# *Helmholtz-Allianz*

MC Usage in CMS

CMS Collaboration
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Transparencies mostly from CMS MC Conveners, P. Bartalini, F. Moortgat

Generators in CMSSW 1/2
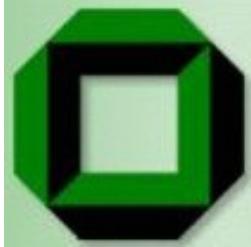
GeneratorInterface in CMSSW:

Pythia6Interface	+++	H. Naves, F. Moortgat
Herwig6Interface (including Jimmy)	+++	F. Stoeckli
Pythia8Interface	++	M. Kirsanov
Herwig++Interface	+	Karlsruhe, in progress
SherpaInterface	+	Karlsruhe, in progress
HydjetInterface	++	C. Mironov
TopRexInterface	++	S. Slabospitsky
MC@NLOInterface	+++	F. Stoeckli
ALPGENInterface	++	M. Pierini, M. Spiropulu
MadGraphInterface (also works for Phantom and Helac)	+++	D. Kcira, M. Hansen (S. Bolognesi, F.M.)
CompHepInterface	++	S. Slabospitsky, D. Konstantinov
EvtGenInterface	+	U. Langenegger, R. Covarelli

Generators in CMSSW 2/2
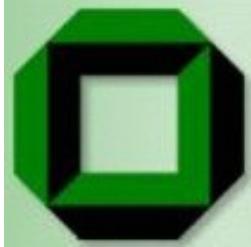
Continued:

ExHumeInterface	+++	A.Vilela Pereira
PomwigInterface	+++	A.Vilela Pereira
LHAPDF	++	H. Naves, F.M.
CosmicMuonGenerator	+++	P. Biallass
BeamHaloGenerator	++	E. Perez
ParticleGuns	++	J. Yarba
MCFileReader	++	J. Weng
NtupleConverter	++	J. Weng

GENSER1 / GENSER2 Libraries are adopted, if available & no need to modify

More information https://twiki.cern.ch/twiki/bin/view/CMS/GeneratorTaskList

|		
+++	=	advanced
++	=	ongoing
+	=	resources identified

Latest Changes
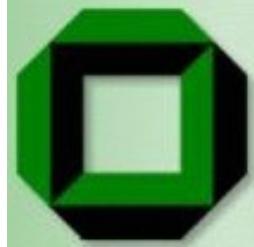
- Using new HepMC (event record) and HepPDT (particle data table) version from LCG

- LHAPDF included

- HERWIG/Jimmy and MC@NLO included

- Two dedicated diffractive generators included

- Pythia version 6.409: Includes (optional) new parton shower and underlying event model

- Tauola interface to Pythia (C. Veelken & S. Nikitenko)

- Upgrade of POMWIG (A. Vilela)

- Cosmic Muon Generator updated

Some Comments
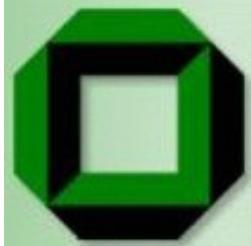
- CMS CSA07 (ComputingSoftwareAnalysis) Challenge:
  - O(200M) events fully simulated since August
- Nevertheless: FastSim used & required for precise background estimations
- Most used SM Generator in CMS: Pythia 6 with DWT tune
- Lastly: A lot of effort went into Alpgen+Pythia usage for
  - W, Z, γ + n jets and QCD n jets
- Updated MadGraph (for CMS production use with cmsGen)

MC Tuning Goals
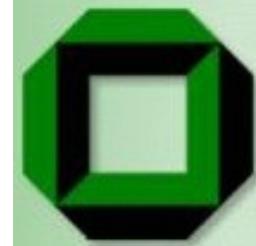
- To provide both Best and Error settings for

  - Hard process description

  - Hard process scale

  - PDF description

  - QCD radiation

  - Fragmentation of light and heavy quarks

  - Minimum Bias (including the variations in the relative amount of diffractives etc.)

  - Underlying Event

  - Decays

  - Etc.

- Big Issue for "Predicting" at the LHC ==> Energy Dependency of the Parameters

Some guidelines available in CMS Note 2005/013 (To be reviewed)

Pythia 6.2 Tunes
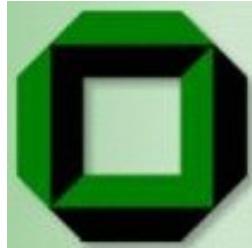
Use LO α_s with Λ = 192 MeV!

K-factor (Sjöstrand)

UE Parameters

ISR Parameter

Intrinsic KT

Parameter	Tune DW	Tune DWT	ATLAS	Tune QW	Tune QWT	Tune QK	Tune QKT
PDF	CTEQ5L	CTEQ5L	CTEQ5L	CTEQ6.1	CTEQ6.1	CTEQ6.1	CTEQ6.1
MSTP(2)	1	1	1	1	1	1	1
MSTP(33)	0	0	0	0	1	1	1
PARP(31)	1.0	1.0	1.0	1.0	1.0	1.8	1.8
MSTP(81)	1	1	1	1	1	1	1
MSTP(82)	4	4	4	4	4	4	4
PARP(82)	1.9 GeV	1.9409 GeV	1.8 GeV	1.1 GeV	1.1237 GeV	1.9 GeV	1.9409 GeV
PARP(83)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
PARP(84)	0.4	0.4	0.5	0.4	0.4	0.4	0.4
PARP(85)	1.0	1.0	0.33	1.0	1.0	1.0	1.0
PARP(86)	1.0	1.0	0.66	1.0	1.0	1.0	1.0
PARP(89)	1.8 TeV	1.96 TeV	1.0 TeV	1.8 TeV	1.96 TeV	1.8 TeV	1.96 TeV
PARP(90)	0.25	0.16	0.16	0.25	0.16	0.25	0.16
PARP(62)	1.25	1.25	1.0	1.25	1.25	1.25	1.25
PARP(64)	0.2	0.2	1.0	0.2	0.2	0.2	0.2
PARP(67)	2.5	2.5	1.0	2.5	2.5	2.5	2.5
MSTP(91)	1	1	1	1	1	1	1
PARP(91)	2.1	2.1	1.0	2.1	2.1	2.1	2.1
PARP(93)	15.0	15.0	5.0	15.0	15.0	15.0	15.0

Default tune used in CMS: DWT

[Rick Field]