Valencia status/plans

Marcel Vos – IFIC Valencia

thanks to L. March, E. Ros

Past work in exotics with high p_T b/top

Search for Kaluza-Klein excitations of the gluon in models with extra dimensions

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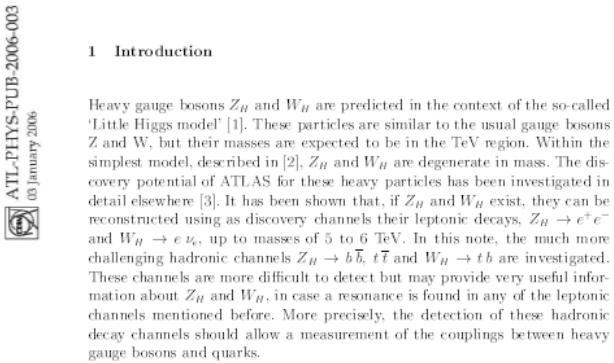
Abstract

The decay of Kaluza-Klein excitations of the gluon is analyzed in the context of some extra-dimension models. The mass of these excitations is assumed to be in the region of a few TeV and decays involving b and t quarks are investigated.

ATL-PHYS-PUB-2006-002
03 January 2006

1 Introduction

Kaluza-Klein (KK) excitations of gauge bosons are predicted in the context of some models with TeV^{-1} size extra-dimensions. Examples of such models are variants of the so called 'ADD model' [1], with fermions confined to a D-brane, but with the difference that all gauge bosons may propagate in the bulk. The phenomenology of such models is discussed for example in [2]. The potential of ATLAS to observe KK excitations of the weak gauge bosons (Z and W) has already been discussed in [3] and [4]. KK gluon excitations are also expected as discussed in [5]. The KK excitations of Z and W are detected by reconstructing their leptonic decays. The detection of KK excitations of the gluon is much more challenging since only hadronic decays are expected. The sensitivity of LHC for such gluon excitations (g^* in the following) has already been discussed in [6]. In these searches, the presence of gluon excitations is detected by analyzing deviations in the dijet cross-section. An alternative is proposed in the present analysis, where the presence of g^* is detected by analyzing its decays into heavy quarks.



Search for hadronic decays of Z_H and W_H in the Little Higgs model

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Abstract

The decay of heavy gauge bosons Z_H and W_H into hadrons is analysed in the context of the 'Little Higgs model'. The mass of these heavy bosons is assumed to be 1 or 2 TeV and decay modes involving b-quarks or t-quarks are investigated.

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03 January 2006

1 Introduction

Heavy gauge bosons Z_H and W_H are predicted in the context of the so-called 'Little Higgs model' [1]. These particles are similar to the usual gauge bosons Z and W, but their masses are expected to be in the TeV region. Within the simplest model, described in [2], Z_H and W_H are degenerate in mass. The discovery potential of ATLAS for these heavy particles has been investigated in detail elsewhere [3]. It has been shown that, if Z_H and W_H exist, they can be reconstructed using as discovery channels their leptonic decays, $Z_H \to e^+e^-$ and $W_H \to e\,\nu_e$, up to masses of 5 to 6 TeV. In this note, the much more challenging hadronic channels $Z_H \to b\bar{b}$, $t\bar{t}$ and $W_H \to t\,b$ are investigated. These channels are more difficult to detect but may provide very useful information about Z_H and W_H, in case a resonance is found in any of the leptonic channels mentioned before. More precisely, the detection of these hadronic decay channels should allow a measurement of the couplings between heavy gauge bosons and quarks.

$G^* \to tt$

KK excitation of gluon in models with Extra Dimensions, B. Salvachua

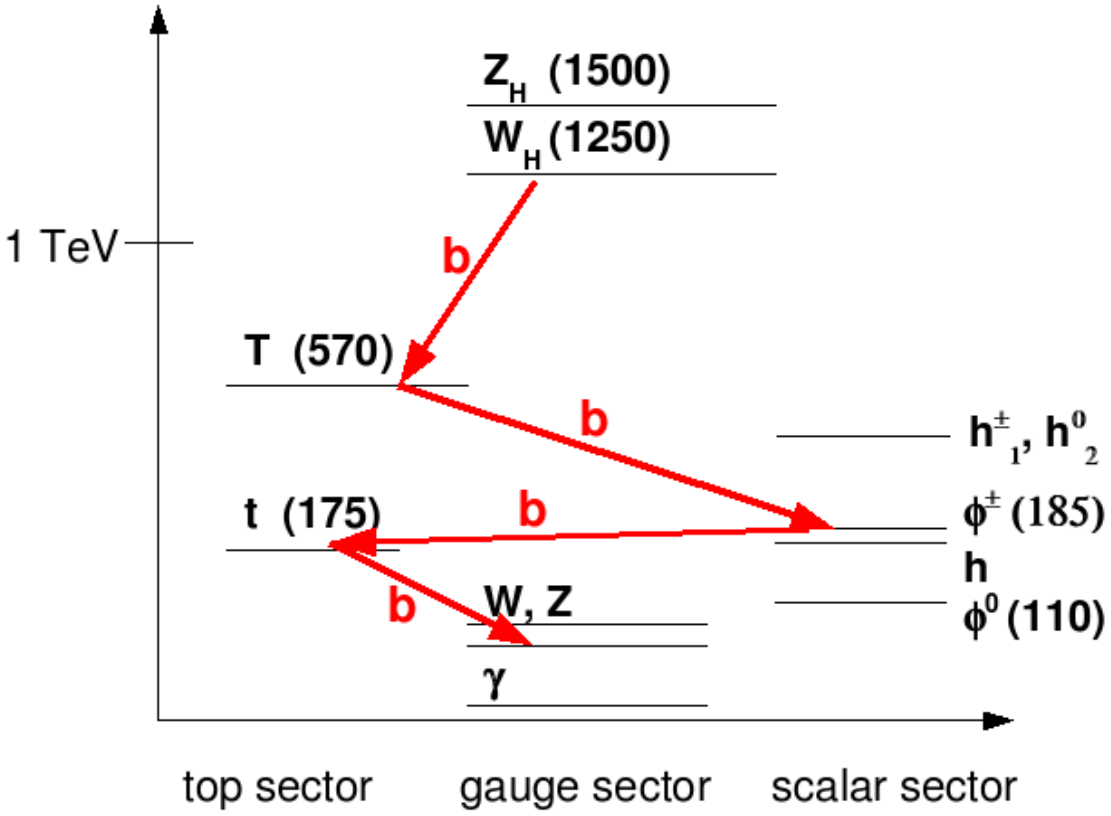
Little Higgs

Hadronic decays of W_H and Z_H

J.E. Garcia, L. March

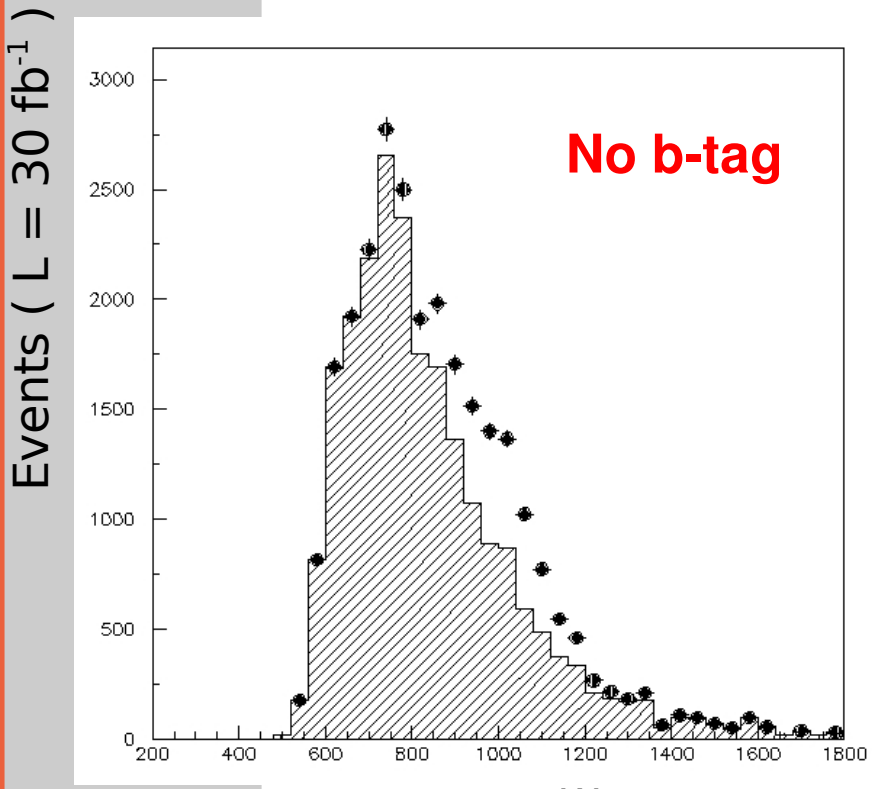
Left Right Twin Higgs model

Left-Right Twin Higgs (Les Houches BSM session, recent exotics WG meetings)

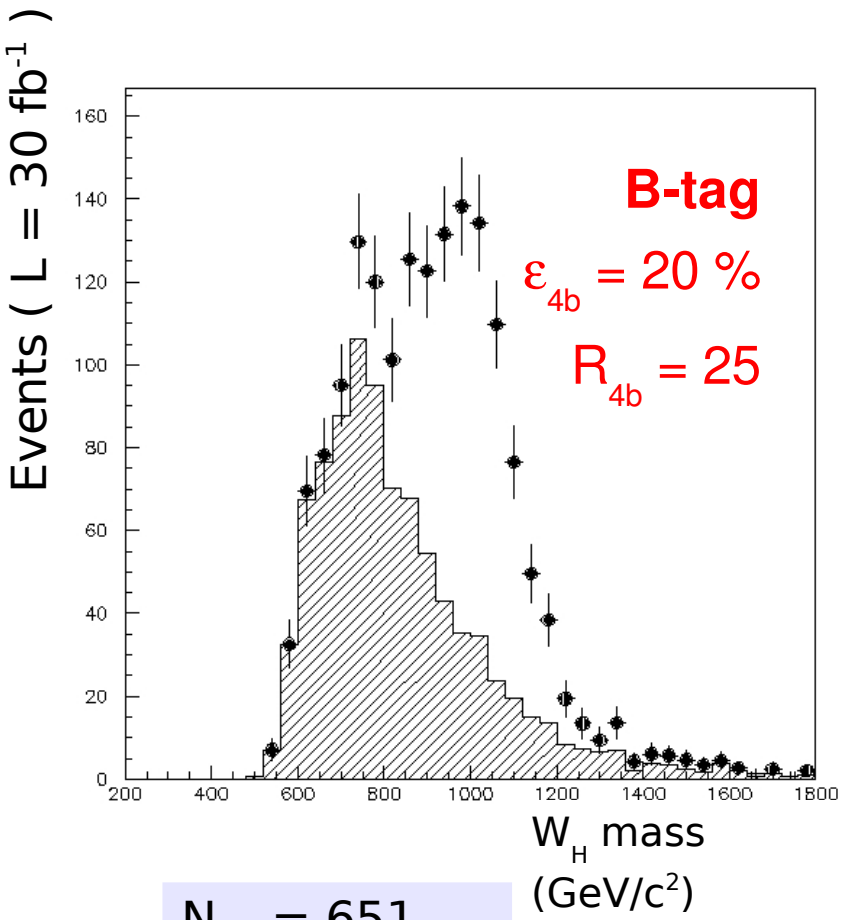


Cascasde decays
$W_H \rightarrow Tb$

W_H (1 TeV/c^2) → Tb signal/bkg for L=30 fb^{-1}

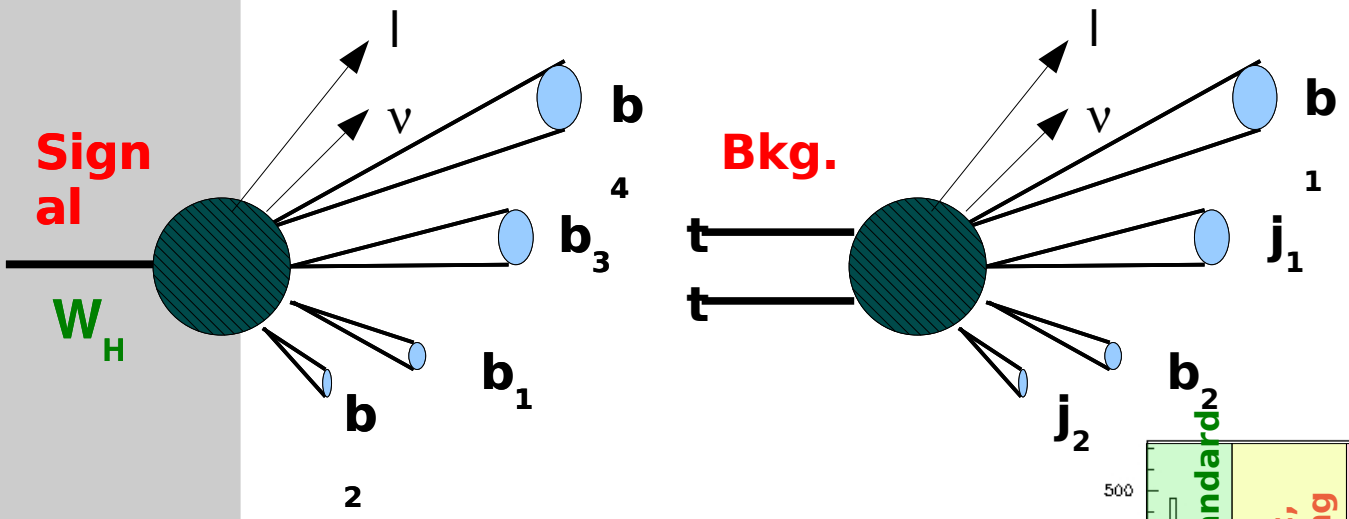


N_{sig} = 3253
N_{tt} = 9427
N_{wj} = 319
$N/\sqrt{B}$ = 33



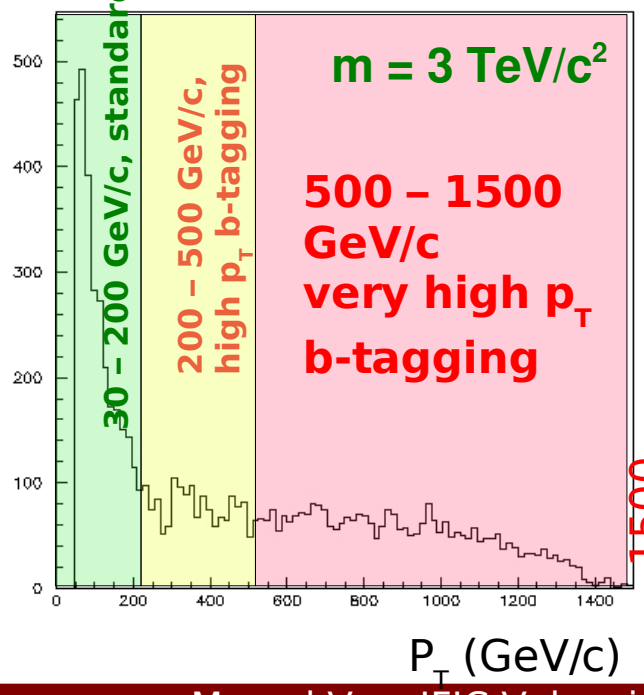
N_{sig} = 651
N_{tt} = 377
N_{wj} ~ 0
$N/\sqrt{B}$ = 33

Reconstruction multi high p_T b-jets final state

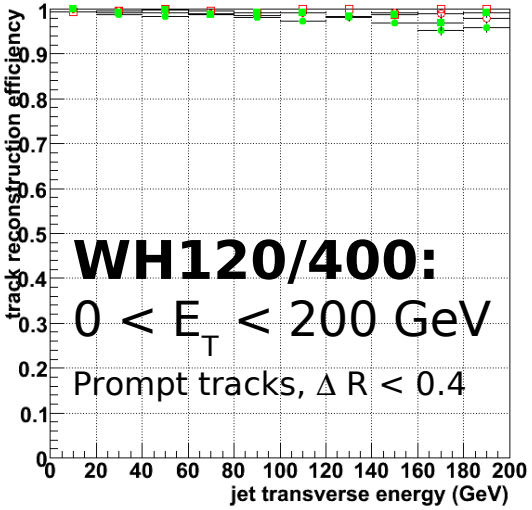


How to tag a signal of 4 b-jets against a background of 2 b + 2 j ?

For multi-jet final states, with large variations in jet energy, **a 4 b-jet likelihood** from individual jet weights, is much more efficient than standard efficiency-rejection curves approach .



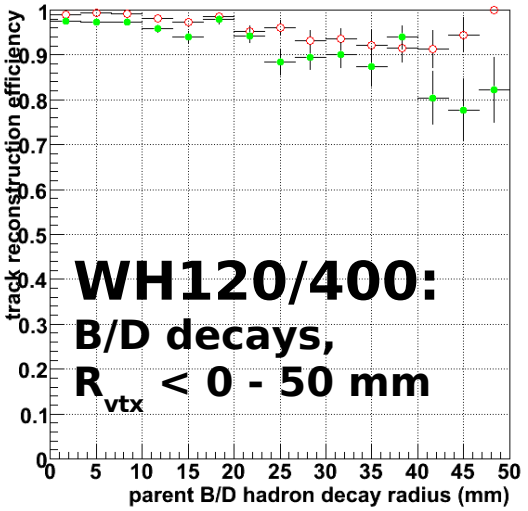
No tagging without tracking

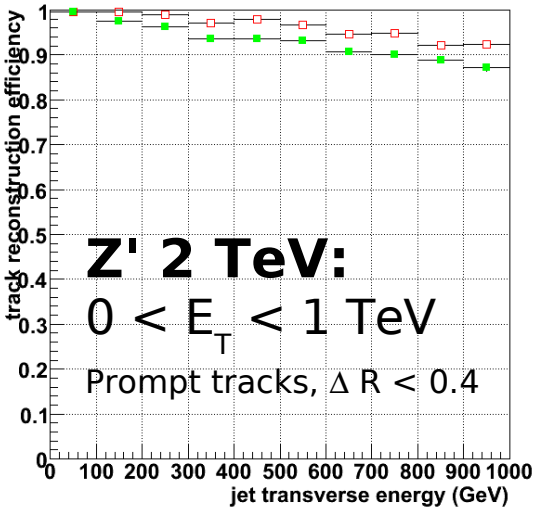


Reconstruction efficiency for "good" tracks >90% inside highest p_T jets!

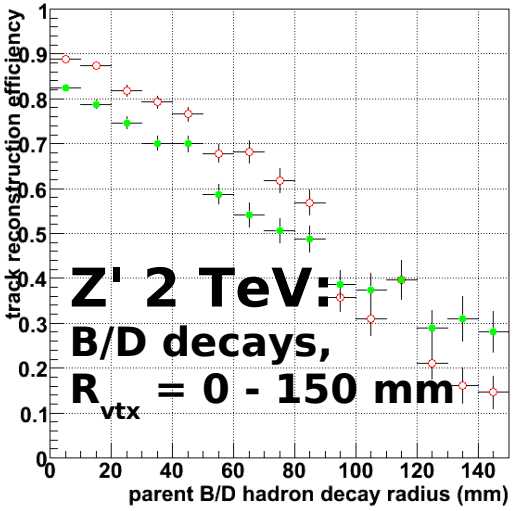
IpatRec

New Tracking





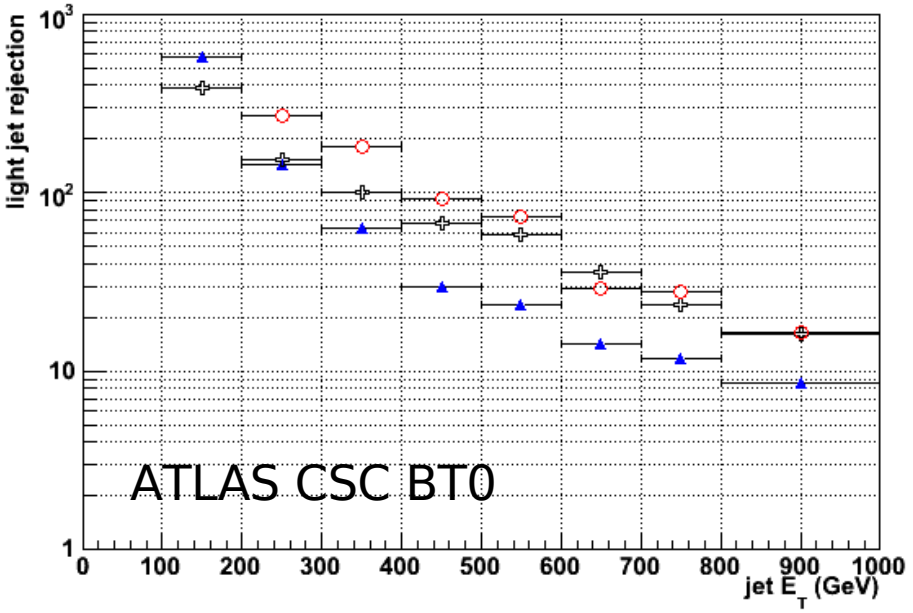
displaced vertices present a real challenge

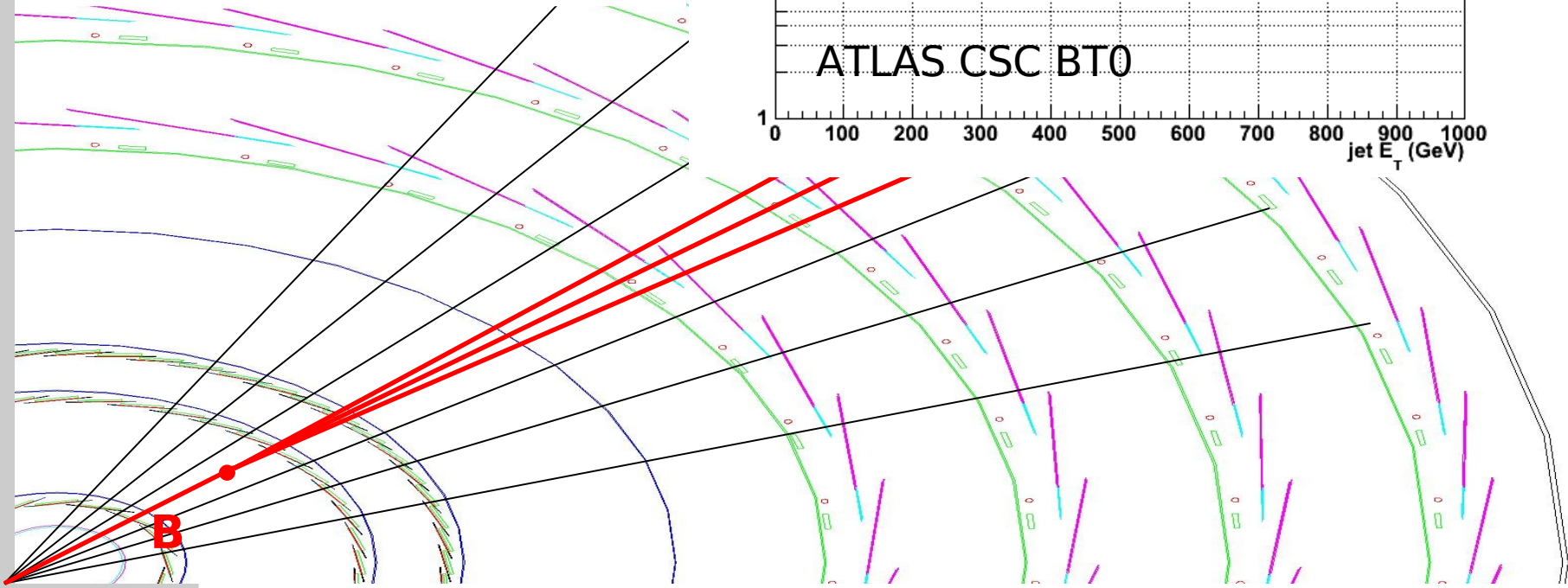


Ongoing work: very high p_T b-tagging

b-tagging in high p_T jets

Try to improve the performance of the ATLAS algorithms in this corner of phase space.
More information: Recent Flavour tagging WG meetings





Ongoing work: top mono-jet identification

Distinguish “top mono-jet” consisting of hadronic decay products of top from QCD light jets using lifetime signature of b-jet. Part II to ATL-COM-PHYS-2008-001

Preliminary results indicate performance in $Z' \rightarrow tt$ is approximately equally good (or as bad) as in $Z' \rightarrow bb$; tagging not affected dramatically by presence of particles from W-decays (tagging cone << jet cone).

Results to be published as “Part II” to ATL-COM-PHYS-2008-001 sometime in spring 2008

Summary

Important track record in exotic physics yielding final states with bottom or top

committed to flavour tagging of high p_T jets