4.4 Performance

During the 1993 running period, the ZEUS trigger system was updated many times. Most of these changes occurred during the early days(before August). For elastic $J/\psi \rightarrow e^+e^-$ measurement, the relevant subtriggers were the GFLT $J/\psi \rightarrow e^+e^-$ and ρ and the TLT BGF03(charm), BGF04($J\psi \rightarrow e^+e^-$) and BGF05(l^+l^-). For these triggers, there were only three effective versions(see Table 11).

Table 11: The 1993 J/ψ trigger versions

Trigger Configuration	Runs	Int. luminosity(nb^{-1})
Standard_Aug20	6494-6578	55.0-87.1
Standard_Aug24	6581-7132	87.1-310.4
Standard_Oct01	7135-7549	310.4-543.2

A slight difference between the Standard_Aug20 and Standard_Aug24 was in the Veto Wall implementation in the GFLT $J/\psi \rightarrow e^+e^-$ and ρ subtriggers (VW_in AND VW_out veto in the Standard_Aug20, VW_in in the Standard_Aug24). The TLT BGF05 experienced a major modification in the Standard_Oct01 version, leading to a 45% increase in its acceptance to elastic $J/\psi \rightarrow e^+e^-$.

The background reduction ratio of the J/ψ triggers was satisfactory. The trigger rate due to J/ψ triggers consisted of only a small fraction of the total trigger rate. In 1993 running period, the average GFLT rate was $116Hz$, and the GFLT $J/\psi \rightarrow e^+e^-$ subtrigger rate was typically 1-2Hz. Average TLT physics rate was 2.6Hz, the TLT $J/\psi \rightarrow e^+e^-$ filter rate was 0.055Hz, and the TLT l^+l^- filter rate was 0.18Hz.

The following tables show the signal acceptance of the J/ψ subtriggers at the GFLT and TLT. Signal acceptance is about 80% by the GFLT $J/\psi \rightarrow e^+e^-$ subtrigger, and 85% combined by the GFLT $J/\psi \rightarrow e^+e^-$ and ρ subtriggers. Signal acceptance at the TLT is 80% by the TLT BGF03(charm), BGF04($J/\psi \rightarrow e^+e^-$), and BGF05($l^+l^-$) filters. The GFLT ρ subtrigger was designed for elastic ρ acceptance but it also contributed to J/ψ acceptance. The TLT BGF03($charm$)

filter was designed for charm, BGF04($J/\psi \to e^+e^-$) for diffractive $J/\psi \to e^+e^-$, BGF05(l^+l^-) for J/ψ in general(including inelastic and muon branch). In the tables, JTLT stands for logic OR of TLT BGF03,BGF04 and BGF05. The TLT trigger efficiency listed in the tables are evaluated without the GFLT requirement. This reflects the goal of the TLT design: to accept all reconstructable signal events. The TLT efficiency is limited mostly by the TLT track finding efficiency, and tight cuts on BHAC/BEMC and RHAC/REMC in BGF04($J/\psi \to e^+e^-$). The most meaningful acceptance is the relative(conditional) acceptance. The first condition, that the J/ψ be "Reconstructible", required both e^+e^- be found by offline analysis program. The second condition required $W \equiv \sqrt{s_{\gamma p}}$ be between 40-140GeV. Under these two conditions, the relative acceptance estimated by different Monte Carlo generators agree quite well. This can be understood from the CTD geometrical acceptance. Within $W = 40 - 140$GeV range, the fraction of events with one or both electrons escaping the CTD is determined by, and not very sensitive to, the t dependence and decay angular distribution. The difference between different MC generators is mostly in the W distribution which is sensitive to the gluon distribution.

Table 12: EPJPSI33ee13 signal acceptance at GFLT and TLT

condition	ρ(s54)	J/ψ(s58)	$\rho + J/\psi$	GFLT
Reconstruct	0.4315	0.8303	0.8728	0.8904
W=40-140	0.4137	0.7298	0.7895	0.8071
Wcut&Recon	0.4258	0.8258	**0.8763**	0.8882

condition	BGF03	BGF04	BGF05	JTLT	TLT
Reconstruct	0.3640	0.5930	0.6515	0.7162	0.9284
W=40-140	0.3655	0.5308	0.5473	0.6640	0.8527
Wcut&Recon	0.4425	0.6855	0.7634	**0.8280**	0.9640

Table 13: DIPSI signal acceptance at GFLT and TLT

condition	ρ(s54)	J/ψ(s58)	$\rho + J/\psi$	GFLT
Reconstruct	0.2948	0.8162	0.8656	0.8746
W=40-140	0.3341	0.6456	0.7324	0.7469
Wcut&Recon	0.3499	0.7872	**0.8535**	0.8624

condition	BGF03	BGF04	BGF05	JTLT	TLT
Reconstruct	0.2266	0.5704	0.6438	0.7011	0.8906
W=40-140	0.2409	0.4951	0.5241	0.6203	0.7969
Wcut&Recon	0.3025	0.6511	0.7449	**0.8014**	0.9328

Table 14: EPJPSI33ee11 signal acceptance at GFLT and TLT

condition	ρ(s54)	J/ψ(s58)	$\rho + J/\psi$	GFLT
Reconstruct	0.3018	0.7945	0.8393	0.8509
W=40-140	0.3550	0.7079	0.7877	0.8012
Wcut&Recon	0.3647	0.8054	**0.8670**	0.8805

condition	BGF03	BGF04	BGF05	JTLT	TLT
Reconstruct	0.2466	0.5405	0.6067	0.6638	0.8699
W=40-140	0.2826	0.5287	0.5646	0.6619	0.8506
Wcut&Recon	0.3412	0.6552	0.7475	**0.8072**	0.9502