Our hopes for the MB&UE working group
Emily Nurse (for ATLAS)

- How to present our results (using our first measurements as examples)

- How can we use our *collective* data to constrain diffractive models used in luminosity measurements?

- Can we get a list of high priority MB and UE measurements (for MC tuning and other reasons)?

Presenting minbias results

<u>In a nut shell :</u>
ATLAS result presented to be as *MC model independent* as possible
CMS and ALICE results are useful for Heavy Ion references and can be compared
directly to other experiments

e.g. $\boxed{1/N_{ev} \cdot dN_{ch}/d\eta}$

	Measured phase space	N_{ev} includes events with…	Corrected for contamination from …
ALICE	$\|\eta\| < 1.6$	inclusive	nothing / SD
CMS	$p_T > 50$, $\|\eta\| < 2.4$	inclusive	SD
ATLAS	$p_T > 500$, $\|\eta\| < 2.5$	≥ 1 charged particle, $p_T > 500$, $\|\eta\| < 2.5$	nothing

Note: ATLAS result corrects for trigger/vertex using data

Presenting minbias results

Can we agree on a couple of ways of presenting our results?
Suggestions (for discussion) :

1. Publish what we see, defined by hadron level cuts (e.g. ≥ 1 charged particle with p_T > X, $|\eta|$ < Y)

    - Most useful for MC tuning
    - Attempt to reduce diffraction with hadron level cuts?
    - Need to use data as much as possible for e.g. trigger corrections (otherwise model dependence creeps back in)

2. Correct back to inclusive (σ_{INEL}, σ_{NSD} or σ_{ND})

    - Less useful for MC tuning (relies on a given model to extrapolate into full phase space)
    - Easier to compare between experiments and to use as input to Heavy Ion physics
    - All three rely on MC models to do correction
    - Should we try to agree on which generator+tune to use?

Correcting to inclusive σ_{INEL}, σ_{NSD} or σ_{ND}

Example from CMS result [arXiv:1002.0621]:

| Energy | PYTHIA | | | | PHOJET | | | |
| | 0.9 TeV | | 2.36 TeV | | 0.9 TeV | | 2.36 TeV | |
	Frac.	Sel. Eff.	Frac.	Sel. Eff.	Frac.	Sel. Eff.	Frac.	Sel. Eff.
SD	22.5%	16.1%	21.0%	21.8%	18.9%	20.1%	16.2%	25.1%
DD	12.3%	35.0%	12.8%	33.8%	8.4%	53.8%	7.3%	50.0%
ND	65.2%	95.2%	66.2%	96.4%	72.7%	94.7%	76.5%	96.5%
NSD	77.5%	85.6%	79.0%	86.2%	81.1%	90.5%	83.8%	92.4%

INEL	100%	70.0%

SD "background" correction   ~5%
DD "background" correction   ~7%

Correct to	Acceptance	Background	Total
NSD	14.4%	-5%	~9%
ND	4.8%	-12%	~7%
INEL	30%	0%	~30%

Note: these numbers are only an example to illustrate a point, part of Sel. Eff. is from detector inefficiencies rather than acceptance

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Constraining diffraction

- Can we use our data to constrain the diffractive models as much as possible?
    - Very important for luminosity measurements (see Beate's talk later)
    - Also important in minbias measurements that include extrapolation to full phase space and/or corrections to NSD
- Particle multiplicities (and forward-backward correlations) as far forward as possible
    - Would it be useful to provide hadron level particle densities in our forward luminosity detectors and minbias trigger counters?
    - Is going lower in p_T in our charged track measurements helpful?
- Enhancing diffractive components (using e.g. rapidity gaps)
    - What to measure to provide useful constraints?
- Are there measurements from previous experiments we can use?

It would be good to piece together information from all experiments

List of priority measurements?

- Charged particle distributions :
  - $1/N_{ev} \cdot dN_{ch}/dp_T$, $1/N_{ev} \cdot dN_{ch}/d\eta$, $1/N_{ev} \cdot dN_{evt}/N_{ch}$, $<p_T>$ vs N_{ch}, forward-backward correlations, …? Should we make 2D slices in η, p_T
  - Particle correlations, global event shapes, …?
  - How interesting are the tails (ie/ should we use high multiplicity triggers to populate the tails of distributions?)
- Energy densities from calorimeter measurements
  - η distribution, forward-back correlations…?
- Identified particles
  - Strange hadrons (K_S^0, Λ, …), charm hadrons, protons, $\pi^\pm$, π^0 ?
  - Which distributions (p_T, η, correlations, ratios)?
- Low p_T (mini) jets (calorimeter and track)
  - Can these be used to study the emergence of structure in data collected with minbias triggers?
  - What properties should we study?

Underlying Event measurements

PTmax Direction
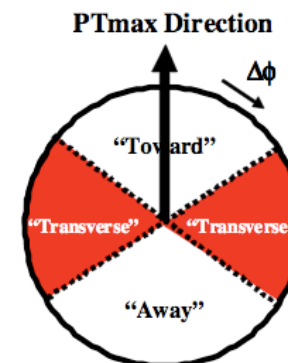
Traditional Field & Stuart plots :

- Particle density in transverse region from lead jet

- Is it interesting to also plot from lead charged particle using our minbias dataset?

    – Simpler measurement (could get results quicker)

    – Smears out distribution (lead particle is not always in lead jet)

    – Provides a link between "minbias" plots and "underlying event" plots

- List of priority measurements in UE data?

For tomorrow's discussion

Summary

- How to present our results

    1. within a well defined phase space [MC tuning]

    2. Extrapolating to full phase space   [Heavy Ion reference]

- How can we use our *collective* data to constrain diffractive models used in luminosity measurements?

    - Forward detectors, low p_T measurements

    - Measuring diffractive events (rapidity gaps)

- Can we form a list of high priority MB and UE measurements (for MC tuning and e.g. Heavy Ion)?

- The best way to co-ordinate tunes to new and/or old data between experiments and phenomenologists