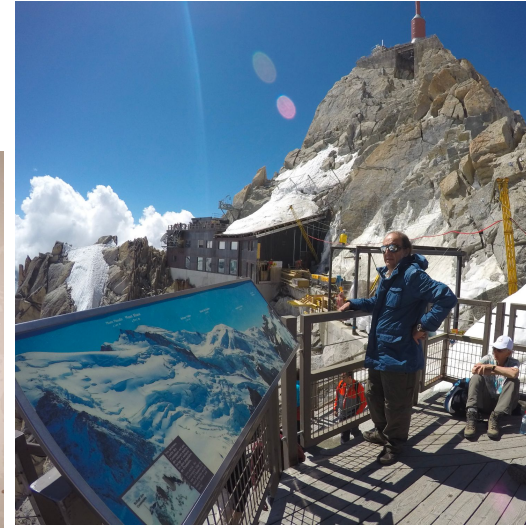
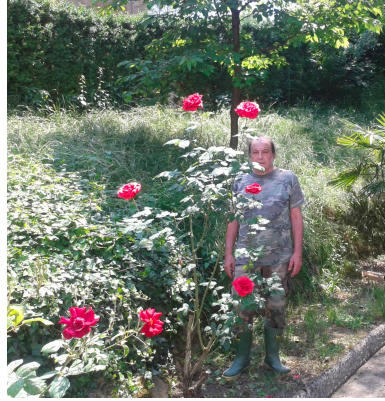

Paving the road to new discoveries at LHC: Physics and Life lessons from Giampiero



Raquel Gomez Ambrosio • 26/09/2022

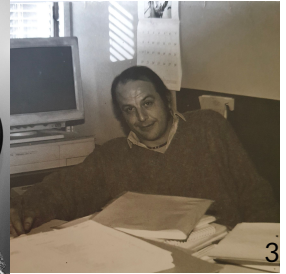
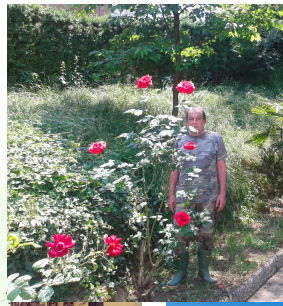
Things that Giampiero Likes



Cooking, Flowers,
Negroni, Kitties,
the Alps, Physics.....



Things that I like



Lesson 1: It's ok to be nervous before a talk, but start talking about physics and the nerves will fade

This talk is not only about physics, so I can't promise to keep my nerves at bay. I will start with the physics though...



Lesson 2: Always have an Outline

- ❖ Lessons from LEP and what to do after the bloody Higgs boson
- ❖ Our projects together: The bottom up and the top down
- ❖ The best projects: those still to come
- ❖ Life lessons:
 - When to fly
 - When to prepare your lectures
 - When to go to Solferino
 - When to say thank you

Lesson 3: What we learnt from LEP. Talk to the experimentalists

The LHC after the Higgs boson

- Define the BSM Lagrangian
- Renormalize it
- Perform precise predictions:
differential distributions,
pseudo-observables
- Perform the measurements
- Do a global fit



Nuclear Physics B

Volume 160, Issue 1, 26 November 1979, Pages 151-207



One-loop corrections for e^+e^- annihilation into $\mu^+\mu^-$ in the Weinberg model

G. Passarino ^{*}, M. Veltman

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[https://doi.org/10.1016/0550-3213\(79\)90234-7](https://doi.org/10.1016/0550-3213(79)90234-7)

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Abstract

Analytical expressions for the $e^+e^- \rightarrow \mu^+\mu^-$ cross section including all the one-loop radiative corrections in the context of the Weinberg model are presented. The systematic calculation of one-loop diagrams has been carried out using a recently proposed scheme. Numerical results are shown in a region from 40–200 GeV c.m. energy and different values of the scattering angle; they indicate that the percentage corrections are mainly due to soft photons. The only departure from QED-like correction can be seen in a region where the lowest-order cross section is lowered by weak-e.m. interference. In that region hard photon contributions are relatively prominent and perhaps within experimental possibilities.

Renormalizing the SMEFT Lagrangian

- Define the BSM Lagrangian
 - Renormalize it
 - Perform precise predictions:
differential distributions,
pseudo-observables
 - Perform the measurements
 - Do a global fit
-

NLO Higgs effective field theory and κ -framework¹

Margherita Ghezzi, Raquel Gomez-Ambrosio, Giampiero Passarino and
Sandro Uccirati

*Dipartimento di Fisica Teorica, Università di Torino,
Torino, Italy*

*INFN, Sezione di Torino,
Torino, Italy*

*E-mail: margherita.ghezzi@to.infn.it, raquel.gomez@to.infn.it,
giampiero@to.infn.it, uccirati@to.infn.it*

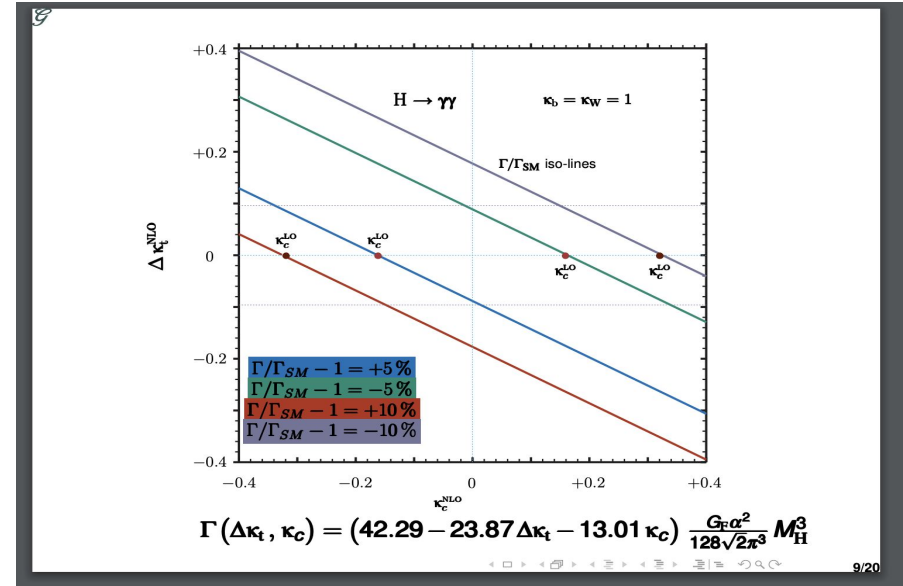
ABSTRACT: A consistent framework for studying Standard Model deviations is developed. It assumes that New Physics becomes relevant at some scale beyond the present experimental reach and uses the Effective Field Theory approach by adding higher-dimensional operators to the Standard Model Lagrangian and by computing relevant processes at the next-to-leading order, extending the original κ -framework. The generalized κ -framework provides a useful technical tool to decompose amplitudes at NLO accuracy into a sum of well defined gauge-invariant sub components.

KEYWORDS: Higgs Physics, Beyond Standard Model, Effective field theories

ARXIV EPRINT: [1505.03706](https://arxiv.org/abs/1505.03706)

Pseudo Observables

- Define the BSM Lagrangian
- Renormalize it
- Perform precise predictions:
differential distributions,
pseudo-observables
- Perform the measurements
- Do a global fit

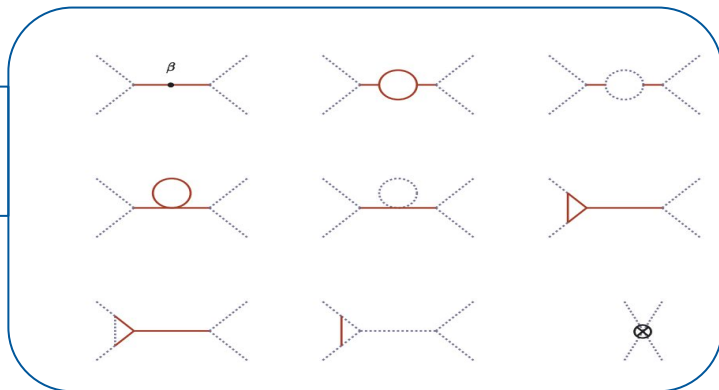


The HiggsTools handbook: a beginners guide to decoding the Higgs sector

M. Boggia, J.M. Cruz-Martinez, Hjalte Frellesvig, E.W.N. Glover, Raquel Gomez-Ambrosio, Giulia Gonella, Y. Haddad, Agnieszka Ilnicka, S.P. Jones, Z. Kassabov, F. Krauss, T. Megy, D. Melini, D. Napoletano, G. Passarino, S. Patel, M. Rodriguez-Vazquez¹, T. Wolf [Détails](#)

Connection with model builders

High
energy



Low energy behaviour of standard model extensions

Michele Boggia,^a Raquel Gomez-Ambrosio^b and Giampiero Passarino^b

^a *Albert-Ludwigs-Universität Freiburg, Physikalisches Institut, D-79104, Freiburg, Germany*

^b *Dipartimento di Fisica Teorica, Università di Torino, INFN, Sezione di Torino, Italy*

E-mail: michele.boggia@physik.uni-freiburg.de,
raquel.gomez@to.infn.it, giampiero@to.infn.it

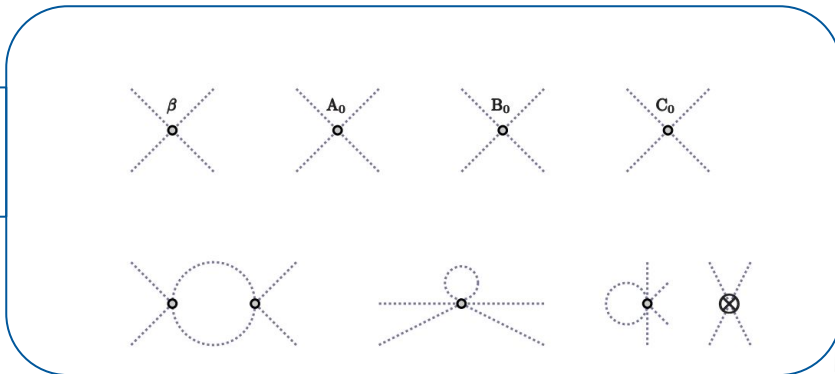
ABSTRACT: The integration of heavy scalar fields is discussed in a class of BSM models, containing more than one representation for scalars and with mixing. The interplay between integrating out heavy scalars and the Standard Model decoupling limit is examined. In general, the latter cannot be obtained in terms of only one large scale and can only be achieved by imposing further assumptions on the couplings. Systematic low-energy expansions are derived in the more general, non-decoupling scenario, including mixed tree-loop and mixed heavy-light generated operators. The number of local operators is larger than the one usually reported in the literature.

KEYWORDS: Effective field theories, Beyond Standard Model, Nonperturbative Effects, Renormalization Regularization and Renormalons

ARXIV EPRINT: [1603.03660](https://arxiv.org/abs/1603.03660)

JHEP05 (2016) 162

Low
energy

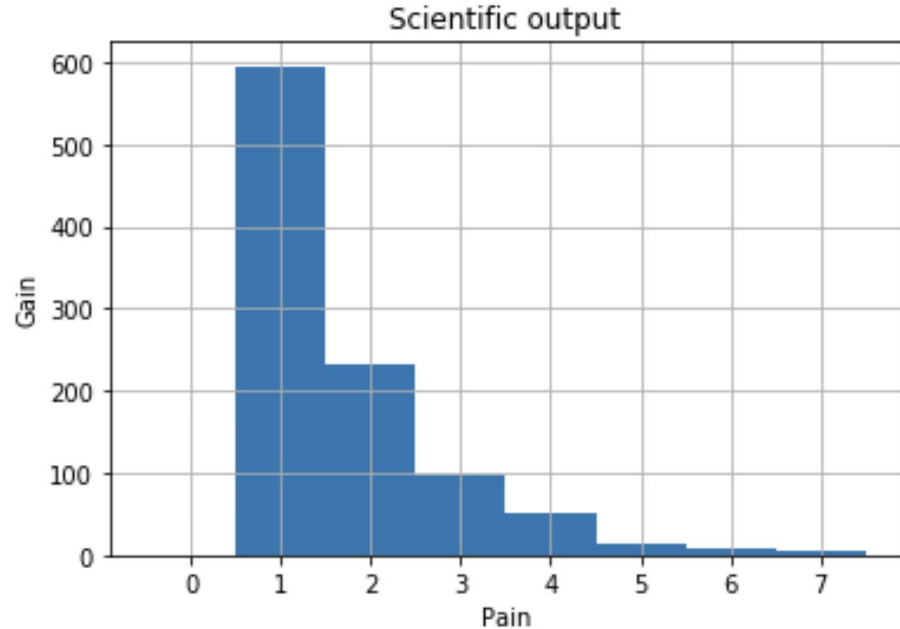


The loopy and fitty collaboration



Lesson 4: No Pain, No gain

The geometric distribution models the number of trials it takes to achieve a success in repeated experiments with a given probability of success.



Lesson 5: Always take the first flight in the morning



Lesson 6: Lectures are important, and so are the students. Spend time and energy preparing your classes.



Giampiero, as seen by the students



I deeply loved and feared his courses for the MSc. Having such a magnetic, charismatic teacher has been a real privilege. His approach to Physics, his rigour and dedication to both teaching and research taught me a lot and have been an inspiring example for me ever since.

Introduzione alla teoria dei Campi (Campi 0), 2011
Teoria dei Campi (Campi 1) 2011

Grazie Giampiero per averci mostrato le pieghe nascoste della realtà, insegnandoci il mondo dell'invisibile, della probabilità, dell'indeterminato.

Meccanica Quantistica, 2020

Grazie a Giampiero per la classe con cui ci ha introdotto gli integrali a loop sondando la vera natura quantistica di una teoria e per aver sempre ritagliato il tempo per rispondere alle nostre (stupide) domande.

Complementi di Teoria dei Campi, 2021

Il suo corso di MQ1 mi ha convinto a proseguire con la magistrale in teorica, cosa che mi ha dato grande soddisfazione!
Meccanica Quantistica, 2019

La tua disponibilità e gentilezza verso gli studenti hanno reso sopportabili anche i più lunghi conti di QFT.
Complementi di Teoria dei Campi, 2021

I corsi di Giampiero sono stati fondamentali e fondanti, non solo nel trasmettere le conoscenze tecniche ma anche e soprattutto nell'attenzione al rigore di cui ogni fisico teorico deve fare tesoro. E per chi pensa che la sua severità si estenda anche al di fuori delle lezioni, cito una delle sue frasi che mi ha più guidato negli anni dopo l'università: “mai estrapolare”.

Metodi Matematici per la Fisica II, 2016 & Fondamenti di Teoria dei Campi, 2017

Giampiero's courses have been fundamental and founding, not only at transmitting the technical details but also and above all, transmitting the attention to rigour that every theoretical physicist must treasure. And, for those who think that his strictness might extend beyond the lectures, I will cite one of his sayings that has most guided me after my University years: “NEVER EXTRAPOLATE”

Lesson 7: Fly High



Corollary: "It is not lonely in the top. I am tired of having company"

Lesson 7: Fly High



Actually, it is quite lonely at the top

Lesson 8: Never Give Up



*As you set out for Ithaka
hope your road is a long one,
full of adventure, full of discovery. [...]*

*Keep Ithaka always in your mind.
Arriving there is what you're destined for.
But don't hurry the journey at all.
Better if it lasts for years,
so you're old by the time you reach the island,
wealthy with all you've gained on the way,
not expecting Ithaka to make you rich.*

*Ithaka gave you the marvelous journey.
Without her you wouldn't have set out.
She has nothing left to give you now.*

*And if you find her poor, Ithaka won't have fooled you.
Wise as you will have become, so full of experience,
you'll have understood by then what these Ithakas mean.*

Lesson 9: If you are going to be depressed, don't let it last more than 2 days



Lesson 10: Always say Thank You at the end of your talk

