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THE DISCOVERY OF CHARM

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In my talk I will cover the period 1973-1976 which saw the discoveries of the J/ψ and ψ' resonances and most of the Psion spectroscopy, the τ lepton and the D^o, D^+ charmed meson doublet. Occasionally I will refer briefly to more recent results.

Since this conference is on the history of the weak-interactions I will deal primarily with the properties of "naked charm" and in particular the weakly decaying doublet of charmed mesons.

Most of the discoveries I will mention were made with the SLAC-LBL Magnetic Detector or "MARK I" which we[1] operated at SPEAR from 1973 to 1976. (See Fig. 1) The groups involved in this work were those of Martin Perl and Burton Richter of SLAC and William Chinowsky, Gerson Goldhaber and George Trilling of LBL. The MARK I was then modified to include a "Lead Glass Wall" (LGW) for improved photon and electron detection. This involved a new physics group from LBL, who built the LGW, A. Barbaro-Galtieri et al as well as a continuing group from SLAC, M. Perl et al to provide continuity in the use of the MARK I.

During the course of the LGW experiment we were engaged in building a new and improved SLAC-LBL Magnetic Detector the "MARK II" which returned to SPEAR in 1978 and was moved to PEP in 1980. We are currently working on an upgrade of the MARK II detector for a subsequent move to the SLC.

A Brief History of the Discovery of the ψ and Psion Spectroscopy

My personal reminiscences regarding the ψ have already been published[2] and I will not repeat them here.

We started our experiment at SPEAR with an energy scan. Since we had not expected narrow structures[3] we measured the cross section in 100 MeV steps in beam energy, i.e., 200 MeV steps in E_{cm}. Fig. 2 shows our data as presented by Burton Richter at the London Conference in June 1974. The data was in good agreement with the earlier CEA and Frascati results[4] and showed a roughly constant cross section from 2.5 to 4.8 GeV. And yet - the data was not completely flat, and we were sufficiently intrigued with the high points at 3.2 GeV and 4.2 GeV that we decided to take additional intermediate points in June 1974 at 3.1 and 3.3 GeV as well as around 4.2 GeV. As I discussed elsewhere[2] it was an irregularity in the new 3.1 GeV data point - as reanalyzed by Roy Schwitters in October 1974 - which convinced us, in early November 1974 that we had to remeasure this region before we could publish our cross section data. Fig. 3 shows the ψ signal which we found on November 10, 1974, by scanning in very small steps. We thus realized that the increase in cross section we first noted at 3.2 GeV and the anomalies at 3.1 GeV were the result of the presence as well as the radiative tail of this enormous resonance.

The next day we learned from Samuel Ting about the MIT BNL results on the J –

MASTER

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