

Comparison of Parameters

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Parameter Comparison Table

These are all the differences between Jung's steering file (with radiative corrections), titled `steer-ep-qedrad-dis` and the one used by Paul Newman (again with the radiative corrections).

I've compared the "steer-ep-no-qedrad-dis" and "steer-ep-qedrad-dis" files as Jung suggested, and it seems that the key differences for enabling or disabling QED radiation lie in the LPIN, ISM3, and INT3 parameters under HERACLES PARAMETERS, the following is how they look in `steer-ep-qedrad-dis` :

```
'LPIN' 4 0 0 ! (D=1) leptonic QED corrections

'ISM3' 1 0 1 ! (D=0) sampling of initial state bremsstrahlung NC
'ISM3' 2 0 1 ! (D=0) sampling of final state bremsstr. NC
'ISM3' 3 0 1 ! (D=0) sampling of Compton contribution NC

'INT3' 1 0 5 ! (D=0) integration of initial state bremsstr. contr. NC number
of iterations for VEGAS <100:VEGAS, >100:VEGAS1/2
'INT3' 2 0 5 ! (D=0) as INT3(1) but for final state bremsstr. NC
'INT3' 3 0 5 ! (D=0) as INT3(1) but for Compton contribution NC number of
iterations for VEGAS <100:VEGAS, >100:VEGAS1/2
```

Table 1: Parameter overview comparing Jung (`steer-ep-qedrad-dis`) and Newman values, with descriptions and relevant sections in the steering file.

Section in steering file	Parameter	Jung	Newman	Description in manual
Kinematic parameters	QMAX	Commented	1000.0	Parameters for kinematics in lepton-hadron collisions: (D:=108) (/DIFFR/) Maximum Q2 to be generated
""	YMIN	0.0005	0.001	Parameters for kinematics in lepton-hadron collisions: (D:=0.0) (/DIFFR/) Minimum y to be generated
""	NFLA	4	3	Parameters for kinematics in lepton-hadron collisions: (D:=5) Number of active flavors, can be set by user. (/LUCO/)

Section in steering file	Parameter	Jung	Newman	Description in manual
Hard subprocess selection:	PTCU	1	0	Parameters for hard subprocess selection: (D = 5.0) Minimum $\hat{p}_\perp^2$ for process IPRO (/PTCUT/). Must be used for generation of light quarks in processes IPRO = 10, 13, 15, 18.
""	IHFL	3	4	(D=3) for IPRO = 14(1400) and for IPRO = 18 which flavor produced (IHFL=4 -> charm, IHFL=5 -> bottom)
""	IFUL	0	0	Parameters for hard subprocess selection: (D := 1) Switch to select lowest order process (IFULL = 0) or quark-parton model with $\mathcal{O}(\alpha_s)$ matrix elements (IFULL = 1) (/OALPINI/).
Intrinsic kt's and beam remnants	IAKT	0	1	The possibility to add primordial p_T (via switch IALMKT = 1) according to $\exp(-5.5 \cdot p_T^2)$ to the partons when process IPRO = 12 is selected. (Possibly)
Scales	IRAS	1	Commented	Parameters for structure functions α_s and scales: IRUNA: (D := 1) Switch for running α_s = 0: Fixed α_s = 0.3 = 1: Running $\alpha_s(\mu^2)$ (Possibly)
""	IRAM	1	0	Parameters for structure functions α_s and scales: IRUNAEM: (D := 0) Select running of $\alpha_{\text{em}}(Q^2)$ = 0: No running of $\alpha_{\text{em}}(Q^2)$ = 1: Running of $\alpha_{\text{em}}(Q^2)$ (Possibly)
""	IQ2S	3	Commented	Parameters for structure functions α_s and scales: IQ2: (D := 5) Select scale μ^2 for $\alpha_s(\mu^2)$ = 1: $\mu^2 = 4 \cdot m_q^2$ (use only for heavy quarks!) = 2: $\mu^2 = \hat{s}$ (use only for heavy quarks!) = 3: $\mu^2 = 4 \cdot m^2 + p_\perp^2$ = 4: $\mu^2 = Q^2$ = 5: $\mu^2 = Q^2 + p_\perp^2$ (Possibly)
HERACLES	XMIN	0.00001	0.00003	Accessing information: lower limits for x (/PARAT/)
""	LPIN 8	1	—	—
""	LPIN 9	1	—	—
""	LPIN 11	1	—	—
PYTHIA	MSTU 112	4	3	Scales, α_s and Parton Distribution Functions: Number of flavors with respect to Λ_{QCD}

Section in steering file	Parameter	Jung	Newman	Description in manual
HIGHER RESONANCES AND BOSE-EINSTEIN CORRELATIONS	PARJ 54	–	-0.078	–
""	PARJ 13	–	0.55	–
for Les Houches interface HERWIG needs a gluon mass	PMAS 21	0.7	–	–
""	PMAS 82	1.2	–	–

Parameters 'LPIN' 8,9 and 11 are also not present in Newmans version. These are in order:

fermionic contribution (") to the gamma-Z mixing,
fermionic contr. to the (") the photon self energy and
purely weak contr. to self(") energies, boxex, vertex corr.,
so I am not sure these are also considered radiative corrections or not.

The reason i wrote **Possibly** some times, is that the parameter names where different between the steering files and the manual. The manual apparently was updated for version 3.2 on 2011, so I'm not sure where these differences in the names come from.