

JOHN WHELAN LIBRARY  
LA PALMA

RG0/LA PALMA TECHNICAL NOTE No. 35

Spectrum of the Copper-Neon lamp on the IDS

Plots of the spectrum cover the wavelength region 320-970nm from IPCS and CCD data taken on the INT on La Palma.

Dianne Harmer (RG0)

Richard Collins

28 November 1985



## SPECTRUM OF THE COPPER-NEON LAMP ON THE IDS

### 1. INTRODUCTION

This series of maps of the copper-neon spectrum is provided in the same spirit as the earlier copper-argon maps, that is, spectra at some representative integration time are shown, with a standard slit width and useful filter combinations. It is not so complete as the copper-argon survey, in that only a few gratings have been used and all data is from the 235 camera. However, this is probably adequate in view of the nature of this particular spectrum.

### 2. THE SPECTRUM

The neon spectrum is dominated by very strong features due to NeI in the wavelength range 5850-7440Å, and continues redwards with prominent lines between 7500 and 9600Å, although these are as much as ten times fainter than those in the former range. Bluewards, neon lines, both NeI and NeII, appear only weakly, and the copper spectrum provides the strongest features. Even so, the strong copper line (CuI) at 5105Å is barely one-twentieth the intensity of the principal NeI lines described earlier.

This implies that for low dispersion work the copper-neon lamp is only really useful for wavelength calibrations in the red, whilst the red features are so spaced that at high dispersions very few lines may be present in certain wavelength intervals. In the blue, at intermediate and high dispersions, it may be useful to supplement the argon spectrum in regions where this is a bit sparse e.g. 3300-4000Å etc., but significantly longer integrations would be necessary to bring up the few NeII lines below 3250Å.



### 3. THE DATA

The data used for these arc maps were obtained by Paul Murdin (IPCS) and Charles Jenkins (CCD).

The IPCS data covers 3200-8900 using the 1200g/mm and R400V gratings on the 235 camera. It is perhaps a little misleading in the far red because of the inherent intensity of the neon spectrum compensating for fall-off in image tube sensitivity, but is a useful identification guide.

To supplement this, some data from a few CCD frames have been added to extend the material to 9700A, taken with the R632V grating on the 235 camera.

According to wavelength tables, it should be possible to reach a few weaker lines redward of this, in particular in the 1.0-1.1 $\mu$ m region. Careful second-order filtering would be required, and probably considerable patience, but CCD frames in this wavelength range need to be calibrated if work is to be carried out, say, on the 10830A line.

### 4. THE PLOTS

While direct pictures of the lamp spectrum are reproduced for both IPCS and CCD data in the first 3 figures, plots are only given for the IPCS. Full details of the instrument configuration are given with each plot, which shows 2000 channels as the mean of five central cross sections in histogram form, together with a representation of the spectrum as if on the 1311 display.

Less data are available for the CCD frames, and these are offered only as an extension to the line identification sequence.

On the plots, a few of the principal lines have been labelled, but the sources of reference for detailed identification are:



## 5. PRINCIPAL REFERENCES

- New lines "The Iron-Neon Hollow-Cathode Spectrum". H M Crosswhite.  
J. Res. N.B.S. 79A, 17, 1975.
- Copper lines Tables of Spectral line intensities arranged by Elements.  
W F Meggers, C H Corliss, B F Scribner.  
N.B.S. Mono. 32., 61, 1961.

Both supplemented by data from

M.I.T. Wavelength Tables, G R Harrison (Wiley, 1939)  
Revised Multiplet Tables, Moore, C E  
N.B.S. Tech. note 36 (1959).

## 6. ACKNOWLEDGEMENTS

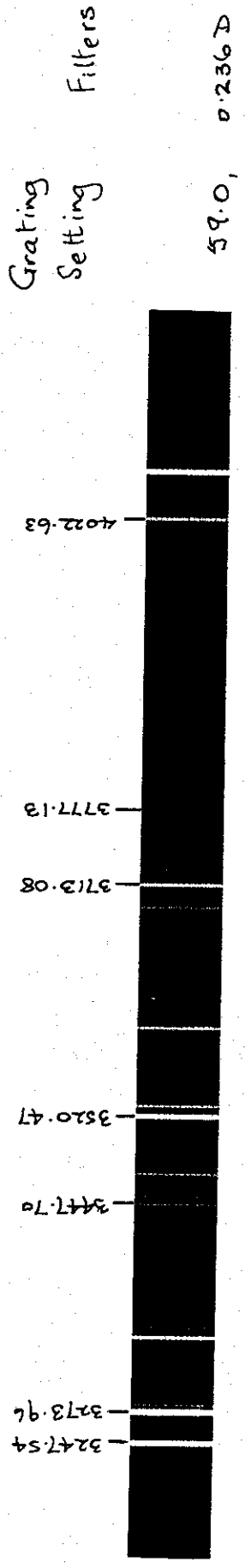
This note is offered in response to many requests for information on the copper-neon spectrum. With the instrumentation less available for detailed work of this nature, we are obliged to coerce observers into providing self-consistent sets of data for us to present to users. We are therefore most grateful to Paul Murdin for his painstaking trip through the necessary routines to provide the IPCS material, and we thank Charles Jenkins for permitting us to use data from a few of his CCD test frames to extend the wavelength coverage. Richard Worth patiently produced the photographs from the Starlink display monitors, and we appreciate his contribution.

Finally, we would be grateful if any errors could be brought to the attention of Bill Martin, who cares for the general documentation.





Grating  
Setting      Filters



56.0, 1.126D



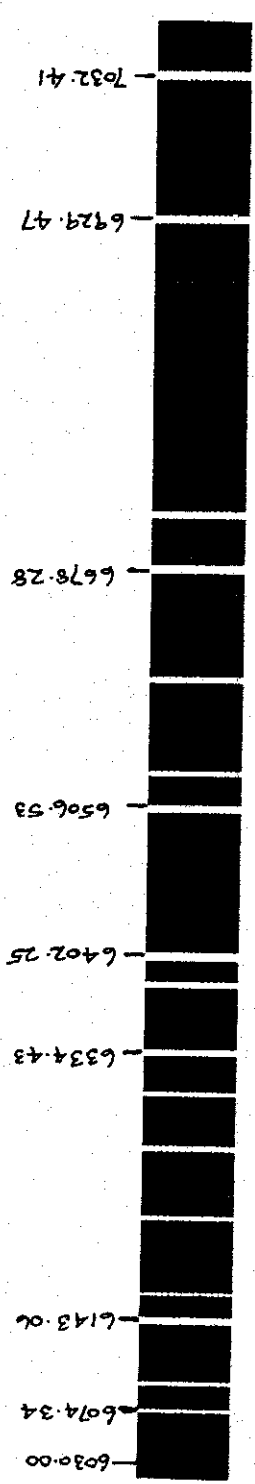
54.0, 2.0D



52.0, 3.33D



48.0, 3.5D

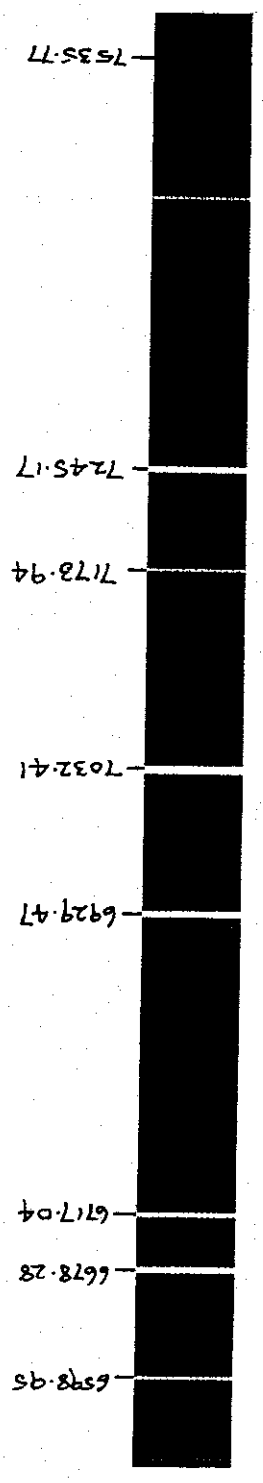


Copper-Neon lamp, 235 Camera, Grating R1200B, 1PCS

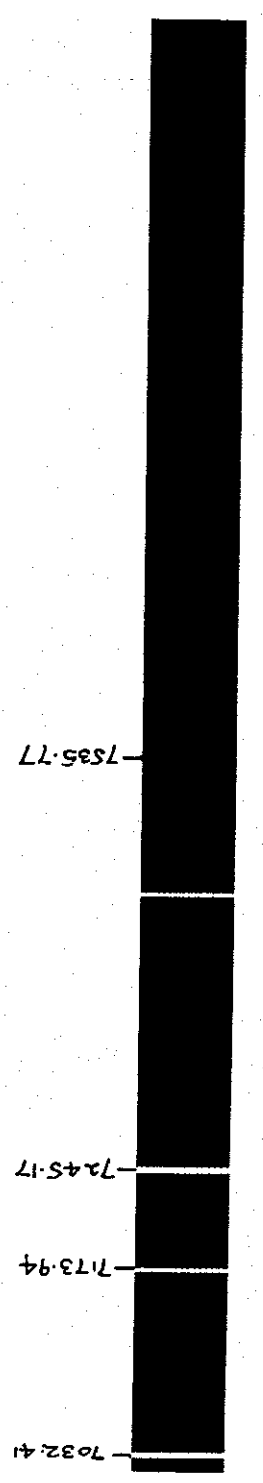


Grating  
Setting  
Filters

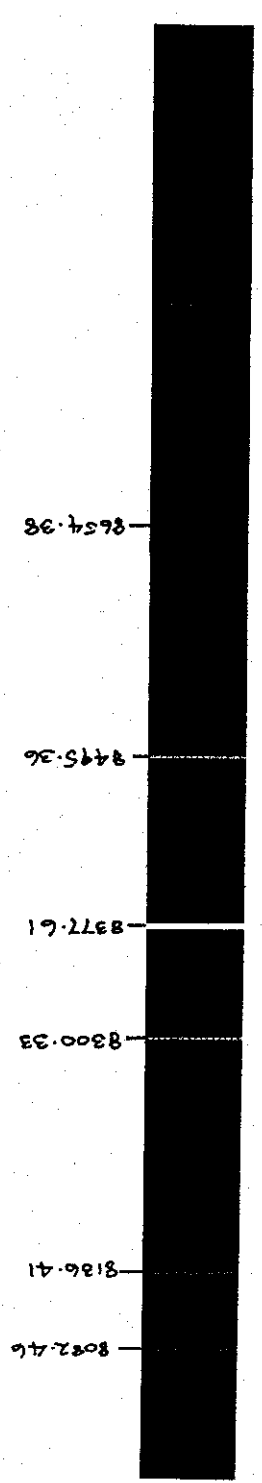
46.0, 4.2D



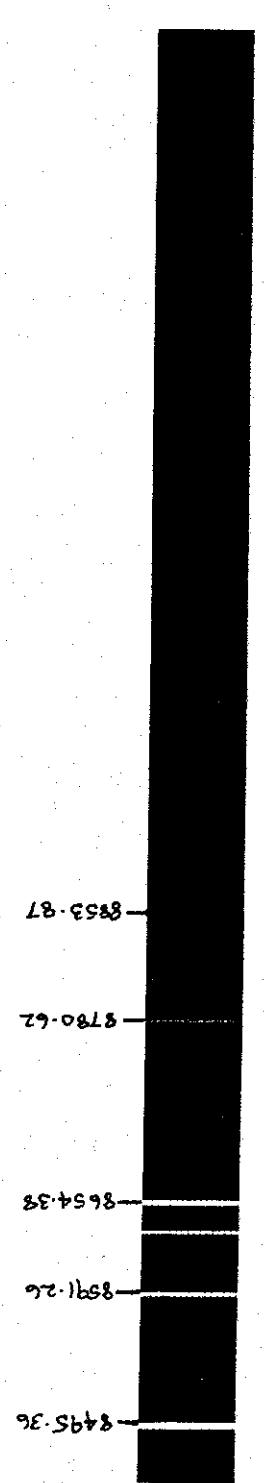
44.0, 3.5D



42.0, 2.0D + GG495



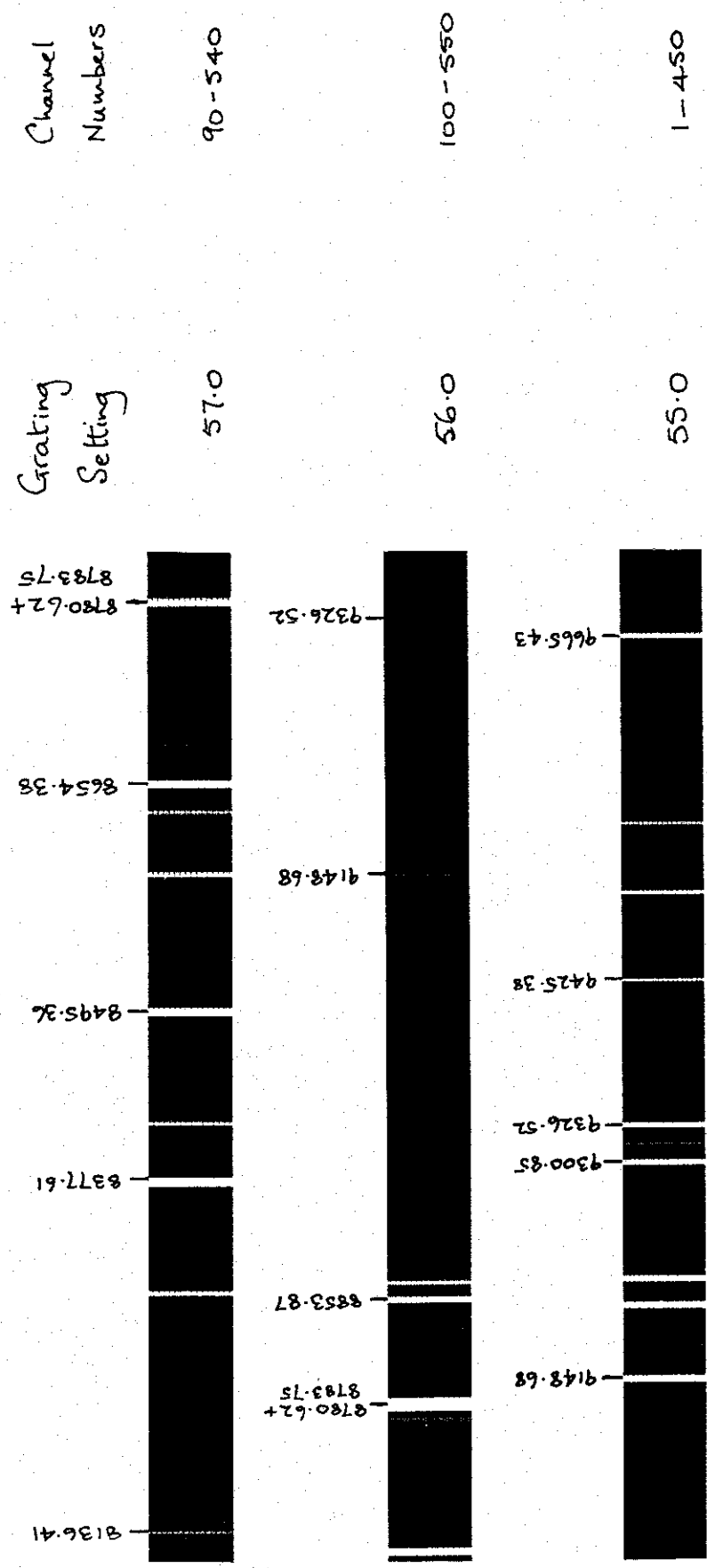
40.0, 2.0D + GG495



38.0, 0.5D + GG495

Copper-Neon lamp, 235 Camera, Grating R1200R, IPCS





Copper-Neon lamp, 235 Camera, Grating R600I, GEC CCD.



**HIGH DISPERSION CU-NE ARC MAPS 8350-3250**

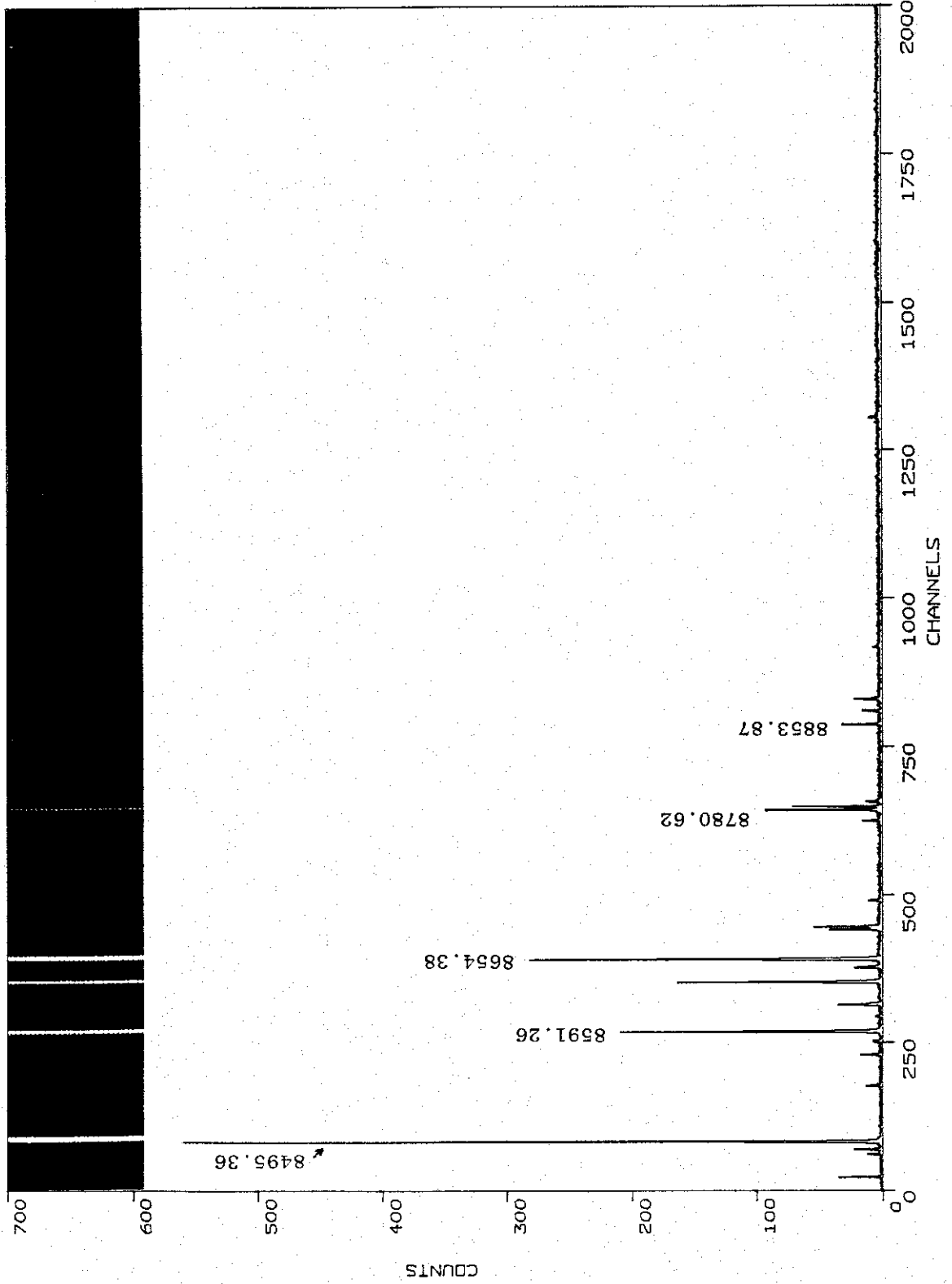




CU-NE  
IPCS  
235  
R 1200R



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200R

SETTING ..... 38.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 11.9 MICRONS

FILTERS ..... 0.50D

..... (A=0, B=2)

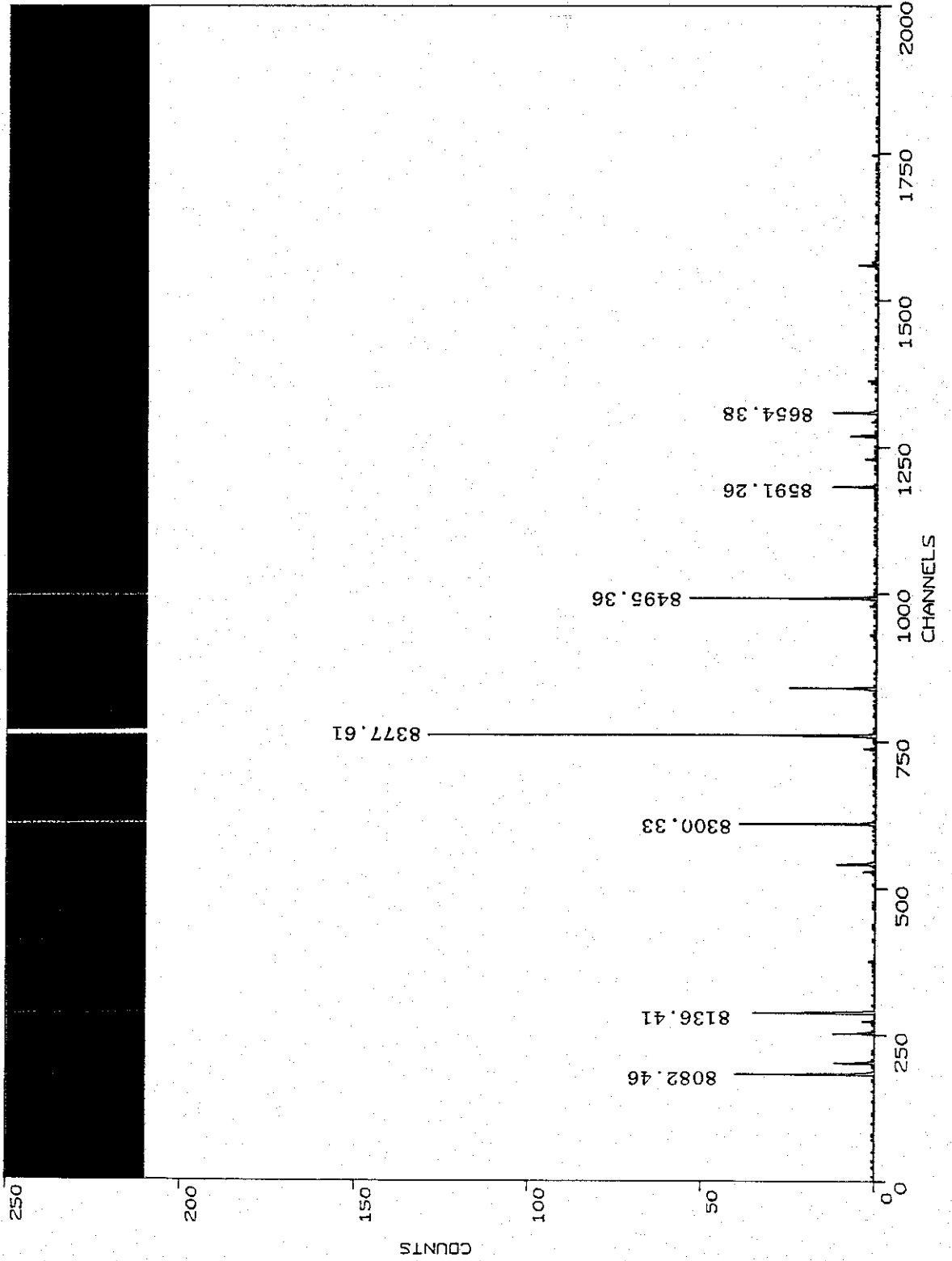
..... GG495

EXPOSURE ..... 200S

SOURCE ..... CUNE



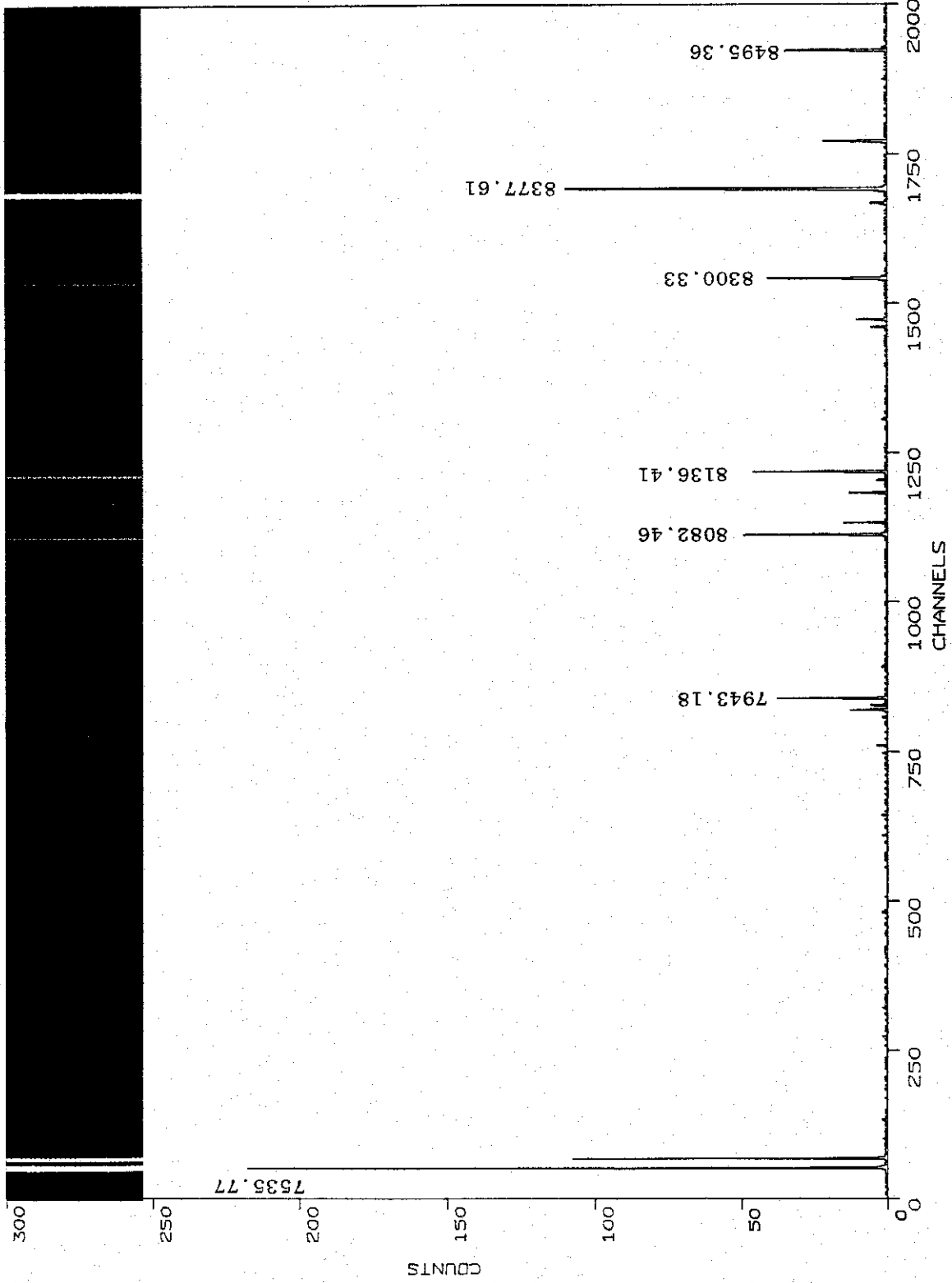
235 CAMERA WITH IPCS



KEY  
GRATING ..... R1200R  
SETTING ..... 40.0  
SLIT ..... 100 MICRONS  
..... 0.54 ARCSEC  
PROJ. SLIT ..... 12.3 MICRONS  
FILTERS ..... 2.00D  
..... (A=3, B=4)  
..... GG495  
EXPOSURE ..... 200S  
SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200R

SETTING ..... 42.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 12.7 MICRONS

FILTERS ..... 2.00D

..... (A=3, B=4)

..... GG495

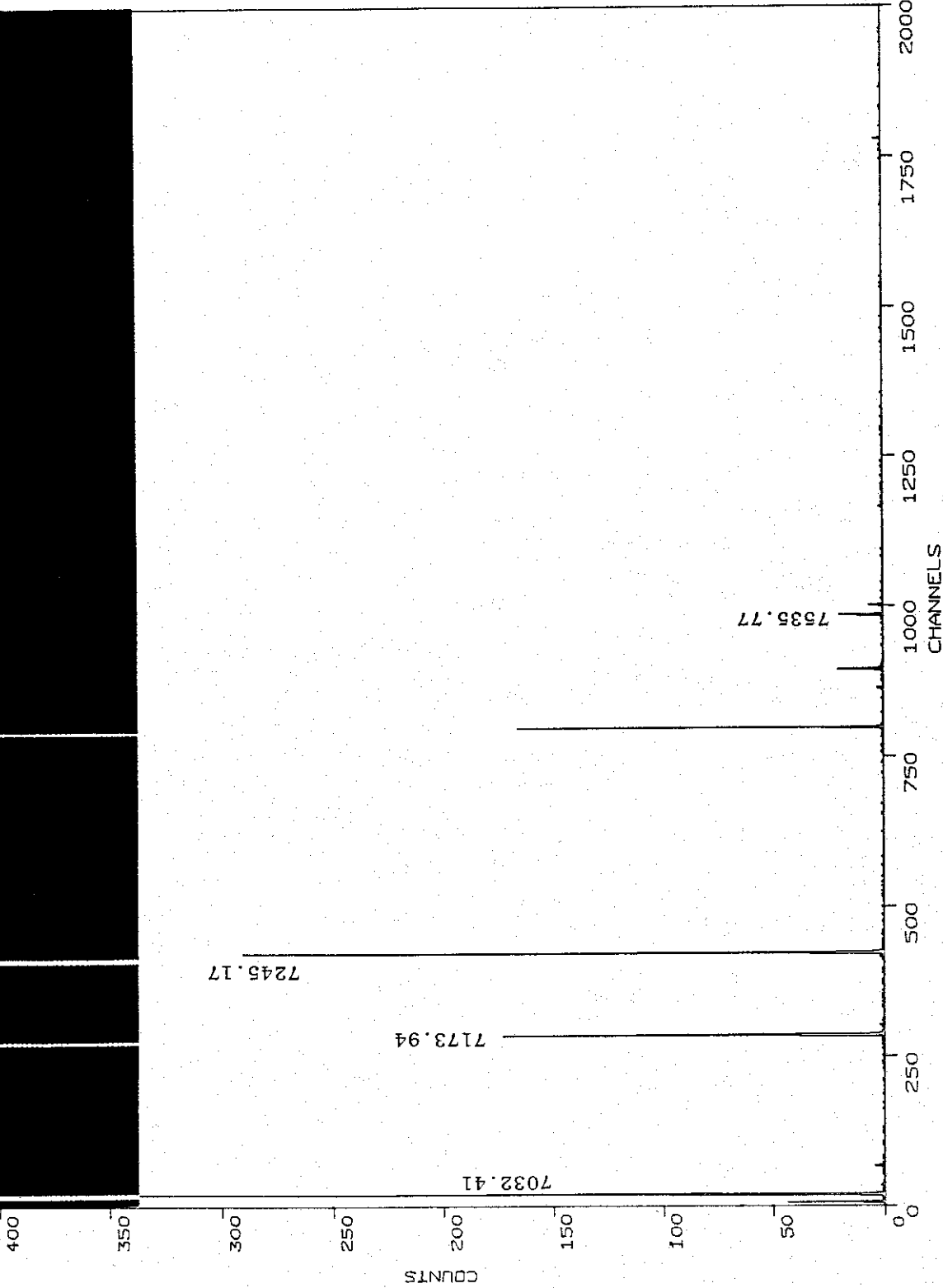
EXPOSURE ..... 200S

SOURCE ..... CUNE





235 CAMERA WITH IPCS



KEY

GRATING ..... R1200R

SETTING ..... 44.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 13.1 MICRONS

FILTERS ..... 3.50D

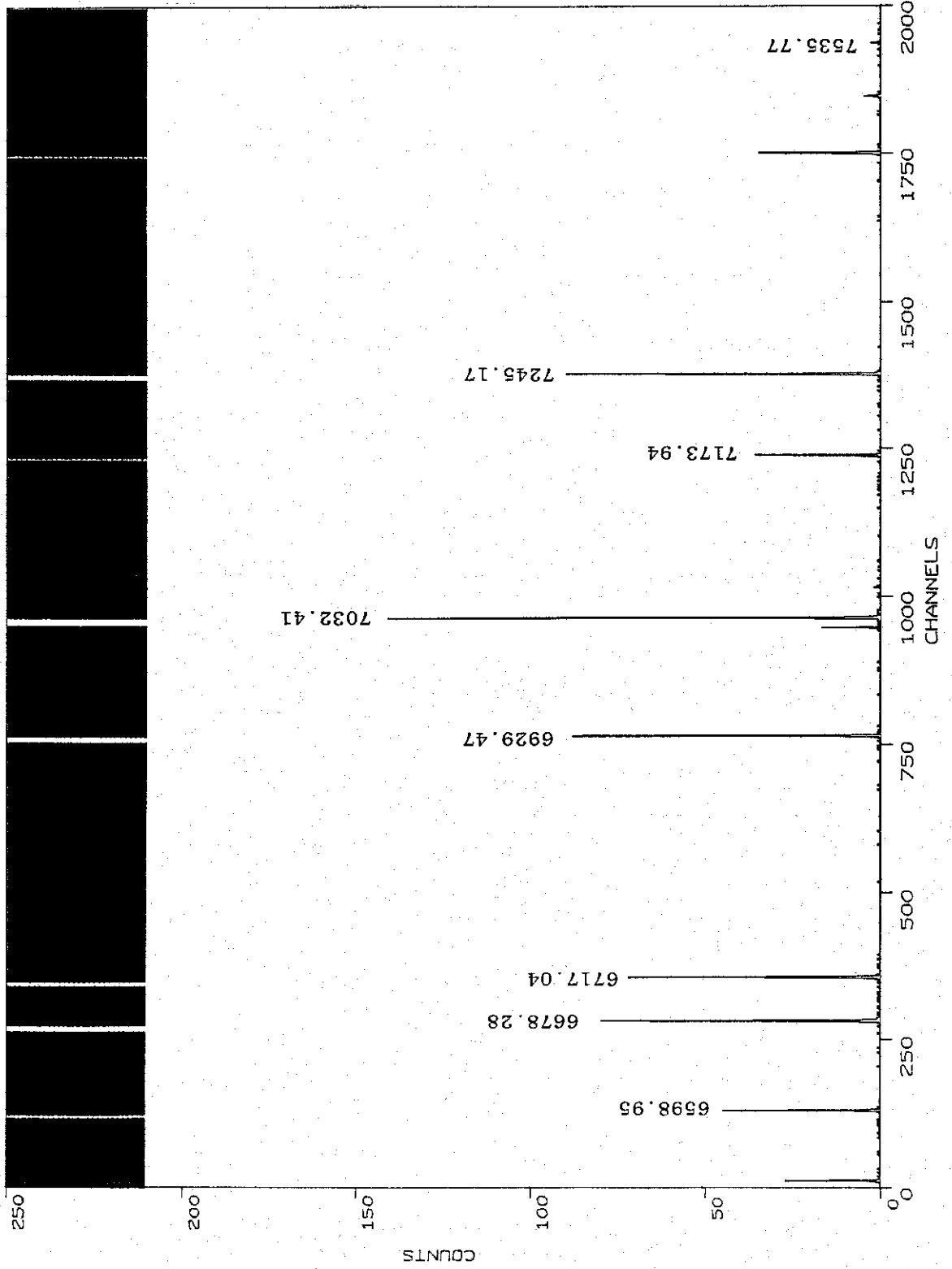
..... (A=5, B=2)

EXPOSURE ..... 200S

SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200R

SETTING ..... 46.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 13.5 MICRONS

FILTERS ..... 4.20D

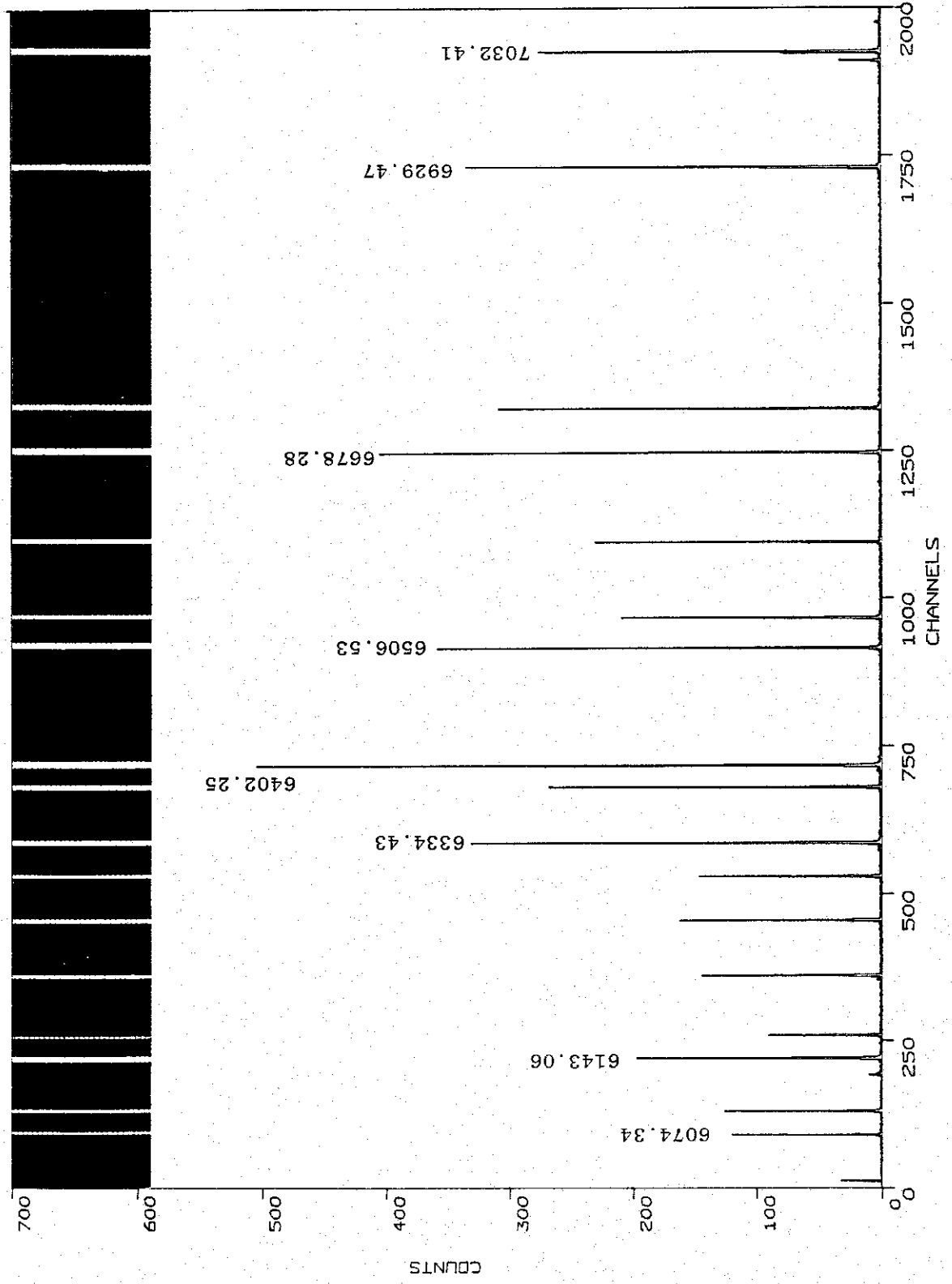
..... (A=5, B=4)

EXPOSURE ..... 200S

SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200R

SETTING ..... 48.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 13.9 MICRONS

FILTERS ..... 3.5D

..... (A=5, B=2)

EXPOSURE ..... 200S

SOURCE ..... CUNE

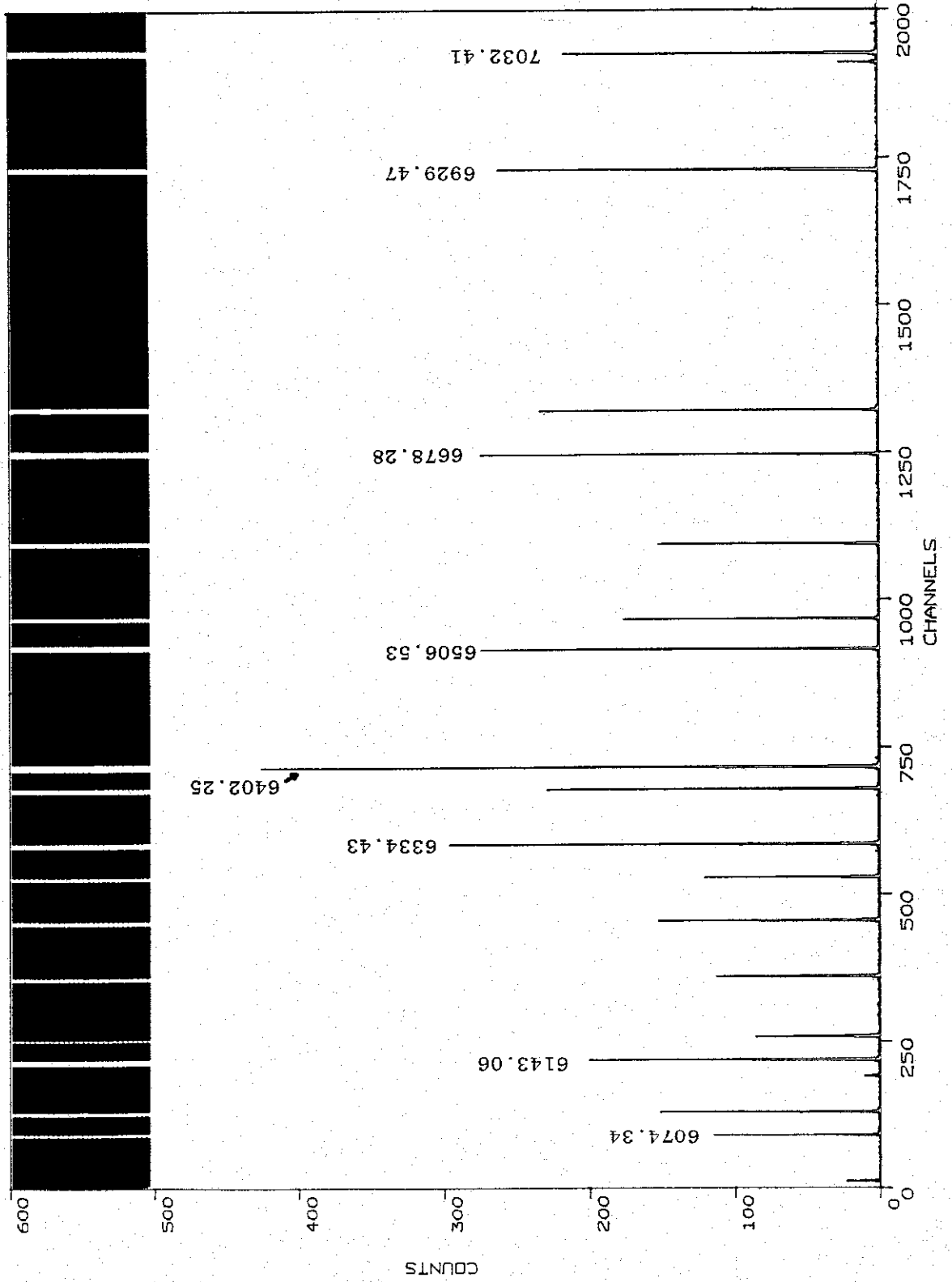


CU-NE  
IPCS  
235  
R 1200B





235 CAMERA WITH IPCS

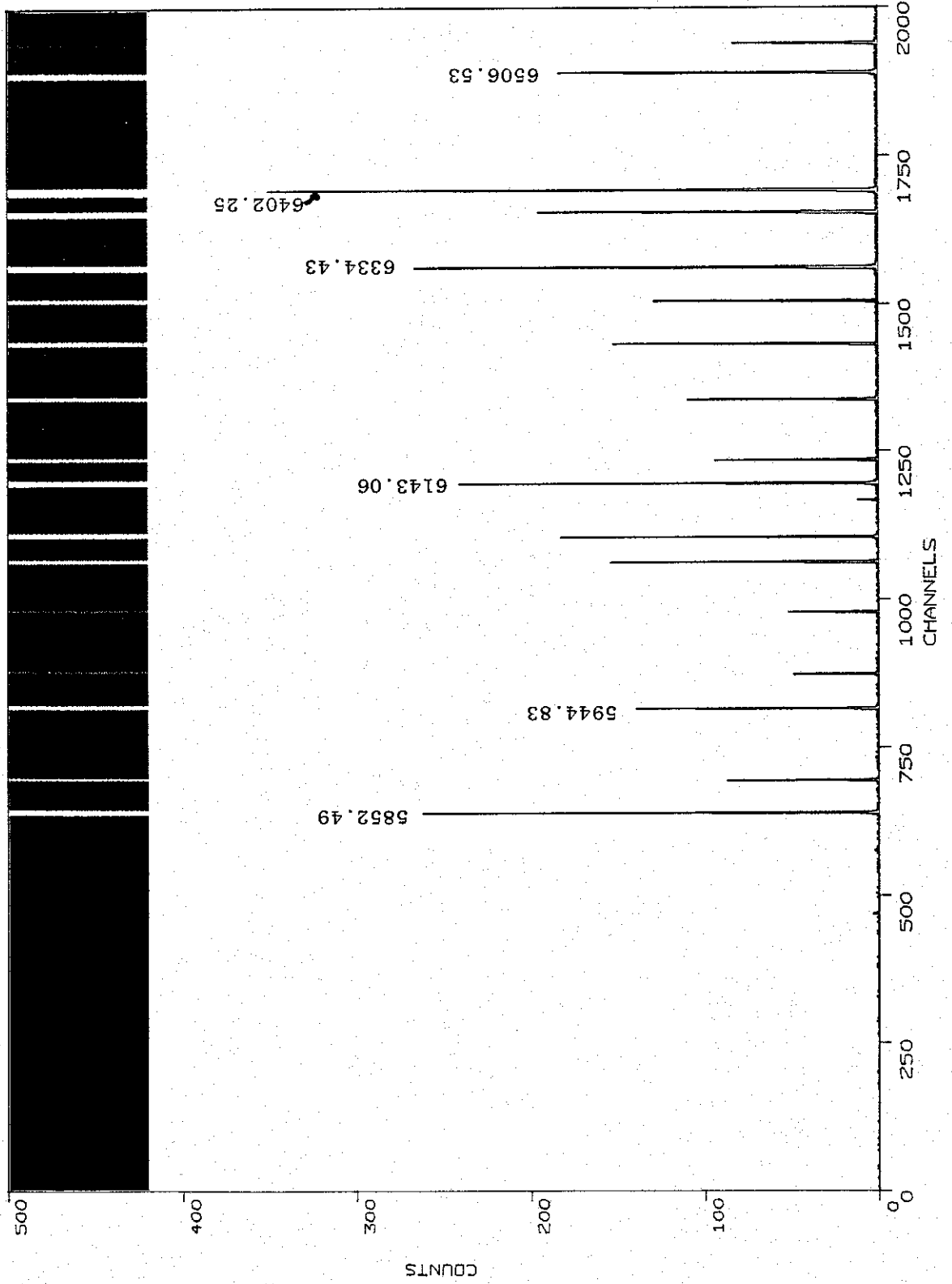


KEY

GRATING ..... R1200B  
SETTING ..... 48.0  
SLIT ..... 100 MICRONS  
..... 0.54 ARCSEC  
PROJ. SLIT ..... 13.9 MICRONS  
FILTERS ..... 3.50D  
..... (A=5, B=2)  
EXPOSURE ..... 200S  
SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 50.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 14.3 MICRONS

FILTERS ..... 3.50D

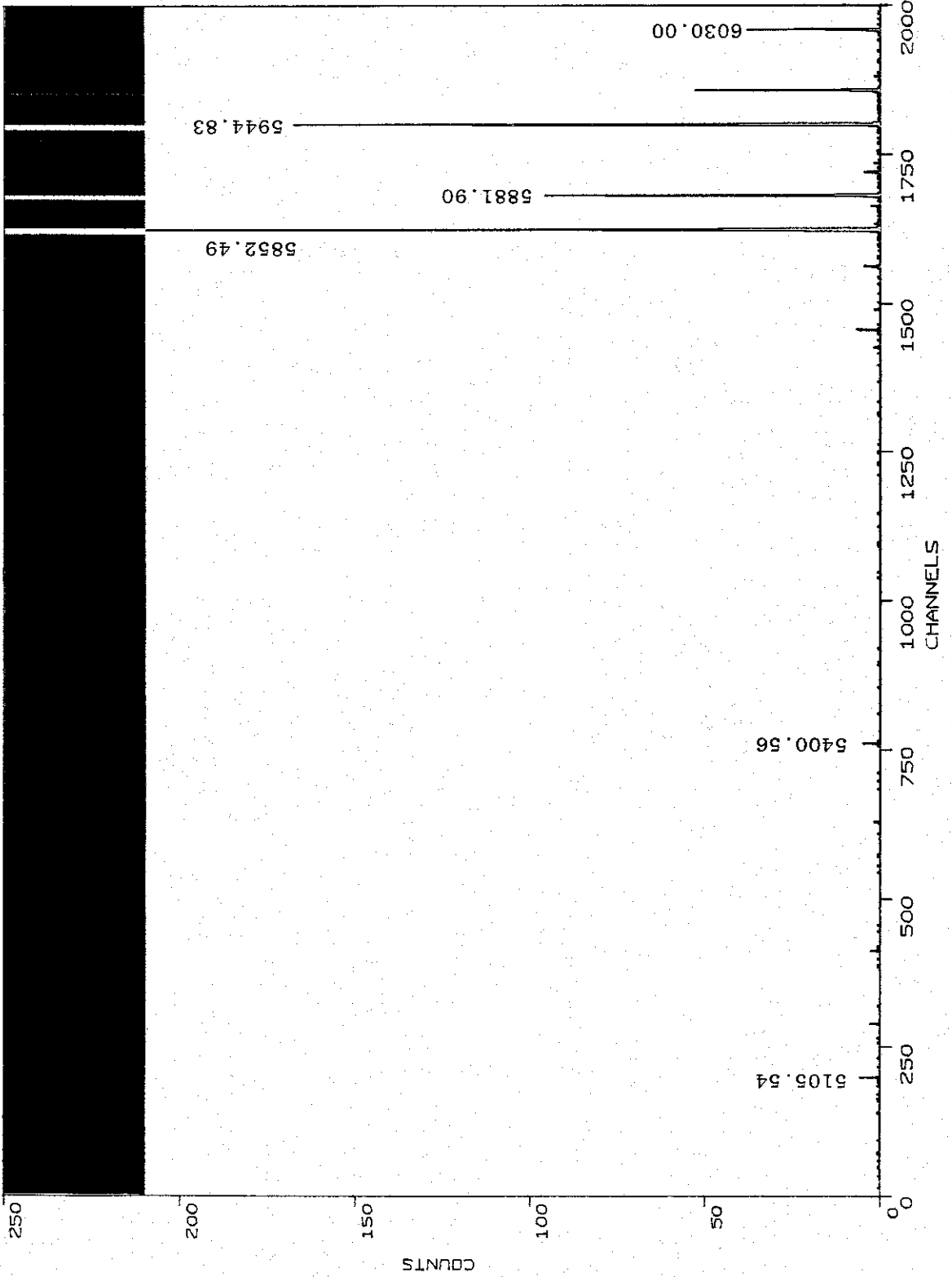
..... (A=5, B=2)

EXPOSURE ..... 200S

SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 52.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 14.6 MICRONS

FILTERS ..... 3.33D

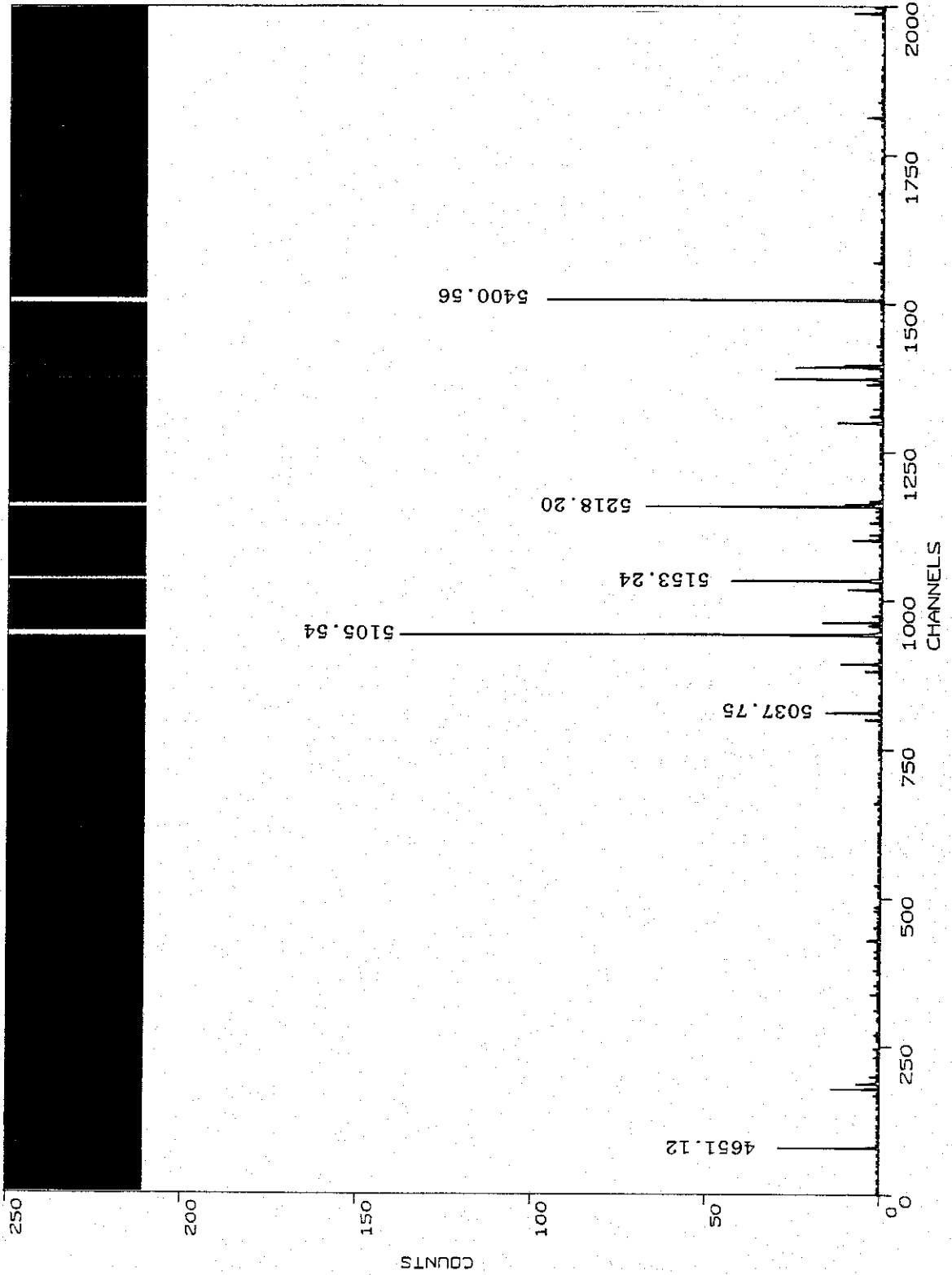
..... (A=5, B=1)

EXPOSURE ..... 200S

SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 53.5

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 14.9 MICRONS

FILTERS ..... 2.00D

..... (A=3, B=4)

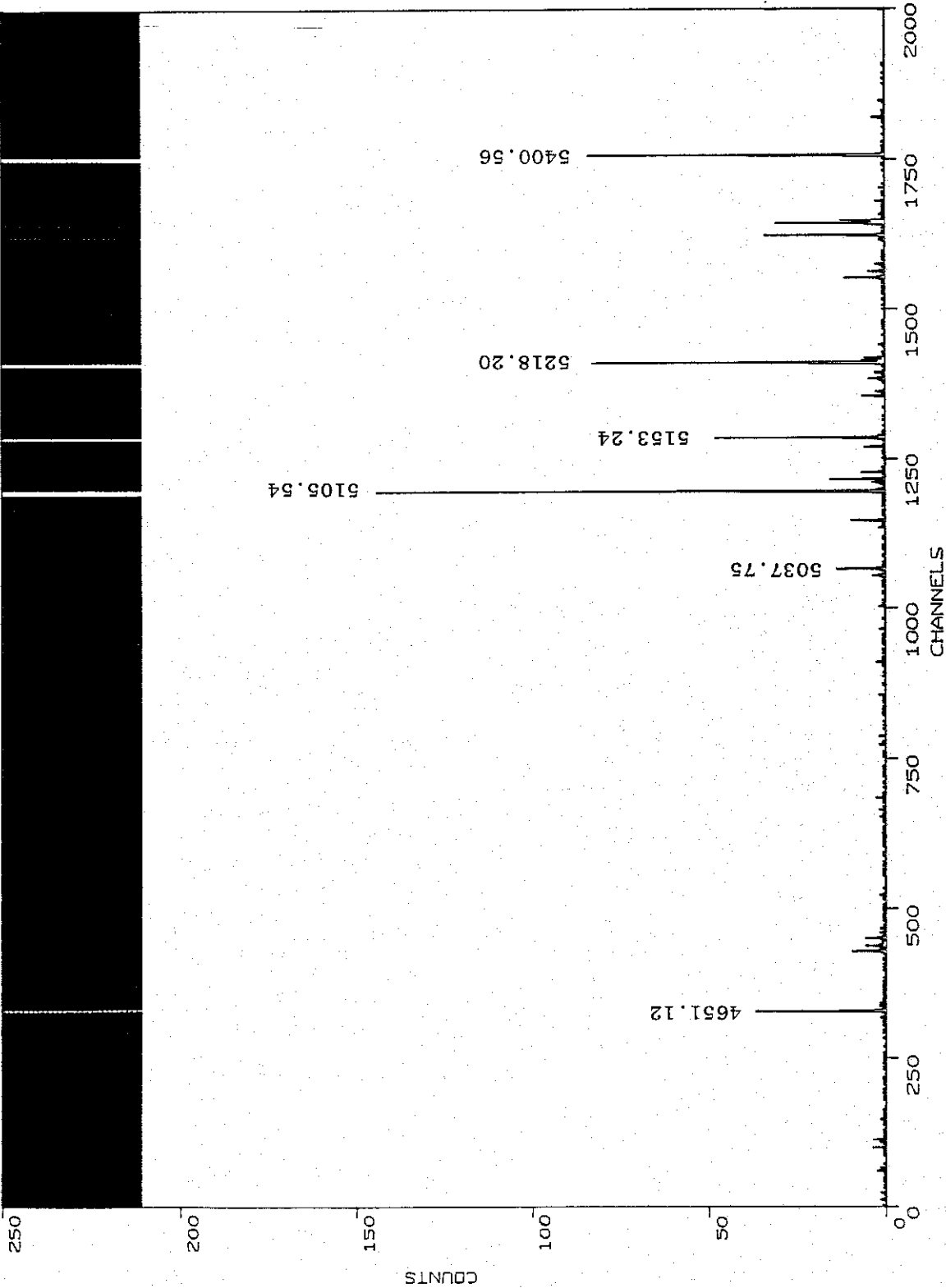
EXPOSURE ..... 200S

SOURCE ..... CUNE





235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 54.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 15.0 MICRONS

FILTERS ..... 2.00D

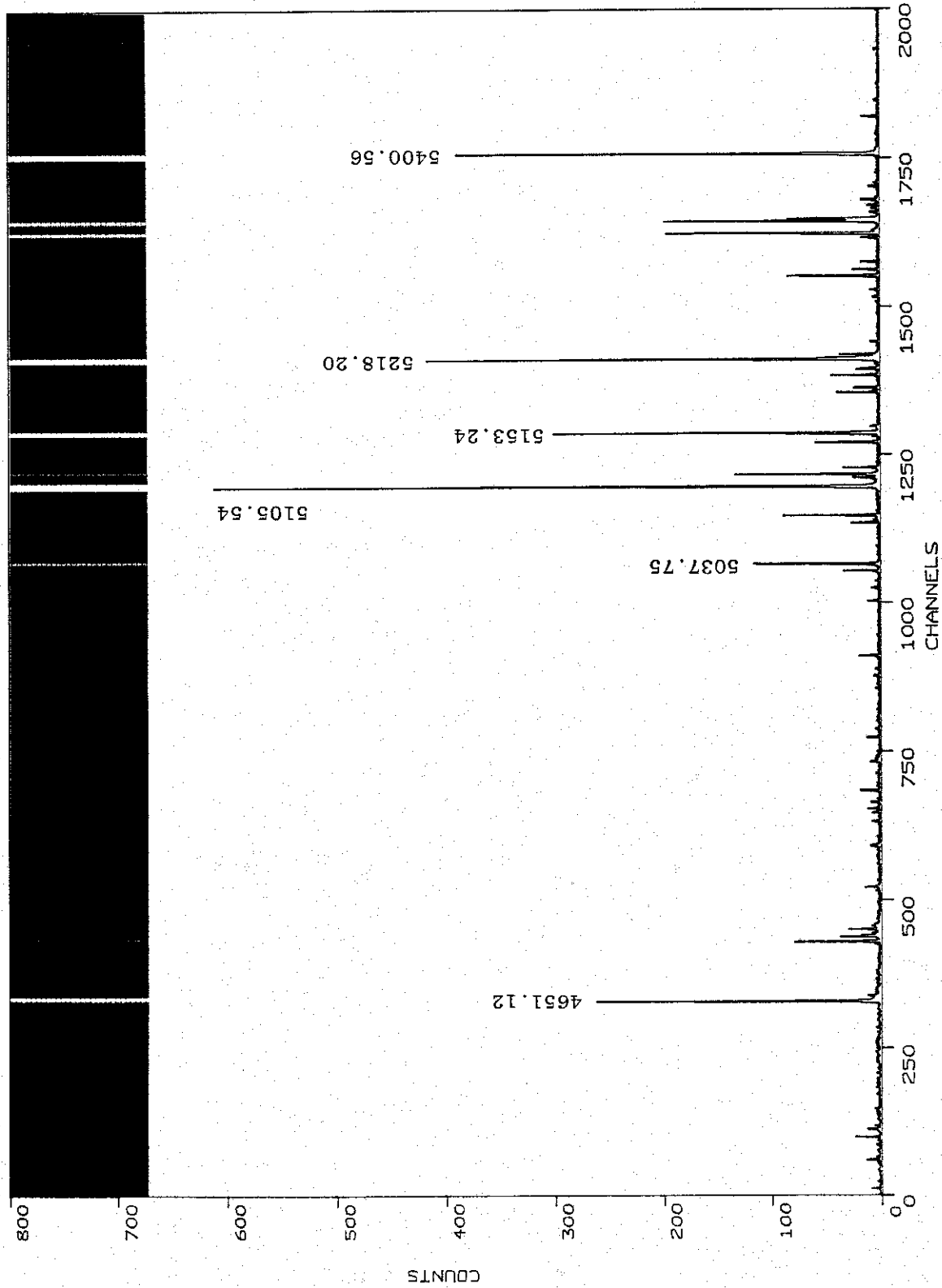
..... (A=3, B=4)

EXPOSURE ..... 200S

SOURCE ..... CUNE



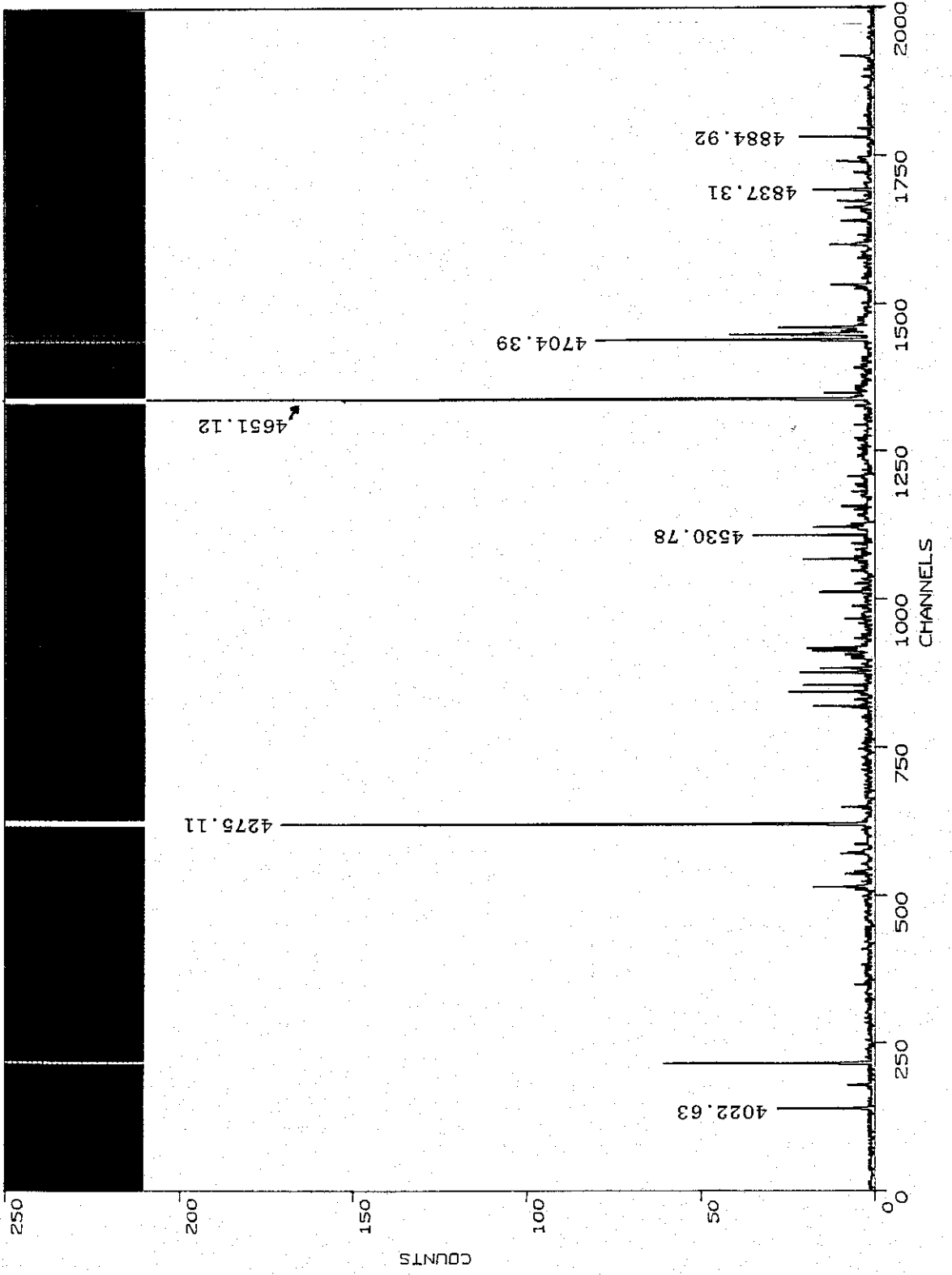
235 CAMERA WITH IPCS



KEY  
GRATING ..... R1200B  
SETTING ..... 54.0  
SLIT ..... 100 MICRONS  
..... 0.54 ARCSEC  
PROJ. SLIT ..... 15.0 MICRONS  
FILTERS ..... 1.126D  
..... (A=1, B=3)  
EXPOSURE ..... 200S  
SOURCE ..... CUNE



235 CAMERA WITH IPCS

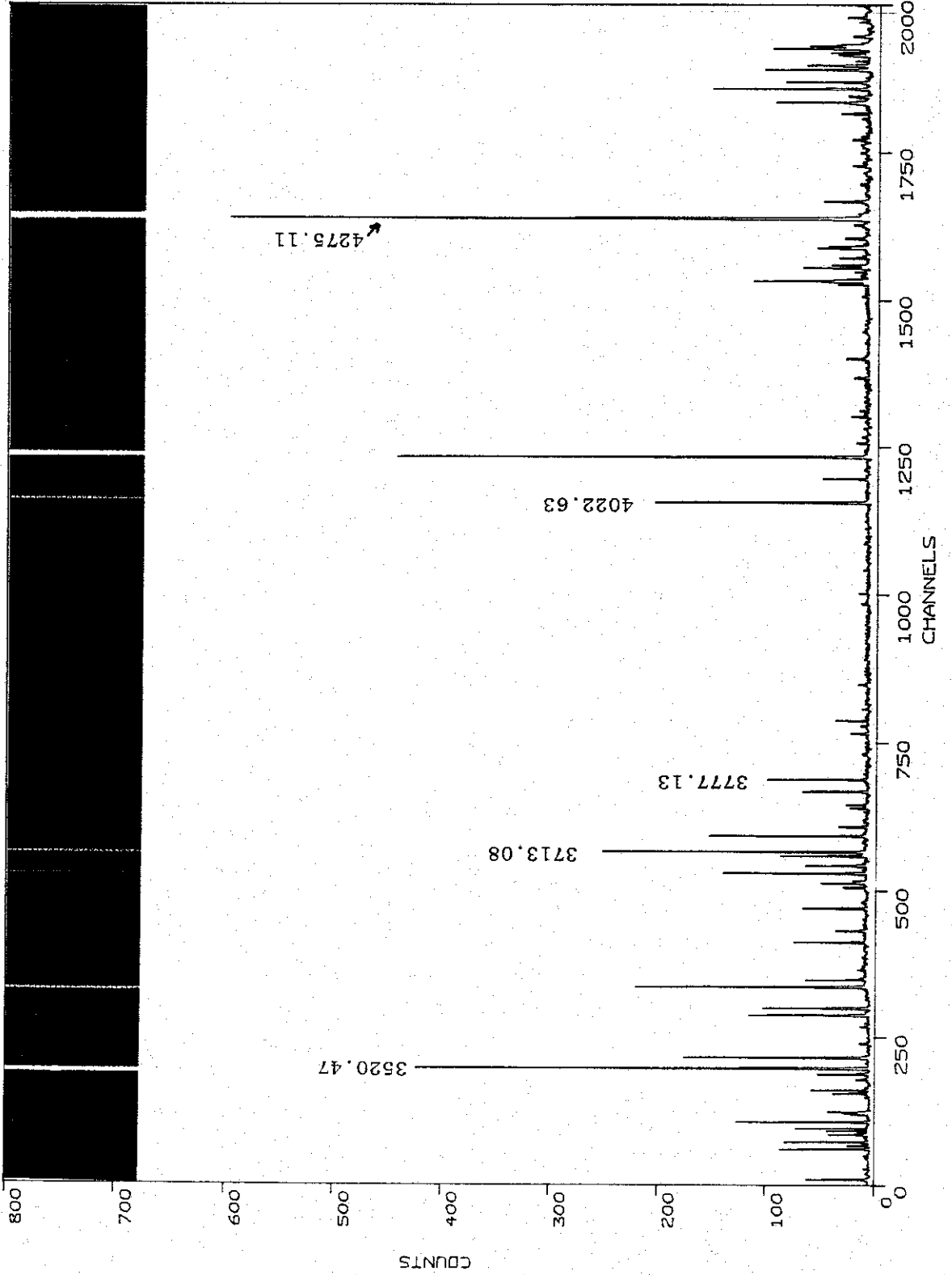


KEY

GRATING ..... R1200B  
SETTING ..... 56.0  
SLIT ..... 100 MICRONS  
..... 0.54 ARCSEC  
PROJ. SLIT ..... 15.4 MICRONS  
FILTERS ..... 1.126D  
..... (A=1, B=3)  
EXPOSURE ..... 200S  
SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 58.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 15.8 MICRONS

FILTERS ..... 0.236D

..... (A=1)

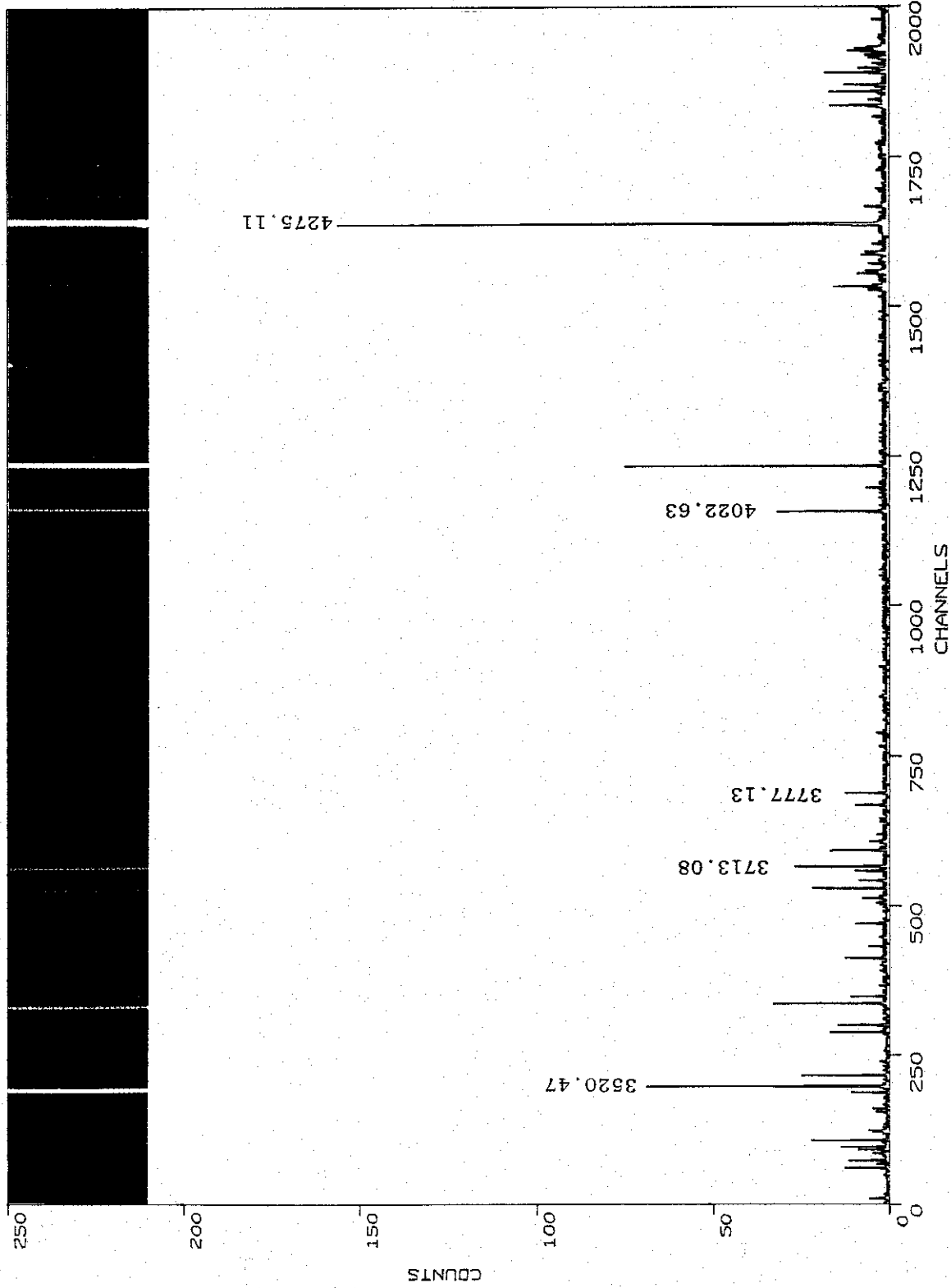
EXPOSURE ..... 200S

SOURCE ..... CUNE





235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 58.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 15.8 MICRONS

FILTERS ..... 1.126D

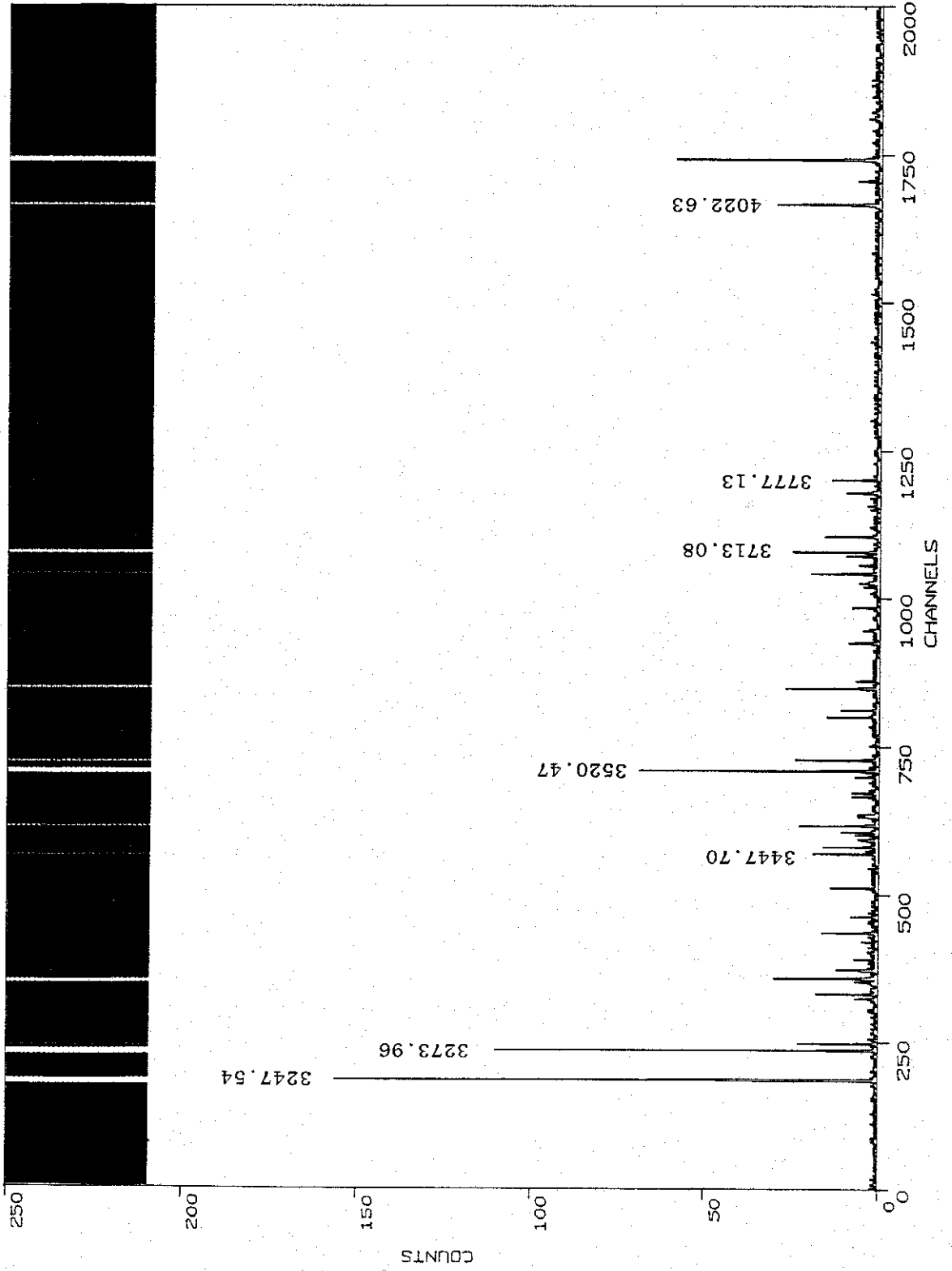
..... (A=1, B=3)

EXPOSURE ..... 200S

SOURCE ..... CUNE



235 CAMERA WITH IPCS

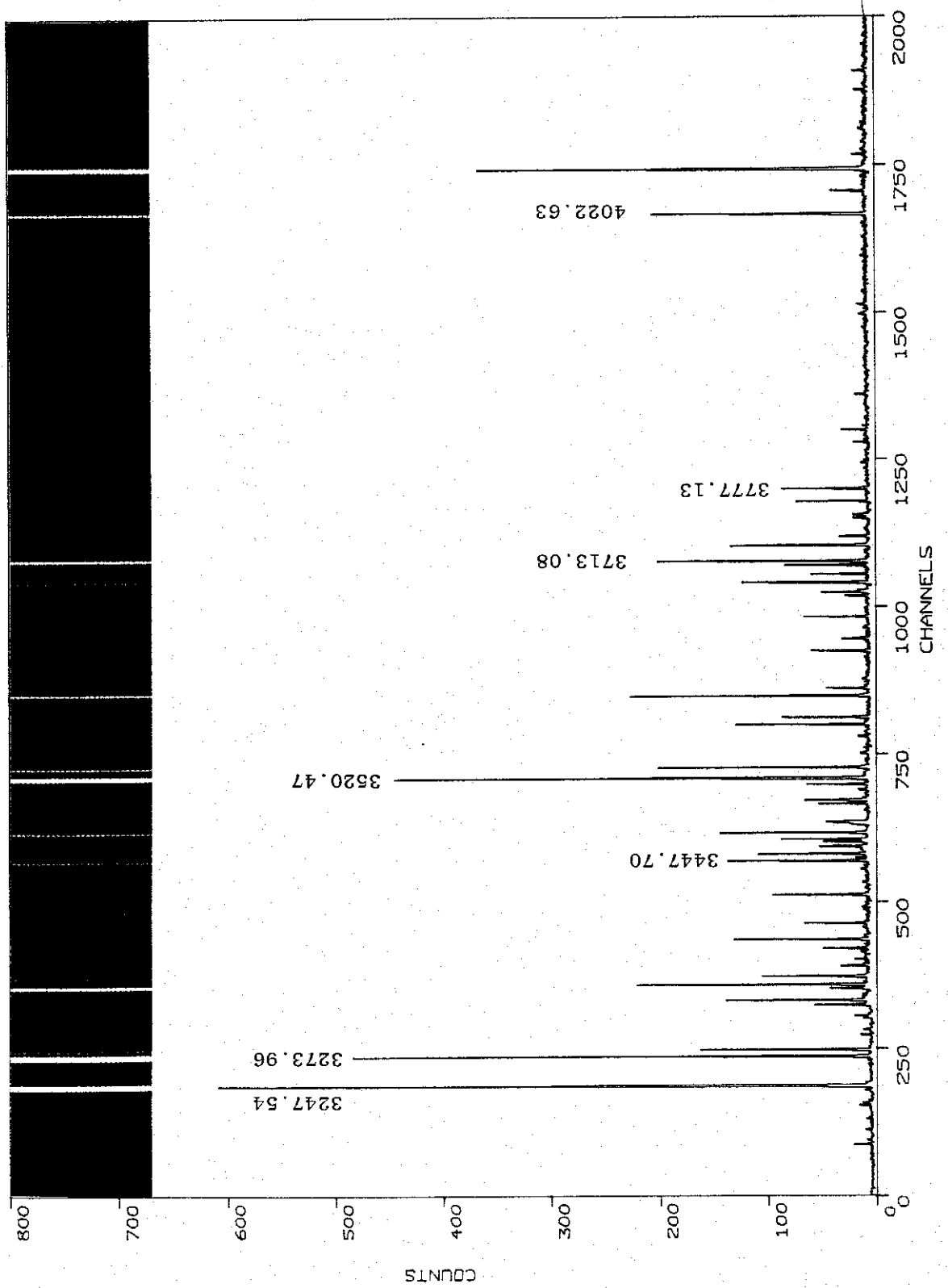


KEY

GRATING .....R1200B  
SETTING .....59.0  
SLIT .....100 MICRONS  
.....0.54 ARCSEC  
PROJ. SLIT .....16.0 MICRONS  
FILTERS .....1.126D  
.....(A=1, B=3)  
EXPOSURE .....200S  
SOURCE .....CUNE



235 CAMERA WITH IPCS

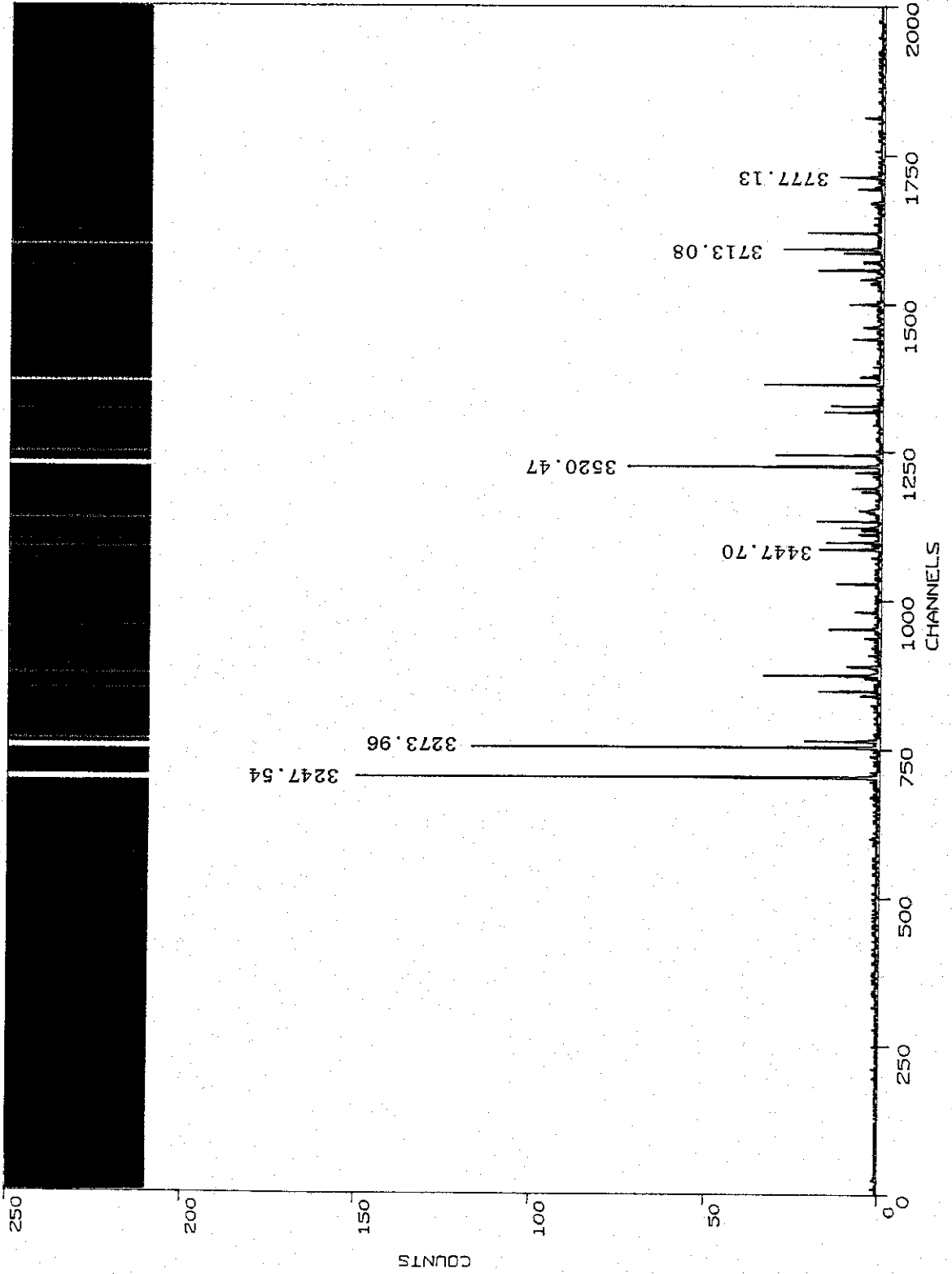


KEY

GRATING ..... R1200B  
SETTING ..... 59.0  
SLIT ..... 100 MICRONS  
..... 0.54 ARCSEC  
PROJ. SLIT ..... 16.0 MICRONS  
FILTERS ..... 0.236D  
..... (A=1)  
EXPOSURE ..... 200S  
SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 60.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 16.2 MICRONS

FILTERS ..... 1.126D

..... (A=1, B=3)

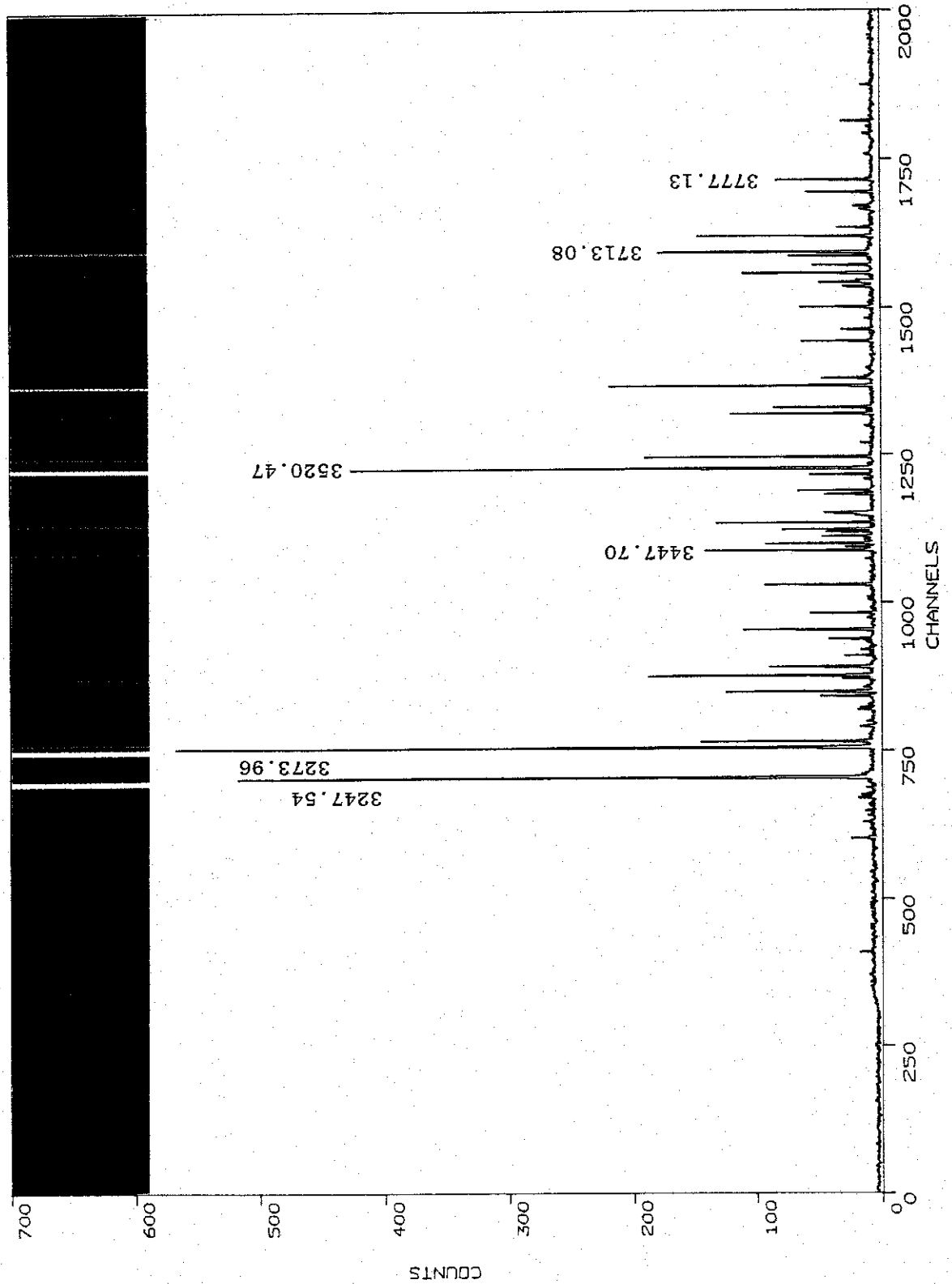
EXPOSURE ..... 200S

SOURCE ..... CUNE





235 CAMERA WITH IPCS



KEY

GRATING ..... R1200B

SETTING ..... 60.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 16.2 MICRONS

FILTERS ..... 0.236D

..... (A=1)

EXPOSURE ..... 200S

SOURCE ..... CUNE



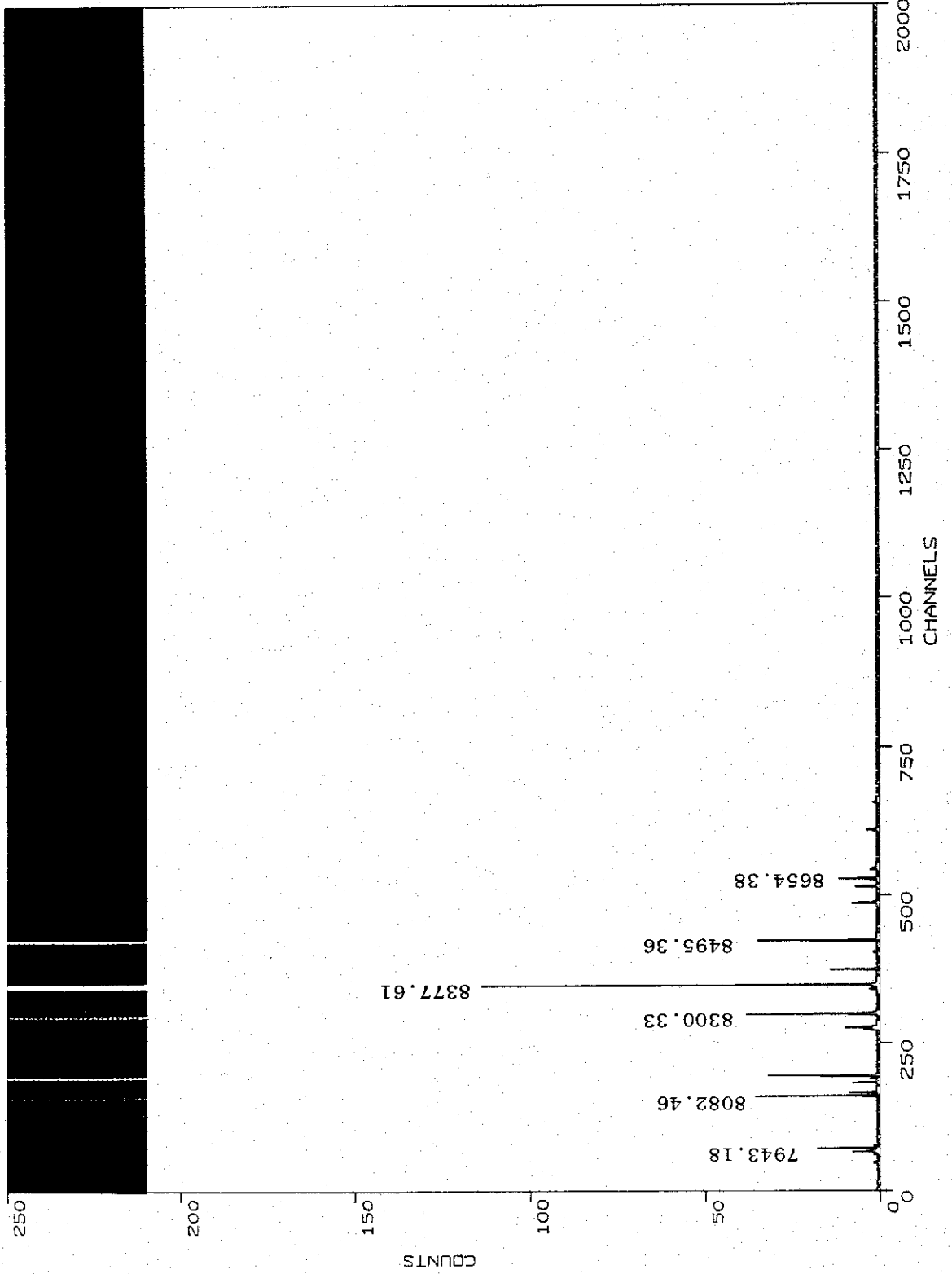
**LOW DISPERSION CU-NE ARC MAPS 8650-4000**



CU-NE  
IPCS  
235  
R 400V



2 3 5 C A M E R A W I T H I P C S



KEY

GRATING ..... R400V

SETTING ..... 61.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 16.5 MICRONS

FILTERS ..... 2.00D

..... (A=3, B=4)

..... GG495

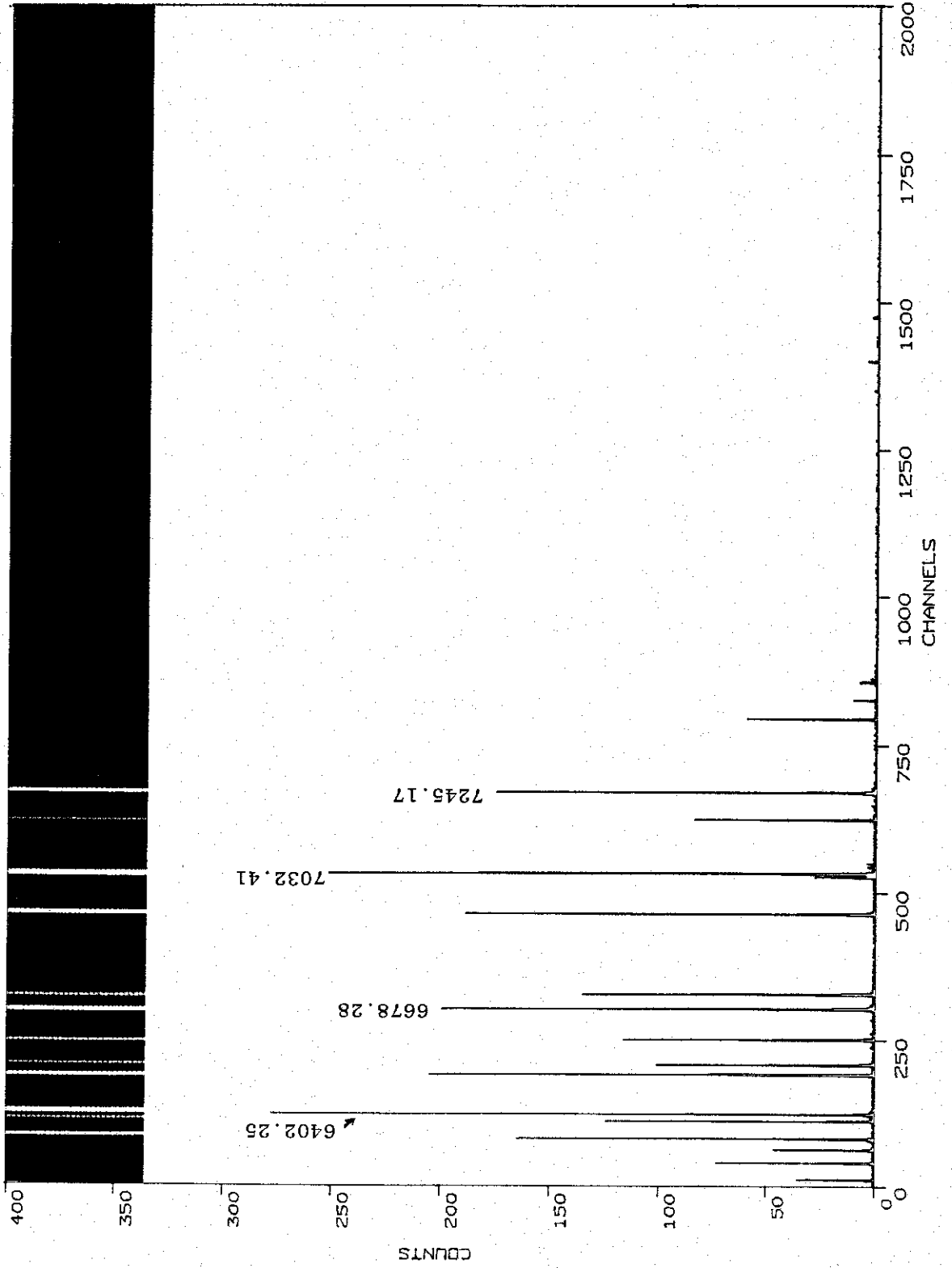
EXPOSURE ..... 200S

SOURCE ..... CUNE





2 3 5 C A M E R A W I T H I P C S



KEY

GRATING ..... R400V

SETTING ..... 63.0

SLIT ..... 100 MICRONS

..... 0.54 ARCSEC

PROJ. SLIT ..... 16.8 MICRONS

FILTERS ..... 3.89D

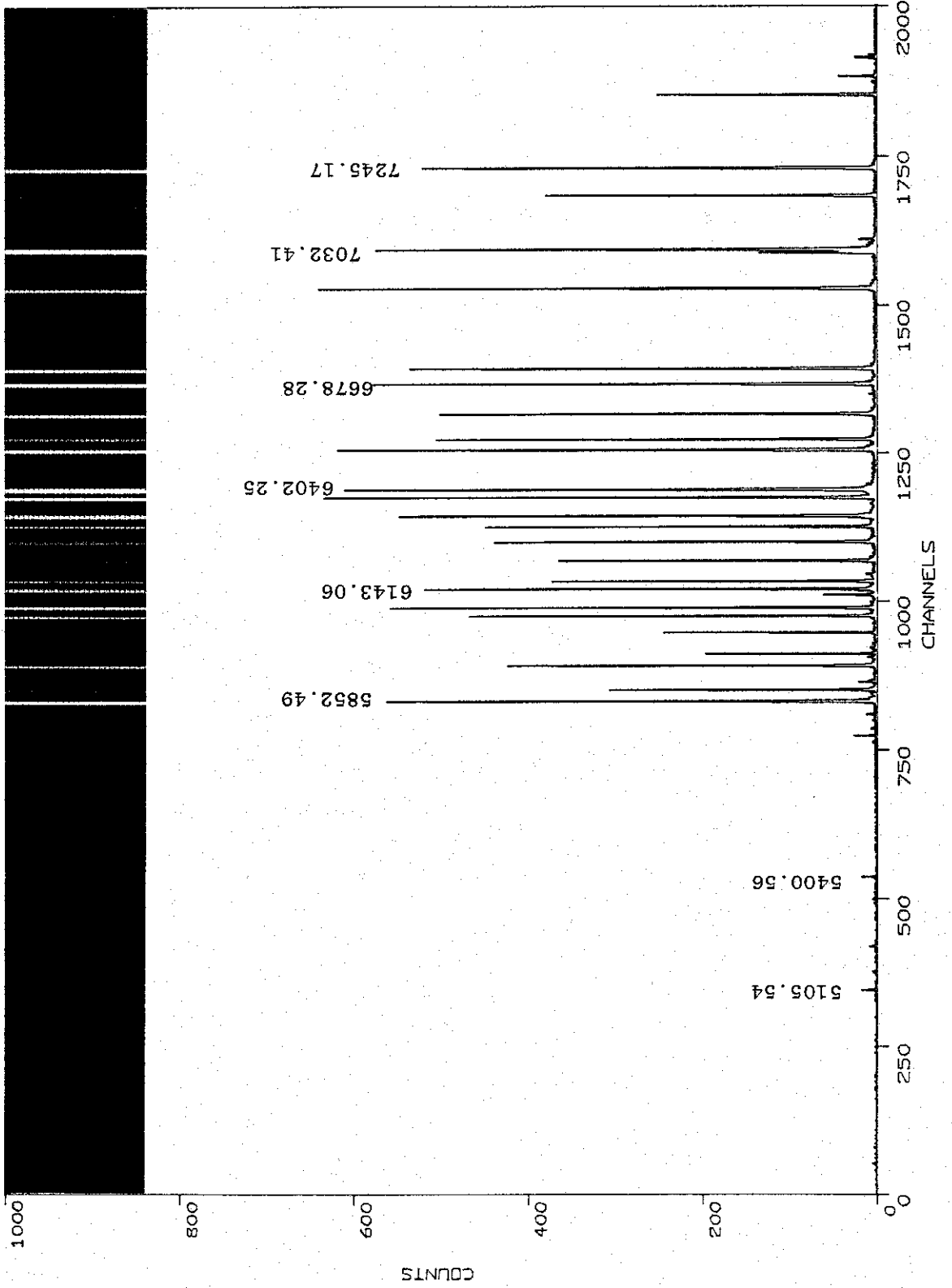
..... (A=5, B=3)

EXPOSURE ..... 200S

SOURCE ..... CUNE



235 CAMERA WITH IPCS



KEY

GRATING .....R400V

SETTING .....65.0

SLIT .....100 MICRONS

.....0.54 ARCSEC

PROJ. SLIT .....17.2 MICRONS

FILTERS .....2.94D

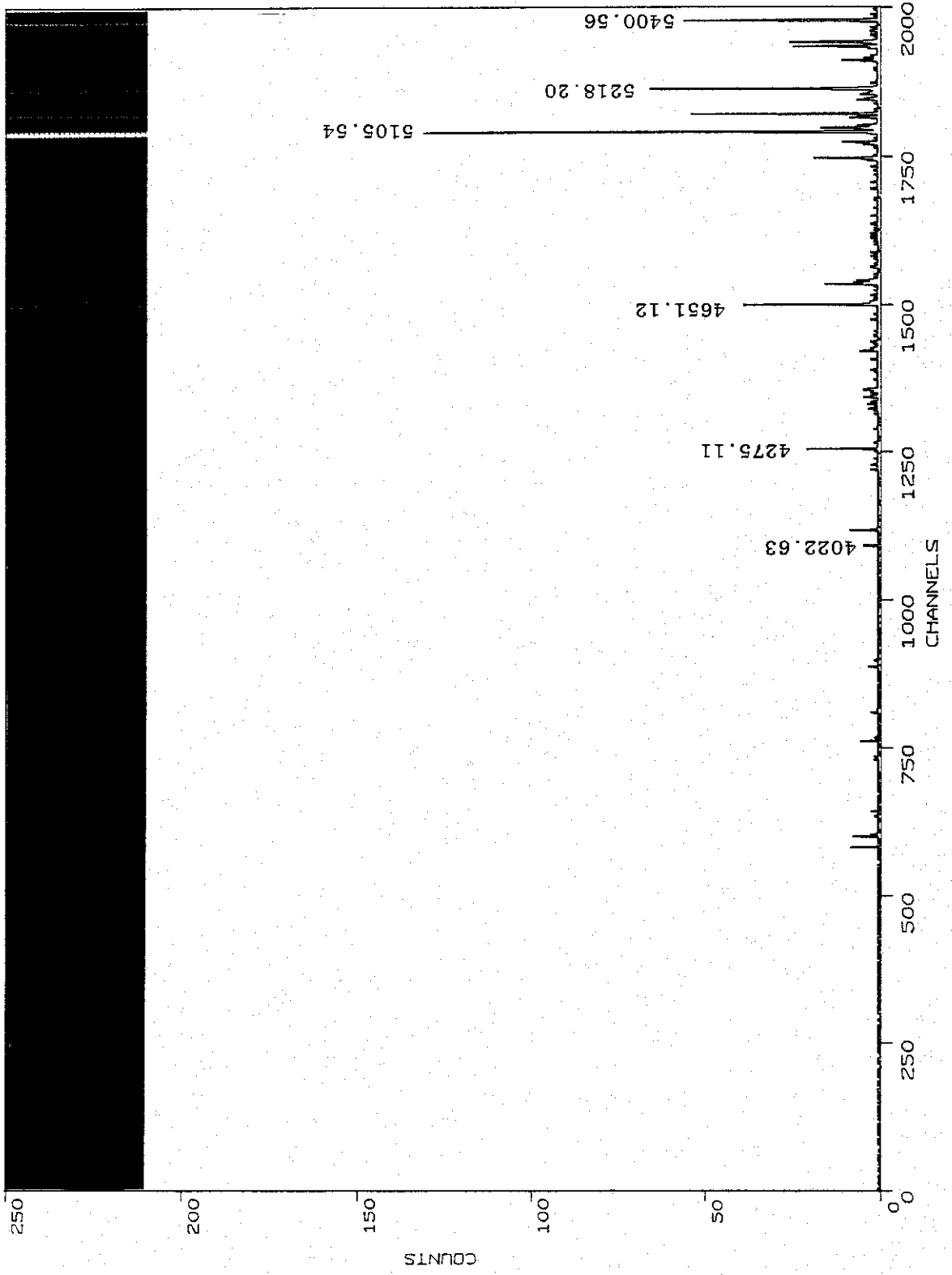
.....(A=4, B=4)

EXPOSURE .....200S

SOURCE .....CUNE



235 CAMERA WITH IPCS



KEY

GRATING ..... R400V  
SETTING ..... 67.7  
SLIT ..... 100 MICRONS  
..... 0.54 ARCSEC  
PROJ. SLIT ..... 17.6 MICRONS  
FILTERS ..... 2.00D  
..... (A=3, B=4)  
EXPOSURE ..... 200S  
SOURCE ..... CUNE

