

DR. TOM GROVES
SECRETARY HIGH-ENERGY ADVISORY COMMITTEE

ANTINEUTRINO INTERACTIONS IN DEUTERIUM AT TEVATRON ENERGIES

AMSTERDAM - BOLOGNA - PADOVA - PISA - SACLAY - TORINO
COLLABORATION

WE PROPOSE TO PERFORM AN EXPERIMENT WITH THE 15' BUBBLE
CHAMBER FILLED WITH DEUTERIUM, EXPOSED TO THE HIGHEST TEVATRON
ENERGY WIDE BAND ANTINEUTRINO BEAM.

THE PROPOSED EXPERIMENT WOULD BE FOR US A LOGICAL CONTINUATION
OF THE EXPERIMENT ON WHICH WE ARE PRESENTLY WORKING, THAT IS
ANTINEUTRINO AND NEUTRINO INTERACTIONS IN THE BEBC BUBBLE CHAMBER
FILLED WITH DEUTERIUM EXPOSED TO THE CERN-SPS-WIDE BAND
NEUTRINO AND ANTINEUTRINO BEAMS.

IN THE WHOLE APPROVED EXPERIMENT WE SHOULD HAVE ABOUT 15000
ANTINEUTRINO-DEUTERIUM AND 15000 NEUTRINO-DEUTERIUM CHARGED
CURRENT INTERACTIONS (AFTER APPROPRIATE CUTS).

THE MAIN MOTIVATIONS FOR CONTINUING THIS EXPERIMENT AT
HIGHER ENERGIES MAY BE SUMMARIZED AS FOLLOWS:

1. COMPARISON OF ANTINEUTRINO-PROTON AND NEUTRON INTERACTIONS
AT THE HIGHEST ENERGY IN ORDER TO SEE POSSIBLE ENERGY DEPENDENT
EFFECTS. BECAUSE OF THE LARGE NEUTRINO CONTAMINATION OF THE
ANTINEUTRINO BEAM WE WILL ALSO BE ABLE TO COMPARE NEUTRINO-
PROTON AND NEUTRON INTERACTIONS. WE SHOULD BE ABLE TO MAKE A
COMPLETE ANALYSIS OF THE STRUCTURE FUNCTIONS ON PROTONS AND
NEUTRONS.

2. STUDY OF THE RATIOS R , BETWEEN NEUTRON- AND PROTON
CROSS SECTIONS FOR ANTINEUTRINO AND NEUTRINO, IN A LARGER
RANGE OF Q^2 .

3. STUDIES OF THE FRAGMENTATION OF THE STRUCK QUARKS OF KNOWN
FLAVOUR, IN PARTICULAR THIS WILL ALLOW TESTS OF QCD.

4. SEARCH FOR NEW PHENOMENA, IN PARTICULAR SEARCH FOR BOTTOM
(BEAUTY) PARTICLES (THE AVERAGE ANTINEUTRINO ENERGY WILL
BE CONSIDERABLY HIGHER THAN THE THRESHOLD ENERGY FOR THE PRODU-
CTION OF BEAUTY PARTICLES).

THE CHOICE OF DEUTERIUM AS A LIQUID FOR THE BUBBLE CHAMBER
MAY BE JUSTIFIED BY THE CONSIDERATION THAT IT ALLOWS THE
STUDY OF THE ELEMENTARY INTERACTIONS ON PROTONS AND ON NEUTRONS,
WHILE YIELDING A REASONABLE NUMBER OF EVENTS. WE HAVE ALREADY
ATTACKED AND SOLVED MOST OF THE CORRECTIONS ARISING FROM THE
USE OF DEUTERIUM (RESCATTERING, ENERGY BROADENING, ETC.).

WE PROPOSE TO EXPOSE THE 15' BUBBLE CHAMBER TO THE HIGHEST
ENERGY WIDE BAND ANTINEUTRINO-ENRICHED BEAM. ACCORDING TO THE
PRELIMINARY INFORMATIONS IN OUR HANDS A 100-DAY EXPOSURE
SHOULD YIELD ABOUT 120,000 PICTURES CONTAINING A NUMBER OF
C.C. ANTINEUTRINO INTERACTIONS OF THE SAME ORDER AS THAT IN
OUR PRESENT EXPERIMENT.

ALL GROUPS IN THIS COLLABORATION HAVE EXPERIENCE WITH HIGH
ENERGY NEUTRINO INTERACTIONS IN DEUTERIUM AND ARE ABLE TO PROCESS
THE COMPLETE SCANNING AND MEASUREMENT OF 800 EVENTS PER WEEK.
WE SHOULD THUS BE ABLE TO FINISH THE MEASUREMENTS OF THE FILM
IN ABOUT ONE YEAR AFTER THE END OF THE RUN.

see other side ->

ABOUT 25 PHYSICISTS AND GRADUATE STUDENTS WILL PARTICIPATE IN
THE PROPOSED EXPERIMENT. AN EVENTUAL COLLABORATION OF US GROUPS
WILL BE QUITE WELCOME.

CONTACTMEN: E. FLAMINIO
G. GIACOMELLI
A. TENNER

SUBJECT TO APPROVAL FROM THE NATIONAL INSTITUTIONS.