-06	-1.263
7	Argom	1.30811e+01	8.73507e-01	2.04383e-03	2.459
8	M_{#rho'}	1.46500e+00	fixed		
9	#Gamma_{#rho'}	4.00000e-01	fixed		

chi2= 54.6523



- Data:
  - Survey on existing data: statistical and systematic errors, covariance mat, Radiative Corrections, etc..
  - Are all the data worth to be analysed (maybe some old set of data can be discarded)?
  - Missing channels: parametrization, isospin relations,…?
- Procedure:
  - Computation of a_μHLO; other obsservables, Adler function, etc…

- We need to identify one/two person(s) responsible of data for each experiment;
- Discuss database maintenance and correct uploading of data information and procedure (see Alberto's presentation)