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4/23/87

DOE/ER/3072-39

September 9, 1986

PROPOSAL FOR AN EXPERIMENTAL STUDY OF
NONLINEAR THOMSON SCATTERING

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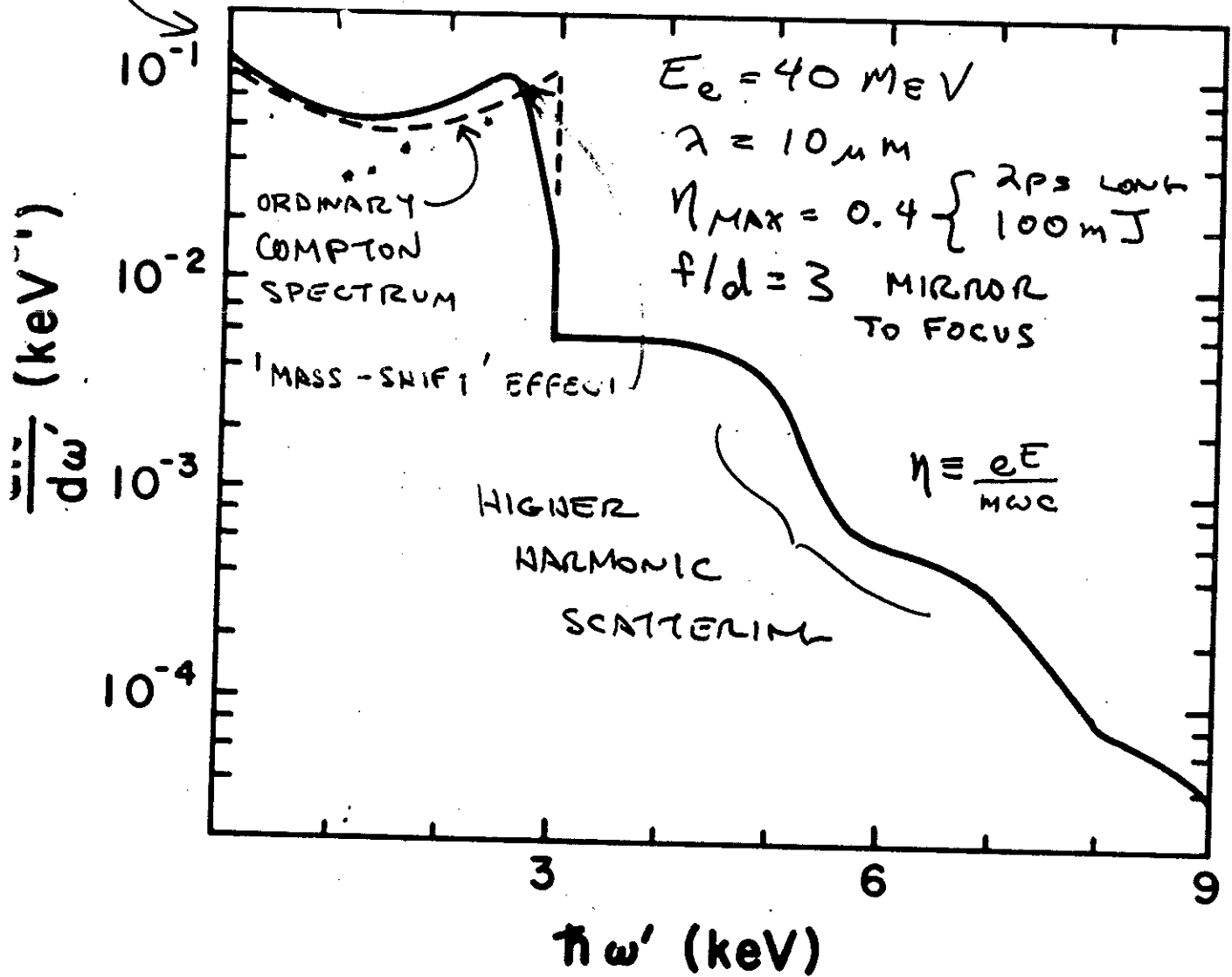
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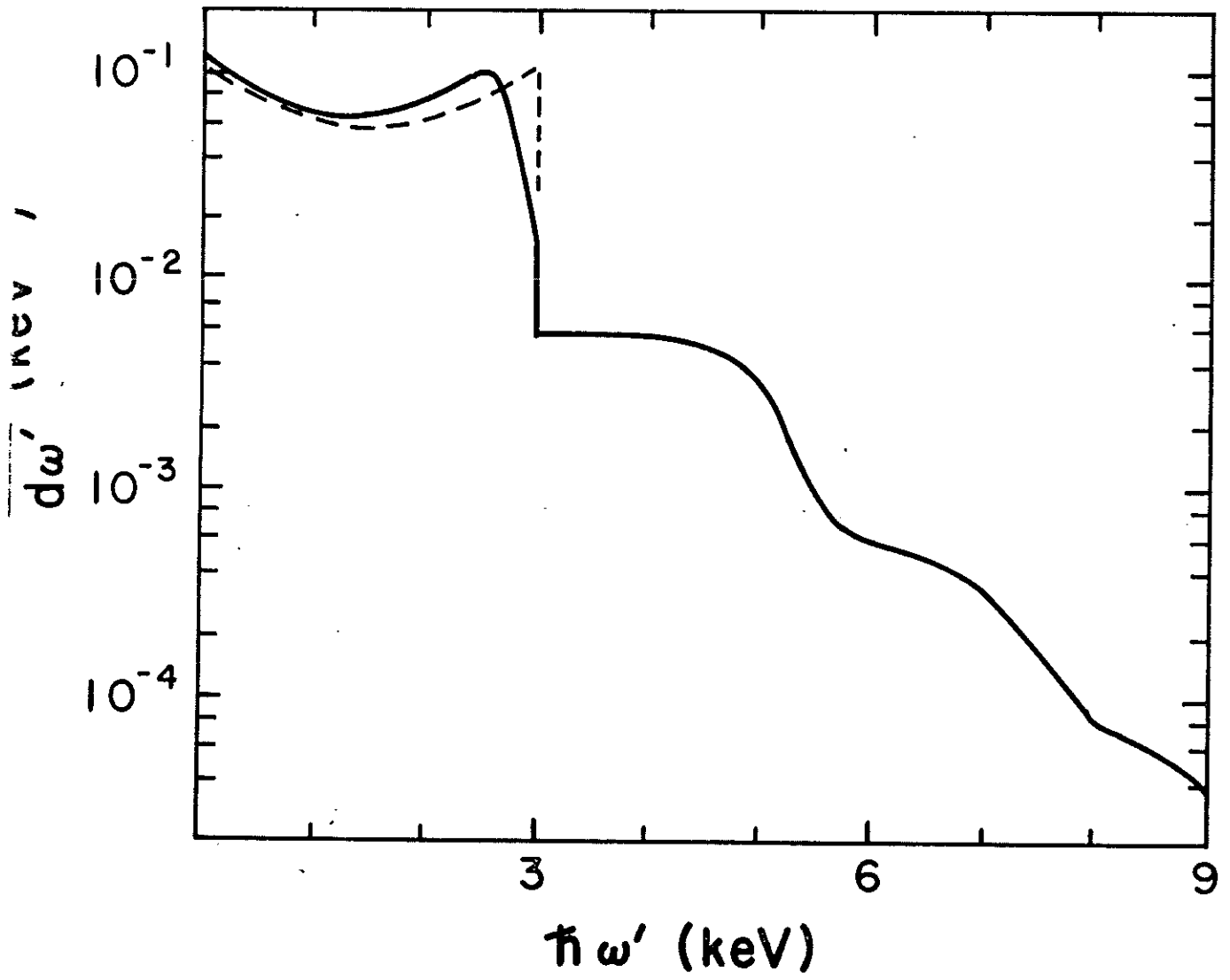
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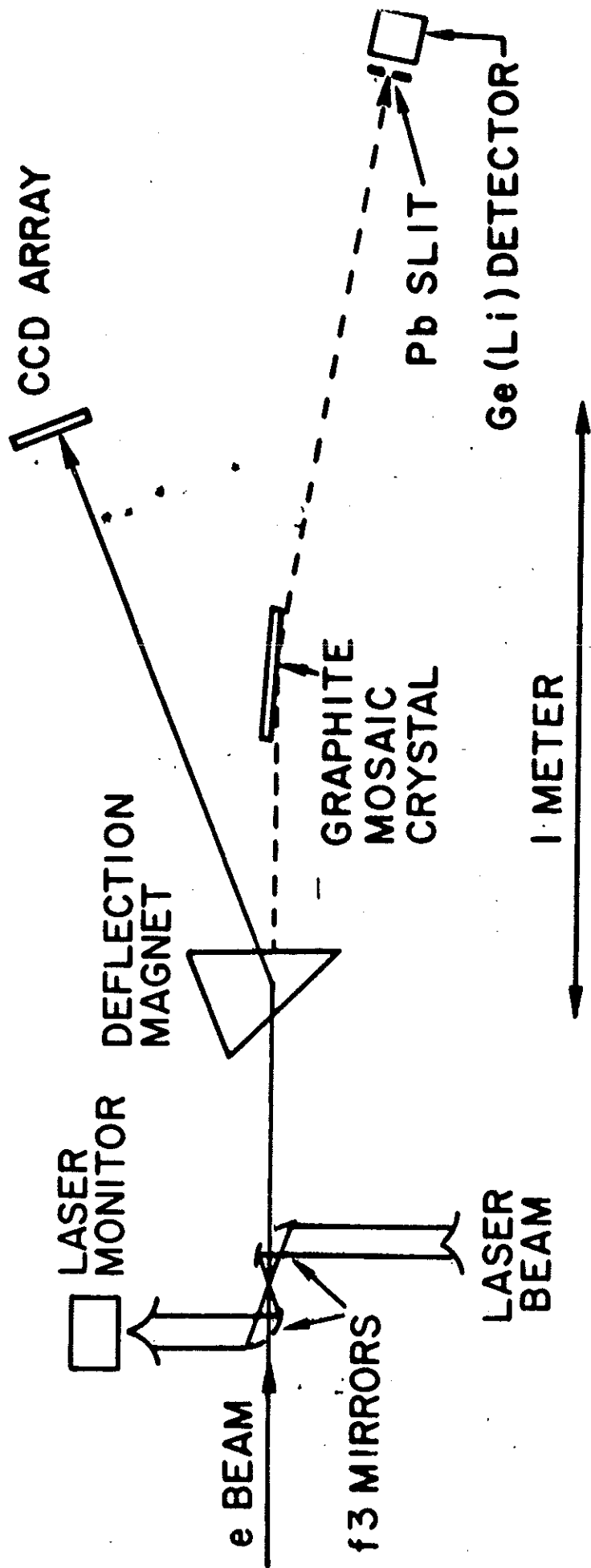
NONLINEAR COMPTON SCATTERING

TOTAL SCATTERING PROBABILITY
= 0.25 PER ELECTRON



X-RAY PRODUCTION = BASIC TEST OF
SYNCHRONIZATION OF LASER AND LINAC.





ANOMALOUS COMPTON SCATTERING

e + LASER INTERACTIONS IN A MEDIUM

INDEX OF GAS \downarrow ELECTRON VELOCITY
 SUPPOSE $n\beta > 1$

\Rightarrow ČERENKOV RADIATION AT $\cos \Theta_c = \frac{1}{n\beta}$

$e \rightarrow e' + \gamma$
 \uparrow ONLY AT Θ_c

WITH LASER ON, CAN ALSO HAVE:

$e + \omega_{LASER} \rightarrow e' + \gamma$ COMPTON SCATTERING

$e \rightarrow e' + \omega_{LASER} + \gamma$ ANOMALOUS COMPTON SCATTERING
 ONLY FOR $\Theta < \Theta_c$

AT $\Theta = 0$, $E_\gamma = \frac{4 \omega_{LASER}}{\Theta_c^2} \sim 1 \text{ eV}$ FOR $\omega_{LASER} \sim 10^{14} \text{ W/m}^2$

RATE $\sim \frac{\eta^2}{\gamma^2}$ ČERENKOV

η^2 LIMITED BY DAMAGE TO MEDIUM

$\Rightarrow \approx 1$ ANOMALOUS PHOTON PER PULSE AT THE A.T.P.

PROGRAM FOR NON LINEAR QUANTUM ELECTRODYNAMICS

- DEMONSTRATION EXPERIMENT:

COLLIDE ULTRA-SHORT LASER PULSES WITH 40 MEV ELECTRONS AT THE BNL ACCELERATOR TEST FACILITY

- 3 KEV BACK SCATTERED PHOTONS

(X-RAY SOURCE 10^7 X 'BRIGHTER' THAN IN PRESENT SYNCHROTRON LIGHT SOURCES)

- STUDY NON LINEAR THOMSON SCATTERING

 - MASS SHIFT OF ELECTRON

 - MULTIPHOTON ABSORPTION

- MAIN EXPT: COLLIDE LASER WITH SLC BEAM

- NONLINEAR COMPTON SCATTERING

- BACK SCATTERED PHOTONS + LASER BEAM:

 - MULTIPHOTON BREIT-WHEELER EFFECT!

 - TRUE LIGHT-BL-LIGHT SCATTERING

- FUTURE EXPTS:

- BREITWHEELER RADIATION OF ELECTRONS IN STRONG FIELDS

- UNRUH RADIATION

- STANDARD MODEL TEST: $e\gamma \rightarrow W\gamma$; ANGLE DIST OF W'S SENSITIVE TO ANOMALOUS MAGNETIC MOMENT OF THE W.