12th meeting of the WG Radio Monte CarLow

H.Czyz/G. Venanzoni

Mainz 27-28 September 2012

Thursday 27 September 2012

Introduction H. Czyz/G. Venanzoni (09:10-09:20)

Hadronic cross section and MC generators I (09:20-11:00)

time	[id] title	presenter
09:20	[15] Precision measurement of hadronic cross section with KLOE	VENANZONI, Graziano
09:50	[16] Update of hadronic cross section measurements at Babar	HAFNER, A.
10:20	[17] Development of Monte Carlo generator for 3(pi+pi-) process study in CMD-3 experiment	LUKIN, P.
10:40	[18] MC generators at BES-III	KLOSS, B.

Hadronic cross section and MC generators II (11:30-13:00)

time	[id] title	presenter
11:30	[12] Latest news from Novosibirsk	SOLODOV, G.
12:00	[13] Measurement of timelike nucleon FFs at BES-III	Prof. MAAS, Frank
12:30	[14] Complete one loop corrections to e+e -> mu+mu- gamma in PHOKHARA generator - an update	GUNIA, M.

Gamma Gamma physics, FSR and Transition Form Factors (14:30-16:00)

time	[id] title	presenter
14:30	[9] gamma-gamma physics at BES-III	PRENCIPE, E.
15:00	[10] Measurement of time like TFF using ISR	Dr. KUPSC, Andrzej
15:30	[11] Report from meson transition form factor workshop	Dr. KUPSC, Andrzej DENIG, Achim

Tau and Search for new physics (16:30-18:00)

time	[id] title	presenter
16:30	[6] TAUOLA MC and related projects	WAS, Z.
17:00	[7] Searching the Dark Photon at Mainz	Dr. MERKEL, Harald
17:30	[8] Search for Lorentz violation at KVI	Dr. MUELLER, Stefan E.

Discussion on the WG (18:00-19:00)

Friday 28 September 2012

Hadronic VP, g-2 and Delta alpha I (09:00-10:30)

time	[id] title	presenter
09:00	[3] The anomalous magnetic moment, the polarization function and the QED beta function at five loop	KUEHN, H.
09:30	[4] Effective field theory estimates of the hadronic contributions to g-2	Prof. JEGERLEHNER, Fred
10:00	[5] Status of g-2 and Delta alpha	Dr. TEUBNER, Thomas

Hadronic VP, g-2 and Delta alpha II (11:00-12:30)

time	[id] title	presenter
11:00	[0] Light-by-Light Scattering Sum Rules	PAUK, V.
11:25	[1] Lattice QCD determination of the hadronic contribution of (g-2)mu	Prof. WITTIG, Hartmut
11:50	[2] The new g-2 experiment	VENANZONI, Graziano

Discussion (12:30-13:00)

At 8.00 pm we will have the dinner at the Restaurant "Geberts Weinstube"

http://www.geberts-weinstuben.de

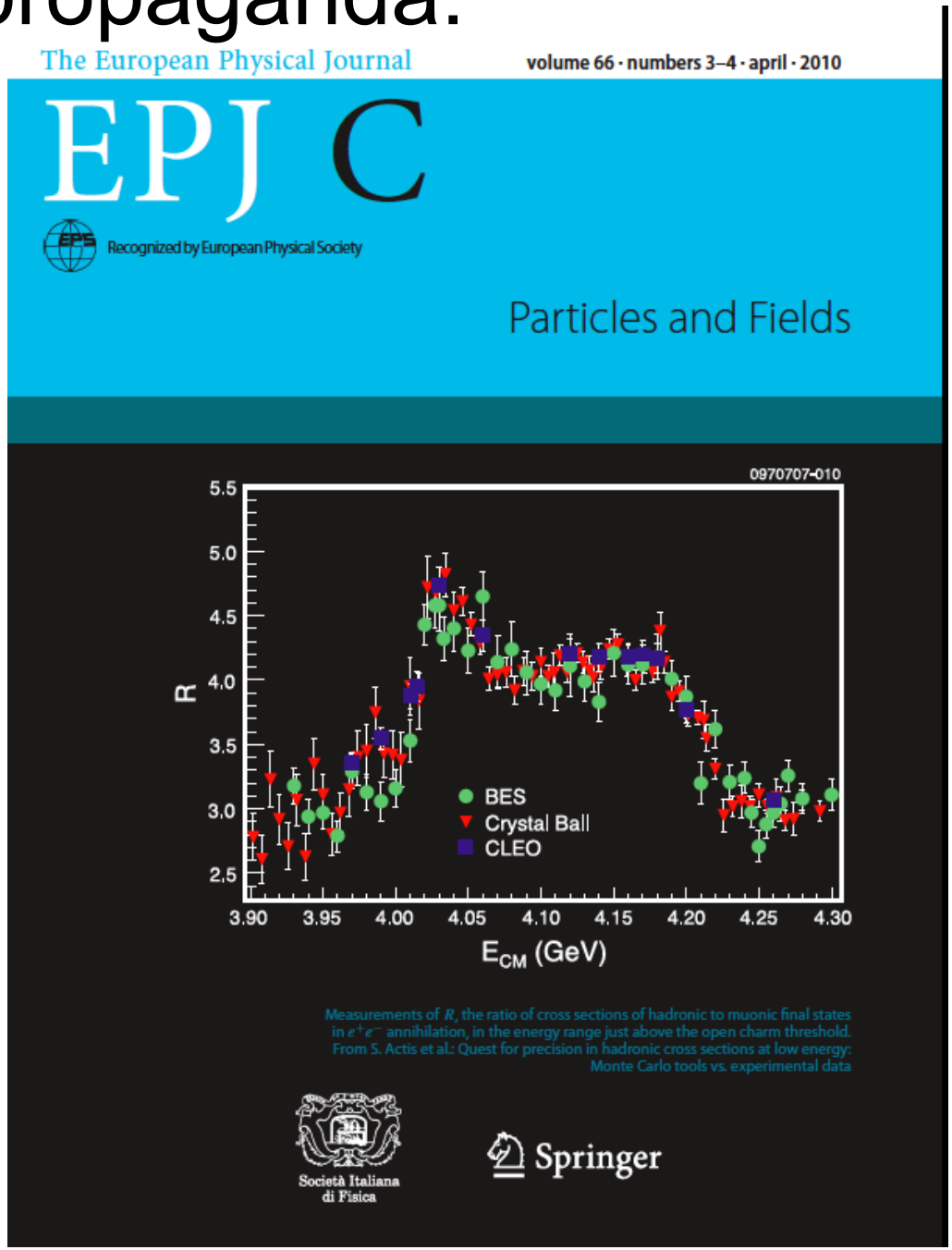
Address: Frauenlobstr. 94 ? 55118 Mainz

Tel. 06131. 611619

Usual propaganda:

The paper "Quest for precision in hadronic cross sections at low energy: Monte Carlo tools vs. experimental data" has been published on the **Eur. Phys. J. C. Volume 66, Issue 3 (2010), Page 585**

Remember to quote the paper.



e+e- current activities

- First of all congratulations to our Russian colleagues for the first results from VEPP-2000!
- DAFNE luminosity and running time is slowing improving reaching the performances of the previous run. After a break during Summer, DAFNE has restarted collisions. The plan is to improve DAFNE performances up to mid November and then a long shut down (~6 months) to insert the new upgrades (Inner Tracker, and QCAL) and undertake DAFNE consolidation. Real data taking expected for Spring/Summer next year.
- BESIII is proceeding very well with plenty of new data. Soon the $\gamma\gamma$ and ISR programs will become an important part if its activities. See presentations at this meeting.
- Still KLOE, BaBar and Belle can give important results on hadronic cross sections, $\gamma\gamma$, and flavour physics.

Good news!

New g-2 experiment at FNAL (E989) received CD0!

Fermilab Today

Wednesday, Sept. 19, 2012

Second muon experiment receives Mission Need approval from DOE

This rendering shows the location of the proposed Muon Campus at Fermilab. The arrow points to the proposed site of the planned Muon g-2 experiment. Click to enlarge. *Image: Muon Department/FESS*

Fermilab's plans for creating a Muon Campus with top-notch Intensity Frontier experiments have received a big boost. The Department of Energy has granted Mission Need approval to the Muon g-2 project, one of two experiments proposed for the new Muon Campus. The other proposed experiment, Mu2e, is a step ahead and already received the next level of DOE approval, known as Critical Decision 1.

"We now are officially on DOE's roadmap," said Lee Roberts, professor at Boston University and co-spokesperson for the roughly 100 scientists collaborating on the Muon g-2 (pronounced gee minus two) experiment. "This should make it easier to increase the size of our collaboration and foster international participation. Potential collaborators supported by the National Science Foundation or foreign funding agencies will be happy to see that we now have DOE's official Mission Need approval."

At present, the Muon g-2 collaboration includes scientists from institutions in China, Germany, Italy, Japan, the Netherlands and Russia as well as 16 institutions in the United States. Physicists from several institutions in the United Kingdom are in the process of joining the collaboration.

Precision target of new experiment at FNAL 1.6 10^{-10} (respect to 6.3 10^{-10} E821)

Accuracy of SM calculation ~5 10^{-10}

$$a_\mu^{exp} - a_\mu^{theo,SM} = (27.7 \pm 8.4)10^{-10} \quad (3.3\sigma)$$

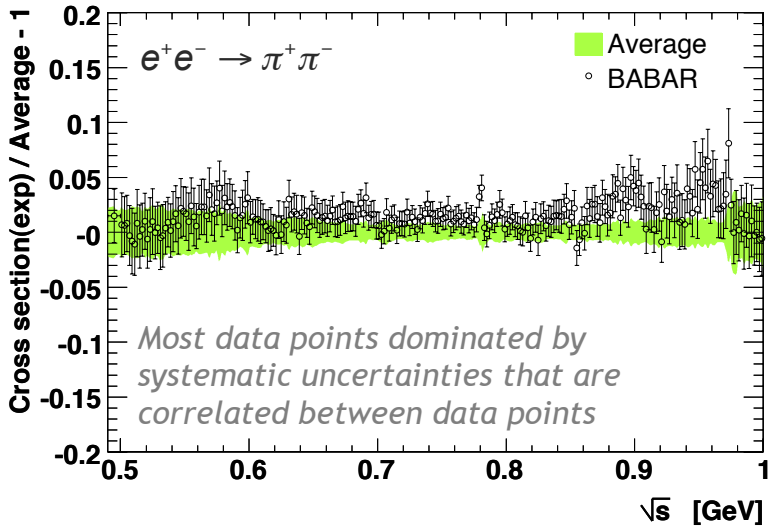
$$8.4 = \sim 5_{HLO} \oplus \sim 3_{HLbL} \oplus 6_{BNL}$$

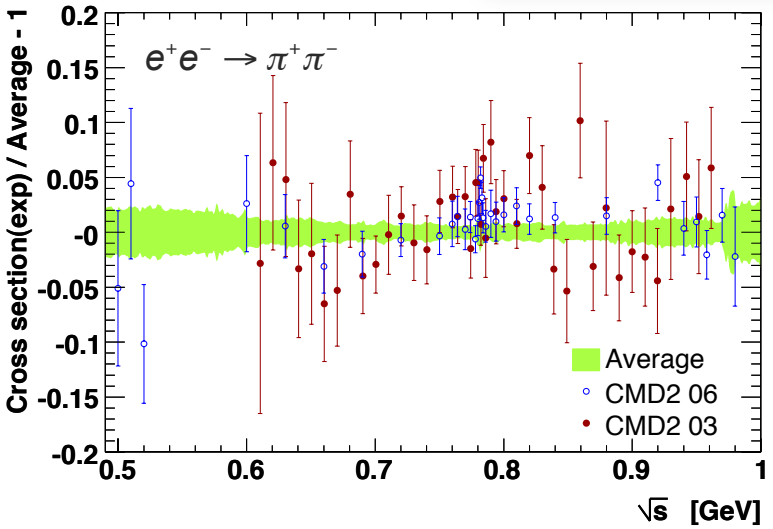
? ? ? $1.6_{NEW\ G\text{-}2}$

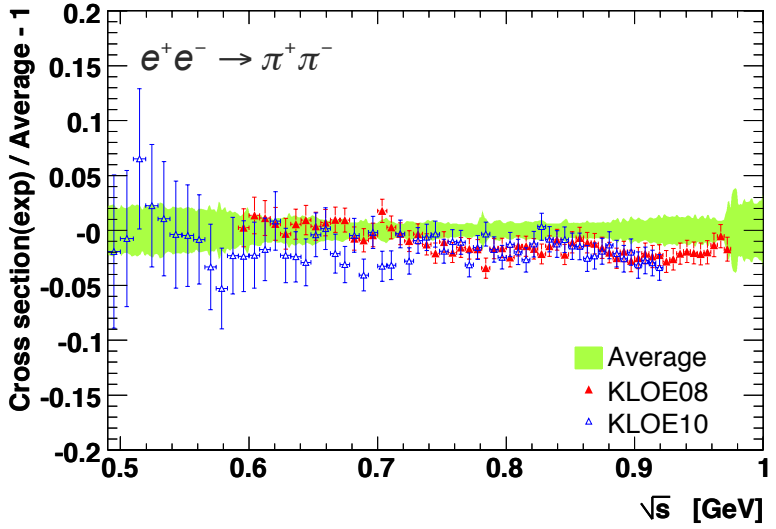
How much can theoretical error improve?

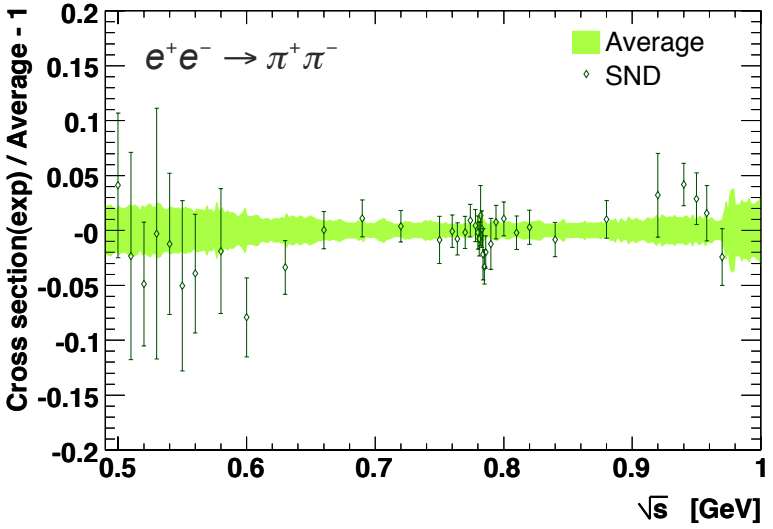
Situation of Two-pion channel

Davier *et al.*, EPJ C 71, 1515 (2011)







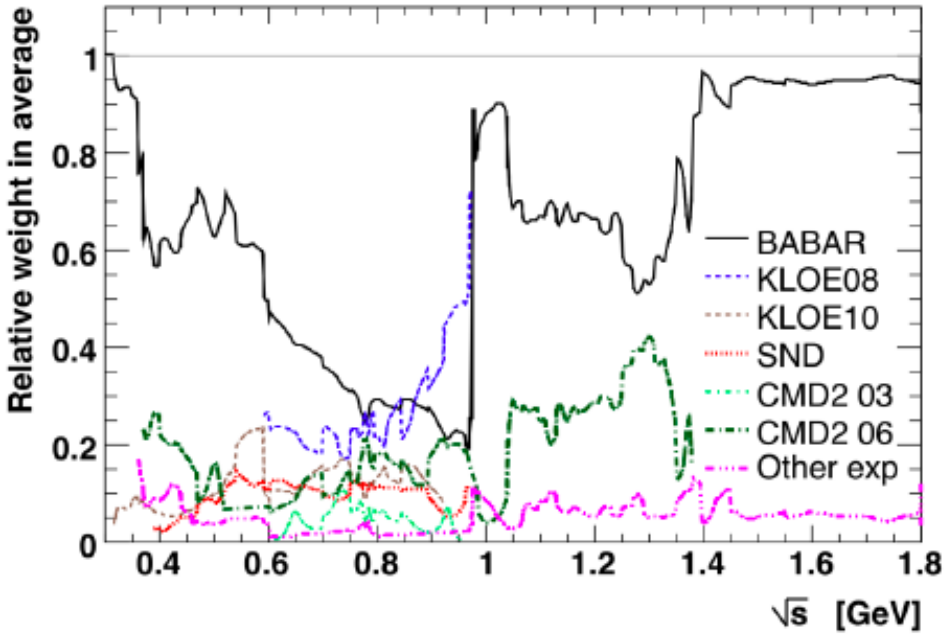


Agreement not excellent amongst all the data.

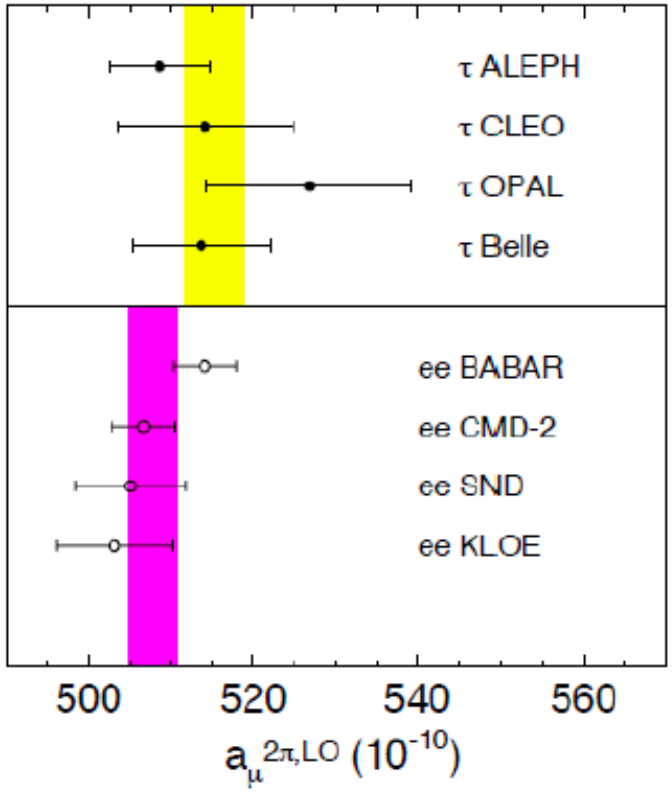
Impact of BABAR data for g-2: $\pi^+\pi^-$

Weights of different experiments in combining their results (DHMZ 2009-2010)

BABAR dominates everywhere, except between 0.8 and 0.93 GeV where KLOE is the most precise



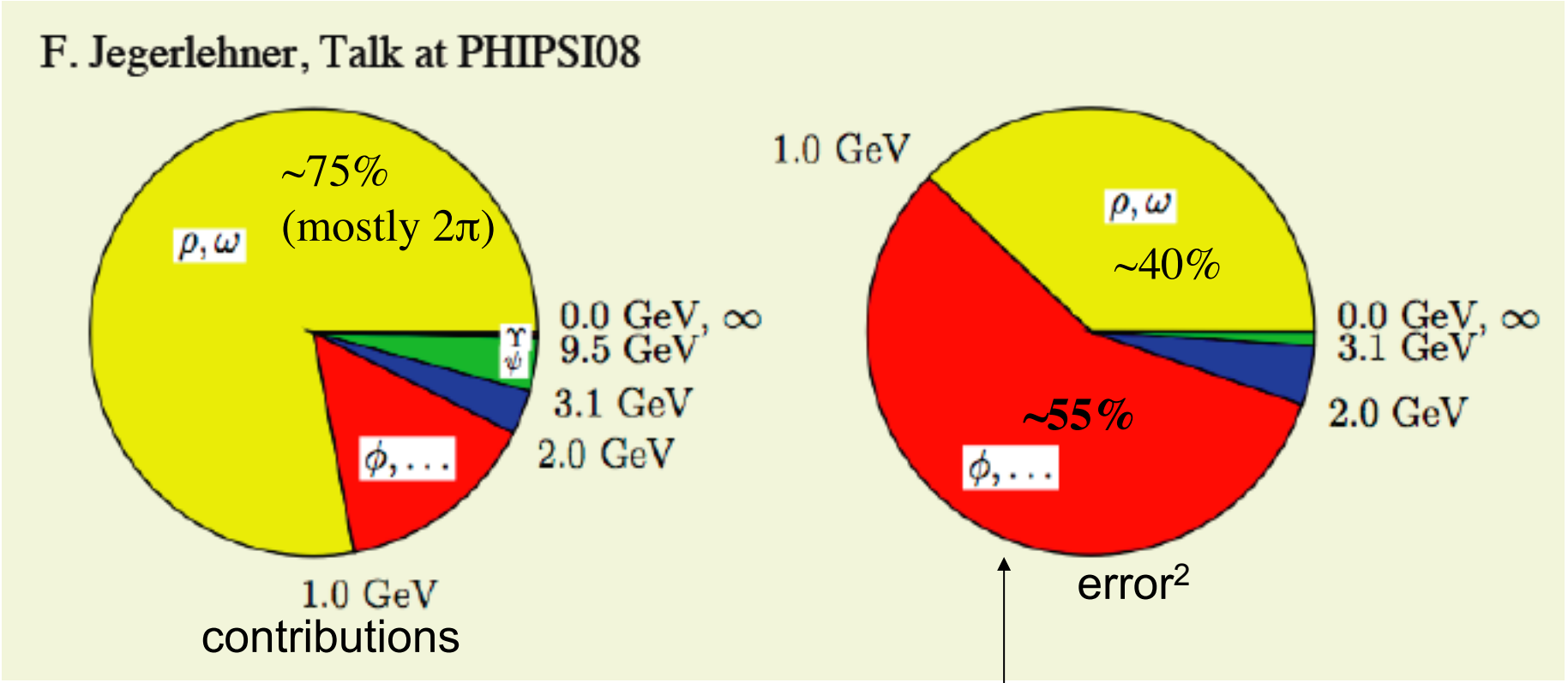
Integral from threshold to 1.8 GeV



BABAR most precise (with CMD-2) reduces tension between e^+e^- and τ

Error budget on a_μ^{HLO}

δa_μ^{HLO}=5.3=3.3(√s<1GeV) ⊕**3.9**(1< √s<2GeV)) ⊕1.2(√s>2GeV)



$e^+e^- \to \pi^+\pi^-$

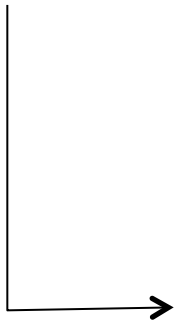
in the range < 1 GeV contributes to 70% !

But

Very important also the region 1-2 GeV !!!

$\delta\sigma_{HAD}$ ~ 0.4% $\sqrt{s}$<1GeV (instead of 0.7% as now)

$\delta\sigma_{HAD}$ ~ 2% 1<$\sqrt{s}$<2GeV (instead of 6% as now)



δa_μ^{HLO} = 2.6 (instead of ~5 as now)

Possible with Direct scan at VEP2000 and ISR at DAFNE, BEPCII and B-factories

What about HLbL ?

- As today $\delta a_\mu^{LbL} = [2.5\text{-}4]10^{-10}$
- How to improve? $\gamma\gamma$ physics can help? YES!

On the possibility to measure the $\pi^0 \to \gamma\gamma$ decay width and the $\gamma^*\gamma \to \pi^0$ transition form factor with the KLOE-2 experiment

D. Babusci[1], H. Czyż[2], F. Gonnella[3,4], S. Ivashyn[a,5], M. Mascolo[3,4], R. Messi[3,4], D. Moricciani[b,4], A. Nyffeler[6], G. Venanzoni[1] and KLOE-2 Collaboration[*]

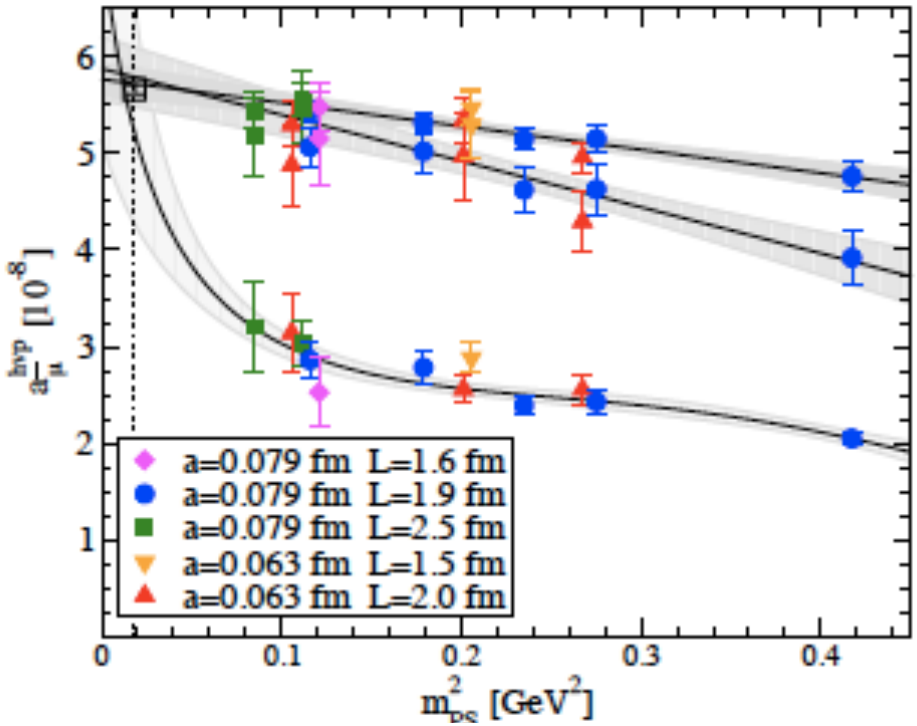
the purpose of this letter. The estimates are performed to demonstrate, within several approaches, an improvement of uncertainty, which will be possible when the KLOE-2 data appear. Discussion of the validity of these approaches as well as the form factor modeling is beyond the scope of this letter.

Eur.Phys.J. C72 (2012) 1917

$\gamma\gamma$ physics is done at B-factories.
It will also be done at KEDR, KLOE-2 and BESIII with dedicated detectors, in a region where data are scarse
Also e+e- $\to$ PSγ (A. Kupsc)

Of course other approaches are possible

- A new 2-3% **lattice** result for the lowest-order hadronic (u,d quarks only) contribution:



$$a_{\mu,N_f=2}^{\mathrm{hvp,new}} = 5.66(11)10^{-8}$$ ← *Excellent agreement*

Prospects for HLBL?

Experimental value:

$$a_{\mu,N_f=2}^{\mathrm{hvp,exp}} = 5.66(05)10^{-8}$$

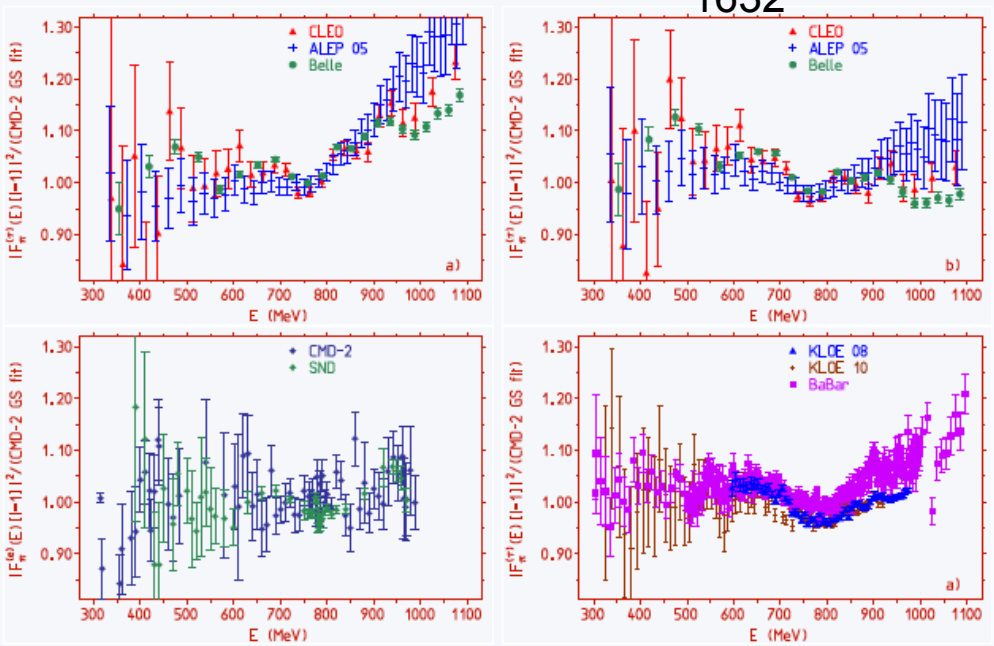
-Other ideas?

In both cases experimental and theoretical activities are essential!

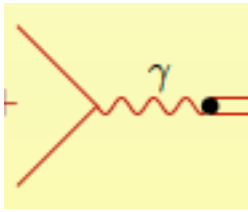
Still a lot of work for our WG!

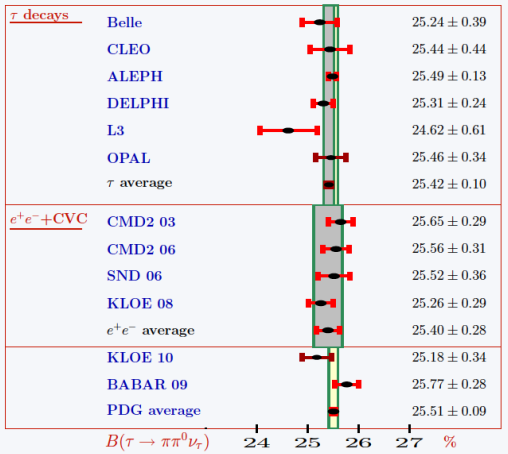
Jegerlehner and Szafron claim that the e^+e^- vs τ is solved if an additional correction ($\rho-\gamma$ mix.) is included

F. Jegerlehner and R. Szafron, Eur. Phys. J. C71 (2011) 1632



$|F_\pi(E)|^2$ in units of e^+e^- I=1 (CMD-2 GS fit): a) τ data uncorrected for $\rho-\gamma$ mixing, and b) after correcting for mixing. Lower panel: e^+e^- energy scan data [left] and e^+e^- radiative return data [right]





$$a_\mu^{\mathrm{had,LO}}[e,\tau] = 690.96(1.06)(4.63)\times 10^{-10} \quad (e+\tau)$$ JS 11

$$a_\mu^{\mathrm{had,LO}}[e^+e^-] = (692.3 \pm 4.2_{ee+\mathrm{QCD}})\times 10^{-10}$$

$$a_\mu^{\mathrm{had,LO}}[\tau] = (701.5 \pm 3.5_{\tau} \pm 1.9_{\mathrm{SU(2)}} \pm 2.4_{ee+\mathrm{QCD}})\times 10^{-10}$$

DHMZ 11

How to improve the critical mass: can we access to European funds (especially for travelling and positions)?

Can we have time to discuss this?

It seems we are too small to apply for a network

When and where the next meeting?

Usually on April

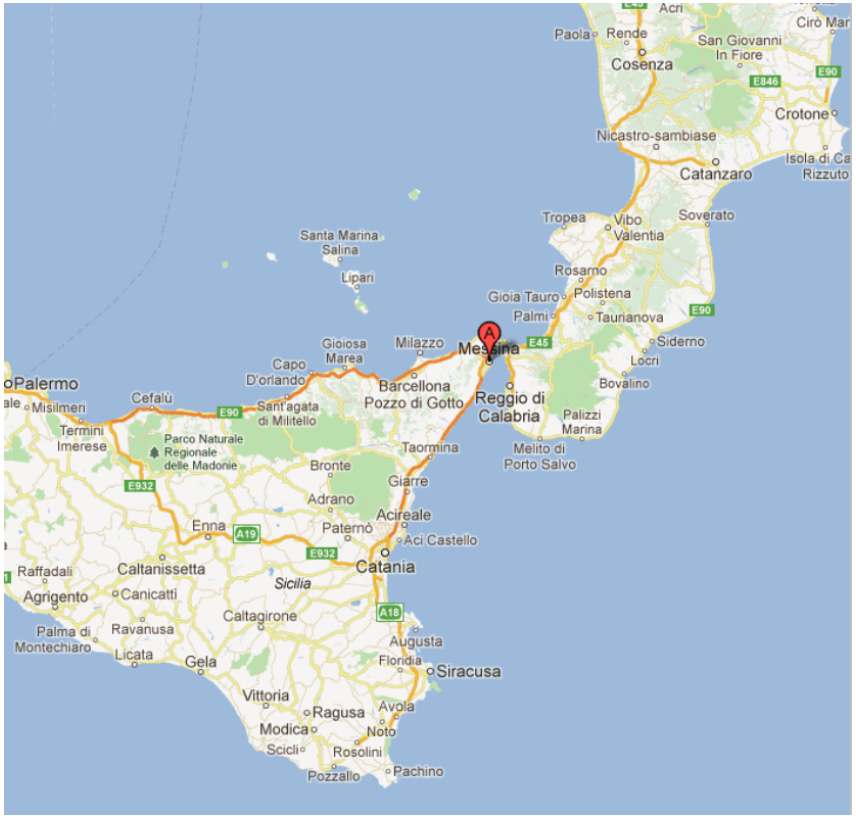
Ping has propsed to have it as satellite of the Heavy Quarkonium Workshop will be held in Beijing from April 22 to 26 2013

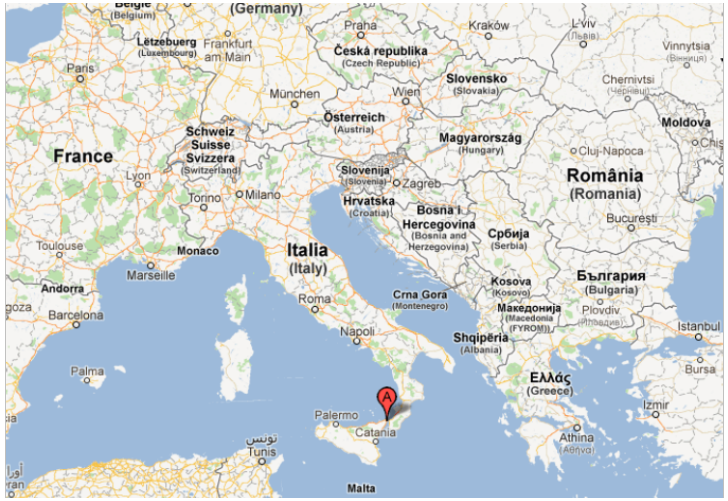
Would be feasible?
How many of us will go there?

Other possibilities?

…Another possibility…

- Messina (South Italy)…





The city can be reached wiithin 30’ by fast ship from Reggio Calabria (who has an airport)

An important date!

- On **September 9-12 2013** at Rome there will be the International Conference on e+e- collisions from Phi to Psi (PHIPSI13)
- As in our tradition the Fall meeting can be done as satellite of PHIPSI13 Conference. We can decide either Sep. 6-7 (Friday and Saturday) or 13-14 (Friday and Saturday)

Have a nice meeting and thanks to Achim, Susanne (who unfortunately cannot be here) and Tanja for the local organization!

Please acknowledge the RMCWG activity!

A possible way in the acknowledgements:

"This work is a part of the activity of the "Working Group on Radiative Corrections and Monte Carlo Generators for Low Energies [http://www.lnf.infn.it/wg/sighad/] ."

This has been already done in several papers.

Can we have a database of the papers done within the WG activities? Please send me the reference of your paper(s)

spare