P. MICHELATO -
INFN-MILANO
LASA

TTF MEETING
ANL, NOV 8-10, 1999

- CATHODE OPERATION IN THE GUN
- NEW CATHODE TRANSFER SYSTEM
- USED CATHODES AND SUBSTRATA
- R & D ON CATHODE

CATHODE OPERATION IN THE FNAL GUN (AT DESY)

! DARK CURRENT AT FNAL IS LOWER! 80 - 100 nA!

DARK CURRENT

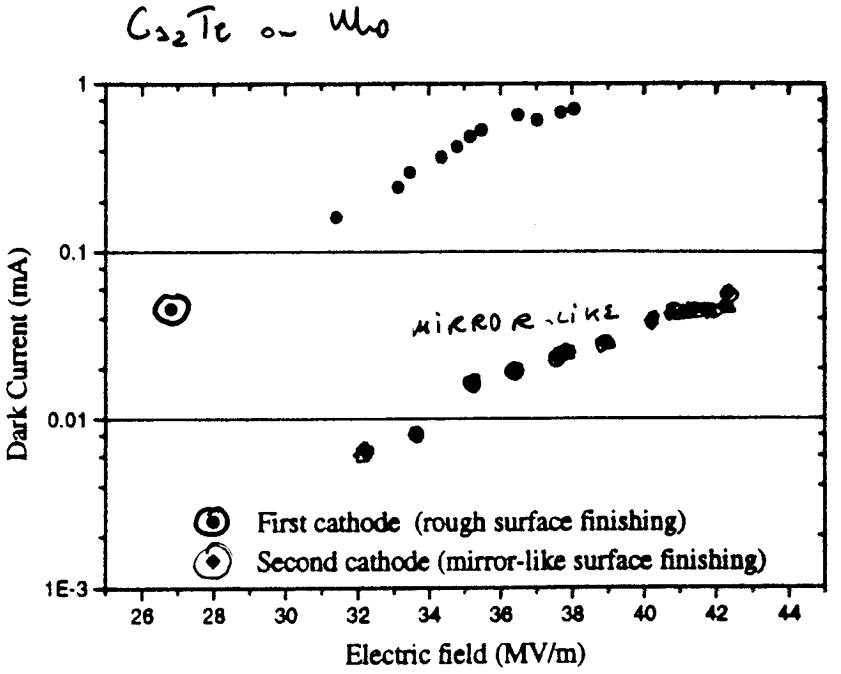


Fig. 4. Dark current measurements in respect to the different surface finishing of a coated substrate.

• QE AND DARK CURRENT

		QE	DARK CURR
FEB/MAR	99	~ 6%	15 nA
JULY	99	0.6 %.	70 nA
Sept	99	0.6 %.	800 nA
OCT	99	~ 0.5 ÷ 0.6 %.	1.2 mA !

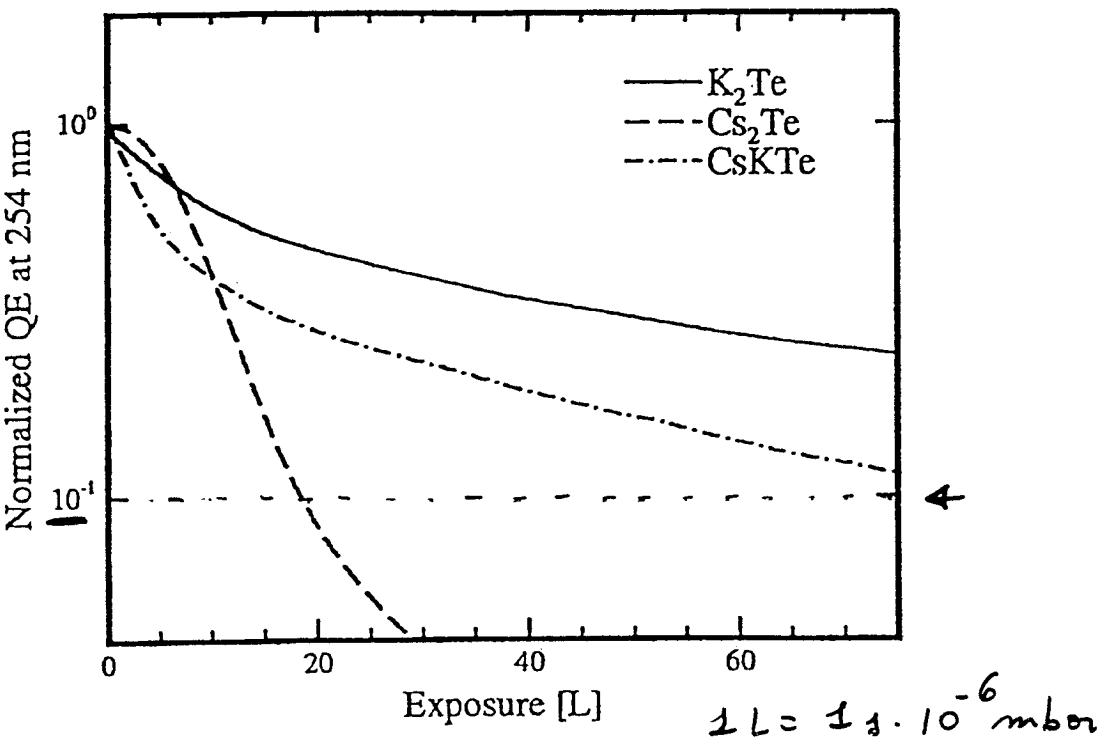
⇒ CATHODE LIFETIME IS LIMITED BY DARK CURRENT AND NOT BY QE DEGRADATION

K_2Te K-Cs Te More robust

? DARK CURRENT ?

"NEW" Photoemissive materials

	QE.
K_2Te	2.6 % @ 254 nm
$Cs-KTe$	12.5 %
Cs_2Te	6.3 %

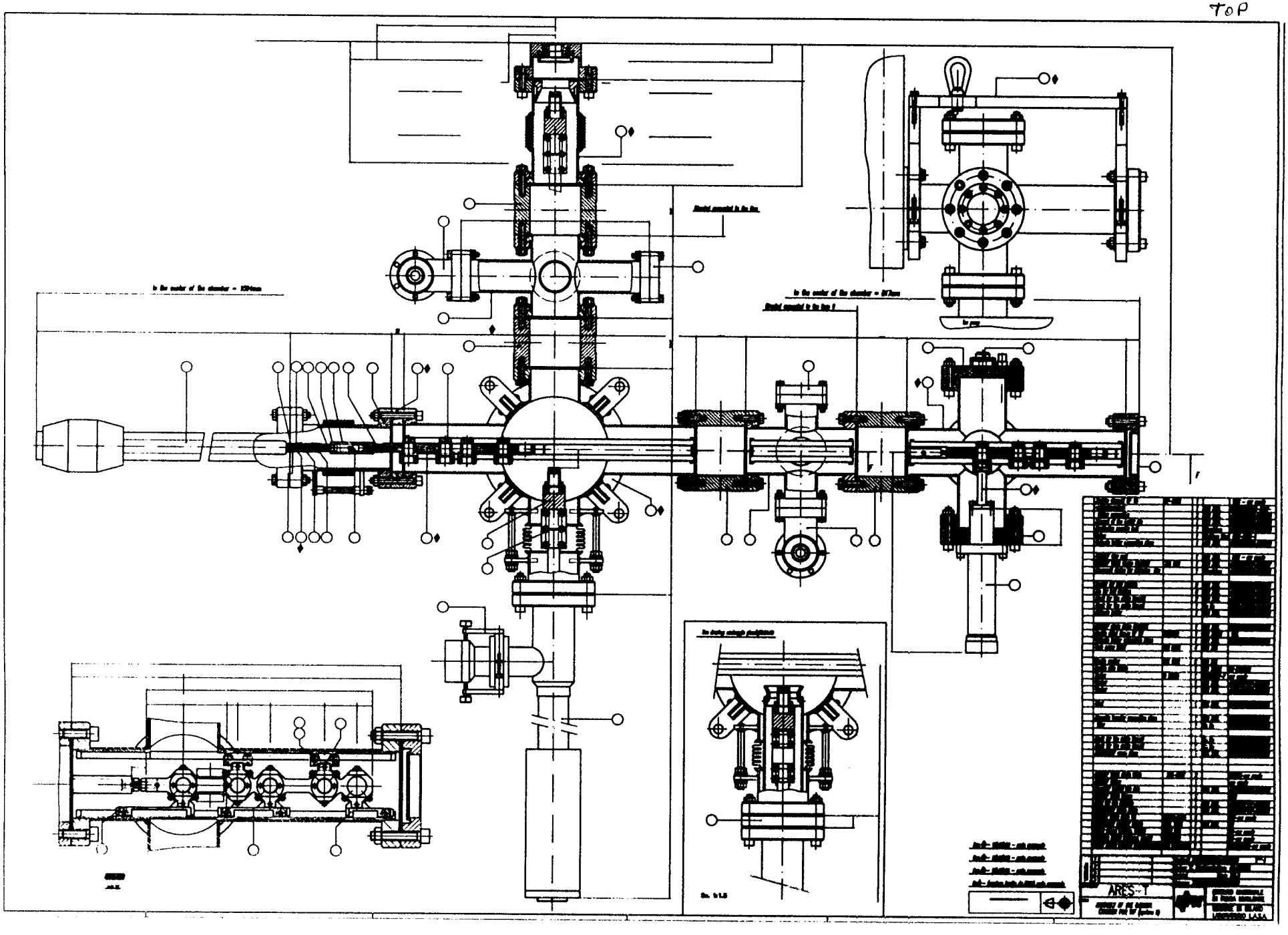


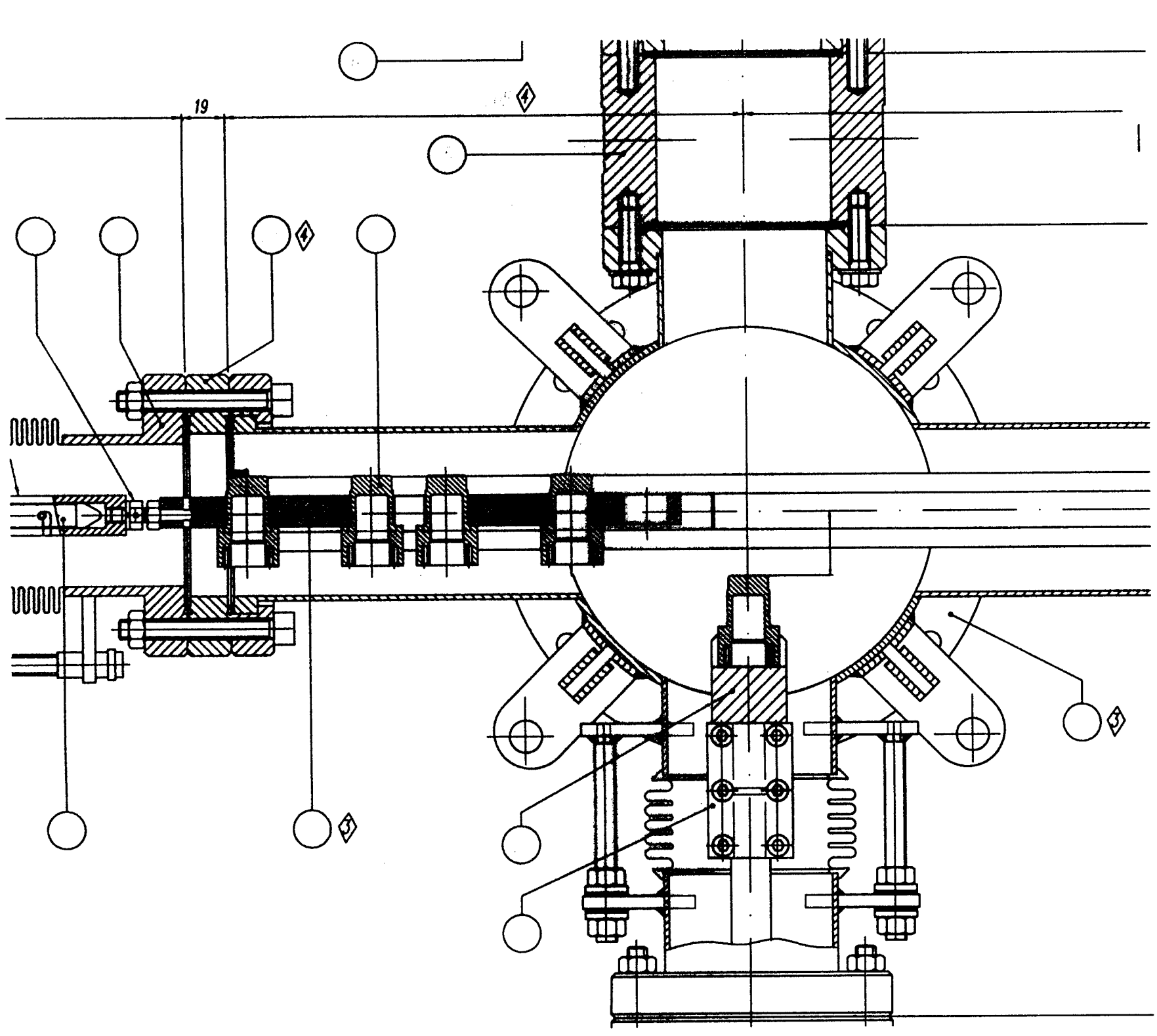
D. Bisero et al.
Solid State Commun.
Fig. 1

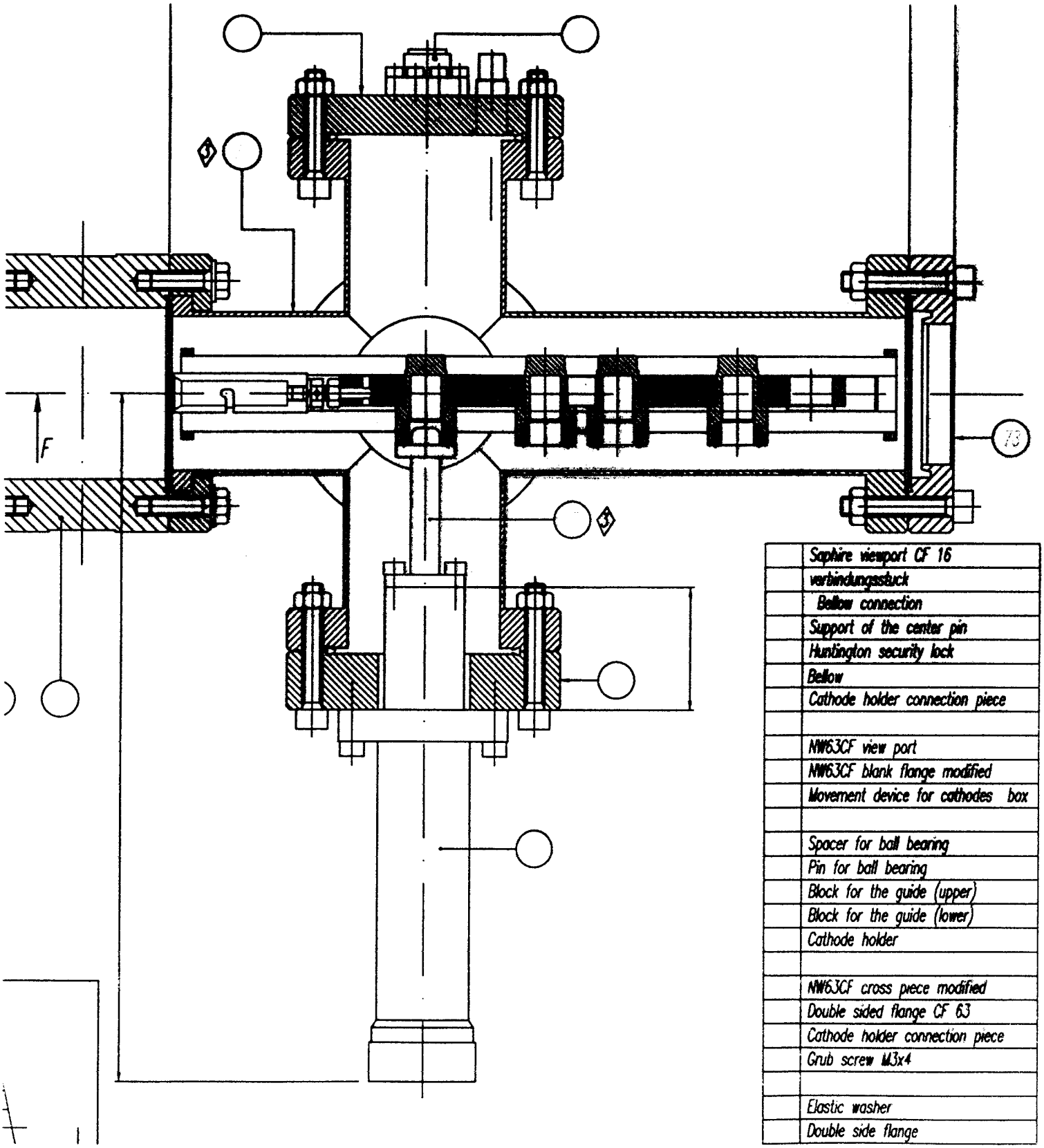
THE NEW CATHODE TRANSFER SYSTEM FOR DESY GUN

⇒ IN VACUUM AT DESY WITHIN THE END 99

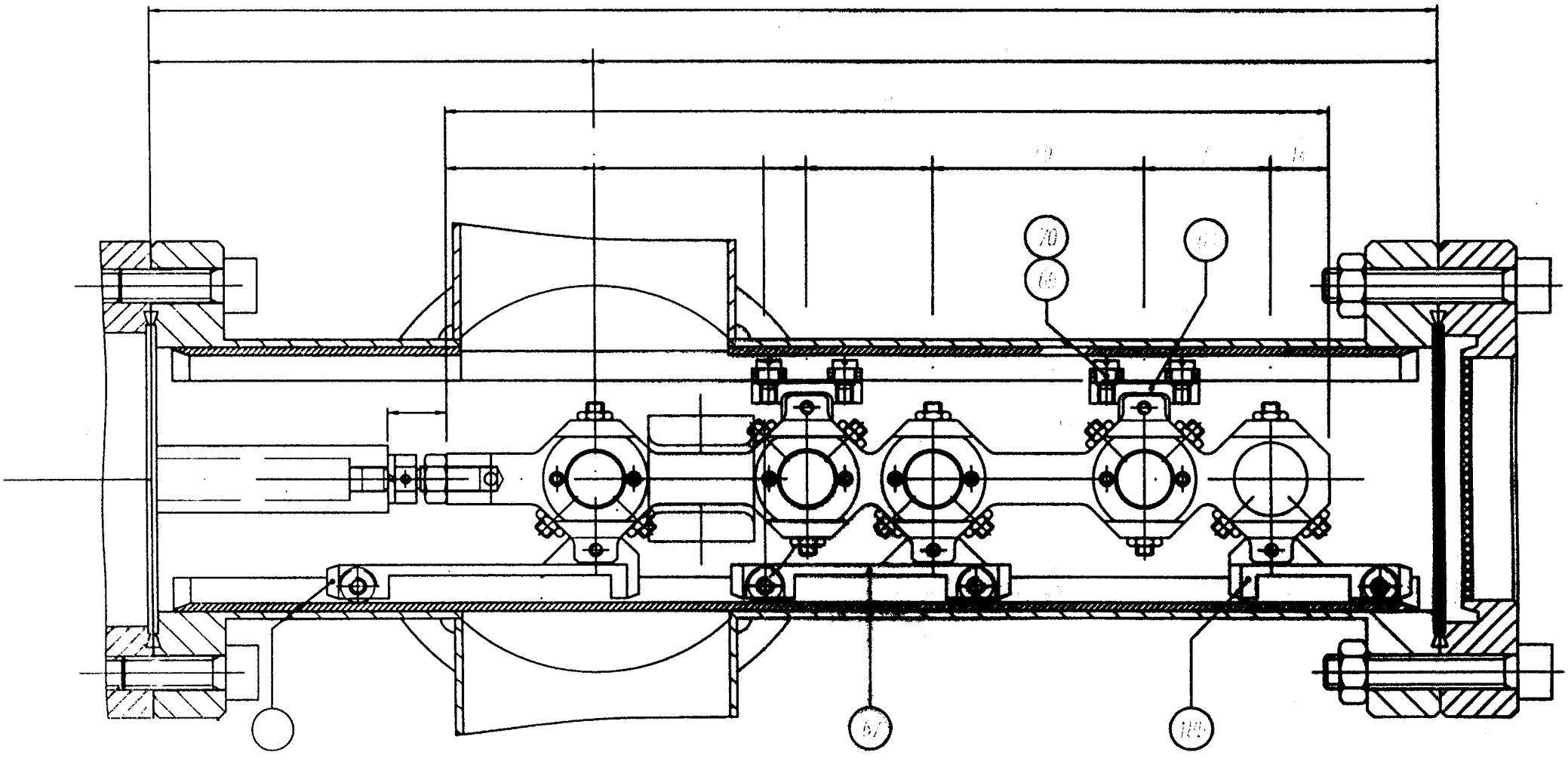
- NEW 5 CATHODE HOLDER
- NEW GUIDE SYSTEM OF THE CATHODE PLIER


TOP
ARES-I


19
4
4
3
3

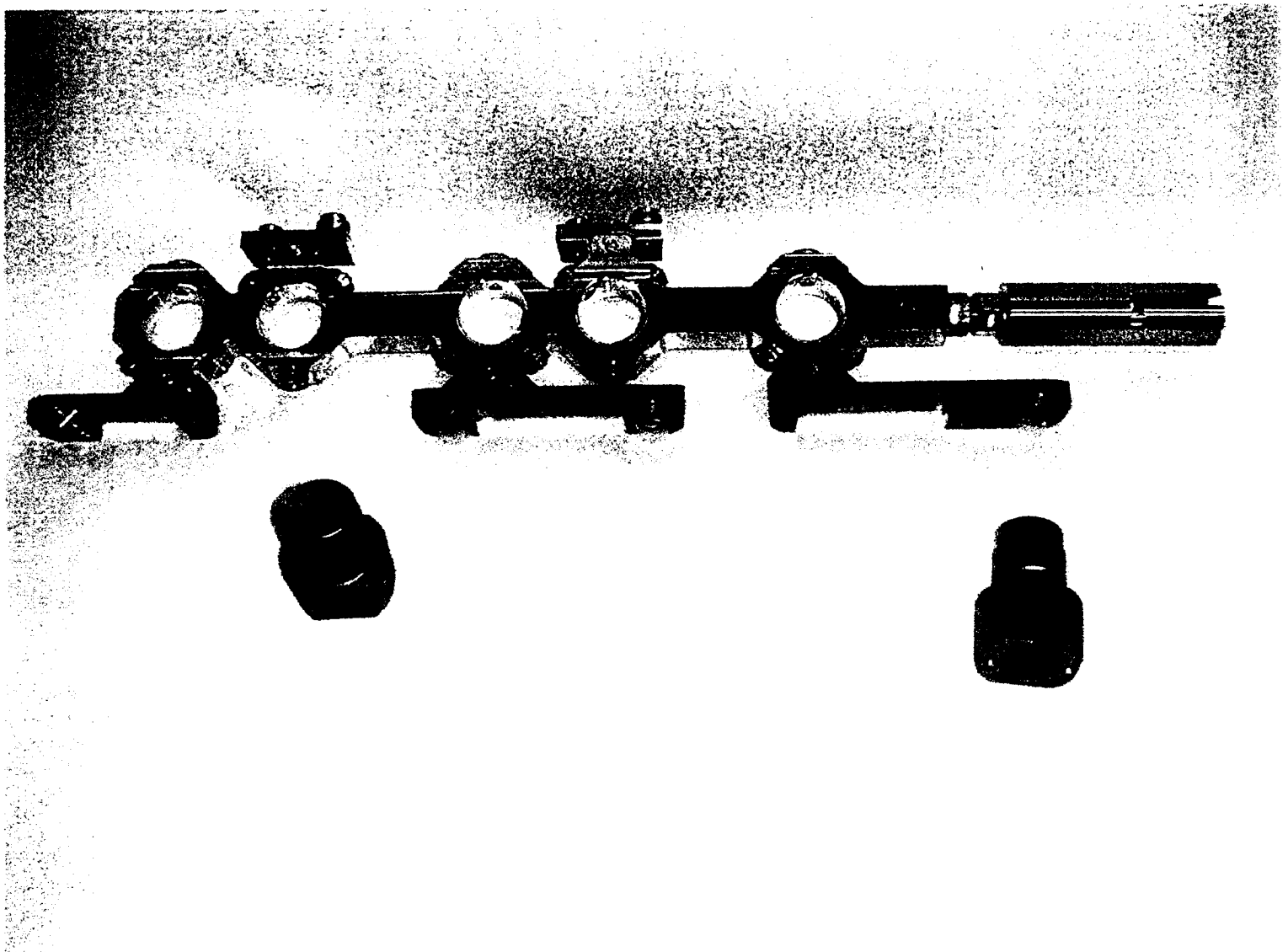


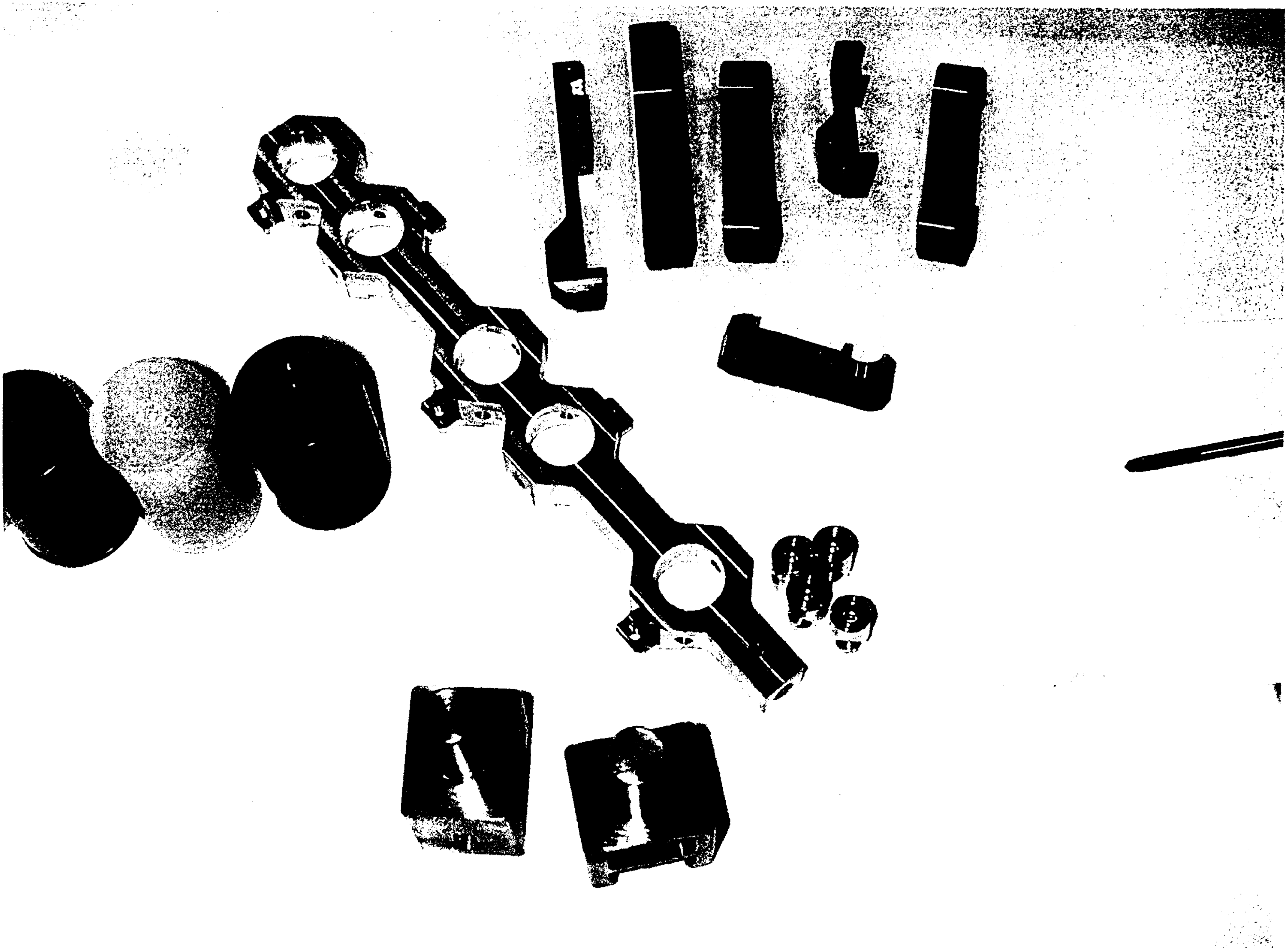
	Saphire viewport CF 16
	verbindungsstuck
	Bellow connection
	Support of the center pin
	Huntington security lock
	Bellow
	Cathode holder connection piece
	NW63CF view port
	NW63CF blank flange modified
	Movement device for cathodes box
	Spacer for ball bearing
	Pin for ball bearing
	Block for the guide (upper)
	Block for the guide (lower)
	Cathode holder
	NW63CF cross piece modified
	Double sided flange CF 63
	Cathode holder connection piece
	Grub screw M3x4
	Elastic washer
	Double side flange



Section E-E

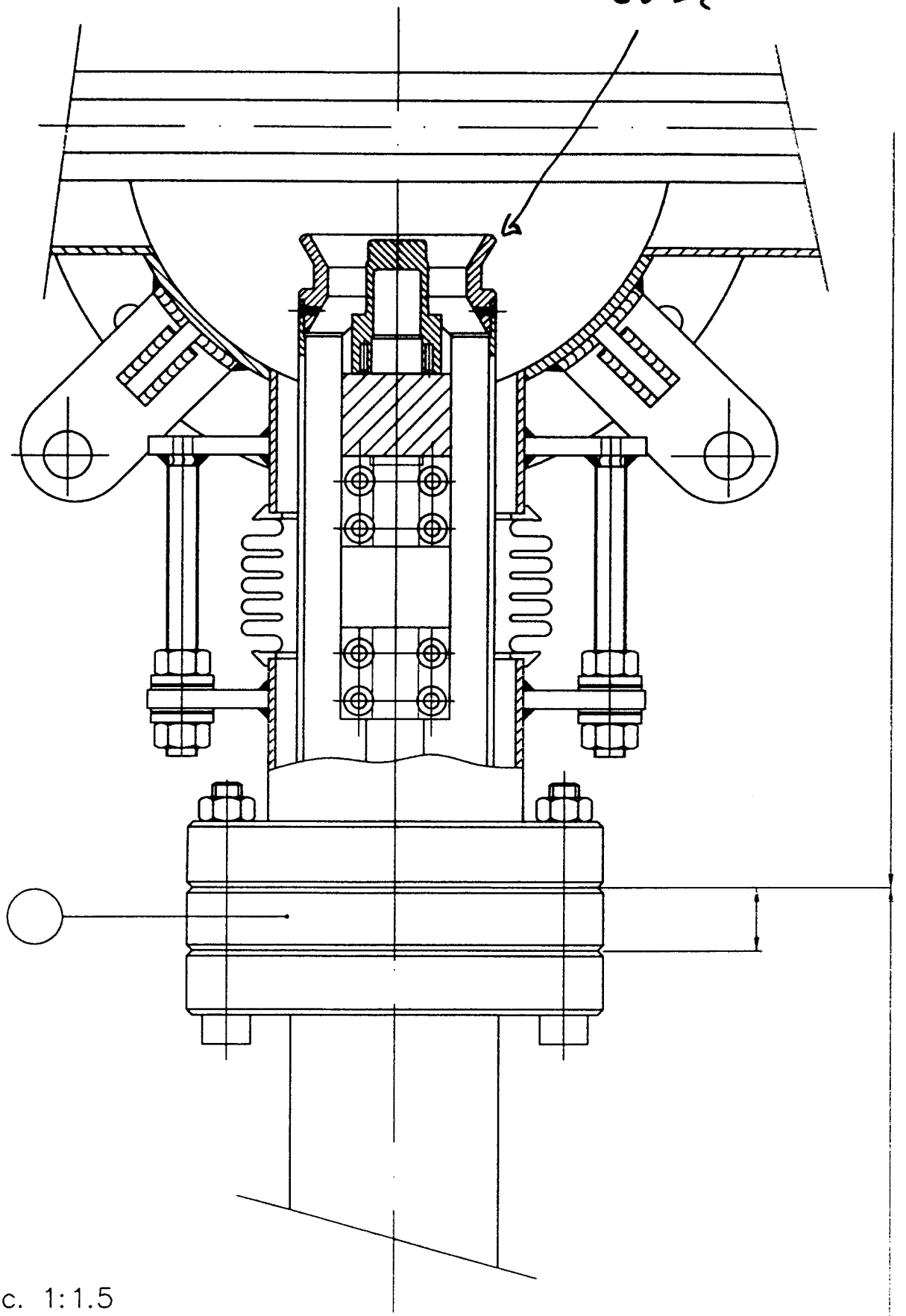
scale 1:1



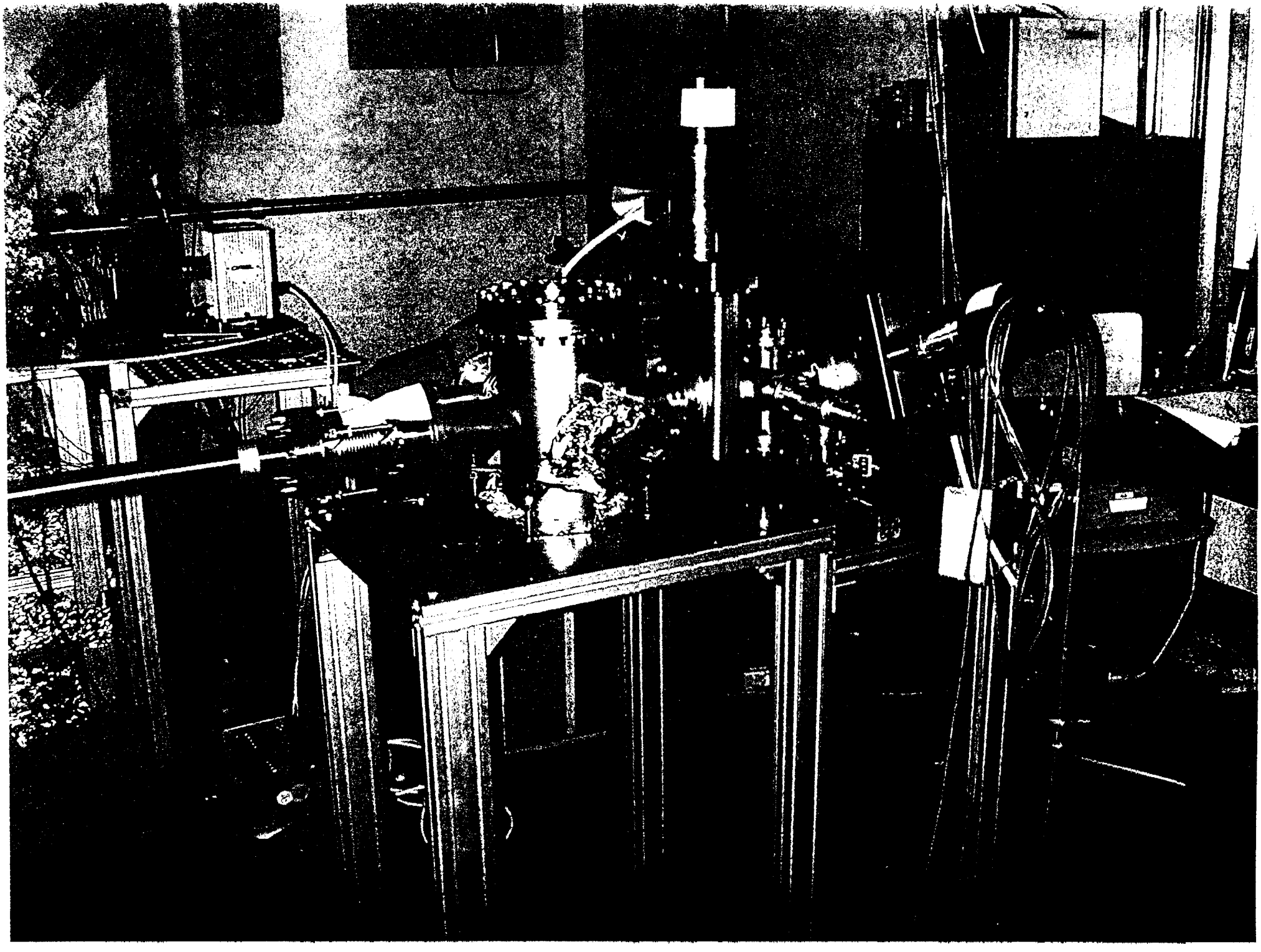


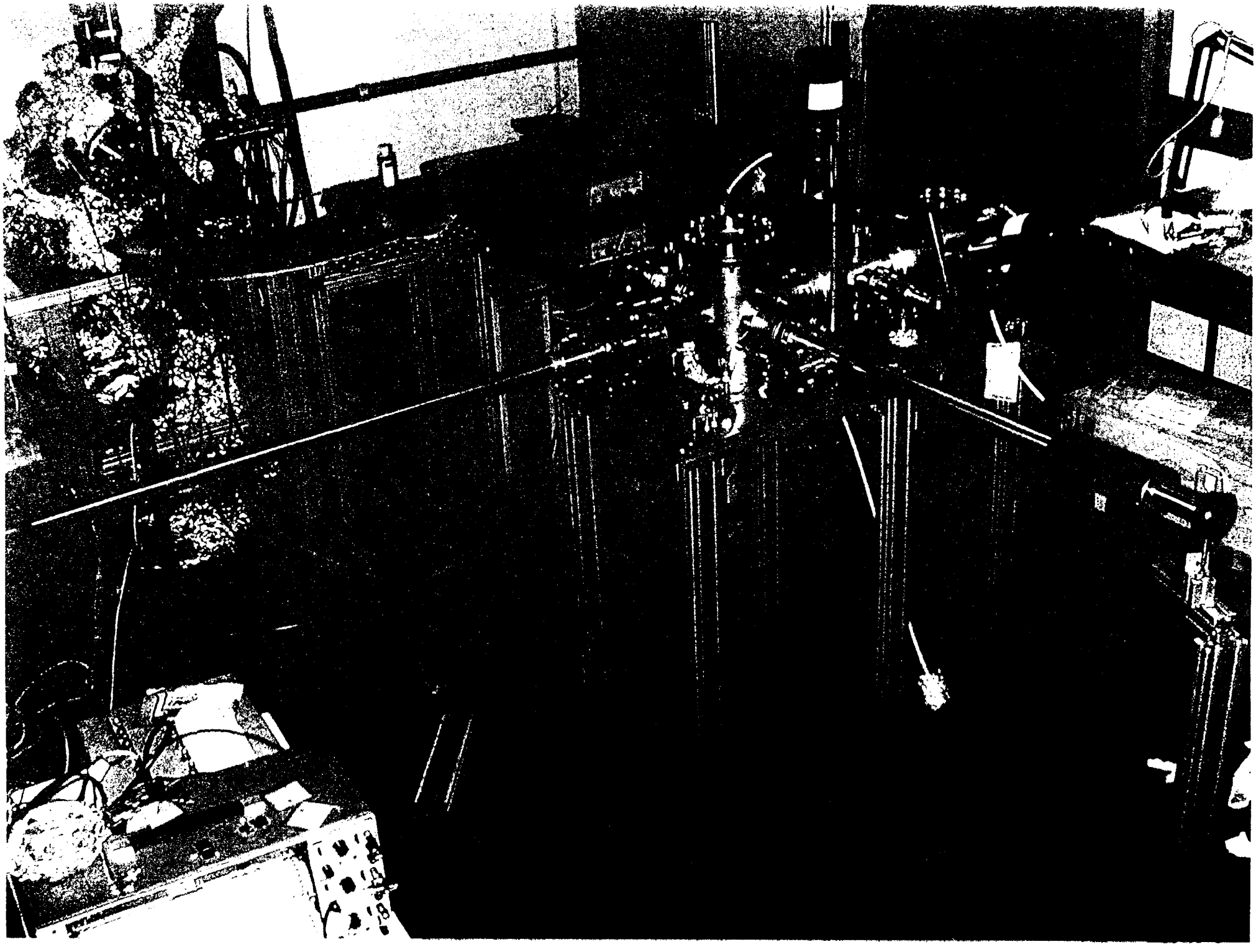
See drawing: centraggio pinza\00.01.00

NEW CATHODE PLIER GUIDE



Sc. 1:1.5





→ USED CATHODE & SUBSTRATA

- CATHODE 1D –

  Mo – FNAL GUN

  Cu + 4 lines

- CATHODE 2C

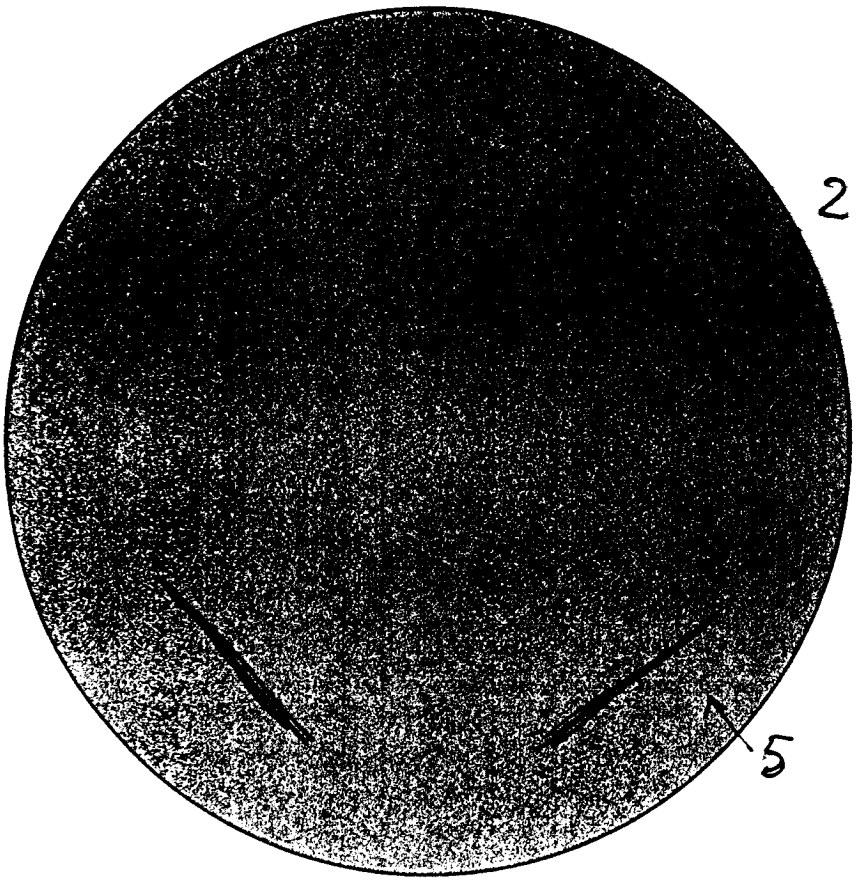
  Mo – DESY GUN

- CATHODE 3S

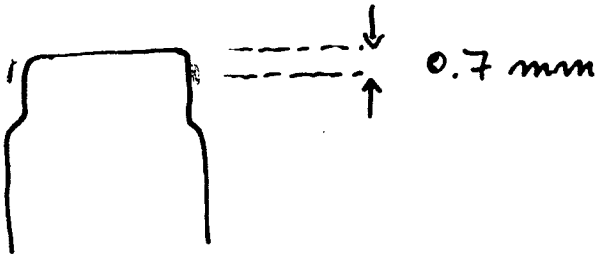
  Mo + Cs_2Te DESY GUN

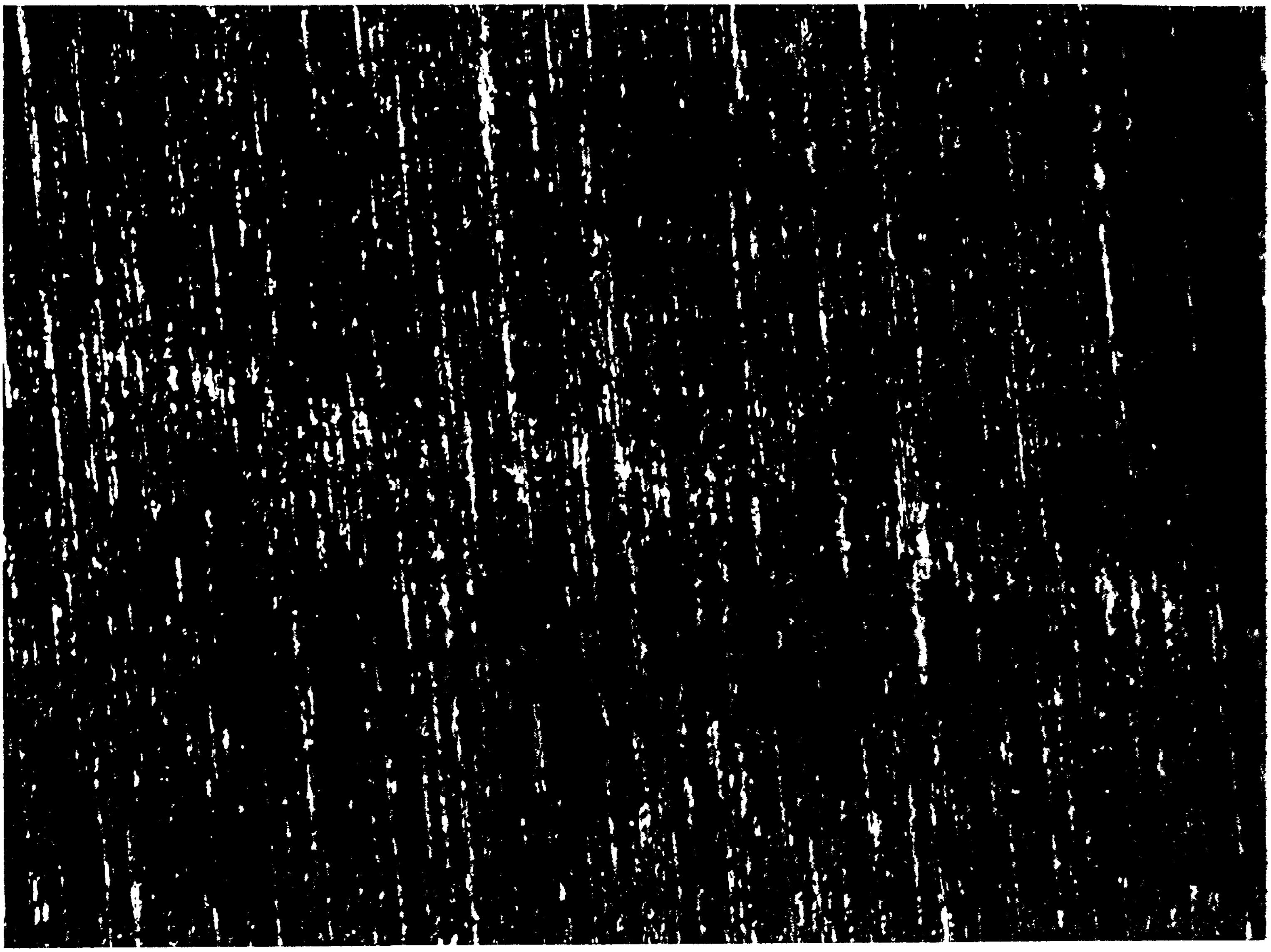
1 D MOLY - FNAL GUN

- 4 wires



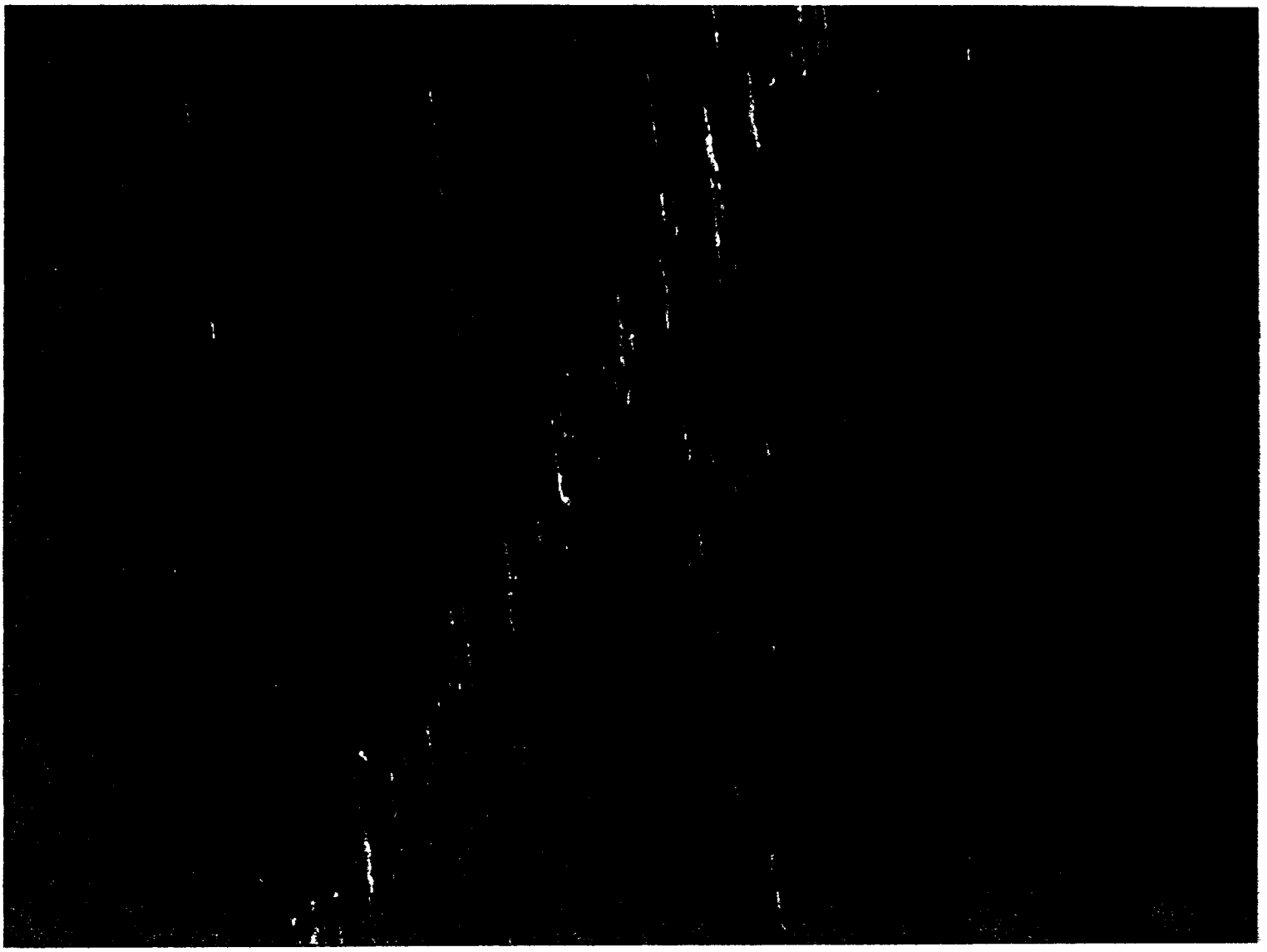
- Cu





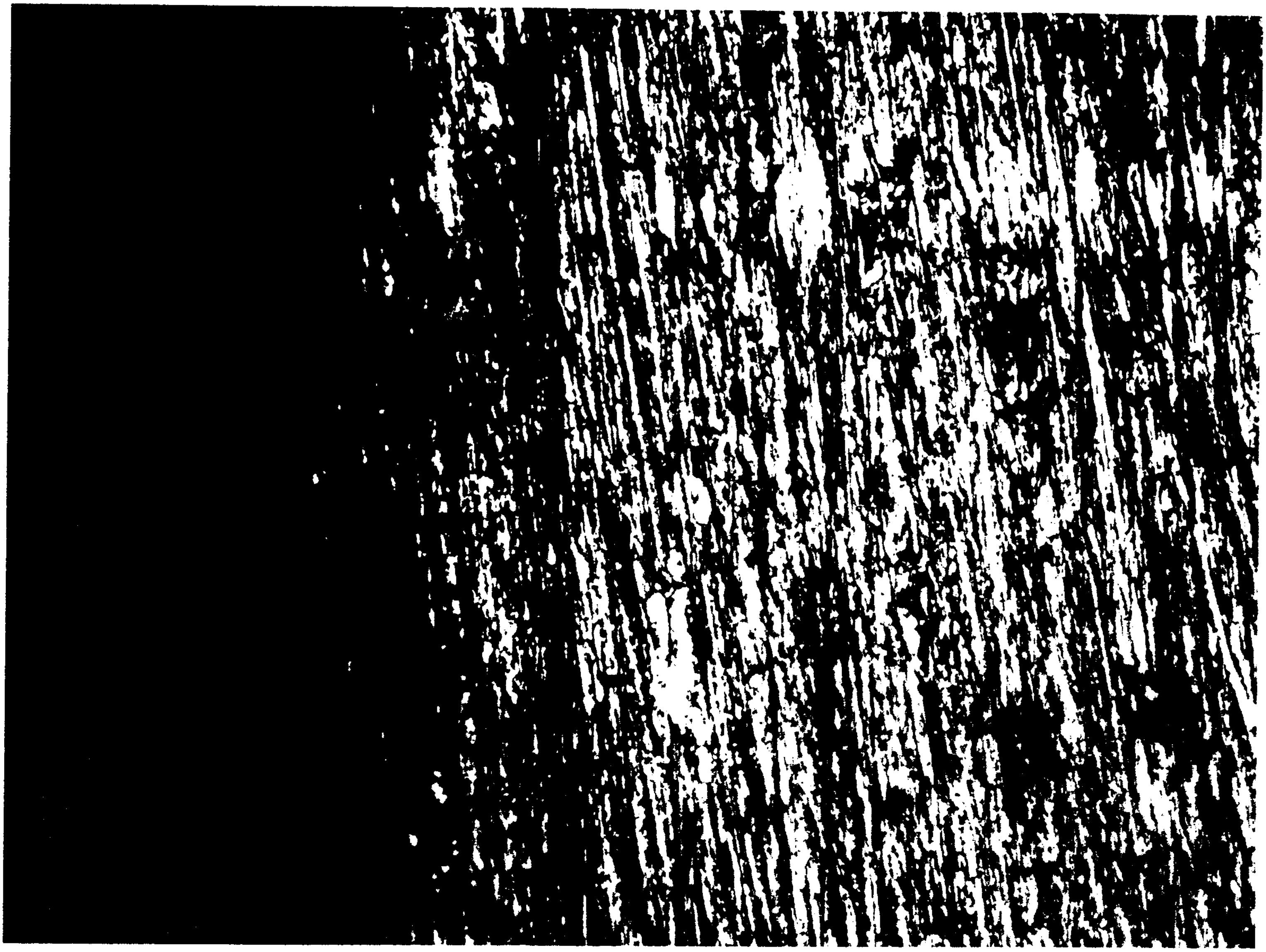
200Nm

1d 100x [illegible] oRE2



200 nm

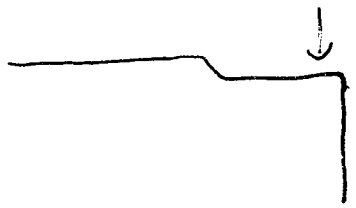
1d 100x CRES



200 Nm

_ol 100x Ms ORi77.

100 µm

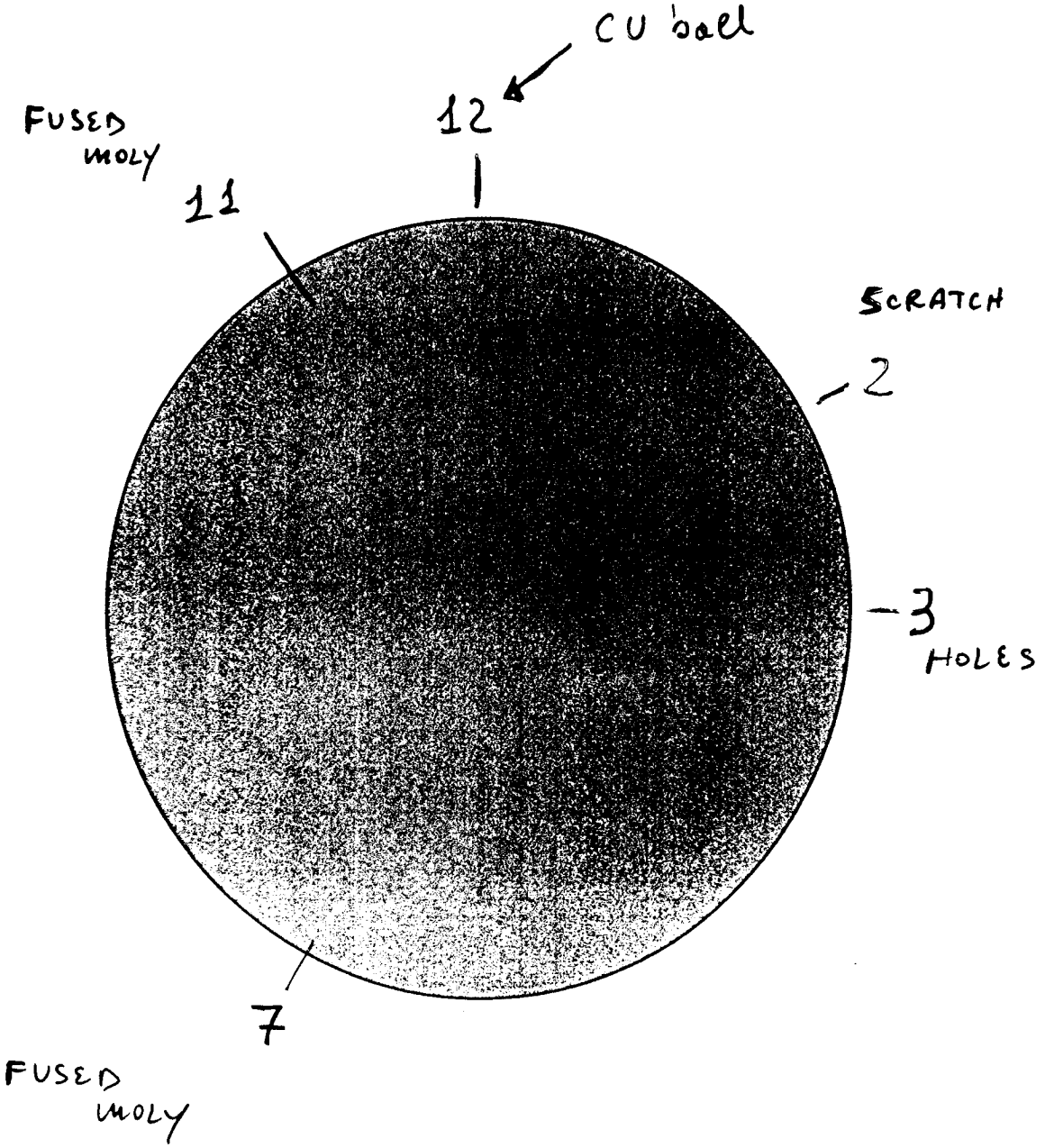


1d. - 200x OK 27

40 μm

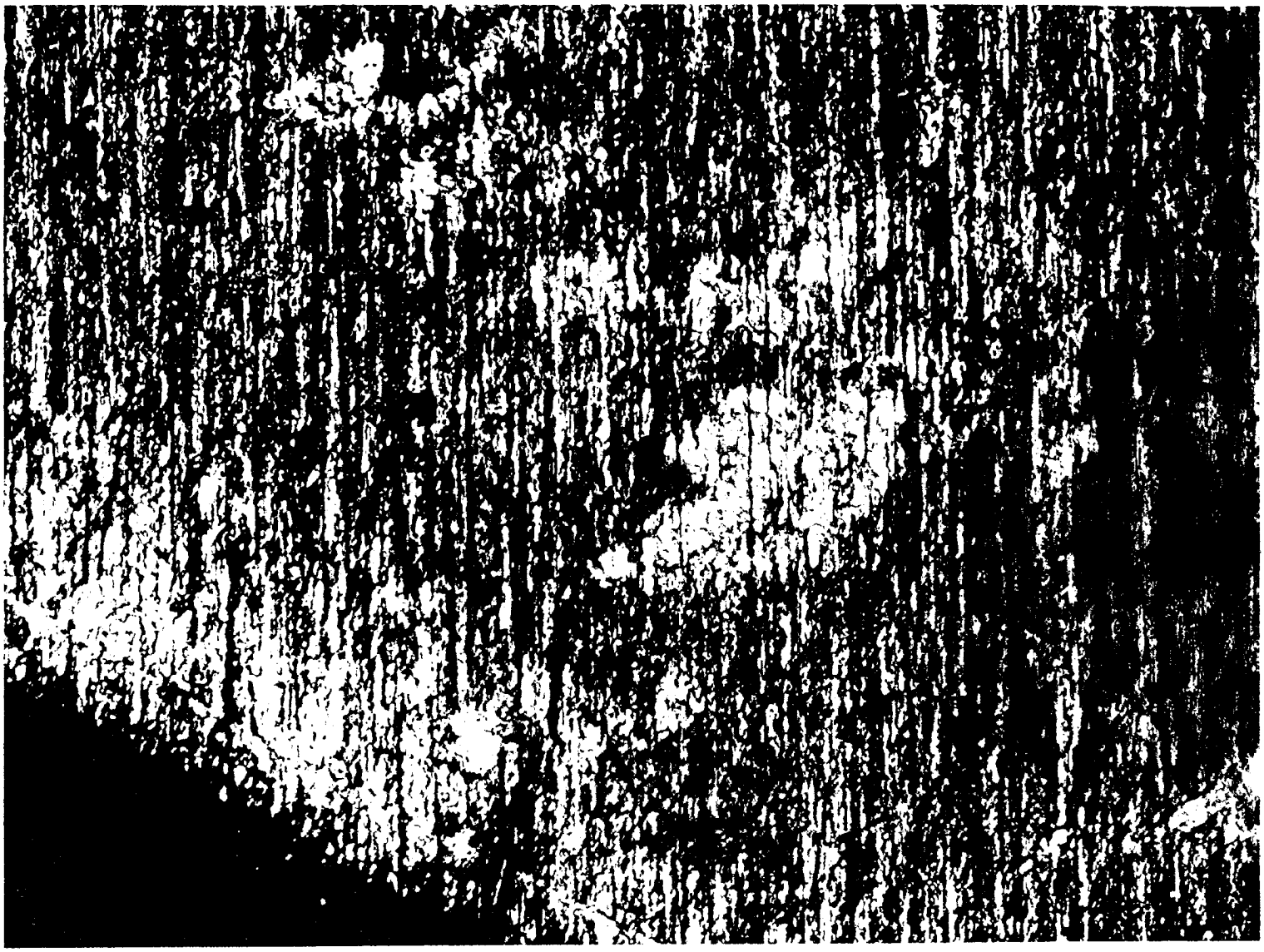
CATHODE SIDE VIEW

2C - MOLY - DESY RUN



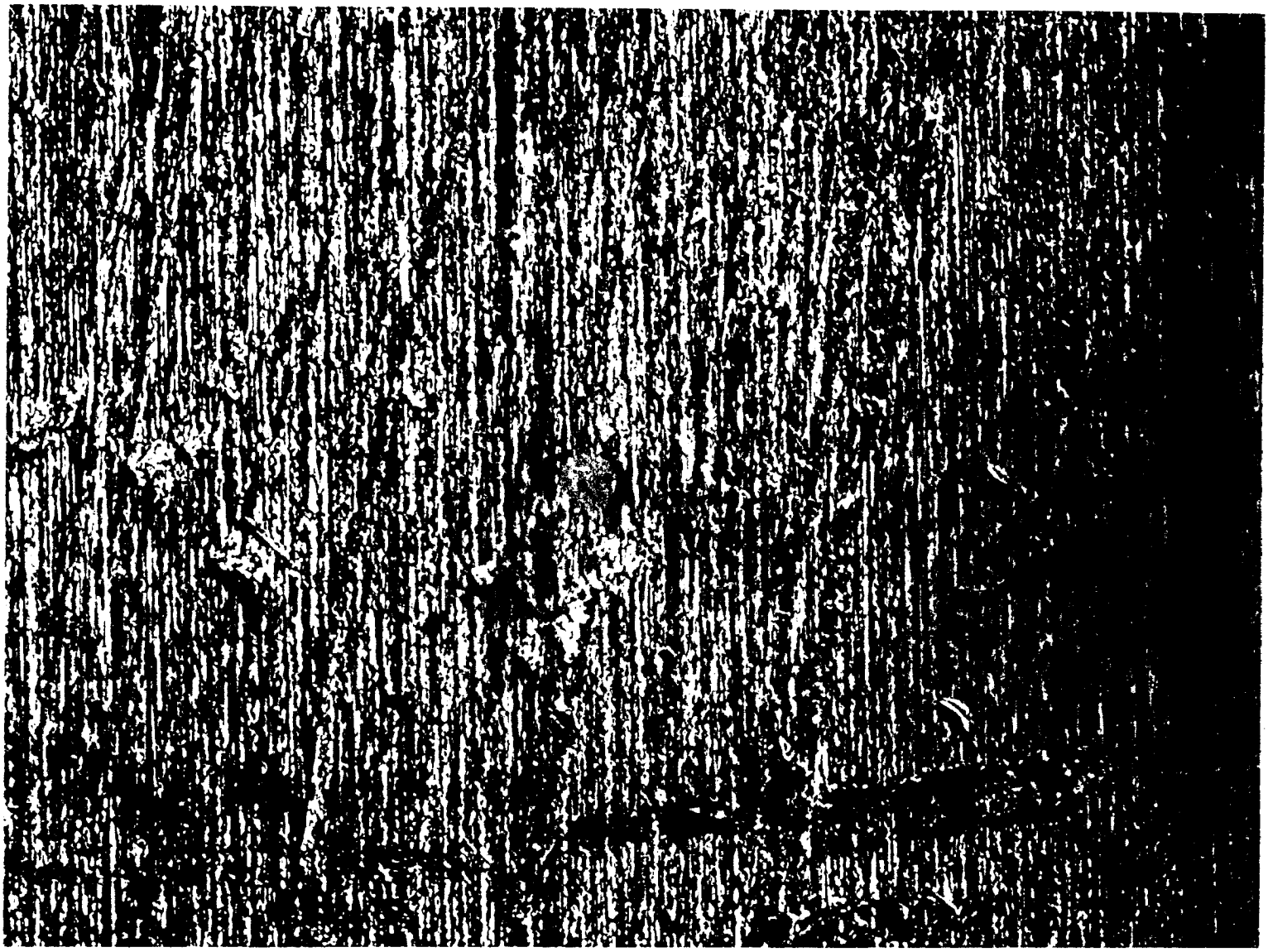
200 Nm

2C_100x_Mo.ORE3_DFIELD



200 µm

:C 100 × ORE 11

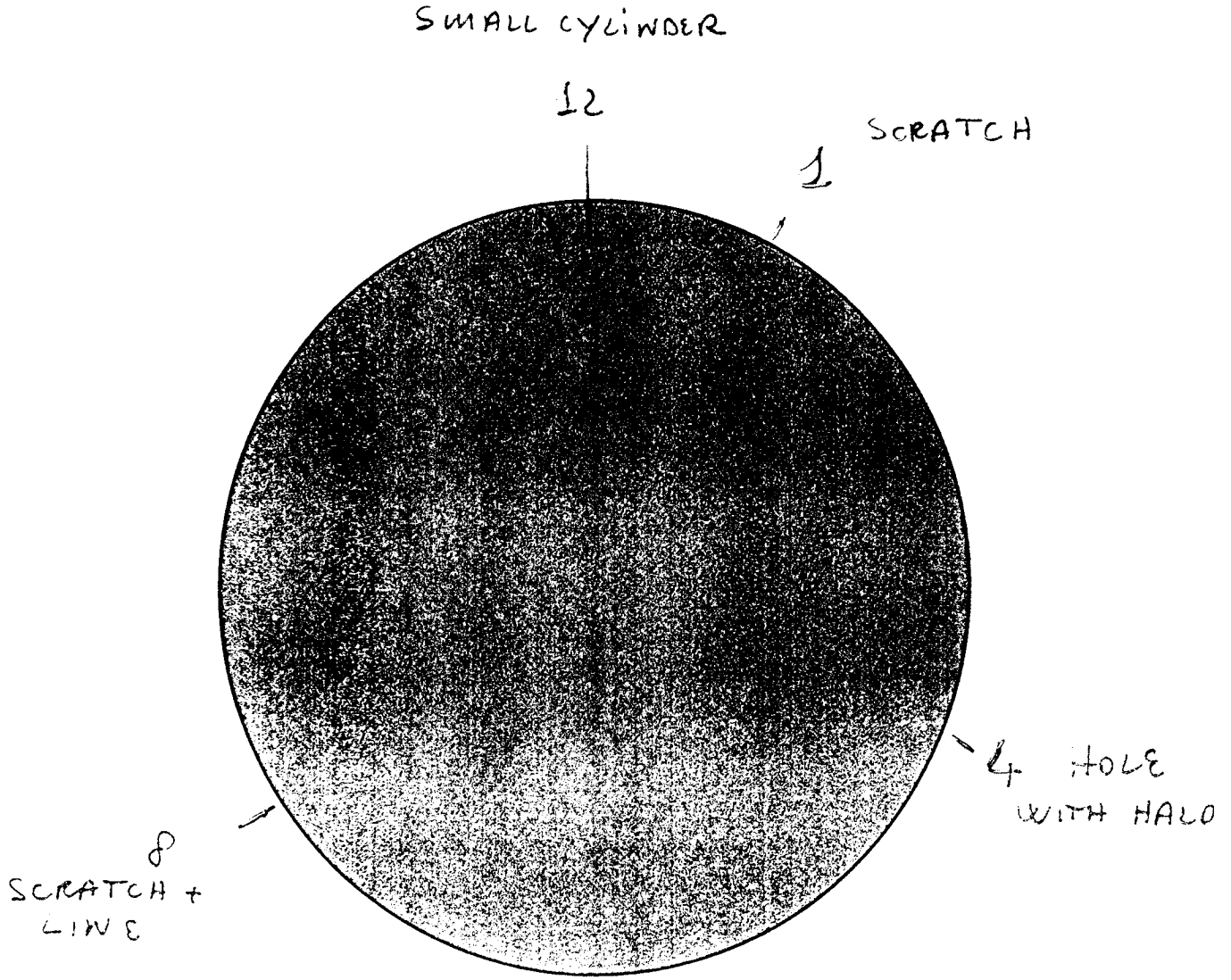


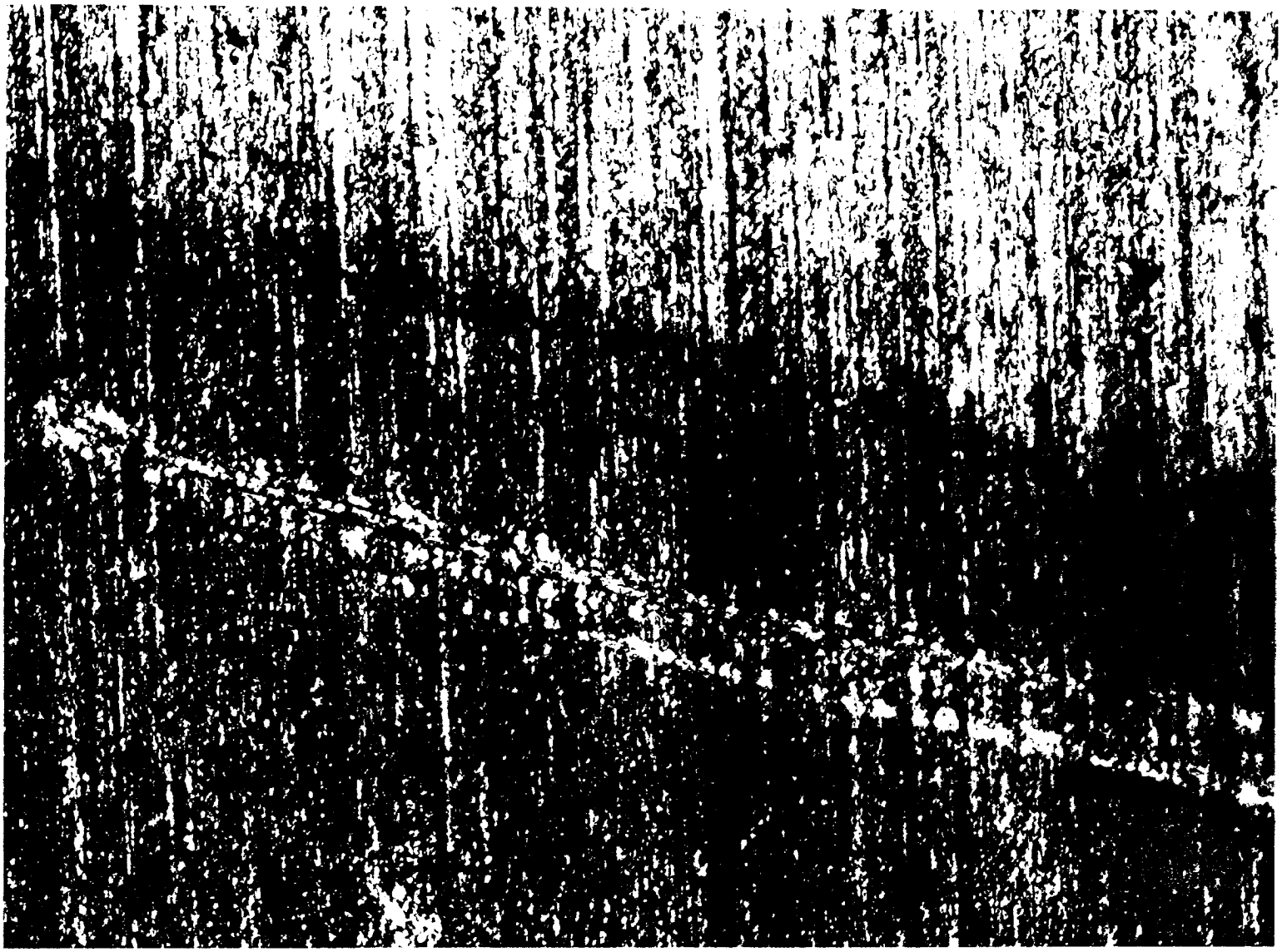
200 Nm

2C 100x ORS212

EC 100x Mo-OR-77

35 - Mo + Cs_2Te - DESY GUN



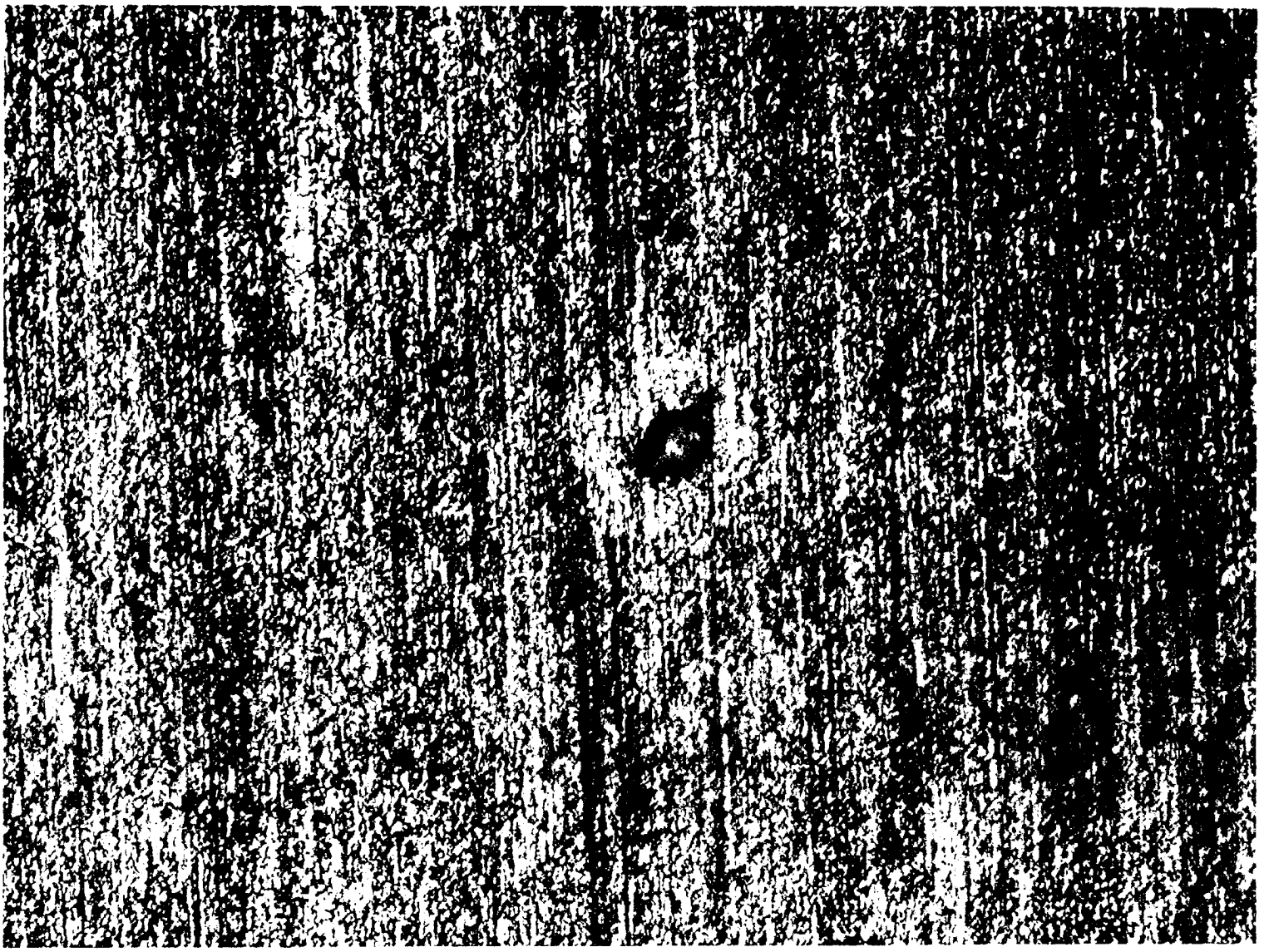


?S 100x ?2 Te one 1

200 Nm

SCRATCH + "LINE"

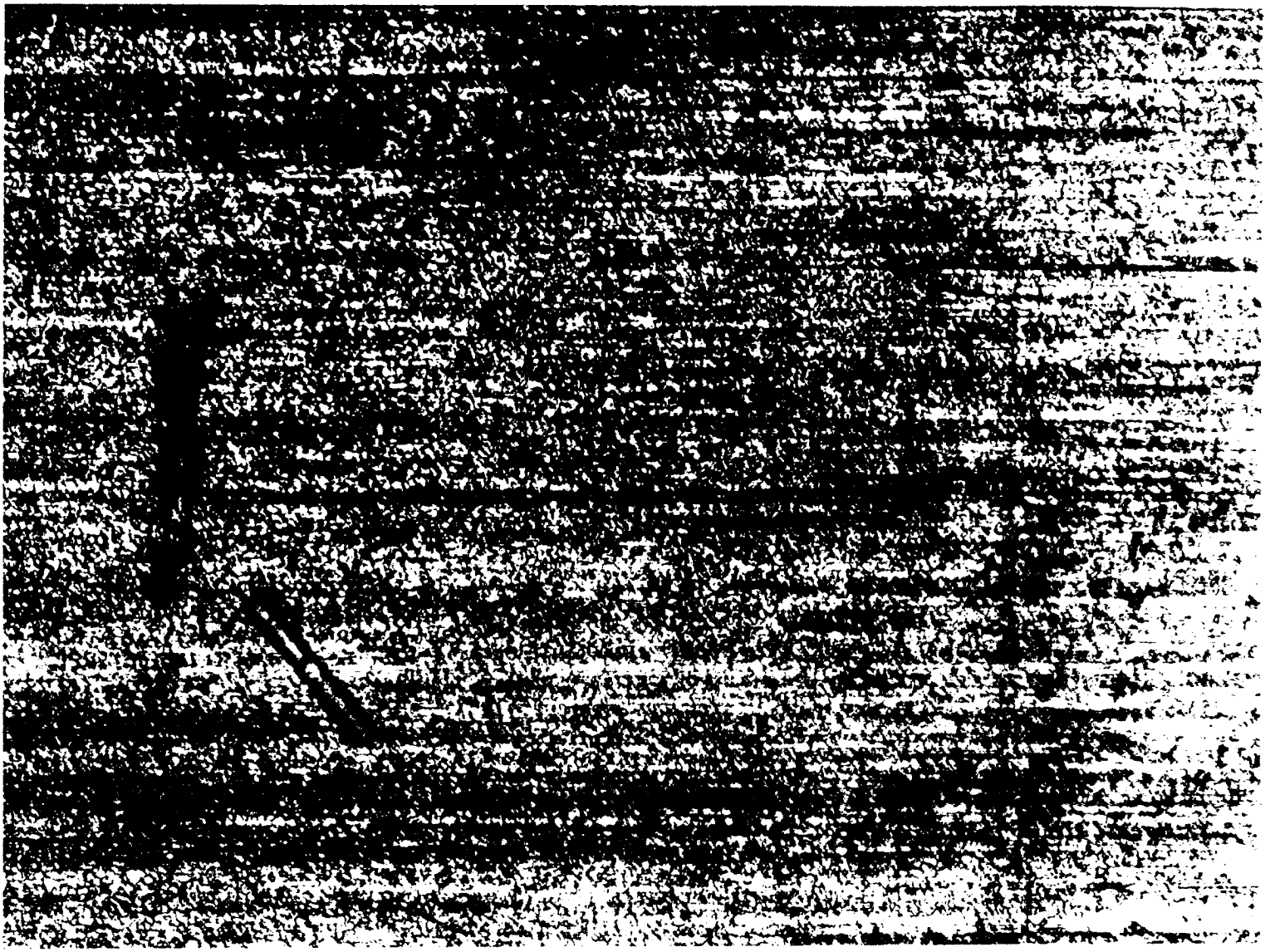
35 100× Sb_2Te one β



100 Nm

HOLE

35 200× Ni_2Te one 4



200 Nm

cylinder ?

oS S_2Te 100× me (?

≈ 30 nm

3S 630x Sb_2Te oe 12

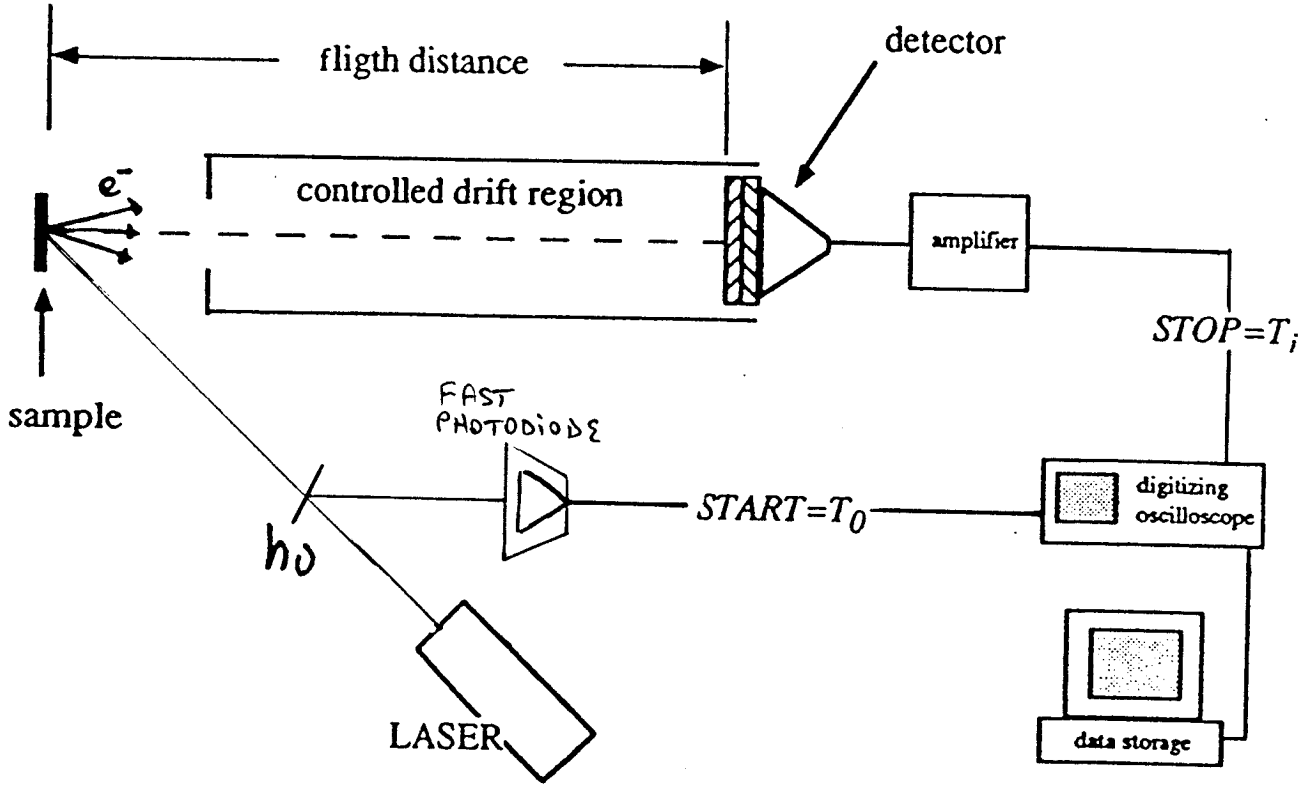
PHOTOCATHODE R&D

- TOF- FIRST MEASUREMENTS ON Mo ($\lambda = 262$ nm)

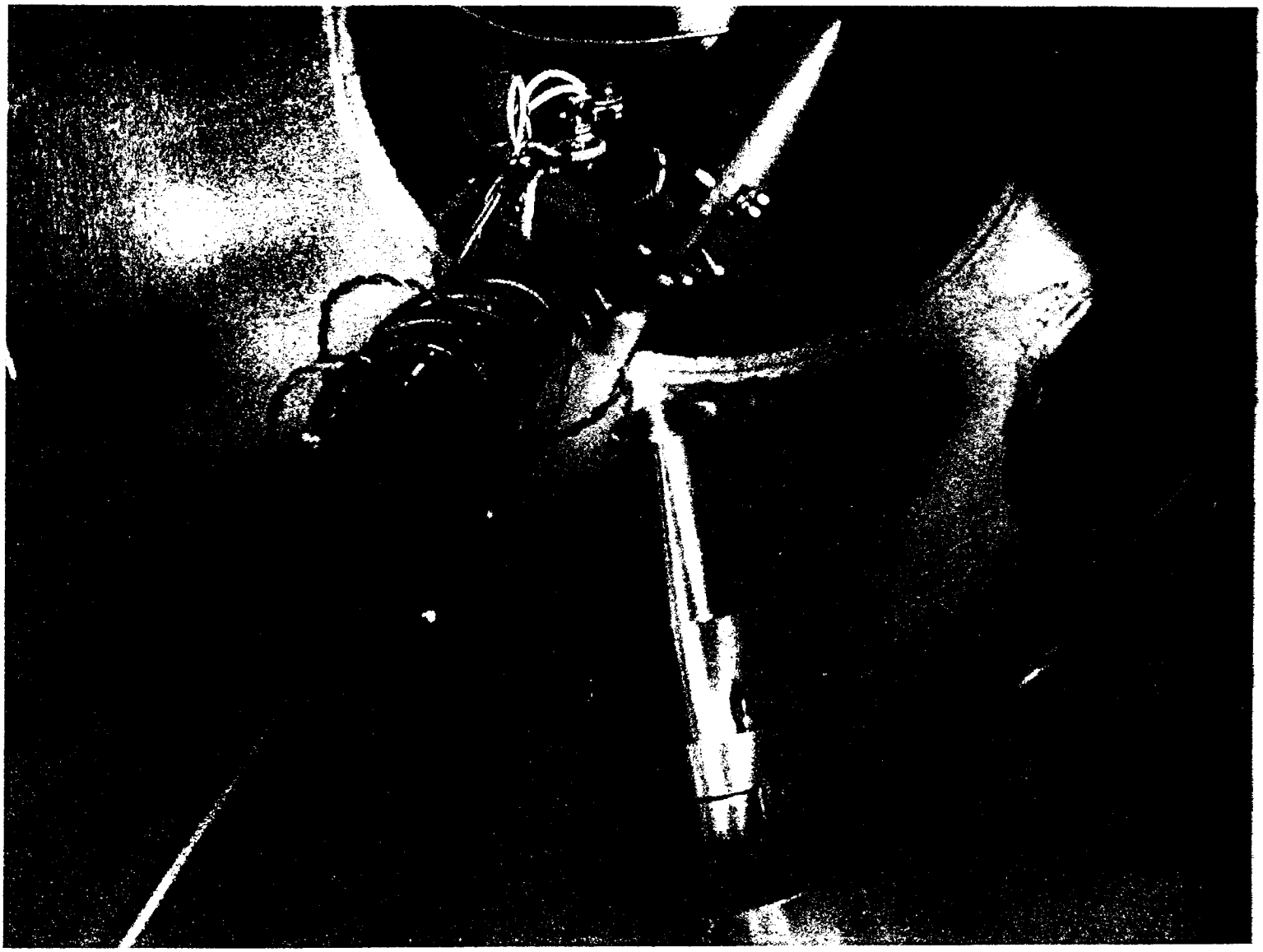
- Te growth (pillars!)
  (NO INFO. ABOUT Cs_2Te)

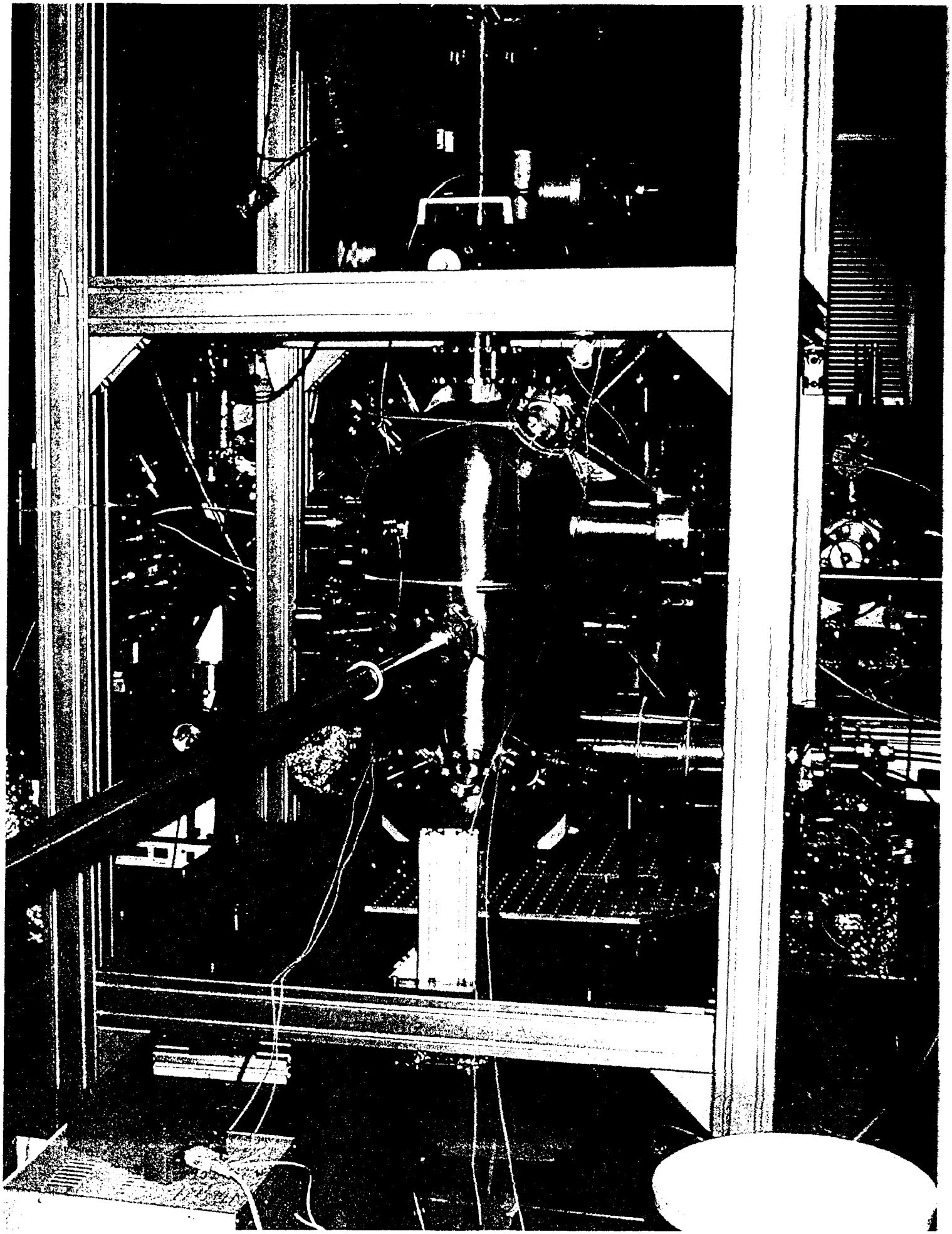
TOF

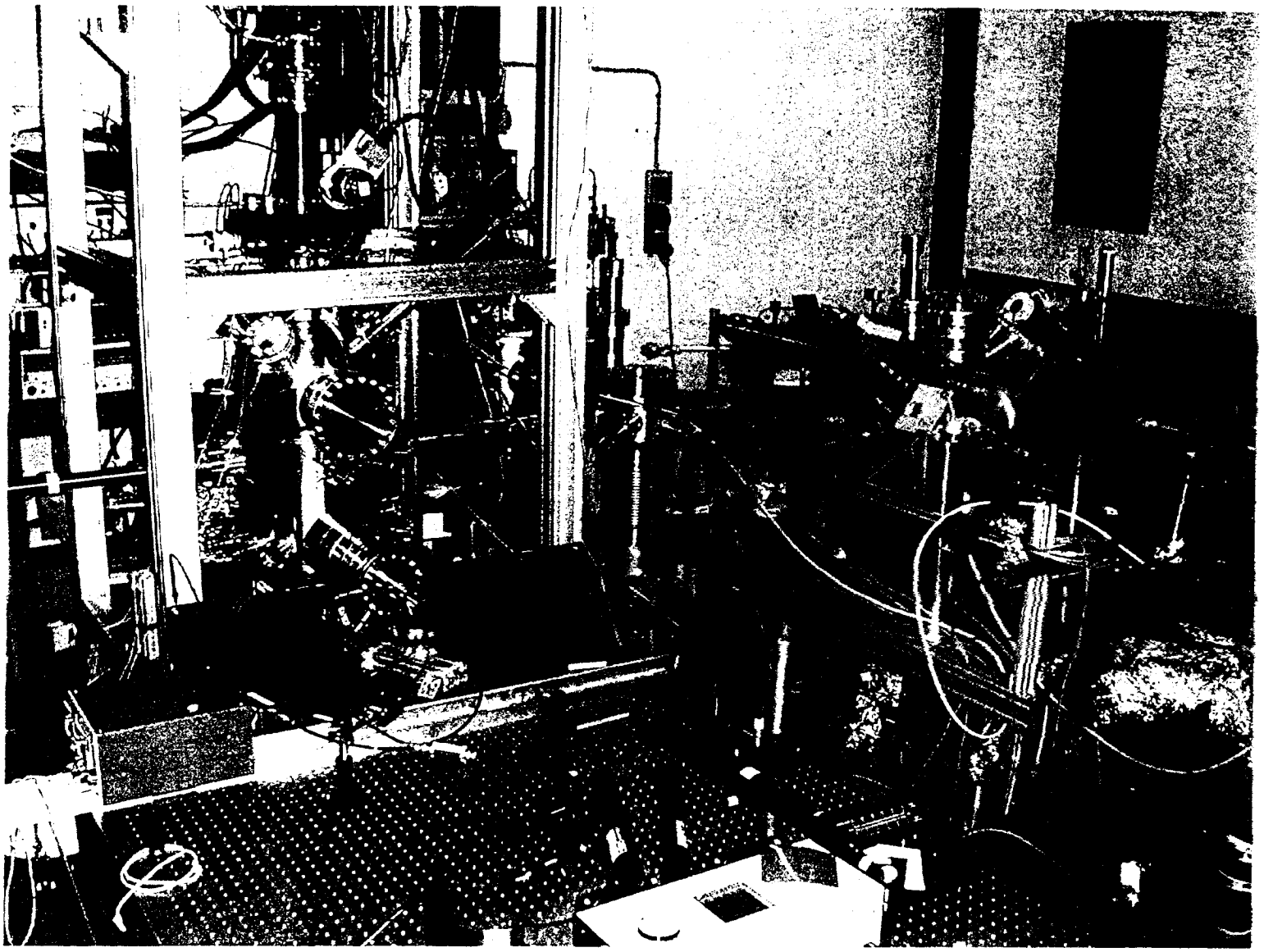
Time of flight



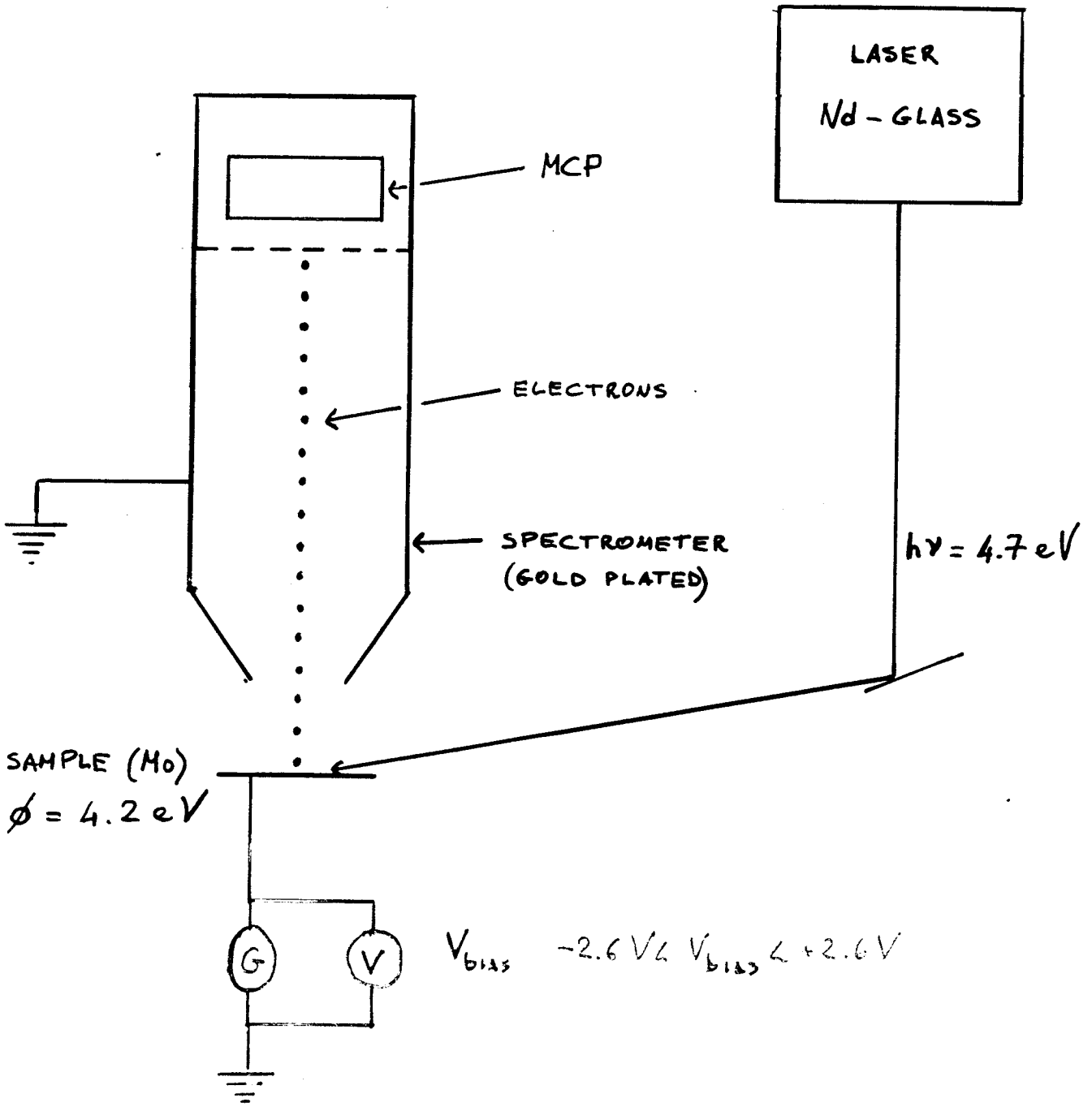
$$t = L \cdot \sqrt{\frac{m}{2E}}$$







FIRST OPERATION OF THE TIME-OF-FLIGHT (TOF) ELECTRON SPECTROMETER



CONTACT POTENTIAL NEUTRALIZATION ⇔ V_{bias}

NEXT MEASUREMENTS

- Ag
- Al
- Cu

| Spectrometer operation & calibration

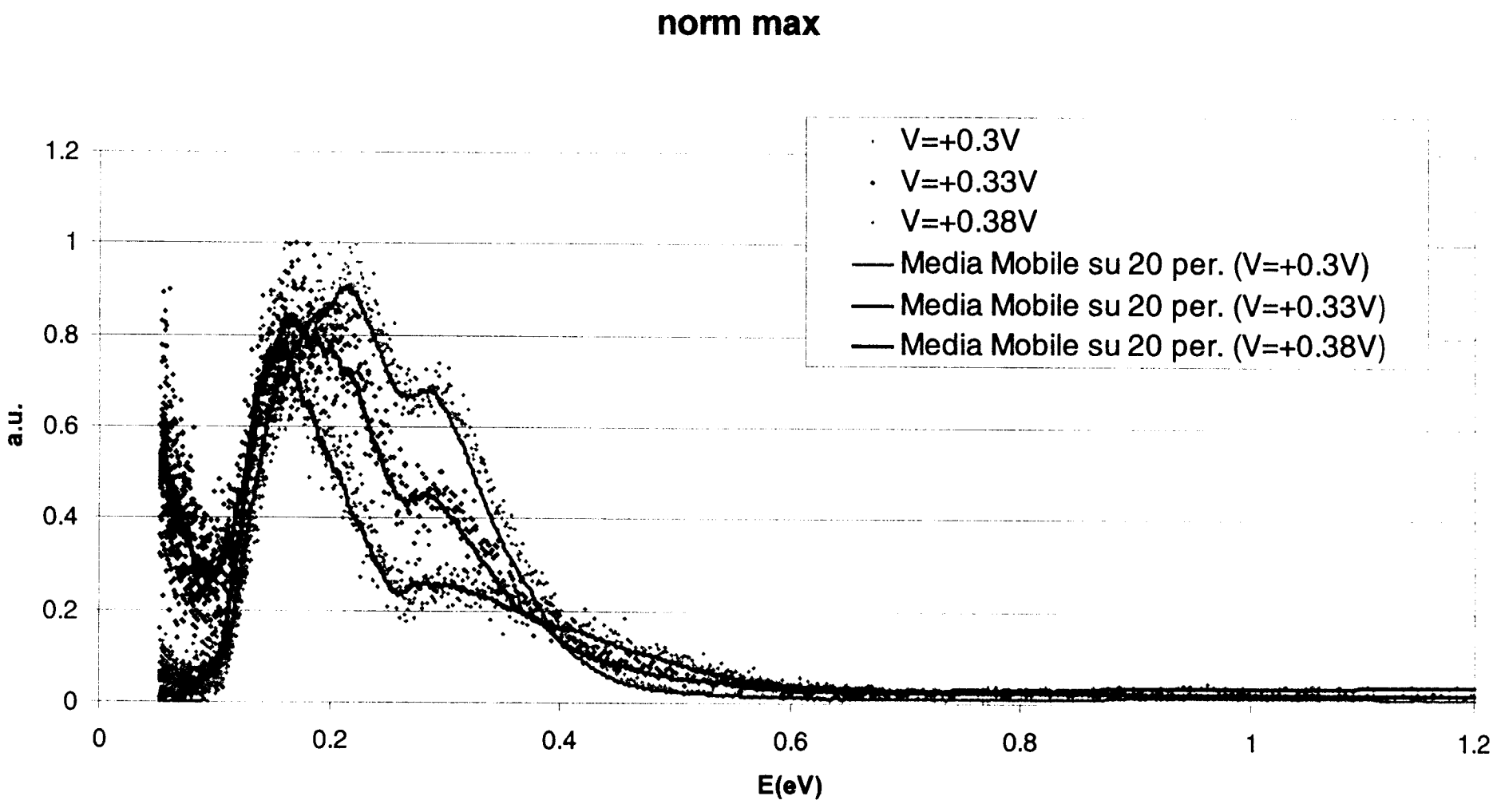
⇒ Cs_2Te on Mo

$E_g \approx 3.3 eV$

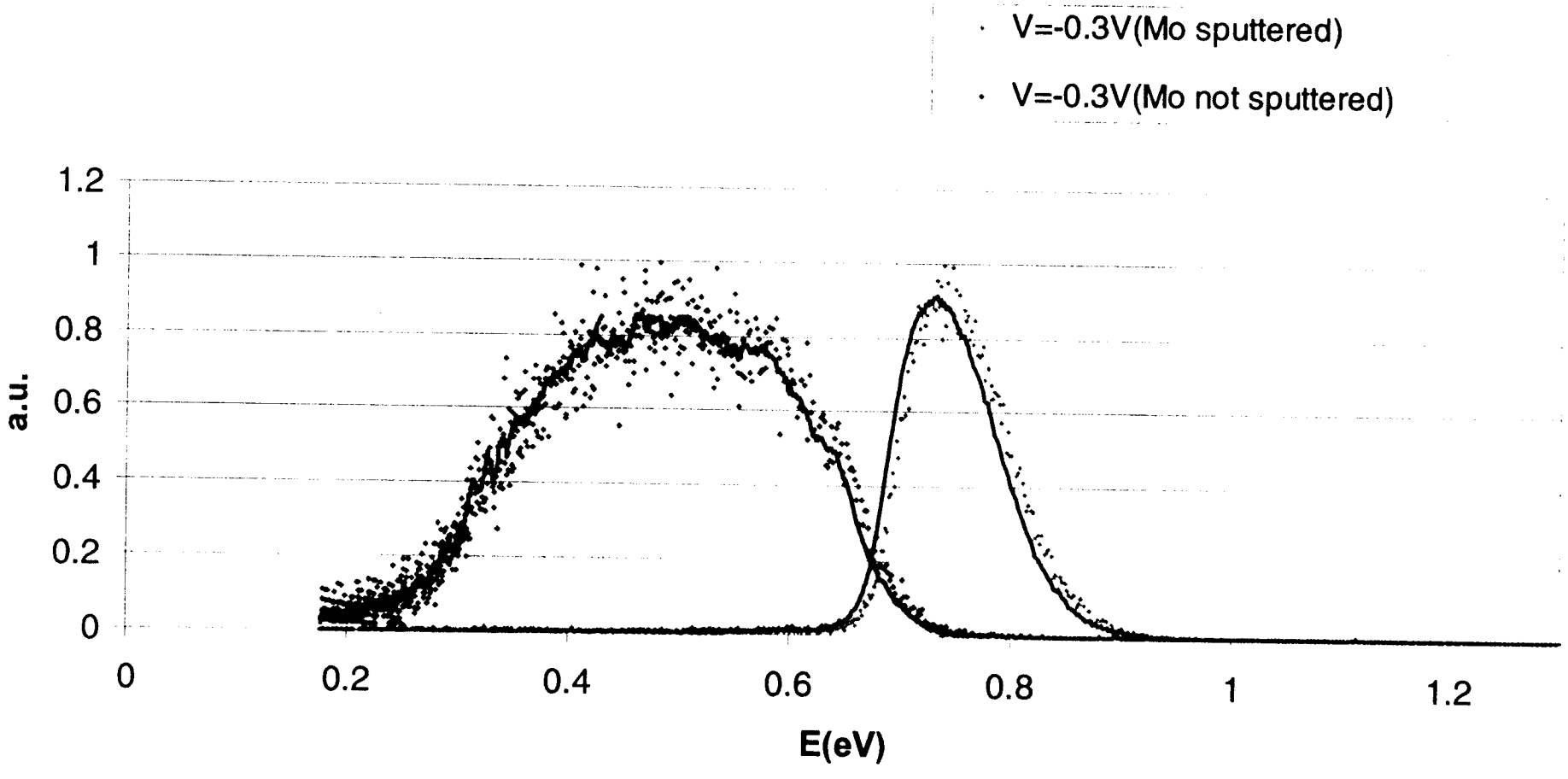
$E_a \approx 0.4 eV$

FIRST MAX IS 0.7 eV BELOW VBM

Experimental result



Mo - hν = 4.7 eV


V=-0.3V(Mo sputtered)
V=-0.3V(Mo not sputtered)
1.2
1
0.8
0.6
0.4
0.2
0
a.u.
0
0.2
0.4
0.6
0.8
1
1.2
E(eV)

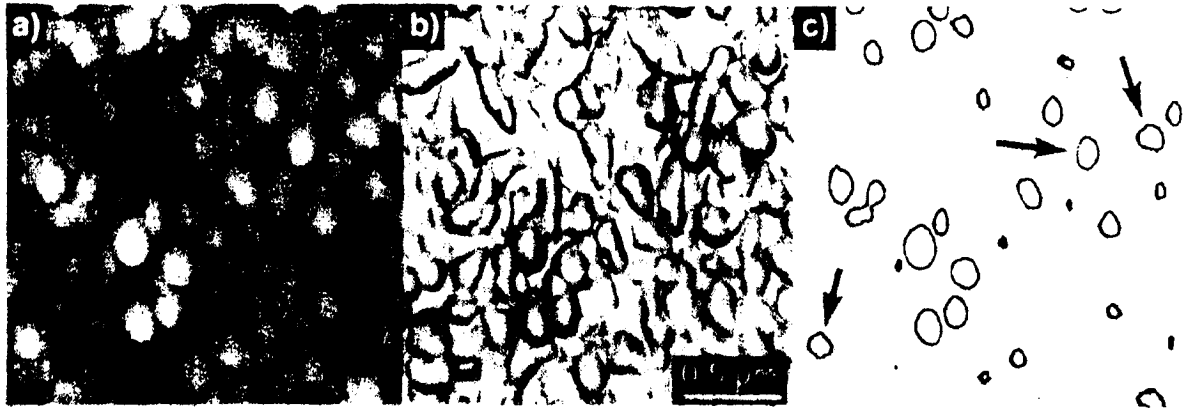


Fig. 4. AFM images at the coverage corresponding to Te/Mo = 1.6: (a) half-tone image, (b) 3*d*-rendered image, (c) contour plot (arrows indicate grain of nearly hexagonal symmetry).

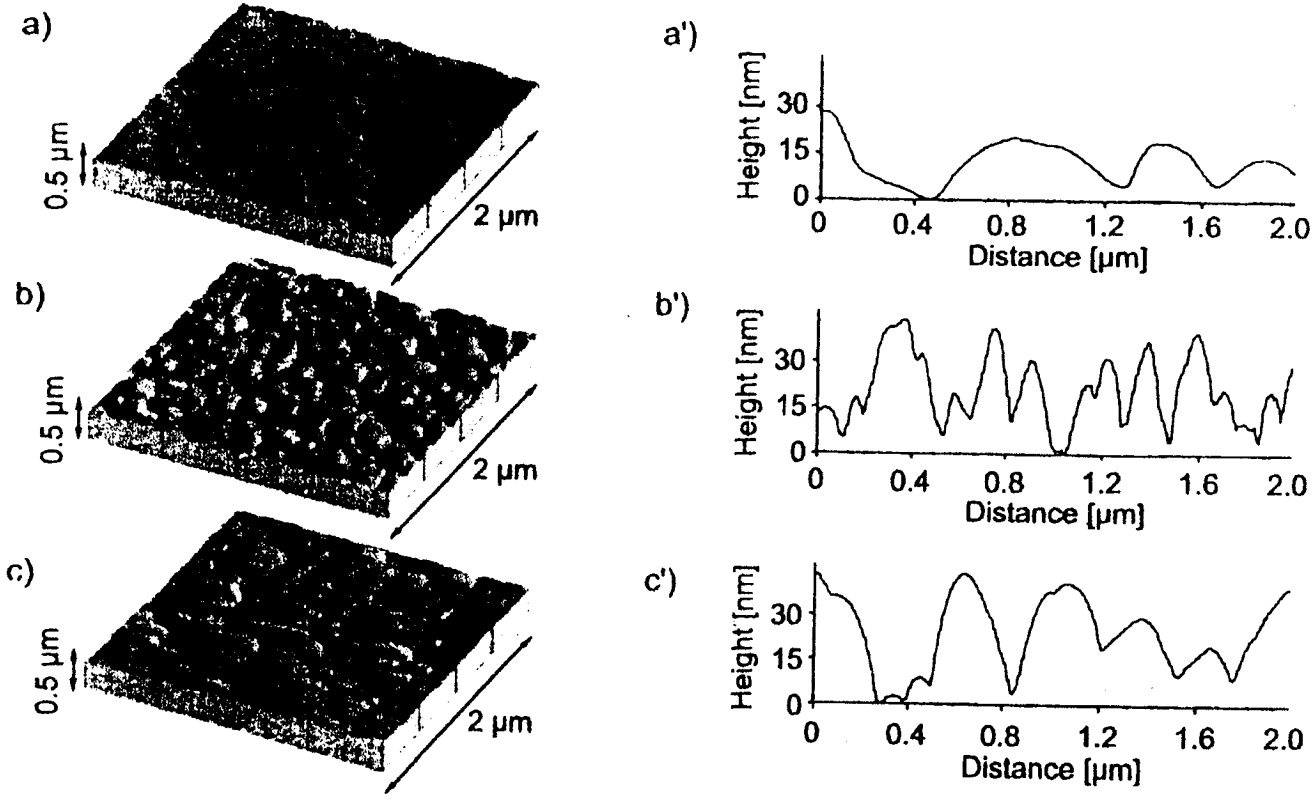


Fig. 3. AFM images of the Mo substrate (a), and of the Te film at two different Te coverages, corresponding to Te/Mo = 1.6 (b) and 5.7 (c). The (a'), (b') and (c') panels show the surface corrugation along a straight line of 2 µm.

S. VALERI et al; Thin Solid Films
352 (1999) 114

Conclusion

- Cs_2Te cathode operation OK
  ! DARK CURRENT MUST BE UNDERSTOOD AND REDUCED

- BEFORE NEXT SH. DOWN
  ⇒ ? K_2Te $KCsTe$ TEST ?

- NEW TRANSFER SYSTEM FOR THE DESY GUN AT DESY WITHIN END 99

- R&D TIME OF FLIGHT SPECTROMETER
  FIRST MEASUREMENTS

  Te GROWTH.