

ORESTE NICROSINI
I.N.F.N. – SEZIONE DI PAVIA



PR21*

Teoria di campo delle interazioni fondamentali

Responsabile nazionale: P. Nason (MIB)

Partecipanti 2012(2013)

L. Barzè*, **M. Chiesa**, G. Montagna,
O. Nicosini, F. Piccinini, **V. Prospero**

<http://www.pv.infn.it/~hepcomplex>

† G. Balossini
† C. Bignamini (RM31)
† G. Bormetti (econophysics, IUSS-INFN/SNS)
† D. Delpini (econophysics, Dip. Economia)

† V. Cazzola (econophysics)
† G. Livan (econophysics)

Collaboratori

† C.M. Carloni Calame (Southampton)
A. Vicini (Milano)
P. Nason (CERN&Mib)

Consiglio di Sezione INFN

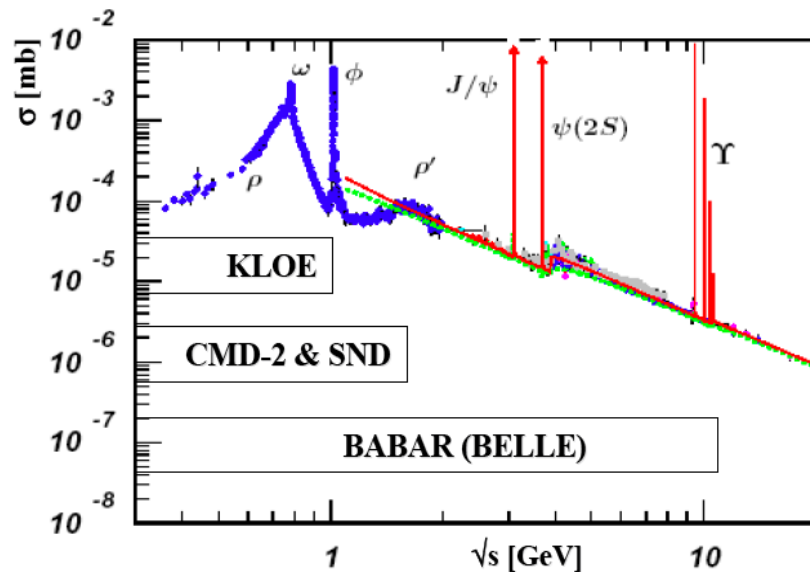
Pavia, 20 giugno 2012

*Giudicata eccellente in valutazione fine 2010

BabaYaga@NLO at flavour factories (BES, DAFNE, SuperB...)

Precision measurements at e^+e^- colliders between 1 GeV - 10 GeV require a knowledge of **luminosity** at a **0.1%** accuracy (QED processes)

Improved BabaYaga with 0.1% precision used by KLOE, BES, CLEO, BABAR... for Bhabha, gamma gamma, $\mu^+ \mu^-$

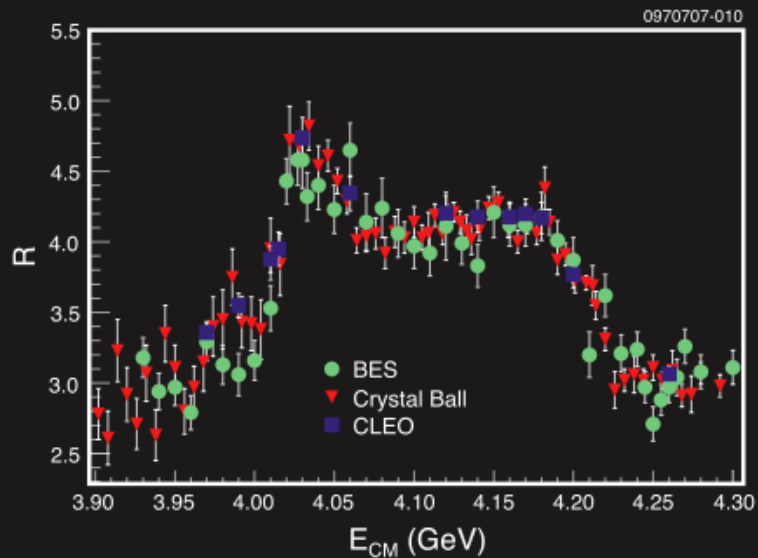


Talks:

C.M. Carloni Calame,
The Summer Topical Seminar on Frontier of Particle Physics 2010: Charm and Charmonium Physics,
Pechino, agosto 2010

G. Montagna,
Monte Carlo Luminosity Tools: Status and Perspectives,
8th Meeting RMCLow WG, Liverpool, settembre 2010

BabaYaga@NLO now implemented in the data analysis software of BES and Belle (C.M. Carloni Calame, in collaboration with P. Wang, Pechino)



Working Group “Radiative Corrections and Monte Carlo Generators for Low Energies” (RADIOMONTECARLOW)



Combining Monte Carlo efforts from the wild east to the wild west since 2006! (S. Muller)

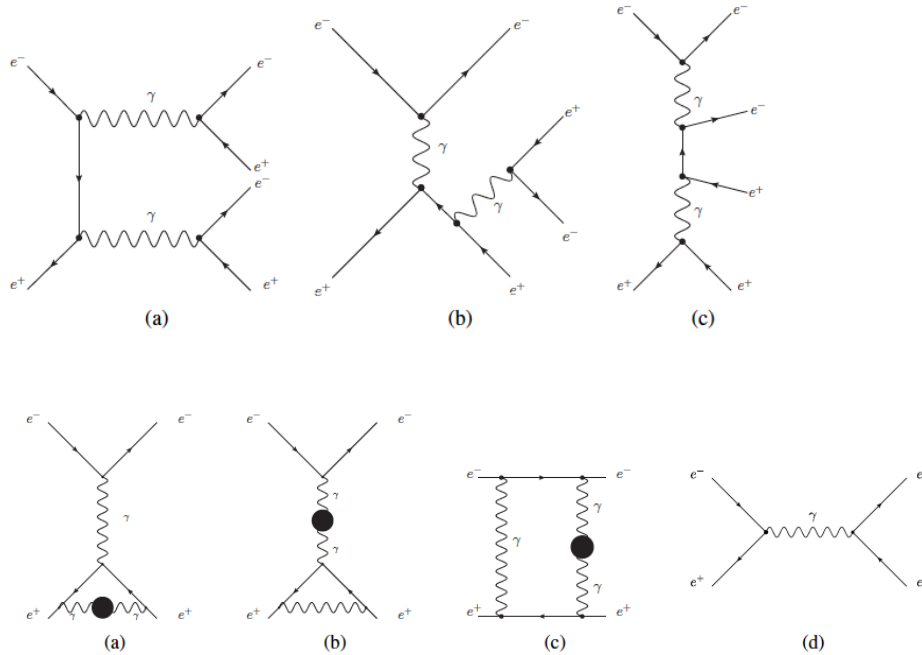
S. Actis *et al.*,

“Quest for precision in hadronic cross sections at low energy: Monte Carlo tools vs. experimental data”

EPJ C66 (2010) 585-686

(46 cit. spires)

NNLO pair corrections to Bhabha scattering



In collaboration with
 H. Czyz, J. Gluza, M. Gunia (Katowice)
 T. Riemann (DESY-Zeuthen)
 M. Worek (Wuppertal)

G. Montagna - *NNLO massive corrections to Bhabha scattering and theoretical precision of BabaYaga@NLO*,
 PHIPSI11, Novosibirsk, September 2011
 (invited talk)

F. Piccinini - *(Some aspects) of gamma-gamma physics at Flavour Factories*
 SuperB Workshop, 29 May - 1 June 2011

Comparison with NNLO exact computation: agreement better than 0.1%;
 For future applications (SuperB) to be included in **BabaYaga@NLO** (structure function).

C. Carloni Calame, H. Czyz, J. Gluza, M. Gunia, G. Montagna,
O. Nicrosini, F. Piccinini, T. Riemann, M. Worek,
**NNLO leptonic and hadronic corrections to Bhabha scattering and
luminosity monitoring at meson factories.**
Journal of High Energy Physics **1107** (2011) 126

C.M. Carloni Calame, H. Czyz, J. Gluza, M. Gunia, G. Montagna,
O. Nicrosini, F. Piccinini, T. Riemann, M. Worek,
**NNLO massive corrections to Bhabha scattering and theoretical
precision of BabaYaga@NLO.**
Nuclear Physics **B** (Proceedings Supplements) (2012), pp. 293-297

Dark matter from a secluded sector of the SM

In some BSM models, a secluded DM sector is assumed, DM interacting via a new Z' weakly coupled light boson. Z' could be mixed to standard EW neutral bosons, resulting in possible new signals detectable at high luminosity flavour factories. Possible explanation for 511 KeV line, positron (but not anti-proton) excess...

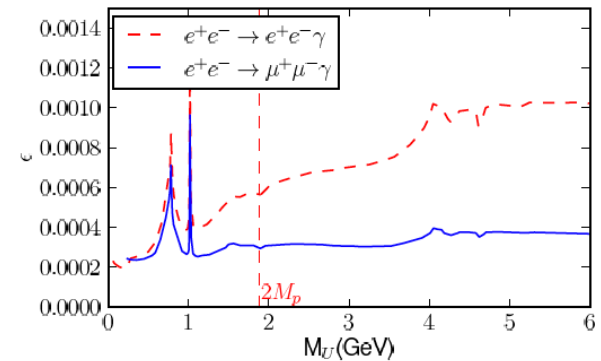
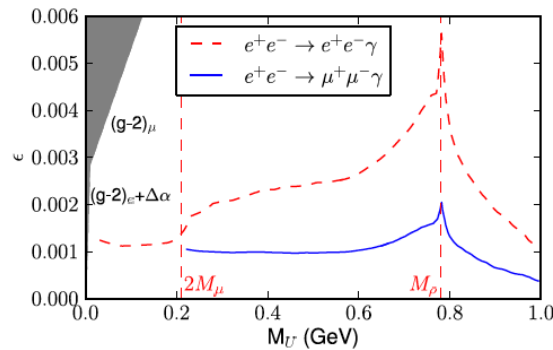
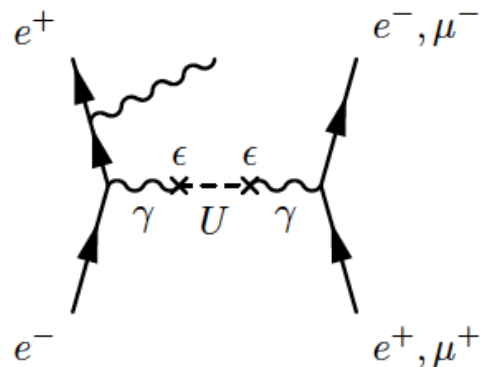
Talks:

Luca Barzè

- Light dark forces at flavour factories, DISCRETE 2010, 6-10 dic 2010, Roma;
- U boson searches at e^+e^- Colliders, LC10, 30 nov-3 dic 2010, Frascati;
- An event generator for Dark Matter search at flavour factories, XCVI Congresso Nazionale SIF 2010, 20-24 set 2010, Bologna;
- Looking for Dark Matter at Leptonic Colliders, TOOLS 2010, 29 giu - 2 lug 2010, Winchester (UK).
- Light dark forces at SuperB, XVII SuperB Workshop Kick Off Meeting, 01 giu 2011

Guido Montagna

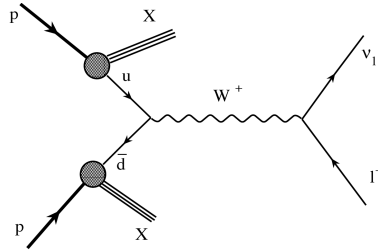
- Probing Dark Forces at GeV-scale Colliders, XXXV International Conference of Theoretical Physics, MATTER TO THE DEEPEST: Recent Developments in Physics of Fundamental Interactions, Ustron (PL), settembre 2011 (invited talk)



L. Barze, G. Balossini, C. Bignamini, C.M. Carloni Calame, G. Montagna,
O. Nicrosini, F. Piccinini
Radiative Events as a Probe of Dark Forces at GeV-Scale e^+e^- Colliders
Eur.Phys.J. **C71** (2011) 1680

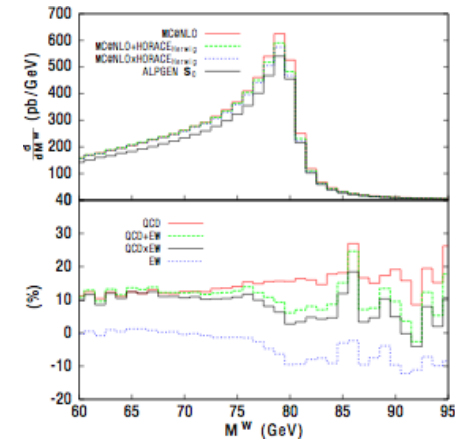
L. Barze, G. Balossini, C. Bignamini, C.M. Carloni Calame, G. Montagna,
O. Nicrosini, F. Piccinini
Probing dark forces at GeV-scale colliders
Acta Phys. Polon. **B42** (2011) 2461-2468

EW&QCD corrections to W/Z production at the Tevatron and LHC



W Mass

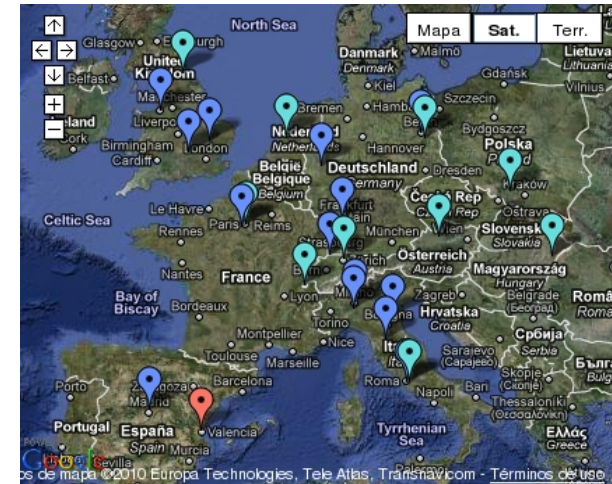
In collaboration with
 CDF & D0 coll.
 ATLAS & CMS coll.
 M. Moretti, M. Treccani and A. Vicini
 JHEP 1001:013, 2010



HORACE*

LHCPhenonet: network EU in 7th Framework Program
 “Advanced Particle Phenomenology in the LHC era”;
 48 mesi, started January 2011; tra i nodi INFN e UNIPV;
 coordinatore G. Rodrigo (Valencia)

*Used by CDF for the latest determination of W boson mass, and
 by ATLAS and CMS for Drell-Yan analysis



- **HORACE** \rightarrow **POWHEGW** Merging EW corrections into a QCD generator for Drell-Yan (the POWRACE project, Pavia + P. Nason); re-computing NLO EW corrections in terms of scalar integrals ('t Hooft-Veltman) in mixed dim. reg./mass schemes. State-of-the-art for Drell-Yan Physics
- Inclusion of pair corrections in HORACE (with I. Bizjak, A. Vicini, C.M. Carloni Calame) and assessment of EW effects and uncertainty (with L. Barzè and F. Piccinini) \rightarrow almost finalized paper on W mass shift

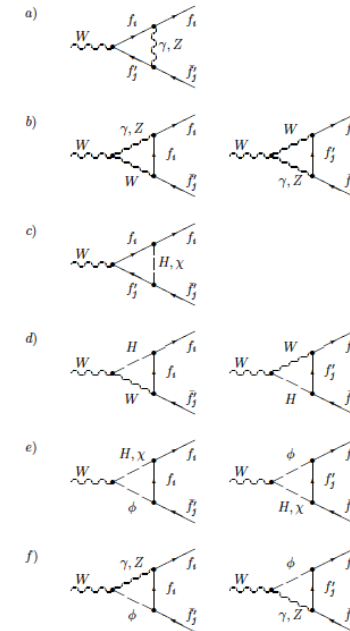


Figure 9.1: One-loop diagrams for $W \rightarrow f_i f_j$.

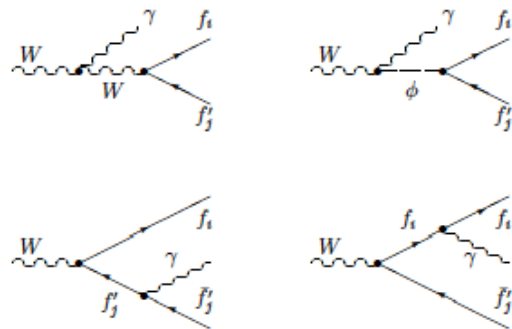


Figure 9.2: Bremsstrahlung Feynman diagrams for $W \rightarrow f_i f_j \gamma$.

- F. Piccinini, WG “EW precision measurements at the LHC”, *Mixed EW/QCD corrections in MCs*, CERN, April 2011
- L. Barzè, LHCPHenoNet Annual Meeting, *NLO EW corrections in the POWHEG-BOX*, Durham, 20.03.2012
- L. Barzè, LHC WG on Electroweak precision measurements, *Implementation of EW corrections in the POWHEG box: single W Production*, CERN, 30.11.2011

Luca Barze, Guido Montagna, Paolo Nason, Oreste Nicosini, Fulvio Piccinini
Implementation of electroweak corrections in the POWHEG BOX: single W production

JHEP **1204** (2012) 037 (e-Print: arXiv:1202.0465 [hep-ph])

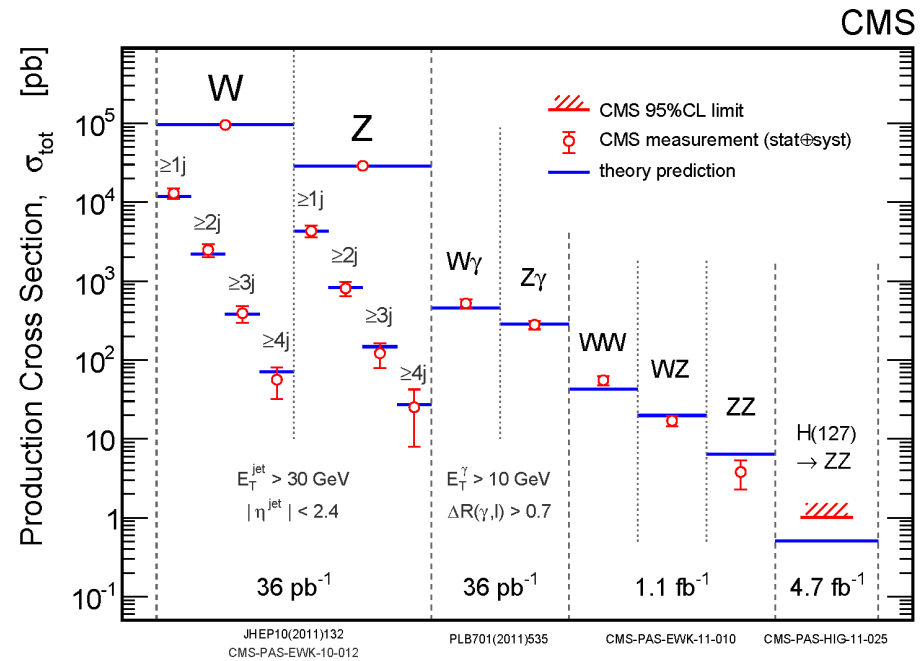
G. Balossini, C.M. Carloni Calame, G. Montagna, M. Moretti, O. Nicosini,
F. Piccinini, M. Treccani, A. Vicini
Combining electroweak and QCD corrections to Drell-Yan processes at hadron colliders

Presented by O. Nicosini at QCD@Work, 20-23 Jun 2010, Martina Franca, Valle d'Itria, Italy (invited talk)

AIP Conf. Proc. **1317** (2011) 25-32

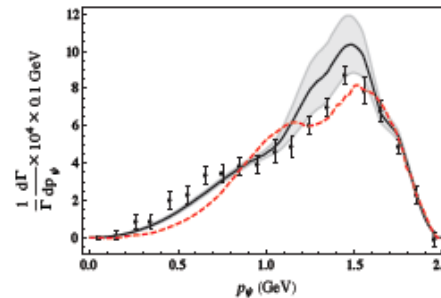
Perspectives – year 2012

- Inclusion of NC DY processes in POWHEG (Pavia + Vicini + Nason), almost finalized
- NLO QCD corrections to $W\gamma$ and $Z\gamma$ and implementation in POWHEG (with M. Chiesa and V. Prospero)



Exotic mesons

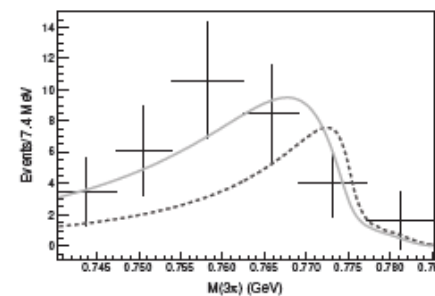
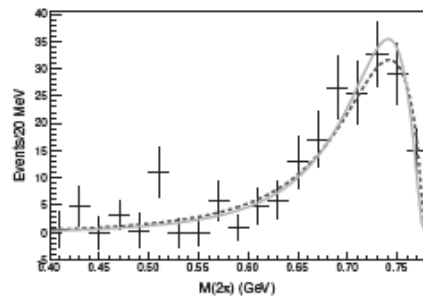
- Impact of XYZ states on the problem of missing J/ψ momentum in B decays



CLEO, BELLE, BABAR

Burns, Piccinini, Polosa, Proserpi, Sabelli, *Phys. Rev D*83 (2011) 114029

- Combined fit to BaBar (right plot) and Belle (left plot) data to study the (in)compatibility of channels $X(3872) \rightarrow J/\psi\omega \rightarrow J/\psi 3\pi$ ($J^{PC} = 2^{-+}$ favoured) and $X(3872) \rightarrow J/\psi\rho \rightarrow J/\psi 2\pi$ ($J^{PC} = 1^{++}$ favoured)



Faccini, Piccinini, Pilloni, Polosa, *arXiv:1204.1223 [hep-ph]*



Cluster di calcolo pv (Beowulf)

- 2002: richiesta di Oreste alla CSN4 per finanziamento
- 2003: installazione cluster Beowulf (Carloni)
- 2003-2011: espansione con fondi di "metabolismo"
- 2011: Cluster con un master + 16 nodi
per un totale di 48 core
- 4 ulteriori nodi disinventariati perche' non piu` funzionanti

Cluster di calcolo pv (Neowulf?)

- 2011: con i residui di bilancio acquisto di un server Dell 48 core e un desktop (12 core) con GPU Tesla C2050 (244 core)
- 2012: dopo un power cut il vecchio server non si accende piu'
Disinventariato il vecchio master + 16 nodi
- Costruito il nuovo cluster con server + 10 nodi (ultimi comprati da Radici e Guagnelli) per un totale di 144 core → L. Barzè