

Searching for the Electric Dipole Moment of the Neutron

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- 1950 All theorists believed P.
- 1950 Purcell & Ramsey [PR. 78
807]. Test needed for nucl.forcs.
- 1953 Beam Oak Ridge.
 $d_n < 5 \times 10^{-20}$ e. cm.
- 1956 Lee & Yang suggest P
failure in weak nucl. force.
Reference to our 1950 paper but
summarize just our 1953 expt. I
begin ^{60}Co expt with L.Roberts.
Oak Ridge delay. Wu&Ambler.

1957 Theorists assumed CP & T sym,
so $d_n = 0$.

But Ramsey and J.D Jackson, et. al.
argued that T symmetry was an
assumption be tested and the search
for an EDM was a good test.

1964 $d_n < 10^{-21}$ e cm Beam
Oak Ridge.

- 1964 Failure of CP in K^0_L so T
sym fail if CPT conserved
- 1967 $d_n < 4 \times 10^{-23}$ e cm. Beam Oak R
- 1973 Beam Grenoble $d_n < 4 \times 10^{-24}$ e cm
- 1984 $d_n < 3 \times 10^{-25}$ e cm. Bottle expts.
St Peters, Grenoble
- 1999 $d_n < 6.3 \times 10^{-26}$ e cm St Peters, Gr
- 2006 $d_n < 3.0 \times 10^{-26}$ e cm Grenoble [ge

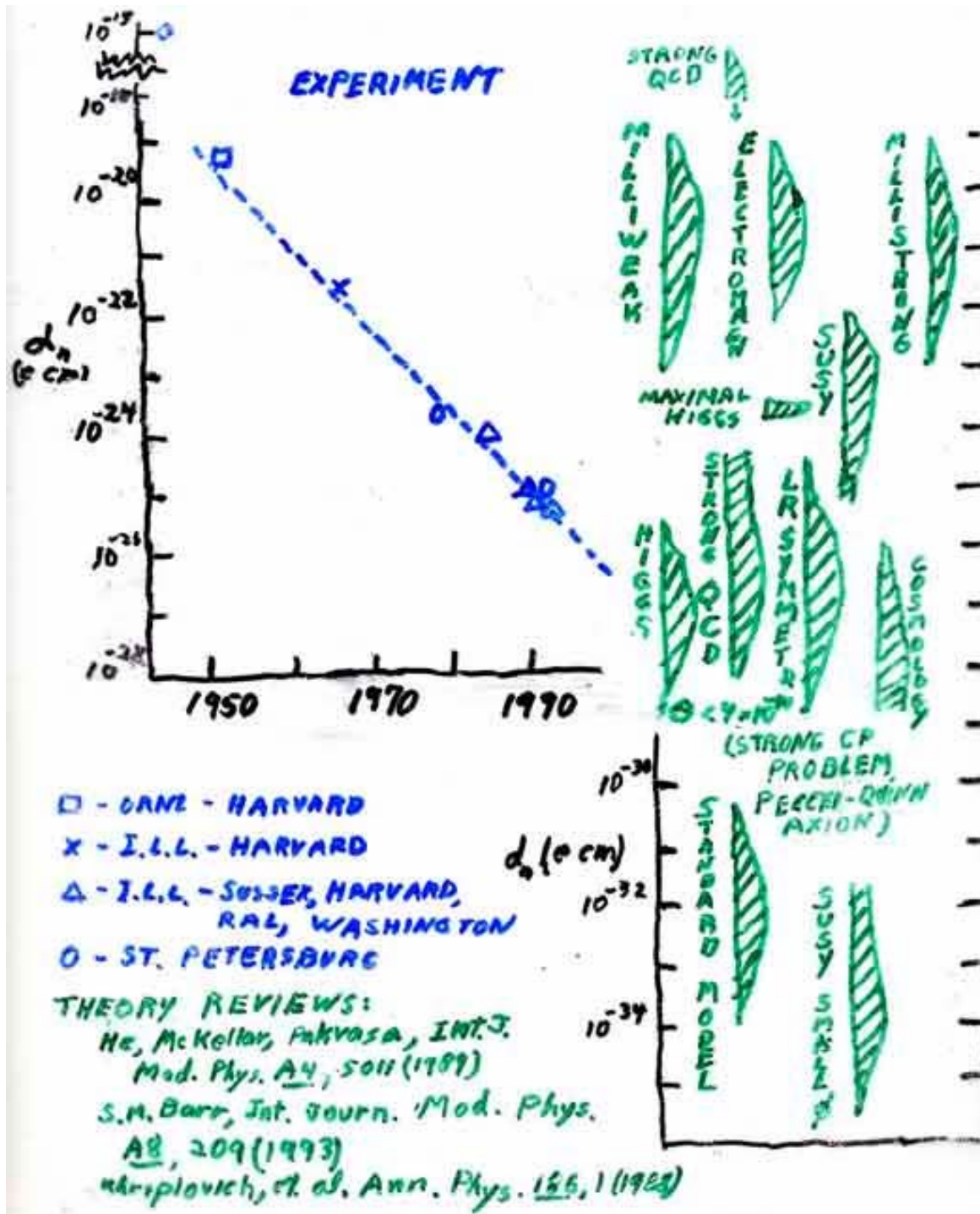


TABLE 1. Upper 90% Confidence Levels on Principal T Non-conserving Interaction Parameters.

The Parameters Are Defined in Khriplovich [Nucl. Phys. A449, 750 (1986) and Ann. Phys.186, 1 (1988)]. This Table Is Based in Part on Tables Prepared by Fortson and Barr. [Corrected 06-17-06 From C.L. Baker, et al Phys. Rev. Lett. (2006)].

System -->	n	¹⁹⁹Hg	TIF	²⁰⁵Tl
Property (Units)				
d (x 10 ⁻²⁶ e cm)	<3.0	<0.063	{d _p <16,000}	
	<23,000	Hadronic Parameters:		
Q _S (x 10 ⁻¹¹ e fm ³)		<1.6	<100	<23,000
η (x 10 ⁻⁶)		<1,200	<20,000	
η _q (x 10 ⁻⁶)	<13	<2.5		
θ _{QCD} (x 10 ⁻⁶)	<1.3	<9.4	<60	<4,000
ε _{q,susy}	<0.0014	<0.005	<0.08	
<1.3				
ε _{e,susy}			<0.012	<0.5
	Semileptonic Parameters:			
C _T (x 10 ⁻⁶)	<0.005	<0.5		
C _S (x 10 ⁻⁶)	<0.23	<20	<0.3	<20
	Leptonic Parameter:			
d _e		<4.4	<40	<0.3
System -->	n	¹⁹⁹Hg	TIF	²⁰⁵Tl

FUTURE

Russian Experiments

Reactor n 's in liquid ^4He at
Grenoble

Spallation n 's in liquid ^4He at
Los Alamos and Oak Ridge

Other Experiments

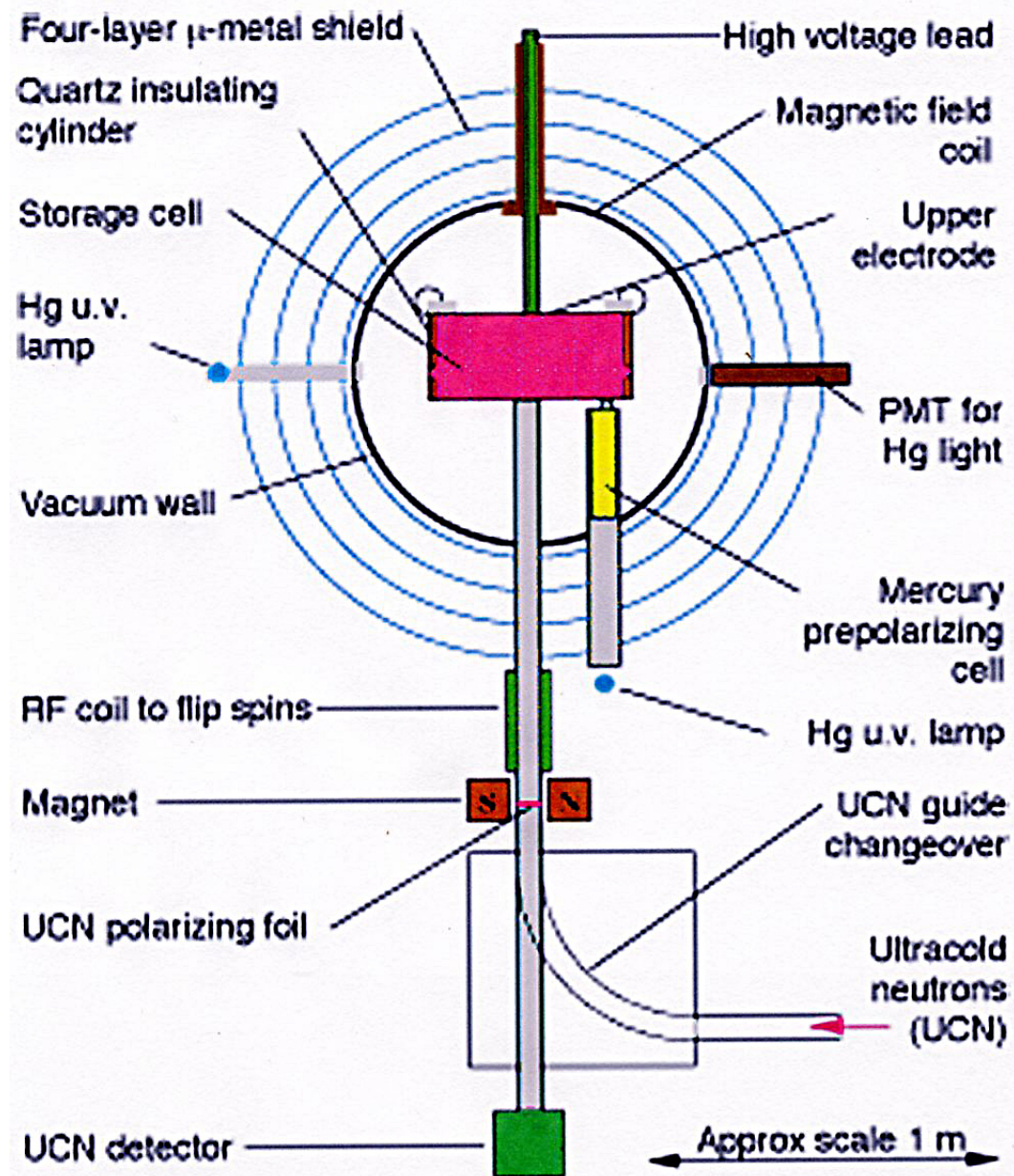


FIG. 1; The Neutron EDM experimental apparatus