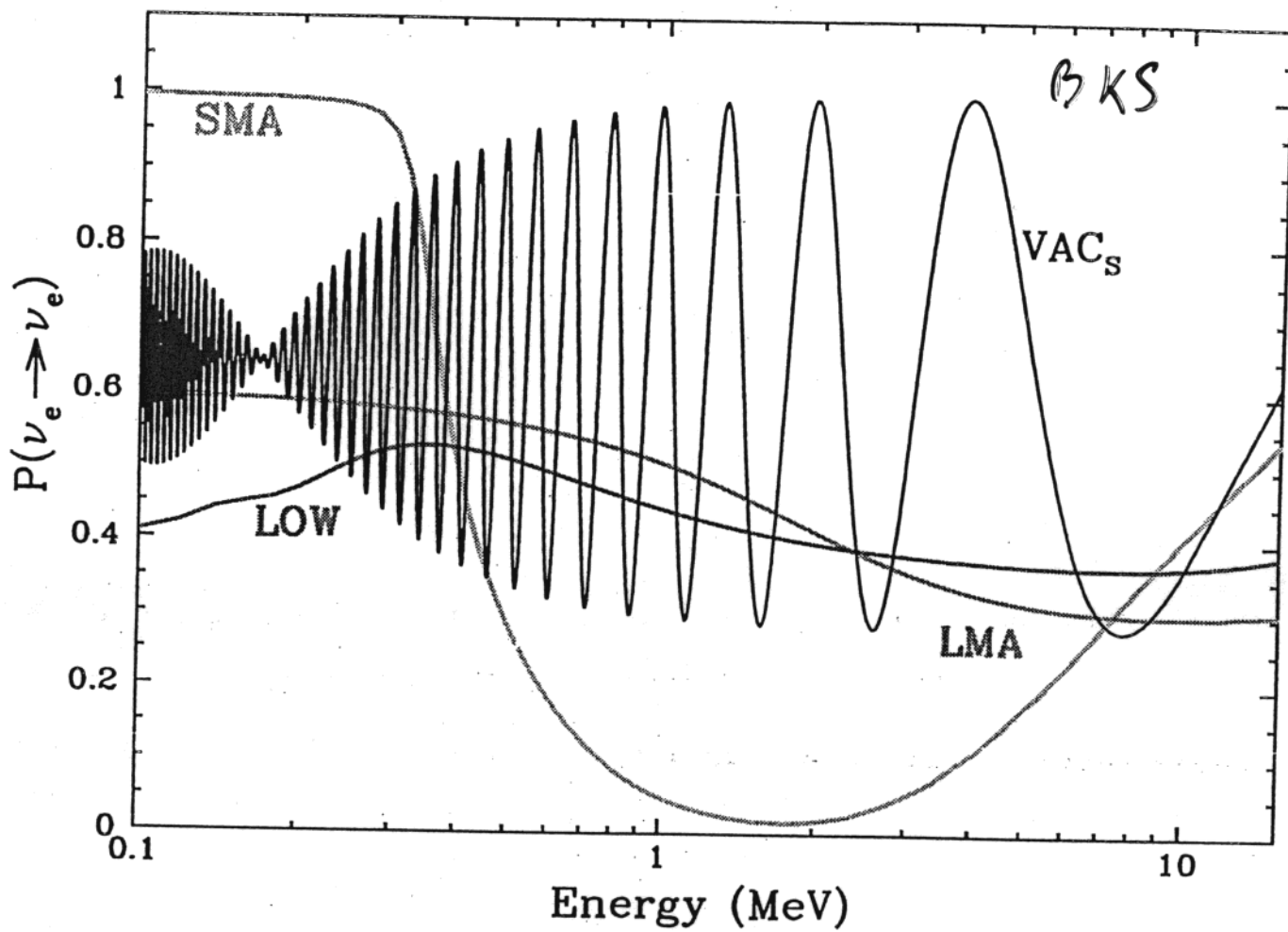


NO VE

CARLO BROGGIN
INFN-PO

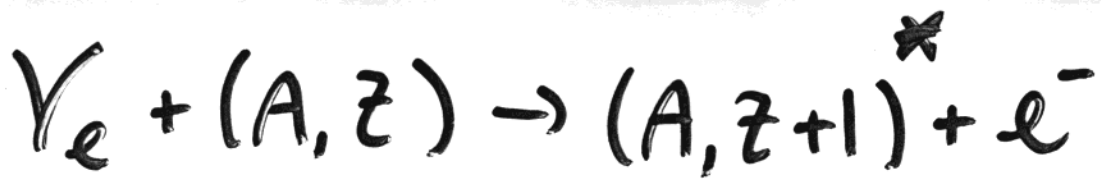
LOW ENERGY $\checkmark^{\odot}$
SPECTROSCOPY





■ ν_{pp}^0 WITH SMALL ERROR

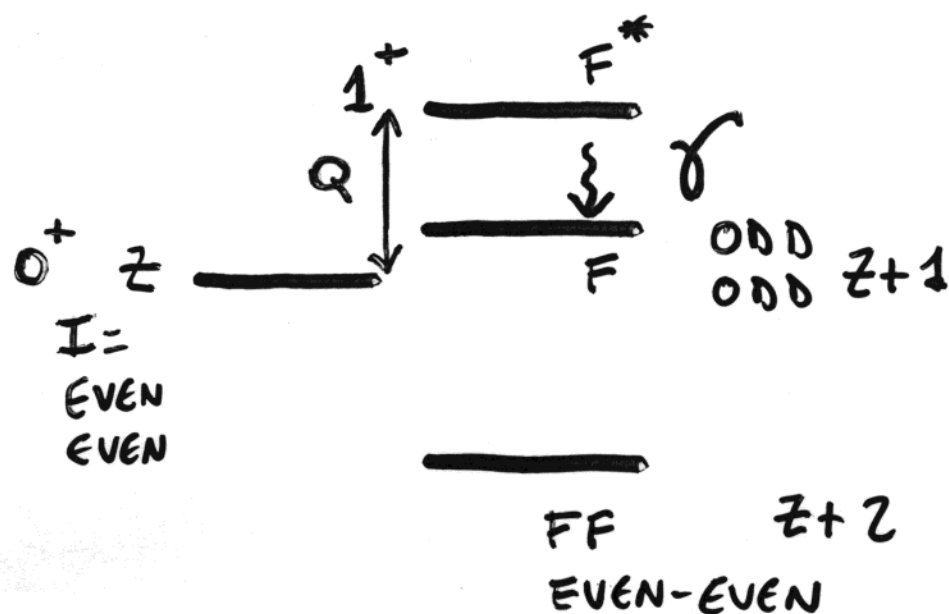
■ $\nu_{pp}^0 + \nu_{7Be}^0 = \text{TINE}$
 $= \text{DETECTOR}$



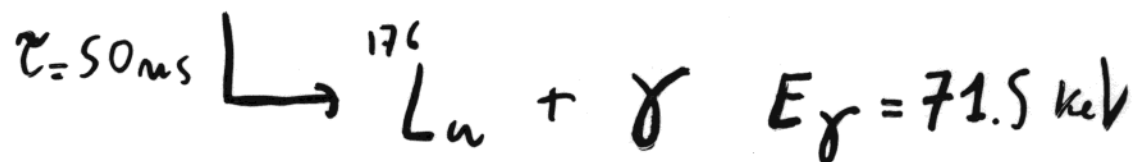
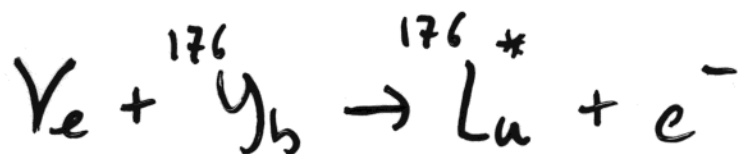
■ ONLY ν_e

■ $E_\nu = T_e + Q$

TARGETS: $\beta\beta$ CANDIDATES (R.R.97)



^{176}Yb i.a. = 17.8%



$$Q = 301 \text{ keV}$$

INORGANIC Yb COMPOUNDS (N, α)

ORGANO-METALLIC Yb COMPOUNDS

8400 $\mu\text{h}/\text{keV}$ WITH 10% LOADING

ATTENUATION LENGTH: A FEW METERS

$$\Delta E/E \sim 35\% \quad \text{FOR } ^{57}\text{Co}$$

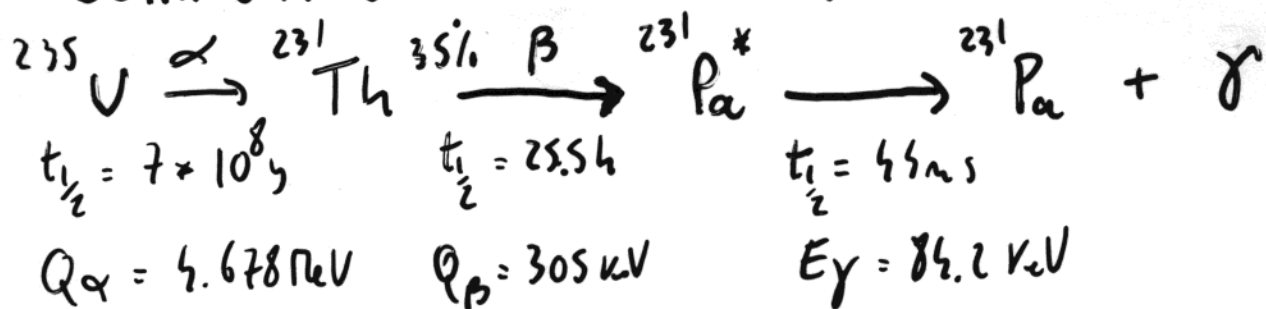
DETECTOR: MODULAR (100-1000 l) STRUCTURE
WITH 20 tons OF Yb

$$180 \text{ pp} + 143 ^7\text{Be EVENTS/YEAR}$$

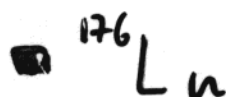
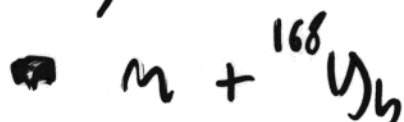
UNCORRELATED BACKGROUND:

$$\text{U, Th} \sim 0.1 \text{ Bq/ton (BOREXINO: } 1 \mu\text{Bq/ton)}$$

CORRELATED BACKGROUND:



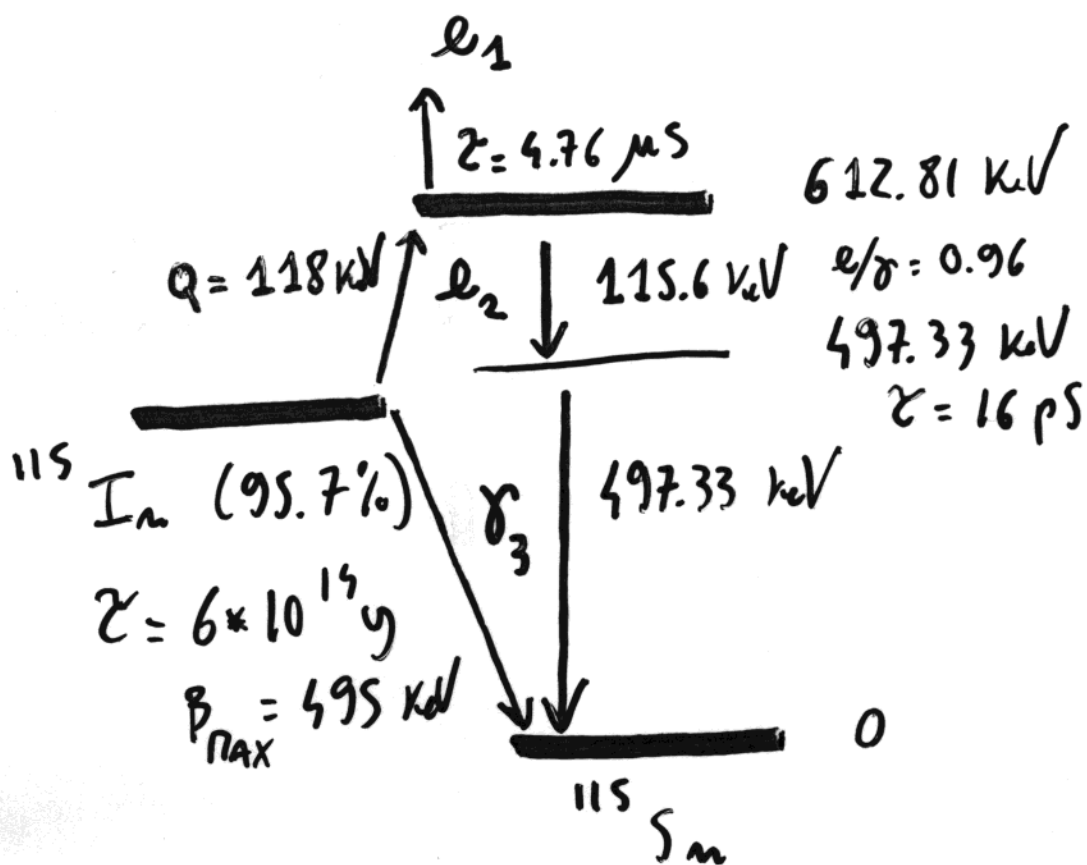
HIGH A $\Rightarrow$ μ ACTIVATION



LLBF IN GRAN SASSO FOR 2001

$Q = 301 \text{ keV}$ RATHER HIGH

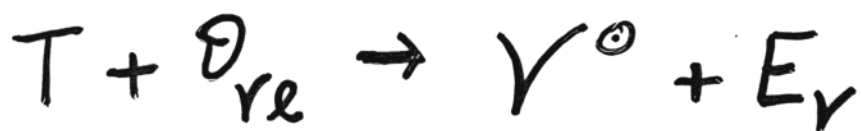
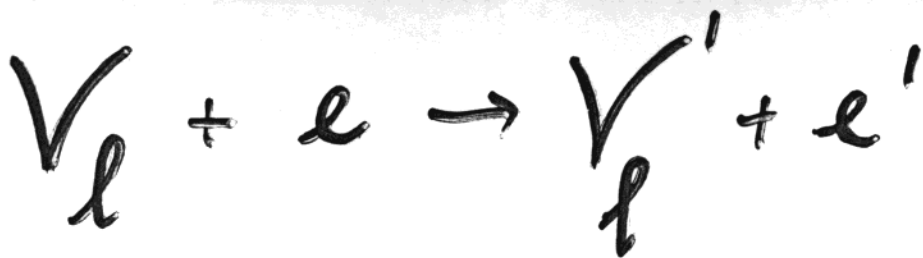
$\Rightarrow$ ORGANO-METALLIC SCINTILLATOR
WITH ^{115}In (R.R. 2001)



$\beta + \text{BREMSSTRAHLUNG} \neq (e/\gamma)_2 + \gamma_3$

$< 495 \text{ keV}$ $\uparrow\uparrow$ 613 keV

GOOD ENERGY RESOLUTION



$$T > 100 \text{ keV} \rightarrow \text{GAS}$$

$$\blacksquare \# e \div \rho \rightarrow \text{HIGH DENSITY}$$

$$\blacksquare \text{MOLECULAR WEIGHT} \uparrow$$

$$\blacksquare \text{PRESSURE} \uparrow$$

$$\blacksquare \text{TEMPERATURE} \downarrow$$

$$\blacksquare \vartheta_{ns} \sim \sqrt{z \cdot \rho}$$

HELLAZ (92) : 2000 m³ TPC WITH He
(+CH₄)

P 5 10 20 bar

T 77 K 140 300 K

$$\rho \sim 3 \text{ gr/l} \quad \sim 10 \text{ w/d}$$

LOI 2001

NO RECONSTRUCTED TRACKS YET

SOLAR TPC WITH CF_3

$$\rho = 3.7 \text{ g/l} \quad (p = 1 \text{ bar}, T = 300 \text{ K})$$

1 m³ LOW BACKGROUND TPC RUNNING
SINCE ~ 2 YEARS IN BUGEY (d = 18 m)

$$\begin{array}{lll} T > 300 \text{ KeV} & 2 \times 10^{-3} \text{ Hz} & P = 3 \text{ bar} \\ T > 800 \text{ KeV} & 3 \times 10^{-4} \text{ Hz} & \end{array}$$

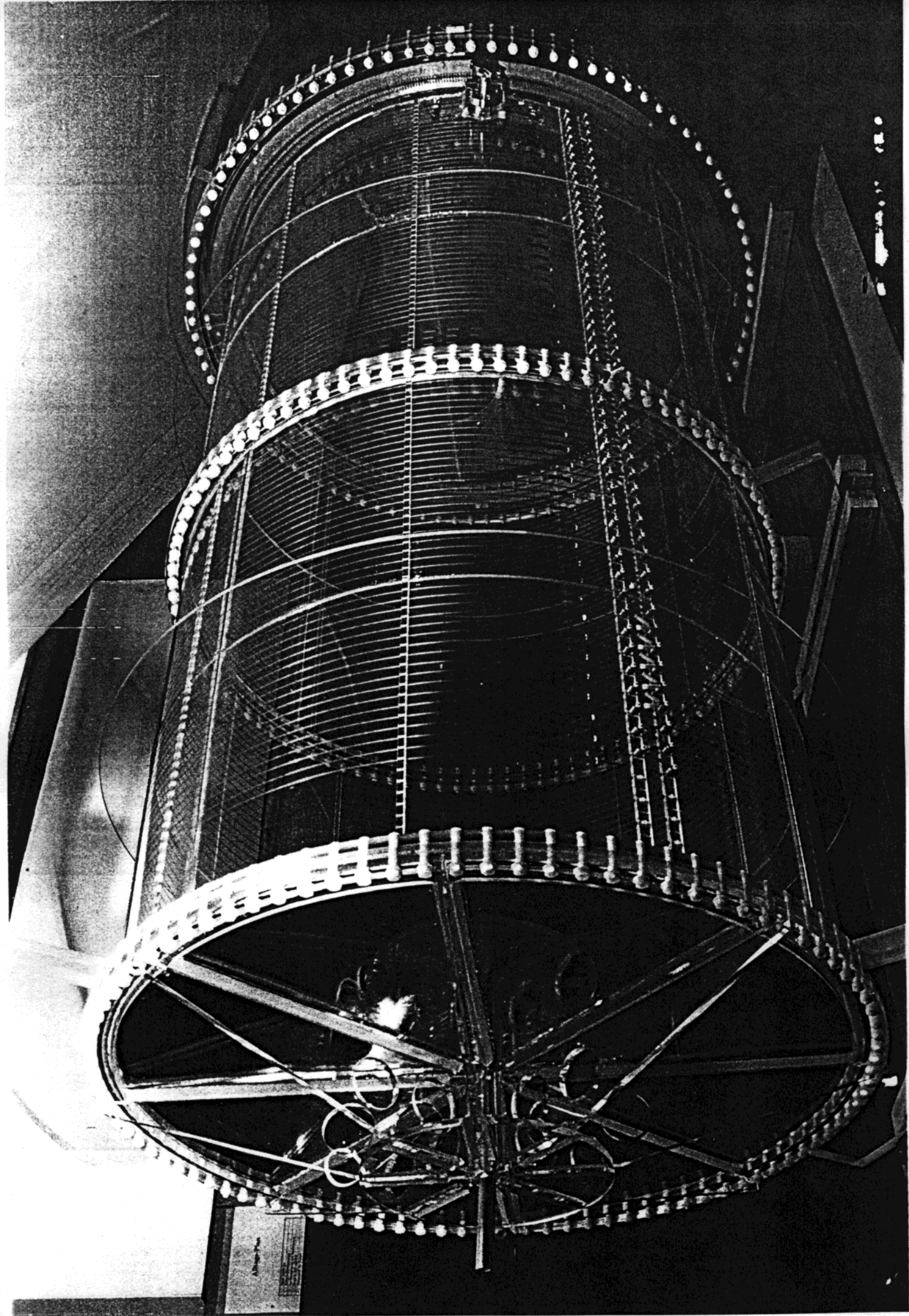
LOW ACTIVITY GE @ GRAN SASSO: $5 \div 11 \text{ cpd/kg}$
($0.8 < E < 1.2 \text{ MeV}$) $\mu\text{UNU: } 2.8 \text{ cpd/kg}$

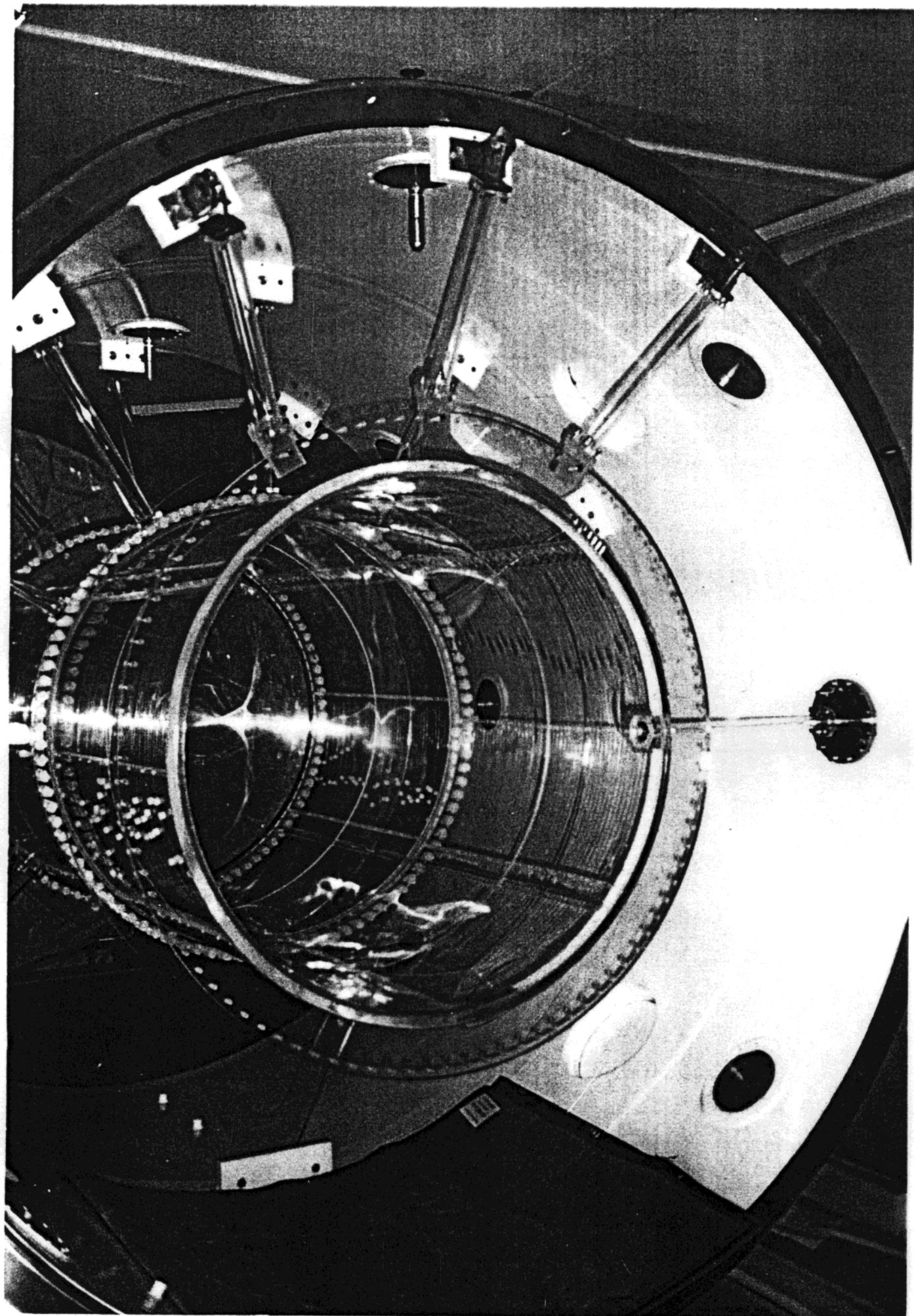
200 m³ TPC WITH CF_3

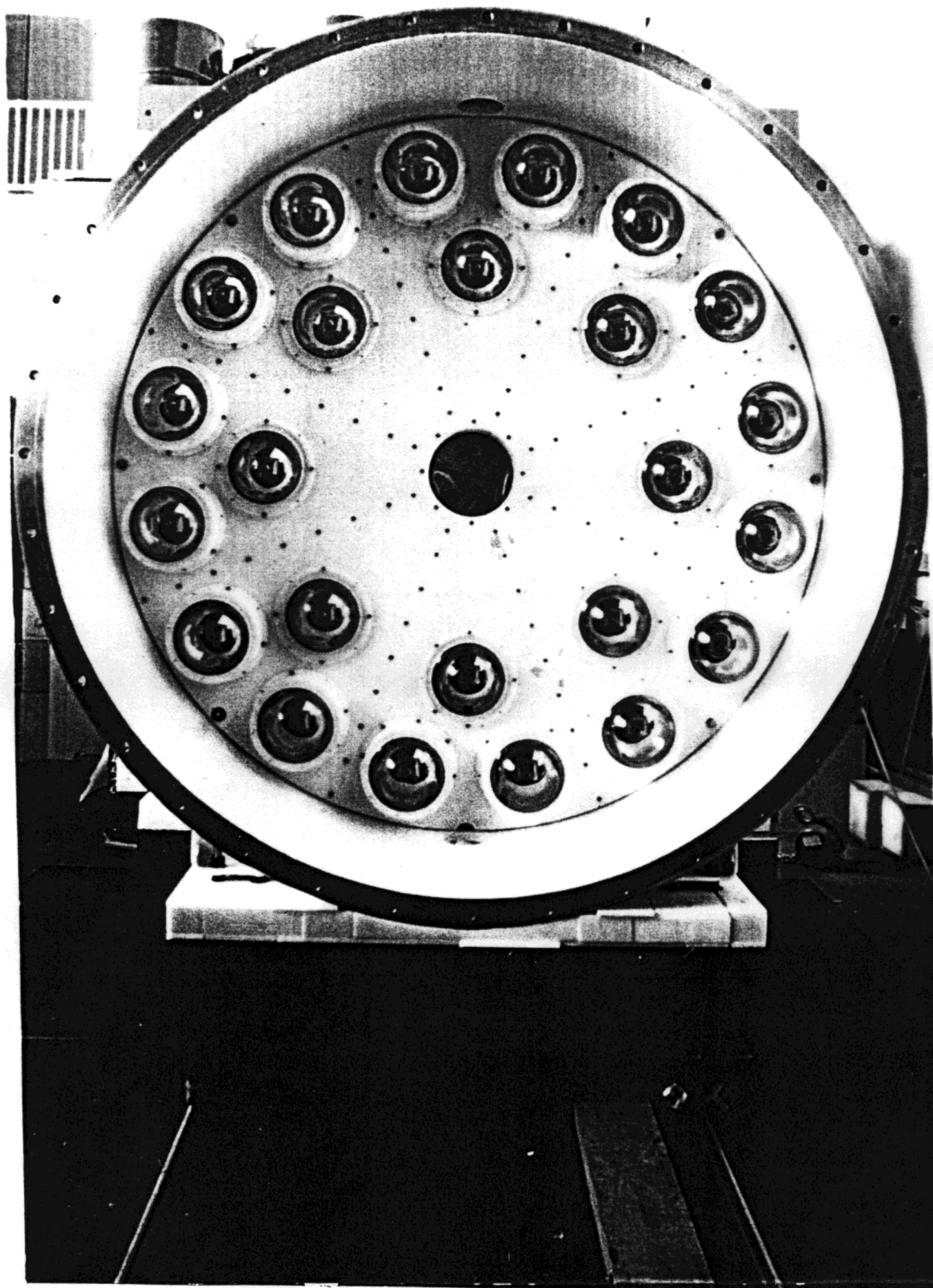
$$@ 1 \text{ bar} (740 \text{ kg}) \Rightarrow \sim 1 \text{ eV}^{\odot}/\text{d}$$

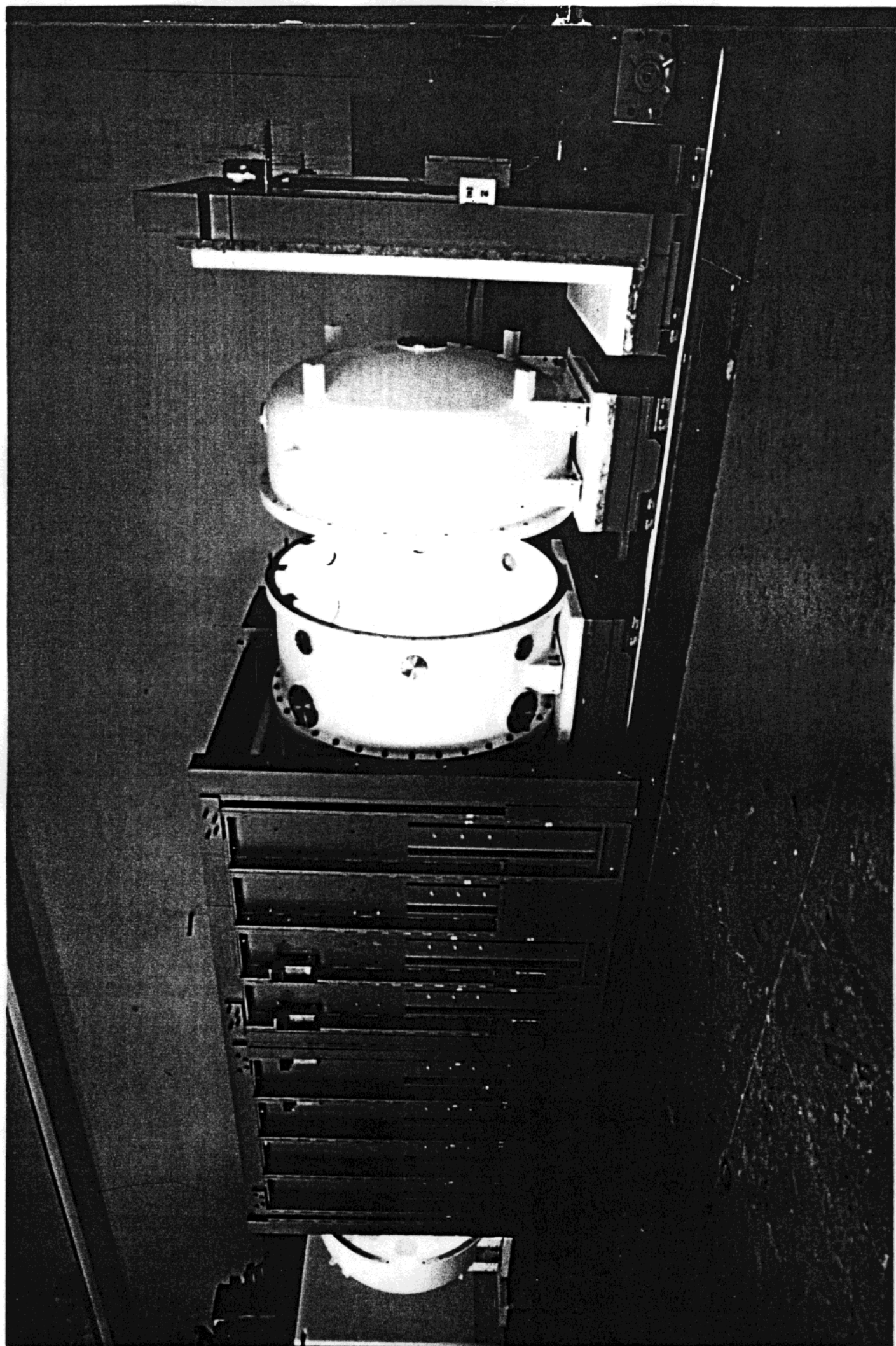
BACKGROUND: $\sim \mu\text{UNU}/10^2 - 10^3$

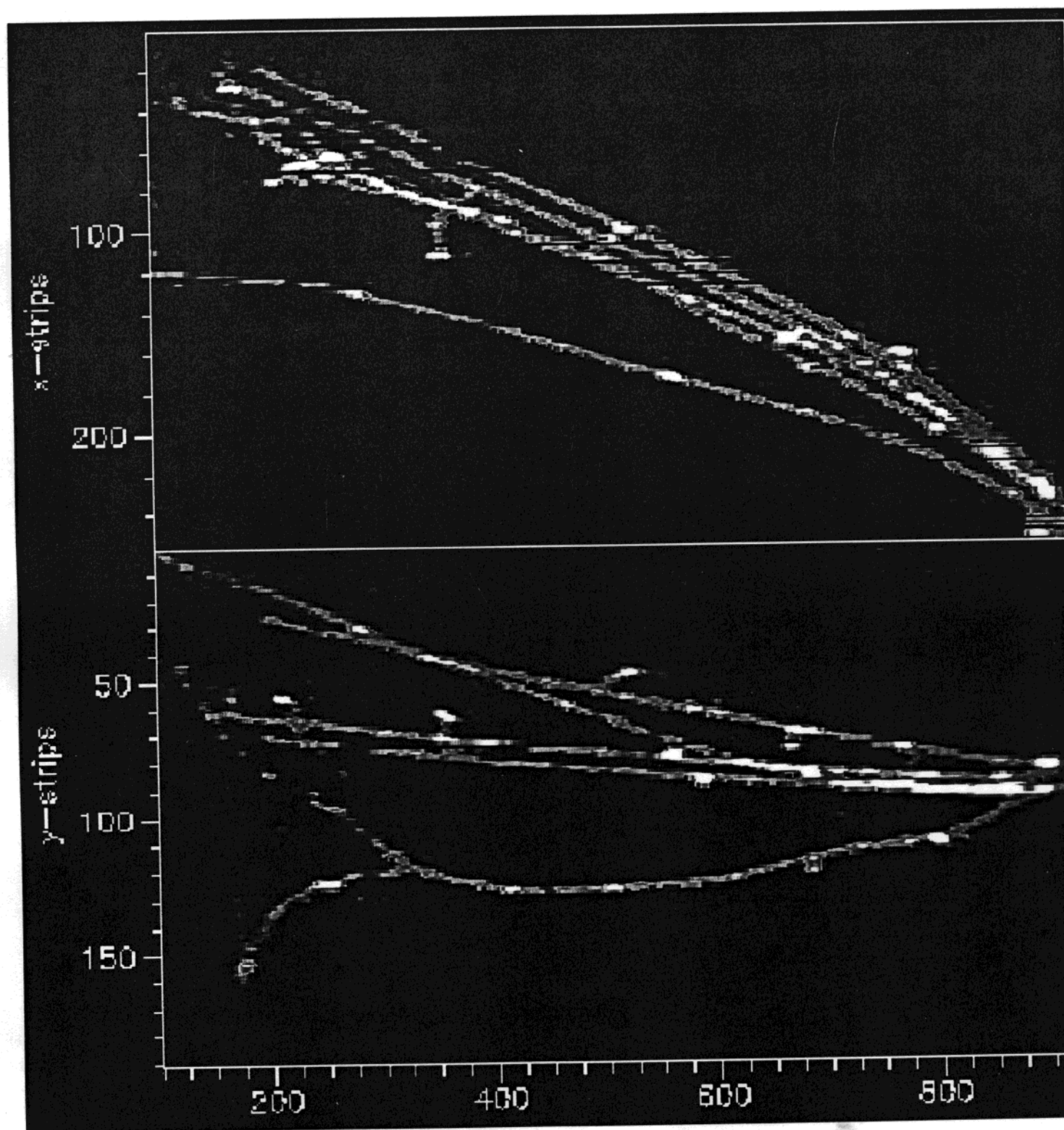
$\Rightarrow$ UNDERGROUND

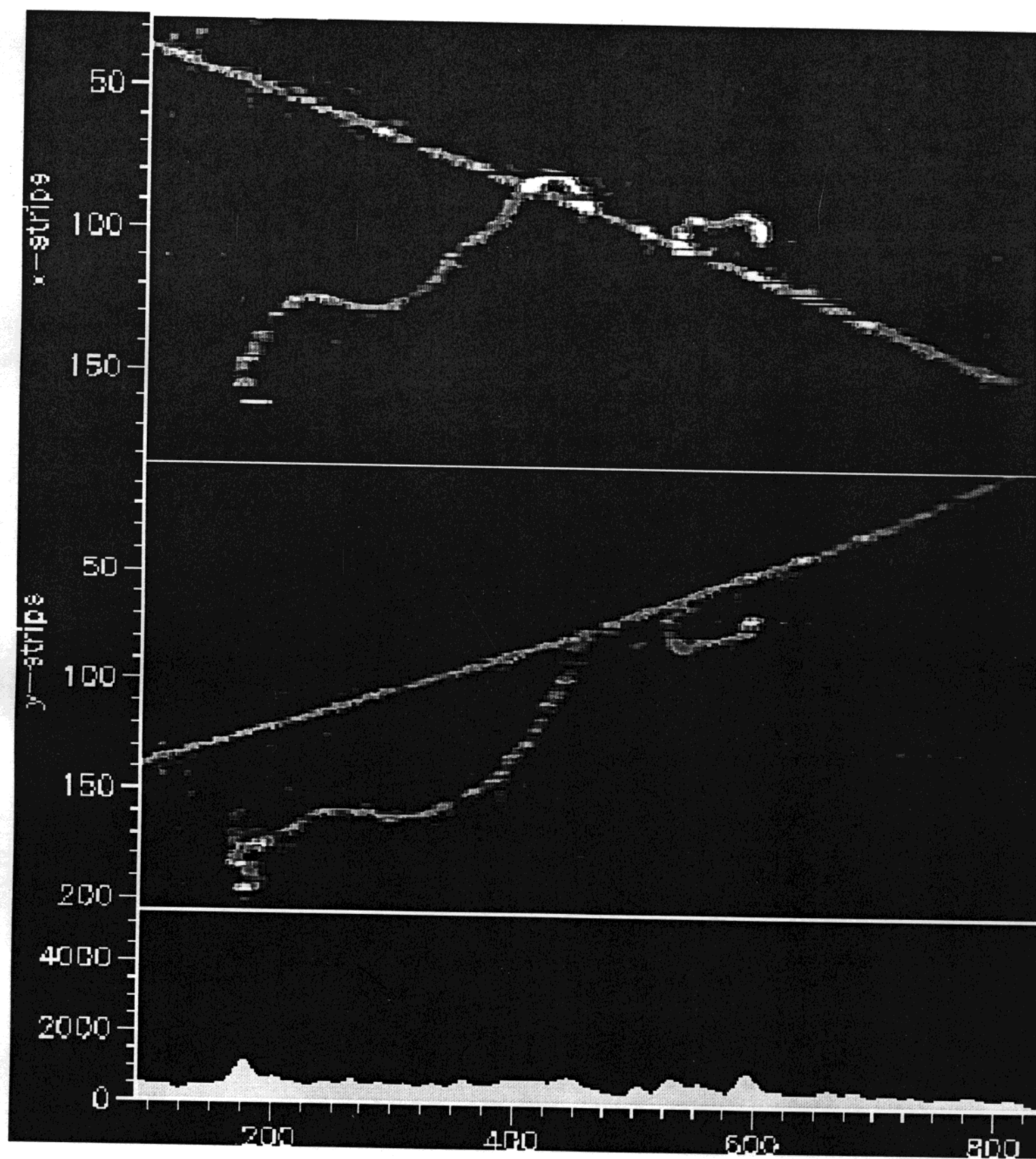


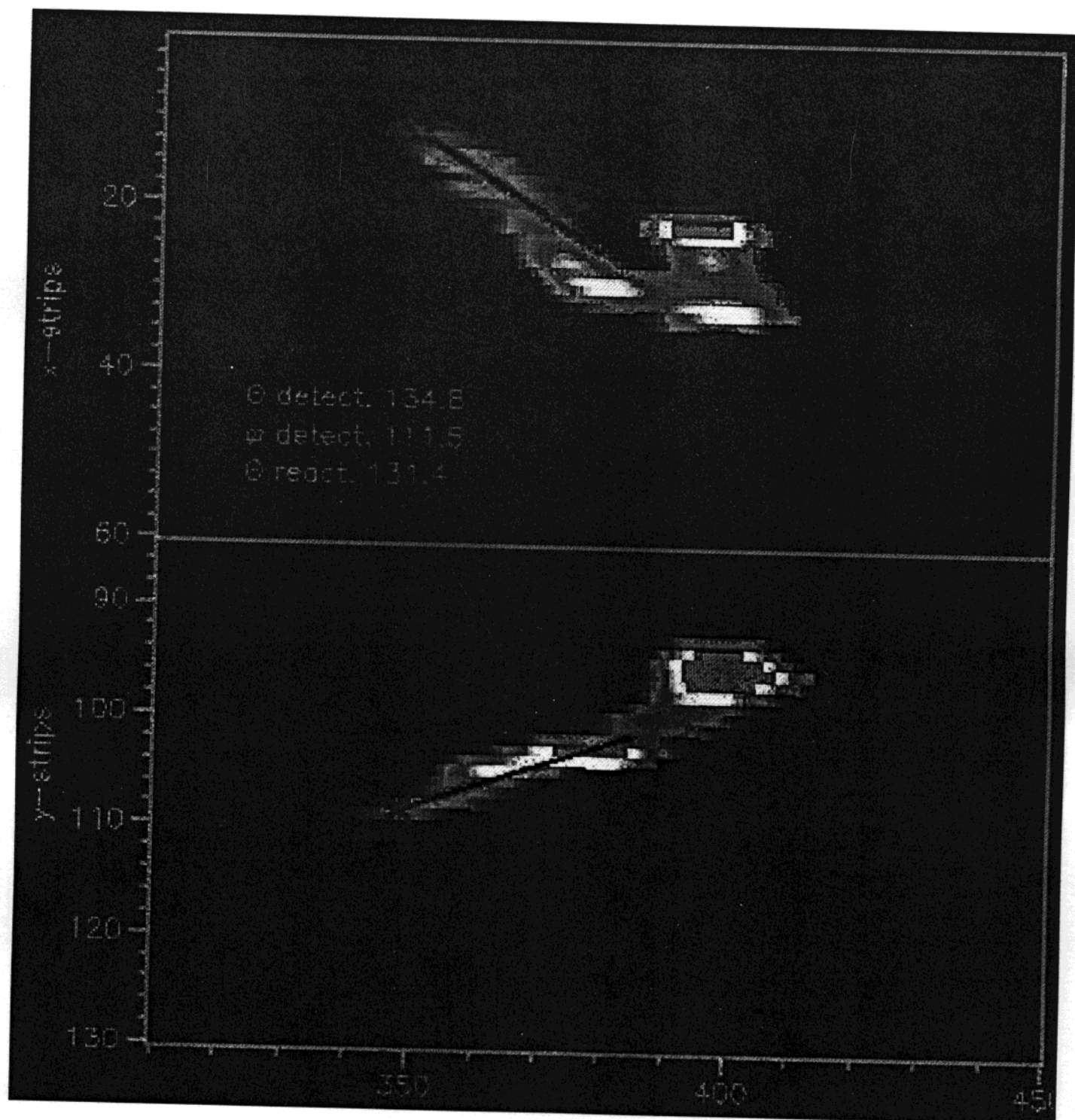


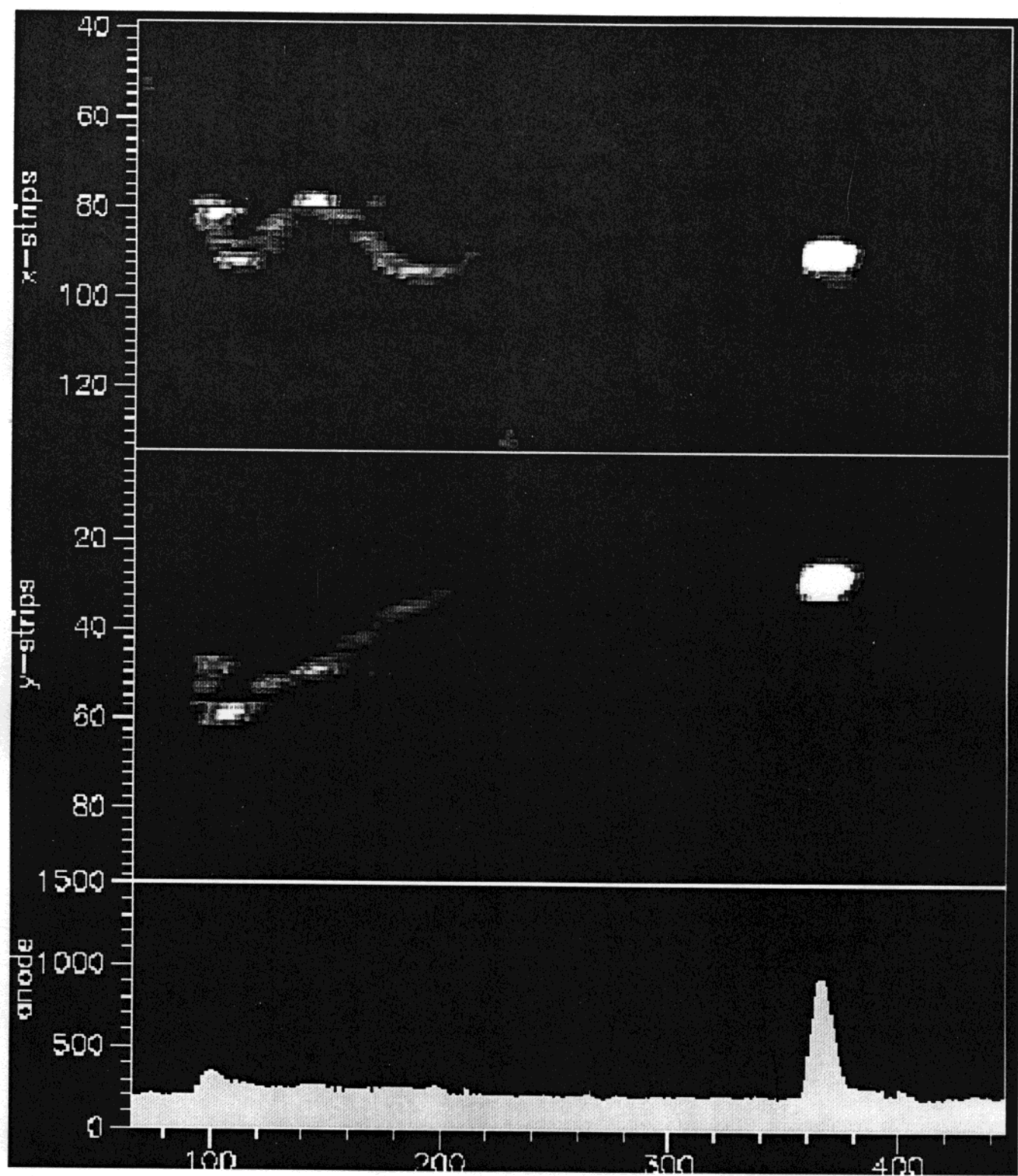


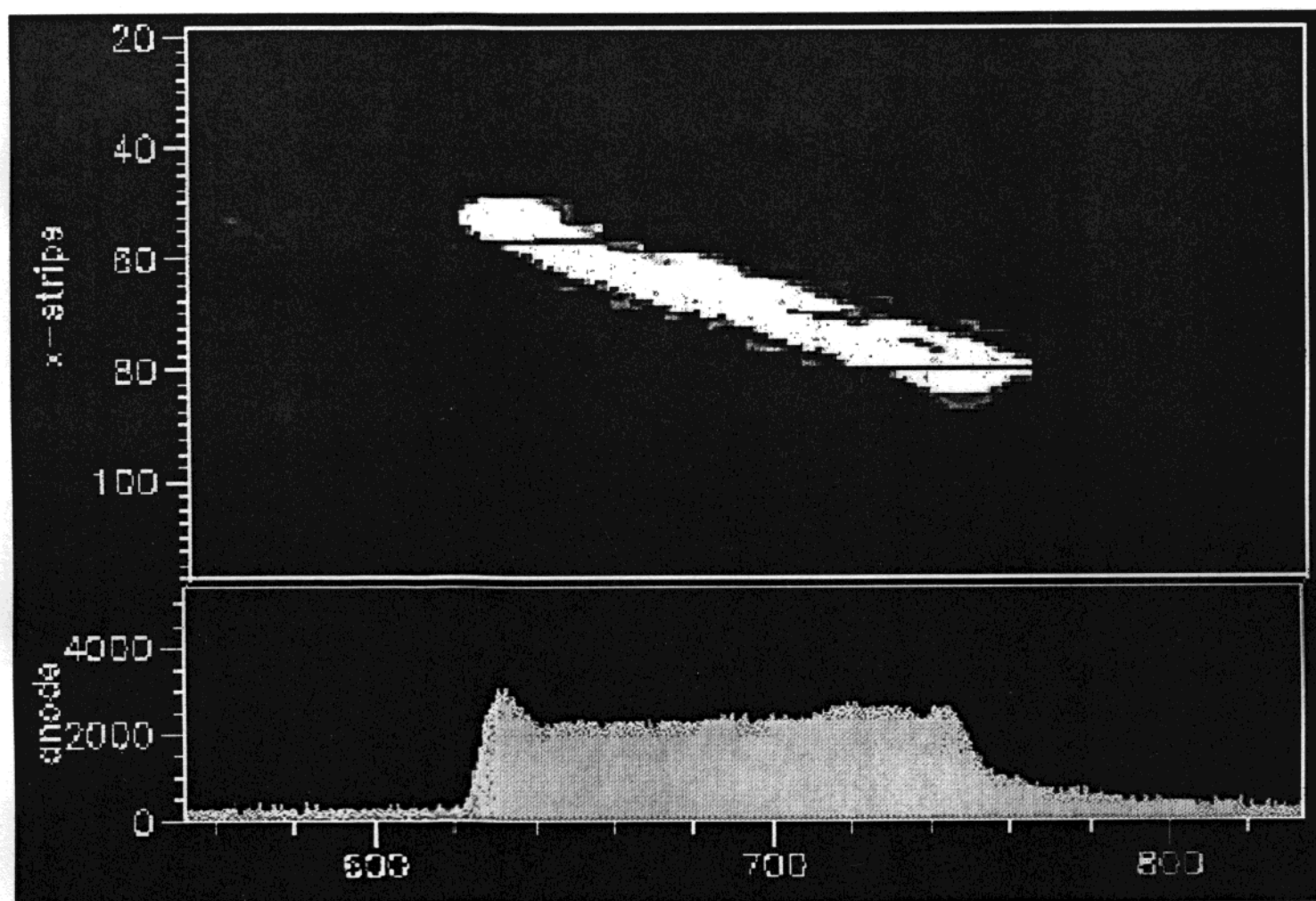


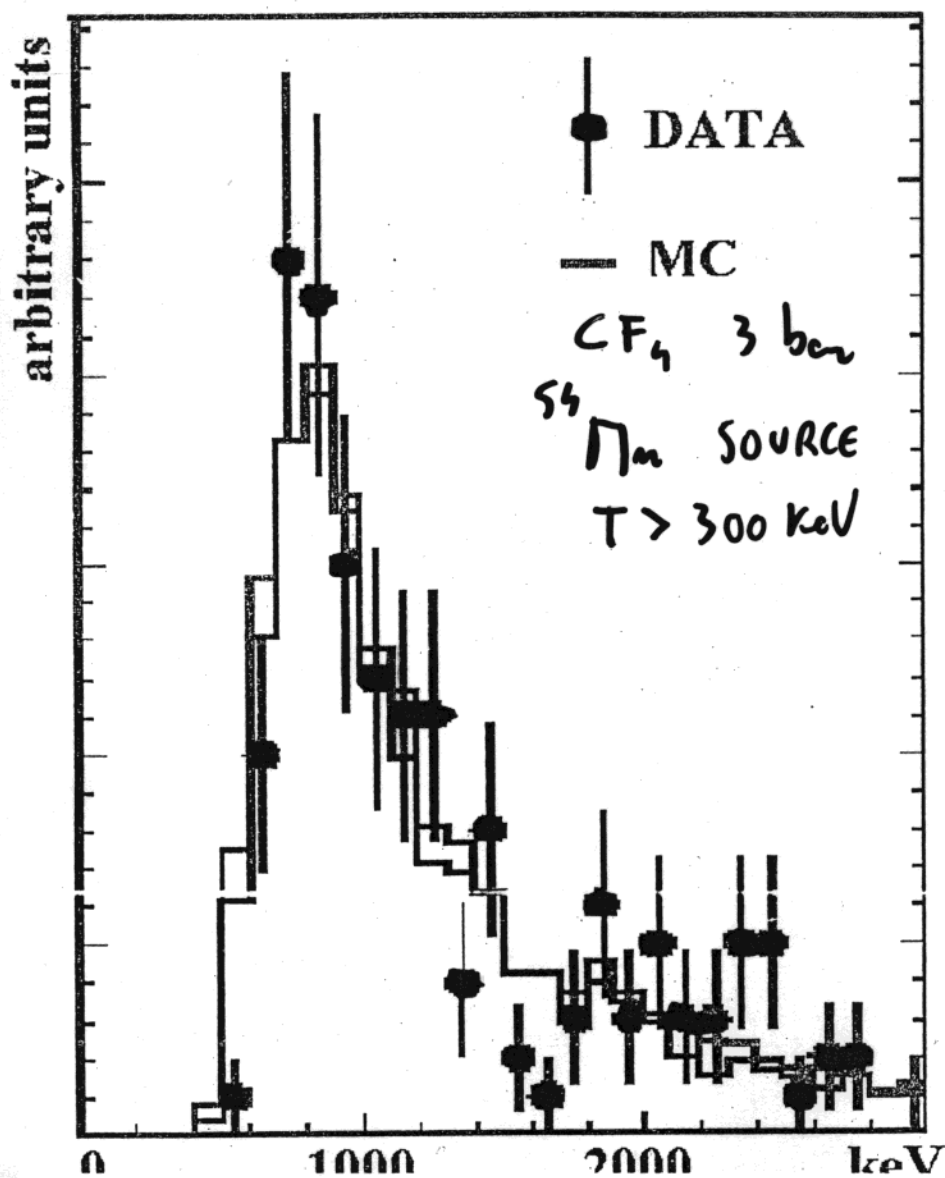
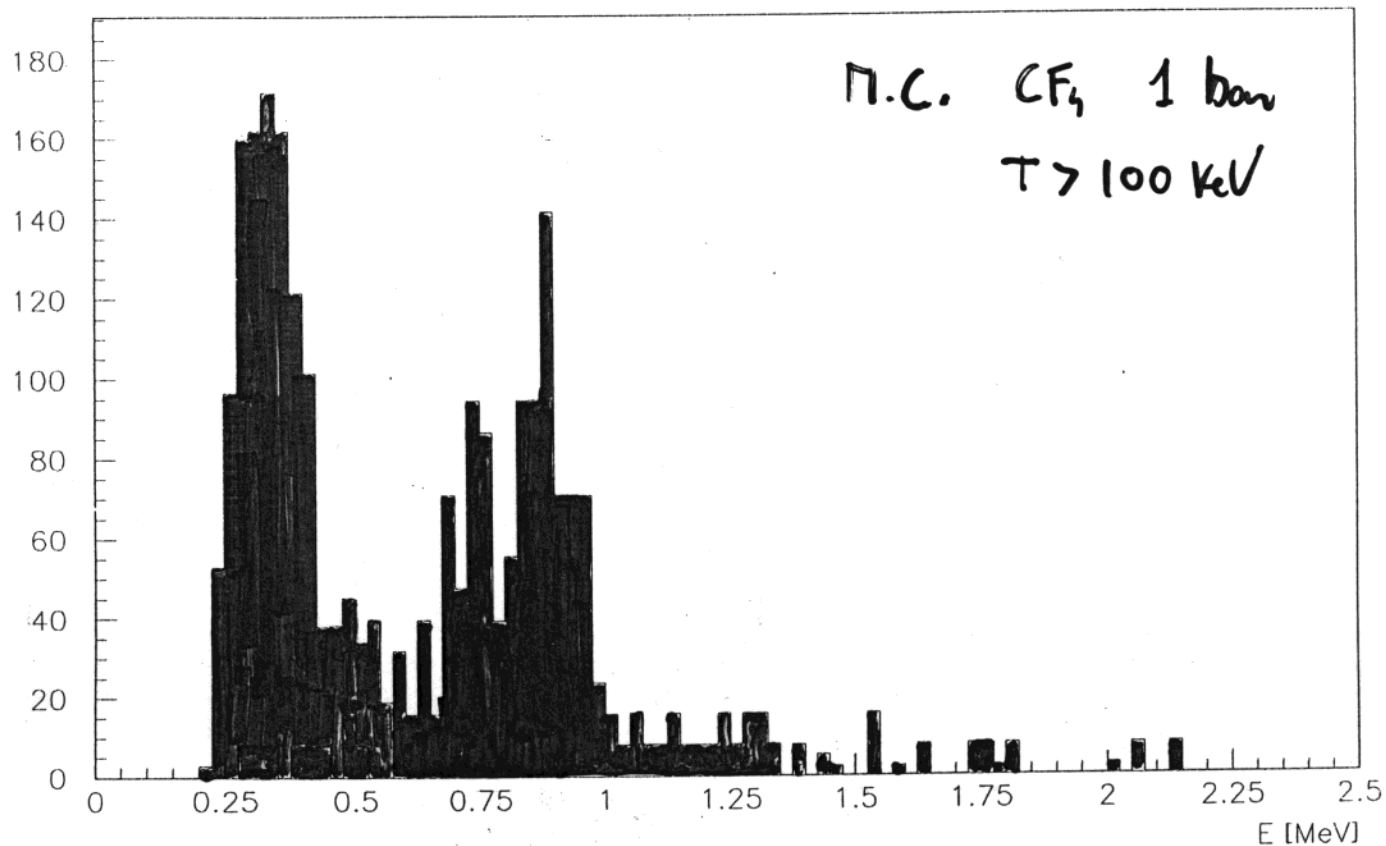








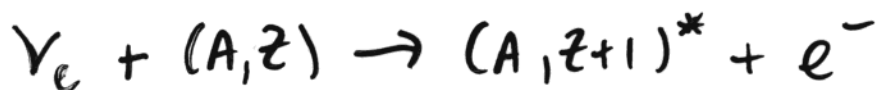




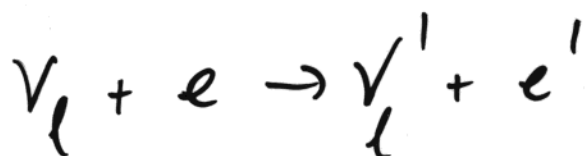
SUMMARY:

MOTIVATION: PRECISE MEASUREMENT OF

$$V_{pp}^{\odot} (V_{pp} + V_{\beta e})$$



- "EASY" DETECTOR
- COINCIDENCE BUT ^{235}U AND HIGH A
- V-SOURCE CALIBRATION NECESSARY
- HIGH THRESHOLD FOR ^{176}Lu
OK ^{115}In



- DIFFICULT DETECTOR
- MORE INFORMATION
- SIMULTANEOUS MEASUREMENT OF S AND E
- LOW A BUT R_n AND ^{14}C