# 17th meeting of the WG Radio Monte CarLow

## H. Czyz/G. Venanzoni



Frascati 20-21 April 2015

# Monday 20 April 2015 Agenda

#### Introduction H. Czyz/G. Venanzoni - Aula Seminari (14:30-15:00)

#### Radiative Corrections and MC generators I - Aula Seminari (15:00-16:30)

time	[id] title	presenter
15:00	[0] Recent results from VEPP-2000	EIDELMAN, Simon
15:30	[1] Babayaga at the BES-III experiment	HAFNER, Andreas
16:00	[2] Measurement of the e+e> pi+pi- cross section using initial state radiation at BESIII	REDMER, Christoph

#### Radiative Corrections and MC generators II - Aula Seminari (17:00-19:00)

time	[id] title	presenter
17:00	[4] Primary MC generator of the process e+e> fo(1370)rho(770)->2(pi+pi-pi0) for the CMD-3 experiment	LUKIN, Peter
17:30	[3] Event Generators at Belle II	FERBER, Torben
18:00	[5] Heavy quark masses from QCD sum rules	MASJUAN, Pere

Soccer match - Aula Seminari (19:00-20:00)

Dinner - Aula Seminari (21:00-23:00)

# Agenda

## Tuesday 21 April 2015

#### Radiative Corrections and MC generators III - Aula Seminari (09:00-11:00)

time [id] title	presenter
09:00 [9] Current status of CARLOMAT 3.0, an automatic tool for low energetic electron-positron annihilation into hadrons	KOLODZIEJ, Karol
09:30 [11] A first glance towards a dispersive formalism for gamma*gamma to pi pi	MASJUAN, Pere
10:00 [13] Current study of two and three pion decay modes within TAUOLA	SHEKHOVTSOVA, Olga
10:30 [16] A new approach to evaluate a_mu^{HLO}	VENANZONI, Graziano

#### Discussion on status and prospects of the WG and H2020 - Aula Seminari (11:30-12:30)

- Presenters: KUPSC, Andrzej

# 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

Thanks again to all authors!!!

Remember to quote the paper



Measurements of R, the ratio of cross sections of hadronic to muonic final states in  $e^+e^-$  annihilation, in the energy range just above the open charm threshold. From S. Actis et al.: Quest for precision in hadronic cross sections at low energy: Monte Carlo tools vs. experimental data

volume 66 · numbers 3–4 · april · 2010





# We think that it's timely to make another report on the progress of the field

At the next WG meeting (in China) we can have this discussion

Next year will be the 10<sup>th</sup> anniversary of our WG...we should think how (and where) to celebrate it!

**Starting Meeting** of the Working Group on Radiative Corrections and Generators for Low Energy Hadronic Cross Section and Luminosity 16-17 October 2006 FRASCATI

Henryk's presentation at our 1<sup>st</sup> meeting in Frascati

## Remembering Eduard in Dubna (6-9 April 2015)

# Home Organizing Committee Scientific program Registration Participant List Travel Information Dubna and JINR maps Contacts

Seminar "Selected problems in quantum field theory" dedicated to the memory of professor E. A. Kuraev



#### Dear Colleagues!

The <u>Bogoliubov Laboratory of Theoretical Physics</u> (BLTP, JINR) will hold a broadened seminar on high ener devoted to the memory of professor Eduard Alekseevich Kuraev (17.10.1940--04.03.2014).

The seminar will be held on 6-8 April 2015 at BLTP JINR in Dubna (Russia).

We are pleased to invite you to participate in our seminar. The subjects of the talks are supposed to cover wid physical fields as prof. Kuraev was always interested in different subjects and problems.

One of the sections of the seminar will be devoted to memoirs which anyone is welcome to share.

# How to reach <1% on $\sigma_{\rm HAD}$ ?

- Improve experimental accuracy
  - Systematic errors under control?
- Improve theory:
  - RC?
  - Modelling of hadron-photon interaction?
- Tuning comparison of MC generator very important:
  - For luminosity this was done;
  - For ISR and scan still the situation is unsatisfactory, and we should try to improve it.
  - FSR modelling should be improved

HLbL contribution can be a limiting factor for the calculation of  $a_{\mu}$ 

- As today  $\delta a_{\mu}^{LbL} = [2.5-4]10^{-10}$
- δa<sub>µ</sub><sup>BNL</sup> =610<sup>-10</sup>→1.5 10<sup>-10</sup>
- How to improve? γγ physics can help?
- Yes

Many experimental efforts on that

## New data are coming from VEPP2000,DAFNE, BESIII, (Super)Belle. But which is the accuracy on RC and MC corrections?

-Accuracy on gg and lepton channels? -Accuracy on hadronic channels?

- Many talks at the meeting (in particular new preliminary  $2\pi$  measurement from BESIII)

## http://arxiv.org/pdf/1504.02228.pdf

## An interesting approach for $a_{\mu}^{HLO}$

Towards a space-like determination of the leading hadronic corrections to the muon  $g-2 \stackrel{\star}{\Rightarrow}$ 

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#### Abstract

We propose a novel approach to determine the leading hadronic correction to the muon g-2 using measurements of the effective electromagnetic coupling in the space-like region extracted from Bhabha scattering data. Although challenging, we argue that this alternative method may become feasible at flavor factories and possibly competitive with the accuracy of the present determinations obtained with the dispersive approach via time-like data.

Feasible at existing e+e- machines? See GV talk tomorrow Which is the status (and prospects) of Bhabha calculation?

- Dinner this evening:
  - It will be at B&B da Giacomo at ~8:30
  - We will go there with cars
  - We maybe have a soccer match before

Bad Breakfast da Giacomo Via di Colonna, 5 00044 Frascati RM



This time due to lack of funding we will ask 50Eur fee to participants who can be reimbursed (rita will come at ~3:00pm)

## spare

## Data and place for next meeting?

- We would like to keep the tradition of one meeting at Frascati and one abroad. Since the fall meeting will be in Hefei, China, on September as satellite of PHIPSI15 Conf (23-26/09/15), the April meeting will be most likely in Frascati
- When: What about 13-14 April (Mon-Tue)?
- When the September meeting:





## spare

# Structure of the WG

- Luminosity (G. Montagna, F. Nguyen)
- R scan (A. Arbuzov, G. Fedotovich)
- ISR (H. Czyz, G. Venanzoni)
- Tau (Z. Was, D. Epifanov)
- Hadronic VP, g-2 and ∆a<sub>em</sub> (T. Teubner, S. Eidelman)
- gamma-gamma physics(S. Ivashin, D. Moricciani)
- FSR models (S. Gorini, A. Denig)

## Ultimate goal of $\sigma_{HAD}$ : 1% up to J/ $\psi$ ( $\Psi$ (4s)?)



Which is the situation on MC above 1 GeV? (see S. Eidelman presentation)

Contribution of different energy regions to the dispersion integral and the error to a<sup>had</sup>

F. Jegerlehner, Talk at PHIPSI08 1.0 GeV  $ho,\omega$ *ρ*,*ω* ~75% ~40% (mostly  $2\pi$ )  $\begin{array}{l} 0.0 \ \mathrm{GeV}, \, \infty \\ 9.5 \ \mathrm{GeV} \end{array}$  $\begin{array}{c} 0.0 \ \mathrm{GeV}, \infty \\ 3.1 \ \mathrm{GeV} \end{array}$ 3.1 GeV 2.0 GeV 2.0 GeV  $\phi,\ldots$  $\phi,\ldots$ ~55% 1.0 GeVVery important also the region 1-2 GeV error<sup>2</sup>

contributions

Experimental errors on  $\sigma^{had}$  translate into theoretical uncertainty of  $a_{\mu}^{had}$ ! → Needs precision measurements!

### A rough estimate for g-2

$$a_{\mu}^{exp} - a_{\mu}^{theo,SM} = (27.7 \pm 8.4)10^{-10}$$
 (3.3 $\sigma$ ) [Eidelman, TAU08]  
8.4 =  $\sim 5_{HLO} \oplus \sim 3_{LbL} \oplus 6_{BNL}$   
4 3 3 1.6 NEW G-2 7-8 $\sigma$  (if 27.7 will remain the same))

$$\delta a_{\mu}^{HLO}$$
=5.29=3.0( $\sqrt{s}$ <1GeV)  $\oplus$ 3.9(1<  $\sqrt{s}$ <2GeV) FJ08

## $\delta a_{\mu}^{\text{HLO}} \rightarrow 3=2.5 (\sqrt{s} < 1 \text{GeV}) \oplus 1.5 (\sqrt{s} < 1 \text{GeV})$ This means: $\delta \sigma_{\text{HAD}} \sim 0.4\% \sqrt{s} < 1 \text{GeV} (\text{instead of } 0.7\% \text{ as now}))$ $\delta \sigma_{\text{HAD}} \sim 2\% 1 < \sqrt{s} < 2 \text{GeV} (\text{instead of } 6\% \text{ as now}))$

Precise measurement of  $\sigma_{HAD}$  at low energies very important also for  $\alpha_{em}$  !!!