

UNIVERSITAT POLITÈCNICA DE CATALUNYA

ESCOLA TÈCNICA SUPERIOR D'ENGINYERS INDUSTRIALS DE TERRASSA

Tesis Doctoral que bajo la dirección del

Catedrático Dr. Lorenzo Alvarez Martínez

y con el título

ESTUDIO TEORICO-EXPERIMENTAL DE LA  
REDUCCION DE LA PROPAGACION SONORA  
EN CONDUCTOS, UTILIZANDO TECNICAS  
DE ABSORCION ACTIVA

presenta el candidato

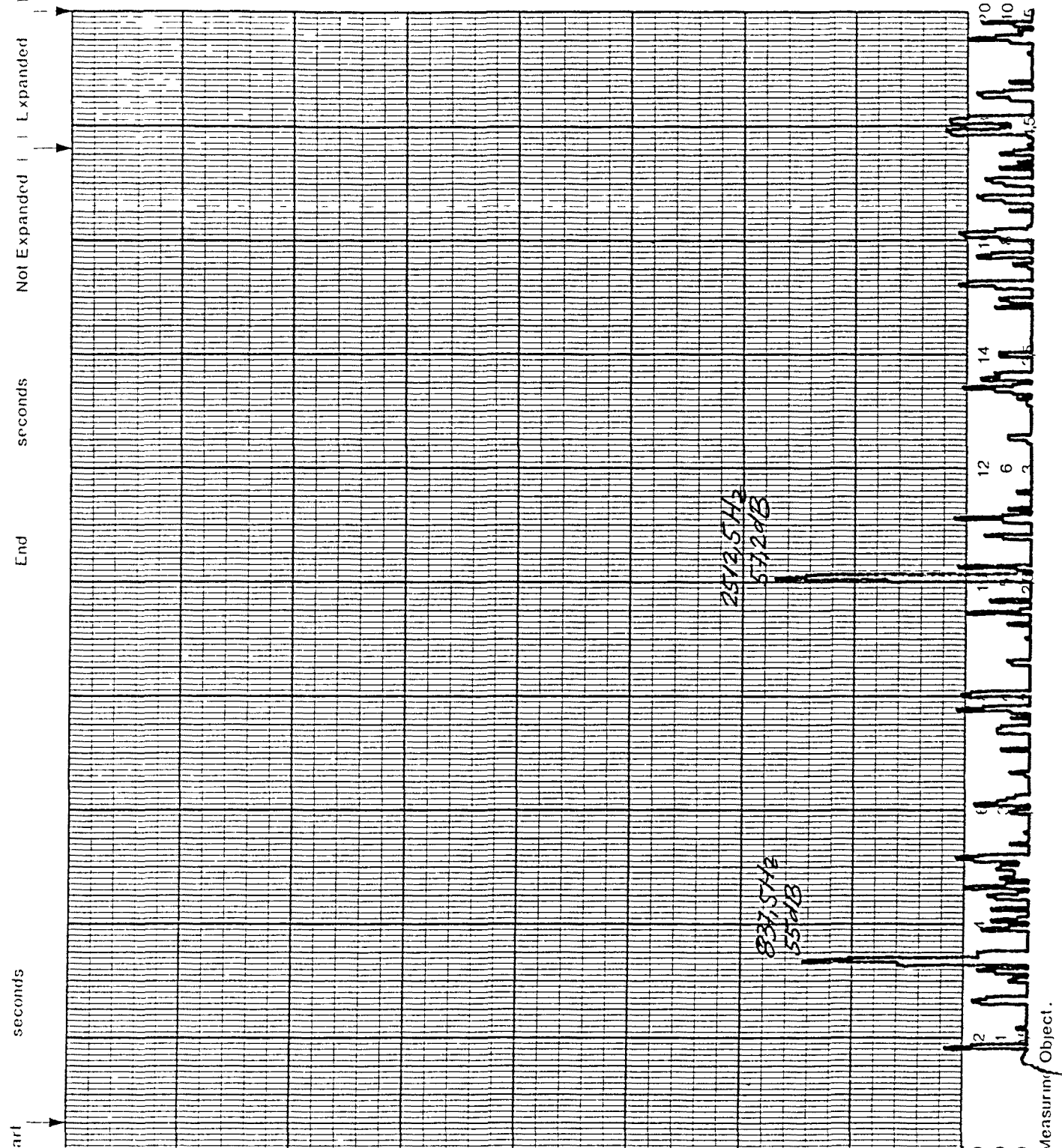
Jaime Gibert Pedrosa

para la obtención del  
Grado de Doctor Ingeniero Industrial

Terrassa, Julio de 1990

FRECUENCIAS DE 837,5 Hz Y 2512,5 Hz,  
SIMULTANEAMENTE, Y CONDUCTO DE  
SECCION CUADRADA. (APARTADO 6.8).





Brüel & Kjær  
 Full Scale Level 120 dB  
 I S Frequency 5 kHz  
 Weighting  
 Average Mode  
 No of Spectra 10

Comments  
*Punto A corriente arriba*  
*Emisión con - junto unidireccional - I ;*  
*55 dB a 837,5 Hz*  
*57,2 dB a 2512,5 Hz con desfases  $\phi_{11}$  y  $\phi_{12}$ , respectivamente*

Record No  
 Date 26-1-90  
 Sign



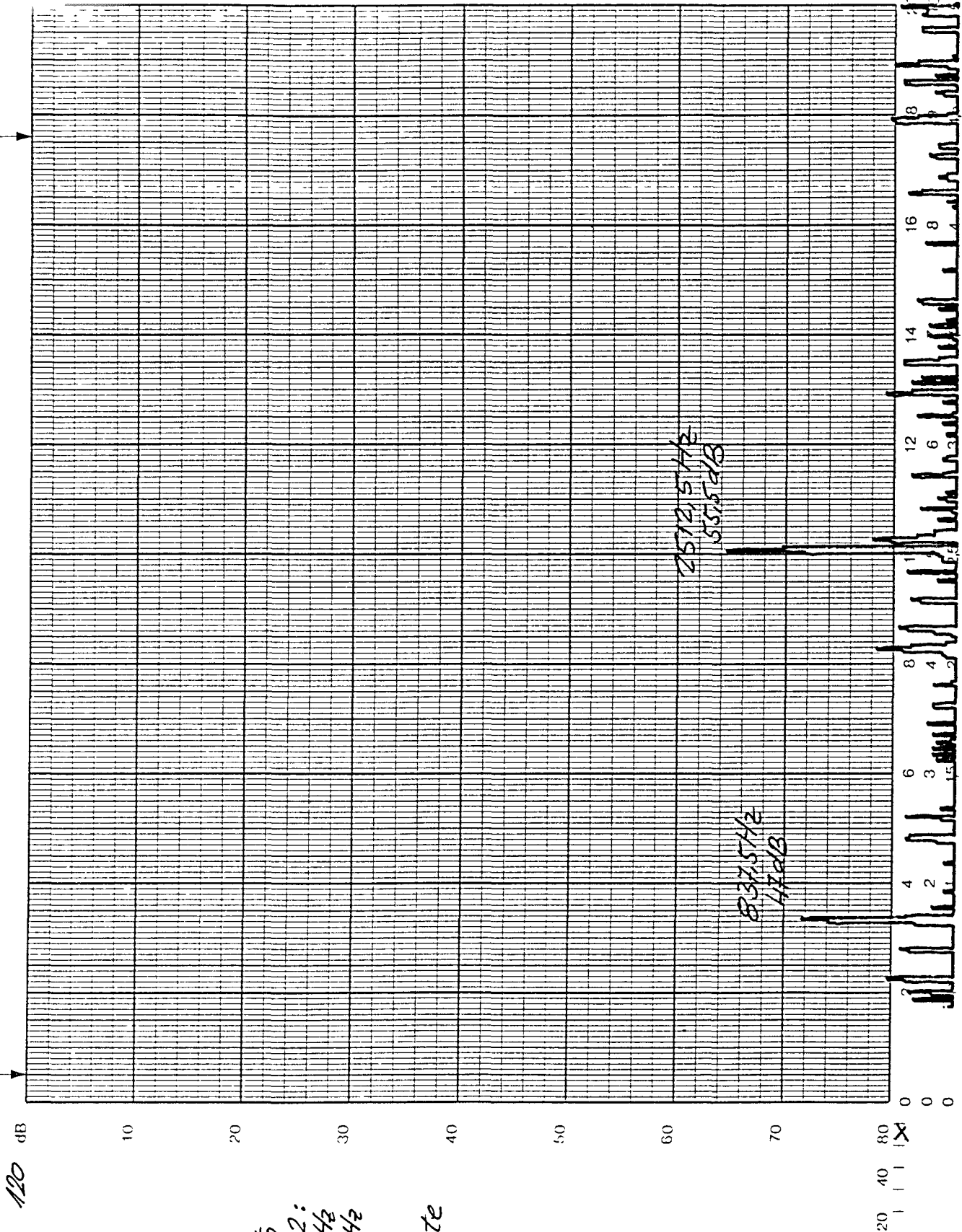
Brüel & Kjær | Time Function Start | seconds | Not Expanded | Expanded

Full Scale Level 120  
F S Frequency 5 kHz

Weighting  
Average Mode  
No of Spectra

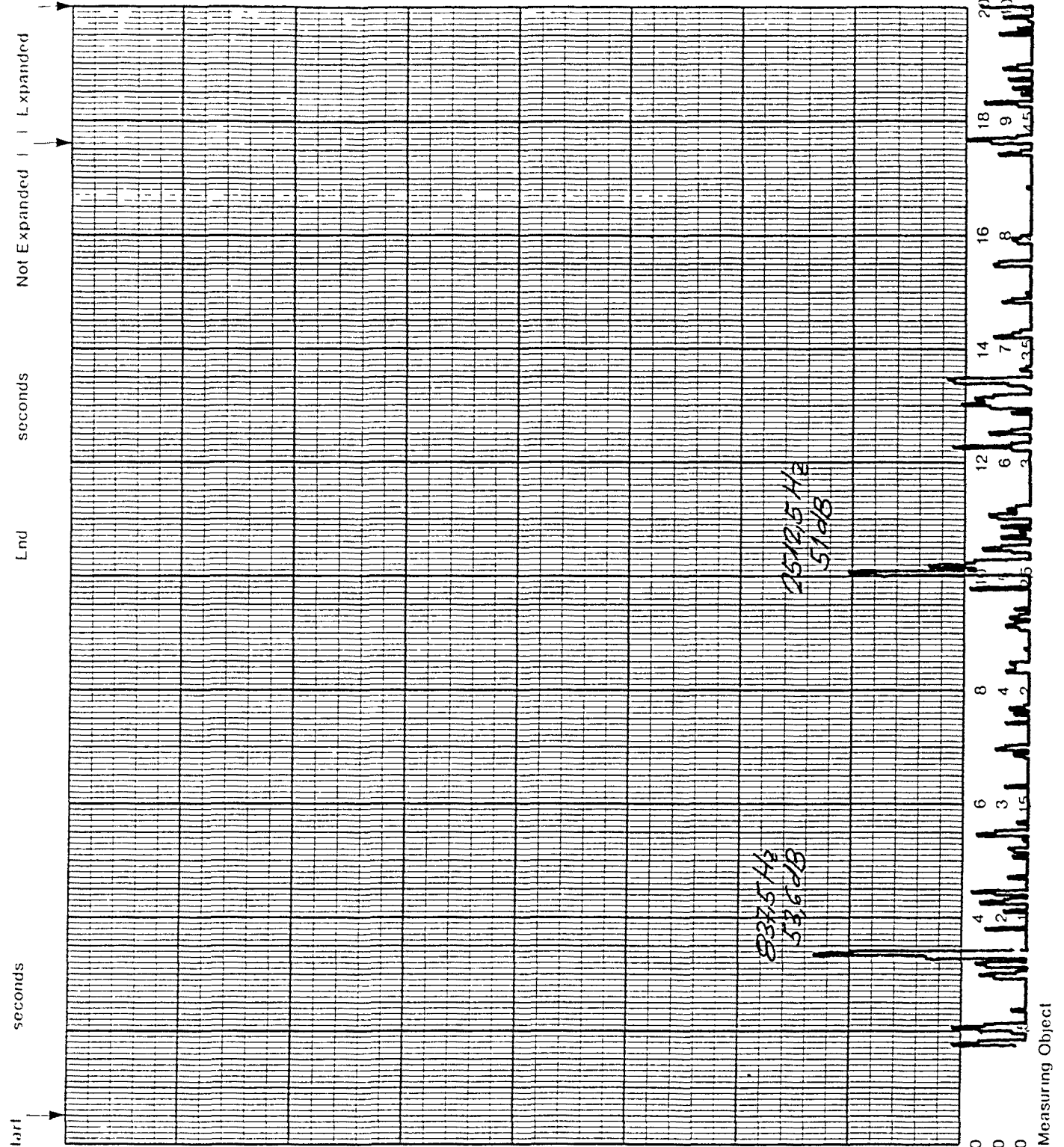
Comments:  
*Punto A corriente arriba*  
*Emisión conjunta unidireccional-2:*  
*47 dB a 837.5 Hz*  
*55.5 dB a 2512.5 Hz*  
*con desfases  $\phi_{n1}$  y  $\phi_{n2}$ , respectivamente*

Record No.  
Date: 26-1-90  
Sign:



Measuring Object:





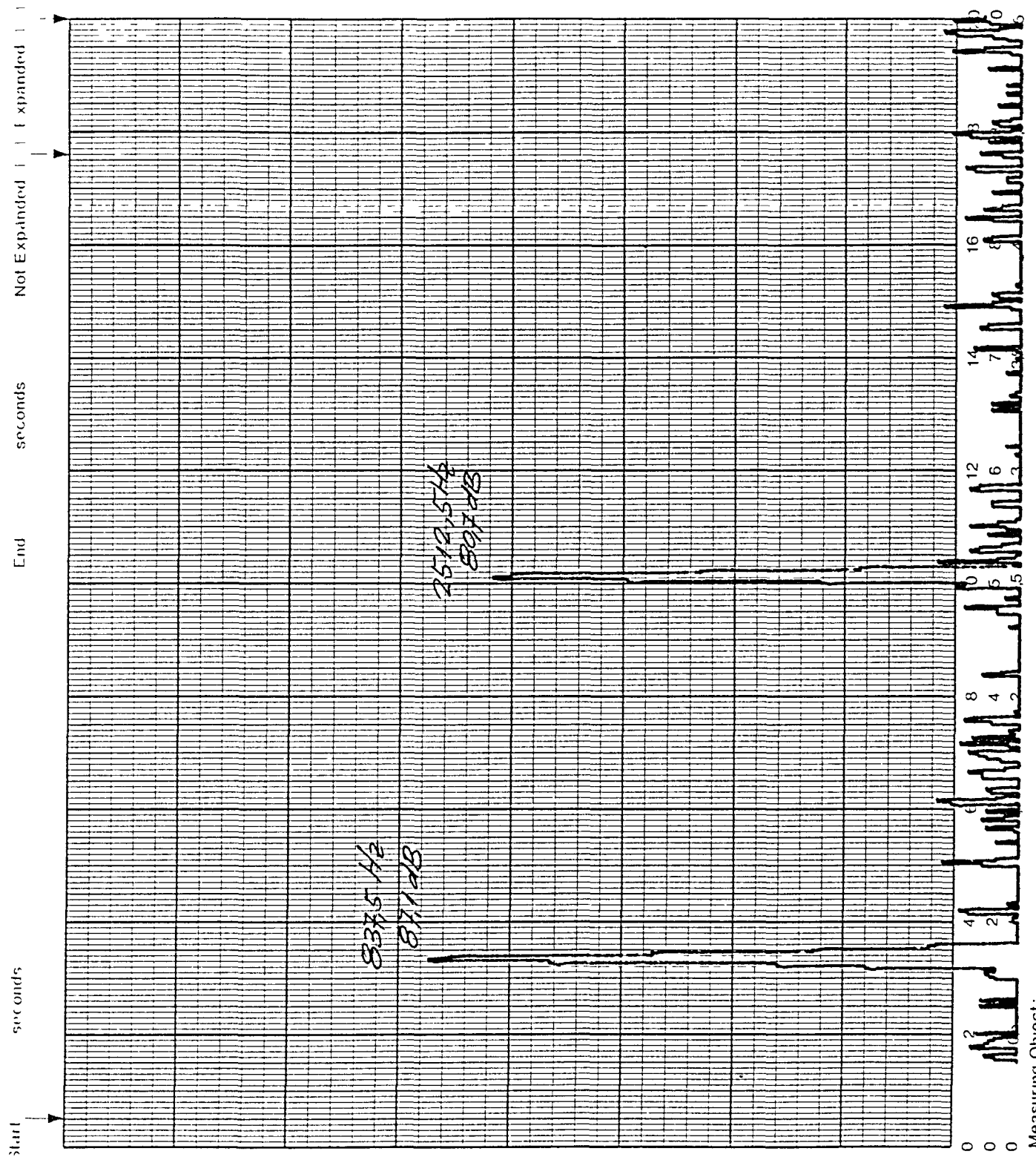
Brüel & Kjær  
 Full Scale Level 120 dB  
 F S Frequency 5 kHz  
 Weighting  
 Average Mode  
 No of Spectra

Comments  
 Punto A  
 corriente arriba  
 Emisión sistema  
 atenuador:  
 53,6 dB a 837,5 Hz  
 51 dB a 2512,5 Hz  
 con desfases  
 $\phi_{31}$  y  $\phi_{32}$   
 respectivamente

Record No  
 Date 26-1-90  
 Sign







Brüel & Kjær  
 Full Scale Level 120 dB  
 F S Frequency 5 kHz  
 Weighting  
 Average Mode  
 No of Spectra

Comments:  
 Punto B  
 corriente abajo  
 Emisión fuente  
 primaria:  
 87.1 dB a 837.5 Hz  
 80.7 dB a 2512.5 Hz

Record No.  
 Date 26-1-90  
 Stan

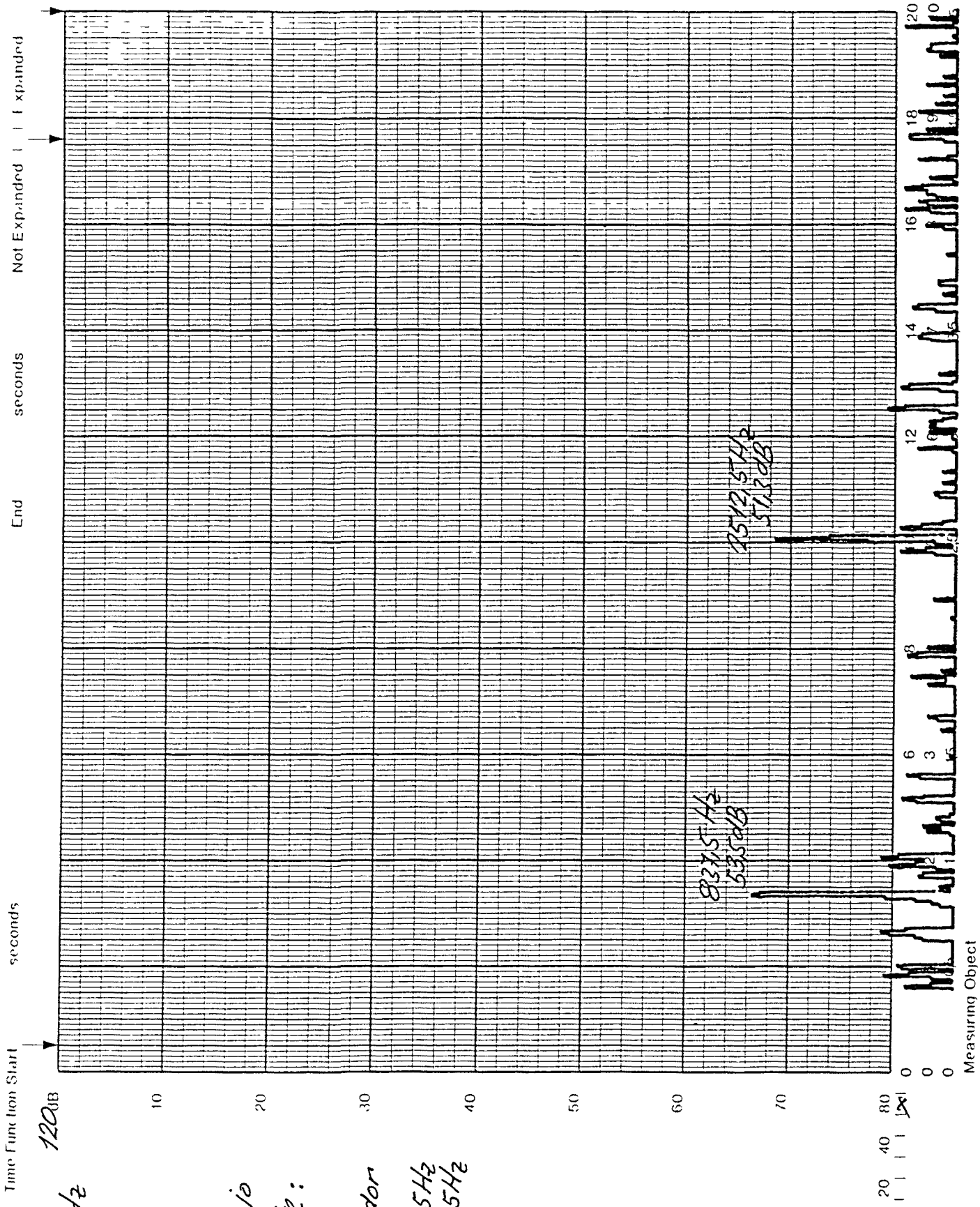


Briel & Kjaer

Full Scale Level 120dB  
F S Frequency 5kHz  
Weighting  
Average Mode  
No of Spectra 10

Comments  
Punto B  
corriente abajo  
N.P.S. resultante:  
Fuente primaria  
\*  
Sistema alternador  
53,5dB a 837,5Hz  
54,3 dB a 2512,5Hz

Record No  
Date 26-1-90  
Sign





FRECUENCIA DE 750 Hz Y CONDUCTO DE  
SECCION RECTANGULAR. (APART. 6.9).



Bruel & Kjaer

Full Scale Level: 110 dB

F. S. Frequency: 2 kHz

Weighting

Average Mode

No of Spectra.

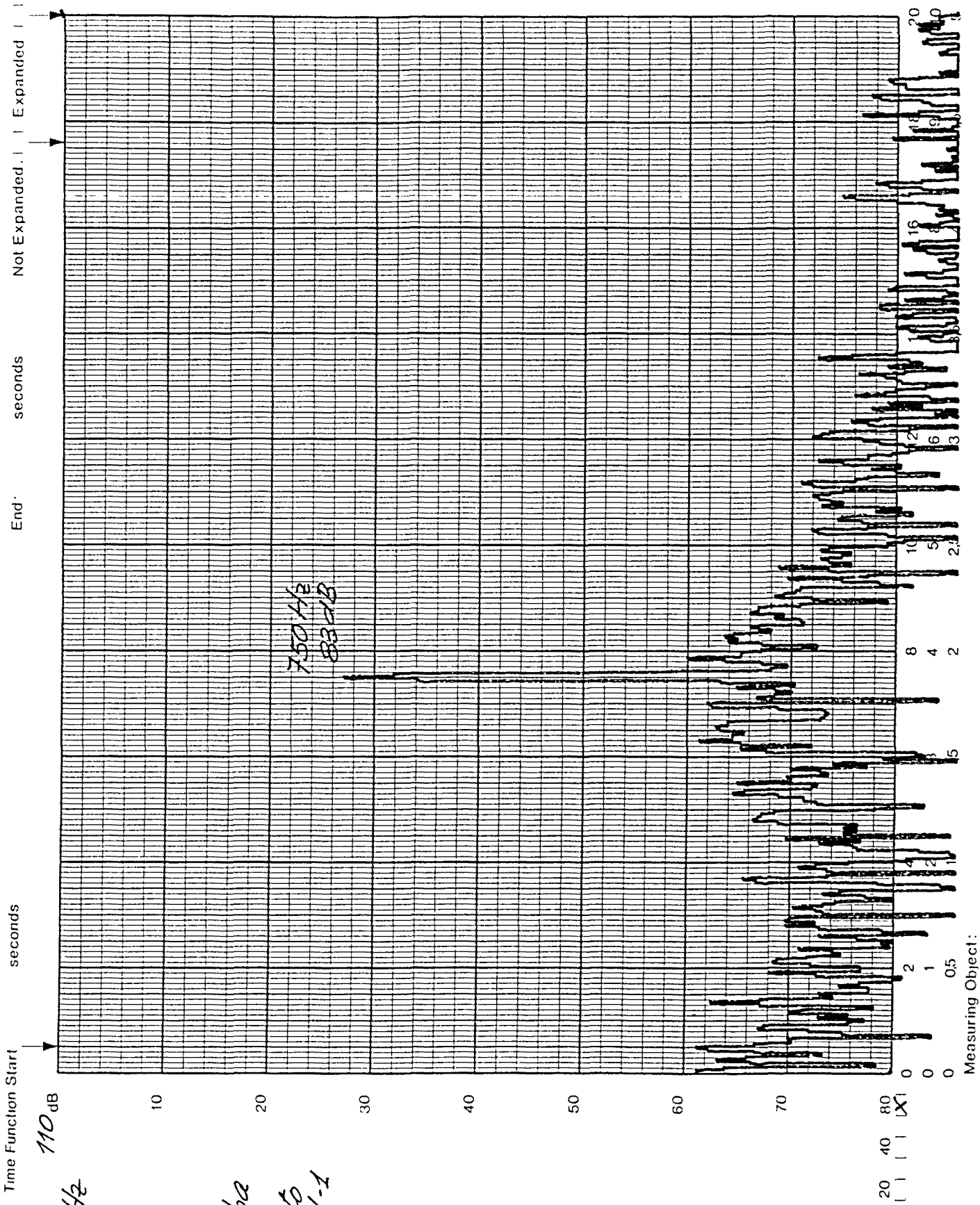
Comments:

*Punto A  
Corriente Arriba*

*Emision conjunta  
unidireccional-1*

$\phi_1$

*750 Hz  
83 dB*



Record No.:

Date: 9-3-90

Sign.:



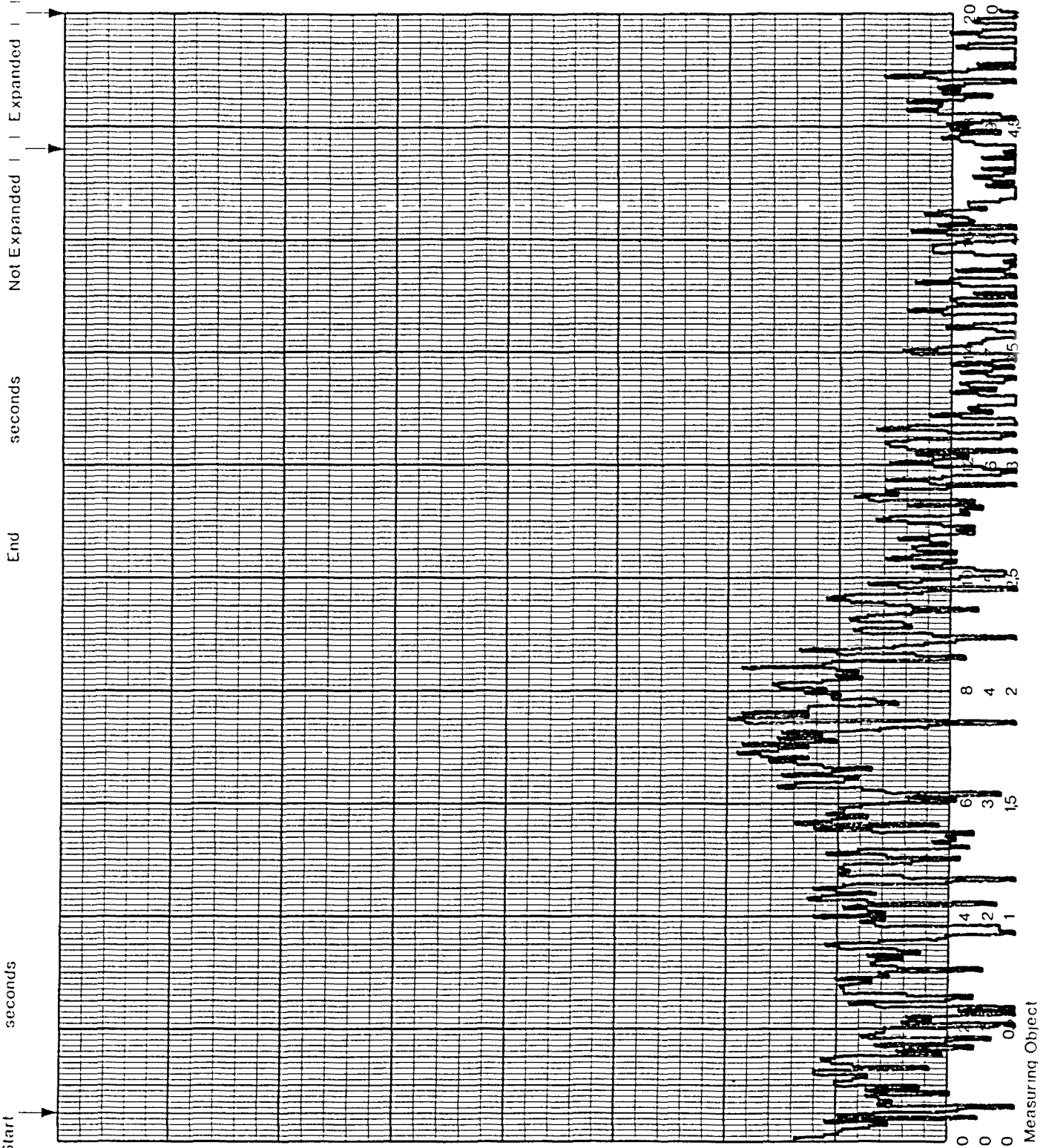


Brüel & Kjær

Full Scale Level  
110 dB  
F S Frequency  
2 kHz  
Weighting  
Average Mode  
No of Spectra  
10

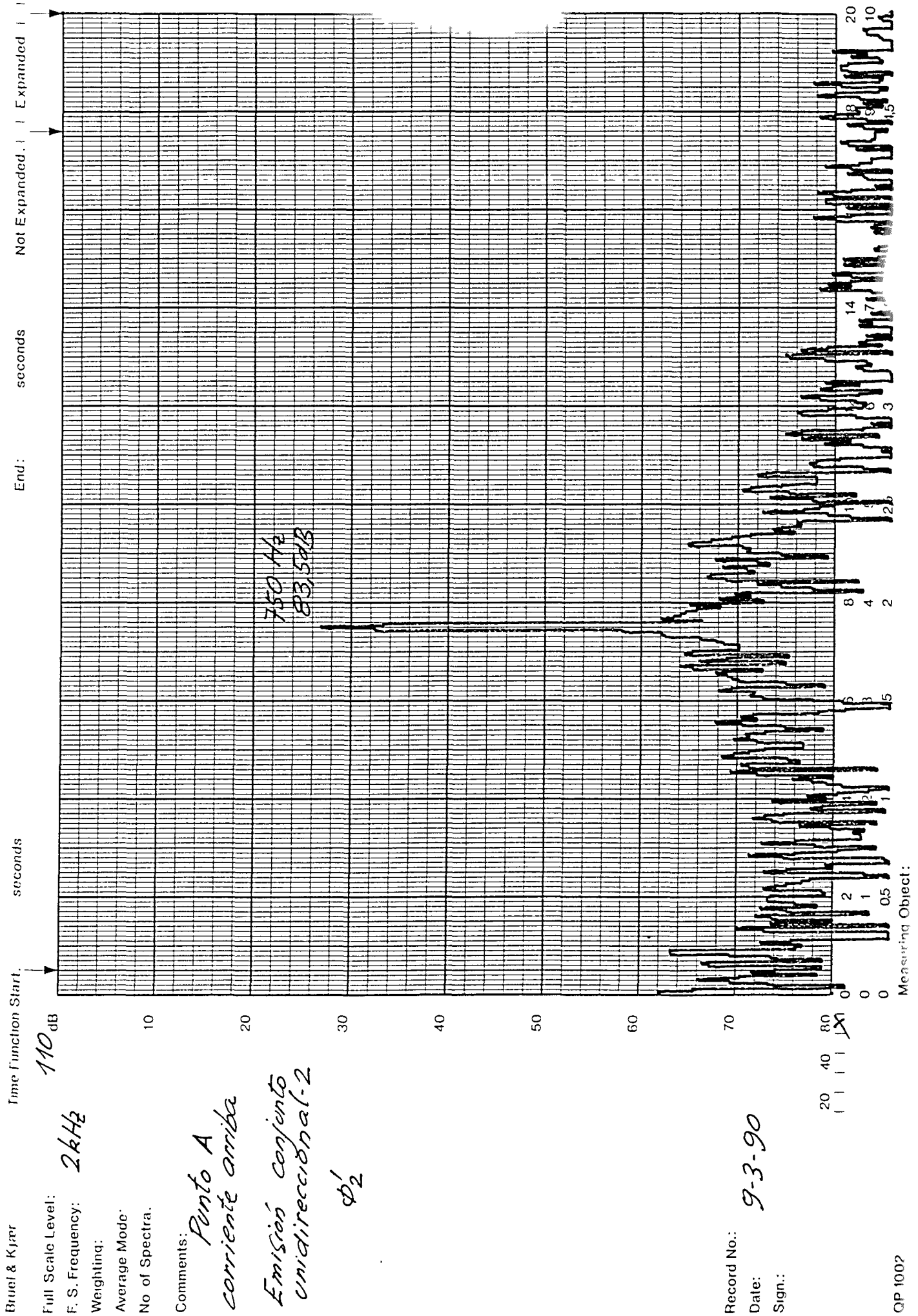
Comments  
*Punto A*  
*corriente arriba*  
*Emission conjunto*  
*unidireccional-1*  
 $\Phi_1$

*50 dB a 750 Hz*

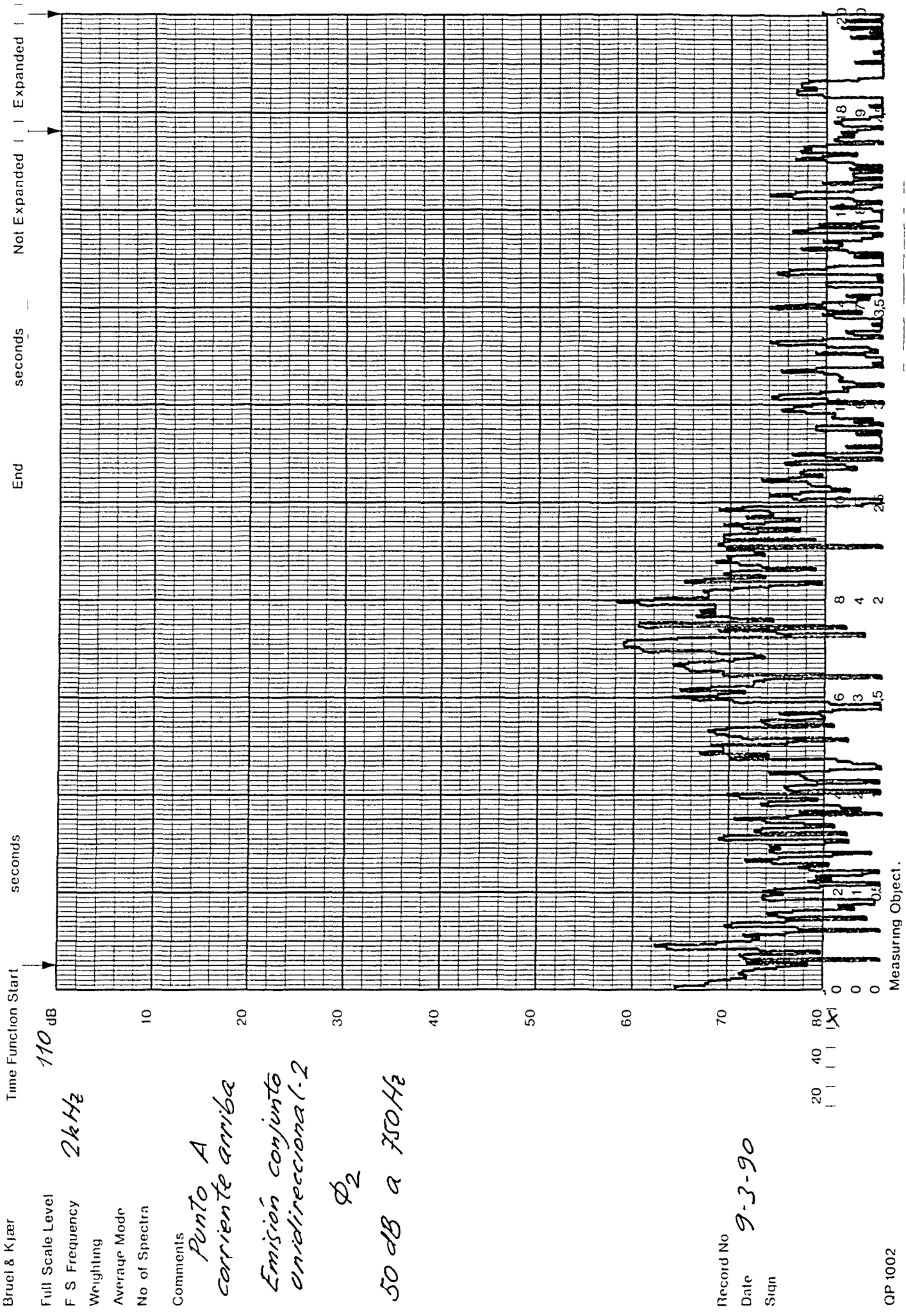


Record No  
Date *9-3-90*  
Sign









Bruel & Kjaer  
 Full Scale Level 110 dB  
 F S Frequency 2 kHz  
 Weighting  
 Average Mode  
 No of Spectra 10

Comments  
 Punto A  
 corriente arriba  
 Emisión conjunta  
 unidireccional 1-2  
 $\phi_2$   
 50 dB a 750 Hz

Record No  
 Date 9-3-90  
 Sign

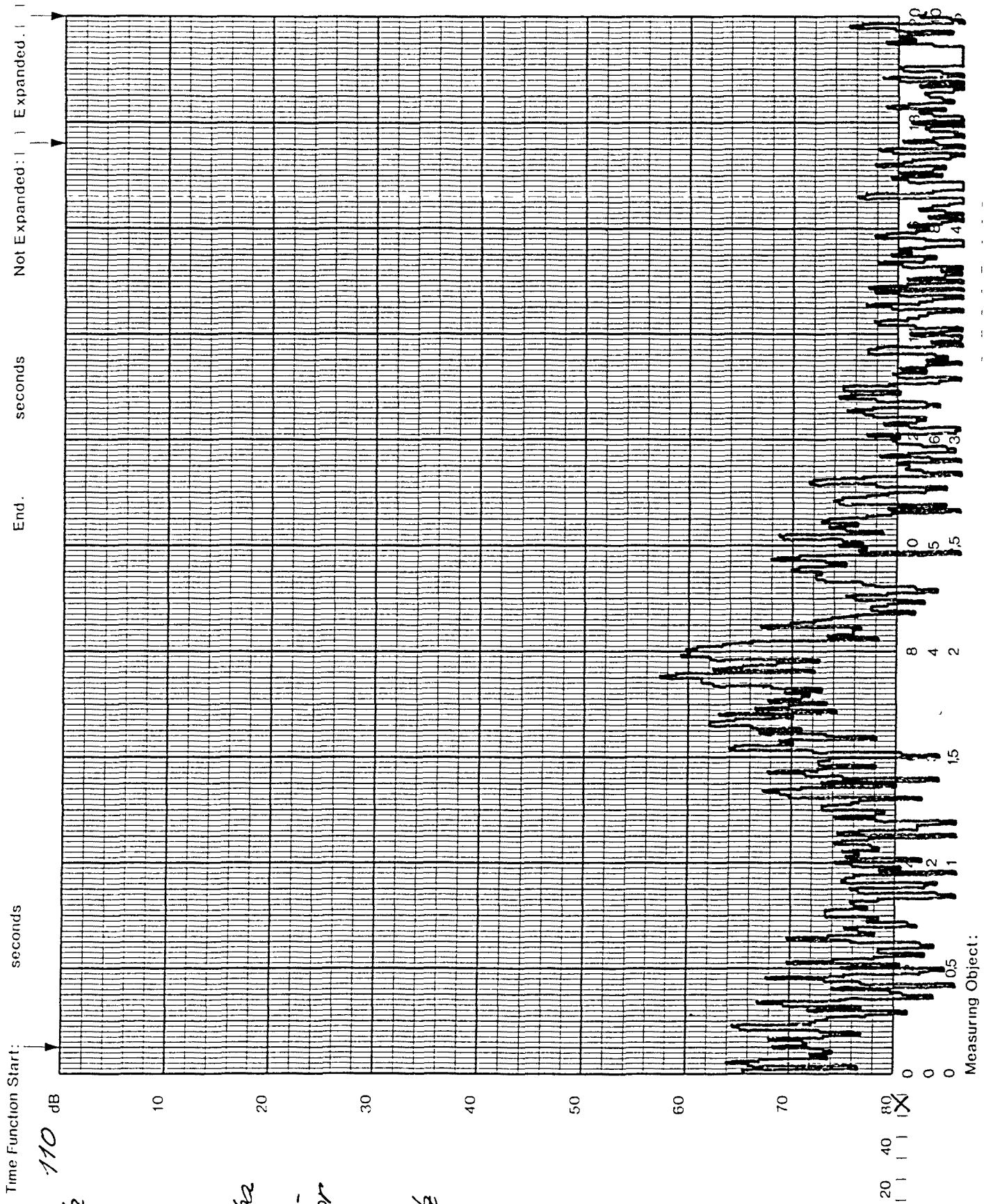


Bruel & Kjaer

Full Scale Level: 110 dB  
F. S. Frequency: 2 kHz  
Weighting  
Average Mode  
No. of Spectra:

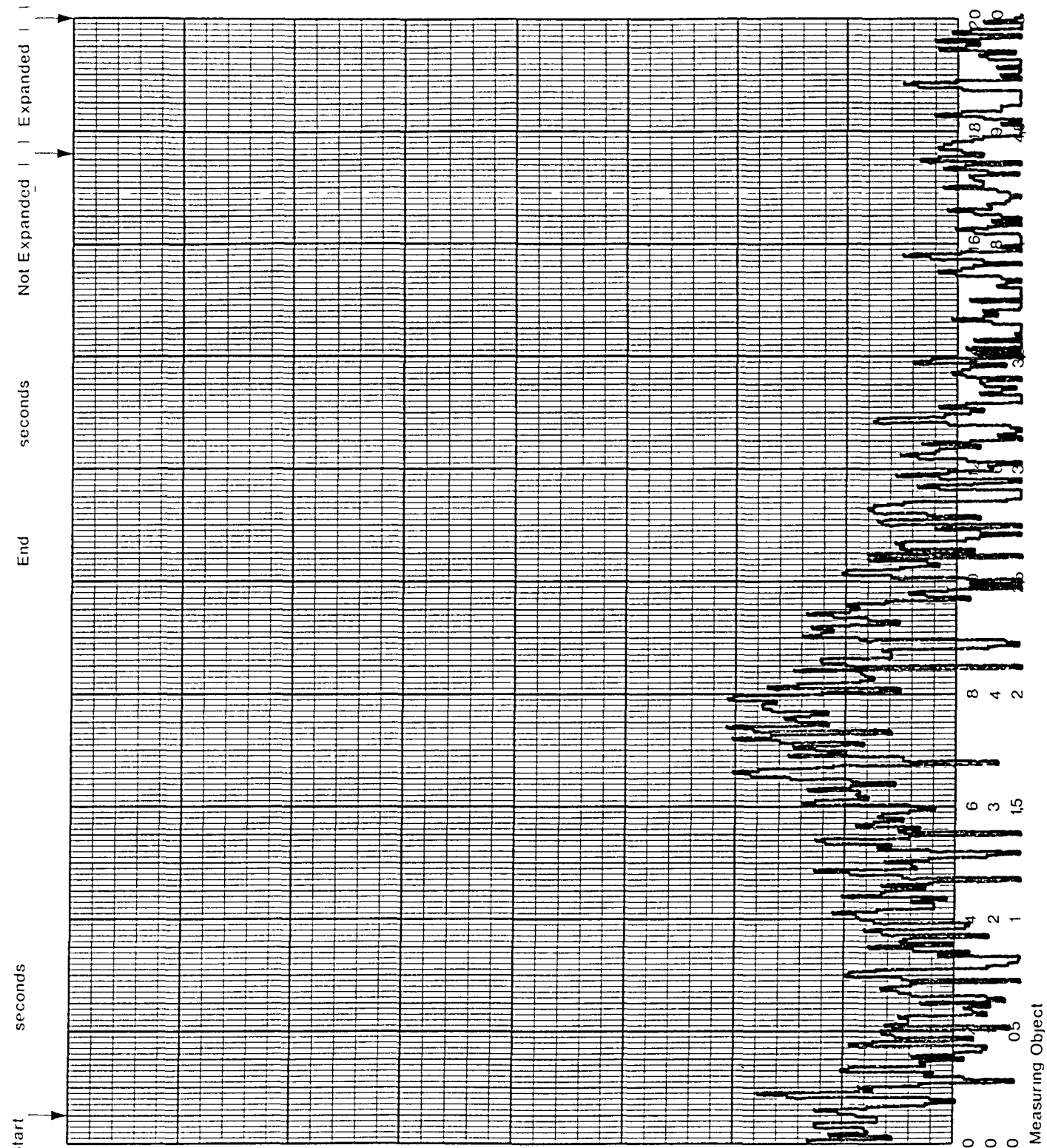
Comments:  
*Punto A*  
*Corriente arriba*  
*Emission siste-*  
*ma atenuador*  
*Φ<sub>3</sub>'*  
*53dB a 750Hz*

Record No.:  
Date: 9-3-90  
Sign.:









Brüel & Kjær

Full Scale Level 110dB  
 F S Frequency 2 kHz  
 Weighting  
 Average Mode  
 No of Spectra 10

Comments  
 Ponto A  
 corriente arriba  
 Emisión sistema  
 atenuador

$\Phi_3$

45dB a 750Hz

Record No  
 Date 9-3-90  
 Sign

20 40 80  
 1 1 1 X



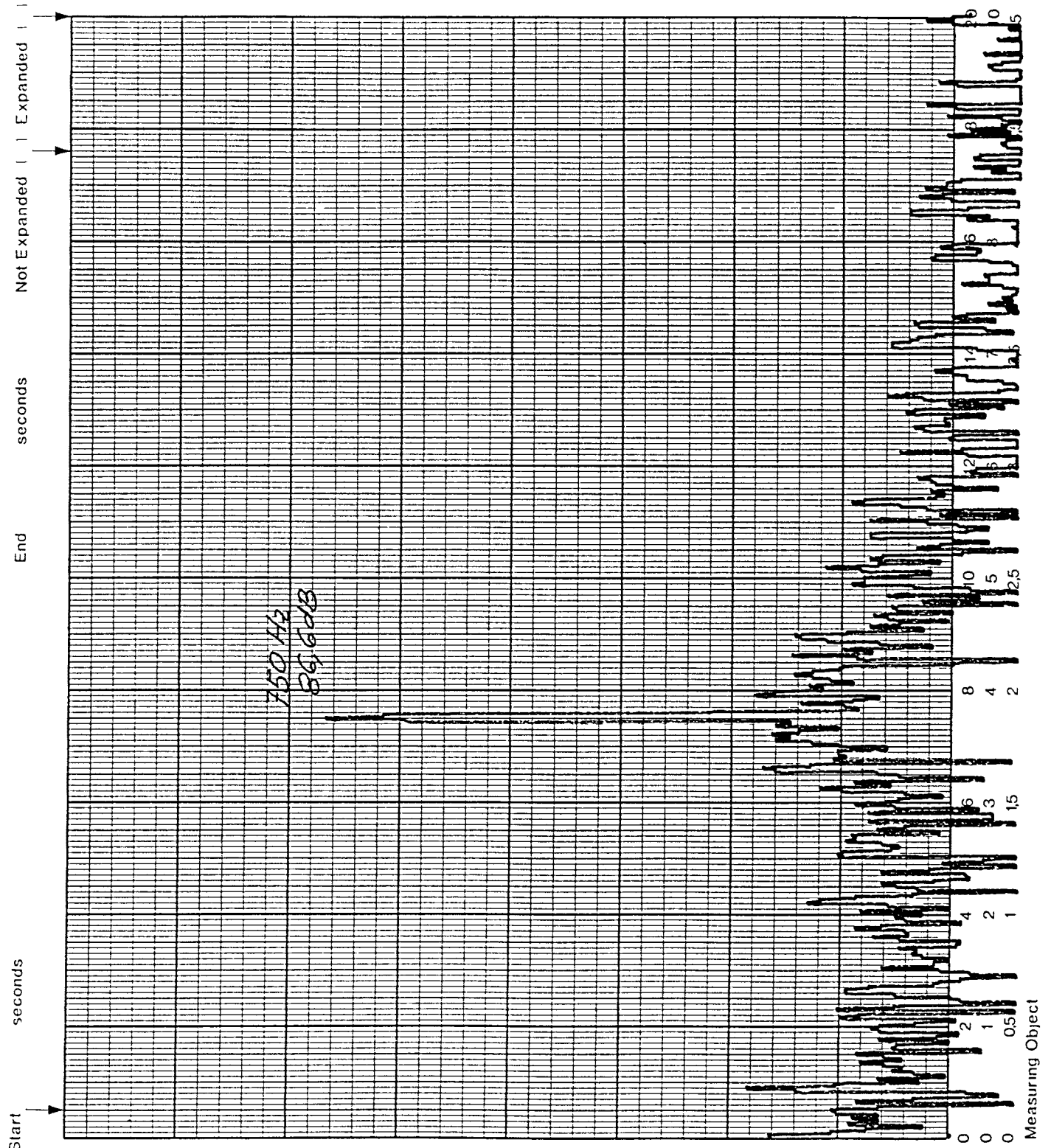
Bruel & Kjaer

Full Scale Level  
F S. Frequency  
Weighting  
Average Mode  
No of Spectra

2 kHz

Comments  
*Punto B  
corriente abajo*

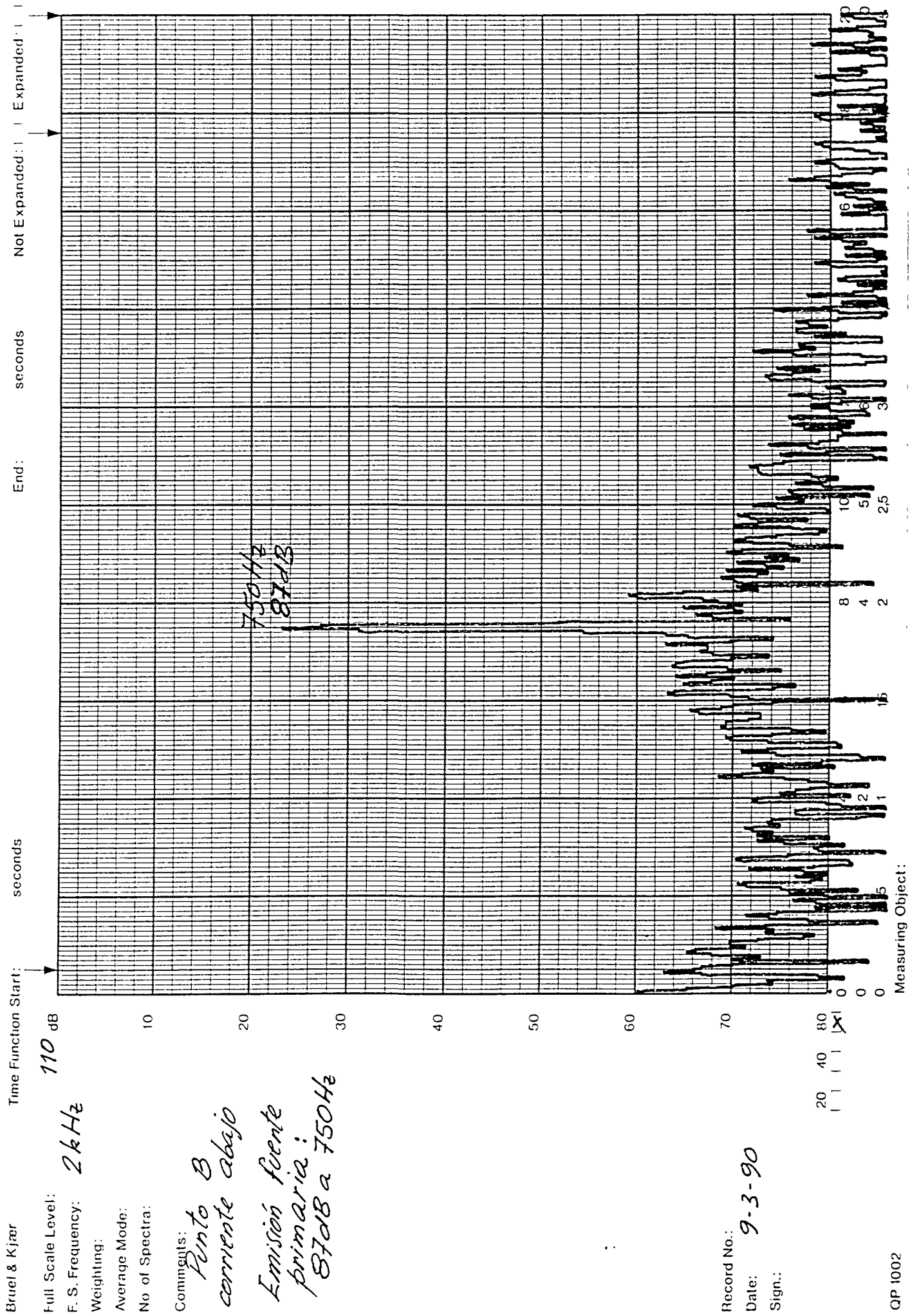
*Emision sistema  
atenuador, para  
una regulacion  
Q3 tal que en  
el punto A, co-  
rriente arriba,  
se obtenia 45dB*



Record No  
Date  
Sign

9.3-90





Bruel & Kjaer

Full Scale Level: 110 dB  
 F. S. Frequency: 2 kHz  
 Weighting:  
 Average Mode:  
 No of Spectra:

Comments:  
 Punto B  
 corriente abajo  
 Emisión fuente  
 primaria:  
 87dB a 750Hz

Record No.:  
 Date: 9-3-90  
 Sign.:



Full Scale Level: 110 dB

F. S. Frequency: 2 kHz

Weighting

Average Mode

No of Spectra

Comments:

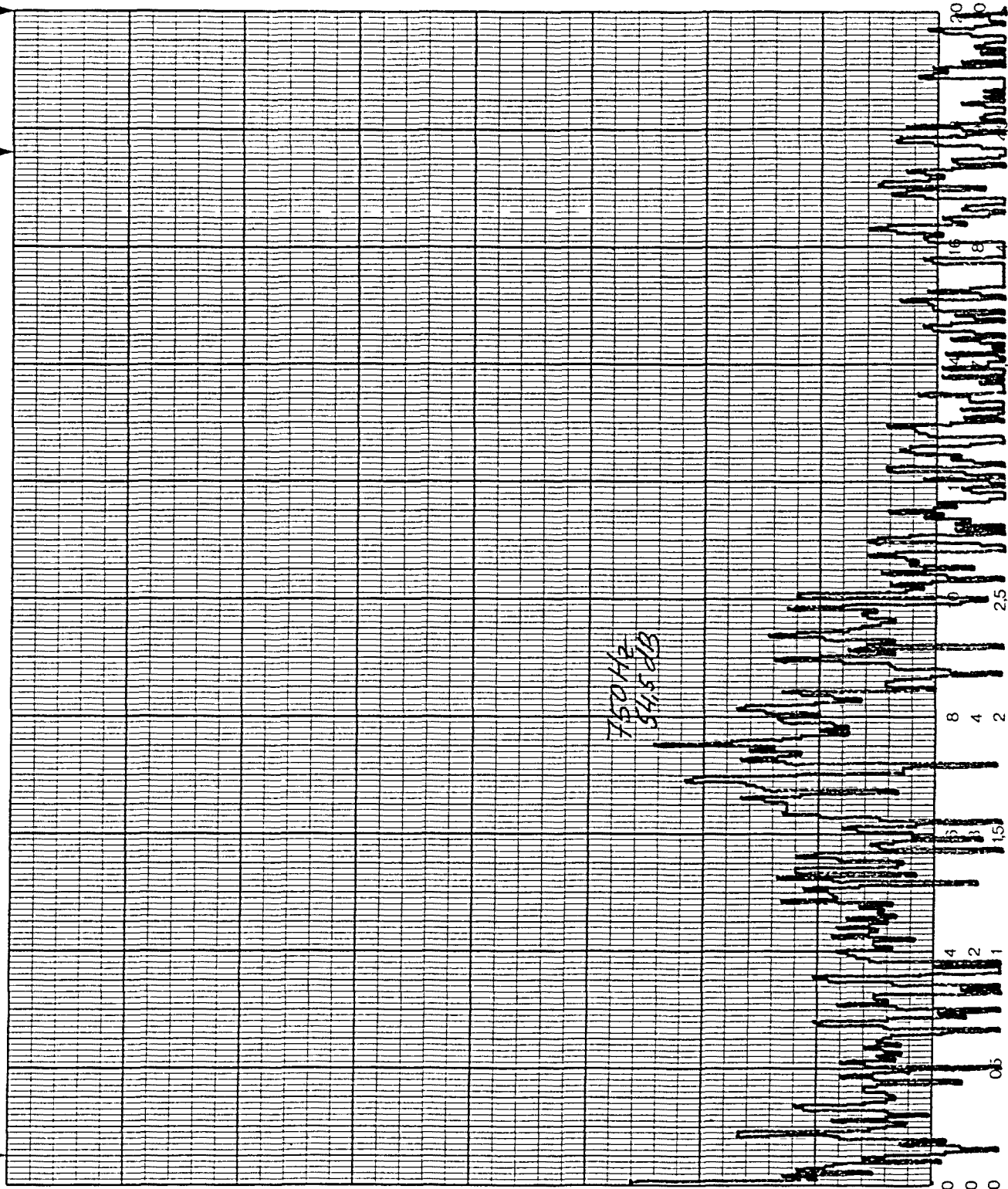
*Punto B corriente abajo*

*N.P.S. resultante: Fuente primaria*

*Sistema atenuador*

*54.5 dB a 750 Hz*

*750 Hz  
54.5 dB*



Record No.:

Date: 9-3-90

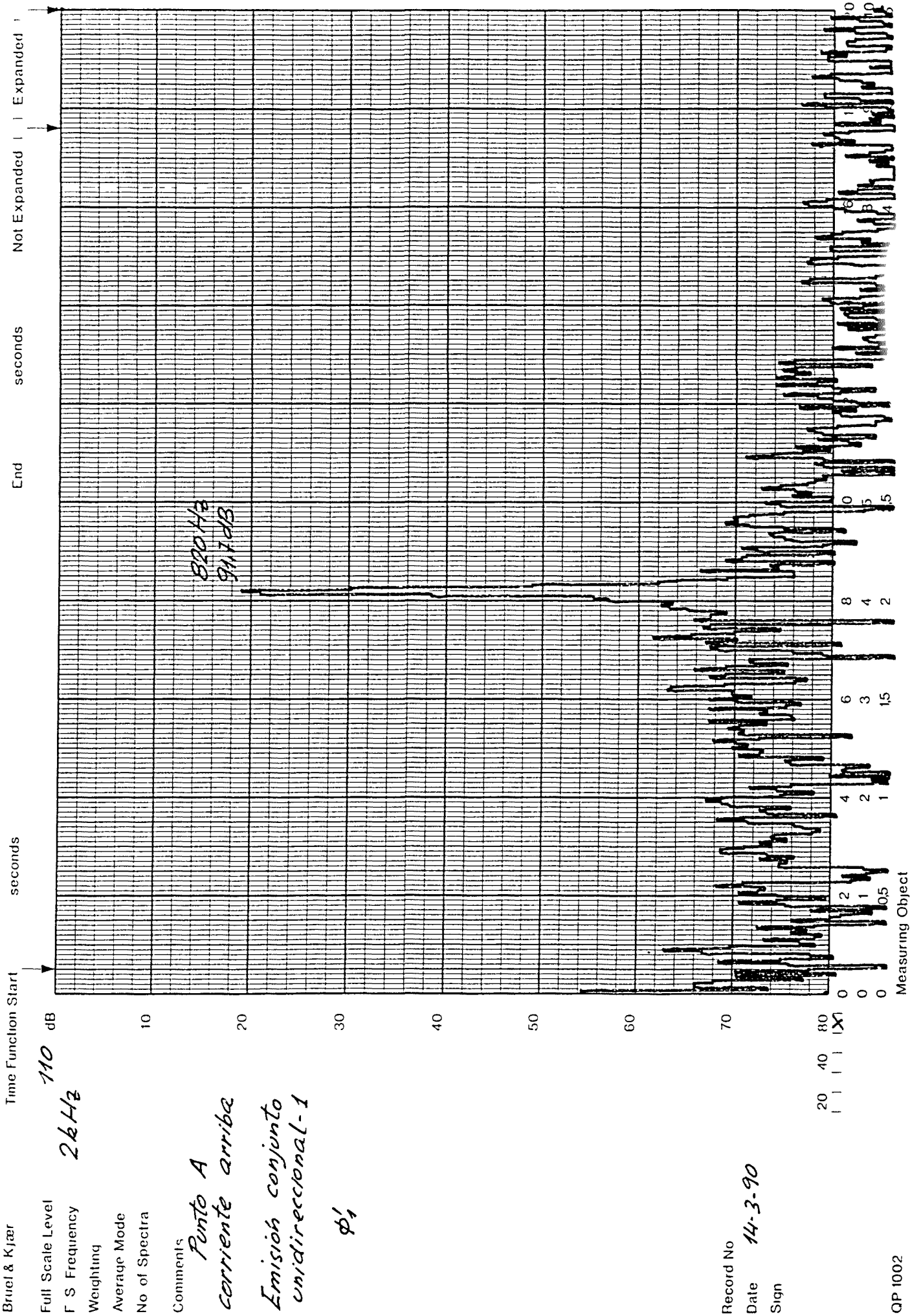
Sign.:





FRECUENCIA DE 820 Hz Y CONDUCTO DE  
SECCION RECTANGULAR. (APART. 6.10).





800 Hz  
91.7 dB

Bruel & Kjaer

Full Scale Level 110

F S Frequency 2 kHz

Weighting

Average Mode

No of Spectra

Comments

Punto A

corriente arriba

Emisión conjunta unidireccional-1

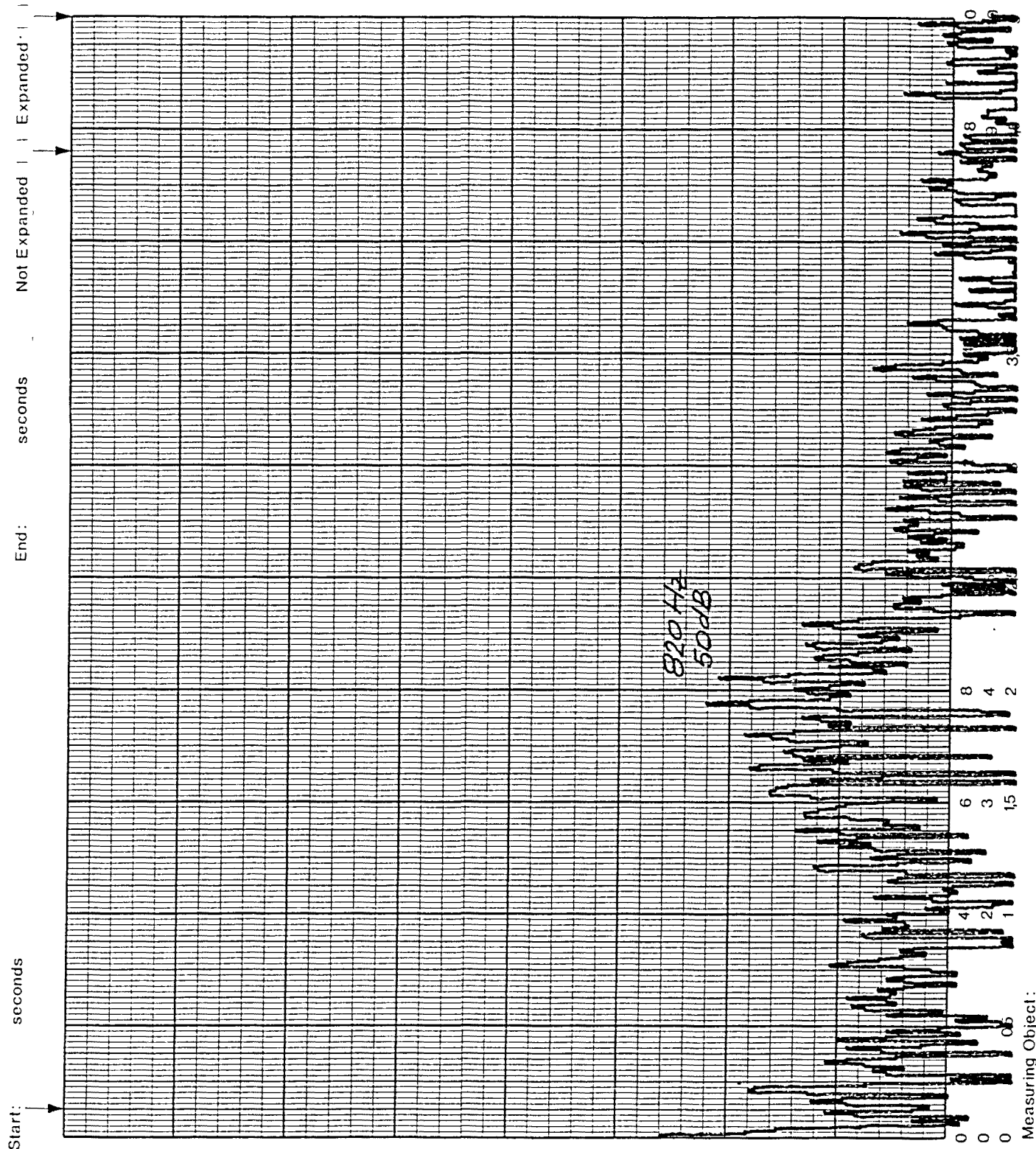
$\phi_1$

Record No

Date 14-3-90

Sign





Bruel & Kjaer  
 Full Scale Level: 110 dB  
 F. S. Frequency: 2 kHz  
 Weighting  
 Average Mode  
 No of Spectra.  
 Comments:  
 Punto A  
 corriente arriba  
 Emisión conjunta  
 unidireccional-1  
 $\phi_1$

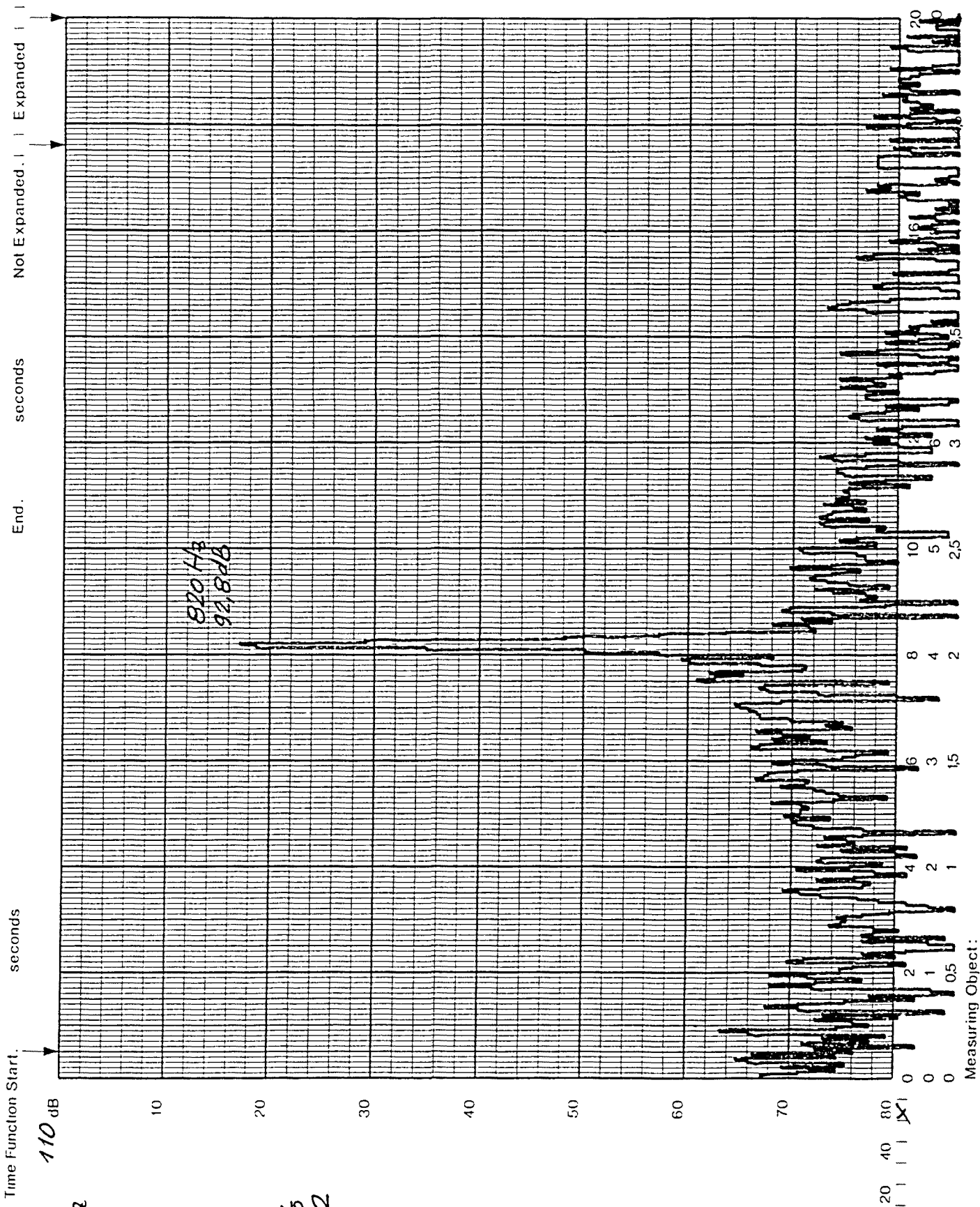
Record No: 14-3-90  
 Date:  
 Sign:



Full Scale Level: 110 dB  
F. S. Frequency: 2 kHz

Weighting:  
Average Mode  
No. of Spectra

Comments:  
*Punto A*  
*Corriente arriba*  
*Emisión conjunta*  
*unidireccional-2*  
 $\phi_2'$



Record No :  
Date: 14-3-90  
Sign :

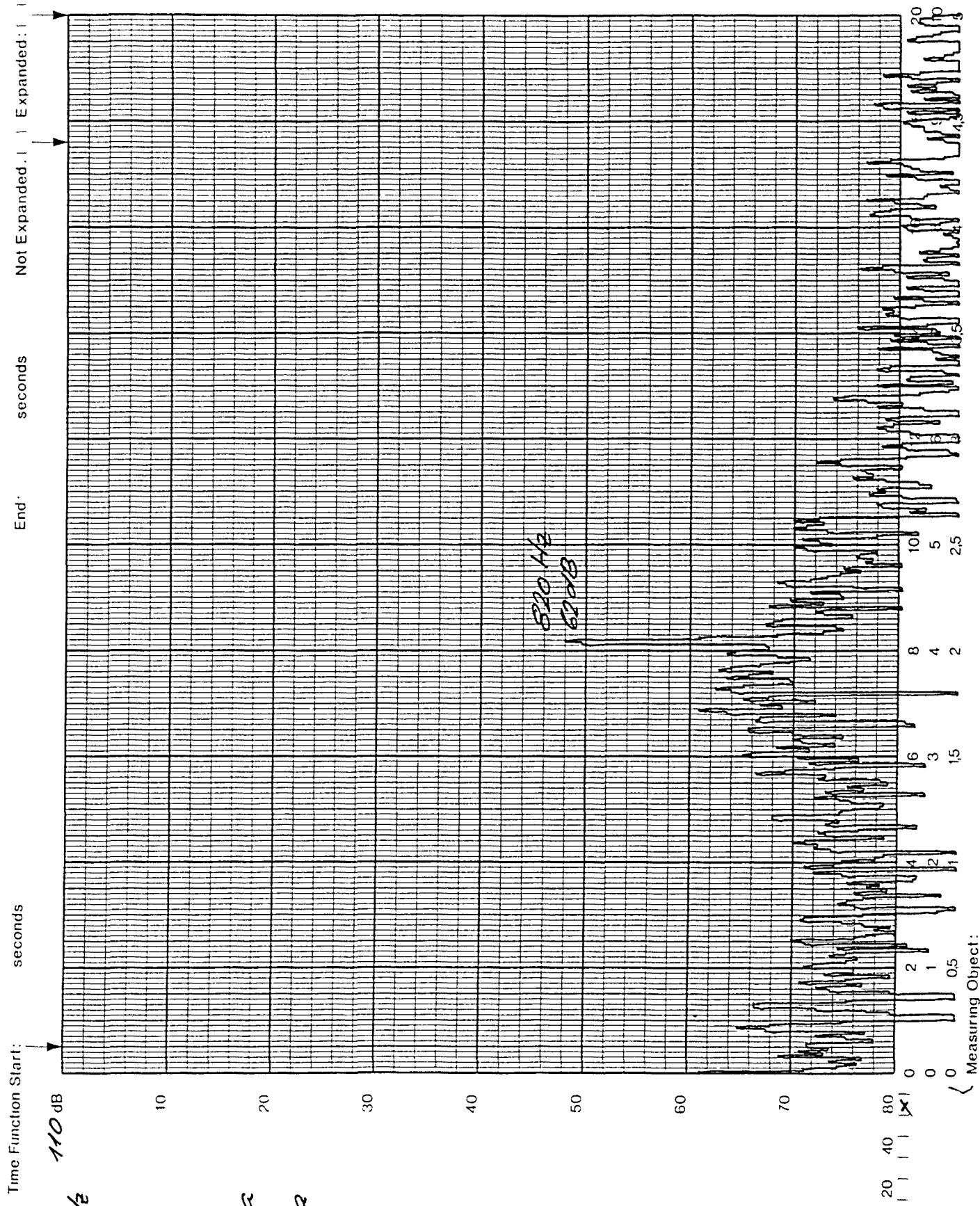
865











Brüel & Kjær  
 Full Scale Level: 110 dB  
 F. S. Frequency: 2k Hz  
 Weighting:  
 Average Mode  
 No of Spectra

Comments:  
 Ponto A  
 corrente arriba  
 Emisión sistema  
 atenuador  
 Φ<sub>3</sub>

Record No.:  
 Date: 14-3-90  
 Sign.:



Bruel & Kjaer

Time Function Start:

seconds

End:

seconds

Not Expanded:

Expanded:

Full Scale Level: 110 dB

F. S. Frequency: 2 kHz

Weighting

Average Mode

No of Spectra

Comments:

*Punto A  
corriente arrive  
Smission sistema  
alternador*

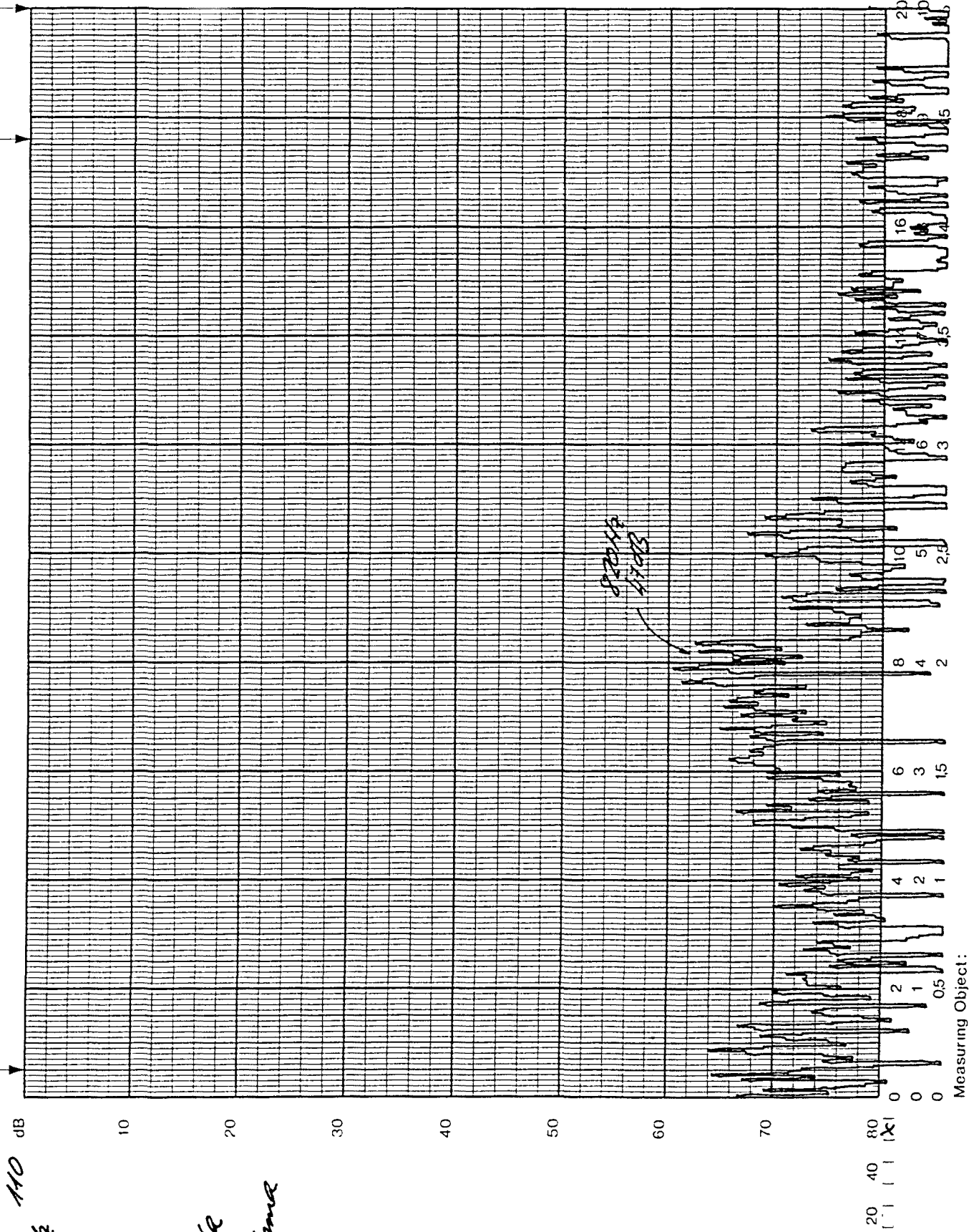
*Ø3*

Record No.:

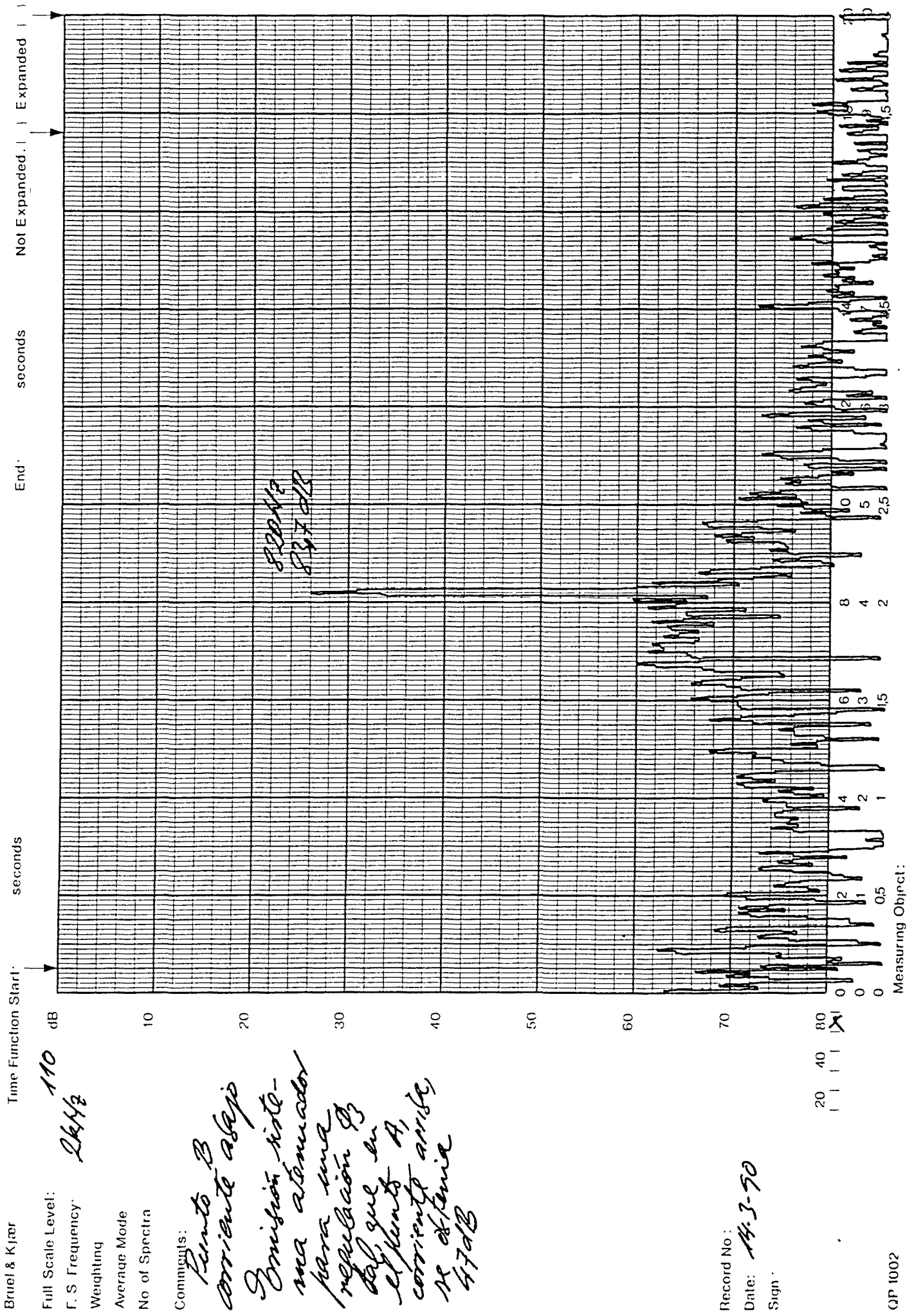
Date: 14-3-70

Sign:

OP 1002







Brüel & Kjær

Full Scale Level: 110  
F. S Frequency: 2kHz

Weighting  
Average Mode  
No of Spectra

Comments:

*Punto B  
orientado abajo  
Emisión rítmica  
para atenuador  
para una  
regulación B3  
del que en  
el punto A,  
corriente arriba  
de 47dB*

Record No:

Date: 14-3-90

Sign:





Bruel & Kjaer

Time Function Start:

seconds

End:

seconds

Not Expanded:

Expanded:

Full Scale Level: 110 dB

F. S. Frequency: 2 kHz

Weighting:

Average Mode:

No. of Spectra:

Comments:

*Punto A  
corriente aribe  
Búsqueda sistema  
atenuador*

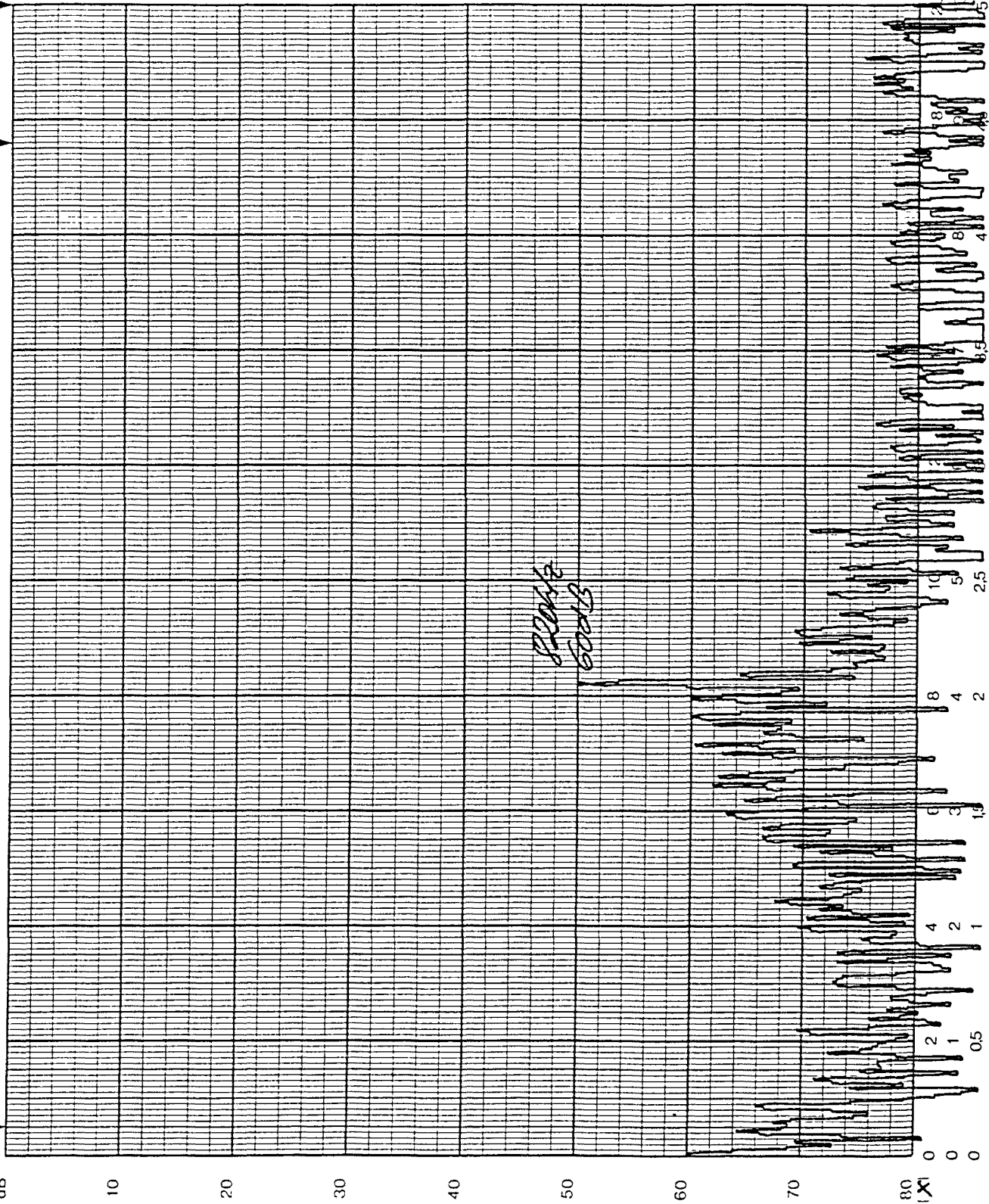
*Φ<sub>3</sub>*

*220 Hz  
60 dB*

Record No.:

Date: 14-3-90

Sign.:





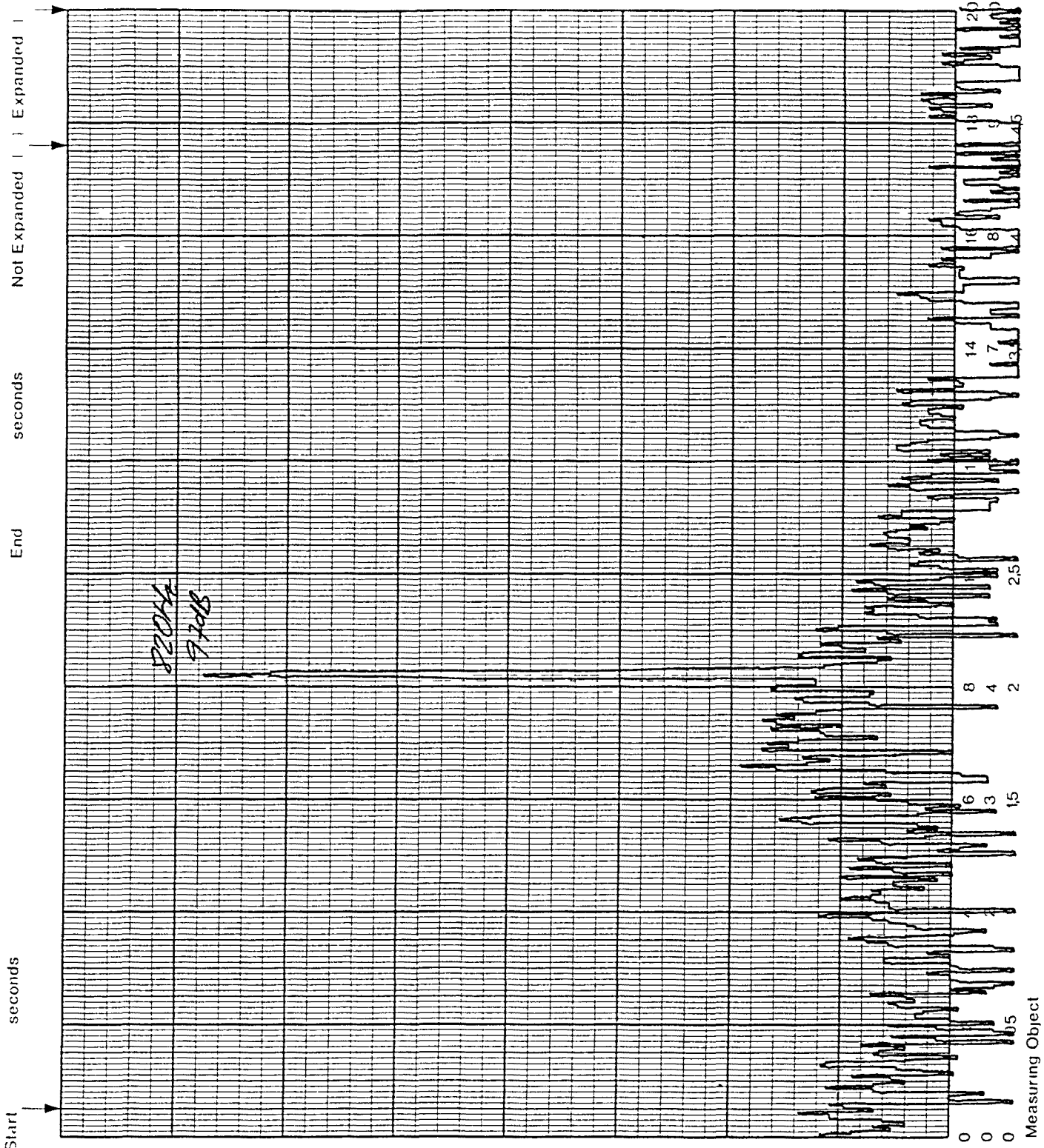
Bruel & Kjaer

Full Scale Level  
F S Frequency  
Weighting  
Average Mode  
No of Spectra

110 dB

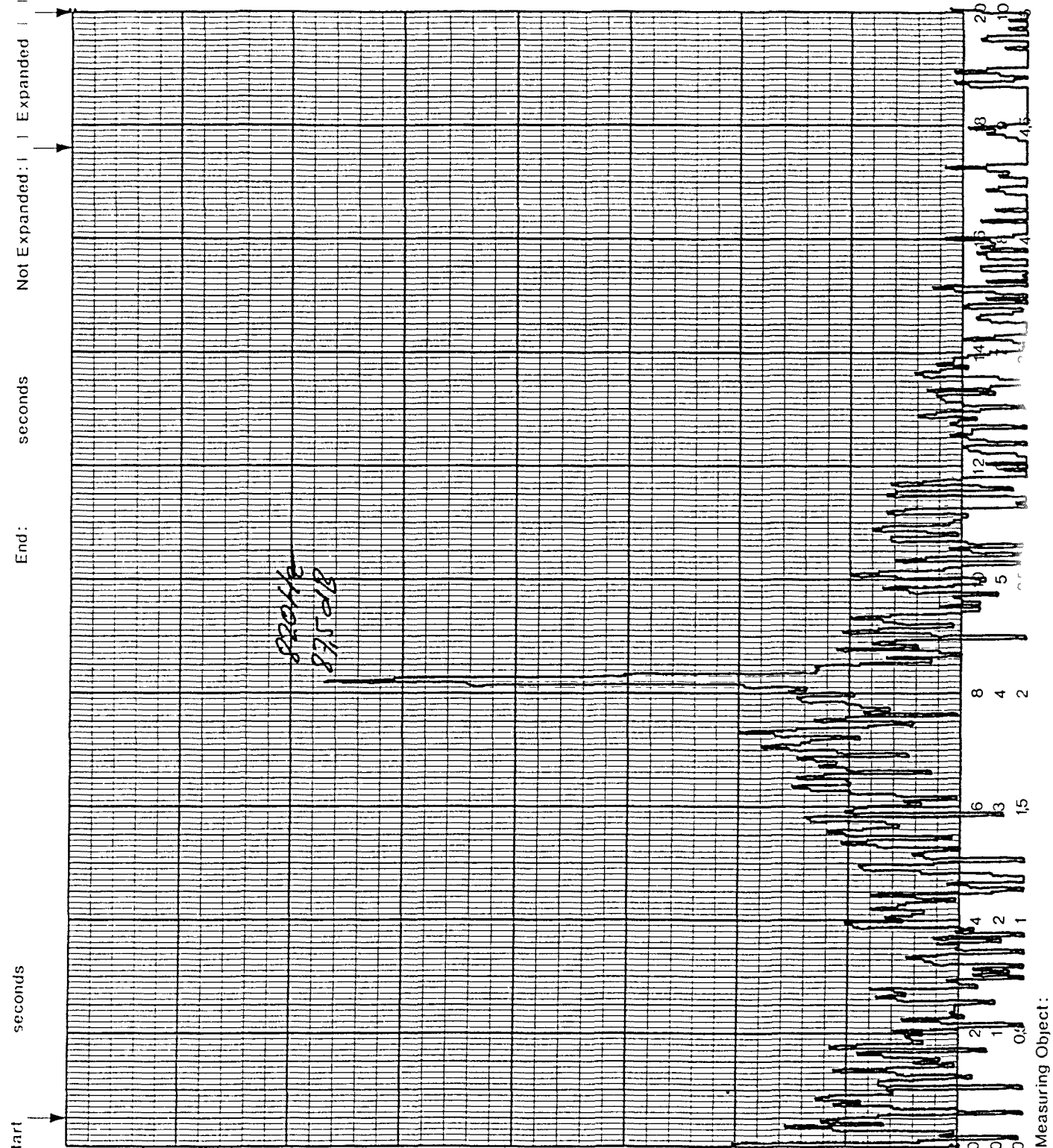
2kHz

Comments  
Punto B  
corriente abajo  
Emision no-  
tena atenuada  
para una  
regulacion  
de 3' del que  
en el punto  
A, corriente  
arriba, se  
obtenia 60dB



Record No  
Date 14-3-90  
Sign



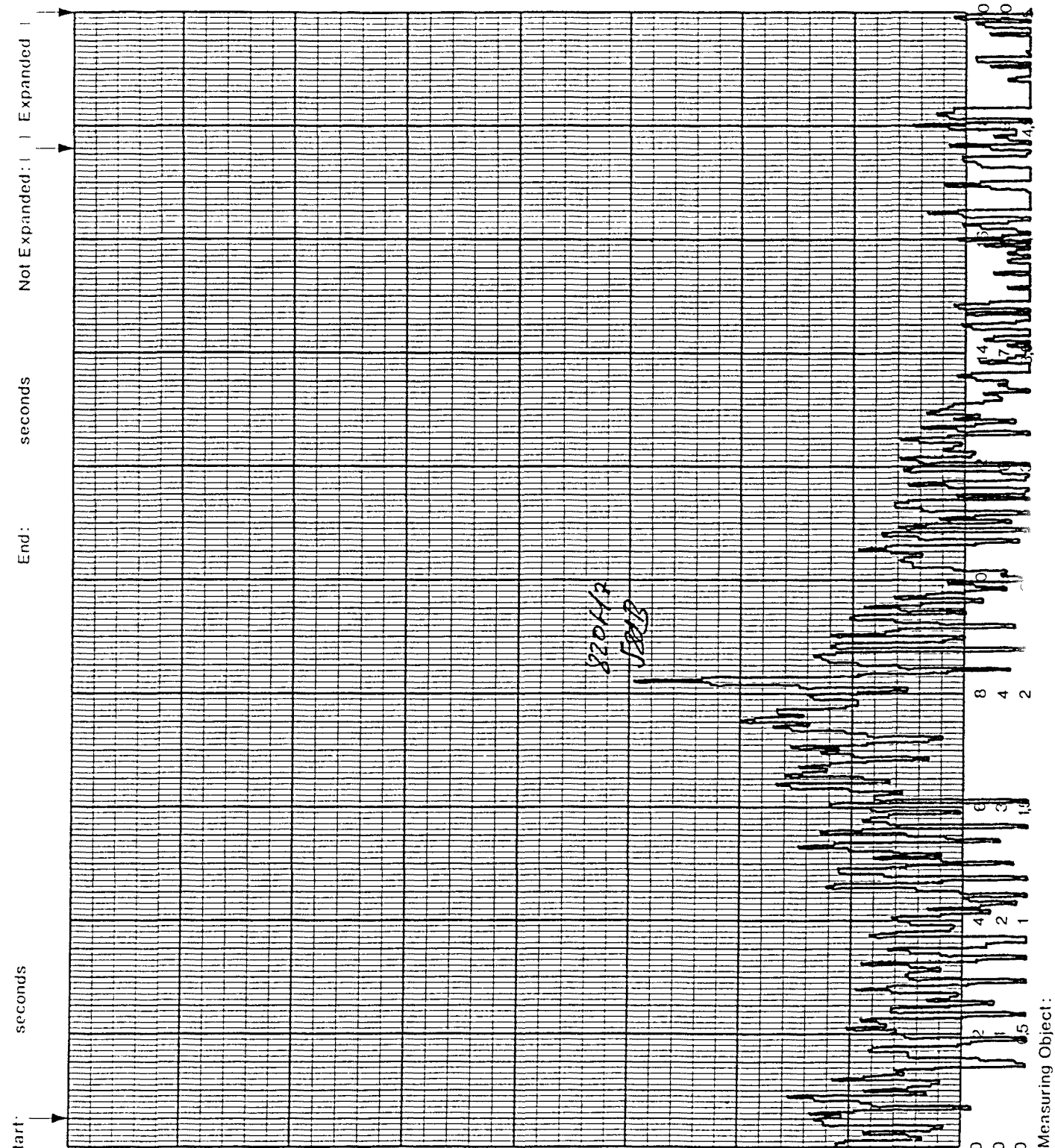


Bruel & Kjaer  
 Full Scale Level 110  
 F S Frequency 2 kHz  
 Weighting  
 Average Mode  
 No of Spectra

Comments:  
 Punto B  
 Corriente abajo  
 Inyección  
 Fuente  
 primaria

Record No.  
 Date: 14-3-90  
 Sign:





Brüel & Kjær  
 Full Scale Level: 110 dB  
 F. S. Frequency: 2 kHz  
 Weighting  
 Average Mode.  
 No of Spectra

Comments:  
*Fuente B*  
*corriente abajo*  
*N.P.S. resultante:*  
*Fuente primaria*  
*Sistema atenuador*

Record No.:  
 Date: *14-3-90*  
 Sign:

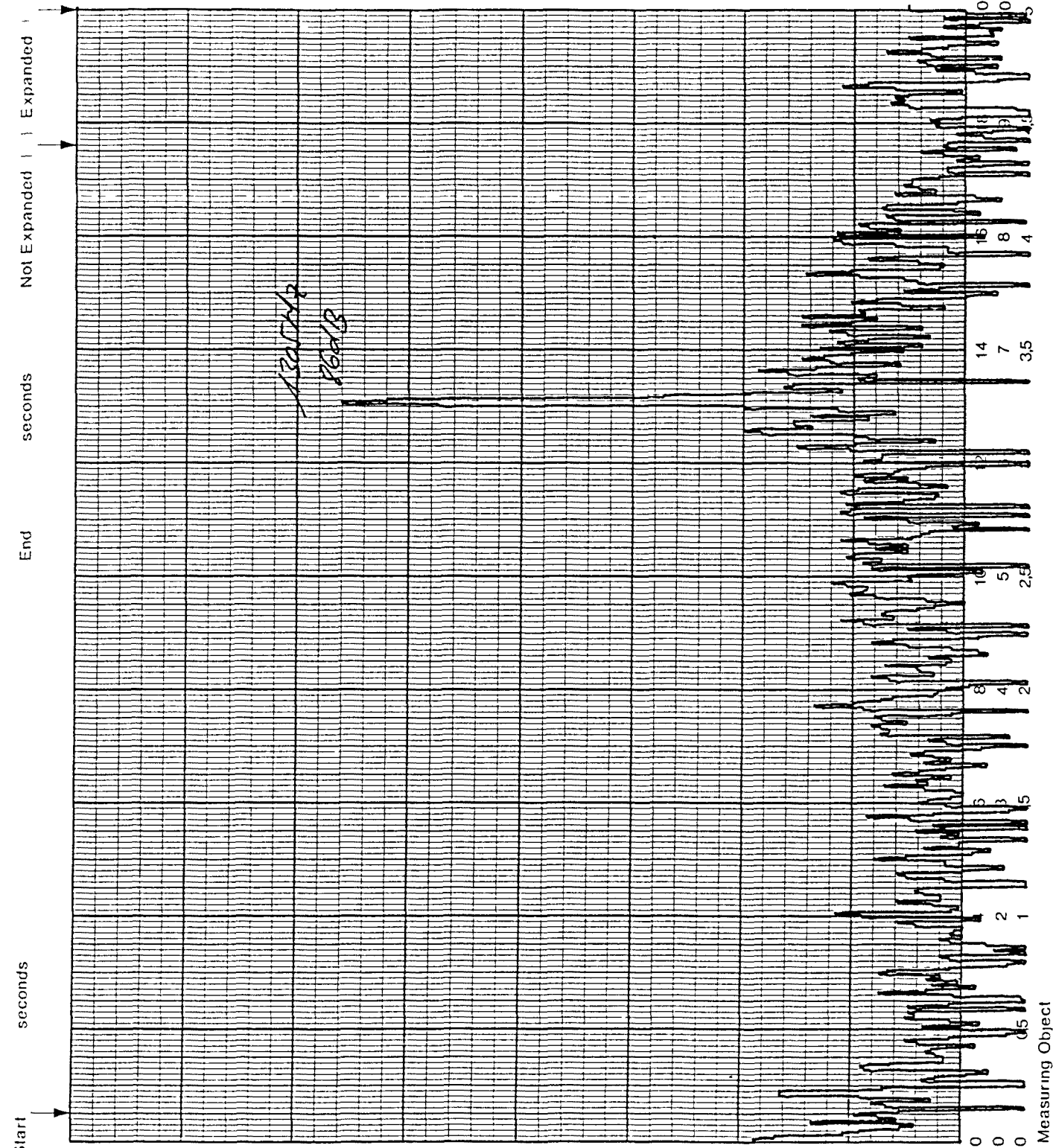
20 40 80  
 0 0 0  
 2 1 5  
 4 2 1  
 6 3 1  
 8 4 2  
 Measuring Object:





FRECUENCIA DE 1305 Hz Y CONDUCTO DE  
SECCION RECTANGULAR. (APART. 6.11).

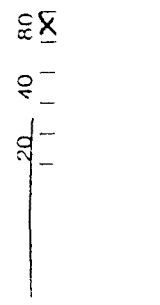




Brüel & Kjær  
 Full Scale Level 110  
 F S Frequency 2 kHz  
 Weighting  
 Average Mode  
 No of Spectra 10

Comments  
 Punto A  
 constante arriba  
 Emisión conjun-  
 to unidireccional-1  
 $\phi_1$

Record No  
 Date 4-4-90  
 Sign





Bruel & Kjaer

Full Scale Level: **2kN<sub>2</sub>**

F. S. Frequency: **110**

Weighting:

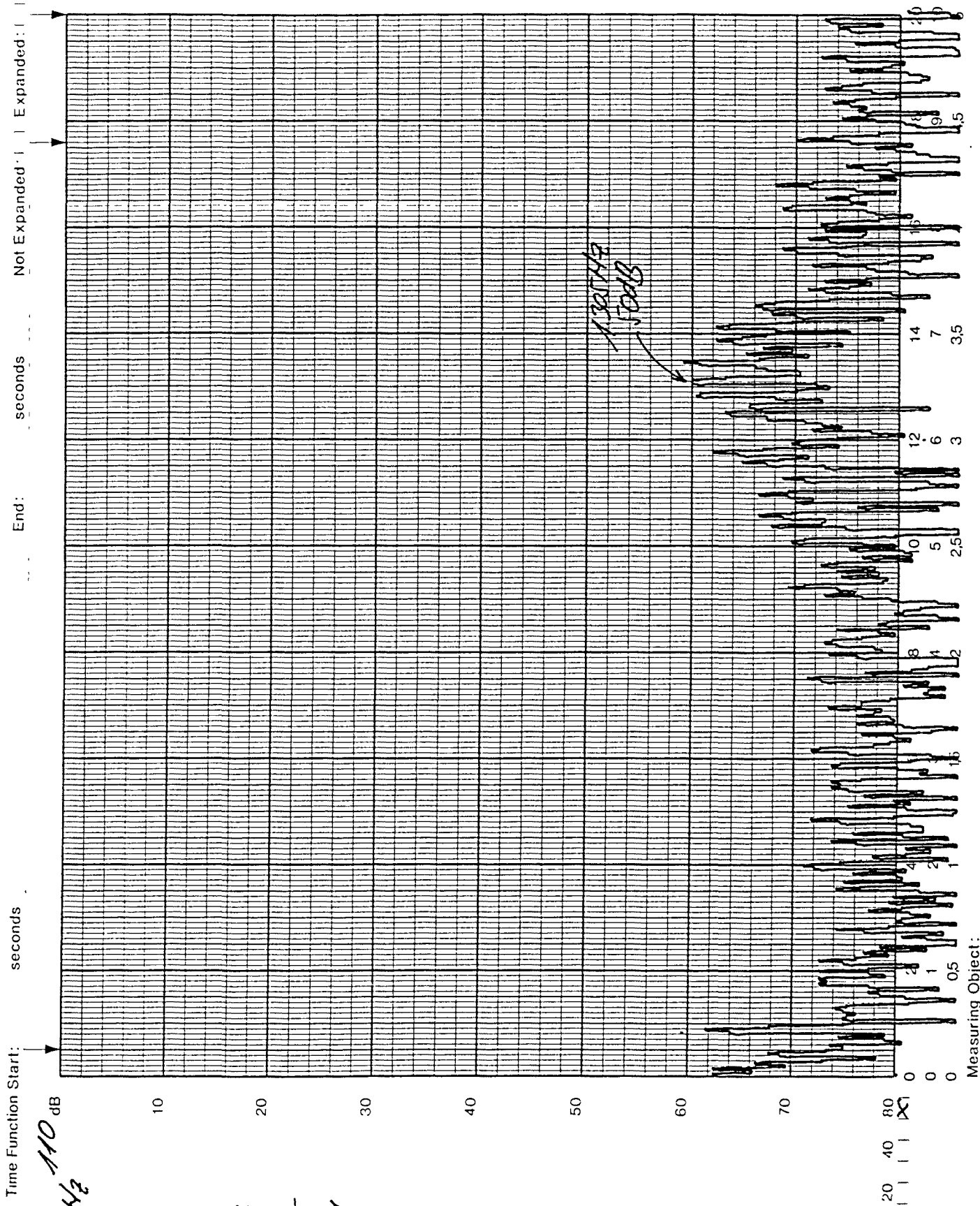
Average Mode:

No. of Spectra:

Comments:

*Punto A  
concreto arriba  
Emisión con-  
Punto uni-  
direccional. 1*

*Φ<sub>1</sub>*



Record No.:

Date: **4-4-90**

Sign:



Bruel & Kjaer

Full Scale Level

f. S. Frequency *2kHz*

Weighting

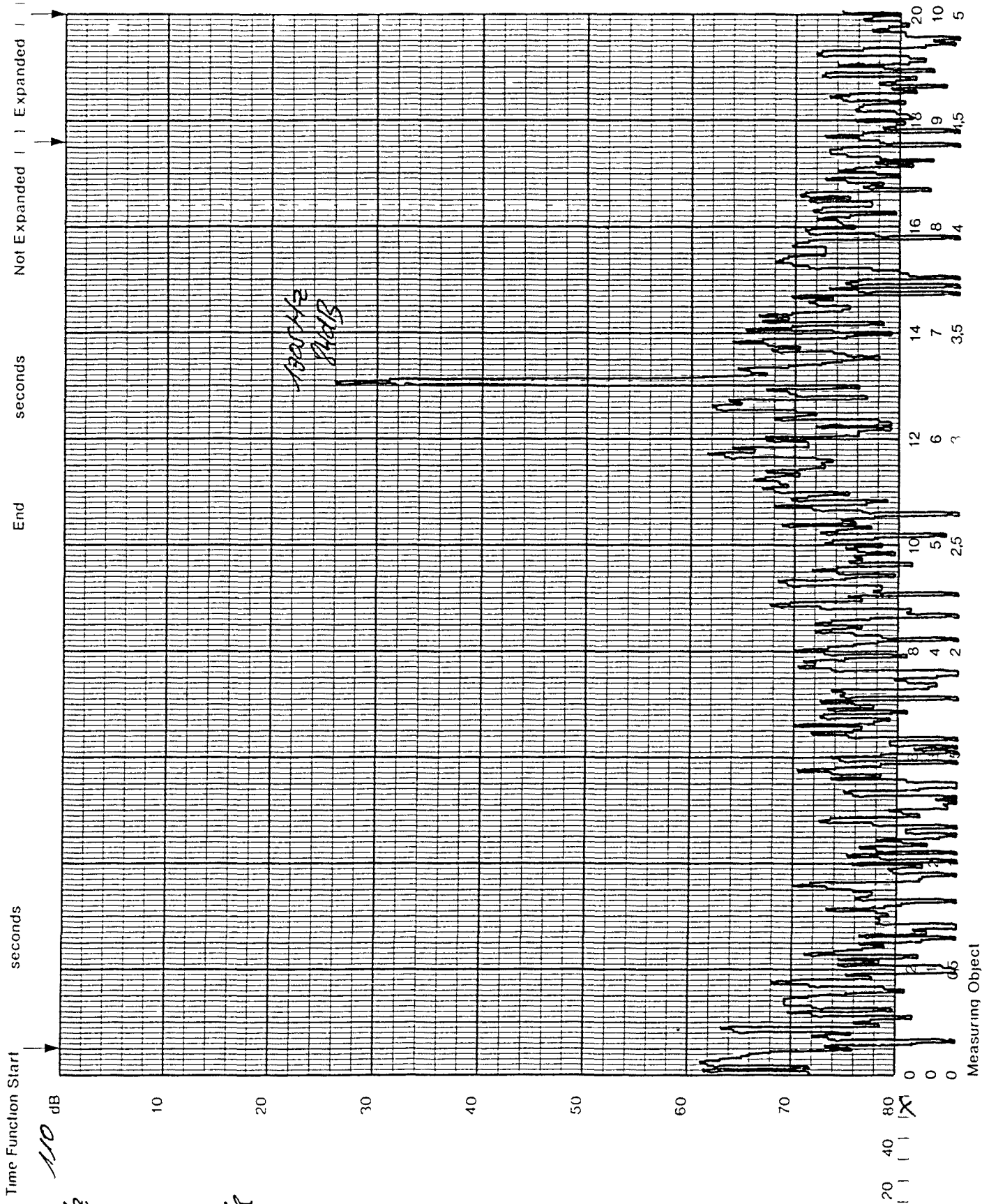
Average Mode

No of Spectra

Comments

*Punto A  
corriente arriba  
Direccion con-  
punto con-  
direccional - 2*

*Φ<sub>2</sub>*



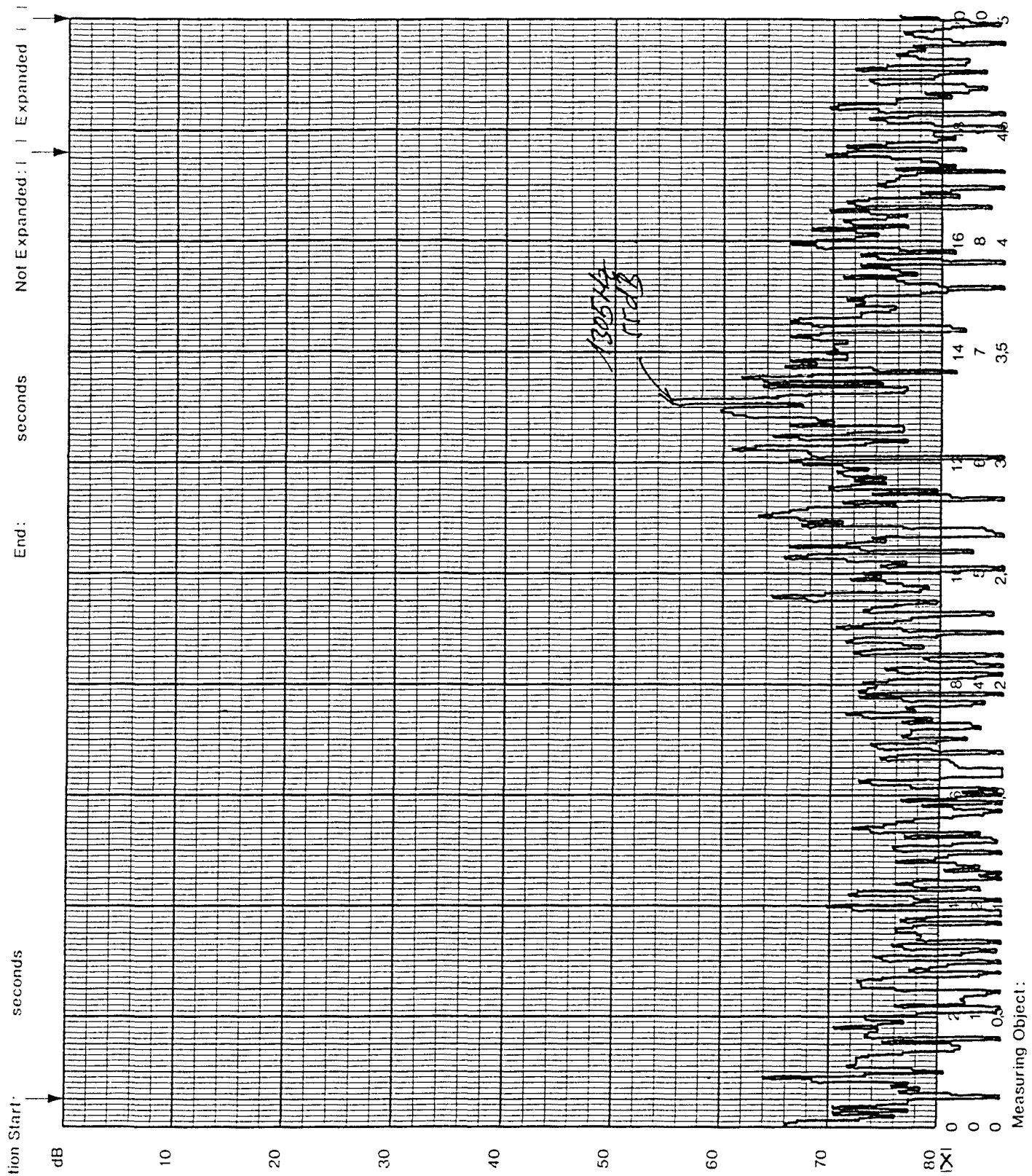
Record No

Date *4-4-90*

Sign







Bruel & Kjaer  
 Full Scale Level: 110  
 F. S. Frequency: 2 kHz  
 Weighting:  
 Average Mode:  
 No of Spectra:

Comments:  
 Puntos A  
 corriente arriba  
 Emision con-  
 puntos unig-  
 direccional - 2  
 P2

Record No.: 4-4-90  
 Date:  
 Sign.:



Measuring Object:





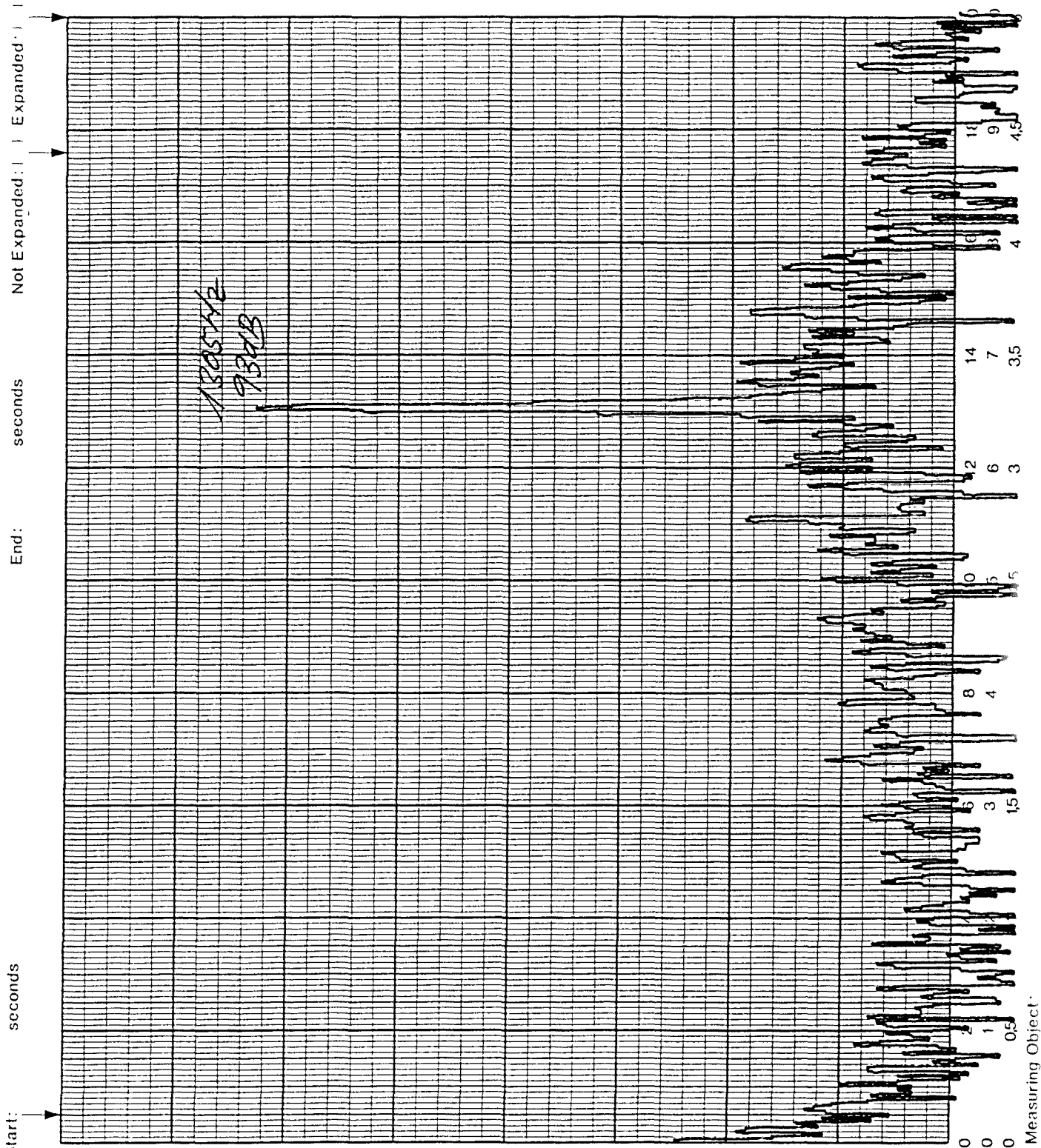


Brüel & Kjær

Full Scale Level: 110 dB  
F. S. Frequency: 2 kHz  
Weighting:  
Average Mode:  
No. of Spectra:

Comments:

Punto B  
corriente abajo  
Emision xite-  
ma a tomador  
para una re-  
gylacion P3  
tal que sea  
el punto A,  
corriente a-  
riba, se  
lectura 67dB



Record No.:  
Date: 4-4-90  
Sign:



Bruel & Kjaer

Full Scale Level: 110

F S Frequency 2kHz

Weighting

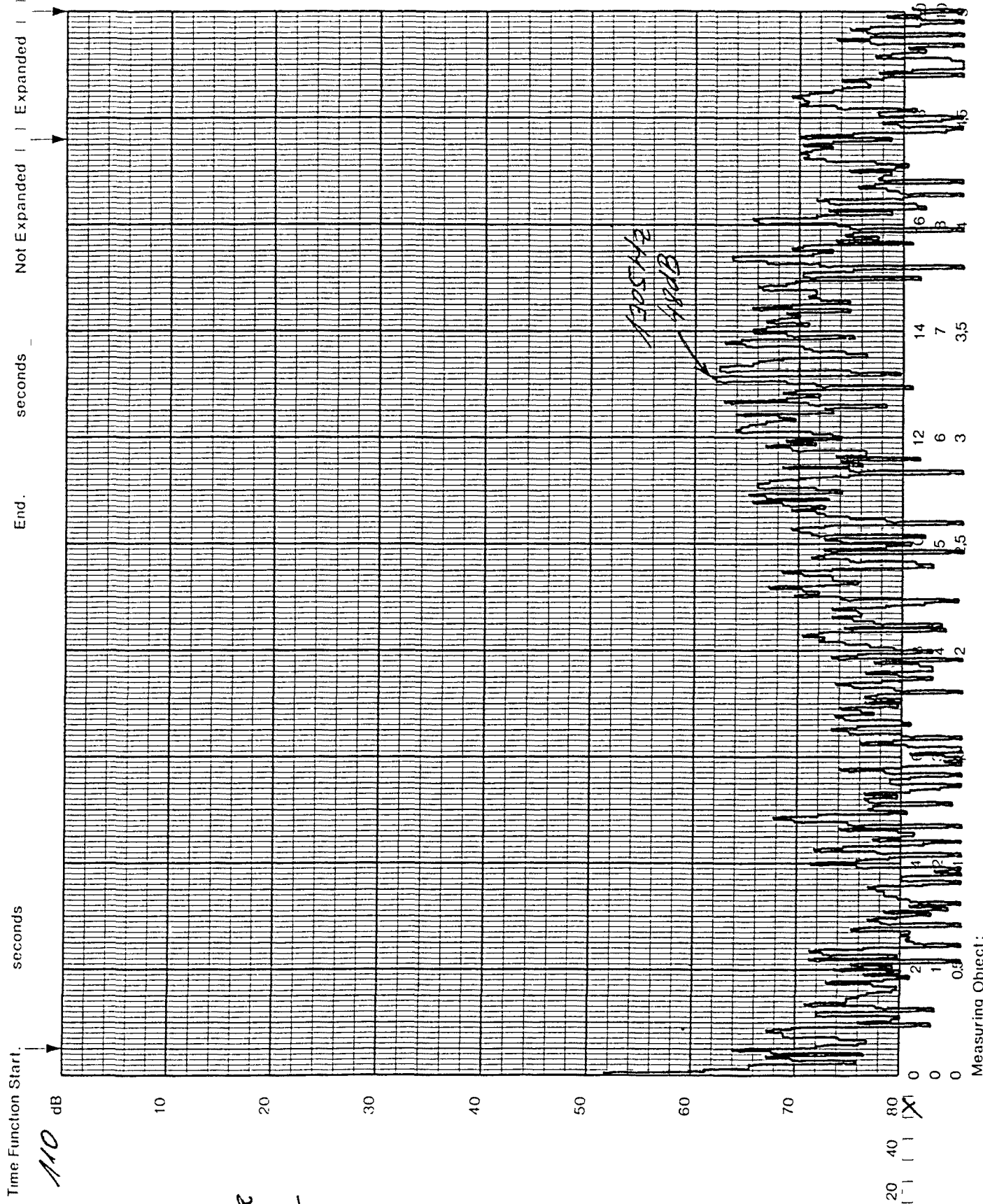
Average Mode

No of Spectra

Comments:

Punto A  
coniente arriba  
Quision his-  
tore ale-  
mados

Q3



Record No:

Date: 4-4-90

Sign.:

QP 1002

Measuring Object:

768









Bruel & Kjaer

Full Scale Level

2KHz

F. S. Frequency.

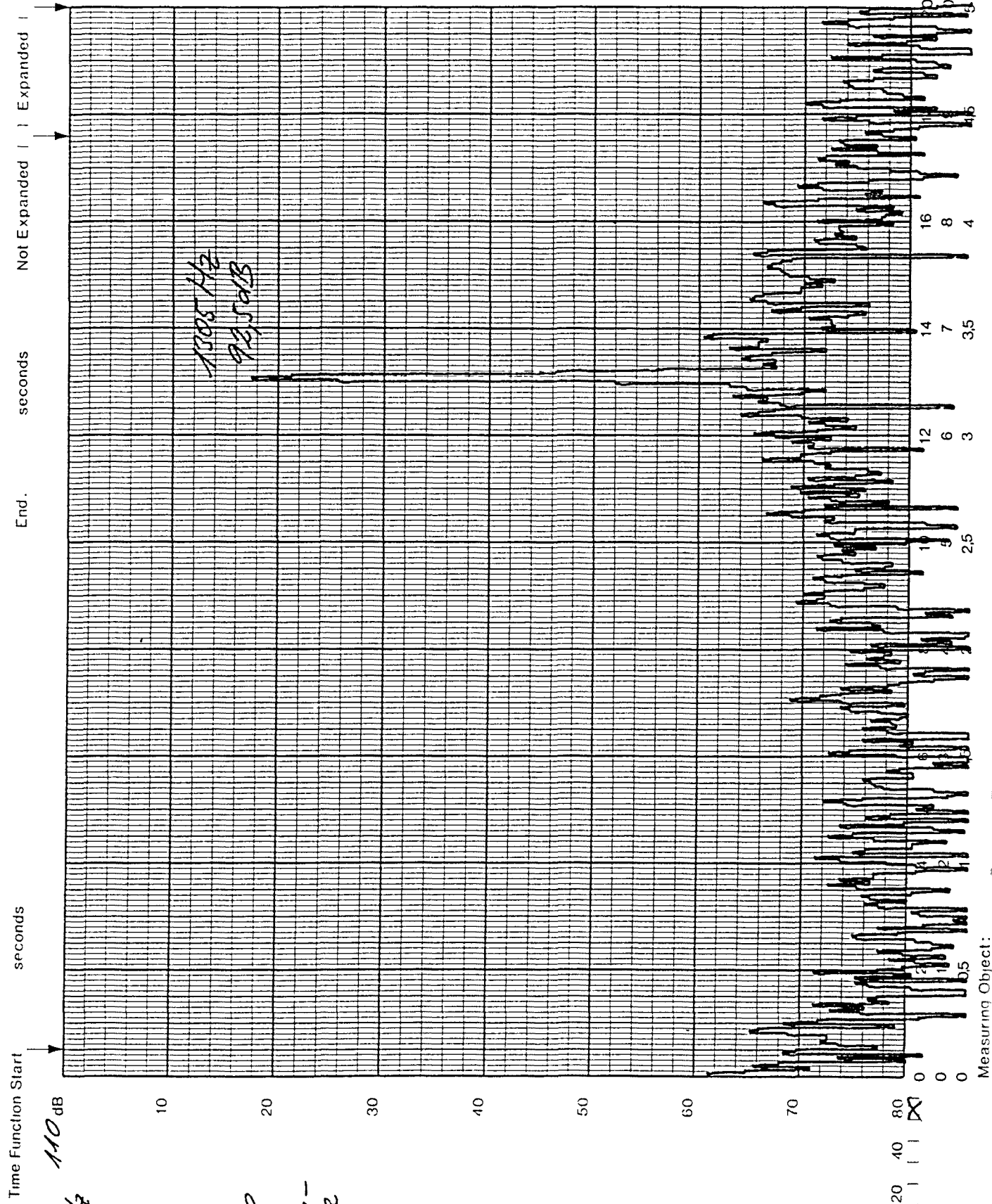
Weighting

Average Mode

No of Spectra

Comments:

*Punto B  
corriente abajo  
Goniómetro sum-  
to primario*

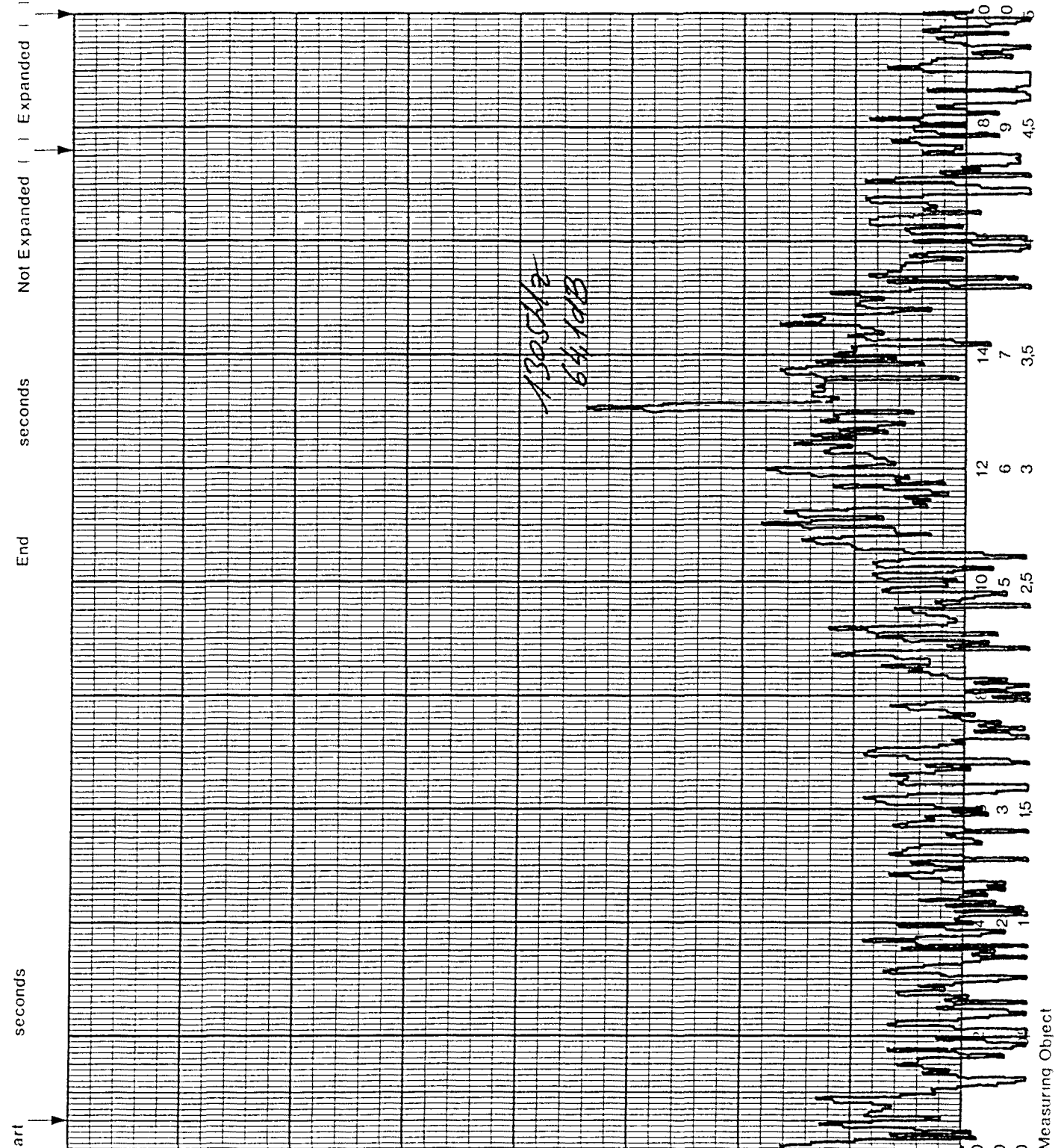


Record No :

Date: 4-4-90

Sign.:





Bruel & Kjaer  
 Full Scale Level 110 dB  
 F S Frequency 2 kHz  
 Weighting  
 Average Mode  
 No of Spectra

Comments  
 Punto Bajo  
 ambiente abajo  
 N.P.S. resultante:  
 Fuente primaria  
 Sistema atenuación

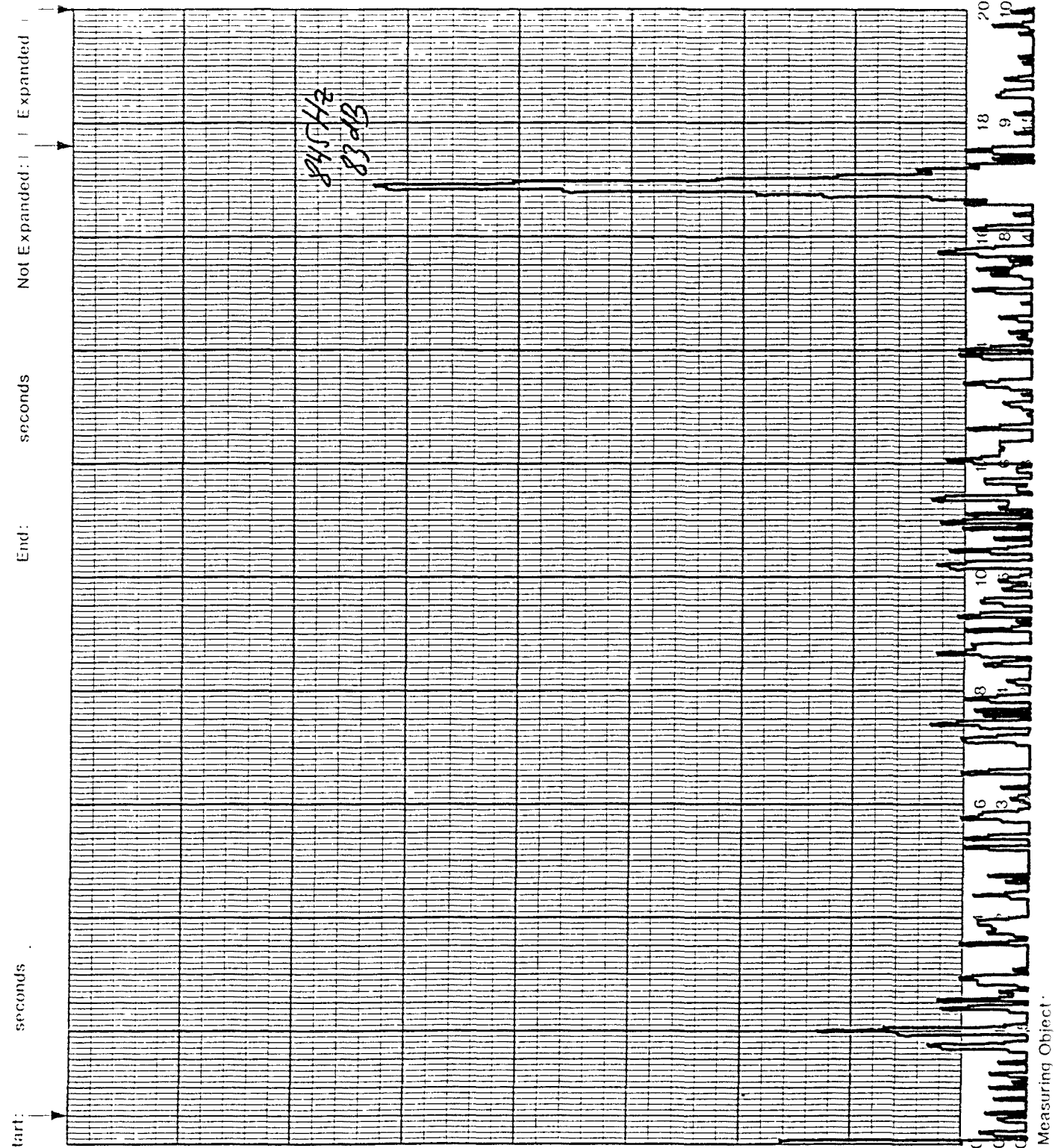
Record No  
 Date 4-4-90  
 Sign



FRECUENCIA DE 845 Hz Y CONDUCTO DE  
SECCION RECTANGULAR. (APART. 6.12).







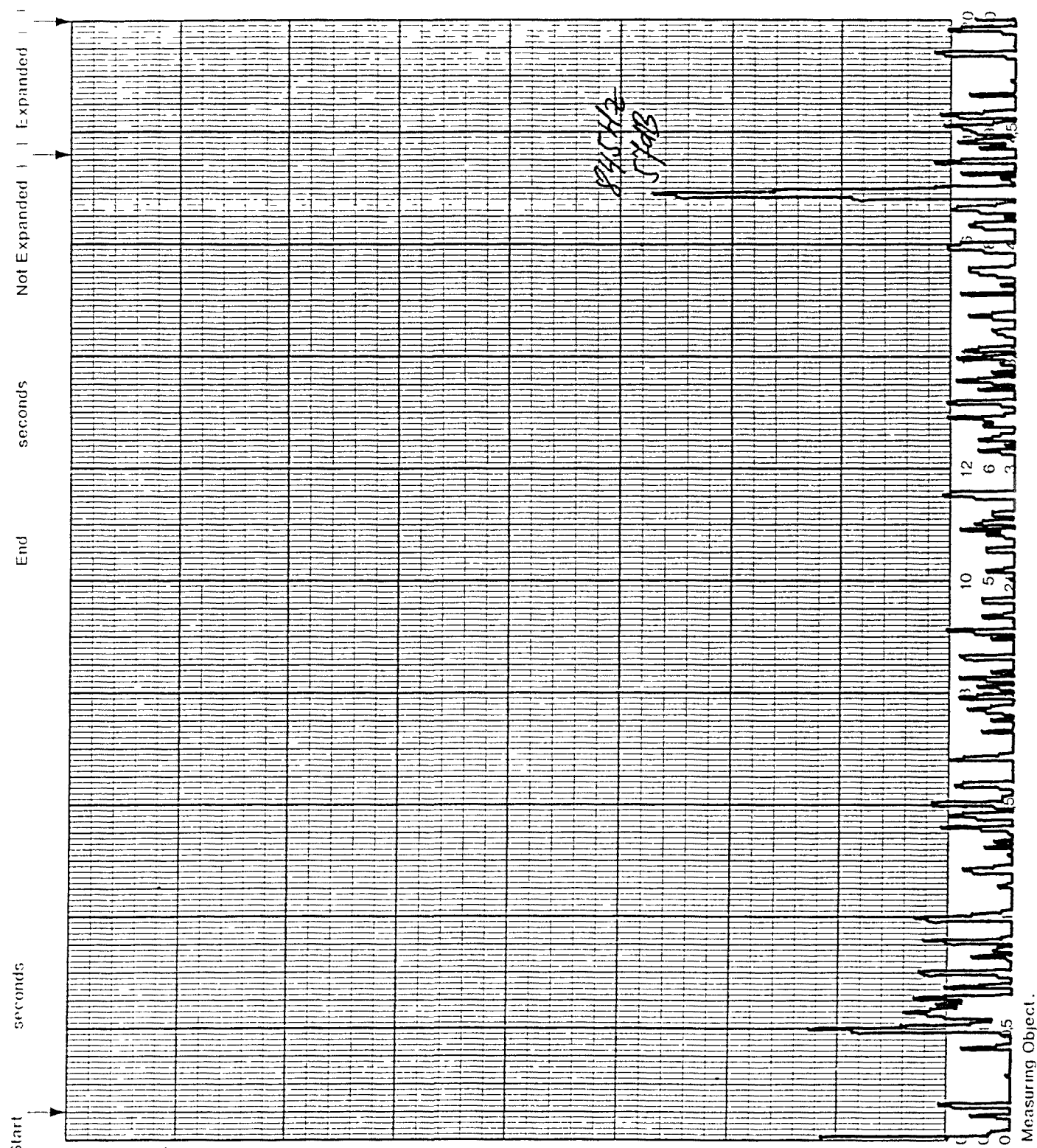
Brüel & Kjær  
 Full Scale Level: 110  
 F. S. Frequency: 1 kHz  
 Weighting:  
 Average Mode  
 No of Spectra: 10

Comments: *Punto A*  
*corrente arriva*  
*Impulsión con un-*  
*to unidireccio-*  
*nal. 1*  
*Φ<sub>1</sub>*

Record No.:  
 Date: 27-4-90  
 Sign.:

20 40 80  
 1 1 1 X





Bruel & Kjaer  
 Full Scale Level 110  
 F S Frequency 1 kHz  
 Weighting  
 Average Mode  
 No. of Spectra

Comments  
 Puntos A  
 comente arriba  
 Goniacion con-  
 puntos unig-  
 direccional - 1  
 Q1

Record No  
 Date 27-4-90  
 Sun

20 40 80 120

Measuring Object.



Bruel & Kjaer

Full Scale Level

F S Frequency

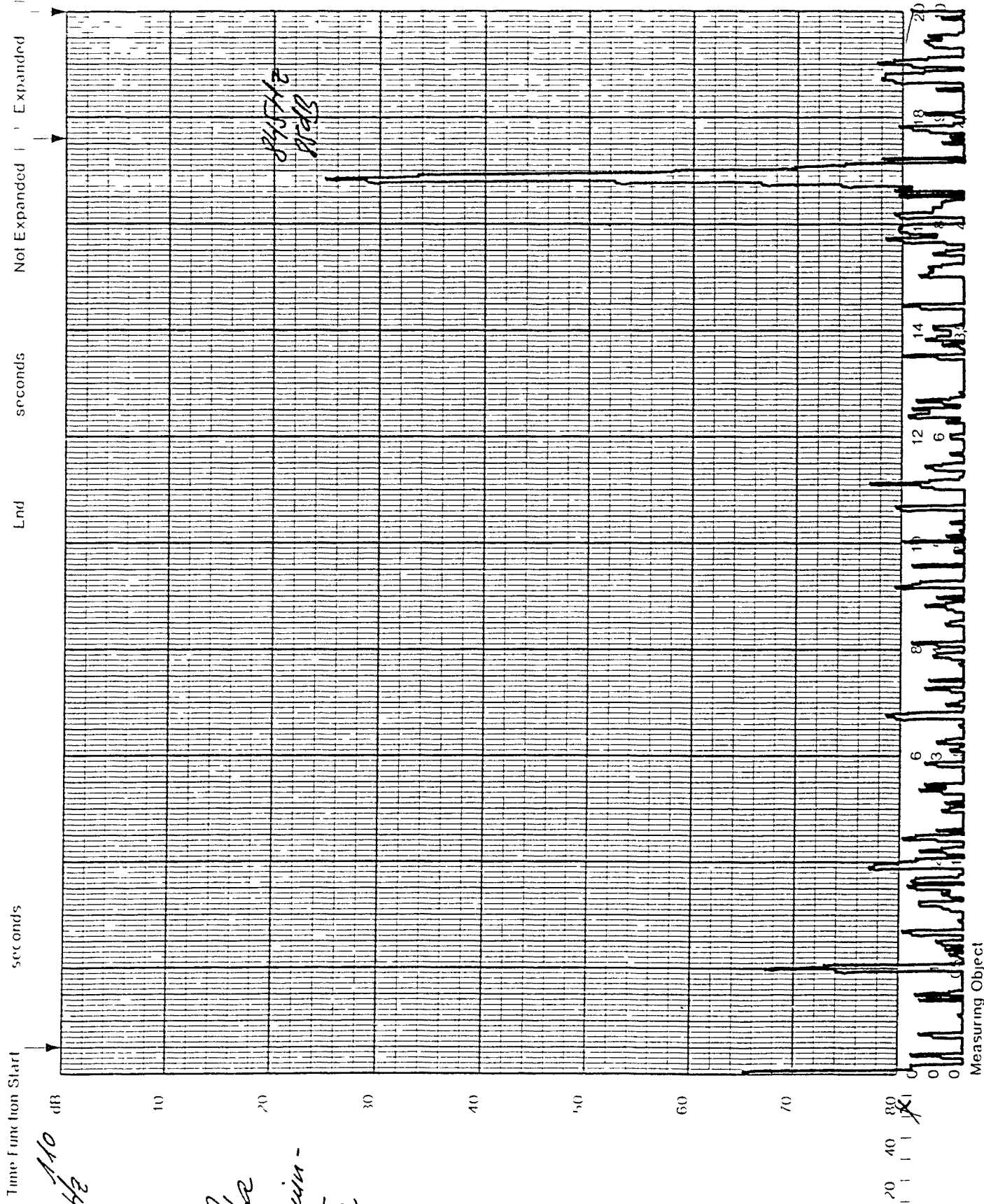
Weighting

Average Mode

No of Spectra

Comments

*Punto A  
coniente arriba  
Omission conjuin-  
to unigti-  
Accional-2  
P<sub>2</sub>*



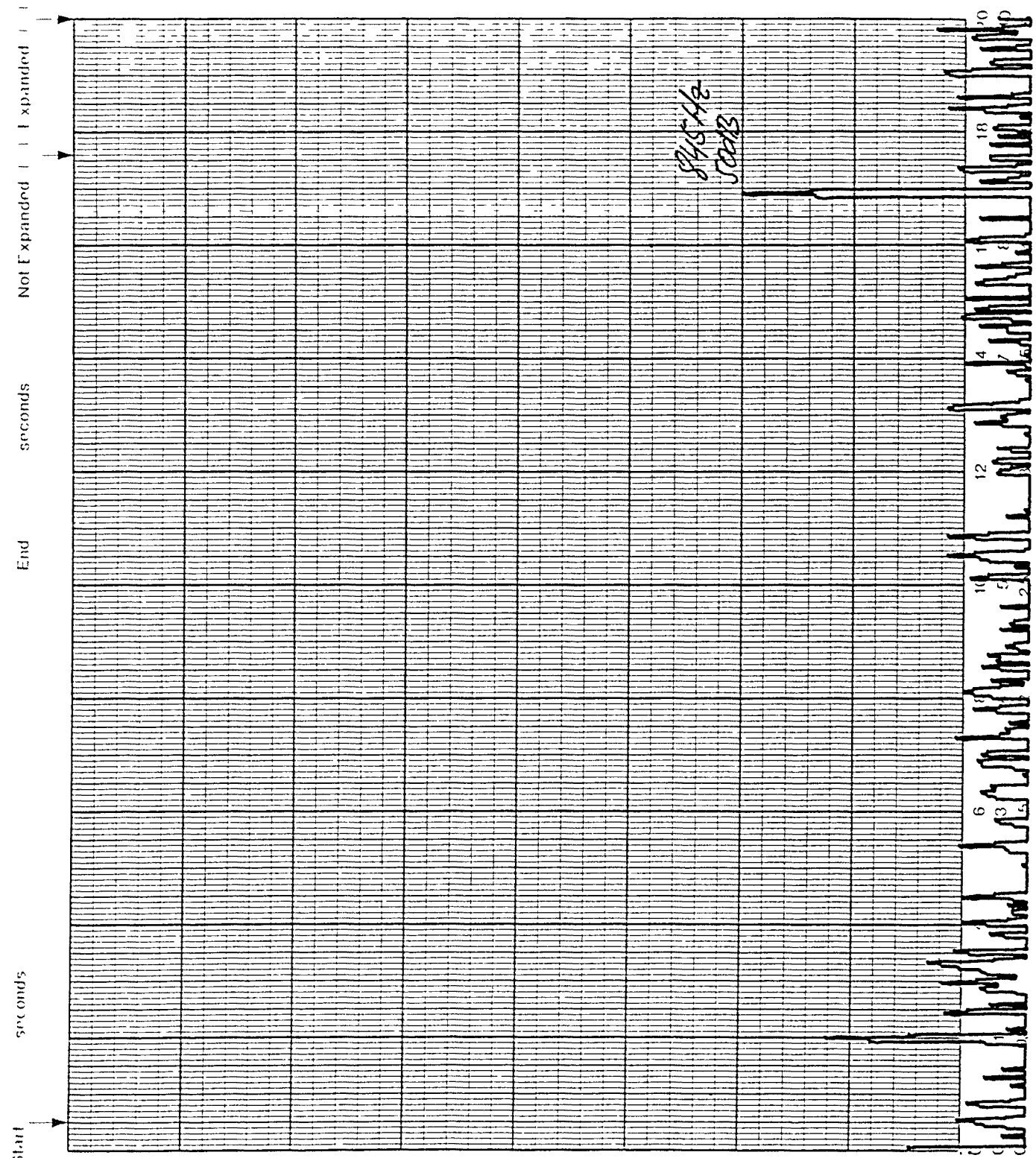
Record No

Date

Sign

*27-4-90*

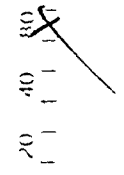




Briel & Kjaer  
 Full Scale Level 110 dB  
 FS Frequency 1 kHz  
 Weighting  
 Average Mode  
 No. of Spectra 10

Comments:  
 Puntos A  
 corriente arriba  
 Sintonia con -  
 Puntos uni-  
 direccionales - 2  
 P2

Record No.  
 Date 27-4-90  
 Scan



Measuring Object





Brüel & Kjær

Time Function Start

seconds

End

seconds

Not Expanded | Expanded

Full Scale Level 110 dB

FS Frequency 1 kHz

Weighting

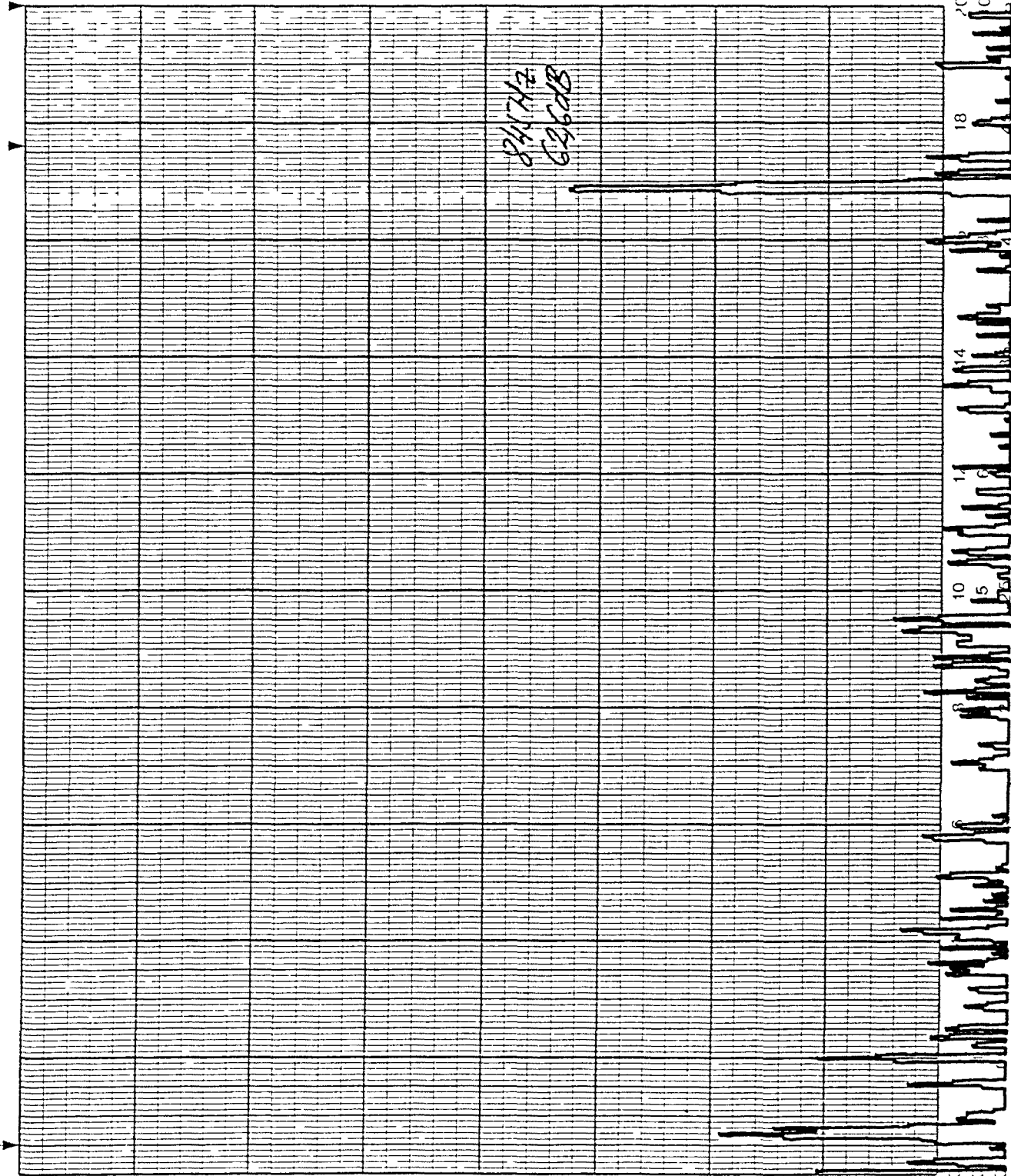
Average Mode

No. of Spectra

Comments

Punto A  
corriente arriba  
Emisión sus-  
tenta atenuador  
Φ<sub>3</sub>

241 Hz  
62.6 dB



Record No

Date 27-4-90

Stn

20 40 80

10

15

20

25

30

35

40

45

50

55

60

65

70

75

80

85

90

95

100

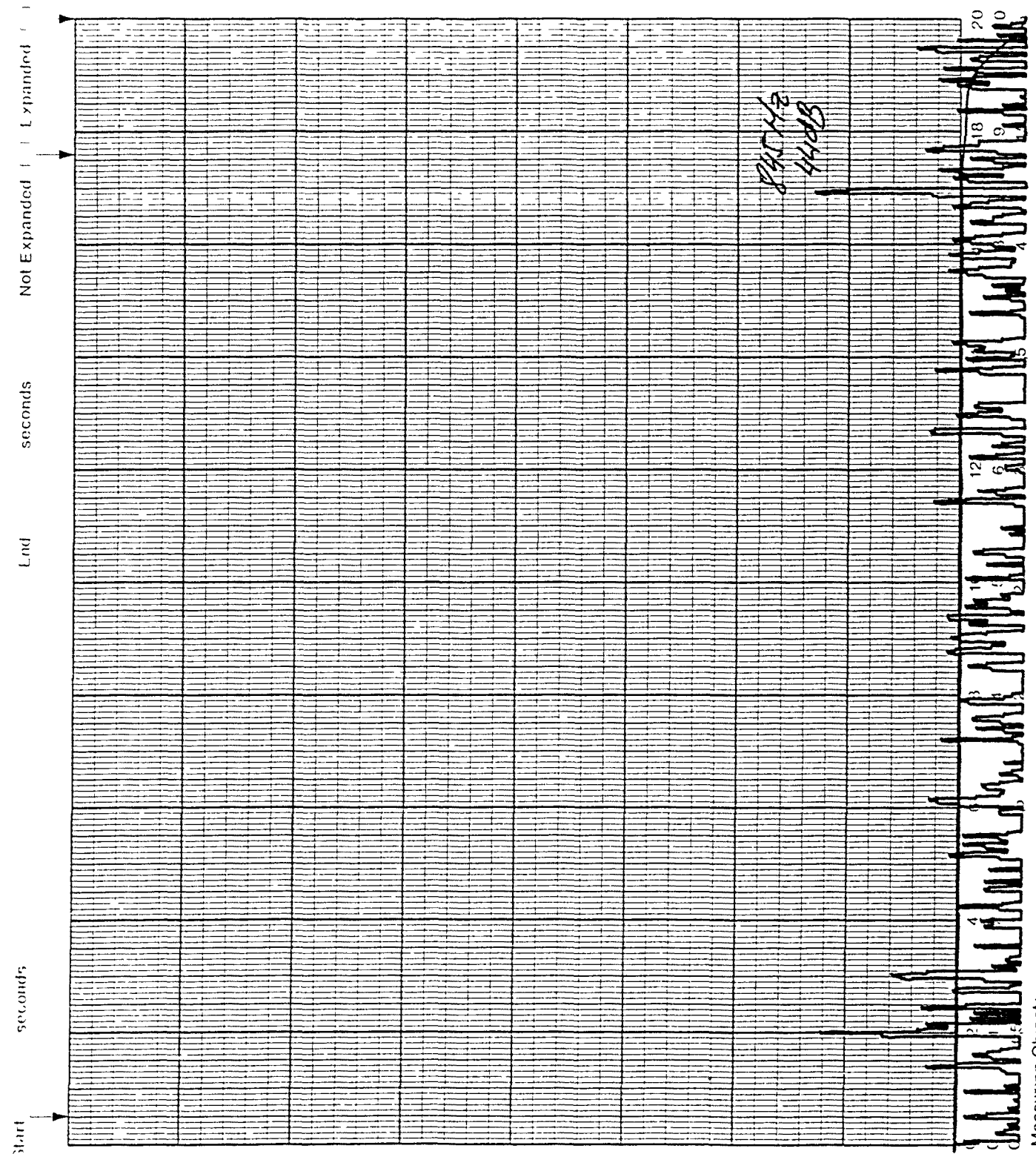
105

110

115

120





Bruel & Kjaer  
 Full Scale Level 110  
 F S Frequency 1 kHz  
 Weighting  
 Average Mode  
 No of Spectra

Comments  
 Punto A  
 con ruido ambiente  
 Quisieron sis-  
 tema atenuados  
 P3

Record No  
 Date 27-4-90  
 Stem

Measuring Object:



Bruel & Kjaer

Full Scale Level

F S Frequency 1 kHz

Weighting

Average Mode

No of Spectra

Comments

*Punto B  
corriente abaj  
Sustencion  
punto  
primaria*

Time Function Start

dB

110

10

20

30

40

50

60

70

80

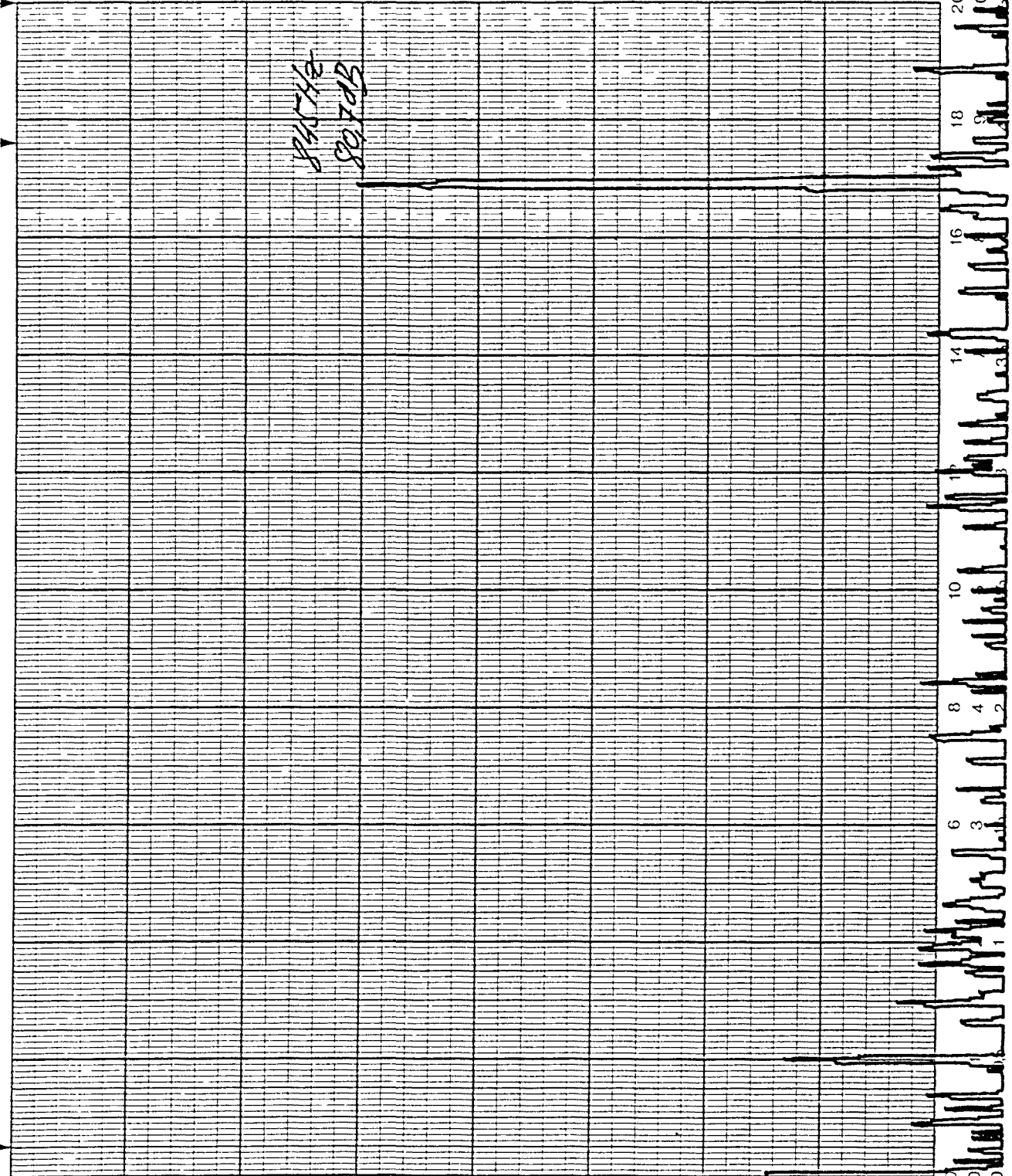
seconds

End

seconds

Not Expanded

Expanded



Record No

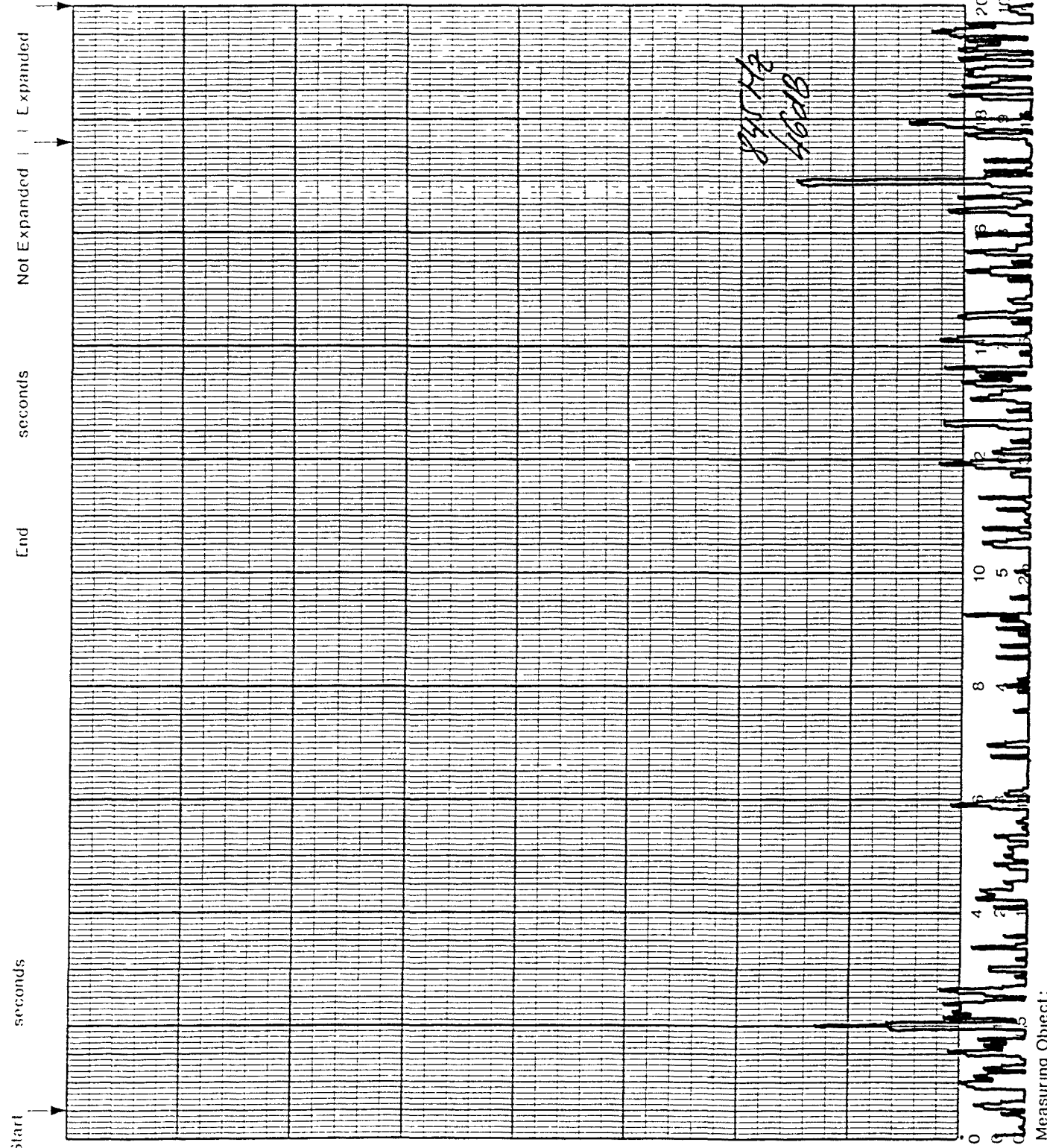
Date: 27-4-90

Sign

QP 1002

Measuring Object:





Bluel & Kjar  
 Full Scale Level 110 dB  
 F S Frequency 1KHz  
 Weighting  
 Average Mode  
 No. of Spectra 10

Comments  
*Punto B corriente abajo*  
*N.P.S. resultant: Fuente primaria Sistema alternador*

Record No  
 Date 27-4-90  
 Station

20 40 80 100

Measuring Object:



