The Monte Carlo Program KORALZ, for the Lepton or Quark Pair Production at LEP/SLC Energies – From version 4.0 to 4.2.

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ABSTRACT

Brief information on the differences of KORALZ version 4.0 and 4.2 is given. The main difference is that the new version can be used at LEP2 energies.

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The KORALZ Monte Carlo for $e^+e^- \to 2f\ n\gamma$, $(f = \mu, \tau, u, d, c, s, b, \nu)$ including YFS exclusive exponentiation of initial and final state bremstrahlung is upgraded to the LEP2 energy range. The detailed description of how to use the program can be found in ref. [1] or in the WWW home page [2]. Let us give here, minimum information on the upgrade content. The new electroweak library DIZET version 5.0 [3] became available recently. This code includes WW and ZZ boxes and other non-QED corrections important at LEP 200 energy range. This library was interfaced to KORALZ and the maximum allowed center of mass energy was shifted to 240 GeV. The pretabulation of the electroweak formfactors used by the generator was extended to that range as well. It is of course straightforward to increase maximum allowed energy to higher values, but only at the expense of further increase of the initialization time. Other, less important modifications were also introduced into KORALZ and/or its libraries.

The basic algorithm was not modified and as precision requirements at LEP2 energies are lower than at LEP1 where the program was extenisvely tested and used, only limited set ot tests were performed. Some of umerical results of table 30 from ref. [4] were reproduced, as well as results from tables 1, 2, and 3 in the talk of G. Passarino [5].

There are two technical points one should keep in mind. First, off the Z peak, QED bremsstrahlung interference correction is not anymore suppresed below permille level. Size of this interference effect, not included in the multiphotonic option of the program, can be checked by swithiching interference corrections on and off [6] in single bremsstrahlung runs of KORALZ. Finally, let us point that for high centre-of-mass energies, it is necessary to exclude from the generation Born singularity region (where invariant mass of the $2f$ pair is smaller than 2 GeV for example). This can be obtained setting KORALZ input parameter XPR(13)=VVMAX to the value smaller than 1. Otherwise inefficiencies of the algorithm will start to appear. Program will substantially slow down, total cross section will be inacurately calculated, and warning messages will be printed.

References

[1] S. Jadach, B.F.L. Ward, and Z. Wąs, Comp. Phys. Commun. **79** (1994) 503.

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[4] D. Bardin et al. "Electroweak Working Group Report" in. "Reports of the working group on precision calculations for the Z resonance", eds. D. Bardin, W. Hollik, G. Passarino, CERN Yellow Report CERN 95-03.

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