

High Energy Physics - Phenomenology

Limiting soft particle emission in e+e-, hadronic and nuclear collisions

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(Submitted on 10 Mar 2010)

In e+e- collisions the particle spectra at low momenta reflect the properties of the underlying "soft" QCD gluon bremsstrahlung: the particle density, in the limit $p \rightarrow 0$, becomes independent of the incoming energy \sqrt{s} and directly proportional to the colour factors C_A, C_F for primary gluons or quarks respectively. We find that experimental data from the pp and nuclear reactions reveal the same behaviour: in the limit $p_T \rightarrow 0$ the invariant particle spectra become independent of the collision energy, and their intensities in e+e-, pp and nuclear reactions are compatible with the expected colour factors $C_F: C_A: (N_{\text{part}}/2) C_A$ for N_{part} nucleons, participating in the interaction. Coherent soft gluon bremsstrahlung is, therefore, suggested to be the dominant QCD mechanism for the soft particle production in all these reactions. These "soft" particles probe the very early stage of hadron formation in the collision. Future measurements at the LHC will provide crucial tests on the contributions from possible incoherent multi-component processes.

Comments: 19 pages, 4 figures

Subjects: **High Energy Physics - Phenomenology (hep-ph)**; High Energy Physics - Experiment (hep-ex); Nuclear Experiment (nucl-ex)

Report number: IPPP/10/20, DCPT/10/40, MPP-2010-29

Cite as: [arXiv:1003.2127v1](https://arxiv.org/abs/1003.2127v1) [hep-ph]

Submission history

From: Wolfgang Ochs [[view email](#)]

[v1] Wed, 10 Mar 2010 15:19:21 GMT (867kb)

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