UNIVERSITY OF CALIFORNIA

Radiation Laboratory

BERKELEY, CALIFORNIA

DISCLAIMER

September 19, 1957

UCRL-3946

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Dr. Bernardini
CERN
P. O. 25
Geneva 23, Switzerland

Dear Dr. Bernardini:

Enclosed is a print of the information you requested during our telephone conversation. I hope it will be of value to you. I am also sending the contents of this letter to Dr. Moravcsik so that he likewise will have a clearer understanding of our experiment. The data is preliminary and some improvements will result in our paper presenting our experimental results.

As you will note from the enclosures, the photon beam is introduced along the magnetic axis of symmetry of our spiral orbit spectrometer. The axis of our cylindrical target, which was a high pressure deuterium gas or carbon and CD_2, was made coincident with the axis of symmetry of the magnetic field. Charged pions created at 90° (in the laboratory system) to the photon beam were magnetically analyzed and counted by a coincidence technique. When quadruple coincidence counting was used, only one sign of the pion was counted at a time. When triple and double coincidence counting was used, both pion signs were counted simultaneously. The magnetic field of the spectrometer was reversed periodically so as to compensate for any geometric effects that might be present in counting the different charged pions. As you are aware, the range of a 10 Mev pion is very small. To measure electronically in this region is not simple. We measure in this region indirectly by using a normalization method. We determine our counter efficiencies for the $\pi^{\pm}$ in the low energy region by surrounding our target by a hollow copper cylinder that degrades higher energy pions into the low energy region. The ratio for the high energy pions is first measured by a triple coincidence method. Remeasuring this ratio after the pions are degraded gives us the proper normalization factor for change in counter efficiency.

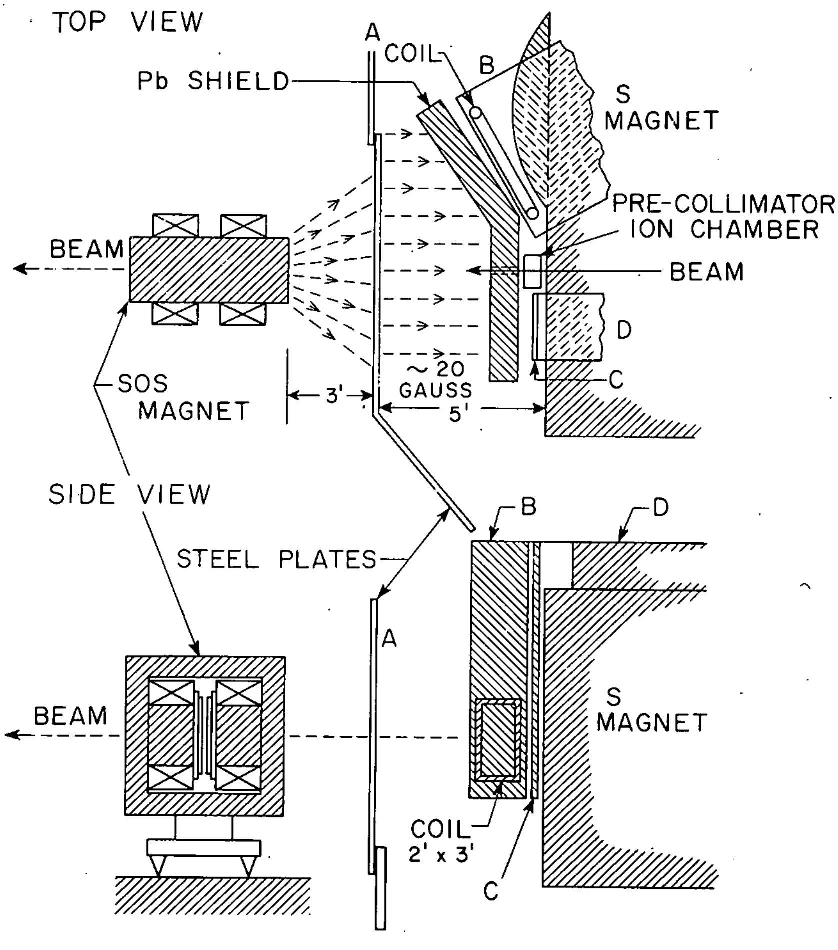
This measure is necessary because in the case of triple or quadruple coincidence the pions have sufficient energy to pass through the counters while a 10 Mev pion stops in the second counter. Because of this the detection efficiency for positive and negative pions is different.

I hope this aids you in understanding our measurements Should additional information be required, please write me

Yours sincerely,

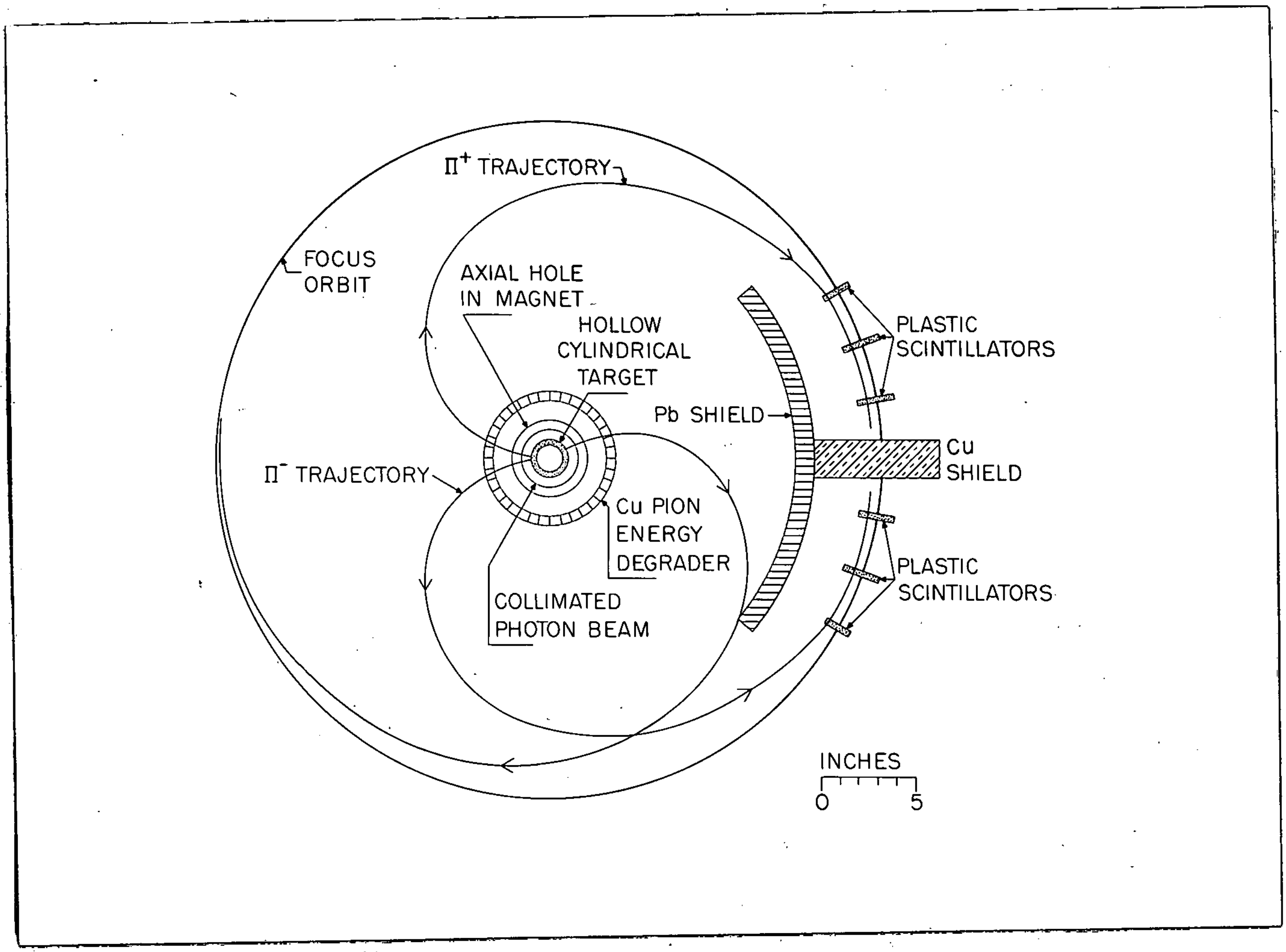
Walter F Dudziak

cc: Dr. M. J. Moravcsik
Brookhaven National Laboratory
Upton, Long Island, N. Y.



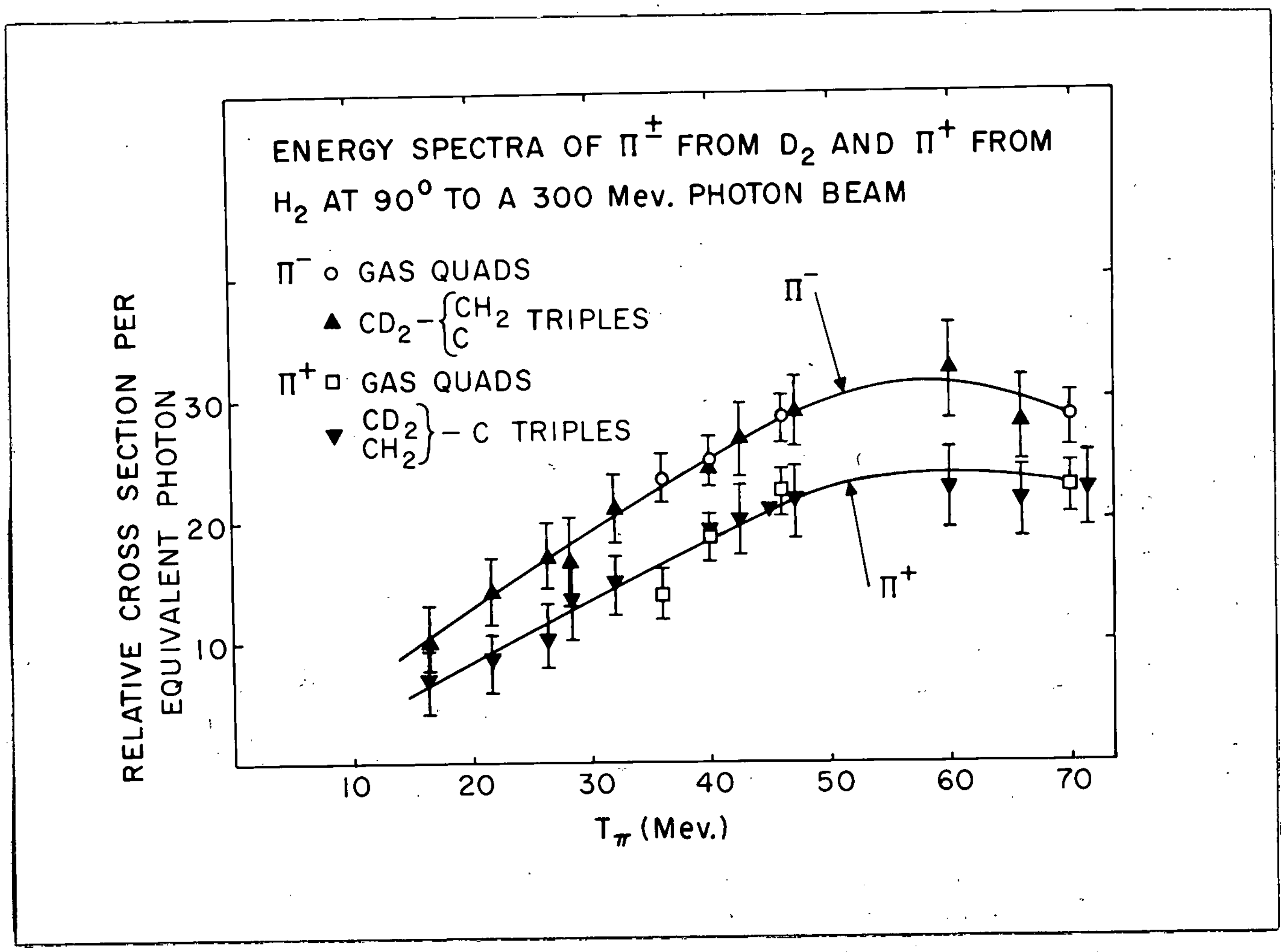
TOP VIEW
A
COIL
B
Pb SHIELD
S
MAGNET
PRE-COLLIMATOR
ION CHAMBER
BEAM
BEAM
D
C
~ 20
GAUSS
3'
5'
SOS
MAGNET
SIDE VIEW
B
D
STEEL PLATES
A
BEAM
S
MAGNET
COIL
2' x 3'
C

Fig. 1.



Π+ TRAJECTORY
FOCUS ORBIT
AXIAL HOLE IN MAGNET
HOLLOW CYLINDRICAL TARGET
PLASTIC SCINTILLATORS
Pb SHIELD
Cu SHIELD
Π- TRAJECTORY
Cu PION ENERGY DEGRADER
PLASTIC SCINTILLATORS
COLLIMATED PHOTON BEAM
INCHES
0
5

Fig. 2.



ENERGY SPECTRA OF Π± FROM D2 AND Π+ FROM H2 AT 90° TO A 300 Mev. PHOTON BEAM
Π− ○ GAS QUADS
▲ CD2 − {CH2 C} TRIPLES
Π+ □ GAS QUADS
▼ {CD2 CH2} − C TRIPLES
Π−
Π+
RELATIVE CROSS SECTION PER EQUIVALENT PHOTON
10
20
30
10
20
30
40
50
60
70
Tπ (Mev.)

Fig. 3.

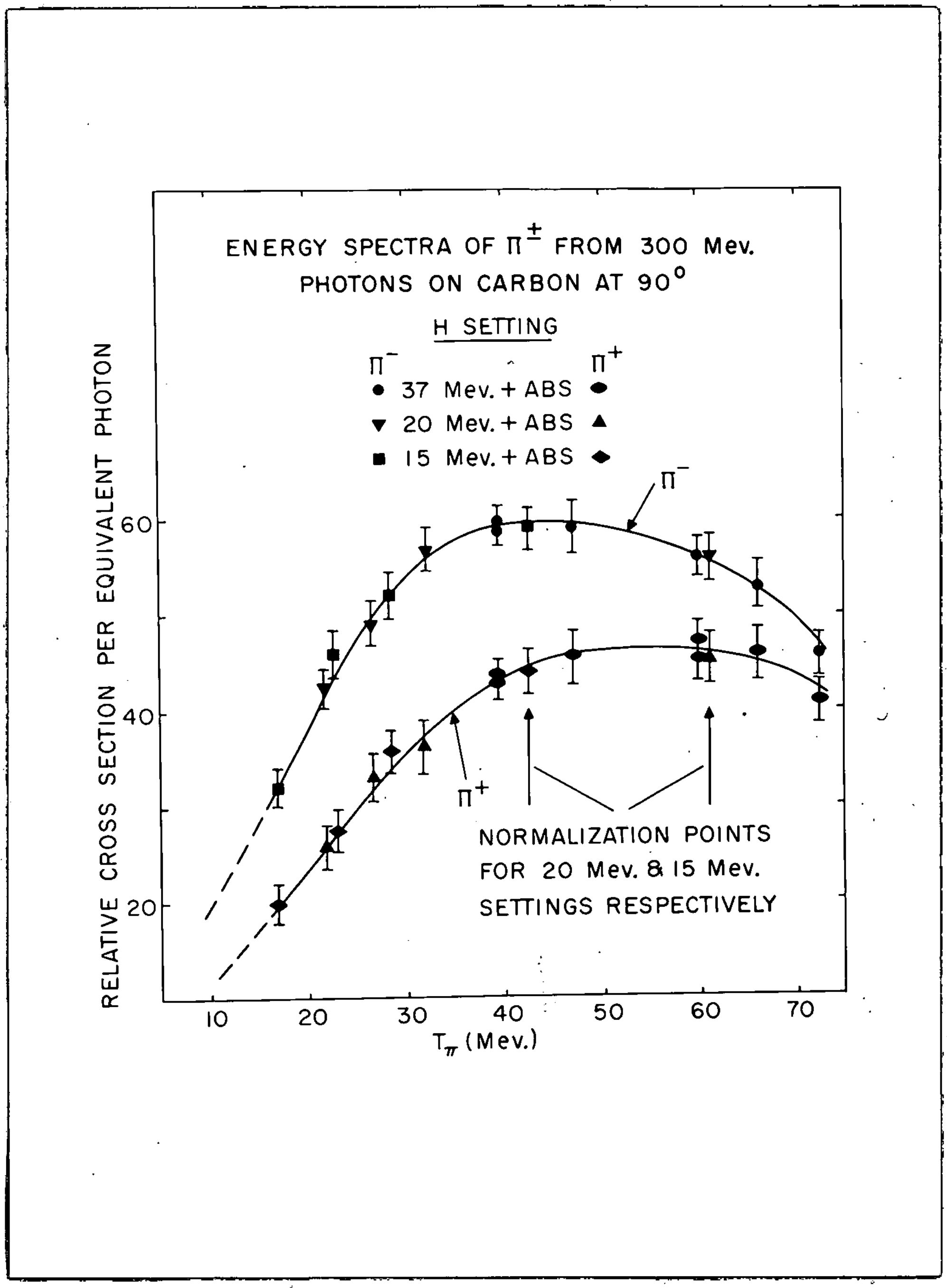

ENERGY SPECTRA OF Π± FROM 300 Mev.
PHOTONS ON CARBON AT 90°
H SETTING
Π−
Π+
37 Mev. + ABS
20 Mev. + ABS
15 Mev. + ABS
Π−
Π+
NORMALIZATION POINTS
FOR 20 Mev. & 15 Mev.
SETTINGS RESPECTIVELY
RELATIVE CROSS SECTION PER EQUIVALENT PHOTON
20
40
60
10
20
30
40
50
60
70
Tπ (Mev.)

Fig. 4.

π^-/π^+ RATIOS AT 90° TO A 300 Mev PHOTON BEAM

Mean Pion Energy	Carbon		Deuterium	
T_π (Mev)	Emulsion	Counters (Triples)	Triples	Quads
72		1.1 ± 0.1		
70				1.25 ± 0.15
66		1.12 ± 0.1	1.18 ± 0.2	
60		1.26 ± 0.1	1.28 ± 0.2	
57	1.2 ± 0.1			
53		1.29 ± 0.15		
47	1.2 ± 0.1	1.30***	1.30 ± 0.2	1.27 ± 0.15
42.5		1.3 ± 0.1	1.30 ± 0.2	
40		1.36 ± 0.1	1.28 ± 0.2	1.31 ± 0.15
36	1.4 ± 0.15			1.36 ± 0.15
32		1.48 ± 0.12	1.35 ± 0.2	
28		1.45 ± 0.12		
26.3		1.4 ± 0.15	1.5 ± 0.3	
22	1.4 ± 0.12	1.66 ± 0.2	1.5 ± 0.3	
16.5		1.68 ± 0.2	1.4 ± 0.3	
15.5		1.67 + 0.2		
12.5	1.62 + 0.2			

***Normalization