DELPHI's 1999 Preliminary results

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Abstract
DELPHI's preliminary results on "searches" with 192 and 196 GeV data are briefly presented. No significant signal for "New Physics" was found in any of the channels.

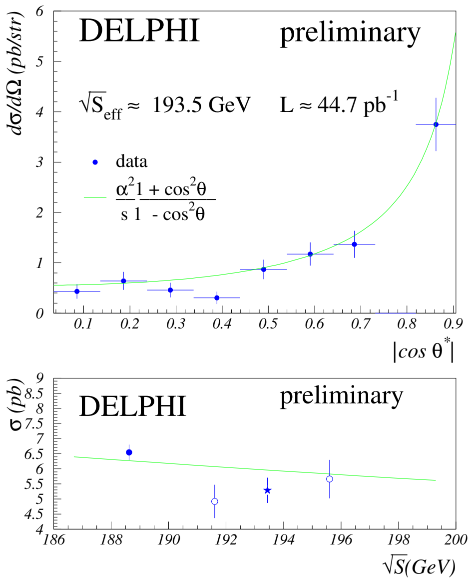
1. Introduction

This note summarises DELPHI's preliminary results on "searches" obtained with the 1999 data corresponding to luminosities between 20 and 25 (20 and 40) pb^{-1} at a centre-of-mass energy of 192 (196) GeV. In the short space available no details of the analysis can be provided. A more complete presentation of these results can be found in reference [1].

2. $e^+e^- \to \gamma\gamma(\gamma)$

At tree level this channel is a pure QED process and so it is very sensitive to deviations from Physics beyond the Standard Model (SM). Differential and total cross section has been measured both at 192 and 196 GeV and combined, after radiative corrections, at an effective centre-of-mass energy of 193.5 GeV (figure 1). The line represents QED tree level expectation. The agreement is fair.

Figure 1. $e^+e^- \to \gamma\gamma(\gamma)$ cross sections



3. Charginos

Charginos could be produced via s or t channel (negative interference) and its main decay is into a neutralino and a fermion-antifermion pair. Neutralino can be stable (MSUGRA) or unstable (GMSB) decaying into a gravitino and a photon. The present searches covers both the cases of stable and unstable neutralinos. The analyses were optimised as a function of the mass difference between the chargino and the neutralino including the quasi degenerate case. The parameters M_2 and μ were varied randomly in the ranges $0 < M_2 < 3000\ GeV/c^2$ and $-200 < \mu < 200\ GeV/c^2$ for three different $tan\ \beta$ ($tan\ \beta = 1, 1.5, 35$).Limits at 95% Confidence Level (CL) on the Chargino mass were obtained. As an example figure 2 shows the particular case of stable neutralino

4. Neutralinos

Neutralinos could be produced via s or t channel (positive interference). The results shown here concern only the final states corresponding to radiative decays either of an heavier neutralino to a stable and lighter one, or of an unstable neutralino into a gravitino and a photon. In the topology with two acoplanar γs in the final state, five candidates were found but the recoil masses are well compatible with the expected background peaking at the Z^0 (figure 3). In the topology with one single γ detected 89 events were found with 97 expected. The energy spectrum of the detected photon is well described by the SM background which is dominated by $e^+e^- \to \nu\bar{\nu}\gamma$.

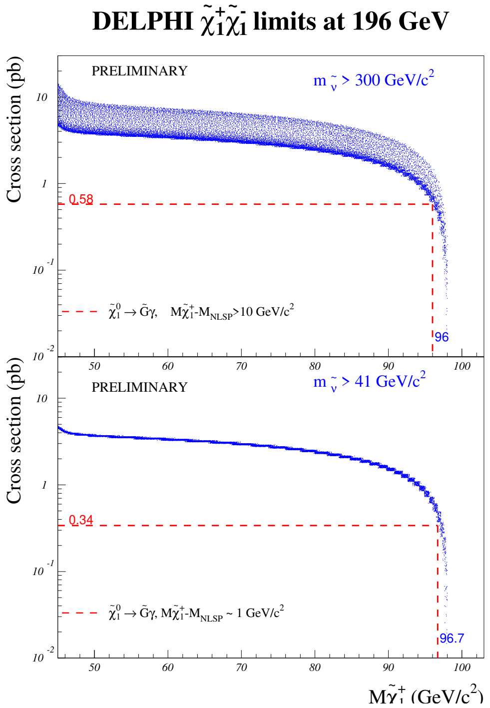


Figure 2. $\chi^{\pm}$ mass limits. The upper (lower) plot corresponds to no-degenerate (degenerate) scenario.

5. Sfermions

A search for the supersymmetric partners for the electron, muon, tau, bottom and top fermions was performed. In table 1 the number of candidates selected and the expected SM background are shown. No significant excess was observed. The exclusion regions at 95 % CL in the planes ($M_{\tilde{f}}$,M_{χ^0}) have been calculated combining these results with those obtained at lower energies and are discussed in reference [1].

Figure 3. Recoil masses of the acoplanar $\gamma\gamma$ candidates.

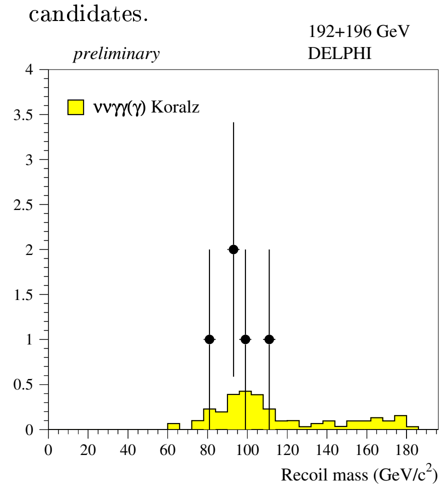
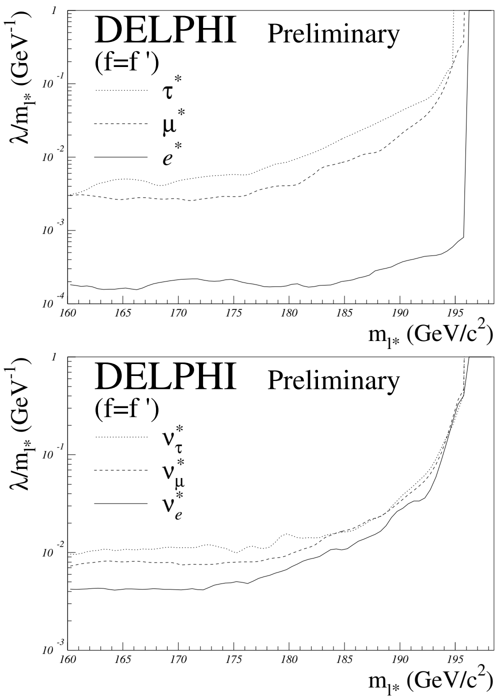


Table 1. Sfermion candidates and SM background.

	E.C.M (GeV)			
	192		196	
$\tilde{e}$ ($\Delta M < 10$)	3	4.1	5	3.9
($\Delta M > 10$)	0	0.2	1	0.2
$\tilde{\mu}$ ($\Delta M < 10$)	2	3.2	1	3.1
($\Delta M > 10$)	1	1.0	1	1.2
$\tilde{\tau}$	0	1.4 ± 0.1	1	1.4 ± 0.1
$\tilde{b}$	0	0.6	0	0.5
$\tilde{t}$	2	1.8	0	1.3

6. Excited Leptons

Figure 4. 95% CL limits for excited charged (a) and neutral (b) leptons assuming $f = f'$.



The single production of excited leptons could proceed via s-channel γ and Z exchange. Important additional t-channel contributions would arise for excited first family leptons. Excited leptons could decay by radiating a γ, Z or W. The decay branching ratios are functions of the f and $f^{'}$ coupling parameters of the model.

Fair agreement between data and SM expectation was found for all the different excited fermion types, decay modes and energies. 95 % CL upper limits on the ratio of the coupling of the excited fermion to its mass (λ/m_{f*}) as a function of m_{f*} were derived. Figure 4 shows, as an example, the combination of these limits with the ones obtained at lower centre-of-mass energies assuming $f = f^{'}$.

7. Neutral Higgs

An update of our search for neutral Higgs bosons to include 1999 data corresponding to an integrated Luminosity of 62 pb^{-1} was performed. The numbers of candidates and expected SM background are shown in tables 2 and 3 for ZH and hA channel respectively. The number of expected signal events for a Higgs boson mass of 95 GeV/c^2 (85 GeV/c^2 and $tan\beta = 20$) in the ZH (hA)search is also given.

Table 2. HZ candidates.

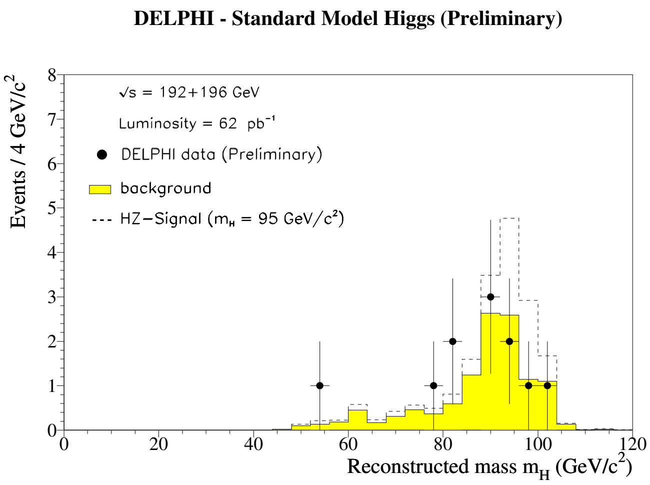
Channel	data	MC	signal (95 GeV/c^2)
$bb\ e^-e^+$	0	1.1	0.3
$bb\ \mu^-\mu^+$	0	0.7	0.4
$b\bar{b}\ \nu\bar{\nu}$	2	1.7	1.3
$bb\ q\bar{q}$	8	8.0	4.5
$q\bar{q}\ \tau^-\tau^+$	1	0.6	0.2
total	11	12.1	6.6

Table 3. hA candidates.

Channel	data	MC	signal (85 GeV/c^2)
$q\bar{q}\ \tau^-\tau^+$	1	0.4	0.1
$bb\ bb$	2	1.9	1.8
total	3	2.3	1.9

The mass distribution of the candidate events in the ZH channel are shown in figure 5. Due to the preliminary nature of the analysis and the fact that the increase in the expected limit when this data is included is only of order of 1 GeV/c^2 no new limits are presented.

Figure 5. Mass spectrum in the ZH analysis.The solid line is the simulated background and the dotted line shows the total expectation when a 95 GeV/c^2 Higgs is included



8. Conclusion

Preliminary results obtained with the data collected so far (July 1999) shows no evidence for Physics beyond the Standard Model. But, as for the OPorto Wine, is to early to know if 1999 will be a vintage year.

References

[1] DELPHI Collaboration 1999 *DELPHI 99-95 CONF 282* contribution to this conference