Searching for the Electric Dipole Moment of the Neutron

1950 Believed P

$D_n = d_n/10^{-26}$ e cm=0

1950 Test Needed. $D_n < 3 \times 10^{8}$

1953 $D_n < 5 \times 10^{6}$ Beam

Oak Ridge

1957 P Failure in weak force

CP & T sym assumed

1957 T must be tested

1964 $D_n < 100{,}000$ Beam

Oak Ridge

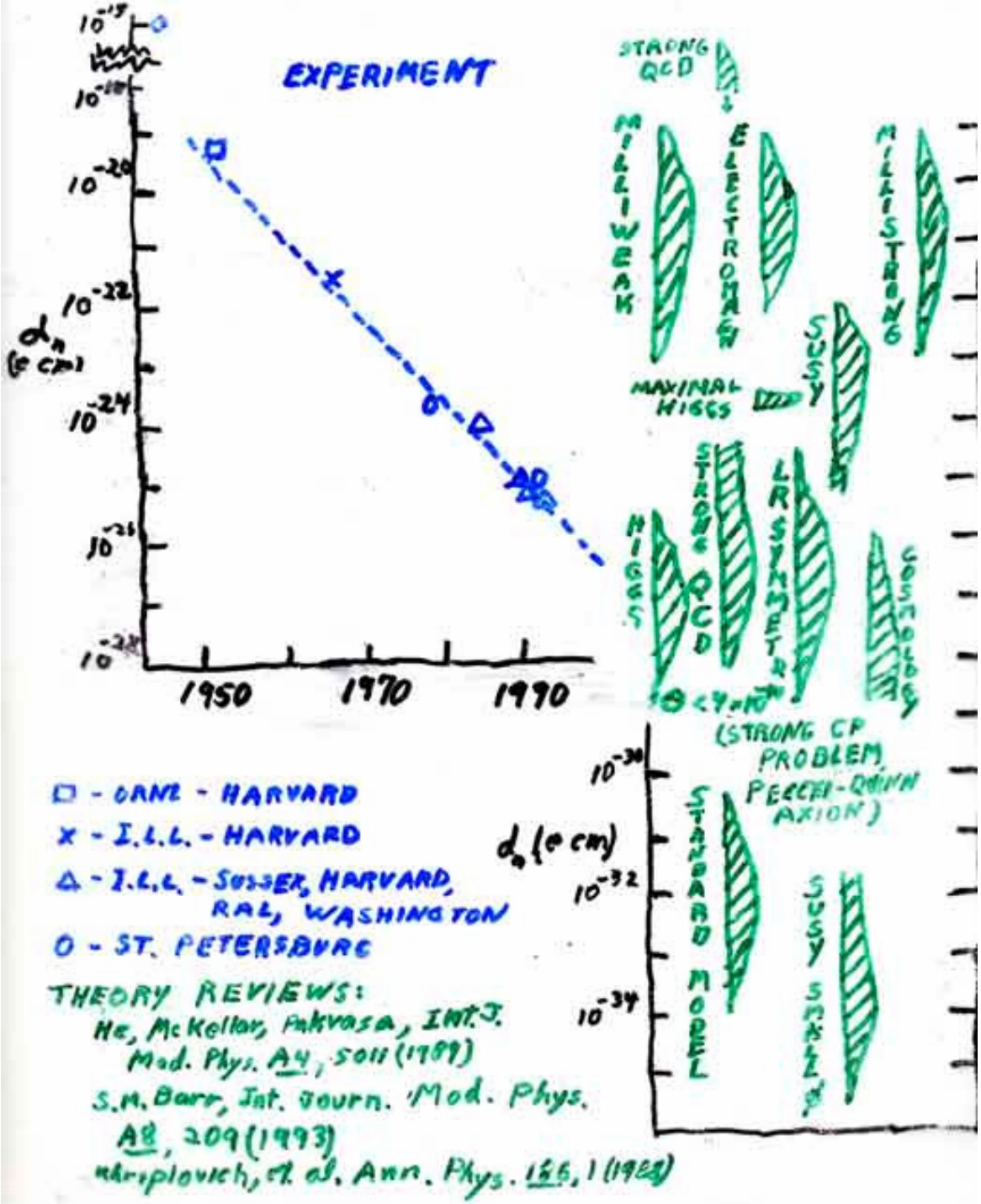
1964	Failure of CP in K^0_L so T sym fail if CPT conserved
1967	$D_n < 4{,}000$ Beam Oak Ridge
1973	Beam Grenoble $D_n < 400$
1984	$D_n < 30$ bottle St Peters, Grenoble
1999	$D_n < 6.3$ St Peters, Grenoble
2006	$D_n < 3.0$ Grenoble [geom. phase]

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**	**^{199}Hg**	**TlF**	**^{205}Tl**
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		
$\bar{\theta}_{QCD}$ (x 10^{-6})	<1.3	<9.4	<60	<4,000
$\varepsilon_{q,susy}$	<0.0014	<0.005	<0.08	<1.3
$\varepsilon_{e,susy}$			<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**	**^{199}Hg**	**TlF**	**^{205}Tl**


EXPERIMENT
d_n (e cm)
1950
1970
1990
STRONG QCD
MILLIWEAK
ELECTROMAG
MILLISTRONG
MAXIMAL HIGGS
SUSY
HIGGS
STRONG QCD
LR SYMMETR
COSMOLOGY
(STRONG CP PROBLEM PECCEI-QUINN AXION)
STANDARD MODEL
SUSY SMALL
□ - ORNL - HARVARD
x - I.L.L. - HARVARD
Δ - I.L.L. - SUSSEX, HARVARD, RAL, WASHINGTON
O - ST. PETERSBURG
THEORY REVIEWS:
He, McKellar, Pakvasa, Int. J. Mod. Phys. A4, 5011 (1989)
S.M. Barr, Int. Journ. Mod. Phys. A8, 209 (1993)
Khriplovich, et al. Ann. Phys. 166, 1 (1985)

FUTURE

Russian Experiments

Reactor n's in liquid ^{4}He at Grenoble

Spallation n's in liquid ^{4}He at Los Alamos

Other Experiments