LA-UR- 09-0d203

Approved for public release; distribution is unlimited.

Title:	Testing SuperSymmetry with Neutron Decay
Author(s):	W.S. Wilburn, L.J. Broussard, V. Cirigliano, M.F. Makela, C.L. Morris, J. Ramsey, A. Salas-Bacci, A. Saunders, and A.R. Young
Intended for:	Division of Nuclear Physics Meeting 2009

Los Alamos
NATIONAL LABORATORY
EST.1943

Form 836 (7/06)

Abstract Submitted
for the HAW09 Meeting of
The American Physical Society

Sorting Category: 14e. (E)

Testing Supersymmetry with Neutron Decay W.S. WILBURN, V. CIRIGLIANO, A. KLEIN, P.L. MCGAUGHEY, M.F. MAKELA, C.L. MORRIS, J. RAMSEY, A. SALAS-BACCI, A. SAUNDERS, Los Alamos National Laboratory, L.J. BROUSSARD, Duke University, A.R. YOUNG, North Carolina State University — It has been recently realized that the neutrino correlation parameter B in neutron decay is sensitive to Minimal Supersymmetric Models for the case of maximal mixing. B is currently known to a precision of 3×10^{-3}, but a precision of better than 1×10^{-3} is required to test these models. Improvements in experimental techniques developed for the ongoing UCNA experiment and the planned abBA experiment may allow an improved measurement of B with a precision approaching 1×10^{-4}. An emerging concept for combining these techniques into an experiment to measure B using ultracold neutrons and large-area silicon detectors will be discussed.

[X] Prefer Oral Session
[ ] Prefer Poster Session

W.S. Wilburn
wilburn@lanl.gov
Los Alamos National Laboratory

Date submitted: 01 Jul 2009

Electronic form version 1.4

Testing Supersymmetry with Neutron Decay

L.J. Broussard *Duke University*

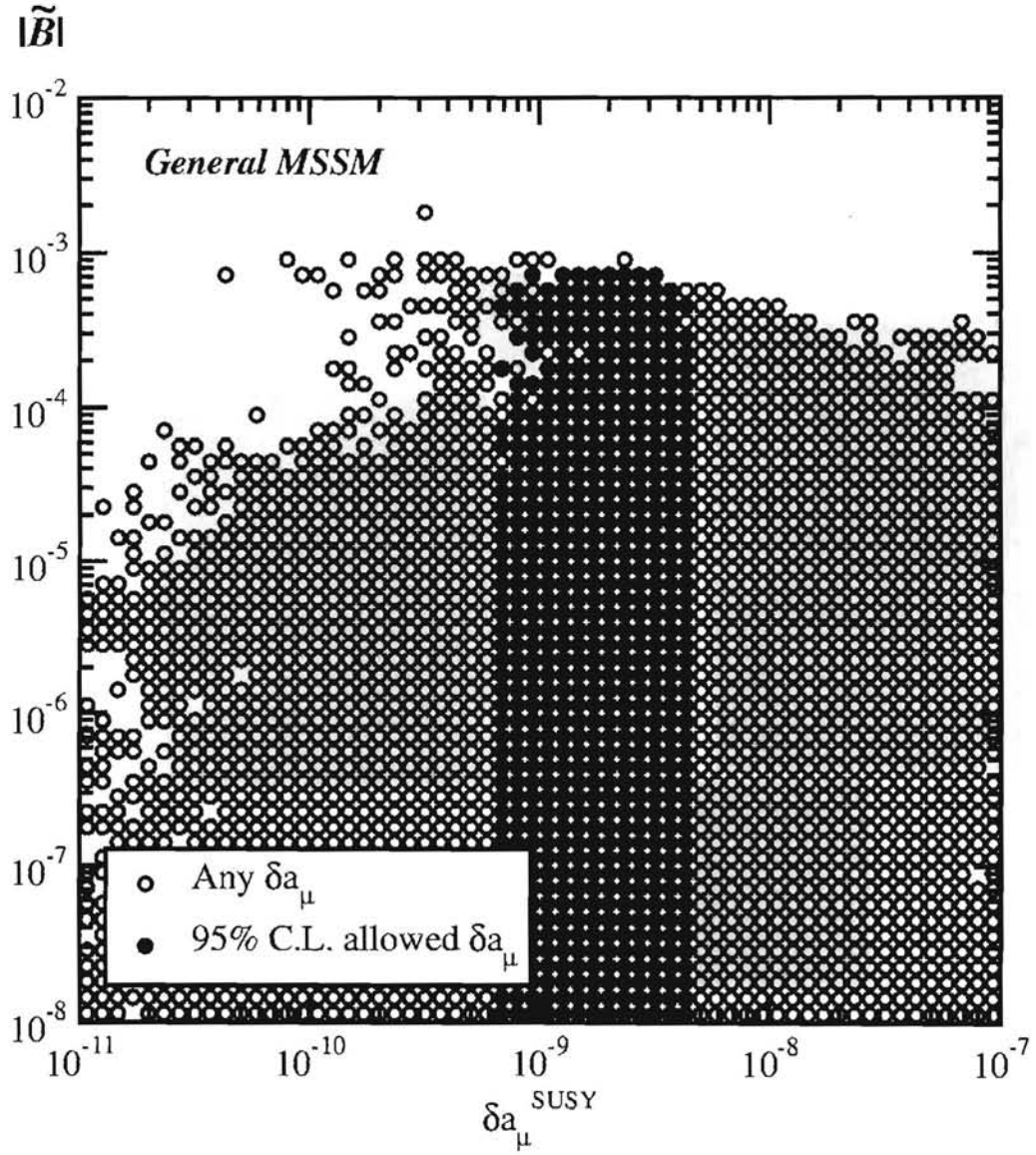
V. Cirigliano, M.F. Makela, P.L. McGaughey, C.L. Morris, J. Ramsey, A. Salas-Bacci, A. Saunders, and W.S. Wilburn
Los Alamos National Laboratory

A.R. Young *North Carolina State University*

Three Miracles

- B is sensitive to SuperSymmetry
  - Induced scalar coupling
- Neutron polarimetry $< 1 \times 10^{-3}$ possible
  - UCNA experiment shows possiblity
- Large area silicon detectors now exist
  - Developed for Nab and abBA experiments

Sensitivity of B to Supersymmetry

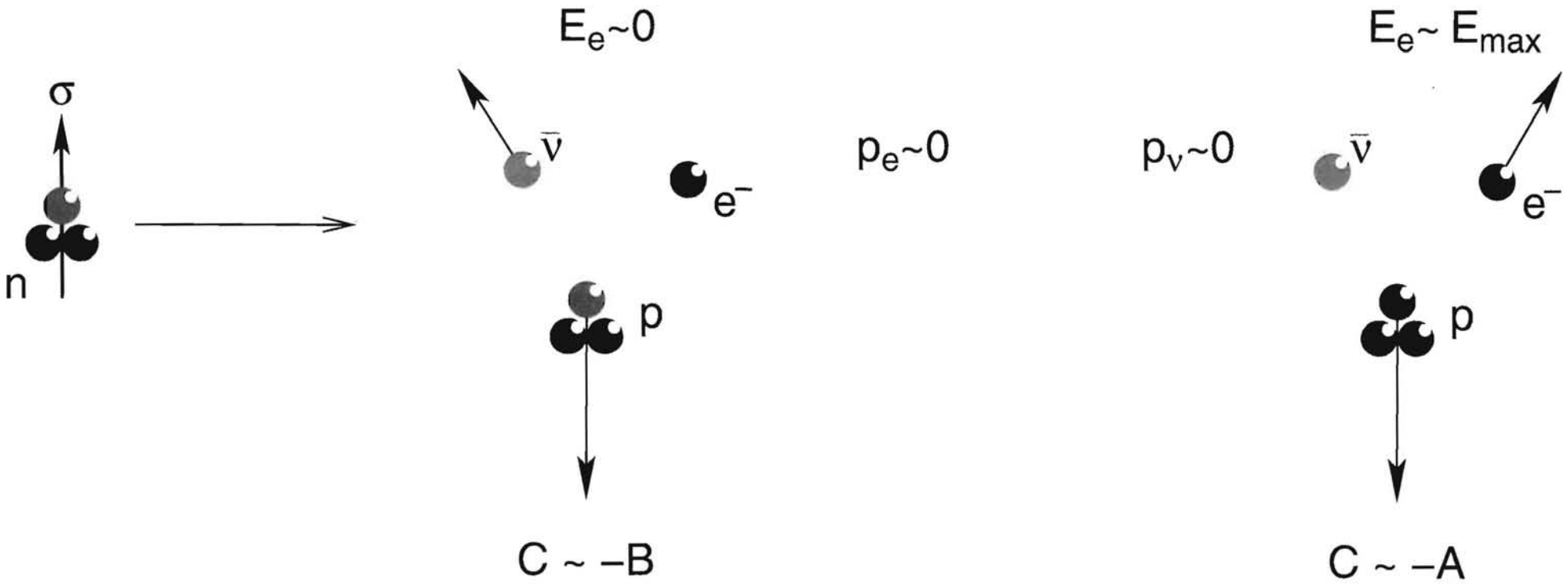


S. Profumo, M.J. Ramsey-Musolf, and S. Tulin. PRD **75, 075017 (2007).**

Current Status of B Parameter

PDG 2008	0.9807 ± 0.003
Achievable	± 0.001
Possible	± 0.0001

Determination of Neutrino Asymmetry B from Proton Asymmetry C

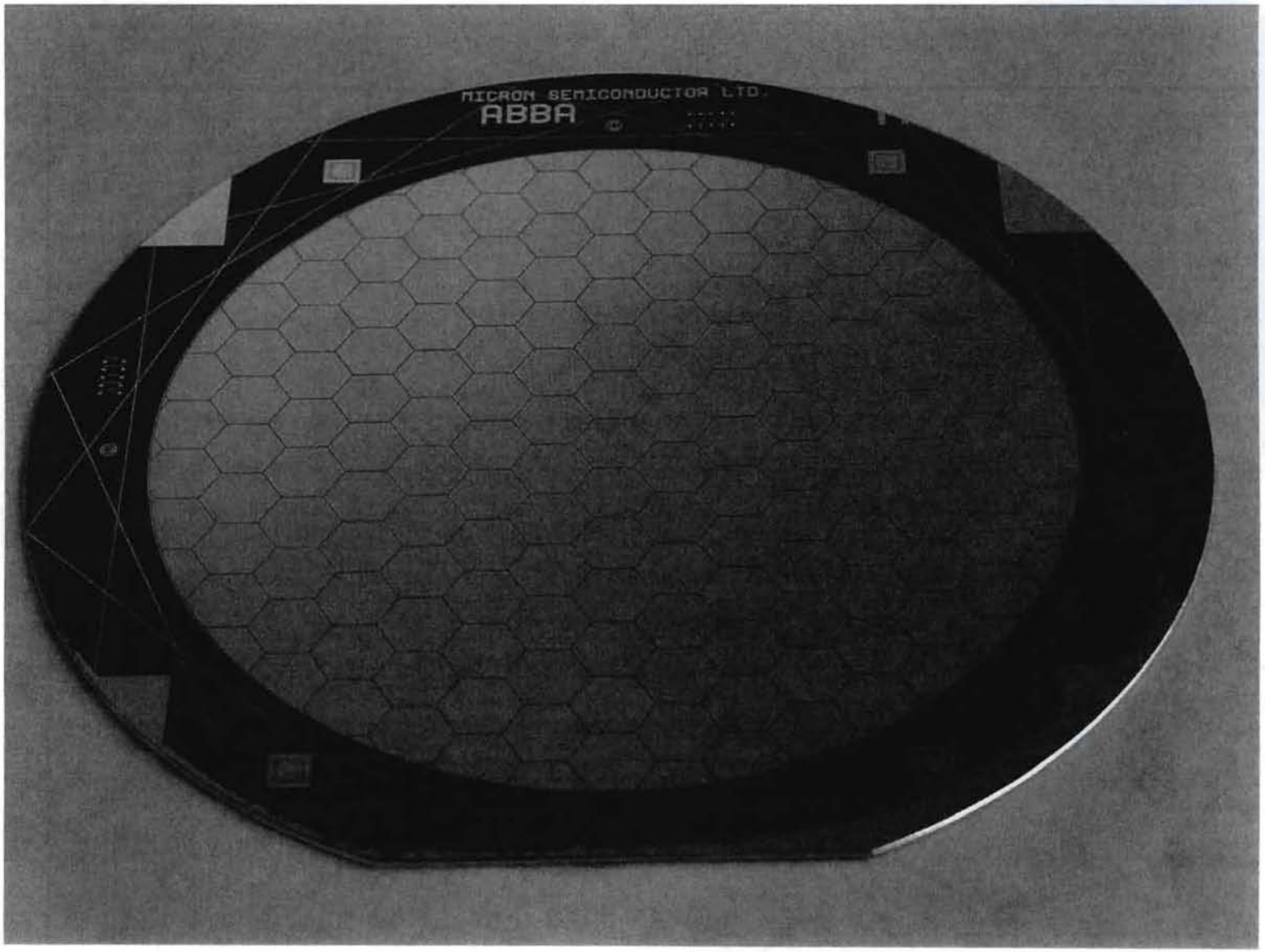


Measure C as a function of E_e

Ultracold Neutron Polarimetry

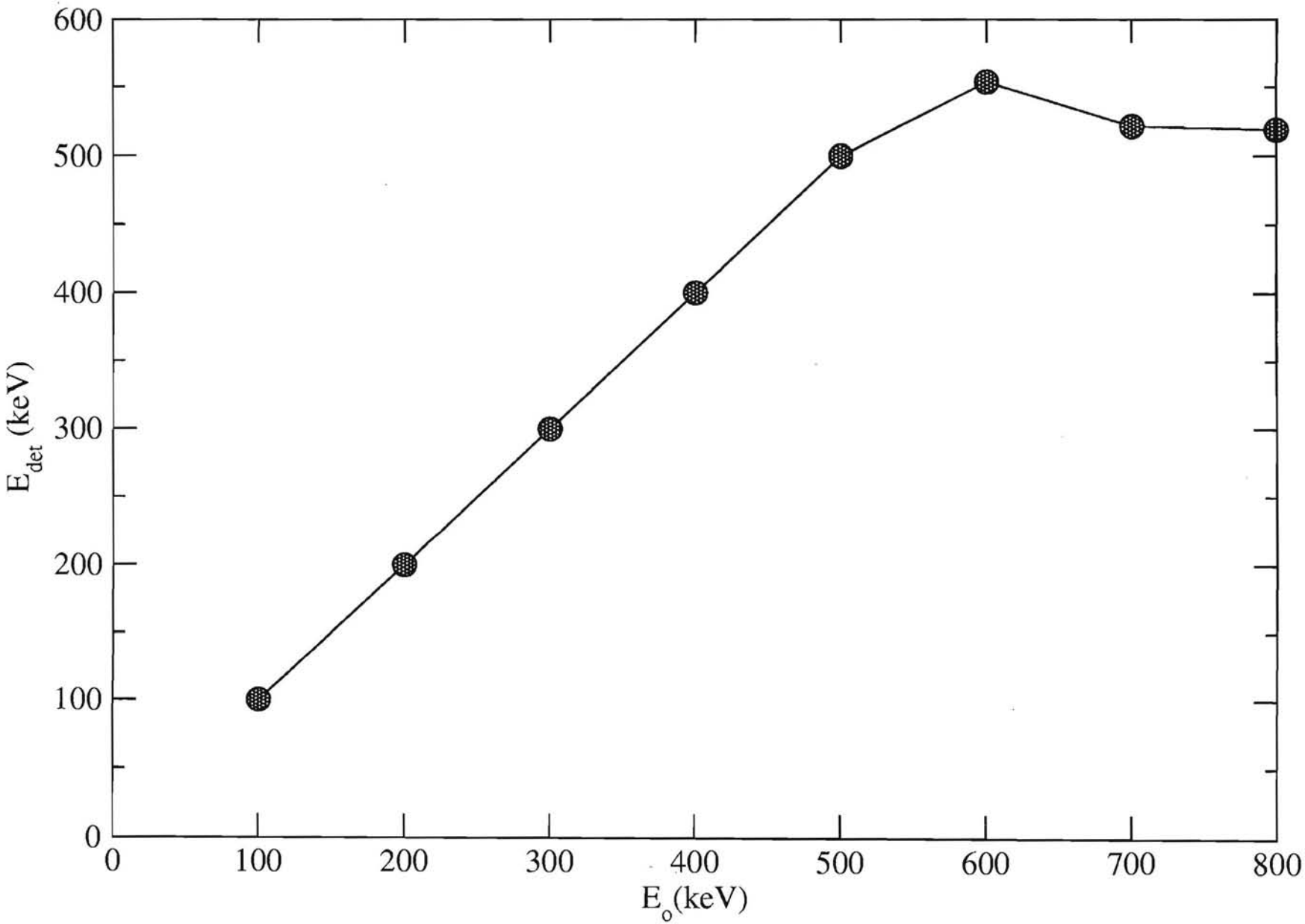
- UCNA has demonstrated $\Delta P_n = 1.3 \times 10^{-3}$
  - Small polarization correction $1 - P_n \leq ?$
- Improvements planned
  - Better measurement of depolarized fraction
  - Improved UCN guide coatings

First Prototype Silicon Detector



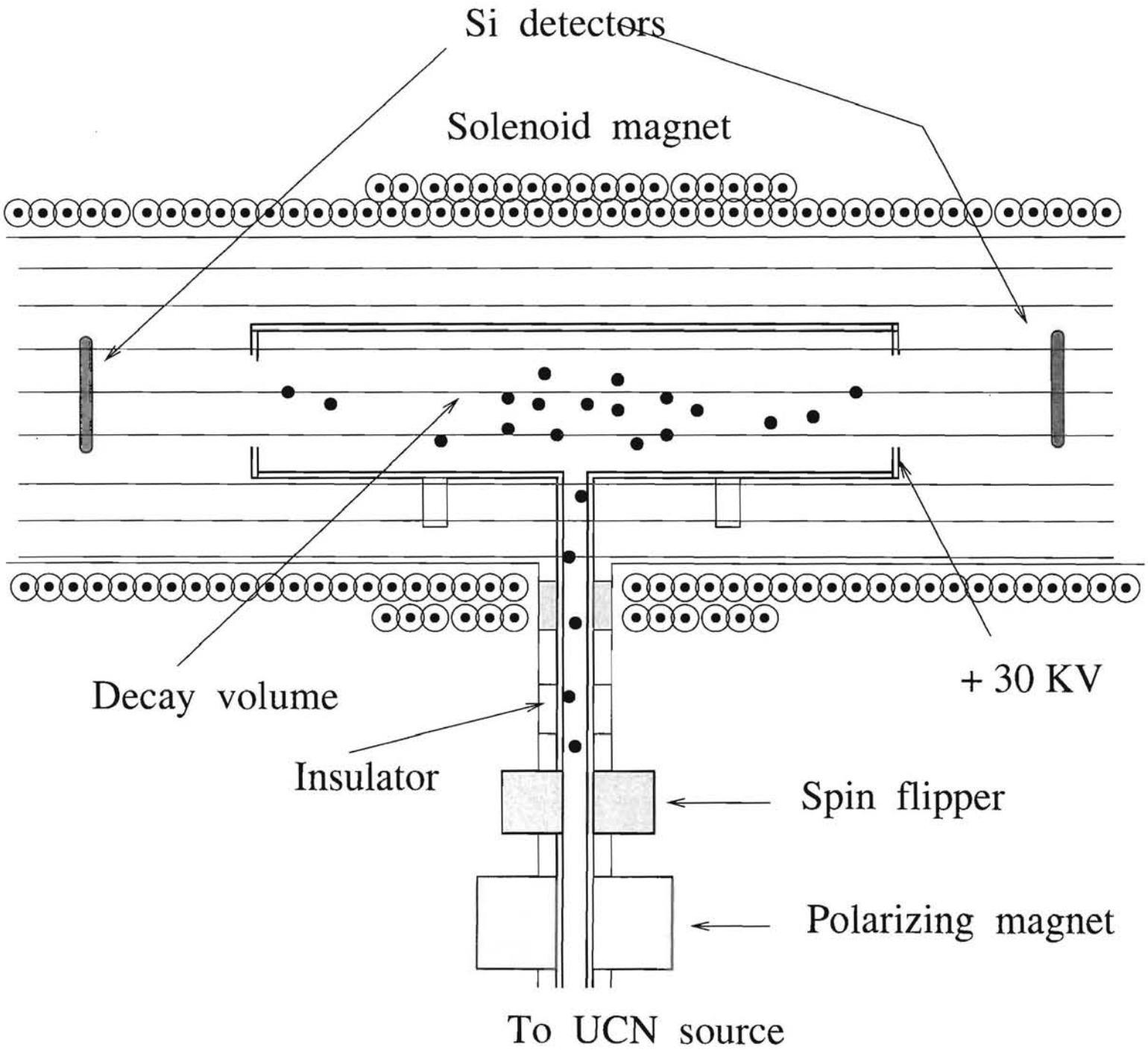
6″ wafer, 0.5 mm thick (now 1.0 mm), 127 full pixels

Electron Energy Deposited in 1 mm Detector



A. Salas-Bacci

Concept of Experiment



Systematic Uncertainty Estimates

	abBA (Calculated)	UCNA (Actual)
Neutron Polarization	0.5×10^{-3}	1.3×10^{-3}
Res. Gas Scatt.	$< 0.5 \times 10^{-3}$	N/A
E-Field Inhomogeneity	$< 0.1 \times 10^{-3}$	N/A
B-Field Inhomogeneity	0.3×10^{-3}	0.5×10^{-3}