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Gribov-Lipatov inequality and inclusive e^+e^- processes

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Abstract. We study the inclusive e^+e^- processes at the PETRA energy range within QCD and a fixed point theory using the phenomenological Gribov-Lipatov inequality suggested in an earlier analysis. Theoretical justification is provided within QCD and its possible implication in hadronization is discussed.

Keywords. Gribov-Lipatov inequality; quantum chromodynamics; hadronization.

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1. Introduction

In this paper we address ourselves to the problem of inclusive e^+e^- processes $e^+e^- \to h + x$. Such processes have been studied recently with various fragmentation models (Field and Feynman 1978; Anderson *et al* 1983; Peterson *et al* 1983; Gottschalk 1983, 1984; Webber 1984). Attempts have also been made to study them in perturbative QCD (Kato *et al* 1983; Peterson *et al* 1983). Monte Carlo models (Ali *et al* 1983; Hoyer *et al* 1979) have been constructed to that end.

Choudhury and Vanryckghem (1978) studied these processes with the moment method (Tung 1975; Eilam and Glück 1976) assuming the validity of the Gribov-Lipatov relation (Gribov and Lipatov 1971, 1972a, b). Data from the SPEAR energy (Morehouse 1975, unpublished) were used.

Theoretical and phenomenological studies (Brandelik *et al* 1979; Kubota 1980; Floratos *et al* 1981; Konishi *et al* 1978; Dokshitzer 1977; Kawabe 1981) suggest the breakdown of the Gribov-Lipatov relation. A more recent phenomenological study (Choudhury and Misra 1987) of PETRA regime (Wu 1984) suggests its breakdown for proton and antiproton data with a definite trend in the form of an inequality.

The present work is an attempt to update our earlier analysis (Choudhury and Vankryckghem 1978) using the "inequality" version of the Gribov-Lipatov relation and the new experimental information (Wu 1984) at the PETRA regime. Theoretical justification for testing the inequality is provided within the QCD. A plausible implication of the relative degree of violation of the Gribov-Lipatov relation in pion and kaon data vs proton/antiproton is also discussed in the present paper.