

Chapter 7 status: cosmic ray physics, multiplicities, correlations and spectra

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Chapter 7

● All contributors were contacted

- ✓ → Structure (TP) : local svn repository settled, outline and first contributions included
- ✓ → Theory (R. Engel) : figures
- ✓ → LHCf (T. Sako) : full text
- ✓ → ATLAS (T. Martin) : full text and figures
- ✓ → ALICE (D. Chinatello) : first draft
- TOTEM (K. Oesterberg) : contribution by the end of June
- CMS (R. Ulrich) : soon
- LHCb (D. Volyansky) : waiting for news ...

Chapter 7 Outline

- **Introduction** (D. Berge, R. Engel, T. Pierog and R. Ulrich)
 - ➔ motivations from CR physics
 - spectral feature
 - mass composition
- **Cosmic Ray and MC tuning** (D. Berge, R. Engel, T. Pierog, D. Salek and R. Ulrich)
 - ➔ relevant observables and corresponding measurements
 - ➔ comparison between EPOS LHC and QGSJETII-04
 - ➔ need for p-O beam
 - ➔ $\sim nb^{-1}$ to get $\sim 10^8$ events

Chapter 7 Outline (2)

- **Detectors**

- energy flow
- multiplicity
- spectra

- **Energy flow**

- ATLAS/AFP
- CMS
- LHCb

- **Multiplicity**

- ATLAS/AFP/ALFA/LHCf
- CMS/TOTEM

Chapter 7 Outline (3)

- **Identified spectra**

- neutral particles (LHCf)
- strange particles (LHCb, ALICE)

- **Beam conditions**

- low pile-up
- $\mathcal{L} < 10^{29} \text{cm}^{-2} \text{s}^{-1}$
- about $\sim 10^8$ events : $\sim 10 \text{nb}^{-1}$
- proton-oxygen

Summary

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Exp	σ^{-1} (nb ⁻¹)	Pile-up	\mathcal{L} (cm ⁻² s ⁻¹)	β^* (m)	N_b	N_p/b	bunch spacing (ns)
LHCf	5-20	<1	6×10^{28}	19	40	10^{10}	
TOTEM	100	<1	10^{30}	90	<156	10^{11}	
ATLAS	1	<1					200
LHCb	10	<1					>50
CR	1	<1					