

High Energy Physics - Experiment

Observation of the $\chi_{c2}(2P)$ meson in the reaction $\gamma\gamma \rightarrow D\bar{D}$ at BABAR

The [BABAR Collaboration](#): B. Aubert, et al

(Submitted on 1 Feb 2010)

A search for the $Z(3930)$ resonance in $\gamma\gamma$ production of the $D\bar{D}$ system has been performed using a data sample corresponding to an integrated luminosity of 384 fb^{-1} recorded by the BABAR experiment at the PEP-II asymmetric-energy electron-positron collider. The $D\bar{D}$ invariant mass distribution shows clear evidence of the $Z(3930)$ state with a significance of 5.8σ . We determine mass and width values of $(3926.7 \pm 2.7 \pm 1.1) \text{ MeV}/c^2$ and $(21.3 \pm 6.8 \pm 3.6) \text{ MeV}$, respectively. A decay angular analysis provides evidence that the $Z(3930)$ is a tensor state with positive parity and C-parity ($J^{PC} = 2^{++}$); therefore we identify the $Z(3930)$ state as the $\chi_{c2}(2P)$ meson. The value of the partial width $\Gamma_{\gamma\gamma}(Z(3930) \rightarrow D\bar{D})$ is found to be $(0.24 \pm 0.05 \pm 0.04) \text{ keV}$.

Comments: 16 pages, 4 tables, 26 postscript figures, submitted to Phys. Rev. D
Subjects: **High Energy Physics - Experiment (hep-ex)**
Report number: BABAR-PUB-09/031, SLAC-PUB-13939
Cite as: [arXiv:1002.0281v1](#) [hep-ex]

Submission history

From: Torsten Schröder [[view email](#)]

[v1] Mon, 1 Feb 2010 16:41:46 GMT (90kb)

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