BSM Higgs and Georg

- but not only

Georg Fest

DESY, Hamburg

13 November, 2025

W. HOLLIK

MAX-PLANCK-INSTITUT FÜR PHYSIK, MÜNCHEN

A 30-years way through science (and more)

85 common publications [SPIRES], average citations: 195

the standard way	**the supersymmetric way**
precision observables	*precision observables*
	Higgs bosons

the common root

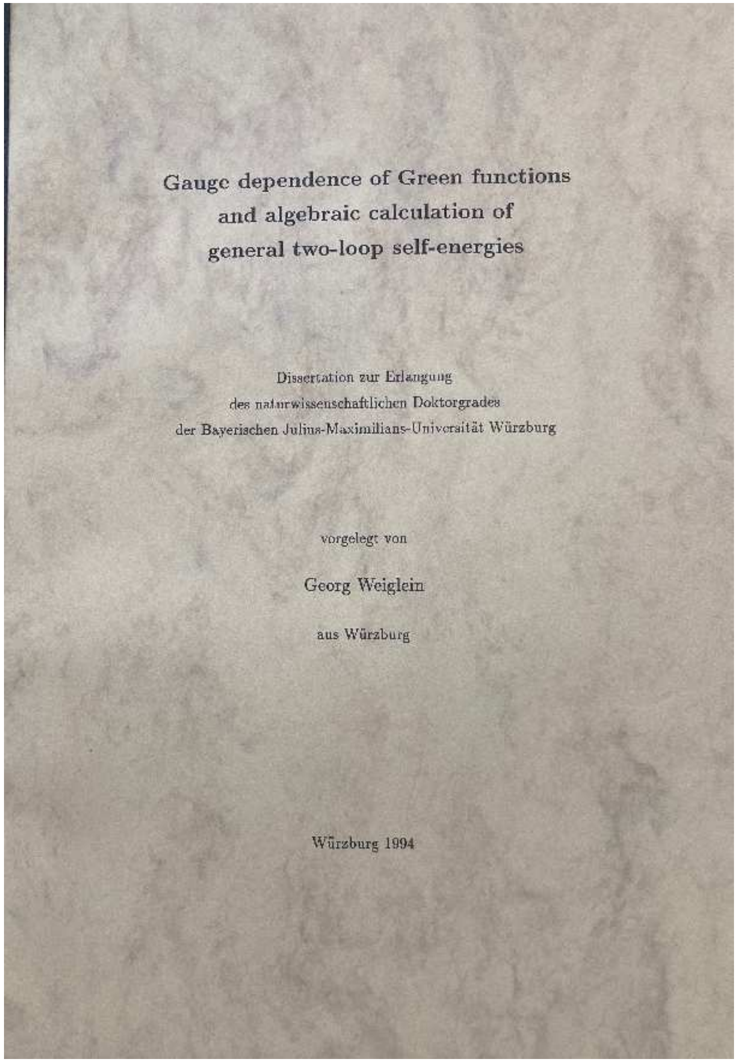
Physikalisches Institut, Universität Würzburg (until 1978)

common thesis adviser

Manfred Böhm at Würzburg University

many students, among others

- *Peter Becher (1975)*
- *Wolfgang Hollik (1979)*
- *Hubert Spiesberger (1984)*
- *Ansgar Denner (1986)*
- *Thomas Sack (1988)*
- *Stefan Dittmaier (1993)*
- **Georg Weiglein (1994)**
- *Thomas Hahn (1996)*
- . . .



Gauge dependence of Green functions
and algebraic calculation of
general two-loop self-energies

Dissertation zur Erlangung
des naturwissenschaftlichen Doktorgrades
der Bayerischen Julius-Maximilians-Universität Würzburg

vorgelegt von

Georg Weiglein

aus Würzburg

Würzburg 1994

Georg's thesis

basis for 2-loop self energies

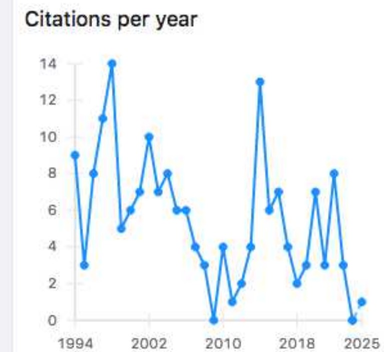
- *algebraic reduction of tensor integrals*
- *tool for practical calculations:* **TwoCalc**

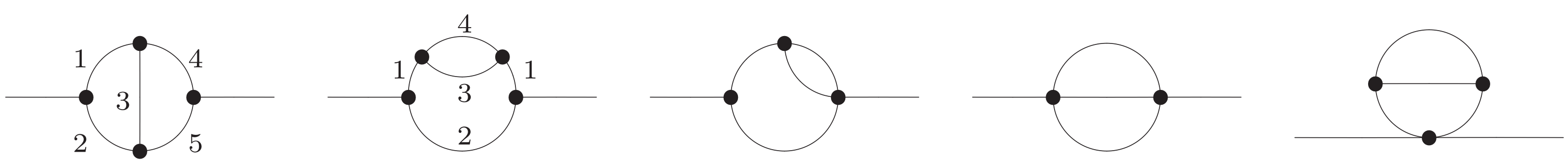
Reduction of general two loop selfenergies to standard scalar integrals

G. Weiglein (Wurzburg U.), R. Scharf (Wurzburg U.), M. Bohm (Wurzburg U.)
Sep 8, 1993

31 pages
Published in: *Nucl.Phys.B* 416 (1994) 606-644
e-Print: hep-ph/9310358 [hep-ph]
DOI: 10.1016/0550-3213(94)90325-5
Report number: PRINT-93-0647 (WURZBURG)
View in: ADS Abstract Service

pdf   cite   claim   reference search   175 citations





numerical evaluation via 1-dim. integral representions

Stefan Bauberger, thesis

Calculation of two-loop self-energies in the electroweak Standard Model

S. Bauberger (Wurzburg U.), M. Böhm (Wurzburg U.), G. Weiglein (Wurzburg U.), Frits A. Berends (Leiden U.), M. Buza (Leiden U.)

Jun, 1994

20 pages

Part of Proceedings, 2nd Zeuthen Workshop on Elementary Particle Theory: Physics at LEP200 and Beyond : Teupitz, Germany, April 10-15, 1994, 95-114

Published in: *Nucl.Phys.B Proc.Suppl.* 37 (1994) 2, 95-114

Contribution to: 2nd Zeuthen Workshop on Elementary Particle Theory: Physics at LEP200 and Beyond, 95-114

Published: 1994

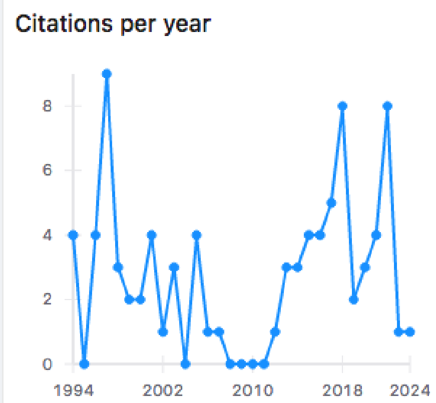
e-Print: hep-ph/9406404 [hep-ph]

DOI: 10.1016/0920-5632(94)90665-3

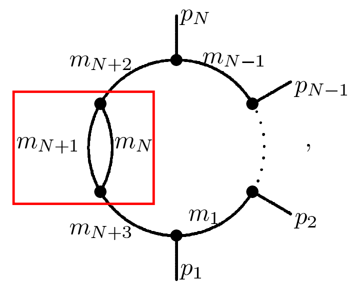
Report number: INLO-PUB-11-94

View in: ADS Abstract Service

pdf cite claim reference search 85 citations



also for 1-loop N-point integrals with self-energy insertion



precision calculation environment in the mid 1990s

Standard Model

EW precision observables

complete 1-loop calculations
+ leading 2-loop terms

no full 2-loop calculation
but
needed by exp. accuracy

Supersymmetric model (MSSM)

EW precision observables

complete 1-loop calculations

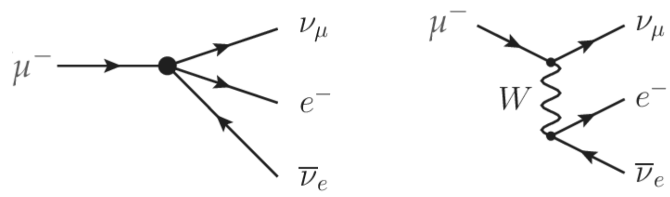
Higgs bosons $h, H, A, H^{\pm}$

$M_h < M_Z$ *at tree level*
$+\Delta M_h$ *shift by 1-loop terms*

complete 1-loop calculations
for Higgs mass spectrum

2-loop calculations 'in statu nascendi'

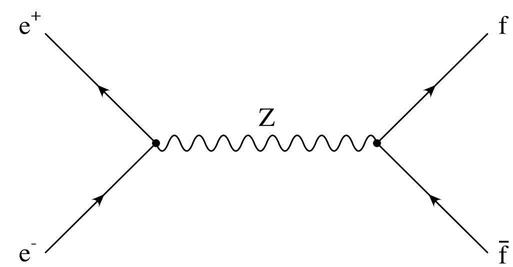
Fermi constant and W−Z mass correlation



- $$\sin^2\theta_W = 1 - \frac{M_W^2}{M_Z^2}, \qquad \frac{G_F}{\sqrt{2}} = \frac{\pi\alpha}{2M_W^2\sin^2\theta_W}\left(1 + \Delta r\right)$$

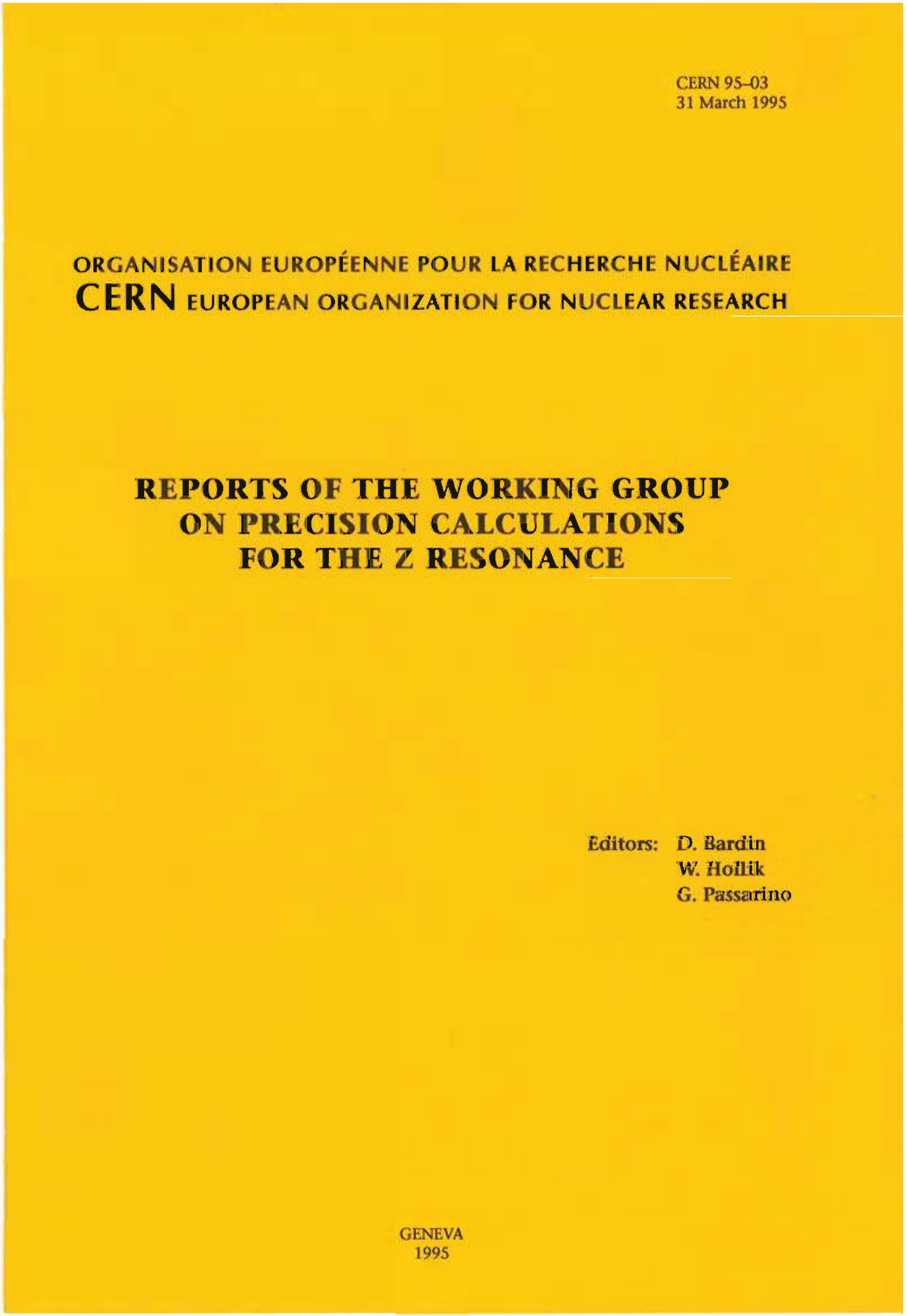
Z resonance observables

$$e^+e^- \to f\bar{f}$$



- effective Z boson couplings with higher-order $\Delta g_{V,A}$

$$g_V^f \to g_V^f + \Delta g_V^f, \qquad g_A^f \to g_A^f + \Delta g_A^f$$


CERN 95-03
31 March 1995

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

REPORTS OF THE WORKING GROUP
ON PRECISION CALCULATIONS
FOR THE Z RESONANCE

Editors: D. Bardin
W. Hollik
G. Passarino

GENEVA
1995

triggered by LEPEWWG

updated codes for
precision observables

systematic estimate
of theoretical errors

$\Rightarrow$ *"blueband plot"*

but: no full 2-loop calculation yet

Institut für Theoretische Physik, Karlsruhe

- 1995: Georg joined the Institute (coming from Bielefeld) strong enhancement of the upcoming two-loop activities
- until 2000/2001: significant work at the two-loop level (SM and MSSM)
- some names from that period:

  Abdelhak Djouadi, Postdoc
  Jose Ignacio Illana, Postdoc
  Thomas Hahn, Postdoc
  Sven Heinemeyer, PhD Student
  Dominik Stöckinger, PhD Student
  Ayres Freitas, Diploma Student
  Heidi Rzehak, Diploma Student
  ...

KLOE Workshop 1996 "Hadronic Contribution to Photon Vacuum Polarization"

the SM two-loop race

Status: one-loop + dominant ho. contributions to Δr

$$\Delta r = \Delta\alpha - \frac{c_{\rm w}^2}{s_{\rm w}^2}\Delta\rho + \Delta r_{\rm rem}$$

$$\Delta\alpha = \Pi^{\gamma}_{\rm ferm}(M_Z^2) - \Pi^{\gamma}_{\rm ferm}(0) \quad \rightarrow \quad \alpha(M_Z) = \frac{\alpha}{1-\Delta\alpha}$$

$$\Delta\rho = \frac{\Sigma_Z(0)}{M_Z^2} - \frac{\Sigma_W(0)}{M_W^2} = 3\frac{G_F m_t^2}{8\pi^2\sqrt{2}} \quad \textit{[one-loop]} \quad \sim \frac{m_t^2}{v^2} \sim \alpha_t$$

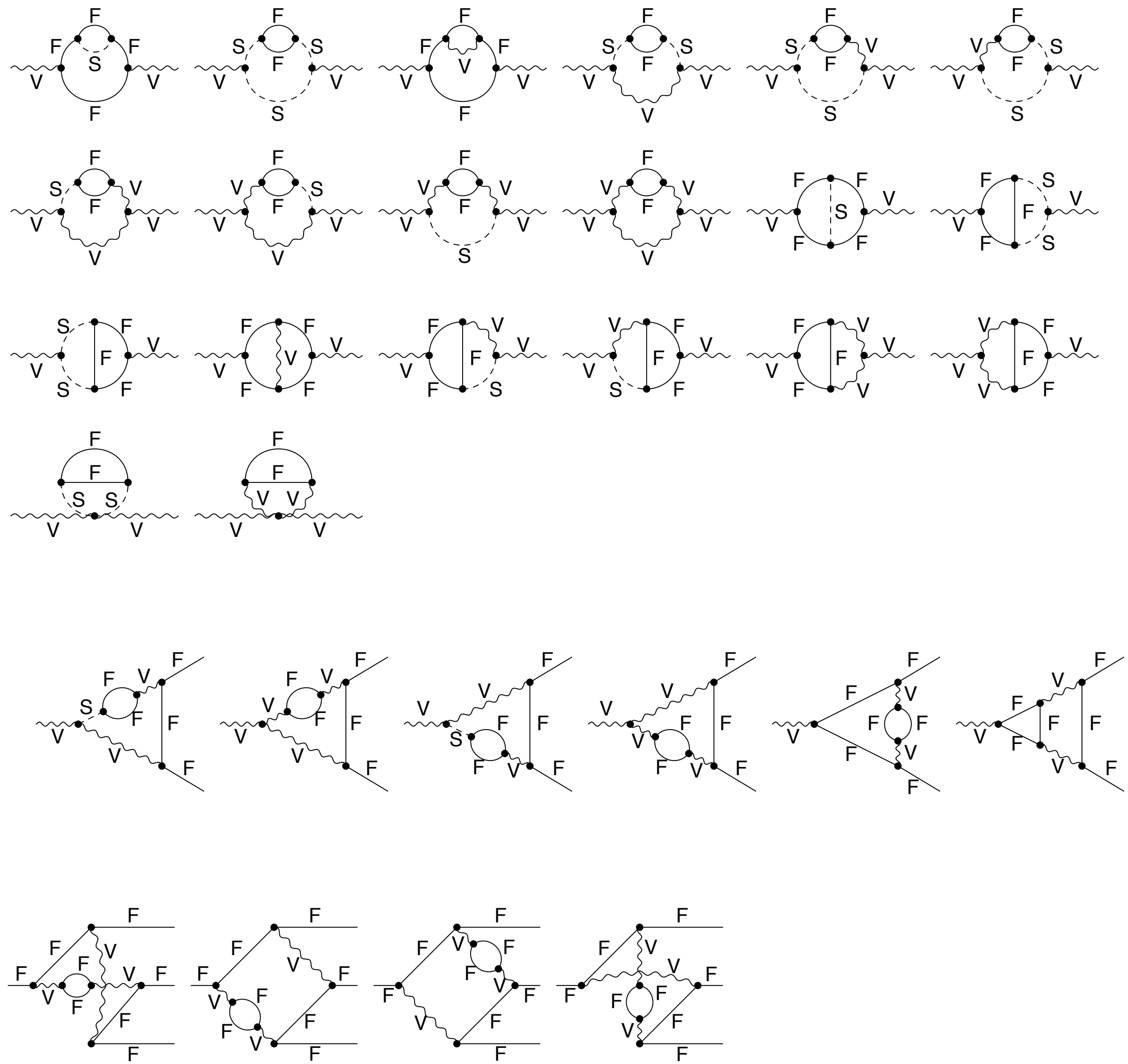
beyond one-loop order: $\quad \sim \alpha^2,\ \alpha\alpha_t,\ \alpha_t^2,\ \alpha^2\alpha_t,\ \alpha\alpha_t^2,\ \alpha_t^3, \ldots$

reducible higher order terms from $\Delta\alpha$ and $\Delta\rho$ via

$$1 + \Delta r \ \rightarrow \ \frac{1}{\left(1-\Delta\alpha\right)\left(1+\frac{c_{\rm w}^2}{s_{\rm w}^2}\Delta\rho\right) + \cdots}$$

towards a full two-loop calculation

$\Longrightarrow$ *diploma thesis of Ayres Freitas*



2-loop fermionic diagrams

ELSEVIER

14 December 2000

Physics Letters B 495 (2000) 338–346

PHYSICS LETTERS B

www.elsevier.nl/locate/npe

Complete fermionic two-loop results for the M_W–M_Z interdependence

A. Freitas [a], W. Hollik [b], W. Walter [b], G. Weiglein [c,*]

[a] *DESY Theorie, Notkestr. 85, D-22603 Hamburg, Germany*
[b] *Institut für Theoretische Physik, Universität Karlsruhe, D-76128 Karlsruhe, Germany*
[c] *CERN, TH Division, CH-1211 Geneva 23, Switzerland*

- *fermionic two-loop contributions (dominating)*

  Freitas, WH, Walter, Weiglein 2000

  Awramik, Czakon 2003

- *bosonic two-loop contributions*

  Awramik, Czakon 2002

  Onishchenko, Veretin 2002

- *simple parametrization for practical use (widely used in global fits)*

  Awramik, Czakon, Freitas, Weiglein 2003

Numerical evaluation

$$\Delta r = \Delta r^{(\alpha)} + \Delta r^{(\alpha^2)} + \Delta r^{(\alpha\alpha_s)} + \Delta r^{(\alpha\alpha_s^2)} + \Delta r^{(\alpha\alpha_s^3)} + \Delta r^{(\alpha^2\alpha_s)} + \Delta r^{(\alpha^3)}$$

(in units of 10^{-4})

$\mathcal{O}(\alpha)$	$\mathcal{O}(\alpha^2)$	$\mathcal{O}(\alpha\alpha_s)$	$\mathcal{O}(\alpha\alpha_s^2)$	$\mathcal{O}(\alpha\alpha_s^3)$	$\mathcal{O}(\alpha^2\alpha_s)$	$\mathcal{O}(\alpha^3)$
302.36	28.93	34.67	6.97	1.22	−1.44	−0.13

$M_Z = 91.1876,\ m_t = 172.76,\ M_H = 125.09$ (*in GeV*)

$\alpha_s(M_Z) = 0.1179,\ \Delta\alpha_{\rm had}^{(5)} = 0.02766$

- $\Delta r \implies M_W(m_t, M_H, \alpha_s, \Delta\alpha)$

reference value 2023 [Bagnaschi et al.]

$$M_W = 80.353\,\mathrm{GeV}$$

$\overline{\mathrm{MS}}$*-scheme [Degrassi, Gambino, Giardino]*

$$M_W = 80.351\,\mathrm{GeV}$$

precision observables in SUSY

Grifols, Solá 1985

Chankowski, Dabelstein, WH, Moesle, Pokorski, Rosiek 1994

Garcia, Solá 1994

Pierce, Bagger, Matchev, Zhang 1997

Djouadi, Gambino, Heinemeyer, WH, Weiglein 1997, 1998

two-loop $\Delta\rho^{\rm susy} \sim \alpha_s \alpha_t$

Hastier, Heinemeyer, Stöckinger, Weiglein 2005

two-loop $\Delta\rho^{\rm susy} \sim \alpha_t^2, \alpha_t \alpha_b, \alpha_b^2$

Heinemeyer, WH, Stöckinger, Weber, Weiglein 2006 $M_W, \Delta r$

Heinemeyer, WH, Weber, Weiglein 2008 *Z observables*

Heinemeyer, WH, Weiglein, Zeune 2013

M_W *and* Δr *in view of LHC results*

SUSY Precision Observables Precisely Evaluated

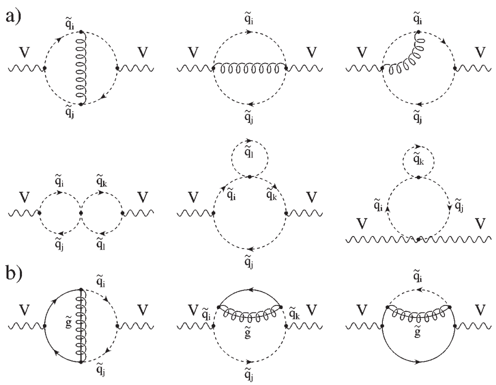
Fortran Code `SUSYPOPE` *[A. Weber, PhD thesis, Munich 2008]*

Supersymmetric Contributions to Electroweak Precision Observables: QCD Corrections

A. Djouadi,[1,2] P. Gambino,[3] S. Heinemeyer,[2] W. Hollik,[2] C. Jünger,[2] and G. Weiglein[2]
[1]*Physique Mathématique et Théorique, Université de Montpellier II, F-34095 Montpellier Cedex 5, France*
[2]*Institut für Theoretische Physik, Universität Karlsruhe, D-76128 Karlsruhe, Germany*
[3]*Max-Planck Institut für Physik, Werner Heisenberg Institut, D-80805 Munich, Germany*
(Received 16 December 1996)

We calculate the two-loop QCD correction to the scalar quark contributions to the electroweak gauge-boson self-energies at zero momentum transfer in the supersymmetric extension of the standard model (SM) and derive the associated $\mathcal{O}(\alpha_s)$ correction to the ρ parameter. The two-loop corrections modify the one-loop contribution by up to 30%; the gluino decouples for large masses. Contrary to the SM case where the QCD corrections are negative and screen the one-loop value, the corresponding corrections in the supersymmetric case are in general positive, increasing the sensitivity in the search for scalar quarks through their virtual effects in high-precision electroweak observables. [S0031-9007(97)03176-1]

PACS numbers: 12.15.Lk, 12.38.Bx, 12.60.Jv



first paper of Georg on a SUSY precision calculation

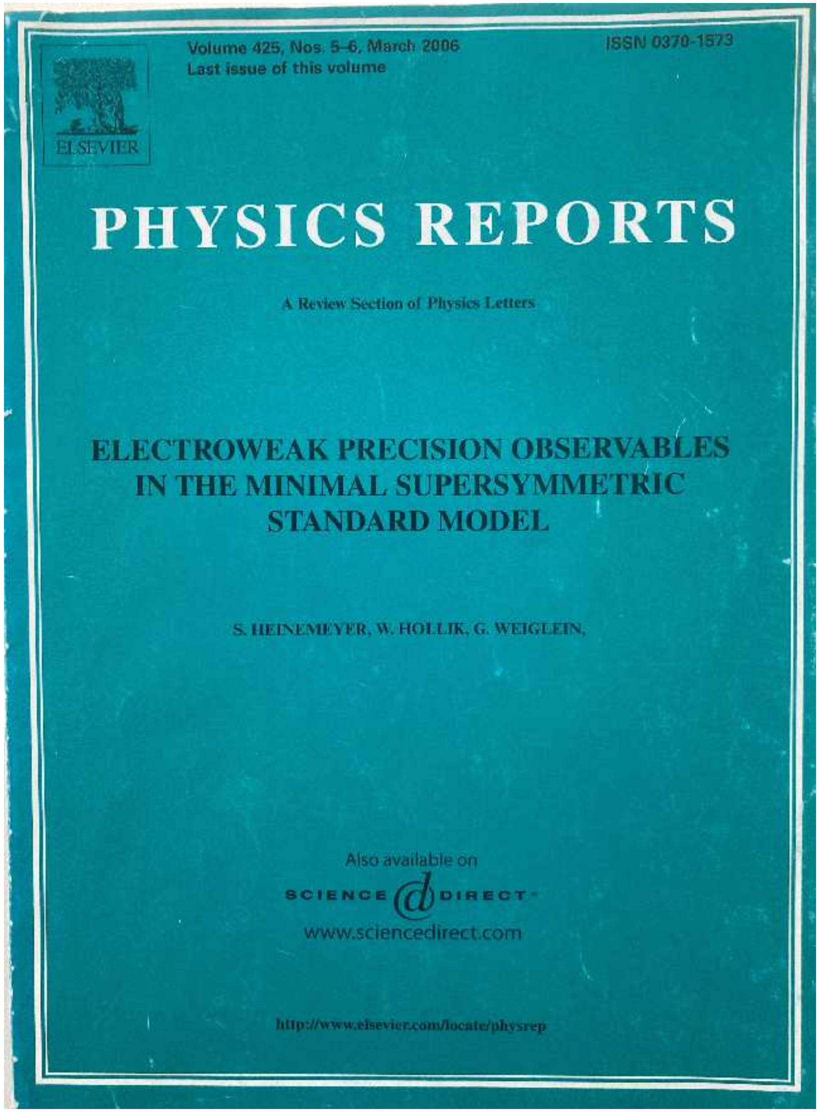
Supersymmetric Contributions to Electroweak Precision Observables: QCD Corrections

A. Djouadi[1,2], P. Gambino[3], W. Hollik[2], A. Rialfoni[2], C. Jünger[2], and G. Weiglein[2]
[1] *Physique Mathématique et Théorique, Université de Montpellier II, F–34095 Montpellier, France*
[2] *Institut für Theoretische Physik, Universität Karlsruhe, D–76128 Karlsruhe, Germany*
[3] *Max-Planck-Institut für Physik, Föhringer Ring 6, D–80805 München, Germany*

We calculate the two–loop QCD correction to the scalar quark contributions to the electroweak gauge boson self–energies at zero momentum–transfer in the supersymmetric extension of the Standard Model. We then derive the $\mathcal{O}(\alpha_s)$ correction to the contribution of the scalar top and bottom quark loops to the ρ parameter, which is the most sizable supersymmetric contribution to the electroweak mixing angle and the W–boson mass. The two–loop corrections modify the one–loop contribution by up to 30%; the gluino decouples for large masses. Contrary to the SM case where the QCD corrections are negative and screen the one–loop value, the corresponding corrections in the supersymmetric case are in general positive, increasing the sensitivity in the search for scalar quarks through their virtual effects in high–precision electroweak observables.

ACKNOWLEDGEMENT

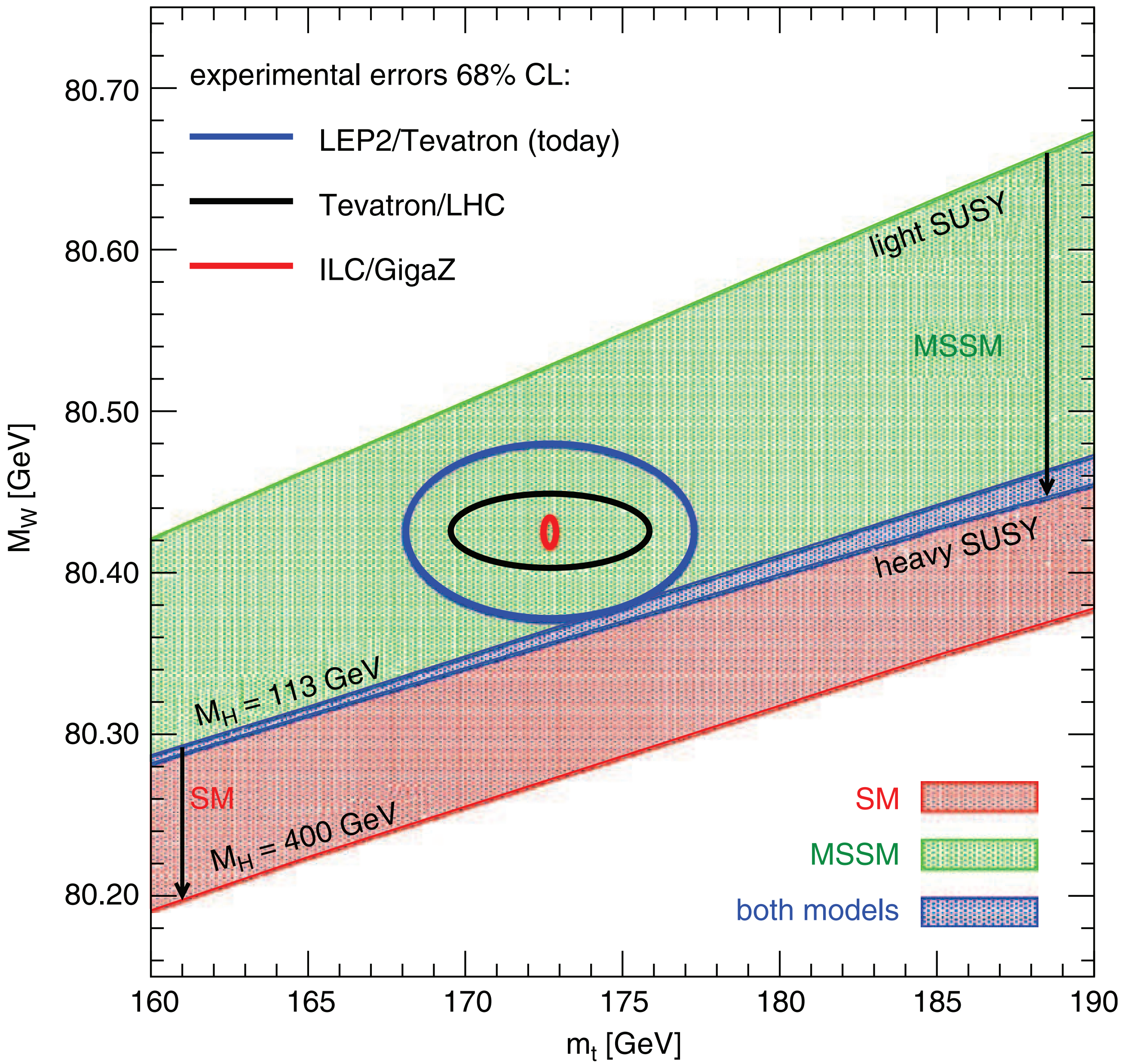
We thank Sven Heinemeyer for collaboration in an early stage of this paper.



Review on recent achievements for M_W and Z precision observables in the MSSM

took quite a few years from signing the agreement with the editor to the final manuscript

ceremony at RESTAURANTE DEL PUERTO, *Santander*



experimental errors 68% CL:
LEP2/Tevatron (today)
Tevatron/LHC
ILC/GigaZ
light SUSY
MSSM
heavy SUSY
M_H = 113 GeV
SM
M_H = 400 GeV
SM
MSSM
both models
80.70
80.60
80.50
80.40
80.30
80.20
M_W [GeV]
160
165
170
175
180
185
190
m_t [GeV]

CDF result 2022 [Science 276 (2022)]

references therein]. Many of these hypotheses include a source of dark matter, which is currently believed to comprise ~84% of the matter in the universe (*10*) but cannot be accounted for in the SM. Evidence for dark matter is provided by the abnormally high speeds of revolution of stars at large radii in galaxies, the velocities of galaxies in galaxy clusters, x-ray emissions sensing the temperature of hot gas in galaxy clusters, and the weak gravitational lensing of background galaxies by clusters [(*13*, *14*) and references therein]. The additional symmetries and fields in these extensions to the SM would modify (*15*–*24*) the estimated mass of the *W* boson (Fig. 1) relative to the SM expectation (*10*) of $M_W = 80{,}357 \pm 4_{\text{inputs}} \pm 4_{\text{theory}}$ MeV (*25*). The SM expectation is derived from a combination of analytical relations from perturbative expansions on the basis of the internal symmetries of the theory and a set of high-precision measurements of observables, including the *Z* and Higgs boson masses, the top-quark mass, the electromagnetic (EM) coupling, and the muon lifetime, which are used as inputs to the analytical relations. The uncertainties in the SM expectation arise from uncertainties in the data-constrained input parameters (*10*) and from missing higher-order terms in the perturbative SM calculation (*26*, *27*). An example of a nonsupersymmetric SM extension is a modified Higgs sector that includes an additional scalar field with no SM gauge interactions, which predicts an M_W shift of up to ~100 MeV (*17*), depending on the mass of the additional scalar particle and its inter-

photons" (*19*), restoration of parity conservation in the weak interaction (*20*), the possible composite nature of the Higgs boson (*21*), and model-independent modifications of the Higgs boson's interactions (*22*–*24*) have also been evaluated.

Previous analyses (*28*–*44*) yield a value of $M_W = 80{,}385 \pm 15$ MeV (*45*) from the combination of Large Electron-Positron (LEP) collider and Fermilab Tevatron collider measurements. The ATLAS Collaboration has recently reported a measurement, $M_W = 80{,}370 \pm 19$ MeV (*46*, *47*), that is comparable in precision to the Tevatron results. The LEP, Tevatron, and ATLAS measurements have not yet been combined, pending evaluation of uncertainty correlations.

CDF experiment at Tevatron

The Fermilab Tevatron produced high yields of *W* bosons from 2002 to 2011 through quark-antiquark annihilation in collisions of protons (p) and antiprotons ($\bar{p}$) at a center-of-mass

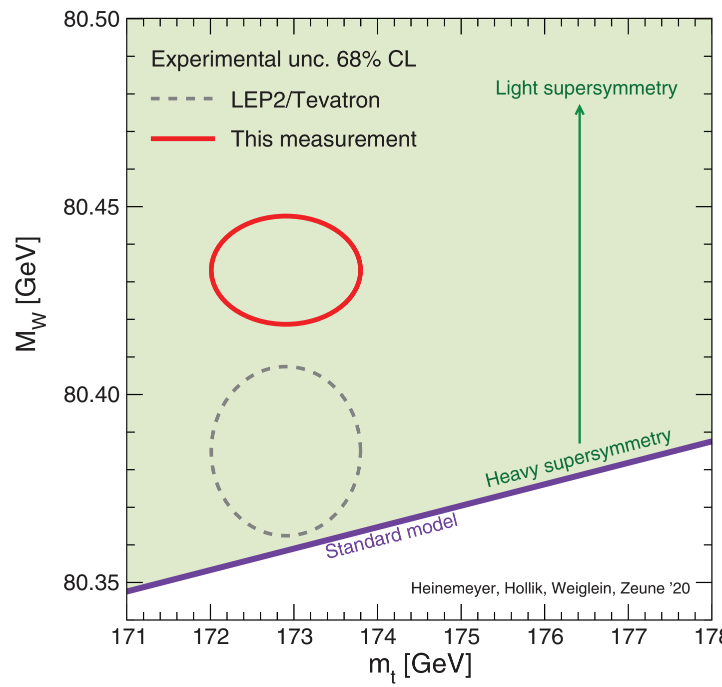
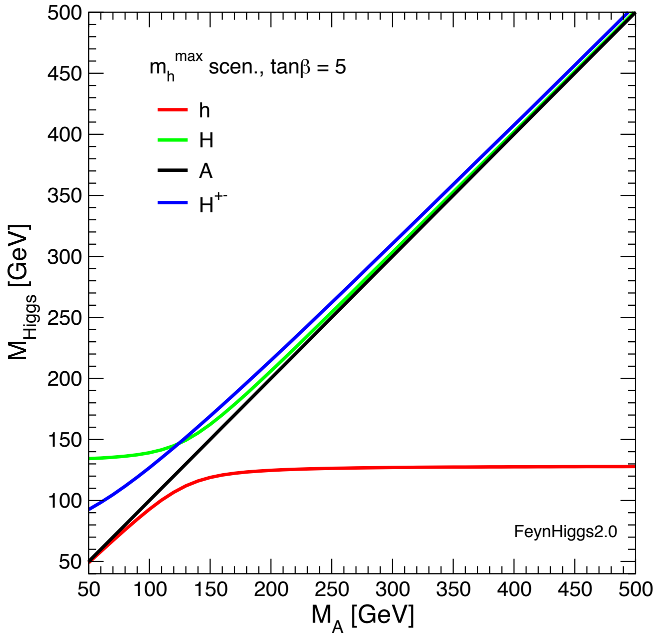


Fig. 1. Experimental measurements and theoretical predictions for the *W* boson mass. The red continuous ellipse shows the M_W measurement reported in this paper and the global combination of top-quark mass measurements, $m_t = 172.89 \pm 0.59$ GeV (*10*). The correlation between the M_W and m_t measurements is negligible. The gray dashed ellipse, updated (*16*) from (*15*), shows the 68% confidence level (CL) region allowed by the previous LEP-Tevatron combination $M_W = 80{,}385 \pm 15$ MeV (*45*) and m_t (*10*). That combination includes the M_W measurement published by CDF in 2012 (*41*, *43*), which this

SUSY Higgs bosons - or how Georg came to the Higgs

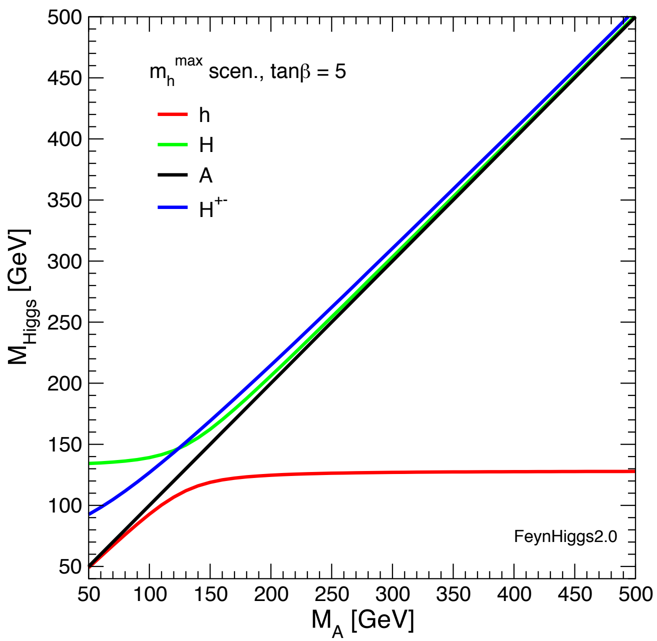


- *light Higgs boson* h^0

  $$m_h \leq m_Z |\cos(2\beta)| + \Delta m_{h^0}$$

  Δm_{h^0} *shift up to 50 GeV at 1-loop order*

SUSY Higgs bosons - or how Georg came to the Higgs



- *light Higgs boson* h^0

  $$m_h \leq m_Z|\cos(2\beta)| + \Delta m_{h^0}$$

  Δm_{h^0} *shift up to 50 GeV at 1-loop order*

VOLUME 66, NUMBER 14 PHYSICAL REVIEW LETTERS 8 APRIL 1991

Can the Mass of the Lightest Higgs Boson of the Minimal Supersymmetric Model be Larger than m_Z?

Howard E. Haber and Ralf Hempfling

Santa Cruz Institute for Particle Physics, University of California, Santa Cruz, California 95064

(Received 3 January 1991)

Z. Phys. C 67, 495–511 (1995)

ZEITSCHRIFT
FÜR PHYSIK C

The one-loop renormalization of the MSSM Higgs sector and its application to the neutral scalar Higgs masses

A. Dabelstein

Institut für Theoretische Physik, Universität Karlsruhe, Kaiserstrasse 12, D-76128 Karlsruhe, Germany
(e-mail: add@dmumpiwh.bitnet)

Received: 21 September 1994/Revised version: 25 October 1994

- *PhD thesis of Andreas Dabelstein*

  full one-loop calculation of h^0, H^0 masses vs A^0 mass

  on-shell renormalization scheme

Andreas Dabelstein *Thomas Sack*

Z. Phys. C 67, 495–511 (1995)

ZEITSCHRIFT
FÜR PHYSIK C

The one-loop renormalization of the MSSM Higgs sector and its application to the neutral scalar Higgs masses

A. Dabelstein

Institut für Theoretische Physik, Universität Karlsruhe, Kaiserstrasse 12, D-76128 Karlsruhe, Germany
(e-mail: add@dmumpiwh.bitnet)

Received: 21 September 1994/Revised version: 25 October 1994

- *PhD thesis of Andreas Dabelstein*
  full one-loop calculation of h^0, H^0 *masses vs* A^0 *mass*
  on-shell renormalization scheme
- *next step: calculation of the leading two-loop terms (QCD corrections)*
  $\Rightarrow$ *PhD thesis of Sven Heinemeyer, starting in fall 1994*
- *Georg came a year later, close cooperation on the project*

$\Rightarrow$ *Phys. Rev. D 58 (1998)*

19 November 1998

PHYSICS LETTERS B

Physics Letters B 440 (1998) 296–304

Precise prediction for the mass of the lightest Higgs boson in the MSSM

S. Heinemeyer, W. Hollik, G. Weiglein

Institut für Theoretische Physik, Universität Karlsruhe, D-76128 Karlsruhe, Germany

Received 24 July 1998
Editor: P.V. Landshoff

combines complete 1-loop calculation of *[Andreas Dabelstein]*
with leading 2-loop contributions

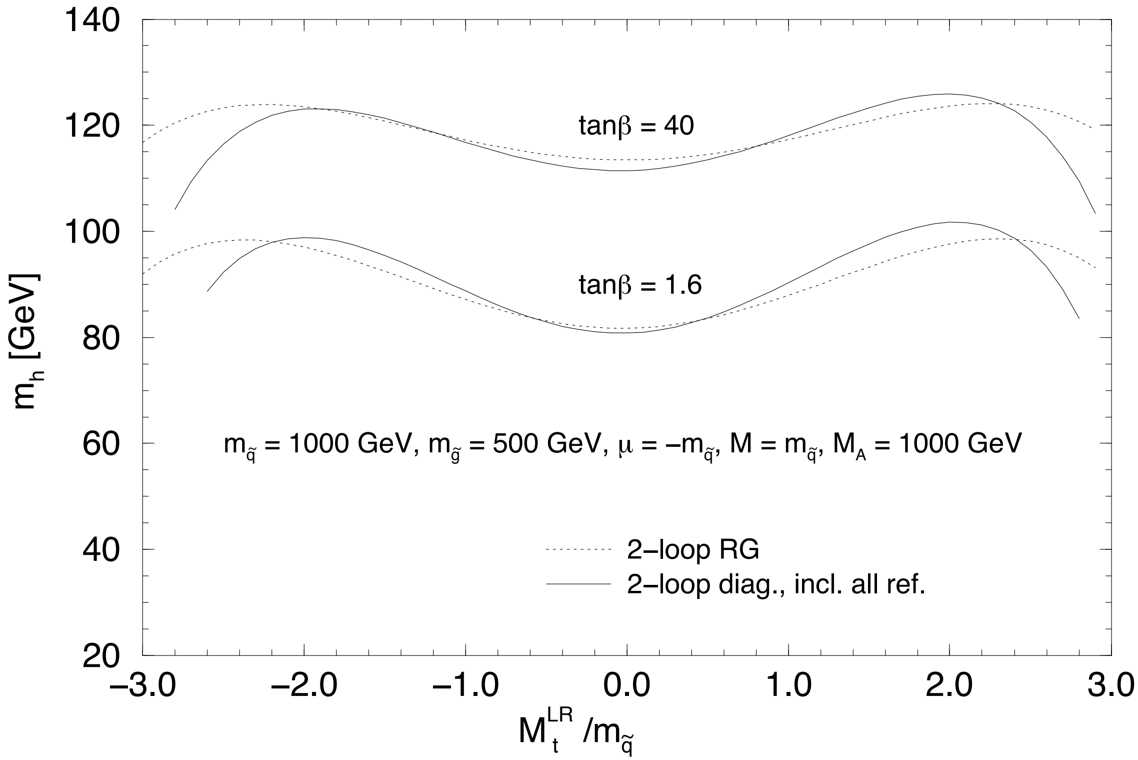
- *diagrammatic 2-loop* $\mathcal{O}(\alpha_t \alpha_s)$ *[Heinemeyer, WH, Weiglein 1998]*
- *EFT 2-loop* $\mathcal{O}({\alpha_t}^2)$ *from* *[Carena, Quiros, Wagner 1996]*

  [later replaced by those of Brignole, Degrassi, Slavich, Zwirner 2001]

FeynHiggs: A Program for the calculation of the masses of the neutral CP even Higgs bosons in the MSSM

S. Heinemeyer (DESY), W. Hollik (CERN and Karlsruhe U.), G. Weiglein (Karlsruhe U.)
Dec, 1998

16 pages
Published in: *Comput.Phys.Commun.* 124 (2000) 76-89
e-Print: hep-ph/9812320 [hep-ph]
DOI: 10.1016/S0010-4655(99)00364-1
Report number: KA-TP-16-1998, DESY-98-193, CERN-TH-98-389
View in: ADS Abstract Service, CERN Document Server



differences to RG at 2-loop *[Carena, Quiros, Wagner; Haber, Hempfling, Hoang]*

- *shift in location and height of maxima*
- *asymmetry between* $+M_{\rm t}^{\rm LR}$ *and* $-M_{\rm t}^{\rm LR}$

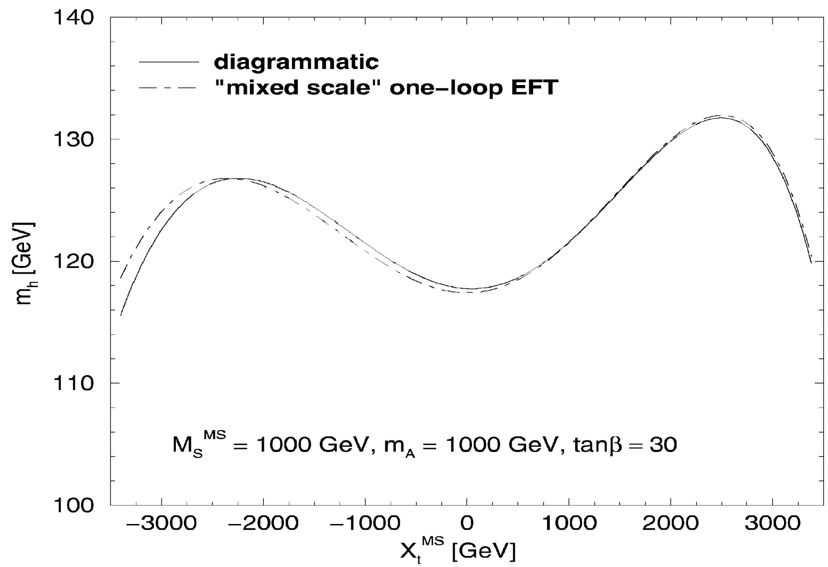
common effort to identify origin of differences

Nuclear Physics B 580 (2000) 29–57

www.elsevier.nl/locate/npe

Reconciling the two-loop diagrammatic and effective field theory computations of the mass of the lightest $\mathcal{CP}$-even Higgs boson in the MSSM

M. Carena[a,b], H.E. Haber[c], S. Heinemeyer[d], W. Hollik[e], C.E.M. Wagner[b,f,g], G. Weiglein[b,*]



differences are induced by

- *non-logarithmic 2-loop terms (threshold corrections)*
- *conversion on-shell* $\longleftrightarrow$ $\overline{MS}$ *parameters*

2nd paper of the new millenium on arXiv

High Energy Physics - Phenomenology

[Submitted on 1 Jan 2000 (this version), latest version 13 Jul 2000 (v3)]

Reconciling the Two-Loop Diagrammatic and Effective Field Theory Computations of the Mass of the Lightest CP-even Higgs Boson in the MSSM

M. Carena, H.E. Haber, S. Heinemeyer, W. Hollik, C.E.M. Wagner, G. Weiglein

The mass of the lightest CP-even Higgs boson of the minimal supersymmetric extension of the Standard Model (MSSM) has previously been computed including O(alpha alpha_s) two-loop contributions by an on-shell diagrammatic method, while approximate analytic results have also been obtained via renormalization-group-improved effective potential and effective field theory techniques. Initial comparisons of the corresponding two-loop results revealed an apparent discrepancy between terms that depend logarithmically on the supersymmetry-breaking scale, and different dependences of the non-logarithmic terms on the squark mixing parameter, X_t. In this paper, we determine the origin of these differences as a consequence of different renormalization schemes in which both calculations are performed. By re-expressing the on-shell result in terms of MS-bar parameters, the logarithmic two-loop contributions obtained by the different approaches are shown to coincide. The remaining difference, arising from genuine non-logarithmic two-loop contributions, is identified, and its effect on the maximal value of the lightest CP-even Higgs boson mass is discussed. Finally, we show that in a simple analytic approximation to the Higgs mass, the leading two-loop radiative corrections can be absorbed to a large extent into an effective one-loop expression by evaluating the running top quark mass at appropriately chosen energy scales.

Comments: 29 pages, 5 figures, LaTeX with axodraw and epsfig style files

Subjects: **High Energy Physics - Phenomenology (hep-ph)**

Cite as: arXiv:hep-ph/0001002

(or arXiv:hep-ph/0001002v1 for this version)

https://doi.org/10.48550/arXiv.hep-ph/0001002

Submission history

From: Howard E. Haber [view email]

[v1] Sat, 1 Jan 2000 09:57:43 UTC (44 KB)

[v2] Wed, 5 Jan 2000 01:18:43 UTC (44 KB)

High Energy Physics – Phenomenology

[Submitted on 1 Jan 2000 (this version), latest version 24 Jun 2011 (v2)]

A Two-Loop Four-Gluon Helicity Amplitude in QCD

Z. Bern, L. Dixon, D.A. Kosower

We present the two-loop pure gauge contribution to the gluon-gluon scattering amplitude with maximal helicity violation. Our construction of the amplitude does not rely directly on Feynman diagrams, but instead uses its analytic properties in 4 - 2 epsilon dimensions. We evaluate the loop integrals appearing in the amplitude through O(epsilon^0) in terms of polylogarithms.

Comments:	Latex, 27 pages
Subjects:	**High Energy Physics - Phenomenology (hep-ph)**; High Energy Physics - Theory (hep-th)
Report number:	SLAC-PUB-8324, UCLA/99/TEP/48, Saclay-SPhT-T99/147
Cite as:	arXiv:hep-ph/0001001
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	https://doi.org/10.48550/arXiv.hep-ph/0001001
Journal reference:	JHEP 0001:027,2000
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Submission history

From: Zvi Bern [view email]

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[v2] Fri, 24 Jun 2011 10:26:41 UTC (39 KB)

Towards high precision predictions for the MSSM Higgs sector

G. Degrassi (Rome III U. and INFN, Rome3), S. Heinemeyer (Munich U.), W. Hollik (Munich, Max Planck Inst.), P. Slavich (Munich, Max Planck Inst. and Karlsruhe U., TTP), G. Weiglein (Durham U., IPPP)
Dec, 2002

19 pages
Published in: *Eur.Phys.J.C* 28 (2003) 133-143
e-Print: hep-ph/0212020 [hep-ph]
DOI: 10.1140/epjc/s2003-01152-2
Report number: DCPT-02-126, IPPP-02-63, LMU-11-02, MPI-PHT-2002-73, RM3-TH-02-19
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pdf   cite   claim   reference search   1,195 citations

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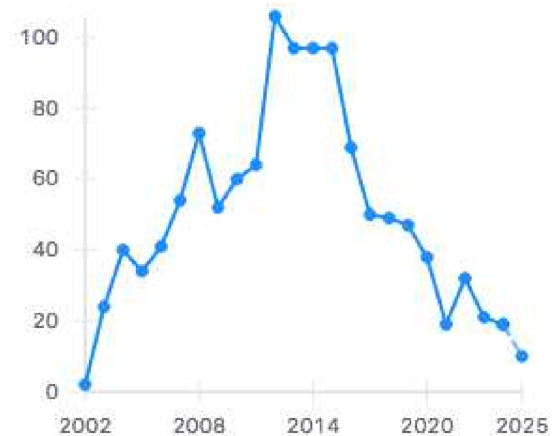

including more 2-loop contributions   [Pietro Slavich . . . 2001,2002]

- *from effective potential* $\mathcal{O}(\alpha_t^2, \alpha_b\alpha_s, \alpha_b\alpha_t)$

in further course:

- *with CP violation*   *[Heidi Rzehak, Thomas Hahn, Sebastian Paßer]*
- *professional computing*   *[Thomas Hahn]*

  new version in Computer Phys. Comm. (2009)
- *resummation of large logs by means of RGE*   *[Henning Bahl]*

  combining fixed-order and EFT methods $\Rightarrow$ *hybrid calculation*

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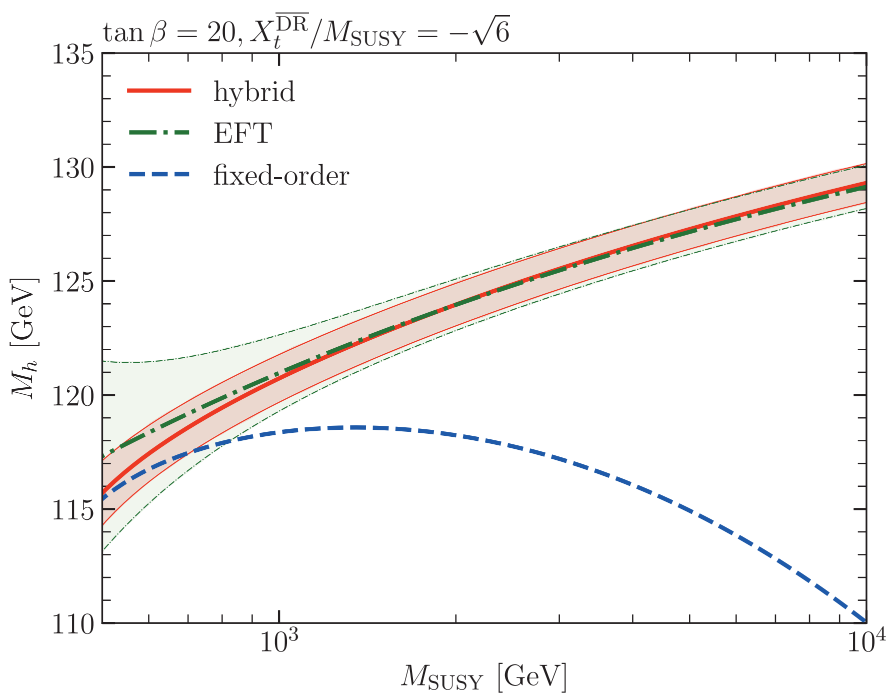
journal homepage: www.elsevier.com/locate/cpc

CPC 50th anniversary article

Precision calculations in the MSSM Higgs-boson sector with FeynHiggs 2.14[☆,☆☆]

H. Bahl[a,b,*], T. Hahn[b], S. Heinemeyer[c,d,e], W. Hollik[b], S. Paßehr[f], H. Rzehak[g], G. Weiglein[a]

[a] DESY, Notkestraße 85, D–22607 Hamburg, Germany
[b] Max-Planck-Institut für Physik, Föhringer Ring 6, D–80805 Munich, Germany
[c] Instituto de Física Teórica, Universidad Autónoma de Madrid Cantoblanco, 28049 Madrid, Spain
[d] Campus of International Excellence UAM+CSIC, Cantoblanco, 28049, Madrid, Spain
[e] Instituto de Física de Cantabria (CSIC-UC), E–39005 Santander, Spain
[f] Sorbonne Université, CNRS, Laboratoire de Physique Théorique et Hautes Énergies (LPTHE), 4 Place Jussieu, F–75252 Paris CEDEX 05, France
[g] CP3-Origins, University of Southern Denmark, Odense, Denmark



Eur. Phys. J. C (2021) 81:450
https://doi.org/10.1140/epjc/s10052-021-09198-2

THE EUROPEAN PHYSICAL JOURNAL C

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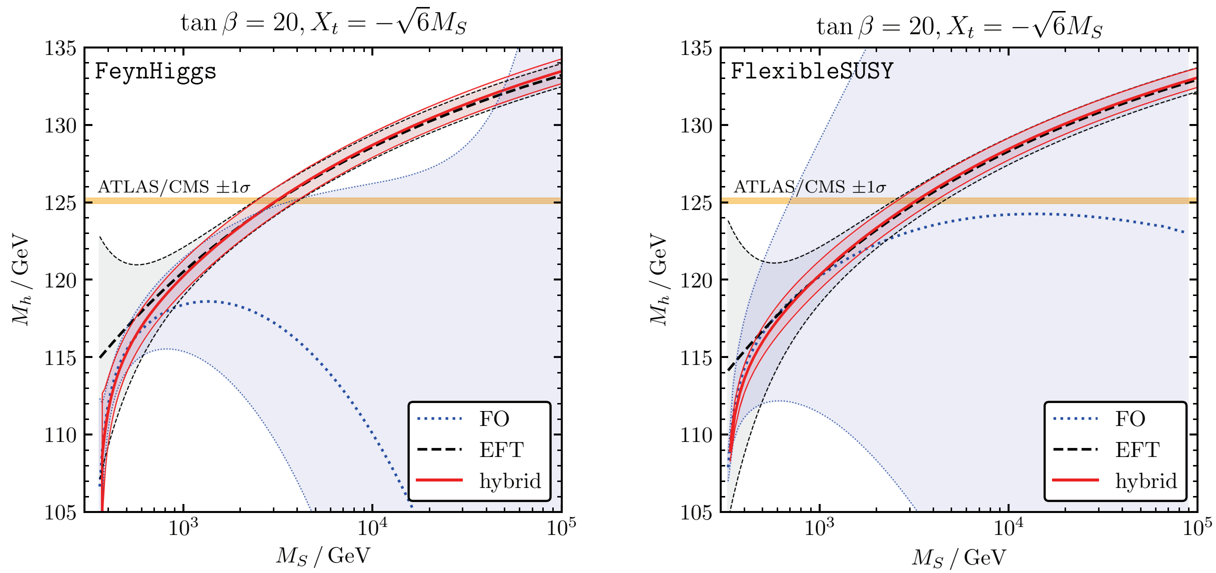
Review

Higgs-mass predictions in the MSSM and beyond

P. Slavich[1,a], S. Heinemeyer[2,3,4], E. Bagnaschi[5], H. Bahl[6], M. Goodsell[1], H. E. Haber[7], T. Hahn[8], R. Harlander[9], W. Hollik[8], G. Lee[10,11,12], M. Mühlleitner[13], S. Paßehr[9], H. Rzehak[14], D. Stöckinger[15], A. Voigt[16], C. E. M. Wagner[17,18,19], G. Weiglein[6], B. C. Allanach[20], T. Biekötter[6], S. Borowka[21], J. Braathen[6], M. Carena[18,19,22], T. N. Dao[23], G. Degrassi[24], F. Domingo[25], P. Drechsel[6], U. Ellwanger[26], M. Gabelmann[13], R. Gröber[27], J. Klappert[9], T. Kwasnitza[15], D. Meuser[6], L. Mihaila[28], N. Murphy[29], K. Nickel[25], W. Porod[30], E. A. Reyes Rojas[31], I. Sobolev[6], F. Staub[13]



this report reflects the current state of the art there is a lot more common activities and events

- conference series *LOOPS and LEGS*
- Linear Collider Workshops
- European Networks *HEPTOOLS, HIGGSTOOLS,* . . .
- Higgs Days at Santander
- annual meeting at the MPI for Physics
  (week before Christmas)
- and many more . . .

Loops and Legs 2014

Weimar

there is a lot more common activities and events

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- Linear Collider Workshops
- European Networks *HEPTOOLS, HIGGSTOOLS,* . . .
- Higgs Days at Santander
- annual meeting at the MPI for Physics (week before Christmas)
- and many more . . .

Happy Birthday
Georg !