Physics Analysis chap-anal The Fit Procedure secfit For the analysis of the , and decays, and are determined using an event-by-event ML fit to the data of the theoretical distribution (Eq. dsig3). In this method, the following expression is minimized, ML W=-2ln $\mathcal{L} = -2\sum_{n=1}^{N} \ln \left\{1d^3ddd\right\}_n$, *whereListhelikelihoodfunction.ThesuminEq. MLrunsoverallNselected−pairevents, whereatleastoneofthetwo′shasbeenidentifiedasa,orcandidate.Theterminthelogarithmisthedifferentialcross−sectionforaproduction ~−pairswhereone ̃decaysintochanneliandthesecondonedecaysintochannelj(Eq. dsig3).Itisnormalizedtoone, andcorrectedforradiation, xresolution, efficiencyandbackgroundeffects, henceitwillbedenotedasprimedσ.* This term corresponds to the case where both decays are identified. When only one decay is identified, it must be replaced by $(1/)d^2/d\,d$.

When both decays are identified, the corrected cross-section can be written in the following form, corcst 1631d$^3ddd = \sum_{hel=\pm}\{[(1\pm)(1+)+(\pm)]\times[+]\times[+]\}+$*.Hereistheefficiencyforselectinga−paireventinwhichonetaudecaysviachanneliandtheotherviaj,istheefficiencyforidentifyingchanneliwhichforsomeofthedecaycombinationsdependsonthedecaymodeintheoppositejetandonthehelicity.Theisthedistributionofbackgroundeventsfromotherdecaychannelswhenapplyingthechanneliselectionprocedureandcorrespondstobackgroundcontributionsfromeventswhicharenottau−pairs.Thefunctionisthexdistributionforchanneli, afterapplyingcorrectionsfordetectorresolutionandradiativeeffectstof*$_i(x_i)\pm g_i(x_i)$. It is given by the following convolution function hxd =C$_i\int_0^1[(^0)\pm(^0)]d^0$*.wherethenormalizationfactor*C$_i$ was introduced to satisfy, normh $\int_0^\infty d = 1$*.The*^{0} is the before resolution effects are taken into account. The functions and are the Born distributions listed in Chapter chap-theory, Eqs. wl, wxh, wx, fgnor. The correction term is due to radiative effects and is the momentum resolution function.

If only one tau decay is identified, the corrected differential cross-section takes a simpler form, corcso 1631 $= \sum_{hel=\pm}\{[(1\pm)(1+)+(\pm)]\times[+]\}+$, *whereisgivenbythefollowingexpression, epsp* $= +11 - \sum_j B_j \sum_{j\neq i} B_j \int d[1-]$*.Here, thefirsttermistheefficiencyforselectinga ~−paireventinwhichonetaudecaysviachanneliandtheotherviaachannelnotincludedinouranalysis.Thesecondtermisthecontributionofeventswheretheotherchannelisincludedinouranalysisbutisnotidentifiedduetoinefficiency.Thecoefficients*B$_j$ are the ̈ branching fractions. They were taken from the OPAL measurements OPALPL. The summation in Eq. epsp is over the three decay channels considered in this analysis.

The normalization factor in Eq. ML, (or in the case of only one identified tau) are the total corrected cross sections evaluated in every step of the fitting procedure.

Our fitted parameters are and . In a former work of OPAL bib-z0par the values of (s) have been determined using the distribution of alone. In the present analysis we have used these reported values as an input. Since has a strong s dependence (see Fig. fig$_a$*ssecm), wedividetheavailablec.m.energyrangeasshowninFig. figecmintoŉ7intervals.ForeachintervalwecalculatetheaverageoftheOPALmeasurementstakenduring*1989−1992*.Inourglobalfitweuseforeacheventthecorrespondingvalueaccordingtoitsc.m.energy.Theenergyintervals, theaverageenergies, thesamplesizesandthecorrespondingvaluesarelistedinTable eint.Theuncertaintiesinthevaluesweretakenintoaccountinthecalculationoftheoverallsystematicerror.*

table [htb] center tabular——c—c—r—c——

(GeV)	(GeV)	# of events	(%)
87.7 - 88.7	88.398	149	-29.0 ± 5.1
88.7 - 89.7	89.372	337	-8.4 ± 4.0
89.7 - 90.7	90.228	555	-7.8 ± 3.2
90.7 - 91.7	91.276	28034	1.2 ± 0.5
91.7 - 92.7	92.046	790	5.1 ± 2.8
92.7 - 93.7	93.072	478	10.8 ± 3.4
93.7 - 94.7	93.914	320	14.6 ± 4.0