

Abstract Submitted  
for the HAW09 Meeting of  
The American Physical Society

**Polarization Correlations of Entangled Photon Pairs from Positronium Decay as a Test of Bell's Inequality** MINORU SANDA, MOTONOBU TAKAKI, Department of Physics, Kyushu University — It is well known that Einstein, Podolsky, and Rosen (EPR) claimed that quantum mechanics might be incomplete in terms of local realism. Bell showed that experimental verification of local hidden variable theories is possible by comparing with the Bell's inequality. We measured polarization correlations  $\langle AB \rangle$  of two photons produced by positronium decay. Here  $A$  and  $B$  are the polarizations of photons. The value  $\langle AB \rangle$  can be expressed as  $-\kappa \cos(2\phi)$  where  $\phi$  is the angle between the axes of two photon polarizations. The Bell's inequality gives  $\kappa \leq \frac{1}{\sqrt{2}}$  in local realism, whereas non-local quantum mechanics gives  $\kappa = 1$  which disagrees with local hidden variable predictions. We have constructed two sets of Compton polarimeters, each of which consists of a liquid scintillator and four NaI scintillators. The photon polarization can be deduced from the azimuthal distribution of Compton scattering. The experimental data was combined in order to reduce experimental false polarizations, and thus we have succeeded to deduce  $\langle AB \rangle$  with high accuracy. Our preliminary result is  $\kappa = 1.0$ . This result is consistent with the prediction based on non-local quantum mechanics, and violates the Bell's inequality. In the meeting, we will report final results for  $\langle AB \rangle$ . Furthermore, we will compare our results with theoretical predictions.

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Date submitted: 27 Jul 2009

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