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Summary

The weak decays of beauty hadrons offer a unique opportunity at the SSC to study CP violation in a system other than the neutral kaons and provides a long lever arm for searching for new physics if a strategy can be found for triggering on and identifying these decays. We have determined that the decay sequence $B \to J/\psi + X$ followed by the decay of the $J/\psi \to \mu^+\mu^-$ presents an opportunity to both trigger on and to unambiguously distinguish $b\bar{b}$ events from the total cross section events.

Introduction

The production and the subsequent weak decays of beauty hadrons present possibilities both for studying QCD by measuring the production and hadronization of heavy flavor quarks and, even more exciting, for measuring various features of the weak decays of the beauty hadrons such as lifetimes, mixing, rare decays, and even CP violation. However, before these possibilities can be realized, strategies must be developed for separating the 4×10^{11} events containing $b\bar{b}$ pairs from the 10^{14} interactions due to a 100 mb total cross section at $\sqrt{s} = 40$ TeV (produced in 10^7 seconds of operation of the SSC at a luminosity of 10^{32} cm^{-2}sec^{-1}). The decay of beauty hadrons inclusively into $J/\psi \to \mu^+\mu^-$ not only allows a trigger to be prepared which will preferentially select $b\bar{b}$ from the 10^7 interactions per second due to the total cross section (at a luminosity of 10^{32} cm^{-2}sec^{-1}) but also allows an unambiguous offline separation of the $b\bar{b}$ events from all backgrounds due to charm production and decay. The strategy has been proposed[1] for Experiment 771 at the Fermilab TEV II. Due to the similarity of the kinematics of $gg \to b\bar{b}$ in 40 TeV SSC collider events to the configuration of $\sqrt{s} = 40$ GeV TEV II Lorentz boosted fixed target events, the same strategy should work well at the SSC.

$b\bar{b}$ Production

The major advantage of the SSC for the study of the weak decays of beauty hadrons is the increased cross sections for hadronic production of beauty. The total cross section for $b\bar{b}$ production in pp interactions at $\sqrt{s} = 40$ TeV is predicted[2] to be 400 μbarns and dominated by gluon fusion. In comparison, the only beauty hadroproduction cross section measurements that have been reported thus far at present machine energies are the indirect measurements of UA1[3] of 2 μbarns for $\bar{p}p$ interactions at $\sqrt{s} = 540$ GeV and the $\pi^- N$ measurement of WA78[4] of (4.5 ± 1.5) nb at $\sqrt{s} = 25.6$ GeV. The WA78 $\pi^- N$ cross section matches well various QCD calculations[5] of $b\bar{b}$ hadroproduction cross section in this energy regime especially if the calculations are adjusted up by a factor of two to take into account higher order terms. These same calculations repeated for pp interactions predict a cross section of 5–10 nb at $\sqrt{s} = 40$ GeV. Thus, since the total inelastic cross section for pp interactions at 40 TeV is expected to be 100 mb, only slightly increased from the 32 mb at $\sqrt{s} = 40$ GeV, the ratio of $b\bar{b}$ cross section to total cross section may increase from 3×10^{-7} at $\sqrt{s} = 40$ GeV to 4×10^{-3} at $\sqrt{s} = 40$ TeV.

There are, however, disadvantages to $b\bar{b}$ experiments at the SSC relative to the same type of experiment in a fixed target experiment at the Fermilab TEV II. Even at $\sqrt{s} = 40$ TeV the average momentum of the b quarks produced by gluon fusion is still lower than the Lorentz boosted b quarks in the comparable fixed target experiment at Fermilab energies. This fact, when coupled with the higher multiplicity expected at the SSC (175–350 final state parti-

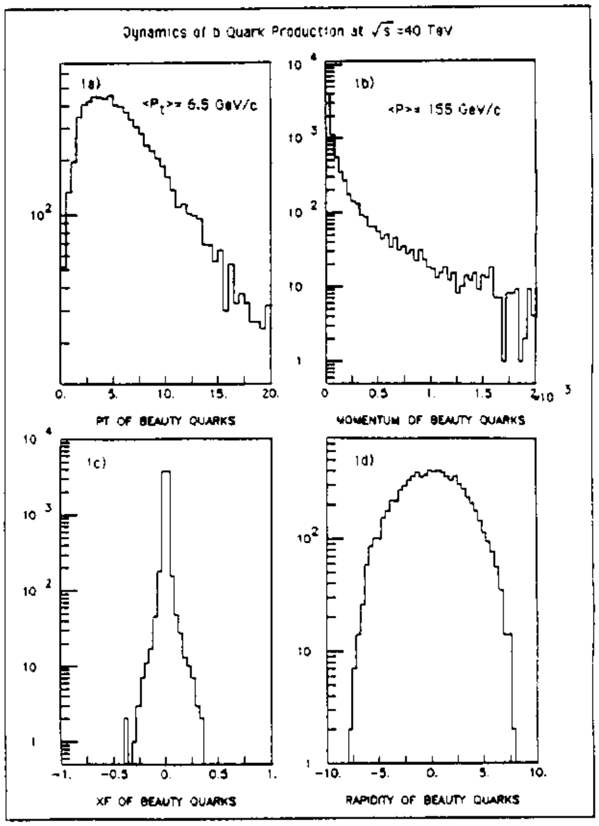


Figure 1: a) p_t, b) momentum, c) x_F, d) rapidity of b quarks produced in $\sqrt{s} = 40$ TeV pp interactions.

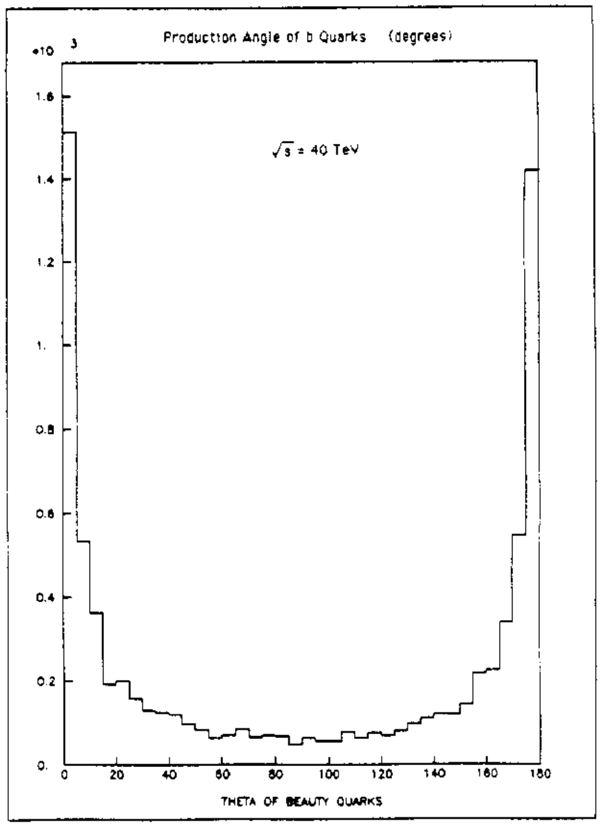


Figure 2: Angle of production of b quarks with respect to the beam direction in $\sqrt{s} = 40$ TeV pp interactions.

cles at $\sqrt{s} = 40$ TeV vs 20–25 at $\sqrt{s} = 40$ GeV), makes it necessary to examine carefully all aspects of an SSC experiment[6] which proposes to study heavy quark production and decay.

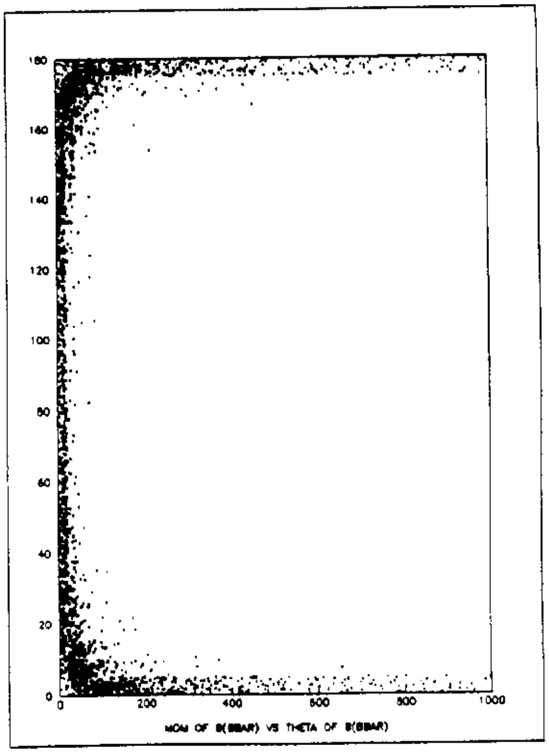
We have used PYTHIA[7] to study $b\bar{b}$ production at $\sqrt{s} = 40$ TeV. The p_t, momentum, x_F, and rapidity distributions of the individual b quarks are shown in Fig. 1a,b,c and d. The peaking of the b quark production in the beam direction is striking and is shown in Fig. 2. The correlation of the angle of production of the b quarks with their momenta, which shows that only the b quarks produced in the directions of the beams have appreciable momenta, is shown in Fig. 3a. The striking correlation of the b and $\bar{b}$ directions is shown in Fig. 3b.

These distributions lead to several significant conclusions that must be taken into account in any apparatus that is constructed to study decays from an appreciable fraction of the $b\bar{b}$ hadrons produced at $\sqrt{s} = 40$ TeV. These are:

1. $\langle p_t \rangle$ of the b quarks will be small ($\approx$ 6–7 GeV/c).
2. No significant production beyond $|y| < 6$ is expected. In particular, there are no theoretical expectations for significant forward diffractive production[8]. However, the angular distributions are still highly peaked in the beam directions.
3. Relatively soft b quark production is expected with high momentum b quarks produced only in the forward direction.
4. Highly correlated b and $\bar{b}$ production is expected with the b and the $\bar{b}$ typically produced in the same direction along one or the other beam directions.

These expectations lead us to study the effectiveness of our J/ψ trigger tag strategy in the forward

3a)



3b)

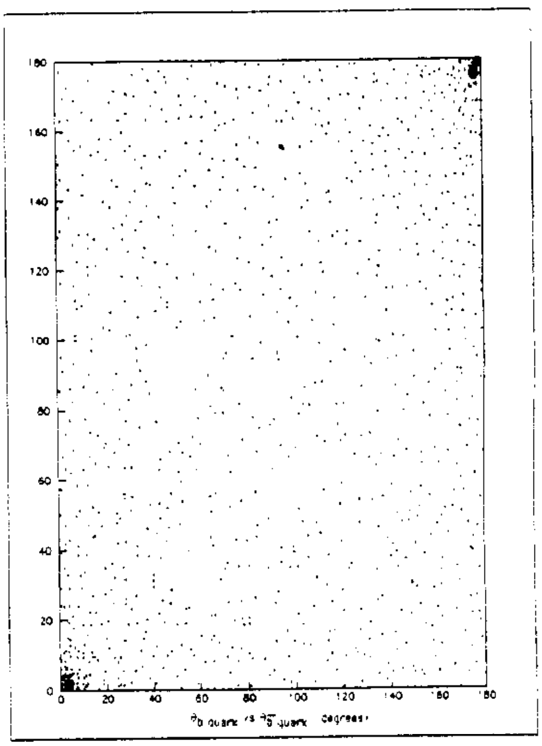


Figure 3: a) Angle of production of b quarks with respect to beam versus b quark momentum and b) Angle of b quark with respect to beam versus angle of $\bar{b}$ with respect to beam for $\sqrt{s} = 40$ TeV pp interactions.

(but not directly forward) directions along the beam directions ($1° < \theta < 20°$). This is the region to be covered by the TASTER detector discussed in the summary[6] of this session.

J/ψ Trigger-Tag

The $b \to J/\psi \to \mu^+\mu^-$ sequence has been chosen because it presents a signature which not only may be triggered on in a relatively simple way but which also, when coupled with the information that the J/ψ is associated with a secondary vertex, is an unambiguous tag that the event contains a $b\bar{b}$ pair. The secondary vertex containing the J/ψ can unequivocally be identified as a beauty decay. The major background to the beauty signature comes mainly from J/ψ produced directly in the primary interactions and mismeasured so as to appear to form a secondary vertex.

At a luminosity of 10^{32} cm^{-2}sec^{-1} at the SSC an experiment must be prepared to handle an interaction rate of 10^7 interactions per second. The cross section for $b\bar{b}$ production predicted for gluon fusion at $\sqrt{s} = 40$ TeV would lead to 4×10^4 $b\bar{b}$ pairs produced per second at this luminosity. If constraints on data recording rates set down in the Fermilab Triggering, Data Acquisition and Computing Workshop for High Energy/High Luminosity Hadron-Hadron Colliders[9] are correct, 1 event per second at 1 Mbyte/event is a reasonable data logging capability to expect at the SSC per experiment. A crude estimate would then be that perhaps only a few 10's of these $b\bar{b}$ pairs can be recorded per second even if a generous allowance is made for technological progress in the next few years. Therefore, the strategy that is chosen for isolating a set of events which is rich in $b\bar{b}$ pairs can sacrifice numbers of $b\bar{b}$ pairs for trigger efficiency and cleanliness of the final data sample to be analyzed offline since not all $b\bar{b}$ pairs can be recorded.

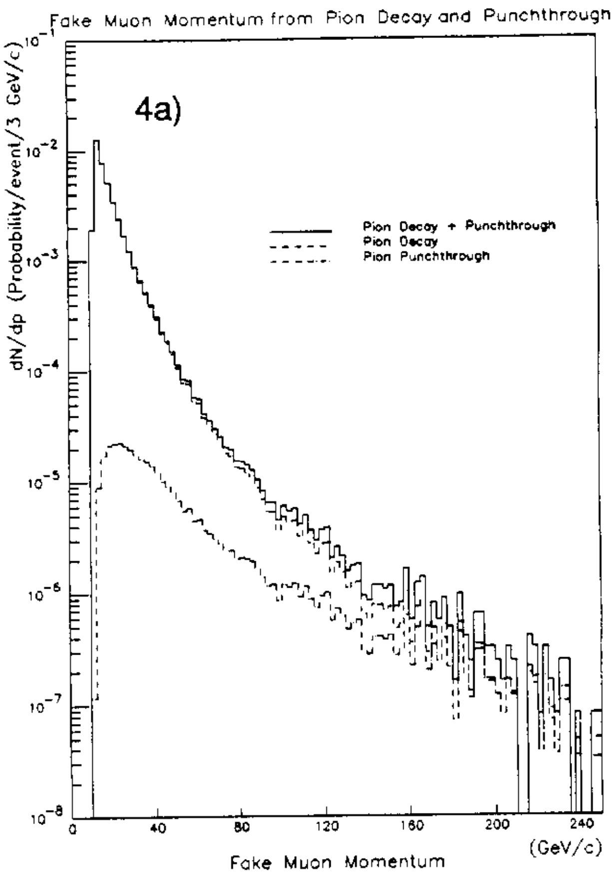
The large number of produced $b\bar{b}$ pairs and their angular correlations make it attractive to take advantage of the relatively large inclusive decay of B's into J/ψ. The branching ratio for $B_{u,d} \to J/\psi + X$ has been measured[10,11] by the ARGUS and CLEO experiments to be $\approx (1.1 \pm 0.2)\%$. The branching ratio for the $\mu^+\mu^-$ decay of the J/ψ is 7%, so an overall penalty of 7.7×10^{-4} is paid in detected beauty events if the decay sequence $B \to J/\psi \to \mu^+\mu^-$ is required as an indicator of a $b\bar{b}$ event. For a canonical run of 10^7 seconds 6×10^8 $b\bar{b}$ pairs (one of which has the $J/\psi \to \mu^-\mu^-$ decay) would be produced over the entire solid angle. The number of such events occuring per second per 4π solid angle would then be approximately 60/second. Approximately 8 of these events would have one or the other b quark in the $1^\circ < \theta < 20^\circ$ solid angle of the TASTER. Only a portion of these events will trigger the experiment because of the muon momentum cut that any real muon detector imposes on the data. To estimate the total dimuon trigger rate we must also consider dimuon trigger rates from sources other than the $B \to J/\psi \to \mu^+\mu^-$ signal. In the following paragraphs we will estimate the dimuon trigger rates from pion decay and punchthrough as well as rate due to direct J/ψ production and decay into $\mu^+\mu^-$ pairs.

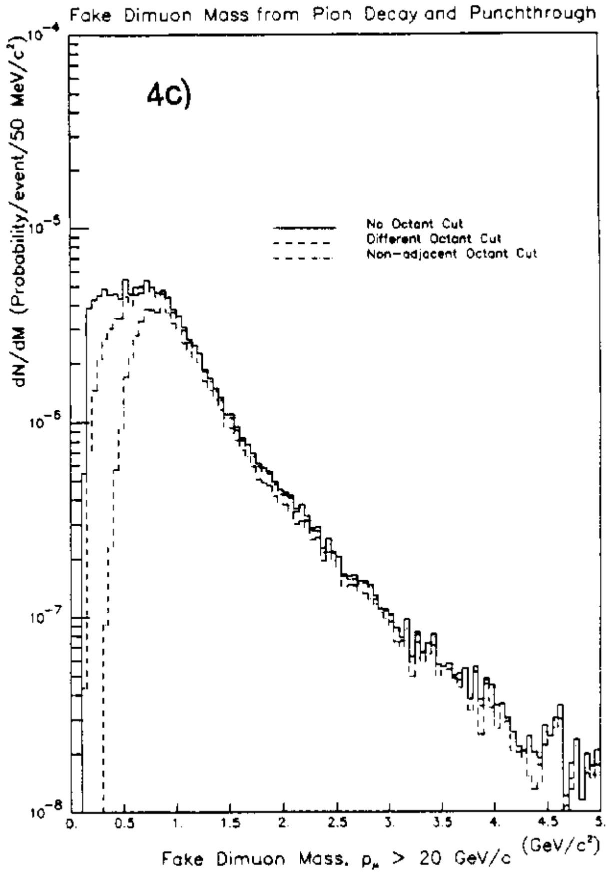
In order to calculate a dimuon trigger rate due to pion decay and punchthrough in the high multiplicity environment of the SSC we have used "minimum bias" events as generated by PYTHIA. In this hadron-hadron Monte Carlo multiple interactions[12] are allowed and initial and final state gluon bremmstrahlung as well as the correlations between particles introduced by the Lund string model[13] are significant features. We have studied the dimuon trigger rates arising from the simultaneous muonic decay of two pions or a combination of hadronic punchthrough[14] and a pion decay in the muon detector of the TASTER (angular coverage $1^\circ < \theta < 20^\circ$, $0 < \phi < 2\pi$). The Level I fast trigger that has been employed requires two or more triple coincidences between elements of three planes of fast scintillation counters embedded in a steel muon absorber. These elements are arranged with octant symmetry and the fast trigger requires that the triple coincidences lie in non-adjacent octants. Fig. 4a shows the simulated muon momentum spectrum that survives this fast trigger, and Fig. 4b shows the dimuon mass spectrum. The dimuon trigger rates for this configuration have been calculated for two thicknesses of the muon absorber, 12 GeV/c and 20 GeV/c. (Note that the 20 GeV/c momentum cut can also implemented with a 12 GeV/c muon absorber by imposing a software cut on the momentum with a high level trigger processor). The mass spectra surviving both of these cuts are shown in Fig. 4b. Table I shows the rates for trigger muon like signals due to pion decay and punchthrough and the suppression of the false dimuon triggers by the non-adjacent octant fast trigger and a second level trigger processor capable of calculating dimuon masses. The results summarized in Table I are for one TASTER at a 10^7 per second interaction rate.

Dimuon trigger processors of the type capable of performing a mass calculation of the sort necessary for the second level trigger indicated above have been constructed[15] and have operated at rates near those corresponding to a 10^{32} cm^{-2}sec^{-1} luminosity. They can operate in times corresponding to 50 microseconds per event (for $\langle n_{ch}\rangle \approx 8$ track events). This trigger processor response time is dominated by the number of track combinations that have to be examined. With good granularity in the TASTER muon detector and taking advantage of the small transverse size of the SSC interaction region ($\sigma \approx 7$ μm), the trigger processor calculation time can probably be kept low at the SSC in spite of the $\langle n_{ch}\rangle \approx 35$ multiplicity by restriction of the regions of the tracking system where muon candidates may be found. These rates are approximate matches to the data recording capability foreseen by the participants in the Fermilab Triggering Workshop. Further reductions in this dimuon trigger rate would perhaps have to invoke reconstruction of secondary vertices on line in similar trigger processor equipment. These false dimuon triggers are eliminated offline by the requirement that the muons form a J/ψ and that the J/ψ come from a secondary vertex.

In addition to these false dimuon trigger rates, there are real dimuons due to direct J/ψ and high mass continuum dimuon production and to the signal itself. The most serious of these two sources is direct J/ψ production with the subsequent decay to muon pairs. Using data[16] on J/ψ production at lower energies and assuming $\sqrt{\tau}$ scaling in pp interactions, we can extrapolate to $\sqrt{\tau} \to 0$ to obtain a $\sigma(pp \to J/\psi + X) \cdot \mathrm{B}(J/\psi \to \mu^+\mu^-) \approx 120$ nbarns at $\sqrt{s} = 40$ TeV. Therefore, we expect approximately 10 $\mu^+\mu^-$ triggers per second from directly produced J/ψ's (and only a fraction of those emitted into the TASTER acceptance). These few events lead to a negligible offline background when the requirement that the J/ψ come from a secondary vertex is imposed.

The efficiency of this trigger for conserving the $b \to J/\psi \to \mu^+\mu^-$ signal has been estimated for the decays of the type $B \to J/\psi K\pi$ as generated by a suitably modified version[17] of PYTHIA that allows specification of particular exclusive decay modes. We have used the same trigger configuration as was used for the background trigger rate and the same solid angle for the detector. We find that 5.0% of the $b \to J/\psi \to \mu^+\mu^-$ signal triggers the semi-forward detector with a 12 GeV/c muon absorber. If the muon absorber is 20 GeV/c thick, then only 2.7% of these decays trigger the detector. These percentages can of course be increased by a factor of two by constructing two detectors, one along either beam direction.





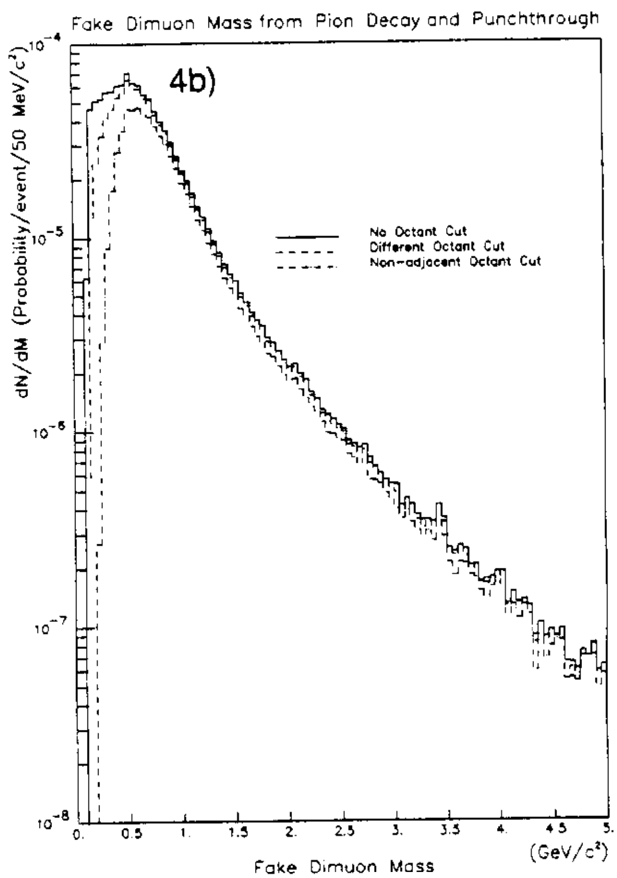


Figure 4: a) Momentum spectrum of background muon signal due to pion decay and punchthrough. b),c) Dimuon mass spectrum of background muons due to pion decay and punchthrough (b) is for a 12 GeV/c muon absorber, c) is for a 20 GeV/c muon absorber; no opposite sign cut for either b) or c)).

We expect trigger efficiencies to be similar for other $b \rightarrow J/\psi$ decay modes. This implies that 3×10^7 events of the form

$$pp \longrightarrow B \quad B + X$$
$$\qquad\qquad \hookrightarrow J/\psi + X$$
$$\qquad\qquad\qquad \hookrightarrow \mu^+\mu^-$$
$$\qquad \hookrightarrow \text{anything}$$

Table I
Background Dimuon Trigger Rates

	12 GeV/c μ Absorber	20 GeV/c μ Absorber
Level 0 Two or More Triple Muon Coincidences	1.1×10^4/sec	1.2×10^3/sec
Level I Trigger Dimuon Fast Logic Trigger Non-adjacent Octants	6.4×10^3/sec	6.4×10^2/sec
Level II Trigger Dimuon Trigger Processor Mass Cut > 2.5 GeV/c^2 No cut on opposite sign	1.4×10^2/sec	3.3×10^1/sec

are collected at a rate of 3 triggers per second in a typical 10^7 second experiment run (doubled if there are two symmetric TASTERs). If we assume that the majority of b quarks are hadronized into B mesons by the acquisition of a light quark (or antiquark) and furthermore that the production of $B_u^{\pm}/B_d^0/B_s^0$ mesons is in the ratio 2/2/1, we accumulate the following numbers of B meson decays in our trigger sample for study:

1. 1.2×10^7 $B_u^{\pm} \rightarrow J/\psi(\rightarrow \mu^+\mu^-)$ + anything accompanied by a 2/2/1 mixture of $B_u/B_d/B_s$ decaying into anything.
2. 1.2×10^7 $B_d^0 \rightarrow J/\psi(\rightarrow \mu^+\mu^-)$ + anything accompanied by a 2/2/1 mixture of $B_u/B_d/B_s$ decaying into anything.
3. 6×10^6 $B_s^0 \rightarrow J/\psi(\rightarrow \mu^+\mu^-)$+anything accompanied by a 2/2/1 mixture of $B_u/B_d/B_s$ decaying into anything.

General Remarks Concerning Beauty Decays Studies Using the J/ψ Triggers

Using the J/ψ trigger events, we may choose either to study the B decays which result in the J/ψ which we have triggered on or we may attempt to study other sorts of beauty decays by looking for the decay of the associated B hadron. If we study the J/ψ decay modes, we will have adequate statistics even for searches for relatively small asymmetries due to CP violation. If we only use the J/ψ mode as a trigger/tag for $b\bar{b}$ events and search for the decay of the accompanying B, we will suffer a loss of statistics due both to another branching ratio and due to the geometric acceptance and detection efficiency for the other mode.

In addition beauty decays, whether they contain a J/ψ or not, fall into two general categories; those which result in a final state which is a CP eigenstate (for example $B_d^0 \rightarrow J/\psi K_s^0$) or a final state which is not a CP eigenstate (for example $B_d^0 \rightarrow D^+\pi^-$). Weak decay phenomena such as CP violating asymmetries in decay rates, charge asymmetries, or time distributions can occur in either type of decay but the strategy for searching for these effects must be tailored to the particular decay. In particular, the particle or antiparticle nature of the parent must be ascertained in any CP violation search. If the final state is a CP eigenstate the particle or antiparticle nature of the parent cannot be determined by an inspection of the final state, whereas if the final state is not a CP eigenstate this should be possible. In the case of a final state which is a CP eigenstate the accompanying B decay must be searched for and identified to fix the nature of the parent particle which decayed into a CP eigenstate. Even if the other B decay is found this determination can be confounded by mixing effects (in the case of an accompanying neutral B hadron where the B^0 has evolved into its antiparticle) or by multiple $b\bar{b}$ where the wrong B is detected. The case in which the accompanying B is charged is the least ambiguous case. However, in almost all cases in collider experiments, the charged or neutral nature of the accompanying B must be determined by a complete collection of all decay products and the complete reconstruction of the B mass (remember that the accompanying B will in general not have the J/ψ tag on its secondary vertex). The beauty particle will not be directly observed. In fixed target experiments a high precision live target does offer the opportunity of directly observing the beauty track and ascertaining its charged or neutral character.

Even if the accompanying B meson can be found and the particle or antiparticle nature of both B mesons in the event can be determined, the relative abundance of B and $\bar{B}$ mesons in $\sqrt{s} = 40$ TeV events must be determined if small asymmetries in B decays due to CP violation are to be observed. It is not possible to assume, a priori, that the populations of B and $\bar{B}$ mesons will be equal in pp interactions since the initial state pp system contains six more quarks than antiquarks. This quark excess can lead to small asymmetries of B and $\bar{B}$ mesons since the b quarks will find it slightly easier to find two light quarks to form a baryon than $\bar{b}$ quarks will to find two light antiquarks. Therefore the number of b quarks available to form $\bar{B}$ mesons will be slightly depleted. However this asymmetry (which could lead to slight asymmetries which could be attributed to CP violation if equality of B and $\bar{B}$ meson populations were assumed) along with any asymmetries which are due to experimental systematic errors can be determined by measurement of a decay mode (such as $B^0 \rightarrow J/\psi K^+\pi^-$) where appreciable CP violating asymmetries are not expected. The particular caveat to this technique is that modes in which CP violating asymmetries are not expected (according to the standard model) present the greatest opportunity and the largest lever arm for observing new physics (asymmetries due to new generations, more Higgs bosons, horizontal gauge bosons, etc.) Therefore, this approach must be exercised with care. A particularly appropriate moral or guideline in examining the weak beauty decays may well be to "look where nothing is expected."

Beauty Decays According to the Standard Model

As an ultimate benchmark for the sensitivity of experiments which use the technique of the J/ψ trigger-tag as a way of identifying and isolating a clean sample of $b\bar{b}$ events, the potential for observing CP violating effects in the B weak decays must be used. Many other exciting or interesting pieces of physics (such as the QCD studies, the hadronization of b quarks, measurements of lifetimes, measurements of mixing effects, branching ratios for exclusive modes, and even the rare non-CP violating decays) are more accessible. If CP violation is observable then these other phenomena can also be studied. CP violation may show up in differing rates for particular CP symmetric decays between B and $\bar{B}$ mesons or in differing time distributions. These possibilities have been remarked on by a number of authors[18,19,20,21] and have been considered in both the 1984 and 1986 Snowmass heavy flavor sessions[22,23]. We now consider some of the potentially interesting decays (which should show CP violation according to the standard model) in the context of the J/ψ trigger-tag.

Using the calculations of branching ratios and asymmetries due to CP violations calculated in reference 18, we have compiled Table II which contains, as examples, some (but not all by any means) of the potentially interesting candidate decays in which CP violating effects could possibly be observed. These effects include not only differences in integrated decay rates of B versus $\bar{B}$ decay rates into CP conjugate final states but also significant differences in the time distributions of the B and $\bar{B}$ decays. Therefore, there is considerably more sensitivity to CP violating effects than may at first be obvious in the integrated numbers of decays shown in Table II that can be collected in 10^7 seconds.

As noted by the authors of reference 18 there is a seesaw effect in these decays (in the standard model) as can be seen in Table II such that large asymmetries are correlated with small branching ratios and vice versa. We have divided Table II into two parts. The first section considers decays which include the trigger J/ψ. We refer to this section as the same side decays. The second part of Table II refers to the decay of the other B hadron in the event which we call the away side decay. The * decays require the identification of the particle or antiparticle nature of the parent B by observation of the accompanying B hadron.

While this list of decay modes does not include all modes that are interesting to examine for evidences of CP violation, these decays serve to demonstrate the problems that arise in accumulating statistics for the CP violation searches. The number of events in the right hand column of Table II still must be decreased by the following:

1. The geometric acceptance for the decay products of the various exclusive modes containing the J/ψ (the same side section of Table II) other than the $J/\psi \rightarrow \mu^+\mu^-$ geometric acceptance which is already included in the number of events.

Table II
Examples of Beauty Decays Sensitive to CP Violating Effects

Same Side Decays	Asymmetry	BR⁺	# per 10^7 sec‡
$^*B_d^0 \to J/\psi\phi$ vs $\bar{B}_d^0 \to J/\psi\phi$	8%	10^{-5}	10900
$^*B_d^0 \to J/\psi K_s^0$ vs $\bar{B}_d^0 \to J/\psi K_s^0$	8%	5×10^{-4}	545000
$^*B_s^0 \to J/\psi\phi$ vs $\bar{B}_s^0 \to J/\psi\phi$	−2%	3×10^{-3}	1640000
Away Side Decays	**Asymmetry**	**BR**	**# per 10^7 sec‡**
$B_d^0 \to D^+\pi^-$ vs $\bar{B}_d^0 \to D^-\pi^+$	−60%	10^{-5}	120
$^*B_d^0 \to K^+K^-$ vs $\bar{B}_d^0 \to K^+K^-$	10%	$< 10^{-4}$	< 1200
$B_d^0 \to D^-\pi^+$ vs $\bar{B}_d^0 \to D^+\pi^-$	−0.2%	2×10^{-2}	240000
$^*B_s^0 \to K^+K^-$ vs $\bar{B}_s^0 \to K^+K^-$	38%	10^{-5}	120
$B_s^0 \to D^+\pi^-$ vs $\bar{B}_s^0 \to D^-\pi^+$	56%	2×10^{-4}	2400
$B_s^0 \to D^-\pi^+$ vs $\bar{B}_s^0 \to D^+\pi^-$	23%	10^{-3}	12000

⁺In the numbers of events given in our dimuon trigger sample we have already included the inclusive branching ratio of 1.1% for $B \to J/\psi + X$ (as well as the $J/\psi \to \mu^+\mu^-$ branching ratio). Therefore only the relative fraction of that inclusive branching ratio that goes into each exclusive mode is applied to calculate the numbers in the "same side" section of Table II.

‡Total number of B and $\bar{B}$ mesons decaying to given final state.

2. The geometric acceptance for all the decay products of the "away side" decays for studies using the away side B mesons.

3. The geometric acceptance for the away side B decays if identification of the particle or antiparticle nature of the meson decaying into the J/ψ + anything is required for the "same side" studies. In general for every case we have listed in the same side section of Table II, the detection and identification of the away side B meson will be required if CP violations are to be detected.

4. Any additional detector efficiencies such as K-π identification in the ring imaging Cherenkov counter or vertex finding in the microvertex detector of the TASTER.

The combination of 1, 2, and 3 make CP violation searches conducted either with the trigger decay or the "away side" more comparable in spite of the big statistical advantage that searches conducted with the J/ψ modes apparently enjoy according to Table II. In most cases a search for CP violation will require the complete identification and reconstruction of both of the associated B meson decays. We also note that if we restrict ourselves to the search for CP violation in events with final states in which $B^\pm B^0$ are produced (in order to facilitate the determination of the particle or antiparticle nature of the B^0) we will be able to use only 40% of the 3×10^7 events in our trigger sample.

In an attempt to estimate the cumulative effect of these factors on the final statistics for a CP search, we made "reasonable" guesses for each of these items for the $B_s^0 \to J/\psi\phi \to \mu^+\mu^-K^+K^-$ decay. The branching ratio $\phi \to K^+K^-$ of 49%, an estimated additional geometric efficiency for collection of the K^+K^- of 70%, an assumed $K^\pm$ identification efficiency of 70%, and an estimated microvertex detector efficiency of 50% for seeing the seondary vertex yield an overall depletion of statistics of 1.2×10^{-1}. Since we require the identification of the other B in the event in order to fix the particle or antiparticle nature of the B_s^0 and since the strategy which requires the other B to be charged is that least fraught with ambiguities, we will suffer an immediate depletion of 0.4 if the 2/2/1 hadronization ratios are correct. Of the remaining 40% of the events, some subset of the $B^\pm$ is completely reconstructed and identified as either a B^+ or a B^-. We have not completely developed a realistic strategy for this problem since it will involve analysis of many modes, but even if we generously assume that 5% of these "away side" B's are in the acceptance of the TASTER and can be identified and reconstructed, an overall reduction of events in our final sample of $0.12 \times 0.4 \times 0.05 = 2.4 \times 10^{-3}$ must be expected. This leaves us with a sample of 3900 events in which to observe effects due to a 2% asymmetry. Similar analyses of other modes lead to slightly more optimistic conclusions for some other decay modes because of the larger asymmetries expected. In general these CP searches, while quite difficult if the level of CP violation is that predicted by the standard model, are not precluded and should be attempted at the SSC. We have not yet completely studied the question of the differences of the time distributions or the possibility of adding other exclusive decay channels (channels such as $J/\psi\phi\pi^+\pi^-$) to the primary channels in order to enhance statistics.

Conclusions

We have studied the potential of the J/ψ trigger-tag and find that we can accumulate significant numbers of events in a clean sample which can unambiguously be determined to contain $b\bar{b}$ pairs. The trigger rates achievable at an interaction rate of 10^7/sec is close to that which can be recorded for a detector such as the TASTER which is discussed elsewhere in the heavy flavor summary. Strategies for searches for CP violation in B decays have been discussed. The residual data samples expected, while small, may allow significant observations of CP violation effects.

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