

# **IOP HEPP Particle Physics 2008**

Monday 31 March 2008 - Wednesday 2 April 2008

Lancaster University

## **Book of Abstracts**



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**Plenary Session 1 / 0**

**Detectors**

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**Plenary Session 1 / 1**

**Accelerators**

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<sup>1</sup> *The Cockcroft Institute*

**Plenary Session 1 / 2**

**Electroweak**

**Author:** Victoria Martin<sup>1</sup>

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**Plenary Session 2 / 3**

**SM/MSSM/Higgs**

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**Plenary Session 2 / 4**

**QCD and the legacy of HERA**

**Author:** Jonathan Butterworth<sup>1</sup>

<sup>1</sup> *University College London*

**Plenary Session 4 / 5**

**Heavy Flavour and CP Violation**

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**Plenary Session 4 / 6****Theory Overview**

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**Plenary Session 3 / 7****Astro-Particle****Plenary Session 3 / 8****Neutrinos**

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**Plenary Session 3 / 9****Grid Computing**

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**Parallel 2B: Flavour Physics - LHC / 12****Quarkonium production and polarisation with early data at ATLAS**

**Author:** Darren Price<sup>1</sup>

<sup>1</sup> *Lancaster University*

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One of the first physics results to come out of ATLAS will be an analysis of J/psi and Upsilon production at 14 TeV. I present an overview of the motivation for looking into the theoretical model underlying quarkonium production, ATLAS expected performance and rates for quarkonium reconstruction and its ability to separate out various proposed production models with a view to improving our understanding of QCD.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 13**



## Z boson decay to photon plus Kaluza Klein graviton in large extra dimensions

**Author:** Jordan Skittrall<sup>1</sup>

**Co-authors:** Ben Allanach<sup>1</sup>; K. Sridhar<sup>2</sup>

<sup>1</sup> *University of Cambridge, UK*

<sup>2</sup> *Tata Institute of Fundamental Research, Bombay, India*

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In the large extra dimensional ADD scenario, Z bosons undergo a one-loop decay into a photon and Kaluza-Klein towers of gravitons/gravi-scalars. We consider the phenomenology of this decay, using LEP data to derive constraints on the size of such extra dimensions.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2C: ILC Physics and Accelerator / 14**

## The top quark threshold at the ILC

**Author:** Filimon Gournaris<sup>1</sup>

<sup>1</sup> *UCL*

**Corresponding Author:** fg@hep.ucl.ac.uk

The top quark threshold at the ILC offers unique opportunities to make measurements of the top quark properties (mass, width, couplings) to an unprecedented precision. I will describe how the measurement will be done, give an overview of the main experimental issues and present recent developments leading to a full simulation of the precision reach at the ILC.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1C: Neutrino Physics / 15**

## Double beta decay of Neodymium-150 in the NEMO-3 experiment

**Author:** nasim fatemi-ghomi<sup>1</sup>

<sup>1</sup> *manchesteruniversity*

**Corresponding Author:** nasim@hep.man.ac.uk

The NEMO3 detector is a currently running double beta decay experiment in Modane underground laboratory in France. Neodymium-150 is one of the 7 double beta decay isotopes in NEMO3. This work presents a precise measurement of the two neutrino double beta decay half-life of Neodymium-150 and also limits on the half-life of the different neutrinoless modes of this isotope.

**Talk, Poster, or Talk & Poster:**

talk

**Parallel 1B: Flavour Physics B-factory and Tevatron / 16**

## Measurements of Partial Branching Fractions for $B \rightarrow X$ and Determination of $|V_{ub}|$ at BaBar

**Author:** Michael Sigamani<sup>1</sup>

<sup>1</sup> *Queen Mary, University of London*

We present partial branching fractions for inclusive charmless semileptonic B decays  $B \rightarrow Xu l ?$ , and the determination of the CKM matrix element  $|V_{ub}|$ . The analysis is based on a sample of 383 million  $Y(4S)$  decays into B Bar pairs collected with the BaBar detector at the PEP-II  $e^+e^-$  storage rings.

$\Psi(4S) \rightarrow B \text{ Bar}$  events are tagged by the full reconstruction of a hadronic decay of one of the B mesons. Signal  $B \rightarrow Xu l ?$  is then identified looking at several kinematic variables. The corresponding value of  $|V_{ub}|$  is extracted.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 17**

## A Search for Heavy Resonances in the $e^+e^-$ Final State

**Author:** Dave Evans<sup>1</sup>

<sup>1</sup> *H.H. Wills Physics Laboratory*

**Corresponding Author:** d.evans@cern.ch

At the LHC bunched proton proton collisions will occur at a centre of mass energy of 14 TeV, an order of magnitude greater than previously available. It has been shown that models predicting new heavy resonances decaying to electron-positron pairs may be detectable with a small data sample given the predicted clean event signature and low background. A search for such high mass events presents one of the earliest opportunities to search for new physics at this energy frontier.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1B: Flavour Physics B-factory and Tevatron / 18**

## Evidence for $b \rightarrow d\gamma$ Transitions Using a Sum of Exclusive Final States

**Author:** Mark Tibbetts<sup>1</sup>

<sup>1</sup> *Imperial College*

We present details of an ongoing analysis of data collected by the BaBar detector at the PEP-II asymmetric-energy  $e^+e^-$  storage rings at SLAC. Making use of a sum of exclusive final states with up to three charged pions and one neutral pion or eta, we demonstrate that it is possible to measure the ratio of the inclusive rates  $b \rightarrow d\gamma$  and  $b \rightarrow s\gamma$ . This provides information on  $|V_{td}/V_{ts}|$  that is complementary to using the exclusive modes  $B \rightarrow \rho\gamma$  and  $B \rightarrow K^*\gamma$ .

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2A: Collider Physics - Higgs / 19**

## The Search for Higgs in the $W+W^-$ Decay Channel at the CDF detector at Fermilab

**Author:** toby davies<sup>1</sup>

<sup>1</sup> *glasgow university*

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An outline of the current search results for the standard model Higgs decaying to  $W+W^-$  and then to leptons from CDF. Descriptions and evaluations of the matrix element and neural net techniques which are presently used together in current searches.

**Talk, Poster, or Talk & Poster:**

Talk & Poster

**Parallel 2B: Flavour Physics - LHC / 20**

## Study of $B^{+-} \rightarrow D^0(K\pi^+\pi^-)K^+$ Dalitz decays and Sensitivity to gamma in LHCb

**Author:** Ying Ying Li<sup>1</sup>

**Co-author:** Valerie Gibson<sup>1</sup>

<sup>1</sup> *High Energy Physics Group, Cavendish Laboratory*

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A measurement of the CP angle gamma at the tree-level is one of the principal goals of LHCb and provides a benchmark for any New Physics. One of the most precise direct determinations of gamma comes from the amplitude analysis of the Dalitz plots in  $B^{+-} \rightarrow (D^0/D^0\text{-bar})K^+$  decays, where the  $D^0/D^0\text{-bar}$  decays to  $K\pi^+\pi^-$ . This has been demonstrated at the B-factory experiments and will be a key measurement at the LHC with the first few years of data. This presentation will cover the expected event yields and backgrounds at LHCb with the first few years of data and provide an estimate of the sensitivity to gamma.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1A: Collider Physics - QCD and Electroweak / 21**

## **Measurement of beauty photoproduction at HERA II with the ZEUS detector**

**Author:** Sarah Boutle<sup>1</sup>

<sup>1</sup> *UCL*

**Corresponding Author:** sarah.boutle@cern.ch

Beauty photoproduction has been measured with the ZEUS detector using a sample of  $124\text{pb}^{-1}$  of HERA II data. The beauty content of a sample with two jets and a muon was analysed exploiting the muon impact parameter, using information from the silicon vertex detector, and the transverse momentum of the muon relative to the closest jet. Differential cross sections for beauty production as a function of the transverse momentum and pseudorapidity of the muon are compared to next-to-leading order (NLO) QCD predictions and to previous measurements. As a further comparison with QCD calculations, dijet correlation cross sections have also been measured.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 22**

## **Simulations of BSM Physics**

**Author:** Martyn Gigg<sup>1</sup>

<sup>1</sup> *University of Durham*

**Corresponding Author:** m.a.gigg@durham.ac.uk

I will present the work I have been doing in simulations of BSM physics within the Herwig++ event generator.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2A: Collider Physics - Higgs / 24**

## **Searching for a Higgs Boson in the channel $t\bar{t}H(H \rightarrow b\bar{b})$ with the ATLAS detector**

**Author:** Lily Asquith<sup>1</sup>

<sup>1</sup> *University College London*

**Corresponding Author:** lilyasquith@gmail.com

The search of a Higgs Boson around the lower mass region (the mass indicated by LEP precision measurements) is particularly challenging at the LHC due to the vast QCD background. For  $M_{\text{Higgs}} < 130$  GeV, decay is predominantly to a  $b$  anti- $b$  quark pair, which makes it difficult to reconstruct because the total cross section for  $b$  anti- $b$  production at the LHC will be  $\sim 10^9$  times higher than the cross section for  $H \rightarrow (b \text{ anti-} b)$ .

We therefore require the Higgs to be produced in association with a top anti-top pair, in order that a high pt lepton from the decay of one of the top quarks can be used as a trigger for Higgs candidate events.

Separating the Higgs signal from the myriad of background events is further achieved by the development and implementation of a cut-based analysis, optimizing the event reconstruction using information from  $b$ -tagging algorithms and implementing a channel-specific jet energy calibration.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2C: ILC Physics and Accelerator / 26**

## Anomalous top coupling at the ILC - from the tools to the physics

**Author:** Erik Devetak<sup>1</sup>

<sup>1</sup> *Oxford University / RAL*

**Corresponding Author:** e.devetak1@physics.ox.ac.uk

After a brief description of the theory behind  $Wtb$  anomalous coupling we will follow with an overview of the vertexing and flavour tagging tools developed. Finally we will outline the usage of flavour tagging and charge reconstruction in the anomalous top coupling analysis.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2B: Flavour Physics - LHC / 27**

## $B_s \rightarrow \phi \phi$ as a potential probe for New Physics at LHCb

**Author:** Nicholas Styles<sup>1</sup>

<sup>1</sup> *University of Edinburgh*

**Corresponding Author:** n.a.styles@ed.ac.uk

The LHCb experiment, currently being commissioned at CERN, will perform precision measurements of mixing and decays in  $B$ -mesons. I will present studies on the decay  $B_s \rightarrow \phi \phi$ , a channel in which physics beyond the Standard Model has the potential to affect parameters measurable at LHCb. An introduction to the channel will be given, including the physics of  $B$ -meson to Vector-Vector decays. Event selection based on the full LHCb Monte-Carlo data will be discussed, along

with expected events yields for various integrated luminosity scenarios. Strategies for fitting the total weak phase,  $\phi_s$ , and the transverse polarisation fraction,  $f_{\text{perp}}$ , will be explored.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 28**

## CP violation in the MSSM at the LHC

**Author:** Jamie Tattersall<sup>1</sup>

**Co-author:** Gudrid Moortgat-Pick<sup>1</sup>

<sup>1</sup> *University of Durham*

**Corresponding Author:** jamie.tattersall@durham.ac.uk

We consider the complex MSSM and examine whether and in which cases CP-violating phases will be observable at the LHC. We study Stop production and subsequent cascade decay into Neutralinos as the process for our investigation. It is found that asymmetries of up to 40% can be produced.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1C: Neutrino Physics / 29**

## Lepton Number Violating mSUGRA and Neutrino Masses

**Author:** Steve Chun-Hay Kom<sup>1</sup>

**Co-author:** Ben Allanach<sup>1</sup>

<sup>1</sup> *DAMTP, University of Cambridge*

**Corresponding Author:** c.kom@damtp.cam.ac.uk

We perform a quantitative study of neutrino phenomenology in the framework of minimal supergravity (mSUGRA) with grand unified theory (GUT)-scale tri-linear lepton number violation. The difficulties in obtaining the observed neutrino mass pattern are discussed, and we show that numerical fits are possible using two GUT scale lepton number violating parameters and three charged lepton mixing angles. We also discuss some phenomenological consequences of the models, such as tuning issues.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1C: Neutrino Physics / 30**

## The SciBooNE Experiment: Motivation, Construction and CCQE Analysis

**Author:** Joseph Walding<sup>1</sup>

<sup>1</sup> *Imperial College London*

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The SciBooNE experiment is the newest neutrino experiment to be built at the Fermi National Accelerator Laboratory (FNAL), USA. The detector sits on-axis, 100 metres downstream of the target in the Booster Neutrino Beam-line.

Proposed in 2005, SciBooNE began its data run in June 2007 with completion projected for August 2008.

SciBooNE has a number of measurement goals, principally sub-GeV neutrino cross-section measurements in both neutrino and anti-neutrino mode, of interest to the T2K experiment which will begin running in Japan in April 2009.

An outline of the SciBooNE experiment, the construction and commissioning of the detectors, in particular the Muon Range Detector (MRD), will be presented along with a discussion on preliminary work towards making a Charged Current Quasi-Elastic (CCQE) cross-section measurement.

**Talk, Poster, or Talk & Poster:**

Talk

### Parallel 2A: Collider Physics - Higgs / 31

## Weak boson fusion

**Author:** Sophy Palmer<sup>1</sup>

**Co-authors:** Georg Weiglein<sup>1</sup>; Terrance Figy<sup>1</sup>

<sup>1</sup> *University of Durham*

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Higgs production via weak boson fusion (WBF) is both an excellent discovery channel and a source of valuable information about the structure of the coupling between weak bosons and a Higgs. WBF is examined in both the Standard Model and the MSSM, with particular emphasis on this coupling and its sensitivity to higher-order corrections.

**Talk, Poster, or Talk & Poster:**

Talk

### Parallel 1A: Collider Physics - QCD and Electroweak / 32

## A data driven measurement of W and Z boson production cross sections in ATLAS

**Author:** Ellie Dobson<sup>1</sup>

<sup>1</sup> *University of Oxford*

**Corresponding Author:** eleanor.dobson@cern.ch

An important aim of the LHC is the precise measurement of W and Z boson production cross sections, as these may be used to extract fundamental electroweak parameters as well as further test and constrain existing QCD models. In first data they may also be used as ‘standard candle events’ to understand detector performance. Any significant deviation from the predicted behaviour of these events could be one of the first indications of physics beyond the Standard Model, and so understanding these events is of paramount importance to new physics searches. It is important to make a data driven measurement of the cross sections and, whenever possible, not to rely on Monte Carlo simulation. Such a method of determining these cross sections in the ATLAS detector is outlined for the electron channel, with particular focus given to recent studies into a data driven determination of MET resolution and measurement of trigger efficiency.

**Talk, Poster, or Talk & Poster:**

Talk and poster

## Parallel 1C: Neutrino Physics / 33

### Acoustic Detection of Ultra High Energy Neutrinos

**Author:** Simon Bevan<sup>1</sup>

<sup>1</sup> *UCL*

**Corresponding Author:** swb@hep.ucl.ac.uk

I will present the latest results in the acoustic detection of Ultra High Energy Neutrinos, focusing mainly on the work of the ACoRNE collaboration.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 2B: Flavour Physics - LHC / 34

### Measuring Gamma with $B^0 \rightarrow D^0 K^{*0}$ decays at LHCb

**Author:** Jacopo Nardulli<sup>1</sup>

<sup>1</sup> *RAL*

**Corresponding Author:** jacopo.nardulli@cern.ch

The LHCb experiment at the LHC is a single-armed spectrometer designed to pursue extensive, high precision studies of CP violation and rare phenomena in B decays. The LHCb collaboration has studied various promising ways to determine the Unitarity Triangle angle Gamma. In this contribution, the potential of the  $B \rightarrow DK^*$



decays has been studied by employing the combined Gronau-London-Wyler (GLW) and the Atwood-Dunietz-Soni (ADS) methods, making use of a large sample of simulated data. The expected sensitivity to the angle  $\Gamma$  is presented.

**Talk, Poster, or Talk & Poster:**

Talk

#### Parallel 1A: Collider Physics - QCD and Electroweak / 35

### POWHEG NLO matching in the Herwig++ Monte Carlo Event Generator

**Author:** Jon Tully<sup>1</sup>

<sup>1</sup> *Durham University*

**Corresponding Author:** j.m.tully@durham.ac.uk

POWHEG is a novel method for combining fixed order NLO calculations with parton showers. In this work the scheme is fully implemented in the Herwig++ Event Generator for electron positron annihilation and Drell Yan vector boson production processes.

**Talk, Poster, or Talk & Poster:**

Talk

#### Parallel 2C: ILC Physics and Accelerator / 36

### The LiCAS FSI subsystem current status and initial measurements

**Author:** John Dale<sup>1</sup>

**Co-authors:** Armin Reichold<sup>1</sup>; Cecilia Uribe-Estrada<sup>1</sup>; Greg Moss<sup>1</sup>; Grzegorz Grzelak<sup>2</sup>; Johannes Prenting<sup>3</sup>; Lee Rainbow<sup>1</sup>; Mark Jones<sup>1</sup>; Markus Schlosser<sup>3</sup>; Mike Tacon<sup>1</sup>; Patrick Brockill<sup>1</sup>; Sigal Cohen<sup>1</sup>; Stephanie Yang<sup>1</sup>; Tony Handford<sup>1</sup>; Yanmei Han<sup>1</sup>

<sup>1</sup> *University of Oxford*

<sup>2</sup> *University of Warsaw*

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The Linear Collider Alignment and Survey (LiCAS) group has developed a Rapid Tunnel Reference Surveyor (RTRS), which will survey the reference network of the ILC to a high accuracy. By measuring small overlapping sections of the tunnel, the LiCAS RTRS will be capable of surveying the entire reference network in the main linac tunnel. The LiCAS RTRS has several measurement subsystems, one being the Frequency Scanning Interferometry (FSI) subsystem. The FSI subsystem has three components, the reference interferometers, the internal and the external FSI components. The current status and initial measurements from the LiCAS RTRS FSI subsystem will be discussed here.

**Talk, Poster, or Talk & Poster:**

talk

**Parallel 1A: Collider Physics - QCD and Electroweak / 37**

## **W and Z Measurements with Initial CMS Data**

**Author:** David Wardrope<sup>1</sup>

<sup>1</sup> *Imperial College London*

**Corresponding Author:** david.wardrope@cern.ch

Measurements of the inclusive cross-sections of W and Z in their leptonic decay modes will be among the first results from the LHC. An overview of the motivation and plans for such measurements with CMS will be presented, with emphasis on describing the use of data-driven methods for efficiency and background determination.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 38**

## **Supersymmetric cascade decays and Higgs effects**

**Author:** Alison Fowler<sup>1</sup>

**Co-author:** Georg Weiglein<sup>1</sup>

<sup>1</sup> *Durham University*

**Corresponding Author:** a.c.fowler@durham.ac.uk

The study of neutralino decays provides valuable information on the underlying MSSM parameters. Contributions from Higgs boson exchange can play an important role in parts of parameter space, particularly in CP violating scenarios. The effect of loop corrections in the Higgs and chargino-neutralino sectors is also considered.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2B: Flavour Physics - LHC / 39**

## **Technical challenges to measurements of the CP phase gamma at LHCb with B->DK decays where the D->KsPiPi**

**Author:** Sean Brisbane<sup>1</sup>

<sup>1</sup> *CERN*

**Corresponding Author:** sean.brisbane@cern.ch

The large numbers of B-mesons produced in high energy proton-proton collisions inside the LHCb experiment at CERN will be exploited to measure precisely the CP violating phase  $\gamma$ . I will discuss a method to probe  $\gamma$  using decays of the form  $B \rightarrow DK$  where the  $D \rightarrow K_S \pi \pi$ . The long flight distance of K0s necessitates a specialised fast reconstruction in order to exclusively trigger on this type of event.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 2B: Flavour Physics - LHC / 40

### Performance and Physics with the channel $B_s \rightarrow J/\psi \phi$ at ATLAS

**Author:** Alastair Dewhurst<sup>1</sup>

<sup>1</sup> *Lancaster University*

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The  $B_s \rightarrow J/\psi \phi$  decay exhibits CP violation sensitive to physics beyond the Standard Model. In order to extract physics parameters it will be necessary to perform a simultaneous fit to both the mass and lifetime of the reconstructed decays. At low luminosities the measured parameters will be useful in detector performance and alignment sensitive tests while at higher luminosities it will be possible to measure the weak phase difference  $\Phi_s$ .

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 3B: Flavour Physics - LHC / 41

### B-Mixing and $b \rightarrow s \gamma$ in the Lee-Wick Standard Model

**Author:** Aoife Bharucha<sup>1</sup>

<sup>1</sup> *Durham University*

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The Lee Wick Standard Model (LWSM) is an extension of the Standard Model and was recently proposed by Grinstein, O'Connell and Wise. It makes use of higher derivatives terms in the Lagrangian to introduce Lee-Wick states of negative norm. These heavy states (1TeV) cancel the quadratic divergences which arise due to the Higgs self-coupling. It is of interest to investigate the effects of this model in the flavour sector. Processes such as  $B_0$ -mixing and  $b \rightarrow s \gamma$  can then be used to constrain the mass of these heavy Lee-Wick states. I will briefly summarise the LWSM and present results of calculations of B-mixing and  $b \rightarrow s \gamma$  in this model.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1A: Collider Physics - QCD and Electroweak / 42****Reconstruction of  $Z \rightarrow \tau\tau \rightarrow e\tau$  jet events using early data with CMS****Author:** Petridis Konstantinos<sup>1</sup><sup>1</sup> *Imperial College***Corresponding Author:** konstantinos.petridis@cern.ch

We report on the selection and reconstruction strategy for  $Z \rightarrow \tau\tau \rightarrow e\tau$  jet events, and their application in CMS with early data, as a benchmark for SUSY  $H/A \rightarrow \tau\tau \rightarrow e\tau$  jet and tau tagging efficiency measurement. Using Monte Carlo simulated data, the performance of the reconstruction algorithms is evaluated. The number of expected signal and background events for  $100 \text{ pb}^{-1}$  of integrated luminosity is estimated and data driven techniques for measuring efficiencies and background contributions are discussed.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1C: Neutrino Physics / 43****MINOS Electron Neutrino Appearance Analysis****Author:** Anna Holin<sup>1</sup><sup>1</sup> *University College London***Corresponding Author:** annah@hep.ucl.ac.uk

MINOS is a long baseline neutrino experiment that sends a beam of muon neutrinos from the Fermi National Accelerator Laboratory to a Far Detector in Minnesota 735 km away. MINOS will be able to improve the limit on the neutrino mixing angle  $\theta_{13}$  by searching for electron neutrino appearance resulting from the subdominant oscillation of muon neutrinos. This analysis will be discussed.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3B: Flavour Physics - LHC / 44****Low  $\tan \beta$  MSSM Predictions for  $B_s \rightarrow \mu^+ \mu^-$  at the LHC****Author:** Philip Tanedo<sup>1</sup>**Co-authors:** Athanasios Dedes<sup>2</sup>; Janusz Rosiek<sup>3</sup>

<sup>1</sup> *Durham University / IPPP*

<sup>2</sup> *University of Ioannina*

<sup>3</sup> *University of Warsaw*

**Corresponding Author:** philip.tanedo@durham.ac.uk

One of the most promising signals of new physics at colliders is the rare decay  $B_s \rightarrow \mu^+ \mu^-$ . The LHC will be the first experiment to directly probe this loop- and helicity- suppressed decay channel down to the Standard Model prediction. Deviations from the predicted branching ratio are a signature of new particles in the loops. In particular, it is well known that the MSSM prediction scales as  $(\tan \beta)^6$  due to the supersymmetric Higgs penguin diagrams, making this a fertile testing-ground for SUSY. In this study we analyse the MSSM prediction for  $B_s \rightarrow \mu^+ \mu^-$  in the hertofore unexplored low  $\tan \beta$  region of the MSSM parameter space where interference with the box and Z-penguin diagrams could cause the branching ratio to dip below the Standard Model prediction. This decay is particularly important since it could be the first unambiguous signal of new physics at the LHC and also guide the future LHCb upgrade.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3C: Detector / 45**

## **Smearing of Monte Carlo simulated photon energies in the Babar Electromagnetic Calorimeter**

**Author:** Sudarshan Paramesvaran<sup>1</sup>

<sup>1</sup> *Royal Holloway, University of London*

**Corresponding Author:** sparamesvaran@yahoo.co.uk

“The photon energy resolution of the Electromagnetic Calorimeter of the BaBar detector at SLAC has been studied. The response of the calorimeter was investigated using single photons above 1 GeV from the reaction  $e^+e^- \rightarrow \mu^+\mu^-\gamma$ . Initially a discrepancy was observed between Data and Monte Carlo simulated events. A smearing technique has been developed to correct this discrepancy, based on the Students t distribution. This smearing is validated using an analysis of  $B \rightarrow K^*\gamma$ , where a significant improvement in the agreement between Data and MC energy distributions is observed. This technique has been implemented as a standard correction for BaBar analyses. “

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3C: Detector / 46**

## **LHCb RICH Alignment**

**Author:** Eames Christopher Edward<sup>1</sup>

<sup>1</sup> *Imperial College London*

**Corresponding Author:** christopher.edward.eames@cern.ch

I present an overview of the proposed alignment strategy for the Ring Imaging Cherenkov Detectors in the LHCb experiment. Small misalignments of optical components in the detectors can be determined from data and corrected for in the event reconstruction. Techniques to achieve this were validated on RICH Testbeam data. Simulated LHCb data was then used to determine the effects of individual misaligned components in order that an effective and efficient overall alignment strategy can be formed.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1A: Collider Physics - QCD and Electroweak / 47**

## The Inclusive Jet Cross-Section at ATLAS (ApplGrid)

**Author:** Daniel Robert Clements<sup>1</sup>

<sup>1</sup> *University of Glasgow*

**Corresponding Author:** daniel.clements@cern.ch

The ATLAS experiment will provide an opportunity to explore interactions at higher energies than previous detectors; allowing a test of standard model predictions, as well as opening the possibility of 'new physics' discoveries. The inclusive jet cross-section at high pT is one measurement which may provide evidence of physics 'beyond the standard model', however a thorough understanding of uncertainties on its prediction and measurement is necessary. I will provide an overview of errors on the inclusive jet cross-section and discuss methods of using hadron-collider data in global PDF fits by use of integration grids (the ApplGrid project). I will also give a brief outline of the potential sensitivity to quark compositeness that ATLAS may be able to achieve.

**Talk, Poster, or Talk & Poster:**

Talk and poster

**Parallel 3B: Flavour Physics - LHC / 48**

## Rare B to K\* $\mu\mu$ Decays at LHCb

**Author:** Hugh Skottowe<sup>1</sup>

<sup>1</sup> *University of Cambridge*

The study of rare B meson decays with the LHCb detector is expected to be one of the highlights of the first phase of LHC physics analysis. The forward-backward asymmetry of the decay  $B_d$  to  $K^* \mu\mu$  is very sensitive to New Physics beyond the Standard Model. Recent work on optimizing the selection of the decay will be presented.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 1C: Neutrino Physics / 49

**K2K  $\nu_\mu$  disappearance analysis with an expanded fiducial volume at Super-Kamiokande****Author:** Ryan Terri<sup>1</sup><sup>1</sup> *Queen Mary, University of London***Corresponding Author:** r.terri@qmul.ac.uk

Measurements of two flavor  $\nu_\mu$  disappearance were made using K2K, the KEK to Kamioka long baseline neutrino oscillation experiment, data for three fiducial volume definitions at the far detector, Super-Kamiokande. A study was conducted on expanding the fiducial volume at Super-Kamiokande to show it is possible to expand it both symmetrically and shifted in the incoming neutrino beam direction. For the fiducial volume definitions, 112, 143, and 140 events are observed with an expectation of  $158.1^{+9.2}_{-8.6}$ ,  $183.3^{+10.7}_{-10.0}$ , and  $170.9^{+9.5}_{-9.0}$  events, respectively. A distortion is also seen in the reconstructed energy spectrum for single ring muon-like events for each fiducial volume. The probability that the observations are explained by no neutrino oscillations are 0.0021% ( $4.3\sigma$ ), 0.018% ( $3.7\sigma$ ), and 0.042% ( $3.5\sigma$ ). The best fit values are  $\sin^2 2\theta=1.0$  for all definitions and  $\Delta m^2=0.0027$  eV<sup>2</sup>, 0.0025 eV<sup>2</sup>, and 0.0024 eV<sup>2</sup>, respectively. All results are consistent with other disappearance measurements.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 3C: Detector / 50

**A Laser-Based Beam Density Distribution Diagnostic for the RAL Front End Test Stand****Author:** David Lee<sup>1</sup>**Co-authors:** Christoph Gabor <sup>2</sup>; Jürgen Pozimski <sup>1</sup><sup>1</sup> *Imperial College London*<sup>2</sup> *ASTeC, STFC***Corresponding Author:** david.a.lee@imperial.ac.uk

The RAL Front End Test Stand is being constructed to demonstrate the production of a 60 mA, 3 MeV, 50 pps, chopped H<sup>-</sup> beam suitable for future high-power proton accelerators.

Due to the high beam brightness and a desire to have online instrumentation while the accelerator is operational, a series of non-intrusive, non-destructive diagnostics, based on the photo-detachment of the outer electrons of the H<sup>-</sup> ions, are being developed. This talk describes a device that will measure the 2D ion beam density distribution, due to be installed in the summer.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2C: ILC Physics and Accelerator / 51**

## Realistic Reconstruction of top Quark Pairs for the ILC

**Author:** Talini Pinto Jayawardena<sup>1</sup>

<sup>1</sup> *STFC Rutherford Appleton Laboratory*

**Corresponding Author:** t.s.pinto.jayawardena@rl.ac.uk

Reconstruction and analysis of simulated top quark pair events for the future 500 GeV electron positron linear collider ILC are discussed. A detailed GEANT-based simulation of the ILC detector concept LDC is used. The reconstruction is performed with realistic tracking, vertex reconstruction, particle flow and jet finding algorithms. Reconstructed properties of the top quark are compared with performance expectations for the ILC.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3C: Detector / 52**

## Development of wavelength shifters for the ArDM Argon Dark Matter detector

**Author:** Konstantinos Mavrokoridis<sup>1</sup>

<sup>1</sup> *University of Sheffield*

**Corresponding Author:** k.mavrokoridis@shef.ac.uk

The Argon Dark Matter (ArDM) is a 1-ton two phase liquid/gaseous argon scintillation/ionisation WIMP detector. The primary VUV scintillation light of argon (wavelength 128 nm) needs to be shifted to visible light in order to match the sensitivity range of the photomultiplier tubes. We discuss results from the development and optimization of wavelength shifters based on the organic scintillator tetraphenyl butadiene (TPB).

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1B: Flavour Physics B-factory and Tevatron / 53**

## Time-Dependent Dalitz Plot Analysis of $B^0 \rightarrow K\pi^+\pi^-$ Decays

**Authors:** Alejandro Perez<sup>1</sup>; Eli Ben-Haim<sup>1</sup>; Gagan Bihari Mohanty<sup>2</sup>; Jelena Ilic<sup>2</sup>; Jose Ocariz<sup>1</sup>; Mathew Graham<sup>3</sup>; Maurizio Pierini<sup>4</sup>; Nitesh Soni<sup>5</sup>; Pablo Del Amo Sanchez<sup>1</sup>; Thomas Latham<sup>2</sup>; Timothy Gershon<sup>2</sup>



<sup>1</sup> *Universite Paris VI et VII*<sup>2</sup> *University of Warwick*<sup>3</sup> *Stanford Linear Accelerator Center*<sup>4</sup> *University of Wisconsin*<sup>5</sup> *University of Birmingham***Corresponding Author:** j.ilic@warwick.ac.uk

We perform a time-dependent Dalitz plot analysis of  $B^0 \rightarrow K^* \pi$  in order to extract the CP violation parameters of  $f_0(980)K^*$  and  $\rho(770)K^*$  and direct CP-asymmetries of  $K^*(892)\pi$ . The results are obtained from a data sample of  $(383 \pm 3) \times 10^6$   $B\bar{B}$  decays, collected with the BABAR detector at the PEP-II asymmetric-energy B Factory at SLAC. The measured values of  $2\beta_{\text{eff}}$  in  $B^0$  decays to  $f_0(980)K^*$  and  $\rho(770)K^*$  are  $(89 \pm 22 \pm 20 \pm 5 \pm 8)$  degrees and  $(37 \pm 19 \pm 17 \pm 5 \pm 6)$  degrees, respectively, where the first quoted uncertainty is statistical, the second is systematic and the third is Dalitz plot signal model uncertainty. We measure the significance of  $2\beta_{\text{eff}}(f_0(980)K^*) \neq 0$  to be 4.3 sigma. In decays to  $K(892)\pi$  we find  $ACP = -0.18 \pm 0.10 \pm 0.03 \pm 0.03$ . The measured phase difference between the decay amplitudes of  $B^0 \rightarrow K^*(892)\pi^-$  and  $B^0 \rightarrow K^*(892)\pi^+$  is  $(-164 \pm 24 \pm 12 \pm 15)$  degrees.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2C: ILC Physics and Accelerator / 54****The use of crab cavities in colliders to increase luminosity****Author:** Graeme Burt<sup>1</sup>**Co-authors:** Amos Dexter<sup>1</sup>; Imran Tahir<sup>2</sup>; Peter McIntosh<sup>3</sup>; Philippe Goudket<sup>3</sup><sup>1</sup> *Lancaster University/ Cockcroft*<sup>2</sup> *Lancaster university/ Cockcroft*<sup>3</sup> *STFC***Corresponding Author:** graeme.burt@cockcroft.ac.uk

Crab cavities have been proposed at a number of particle colliders to increase the luminosity in the presence of a crossing angle, including the LHC upgrade, ILC and CLIC colliders. These RF devices rotate the incoming bunches prior to collision in order to provide a head-on collision. However if the phase and amplitude is sufficiently unstable the crab cavities can cause a decrease rather than an increase of luminosity. In addition wake field instabilities can also reduce the luminosity of the collider. The effects of these instabilities as well as cavity alignment on the peak luminosity has been studied using the beam tracking code PLACET combined with the code GUINEA-PIG to simulate collisions, as well as using analytical techniques to calculate the variations in luminosity.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2B: Flavour Physics - LHC / 55** **$B_s \rightarrow J/\psi \Phi$  and Misalignment in the ATLAS Detector**

**Author:** Ruth Davidson<sup>1</sup>

<sup>1</sup> *Physics Department*

**Corresponding Author:** r.davidson@lancaster.ac.uk

The decay of  $B_s \rightarrow J/\psi \Phi$  is parameterised by 8 variables, which we obtain from data using a maximum likelihood fit. The effect of systematic errors, particularly from detector resolution and misalignment, will significantly impact the accuracy of this fit. I investigate using lifetime measurements to estimate these errors.

**Talk, Poster, or Talk & Poster:**

Talk

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## The RAL Front End Test Stand

**Author:** David Lee<sup>1</sup>

<sup>1</sup> *Imperial College London*

**Corresponding Author:** david.a.lee@imperial.ac.uk

High-power proton accelerators with beam powers in the megawatt range have many applications including high intensity neutrino sources and spallation neutron sources. The RAL Front End Test Stand (FETS) is being constructed to demonstrate production of a 60 mA, 3 MeV, 50 pps, chopped H<sup>-</sup> beam suitable for such future accelerators. This poster gives a description and status report of the various components (H<sup>-</sup> ion source, magnetic low energy beam transport, radio frequency quadrupole accelerator, high speed beam chopper and a comprehensive suite of diagnostics) of the FETS.

**Talk, Poster, or Talk & Poster:**

Poster

**Parallel 3C: Detector / 57**

## Photosensors for the T2K 280m Near Detector

**Author:** Mark Ward<sup>1</sup>

<sup>1</sup> *University Of Sheffield*

**Corresponding Author:** mark.ward@sheffield.ac.uk

The T2K long baseline neutrino oscillation experiment will fire a neutrino beam from the JPARC facility on the east coast of Japan, 295km to the Super Kamiokande detector. At a distance of 280m from the neutrino beam source a Near Detector will be used to parametrise the beam. The optical channels of the 280m Near Detector will be instrumented using a relatively new photosensor, the Geiger-mode Multipixel APD.

A study detailing the operational parameters of Hamamatsu MPPCs will be presented.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 2A: Collider Physics - Higgs / 58

### Higgs studies at a future electron-positron collider

**Author:** Mark Grimes<sup>1</sup>

<sup>1</sup> *University of Bristol*

**Corresponding Author:** mark.andrew.grimes@cern.ch

An electron-positron collider would provide a tool for incredibly precise measurements of the discoveries made at the LHC. This talk will discuss the applications to Higgs physics, and how the excellent vertexing capabilities at such a collider would be able to distinguish between many physics models, through the measurement of the Higgs branching ratios.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 3C: Detector / 59

### The T2K 280m Near Detector P0DECAL

**Author:** Benjamin Still<sup>1</sup>

<sup>1</sup> *University of Sheffield*

**Corresponding Author:** ben.still@shef.ac.uk

The T2K experiment will fire an intense neutrino beam from the JPARC facility on the east coast of Japan to the Super Kamiokande detector 295km to the west. To measure the sub dominant  $\theta_{13}$  lepton mixing angle, Super Kamiokande will detect the appearance of electron flavour neutrinos from the originally >99% pure Muon neutrino beam.

One of the major backgrounds to this electron neutrino signal is that of neutral current single neutral pion production (NC1p). The cross-section of this process is little understood at the energies employed by T2K. The T2K near detector (ND280), situated at 280m from beam production, will characterise the neutrino beam and measure the electron neutrino background processes.

The Pi-Zero Detector (P0D) inside the ND280 is dedicated to measuring the NC1p cross section. To improve the systematics and statistics of NC1p vertex detection the P0D will be surrounded by an electromagnetic calorimeter (P0DECAL). In this talk I discuss the design of the P0DECAL using MC simulation data.

**Talk, Poster, or Talk & Poster:**

Talk

60

## Electro-optic detection of Longitudinal Bunch Profile Measurements at FLASH

**Author:** Paul Phillips<sup>1</sup>

**Co-authors:** Alexander van der Meer<sup>2</sup>; Allan Gillespie<sup>1</sup>; Bernard Schmidt<sup>3</sup>; Bernd Steffen<sup>3</sup>; Giel Berden<sup>2</sup>; Holger Schlarb<sup>3</sup>; Peter Schmuser<sup>3</sup>; Steve Jamison<sup>4</sup>; Vladimir Arsov<sup>3</sup>

<sup>1</sup> *Dundee University*

<sup>2</sup> *FOM Rijnhuizen, Nieuwegein*

<sup>3</sup> *DESY, Hamburg*

<sup>4</sup> *STFC/DL/ASTEC Daresbury*

**Corresponding Author:** pjphillips@dundee.ac.uk

We have installed an electro-optic experiment for single-shot, non destructive measurements of the longitudinal electric field charge distribution of individual electron bunches at FLASH, DESY. The electron bunch profile is encoded on a stretched Ti:Sapphire laser pulse through the interaction of an electro-optic crystal. This profile is retrieved from a cross-correlation of the encoded pulse with a 35 fs laser pulse, obtained from the same laser. At FLASH, sub- 100fs electron bunches have been measured during FEL operation with a resolution of better then 50 fs. We have also benchmarked this measurement with a transverse deflecting cavity.

**Talk, Poster, or Talk & Poster:**

Poster

61

## MPPC Testing for the ND280 ECAL

**Author:** Martin Haigh<sup>1</sup>

**Co-authors:** Antonin Vacheret<sup>2</sup>; Antony Carver<sup>1</sup>; Gary Barker<sup>1</sup>

<sup>1</sup> *University of Warwick*

<sup>2</sup> *Imperial College London*

**Corresponding Author:** m.d.haigh@warwick.ac.uk

The 280m Near Detector component of the T2K long-baseline neutrino experiment is largely based upon scintillator technology. Scintillator light is read out by a novel detector, the Multi-Pixel Photon Counter (MPPC), marketed by Hamamatsu Photonics. These devices are solid-state photodetectors operated in Geiger mode, and exhibit large, stable gain (of order 1E6). Extensive tests on these devices have now been performed, in order to characterise the properties of MPPCs to enable precise modelling, and to prepare for production-scale QA. The results of these tests are presented.

**Talk, Poster, or Talk & Poster:**

Poster

**Parallel 1A: Collider Physics - QCD and Electroweak / 62****The CMS L1 trigger: from LHC to SLHC****Author:** Rose Andrew William<sup>1</sup><sup>1</sup> *Imperial College - University of London***Corresponding Author:** andrew.william.rose@cern.ch

The LHC has been described as a statistics machine, using very high interaction rates to compensate for the very low cross-sections of 'new' (interesting) physical processes. Were the detector to be read out continually a data rate of around  $5 \times 10^7$  Mbyte/s ( $\sim 50$  Tbyte/s) would be routine, the vast majority of which is of no interest. To reduce this to a storable (100 MByte/s) rate, two levels of triggering are used; the Level-1 trigger (custom hardware) and the Higher-Level Trigger (software).

I discuss here the current level-1 trigger architecture, the complications introduced by the increased luminosity of the proposed accelerator upgrade (SLHC) and several solutions currently under investigation.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1B: Flavour Physics B-factory and Tevatron / 63****Measurement of the branching fraction  $\text{Br}(\text{Bs} \rightarrow \text{Ds}^* \text{Ds}^*)$  by the D0 Experiment****Author:** James Walder<sup>1</sup><sup>1</sup> *Lancaster University***Corresponding Author:** walder@fnal.gov

The measurement is reported of the branching fraction  $\text{Br}(\text{Bs} \rightarrow \text{Ds}^* \text{Ds}^*)$  using a data sample corresponding to  $1.3 \text{ fb}^{-1}$  of integrated luminosity collected by the D0 experiment in 2002-2006 during Run II of the Fermilab Tevatron Collider. One  $\text{Ds}^*$  meson was *partially reconstructed in the decay*  $\text{Ds}^* \rightarrow \phi \mu \nu$ , and the other  $\text{Ds}^*$  meson was identified using the decay  $\text{Ds}^* \rightarrow \phi \pi$  where no attempt was made to distinguish  $\text{Ds}$  and  $\text{Ds}^*$  states.

The resulting measurement of  $\text{Br}(\text{Bs} \rightarrow \text{Ds}^* \text{Ds}^*)$  was subsequently used to estimate the width difference  $\Delta \Gamma_{\text{CP}}^{\text{CP}}$  in the  $\text{Bs}$ - $\text{Bs}^*$  system:  $\Delta \Gamma_{\text{CP}}^{\text{CP}} / \Gamma_{\text{CP}}$ .

**Talk, Poster, or Talk & Poster:**

Talk

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**Particle Identification in the ND280 ECAL****Author:** Antony Carver<sup>1</sup>**Co-authors:** Ian Taylor<sup>2</sup>; John Back<sup>1</sup>; Steve Boyd<sup>1</sup>

<sup>1</sup> *Warwick University*<sup>2</sup> *Imperial College London***Corresponding Author:** antony.carver@warwick.ac.uk

The ECAL in T2K's 280m Near Detector is a Lead/scintillator tracking calorimeter. The relatively coarse resolution of such a detector makes a comprehensive particle identification a challenging task. This poster describes a particle identification algorithm that has been developed for the ECAL subdetector. The algorithm can separate tracks from showering particles and work is ongoing to distinguish between Hadronic and Electromagnetic showers.

**Talk, Poster, or Talk & Poster:**

Poster

**Parallel 3B: Flavour Physics - LHC / 65****Measurement of CP and production asymmetries with  $B_s \rightarrow D_s \mu \nu$  decays at LHCb****Author:** Kenneth Lessnoff<sup>1</sup><sup>1</sup> *University of Bristol***Corresponding Author:** kenneth.lessnoff@cern.ch

The CP asymmetry in  $B_s$ - $B_s^*$  mixing is sensitive to new Physics. This can be probed from measurement of the time dependent charge asymmetry. This method also allows measurement of the  $B_s$ - $B_s^*$  production asymmetry. This talk describes an approach for making this measurement at LHCb. The  $B_s$  lifetimes are calculated using energy and momentum conservation considerations. This results in a two-fold ambiguity of the lifetime. Methods for dealing with the two solutions are presented as well as the resulting measurements of the CP and production asymmetry.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1B: Flavour Physics B-factory and Tevatron / 66****First observation of the excited  $B_s^{*}$  meson at D0****Author:** Mark Williams<sup>1</sup><sup>1</sup> *Lancaster University***Corresponding Author:** m.williams@lancaster.ac.uk

Recently, CDF and D0 simultaneously reported the world's first ever observation of the  $B_s^{*}$  meson, a narrow, orbitally-excited state of the  $B_s$  meson. I will describe D0's efforts to reconstruct and study this particle in decays to  $B^+ K^-$  ( $B^+ \rightarrow J/\psi K^+$ ), and the fitting procedure used to determine the  $B_s^{*}$  mass ( $5839.6 \pm 1.1 \pm 0.7$  MeV). In addition, the production rate of the  $B_s^{*}$  relative to the  $B^+$  is measured for the first time.

These results will be compared with those for the  $B^*$  mesons (narrow orbitally-excited states of the  $B^0$ ), which were observed and measured for the first time last year at D0.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 2C: ILC Physics and Accelerator / 67**

## Depolarization effects at the interaction point of a linear collider

**Author:** Anthony Hartin<sup>1</sup>

**Co-authors:** Gudrid Moortgat-Pick<sup>2</sup>; Ian Bailey<sup>3</sup>

<sup>1</sup> *Oxford University*

<sup>2</sup> *IPPP, University of Durham*

<sup>3</sup> *Cockcroft Institute*

Depolarization effects at the interaction point of a linear collider are analyzed. The main effects occur during the intense beam-beam interactions. Higher-order effects as well as theoretical improvements in the derivation of suitable equations are given. Updates on existing simulation programs are reported. Numerical results for the design of the International Linear Collider (ILC) and the Compact Linear Collider (CLIC) are discussed.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3B: Flavour Physics - LHC / 68**

## An unbinned method to extract the Forward-Backward Asymmetry of $B_d \rightarrow K^* \mu^+ \mu^-$ decay on LHCb

**Author:** Franciole Marinho<sup>1</sup>

<sup>1</sup> *University of Glasgow*

**Corresponding Author:** fmarinho@ift.unesp.br

The  $B_d \rightarrow K^* \mu^+ \mu^-$  decay occurs via the FCNC process in the Standard Model (SM) with a branching ratio calculated to be  $11.9 \pm 3.9 \times 10^{-7}$ . It has been already measured in previous experiments and the obtained value is of the order of  $12.2^{+5.8}_{-5.2} \times 10^{-7}$ . A set of important quantities such as dimuon mass spectra and the forward-backward asymmetry (FBA) can be measured with this decay in order to test the SM and search for new Physics. In this work we propose an unbinned method to evaluate these distributions using a non-parametric approach. This study has also been carried out to evaluate the zero point of the FBA distribution and its resolution. Such values were estimated to be  $4.04 \pm 0.4 \text{ GeV}^2/c^4$ . Acceptance effects and background issues are also addressed.

**Talk, Poster, or Talk & Poster:**

Talk & Poster

**Parallel 2C: ILC Physics and Accelerator / 69****The effect of electromagnetic backgrounds on an IP feedback system at ILC and CLIC****Author:** Anthony Hartin<sup>1</sup>**Co-authors:** Christina Swinson <sup>1</sup>; Christine Clarke <sup>1</sup>; Philip Burrows <sup>1</sup><sup>1</sup> *Oxford University*

Experiment T-488 at SLAC, End Station A recorded distorted BPM voltage signals due to the impingement of background e+, e- and gamma particles on the BPM striplines. Simulations agreed with the experiment to show that the impact of background pairs at the level expected at the ILC would be negligible. However for CLIC default parameters (centre of mass E=3 TeV, s<sub>x</sub>/s<sub>y</sub>=53/1nm, e<sub>x</sub>/e<sub>y</sub>=660/20 nm rad) an error due to secondary emission from the IP BPM strips would lead to a position error of 5%

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 70****Patterns of Gauge Mediation in Metastable Supersymmetry Breaking****Author:** Callum Durnford<sup>1</sup><sup>1</sup> *Durham University***Corresponding Author:** callum.durnford@durham.ac.uk

It can be argued that in generic models of low scale supersymmetry breaking (where gravity effects can be neglected) metastability is inevitable. Accepting this fact allows one to build simple and concrete models of gauge mediated supersymmetry breaking. We exhibit a compact model of direct gauge mediation and its resulting MSSM phenomenology, which is able to interpolate between the standard gauge mediation scenario and split susy models.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 1C: Neutrino Physics / 71****CRESST to EURECA: Progress with cryogenic dark matter searches****Author:** Samuel Henry<sup>1</sup><sup>1</sup> *University of Oxford*



**Corresponding Author:** s.henry1@physics.ox.ac.uk

EURECA is a proposed dark matter experiment which will use cryogenic detector technology pioneered by the CRESST and EDELWEISS projects. This will use up to 1 tonne absorber mass made from multiple materials to search for the elastic scattering of neutralino WIMPs with a cross section down to  $10^{-10}$ pb. The CRESST experiment is currently running. It will search down to  $10^{-8}$ pb and provides a test facility to develop ideas for EURECA.

**Talk, Poster, or Talk & Poster:**

Talk

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## Energy Reconstruction in the ND280 ECAL

**Authors:** Neil McCauley<sup>1</sup>; Tom Maryon<sup>1</sup>

<sup>1</sup> *colleague*

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A Lead-Scintillator Calorimeter is now in construction for use in the 280m Near-Detector, being built as part of the T2K long baseline experiment. Like in any Calorimeter, accurate Energy Reconstruction is a challenging necessity. This poster will describe the Energy Reconstruction fitter being produced for use in the Calorimeter.

**Talk, Poster, or Talk & Poster:**

Poster

**Parallel 2A: Collider Physics - Higgs / 73**

## Search for Associated Production of Z and Higgs Bosons in $n\nu n\bar{b}b$ Final States

**Author:** Theo Christoudias<sup>1</sup>

<sup>1</sup> *Imperial College*

**Corresponding Author:** tc502@imperial.ac.uk

We present a search for a light Standard Model Higgs Boson produced in association with a Z boson decaying invisibly into a pair of neutrinos. The final state is characterised by a presence of two b-tagged jets from the Higgs Boson decay and a large imbalance in the transverse energy of the event. The search has been performed using data collected by the D0 experiment at Fermilab. This channel is challenging as the decay signatures are common in QCD and instrumental backgrounds.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3B: Flavour Physics - LHC / 74** **$a_{\text{fs}}$  at LHCb: illuminating new physics****Author:** Robert Lambert<sup>1</sup><sup>1</sup> *Edinburgh LHCb*

This summer the Large Hadron Collider beauty experiment, LHCb, will start its ambitious physics programme: to make precision measurements at the Large Hadron Collider. With  $10^{12}$  b-quarks produced in each 2fb<sup>-1</sup> (~1 year) LHCb has the opportunity to perform very precise measurements of b-quark physics with much more copious samples of decays than currently available.

In the measurement of the parameter called the flavour-specific asymmetry,  $a_{\text{fs}}$ , LHCb could discover unknown new physics.  $a_{\text{fs}}$  will be measured separately for the first time in the channels  $B_s^0 \rightarrow D_s \pi$ ,  $B_s^0 \rightarrow D_s \mu \nu$ , and  $B_d^0 \rightarrow D \mu \nu$ . Hints of supersymmetry, or even so-called unparticles could be detected as we enter the LHC era.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3B: Flavour Physics - LHC / 75****Probing CP violation in  $B_s$  mixing****Author:** Colin David Mc Lean<sup>1</sup>**Co-authors:** Andres Osorio <sup>2</sup>; Peter Clarke <sup>1</sup><sup>1</sup> *Edinburgh*<sup>2</sup> *Edinburgh***Corresponding Author:** colin.david.mc.lean@cern.ch

The LHCb experiment will offer a precise hadronic probe with which to study CP violation and possible New Physics (NP) effects in the  $B_s$  system. For example from  $B_s \rightarrow J/\psi \Phi$  decays, it will be possible to measure the CP violating weak phase,  $\phi_{\text{fs}}$ . This phase owing to its small Standard Model (SM) prediction,  $-0.04$  rad, will provide a sensitive indicator to NP occurring at the TeV scale. The analysis of  $B_s \rightarrow J/\psi \Phi$  decays requires using its decay angular information to separate out the CP eigenstates. The sensitivity to  $\phi_{\text{fs}}$  can then be extracted from the angular differential rate for this mode. Previous studies have shown this sensitivity using reduced expression for the decays rates. But by studying the full expression, we find both a quantitative and qualitative improvement in the precision with which  $\phi_{\text{fs}}$  is obtained. This talk, in preparation for data taking at the LHCb, presents this expected improvement.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3A: Collider - BSM / 76****Trilepton SUSY signatures at ATLAS****Author:** Christina Potter<sup>1</sup>

<sup>1</sup> RHUL

The trilepton signature is one of the ‘golden’ channels for SUSY due to its striking signature of three leptons and missing energy in the final state. The classic trilepton SUSY signature is gaugino pair production and decay via virtual Z and W bosons to three leptons, neutrinos and the LSP. The Tevatron collider at Fermilab has been looking for these events using proton-antiproton collisions at a centre of mass energy of 1.96 TeV. The D0 and CDF experiments have observed no excess of candidates of the classic SUSY trilepton signature with respect to the Standard Model prediction. The LHC will be colliding protons at seven times the energies of the Tevatron and at luminosities 100 times higher, greatly increasing the possibility of observing a trilepton SUSY signature. Trilepton signatures are incredibly important to ATLAS, despite their low statistics, since backgrounds are greatly reduced by the clean leptonic event topology, and the application of a minimal number of event selection cuts could yield a SUSY discovery signal at the LHC.

**Talk, Poster, or Talk & Poster:**

Trilepton SUSY signatures at ATLAS

## Parallel 2A: Collider Physics - Higgs / 77

### Higgs self coupling sensitivity at ILC

**Author:** Michele Faucci Giannelli<sup>1</sup>

<sup>1</sup> *Royal Holloway University of London*

**Corresponding Author:** michele.faucci.giannelli@cern.ch

The Higgs self coupling is a precision measurement that LHC cannot produce. A linear collider detector must be able to perform such measurement therefore this channel can be used as a benchmark to optimize the detector design. The challenge of this analysis is the overwhelming tt background. In order to reduce it, a cut based and a neural network analysis have been performed. After an introduction describing the ILC detector concept and the ZHH channel, I will present results of both analysis.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 3C: Detector / 78

### Construction of an Electromagnetic Calorimeter for ND280 and the T2K collaboration

**Author:** Gavin Davies<sup>1</sup>

**Co-authors:** Athans Hatzikoutelis<sup>1</sup>; Laura Kormos<sup>1</sup>

<sup>1</sup> *Lancaster University*

**Corresponding Author:** g.davies4@lancaster.ac.uk

T2K (Tokai to Kamioka) is a 295km long-baseline neutrino experiment in Japan, which is due to start taking commissioning data late in 2009. It is designed to measure muon-neutrino oscillations to other flavours. This will enable the measurement of some of the components of the MNSP mixing matrix.

One of the UK's main contributions is the construction of an Electromagnetic Calorimeter (ECal) for the near detector, ND280, situated 280m downstream from the neutrino production target. This talk will present an update on construction of one of the ECal modules for ND280, the Downstream ECal, which is being built at Lancaster University. In addition, quality assurance tests of the scintillator bars will be discussed.

**Talk, Poster, or Talk & Poster:**

Talk

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## T2K (Tokai To Kamiokande)

**Author:** Melissa George<sup>1</sup>

<sup>1</sup> *Queen Mary University of London*

**Corresponding Author:** m.a.george@qmul.ac.uk

The Tokai to Kamioka (T2K) experiment is a long baseline neutrino oscillation experiment.

An intense neutrino beam from the J-PARC facility in Tokai will be sent 295 km across Japan towards the Super Kamiokande detector in Kamioka.

T2K is expected to start taking data in 2009.

The main objectives of the first stage of the T2K experiment are the search of muon into electron neutrino oscillation and a precision measurement of  $\theta_{23}$  and  $\Delta m_{21}^2$ .

Compared to the current experimental results, one order of magnitude improvement in all three measurements are expected.

The properties of the neutrino beam at Tokai, before it can oscillate, will be studied by the ND280 experiment.

This poster will give an overview of the T2K experiment and its goals.

**Talk, Poster, or Talk & Poster:**

Poster

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## Polarised Positron Sources for Future Linear Colliders

**Author:** Ian Bailey<sup>1</sup>

<sup>1</sup> *University of Liverpool*

**Corresponding Author:** ian.bailey@physics.org

The designs for both the International Linear Collider (ILC) and the Compact Linear Collider (CLIC) envisage the need for of order  $10^{14}$  positrons per second, two orders of magnitude greater than the rates delivered at the Stanford Linear Collider (SLC). This extrapolation requires novel technologies to keep the stresses placed on the conversion targets to manageable levels. At the same time, it has been recognised that it is highly-desirable to be able to deliver both polarised electrons and polarised

positrons to the interaction point(s) of the colliders in order to maximise the physics reach of the machines.

Here I present the status of the two leading technologies for generating intense beams of polarised positrons: helical undulator insertion devices and laser Compton scattering techniques, with emphasis on work carried out by the HeLiCal collaboration in developing the baseline positron source for the ILC.

**Talk, Poster, or Talk & Poster:**

Poster

**Parallel 2C: ILC Physics and Accelerator / 81**

## A Micron-Scale Laser-Based Beam Profile Monitor for High Luminosity Particle Accelerators

**Author:** Lawrence Deacon<sup>1</sup>

**Co-authors:** Alessio Bosco<sup>2</sup>; Alexander Aryshev<sup>3</sup>; Brian Foster<sup>4</sup>; David Howell<sup>4</sup>; Fred Gannaway<sup>4</sup>; Gary Boorman<sup>2</sup>; Grahame Blair<sup>2</sup>; Hitoshi Hayano<sup>5</sup>; Junji Urakawa<sup>5</sup>; Kiyoshi Kubo<sup>5</sup>; Laura Corner<sup>6</sup>; Myriam Newman<sup>4</sup>; Nicolas Delerue<sup>4</sup>; Nobuhiro Terunuma<sup>5</sup>; Pavel Karataev<sup>2</sup>; Rohan Senanayake<sup>4</sup>; Roman Walczak<sup>4</sup>; Stewart Boogert<sup>2</sup>

<sup>1</sup> *John Adams Institute at RHUL, London, U.K.*

<sup>2</sup> *John Adams Institute at RHUL, London*

<sup>3</sup> *John Adams Institute at RHUL*

<sup>4</sup> *John Adams Institute at Oxford*

<sup>5</sup> *KEK, Ibaraki, Japan*

<sup>6</sup> *John Admas Institute at Oxford*

**Corresponding Author:** deacon@pp.rhul.ac.uk

Transverse beam size diagnostics systems are essential for luminosity and beam property optimisation of low emittance beams. The laser-wire (LW) system in the extraction line at the Accelerator Test Facility (ATF) at KEK aims to achieve micron-scale electron beam profile measurements. This is done by colliding high energy laser pulses with an electron beam and monitoring the inverse Compton scattering rate. Recent upgrades to the LW system, including custom lens, chamber movers, laser optics and data acquisition are presented together with recent results.

**Talk, Poster, or Talk & Poster:**

Talk

**Parallel 3C: Detector / 83**

## Positional and Angular Resolution of the CALICE pre-Prototype ECAL

**Author:** Hakan Yilmaz<sup>1</sup>

<sup>1</sup> *Imperial College*

**Corresponding Author:** hakan.yilmaz@imperial.ac.uk

In order to meet the physics goals of a future linear collider, a high level of hadronic jet energy resolution is required. This is best done by accurate track-shower matching, which has led to the proposal of high spatial granularity calorimetry. This talk will focus on a method of determining the positional and angular resolutions of the CALICE pre-prototype ECAL, in response to electrons. Data presented are taken from two recent test beam periods at DESY and CERN.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 1B: Flavour Physics B-factory and Tevatron / 84

### Study of $B \rightarrow K^* \ell \ell$ decays with BaBar

**Author:** Jennifer Watson<sup>1</sup>

<sup>1</sup> *University of Edinburgh*

**Corresponding Author:** jwatson@slac.stanford.edu

Measurements of the FCNC decay  $B \rightarrow K \ell \ell$  allow for sensitive test of the Standard Model due to possible New Physics contributions in the interference between penguin and box diagrams. Results from Babar on the forward-backward asymmetry,  $K$  polarization, rate asymmetries and branching fraction are presented. The study of additional angular variables and the extension of the analysis to inclusive  $B \rightarrow s \ell \ell$  decays are also discussed.

**Talk, Poster, or Talk & Poster:**

Talk

## Parallel 1A: Collider Physics - QCD and Electroweak / 87

### CMS upgrade studies

**Author:** Mark Pesari<sup>1</sup>

<sup>1</sup> *Imperial College*

A luminosity upgrade to  $10^{35} \text{ cm}^{-2} \text{ s}^{-1}$  for the LHC is expected after 2016. In order to maintain physics performance, the CMS experiment will also require upgrading; principally to the tracking and triggering systems, since detector occupancies and trigger rates are expected to be much higher. We report on ongoing studies into possible tracker designs and the feasibility of using tracking information in a Level 1 Trigger.

**Talk, Poster, or Talk & Poster:**

talk

## Parallel 1B: Flavour Physics B-factory and Tevatron / 88

## Study of direct CP violation in $B^\pm \rightarrow J/\psi K^\pm(\pi^\pm)$ decays

**Author:** Kostyantyn Holubyev<sup>1</sup>

<sup>1</sup> *Lancaster University*

**Corresponding Author:** kpticin@gmail.com

We present a search for direct CP violation in  $B^\pm \rightarrow J/\psi K^\pm(\pi^\pm)$  decays.

The event sample is selected from  $2.8 \text{ fb}^{-1}$  of  $p\bar{p}$  collisions collected by the D0 experiment in Run II of the Fermilab Tevatron Collider.

The charge asymmetry

$$A_{CP}(B^+ \rightarrow J/\psi K^+) = +0.0075 \pm 0.0061(\text{stat.}) \pm 0.0027(\text{syst.})$$

is obtained using a sample of approximately 40,000

$B^\pm \rightarrow J/\psi K^\pm$  decays.

The achieved precision is of the same level as the expected deviation predicted by some extensions of the standard model.

We also report the charge asymmetry

$$A_{CP}(B^+ \rightarrow J/\psi \pi^+) = -0.09 \pm 0.08(\text{stat.}) \pm 0.03(\text{syst.}).$$

**Talk, Poster, or Talk & Poster:**

talk

**Parallel 2A: Collider Physics - Higgs / 89**

## Small x gluon from exclusive J/psi production

**Author:** Cathy Nockles<sup>1</sup>

<sup>1</sup> *Liverpool University*

Exclusive J/psi production,  $\gamma p \rightarrow J/\psi p$ , offers a unique opportunity to determine the gluon density of the proton in the small Bjorken x domain. We use the available HERA data to determine the gluon distribution in the region  $10^{-4} < x < 10^{-2}$  for scales  $2 < Q^2 < 10 \text{ GeV}^2$ , where the uncertainty on the gluon extracted from the global parton analyses is large. We present results for gluons extracted using a LO analysis and for gluons extracted including NLO corrections and compare to the global analyses.

**Talk, Poster, or Talk & Poster:**

talk

**Parallel 3A: Collider - BSM / 90**

## Sherpa - an event generator for the LHC

**Author:** Stefan Hoeche<sup>1</sup>

<sup>1</sup> *IPPP, Durham University*

We present recent developments in the Monte Carlo event generator Sherpa. An extension of the CKKW algorithm for merging Matrix Elements and Parton Showers to processes including decays of heavy unstable particles is discussed.

New shower algorithms based on the Catani-Seymour subtraction terms and dipole splitting functions are introduced.

A new Matrix Element generator for high multiplicity processes is presented together with two new phase space integration techniques. Applications to LHC physics are discussed.

**Talk, Poster, or Talk & Poster:**

talk

**STFC Town Meeting Session 2 / 95**

## **Progress on PP2020**

**STFC Town Meeting Session 2 / 96**

## **PP Outreach Activities**