

DESY CMS Physics Planning

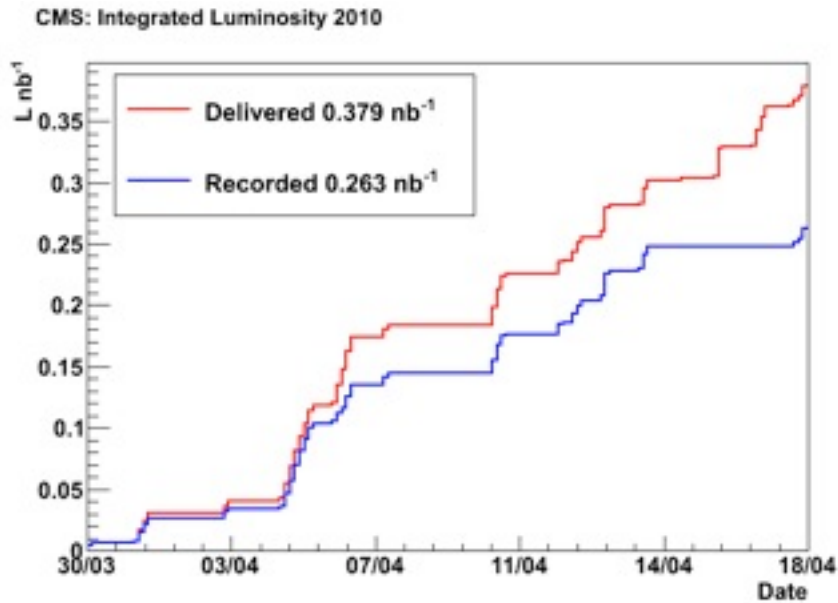
CMS Plans for ICHEP
Results from Questionnaire

April 2010

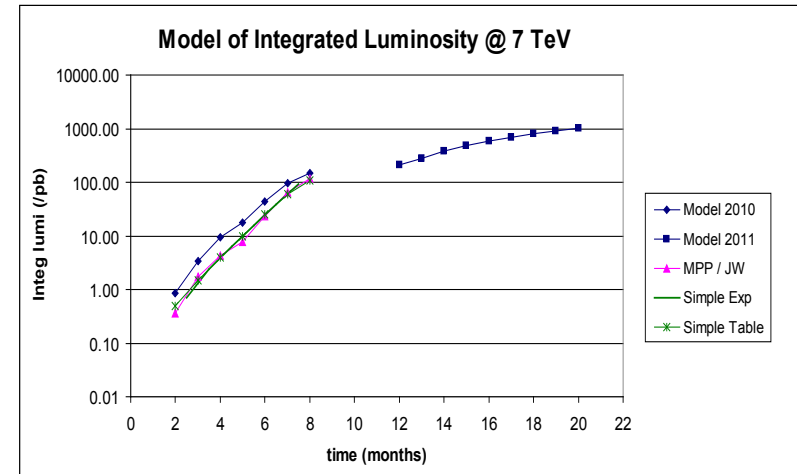
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Questionnaire material on agenda page (22 March 10)
<https://indico.desy.de/conferenceDisplay.py?confid=2837>

Integrated Luminosity



<https://twiki.cern.ch/twiki/bin/view/CMS/LumiWiki2010Data>



re 1 Luminosity scenario vs. time from first 7 TeV collisions used by CMS for planning.

- integrated luminosity so far (17 April): 0.4 nb⁻¹
- expect 1 - 10 pb⁻¹ by end of July (factor 2000 to 20000)



- Accessible physics vs. integrated Luminosity
 - Analyses at $\sim 0.1 \text{ pb}^{-1}$
 - QCD: Repeat at 7 TeV the analysis as in 2009 sample using an early sample of min bias events.
 - Analyses at 1 pb^{-1}
 - QCD: Identified particles in pp collisions at various center of mass energies, many di/multijet analyses (production ratio, azimuthal decorrelation, and angular distributions), and inclusive photons.
 - BPH: Open-beauty production cross section, $B^+ \rightarrow J/\psi K^+$ and $B^0 \rightarrow J/\psi K^0$, Inclusive J/ψ differential cross section, B-hadron fraction of $J/\psi \rightarrow \mu\mu$ events, $Y(1S)$ differential cross-section
 - FWD: E-flow for min bias event sample in HF and CASTOR region, Estimate of soft diffractive contribution to total cross section
 - EWK: W and Z production, ratios
 - TOP: Observation... few events
 - Analyses at 10 pb^{-1}
 - QCD Improved di/multijet analyses (gamma + jets, gamma gamma)
 - BPH Improved B exclusive channels, $b\bar{b}$ correlations, measurement of the X_c feed down fraction
 - FWD: Observation of exclusive Upsilon decays
 - EWK: W/Z production, ratios, differential cross sections ($d\sigma/dq_T$). Lepton asymmetry, W + jets jet-multiplicity, W polarization in W+1jet sample
 - TOP: Cross section in the dilepton channel, μ +jets, e+jets, as well as cross section ratios (dilepton/Z, lepton + jets/W)
 - EXO: di-jet resonances, long lived charged particles, leptoquarks
 - SUS: missing energy, background studies, QCD background modeling



■ Proposed priority analyses

- BPH: Vertical integration of MUO/TRK DPGs and POGs with the BTV POG. •
 - Inclusive b-quark cross section in the μ channel.
- BPH: Vertical integration of MUO/TRK DPGs and POGs with the BTV POG.
 - Inclusive ONIA differential cross sections in the muon channel
- QCD: Vertical integration with HCAL/ECAL DPGs, JME/PFT POGs & TRK DPG-POG.
 - The luminosity independent jet-based (high- p_T) measurements (dijet angular distributions, dijet ratios and event shapes).
- EWK: Vertical integration with TRK DPG-POG, MUO/ECAL DPGs, MUO/EGM POGs as well as JME/PFT POGs for MET in the W case.
 - Measurement of Z and W cross sections and luminosity-independent ratios in muon and electron channels.
- TOP: Vertical integration of TRK/MUO/ECAL DPGs, TRK/MUO/EGM/JME/

Where are we contributing (?)

Results from Physics Planning Questionnaire



- **Data Analysis 2009 / 2010**
 - which datasets of 2009 data do you use ?
 - what are the data formats that you use (ntuple / PATtuple / RECO) ?
 - where are these data available and processed (DESY, NAF, CERN, elsewhere) ?
 - who do you share the data with and how ?
 - what are the plans / strategies for real data analysis and production in 2010 ?

- **Towards DESY contributions to publications**
 - what are the goals / timescales for 2010 ?
 - networking with HH, KA, AC
 - Interaction with which POG and PAG ?
 - contributions to analysis notes ?
 - participation in reference analysis ?

- which datasets of 2009 data do you use ?

- QCD

- /MinimumBias/BeamCommissioning09-Jan23ReReco-v1/RECO
- /MinBias/Summer09-STARTUP3X_V8P_900GeV_*-v1/GEN-SIM-RECO
- /PHOJET_MinBias_900GeV_STARTUP3X_V8P_336patch4-HLT-v1 User data sets
- /MinBias/Summer09-STARTUP3X_V8O_2360GeV_Jan29ReReco-v1/GEN-SIM-RECO

- Higgs

- /MinimumBias/BeamCommissioning09-BSCNOBEAMHALO-Dec19thSkim_336p3_v1/RAW-RECO
- /MinimumBias/BeamCommissioning09-SD_AllMinBias-Feb9Skim_v1/RAW-RECO
- /MinBias/Summer09-V16D_900GeV-v1/GEN-SIM-RECO
- /MinBias/Summer09-V16E_2360GeV-v1/GEN-SIM-RECO

- Susy

- latest rereco, e.g. 342p1 re-reco AllMinBias-Feb9Skim
- MC: MinBiasSummer09-V16D_900GeV-v1 MinBiasSummer09-V16E_2360GeV
- MC to be produced from new 7TeV MC datasets: https://twiki.cern.ch/twiki/bin/viewauth/CMS/SUSYMCRequirements0911#Tables_for_7_TeV

- Top

- see cms.desy.de/e48952 -> Analysis: Joint Aachen-Hamburg Activities or Twiki: TopDileptonDCMS, ZbbDimuDCMS

Data Tiers



- what are the data formats that you use (ntuple / PATtuple / RECO) ?
 - QCD
 - RECO
 - Higgs
 - RECO
 - Susy
 - mainly SusyPVT ntuple format (see AN-10-010)
 - in addition PAT tuples from Susy group
 - Top
 - PATtuple for Top/Z-Analysis
 - RECO for DQM

- where are these data available and processed (DESY, NAF, CERN, elsewhere) ?
 - QCD
 - T2-centers (DESY et al)
 - Higgs
 - skimmed samples (H->WW->2l skim) processed @ CERN, : CAF, stored: castor
 - private NAF copies (small datasets)
 - Susy
 - SusyPVT ntuple: CERN: processed: CAF, stored: castor and private NAF copies (small datasets)
 - Susy PAT tuples Susy T2 centers e.g. Aachen
 - Top
 - Available: at T2; Processed: DESY/NAF; Stored: dCache

Sharing of data



- **who do you share the data with and how ?**
 - **QCD**
 - CERN group, Antwerp group
 - **Higgs**
 - Higgs- τ and Higgs- WW subgroups of Higgs PAG.
 - **Susy**
 - within group (see above)
 - **Top**
 - within group (planned to share more widely)

Plan for 2010



■ what are the plans / strategies for real data analysis and production in 2010 ?

■ QCD

- We plan to have the forward energyflow measured in 900, 2360 and 7000 GeV. We will have measurements for the HF region ($3 < |\eta| < 5$ and also for the CASTOR region $5.5 < \eta < 6.5$). First we will measure the ratio of Eflow for QCD digest events to minbias events. Then the absolute Eflow will be measured and corrected to hadron level.
- A next study is forward + central jets, where the forward jet can be in HF or CASTOR.
- Also DY will be investigated for calibration of CASTOR but also for a physics signal.

■ Higgs

- participation in tracking/vertexing validation with analysis aiming at the reconstruction of $\Xi \rightarrow \Lambda + \pi$ and $K^*(892) \rightarrow K_{\text{short}} + \pi$ (Alexei);
- participation in validation of secondary vertex finding algorithms, extensive data-MC comparisons (Roberval in cooperation with Maria);
- physics commissioning of MSSM Higgs $\rightarrow \tau + \tau \rightarrow \mu + \mu$ analysis with Z+jets events, extensive data-MC comparisons, Z+jets cross section
- measurement in the "dimuon + missing Et" channel ($Z \rightarrow \tau\tau \rightarrow 2\mu$) (Alexei, Agni);
- studies of QCD background in the same and opposite sign dimuon samples (Roberval, Agni).

Plan for 2010 cont'd



- **what are the plans / strategies for real data analysis and production in 2010 ?**

- **Susy**

- main interest leptonic SUSY, especially electrons -> understanding first leptons, MET and Jets
- participation in following SUSY subgroups
 - SusyPVT (SUSY prompt validation)
 - SUSY leptonic commissioning

- **Top**

- use common dilepton selection and data sets with top/Higgs/SUSY groups,
- potentially also with AC. Both data and MC. Aim for cross sections.
- Use common selection and dilepton datasets with Top, SUSY and Higgs, potentially also with AC.



■ what are the goals / timescales for 2010 ?

■ QCD

- Contribute significantly to Eflow paper and tuning of MC (should be ready by summer 2010).
- Also active contribution to forward jet analysis, to be ready by summer 2010, but using also higher lumi.

■ Higgs

- plots for summer conferences (K^* and Ξ analyses), (K^* analysis is already included in Trk-PAS-10-001);
- possible contribution to the paper on strangeness production @ 900GeV, 2.36TeV and higher energies (fall of 2010);
- possible contribution to the paper on Z+jets production ($Z \rightarrow \tau\tau \rightarrow 2\mu$ ons channel) (fall of 2010).

■ Susy

- plots for summer conferences
- SusyPVT had prepared a draft analysis note (AN-10-010), which had been joined with JetMET PAS (JME-10-002)
- SUSY leptonic commissioning group is being formed

Goals / Timescales



■ what are the goals / timescales for 2010 ?

■ Top

- Top rediscovery + total cross section in dimuon channel from first 50 pb⁻¹ (thesis summer/fall 2010) - aim for contribution to corresponding CMS paper
 - understanding first leptons, jets, ...
 - First performance plots showing comparisons data-MC
- Differential top cross sections in mu+e channel from full 2010 data set (thesis June 2011) - aim for contribution to corresponding CMS paper
- Cross section for associated Z+bb production from full 2010 data set (thesis October 2011) - aim for contribution to corresponding CMS paper
- Cross sections for inclusive Z production (thesis only)
- Differential top cross sections in dimuon channel from full 2010+11 data set (thesis 2012) - aim for contribution to corresponding CMS paper

- Further additions: btagging and advanced reconstruction tools, such as track-jets or PFlow
- Feasibility studies for measuring the top mass in the dileptonic channel using the "Lxy method"
- Participation in joint Tracking-Btagging POG validation activities

- networking with HH, KA, AC ?

- QCD

- Antwerp and CERN

- Higgs

- collaboration with KA on evaluation of $Z \rightarrow \tau\tau$ backgrounds for MSSM Higgs searches with embedding method ($Z \rightarrow \mu\mu$ by $Z \rightarrow \tau\tau$ substitution);
- collaboration with KA on combination of MSSM Higgs searches in various $H \rightarrow \tau\tau$ channels ($H \rightarrow \tau\tau \rightarrow$
 - $\mu + \tau$ -jet,
 - $e + \tau$ -jet,
 - $e + \mu$
 - $\mu + \mu$

- Susy

- Participation via common code/code development in SusyPVT, especially AC

- Top

- common top dilepton analysis group with AC. HH joining (Diplomand).
- KA to join hopefully as soon as corresponding analysis restarts.
- common $Z+bb$ analysis group with AC

- **Interaction with which POG and PAG ?**
 - **QCD**
 - FWD QCD PAG
 - Hcal DPG
 - **Higgs**
 - PAG: Higgs (Higgs->2tau subgroup), EW (Z+jets subgroup)
 - POG: Tracking, Muon, JetMET.
 - **Susy**
 - PAG: SUSY and SUSY subgroups: leptonic SUSY, leptonic SUSY commissioning, SusyPVT
 - POG: SUSY leptonic commissioning group is looking for close cooperation with egamma and muon
 - **Top**
 - trigger (DQM), muon, top, EWK
 - top Dilepton PAG meetings
 - POG: btagging group

- **contributions to analysis notes ?**

- **QCD**

- PAS on Eflow is mainly written by us

- **Higgs**

- MSSM Higgs \rightarrow tau tau \rightarrow mu mu analysis at 7TeV (Monte Carlo studies);
- Strangeness production at 0.9, 2.36 and 7TeV (contribution with K^* and Xi analyses);
- Z+jets production (contribution with $Z \rightarrow \tau\tau \rightarrow 2\mu$ ons analysis)

- **Susy**

- draft analysis note (AN-10-010), which had been joined with JetMET PAS (JME-10-002)

- **Top**

- Top DQM note in preparation.
- Aim for contribution to the top rediscovery and cross section in dimuon channel CMS analysis note
- Further contributions to publications outside Top physics activities:
- Contribution to the Measurement of the charge asymmetry of atmospheric muons with the CMS detector (CMS AN-2010/011, CMS AN-2010/033).
- PAS MUO-10-001 awaiting final approval (expected: week 22-26 March)



- "participation in reference analysis" ?
 - QCD
 - Higgs
 - Susy
 - Reviewing RA4 (SUSY in 1 lepton channel)
 - Top

Summary "Questionnaire"



- **general information collected**
 - needs continuous updating
 - follow up specific issues with groups
 - improved picture for PRC

- **Conclusion**
 - Huge step forward in the past year !!!
 - Clear physics profile emerging
 - Now, work on data, maximize contributions

- **Managerial concerns**
 - make sure we are optimally connected with CMS physics coordination
 - take on defined responsibilities for analysis deliverables (should be both: significant and feasible)

For PRC



Activities



Activities



Activities



Activities

Input welcome

For PRC

