

# WP 2 Overview-Strategies

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# Goals-Objectives

- **Detector Performance from first data** (deliverables 2.1-1st year)
  - Topics fully active in ATLAS
  - Topics interesting for ARTEMIS/less popular in ATLAS
- **Standard Model physics measurements with first data** (deliverables 2.2-2nd year)
  - Topics covered in ATLAS & by ARTEMIS institutes
  - Topics not sufficiently covered in ATLAS - appealing for ARTEMIS
- **Standard Model physics measurements with more statistics** (deliverables 2.3-3rd year)

# Detector performance from first data

Topics fully covered in ATLAS

- Efficiency and fake rates
- Energy scale determination
- Resolution

- **Electrons/Photons**

Institutes involved: USFD, CEA

Currently active in ATLAS & Artemis:

Use  $Z \rightarrow ee$  events & CTB

- **Muons**

Institutes involved: CEA, MPS, AUTH

Currently active in ATLAS & Artemis:

Use  $Z \rightarrow \mu\mu$  events (tag&probe method)

- **Jets & Missing ET**

Institutes involved: MPS, FisicaPisa

Currently active in ATLAS & Artemis:

Energy flow & Jet calibration,  
performance

## Institutes involved in Detector/object Performance issues

<b>a) Electrons, Photons</b>	USFD
	CEA

<b>b) Muons</b>	MPS
	AUTH
	CEA
b1) Muon tag with Tile + catastrophic muons	AUTH
	CEA
	FisicaPisa

<b>c) Jets, ETMISS</b>	FisicaPisa
	MPS

<b>d) bjet identification btag algorithm</b>	MPS
	UCL

<b>e) PDF's</b>	UDUR
	UCL
	CEA

Need to summarize the work & conclude

Status unknown ?

# Detector performance from first data

Topics interesting for Artemis/less popular in ATLAS

- Exploit first physics data for calibration purposes :  
J/psi, Ypsilon, W's
- Use  $B^+ \rightarrow J/\psi K^+$  channel as ID alignment tester
- Exploit other methods: E/p for electrons (ID vs Calo),  
p/p for muons (ID vs muon spectrometer)
  - Can the non gaussian tails of the detector response be understood
- Quantify fake rates from the data : look for Z peak in gamma-gamma peak
- Exploit studies from testbeam/CTB for electrons & muons (Still on going in USFD, CEA, AUTH)

# Standard Model physics measurements with first data

Topics covered in ATLAS & by Artemis Institutes

- Measurement of  $W$  and  $Z$  production rates and distributions (CEA, USFD, UDUR)
- Improved determination of Structure Functions (CEA, USFD, UDUR)
  - Suggestion : Quantify the impact of  $W$ ,  $Z$  measurements to Parton Densities -> provide to Artemis theorists (R.Thorne) non-smearred differential cross section distributions to fit with QCD
- Study jet multiplicities in  $W$ ,  $Z$  + jets events and in top quark production (FisicaPisa & MPS)

# Standard Model physics measurements with first data

Topics not sufficiently covered in ATLAS -  
appealing for Artemis

- Extraction of Electroweak Vector Boson Fusion (VBF) production of W & Z from the QCD backgrounds
  - Important for VBF Higgs production
- Measurement of event shapes in  $t\bar{t}$  production
  - Relevant to the  $t\bar{t}H$  searches
- Measurement of the  $Zb\bar{b} \rightarrow 4l$  cross-section
  - Major background in  $ZZ \rightarrow 4l$ ,  $H \rightarrow 4l$  searches - large uncertainties in theoretical predictions

# Standard Model physics measurements with more statistics

Topics covered in ATLAS & by Artemis Institutes

- Gauge boson pair production
  - $WW$ ,  $WZ$ ,  $ZZ$ ,  $W\gamma$ ,  $Z\gamma$
- $ZZ \rightarrow 4l$  is entirely covered by Artemis
- Look for TGC's in  $ZZ$  channel can be covered by Artemis



1.  $B^+ \rightarrow J/\psi K^+$  Control channel (AUTH & recently CEA)
2. Pt Jet inclusive x-sections (FisicaPisa MPS)
3. W, Z + jets x-sections & PDF's (CEA, UCL, UDUR)
4.  $Zb\bar{b}$  x-section measurement (AUTH, USFD, CEA)
5. DiBoson x-sections (AUTH, USFD, CEA)
6.  $t\bar{t}$  as signal (CEA –part of Artemis?)
7.  $t\bar{t}$  as background (USFD, CEA, AUTH, FisicaPisa)
8. Z+jets,  $Z \rightarrow b\bar{b}$  as backgrounds to DiBoson & Higgs (USFD, CEA, AUTH, MPS)

## Summary of Standard Model Topics in Artemis and Institutes Involved

# Summary of Artemis WP 2 Activities/Topics

- Detector/Combined detector performance Topics from:
  - current simulation studies
  - CTB data
  - Commissioning data

- Physics Topics
  - Minimum bias
  - Jet physics
  - B+ lifetime, mass
  - W, Z physics
    - W, Z production, mass, pdf
    - VBF (W,Z) (free)
  - Diboson physics
    - ZZ x-section
    - TGC's
  - Zbbar measurement

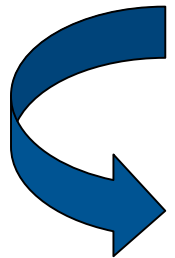
# Standard Model Analysis Strategies

- Aims of Artemis WP2 -not different from ATLAS- but must fully exploit our small size and wide expertise :

- o Fast, correct, interesting results

- ⇒ Understand the detector

- ⇒ Understand Systematics



Develop strategies to validate subdetectors and objects : Electron, Muon, Jets, Missing ET

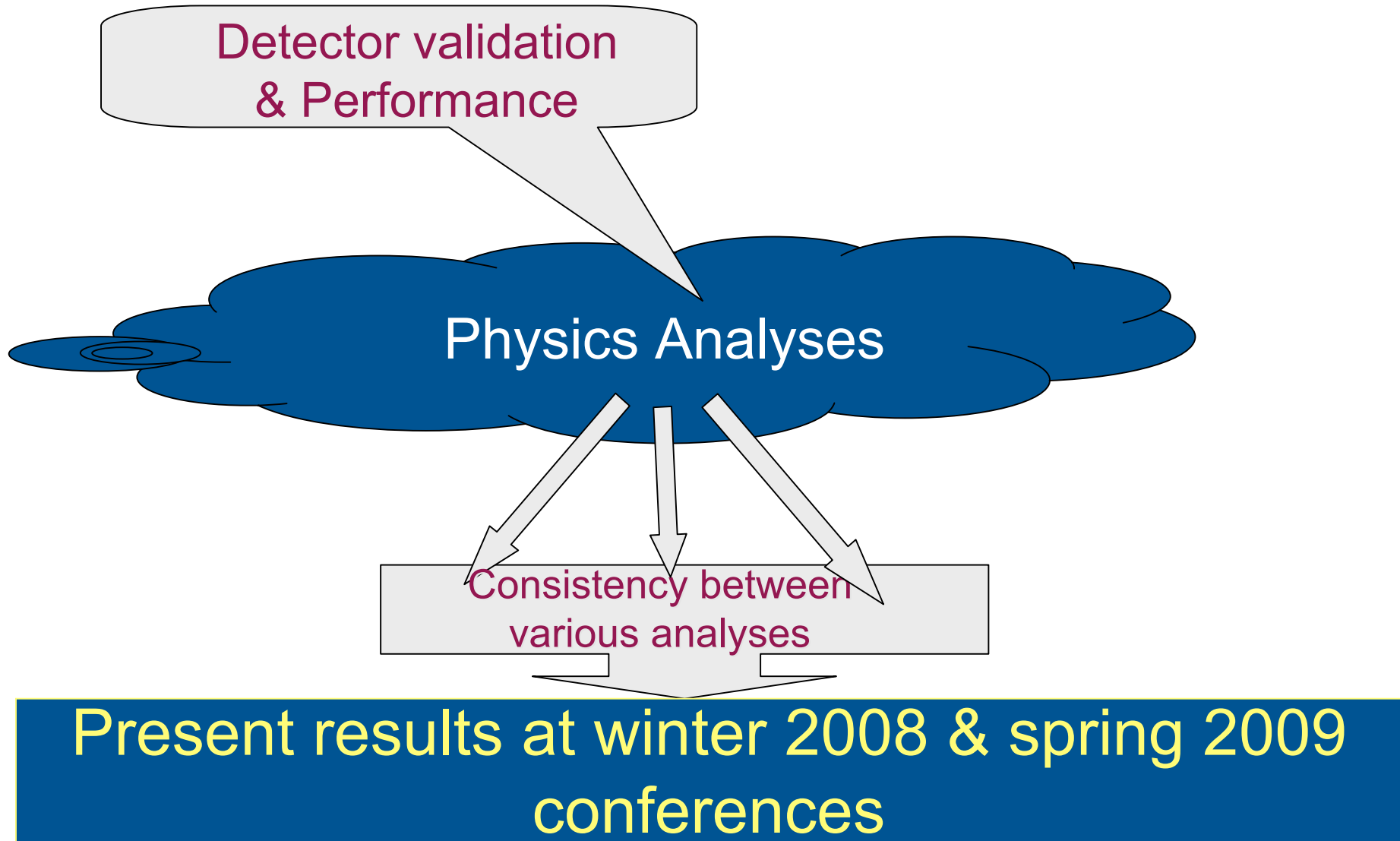
# WP2 Analysis Strategies

Detector validation  
& Performance

Physics Analyses

Consistency between  
various analyses

Present results at winter 2008 & spring 2009  
conferences



**BACKUP SLIDES**

**ttbar Signal studies** 1. Jet scale from WW->jj

2. x-sections
3. top mass measurement
4. Calibration signal to ttH

**ttbar Background studies**

**ttbar ->4l for dedicated** 1. ZZ, WZ, H->4l  
2. VBF H( $\tau\tau$ )h  
**ttbb, ttjj** 3. ttH(bb)

**DiBoson Signal studies** 1. ZZ ->4l x-section measurements  
2. Anomalous gauge couplings (TGC's)

**DiBoson Background studies** 1. ZZ irreducible to H->4l  
2. WW irreducible to H->WW

**VBF Z->ll Signal studies** 1. Possible channel for Artemis  
2. Calibration signal to VBF H( $\tau\tau$ )

**Z + jets ->4l**

**Zbbar ->4l Background studies** 1. Backgrounds to ZZ and H->4l

**Zbbar ->4l Signal studies** 1. Possible measurement with data

Summary of  
Signal &  
Background  
samples relevant  
for Artemis  
Physics Topics