

# The Physics of Ultrapерipheral Relativistic Heavy Ion Collisions

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In ultra-peripheral collisions (UPC) the heavy ions pass by each other at large impact parameters and do not interact via the strong interaction with each other; still, there are interesting effects due to the very strong electromagnetic fields present in these collisions. UPC can be considered as a new laboratory for high energy physics, see the transparencies of the talk by S. Brodsky at the March UPC workshop [1].

This field is reviewed in [2]. Due to coherence there are strong electromagnetic fields of short duration in such collisions. They give rise to photon-photon and photon-hadron collisions up to invariant mass regions hitherto unexplored experimentally. A popular account of the present status is given in [3], some of the hot topics of the field were presented in [4]. The Relativistic Heavy Ion Collider RHIC is now in operation in Brookhaven. A dedicated program exists to study these peripheral collisions [5] and first experimental results on coherent  $\rho^0$  production in UPC's are published [6]. Further references can be found in the proceedings of the Erice workshop on Electromagnetic Probes of Fundamental Physics, October 2001 [7] and the webpage of the UPC workshops at CERN in March and October 2002 [1]. A CERN theory working group was established in order to prepare a "Yellow Report" which will describe in detail the physics opportunities of UPC's at the forthcoming LHC.

It was suggested to use the CMS detector at LHC for photon-hadron and photon-photon physics at LHC [8]. UPC were also discussed in connection with the Letter of Intent for FELIX [9].

These relativistic heavy ion colliders are also vector meson factories [10]. At RHIC the invariant mass region is similar to the one at HERA. A new energy regime will be entered at LHC.

In Fig. 1 we show the differential cross section for exclusive diffractive  $\Upsilon$  production in photon-Pomeron collisions, taken from Fig 39 of [9].

Some basic aspects of (multiple)  $e^+e^-$  pair production and Coulomb correction in this process were studied in [11].

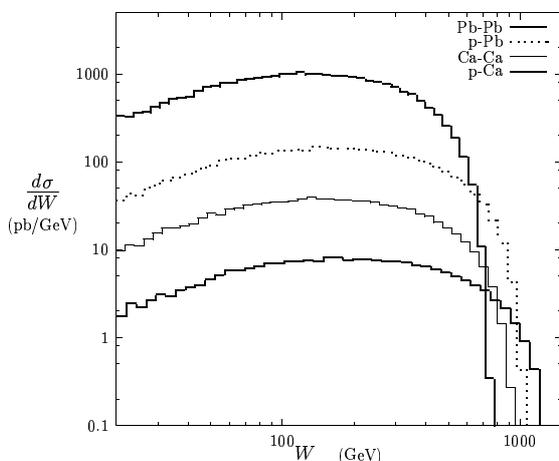


Fig. 1: Differential cross section for exclusive diffractive  $\Upsilon$  production in photon-Pomeron collisions for various AA and Ap systems at LHC. For further details see [9]

## References:

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