Description for `RenConstSQCD.m`

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The renormalization constants up to three-loop order for the wave functions of quarks, squarks, gluons, ϵ-scalars, gluinos, ghosts, and for the masses of quarks and gluinos, as well as for all cubic vertices evaluated in softly broken SUSY-QCD are listed in the `Mathematica` file `RenConstSQCD.m`, available from

`http://www-ttp.particle.uni-karlsruhe.de/Progdata`

or from any of the authors upon request. If you use any of the contents of this file, please refer to Ref. [1] in the corresponding publication.

The renormalization constants for the fields, masses and vertices are defined as

$$\Phi^B = \sqrt{Z_\Phi}\,\Phi\,, \qquad m^B = m\,Z_m\,, \qquad \Gamma_X^B = Z_X\,\Gamma_X\,,$$

where the bare quantities are marked by the superscript "B", and Φ , m , Γ_X denotes a generic field, mass and vertex function, respectively. Our notation for the renormalization constants is given by

Wave function ren. const.		Vertex ren. const.		ϵ-scalar-Vertex ren. const.		Mass ren. const.	
`Z3es`	Z_ϵ	`Zggg`	Z_{ggg}	`Zgepep`	$Z_{g\varepsilon\varepsilon}$	`Zmq`	Z_m^q
`Z2q`	Z_q	`Zgqq`	$Z_{gq\bar{q}}$	`Zepqq`	$Z_{\varepsilon q\bar{q}}$	`Zmgl`	$Z_m^{\tilde{g}}$
`Z2gl`	$Z_{\tilde{g}}$	`Zgglgl`	$Z_{g\tilde{g}\tilde{g}}$	`Zepglgl`	$Z_{\varepsilon\tilde{g}\tilde{g}}$		
`Z2sq`	$Z_{\tilde{q}}$	`Zgsqsq`	$Z_{g\tilde{q}\tilde{q}}$				
`Z3g`	Z_g	`Zgcc`	$Z_{gc\bar{c}}$				
`Z3c`	Z_c	`Zglsqq`	$Z_{\tilde{g}q\tilde{q}}$				

The following notation has been used ($\epsilon = (4-d)/2$):

q	quark
$\tilde{q}$	squark
g	gluon
$\tilde{g}$	gluino
c	ghost
ε	ϵ-scalar

`as`	$\frac{\alpha_s}{\pi}$
`ep`	ϵ
`z3`	$\zeta(3)$
`xi`	ξ
`CF`	C_F
`CA`	C_A
`Tf`	T_f

where the gauge parameter ξ is defined through the gluon propagator

$$D_g^{\mu\nu}(q) \quad = \quad -i\,\frac{g^{\mu\nu} - \xi\,\frac{q^\mu q^\nu}{q^2}}{q^2 + i\varepsilon}\,.$$

(See Ref. [1] for more details concering the notation.) The renormalization constants for the SUSY–Yang-Mills theory can be obtained by setting $T_f = 0$.

References

[1] R.V. Harlander, L. Mihaila, M. Steinhauser, *The SUSY-QCD β function to three loops*, SFB/CPP-09-36, TTP09-13, WUB/09-02