SCPC INTERFERENCE STUDY

TEST RESULTS

SPAR

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SCPC INTERFERENCE STUDY

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1. TEST SET-UP DESCRIPTION

A general representation of the Interference performance of the SCPC link test set-up is shown in Figure 1.

The S/N / BER Measuring equipment injects a signal, a 1 kHz tone or a bit stream, whichever is the case, into the SCPC transmit equipment, compares it to the received signal from the SCPC receive equipment after being interfered with through the series of combiners, and detects the noise captured in the channel link or the errors that occurred during transmission in order to give a read-out in the form of a signal to noise ratio (S/N), an impulse noise count or a bit error rate (BER).

The SCPC Transmit and SCPC Receive equipments can be of the analog FM type or the digital QPSK type. The received IF carrier level is set with the attenuator next to the output of the XMT equipment, to the nominal value of -37 dBm for FM-SCPC and -43 dBm for QPSK-SCPC.

Separate attenuators are used for the white (Thermal) noise generator and the interfering signal(s) to allow the variation of one parameter keeping the other constant.

In some cases either one of the combiners in Figure 1 is bypassed or terminated to allow measurements with a single type of interference (i.e. white noise only or signal only).

Figure 2 describes the set-up for FM-SCPC type channel link.

For one interfering carrier, the 4-way combiner is bypassed at points P1 and P2. A video waveform generator is used to provide a full-field colour bar signal of 1 V p-p (nominal) of amplitude. This signal is passed through an attenuator-amplifier-preemphasis chain before it is fed to a two-way splitter which combines it with the synchronized energy dispersal waveform. This triangular waveform is synchronized with the field rate (or line rate) using the vertical drive (or horizontal drive) output of the video waveform generator.

For four interfering carriers, the 4-way coupler is inserted between P1 and P2 such as the colour bar modulated signal constitutes one of its four inputs. The second input is a dispersed unmodulated carrier, while the third and fourth carriers are modulated by two picked up live TV signals from two different local channels; each of these two signals is fed to a BPU (Baseband Processing Unit) where it is subjected to amplification, preemphasis and variable attenuation as well as 30 Hz energy dispersal, if so is the case; while in the case of line rate (or half-line rate) dispersal the 30 Hz EDW is switched off and the synchronized dispersal frequency is mixed with the video signal through an external combiner (see special circuits).

This part of the set-up, down to the 4-way combiner, holds for digital SCPC measurements as well.

For Radar like interference measurements a pulsed sine wave signal of preset amplitude and period is injected at point P2, replacing the video signals (see Figure 4).

Figure 3 shows the set-up for digital QPSK-SCPC interference measurements. In this case the interfering signal(s) and noise are added through the 30 dB couplers existing on the Channel Unit Test Panel, which acts as a transponder.

In analog FM-SCPC measurements, a 1004 Hz tone at -5.5 dBm, in 600 ohms load, is fed to the SCPC transmit channel; the received tone is set at -2.2 dBm/600 ohms. When delivered to the TIMS and the TNMS the tone is notched and the interference is C-MSG weighted, then an internal power meter detects the energy content of the interference relative to that of the tone.

In digital, QPSK-SCPC measurements, a bit stream of length 2048 bits is repeatedly injected into the SCPC transmit channel at the rate of 64 Kbits/sec. The received bit stream is compared to that transmitted and the occurring errors are counted for a presettable period of time corresponding to 10^n bits, where n is set equal to 5, 6, 7, 8 or 9 for the most convenient reading.

2. INTERFERENCE LEVEL CALIBRATION

2.1 VIDEO SIGNALS AND EDW

The modulators have a carrier frequency of 70000 ± 0.7 kHz and a nominal output of +5.2 dBm. Their sensitivity is calibrated by Bessel zero method, to -21 dBm for 1 MHz RMS deviation; hence the triangular waveform at the modulator input is set to 24.5 mV p-p per 1 MHz deviation. The video level at the modulator input is set so that a 15 kHz sine wave of the same amplitude as the video signal (1 V p-p nominal) delivers at this point 165.6 mV p-p (for 6.8 MHz peak-to-peak deviation).

2.2 VIDEO CARRIERS

The interfering carrier(s) level is set by comparison. The procedure consists of (refer to Figures 2 and 3):

- Terminating the noise input.
- Measuring the SCPC signal level at point P4 when P3 is terminated.
- Set the attenuator located between P2 and P3 as to provide at point P4 the same reading as for the previous step when the SCPC carrier is switched "off".
- Take note of this attenuator setting at which $C_o/I = 0$ dB.
- Add to the attenuator setting the desired C_o/I level (dB).

2.3 WHITE NOISE IN FM-SCPC

The noise level is set, for analog FM-SCPC interference, by the comparison method using a calibrated filter. The procedure is as follows (refer to Figure 2):

- Insert the calibrated filter between point P5 and the m watt-meter.
- Measure the SCPC carrier level when the noise input is terminated.

- Switch the carrier off and reconnect the noise generator.

- Set the noise generator attenuator as to provide the same reading as the previous step.

- Reduce the attenuation by the value: 10 log (B/b) - K

  where: B = noise bandwidth of the calibrated filter (= 22 863 kHz)
  b = SCPC channel bandwidth (= 26 kHz)
  K = desired C_O/N (= 15 dB).
  (for the given values, the attenuation decrease is:
  10 log (22863/26) - 25 = 14.4 dB)

- Take note of this attenuator setting and reconnect the set-up as in Figure 2.

2.4 WHITE NOISE IN QPSK-SCPC

The noise level for digital QPSK-SCPC interference, is set as follows (refer to Figure 3):

- Set the noise generator attenuator to its maximum attenuation.

- Terminate P3.

- Set the SCPC carrier level as to provide -43 dBm at point P4.

- Set the slide switch inside the downconverter drawer of the RCVR equipment to MGC (manual gain control).

- Switch "IN" the 14.2 dB attenuator on the CU Test Panel.

- Connect an RMS voltmeter to the QPSK MON. on the SCPC demodulator and read the signal level.

- Switch the SCPC carrier off.

- Set the noise attenuator as to provide the same reading as the previous step.

- Take note of this attenuator setting where C_O/N = 14.2 dB.

- Set the slide switch back to AGC.

- Switch "OUT" the 14.2 dB attenuator.

- Modify the noise attenuator setting as to obtain the desired C_o/N instead of 14.2 dB (i.e. for C_o/N = 15 dB increase the attenuation by 0.8 dB).

2.5 PULSED CARRIER

The interfering pulsed carrier level, for radar like interference test, is set in a similar way to that of the video carrier (see section 2.2). The procedure consists of (refer to Figures 2 and 4):

- Measuring the SCPC carrier level at P4 as in section 2.2.

- Setting the pulse generator for a 10% duty cycle pulse, 1 V p-p nominal, using an oscilloscope and/or a frequency/period counter.

- Setting the attenuator between points P2 and P3 to maximum attenuation.

- Setting the 70 MHz modulator to pulsed mode and to maximum output level.

- Setting the attenuator for equal reading, as in section 2.2, which corresponds to C_o/I_p = -10 dB.

- Increasing the attenuation by 10 dB where C_o/I_p = 0 dB and keeping note of this setting to which is added the desired C_o/I_p.

3. TEST CONDITIONS

The test conditions are set to meet, with few exceptions, the contract requirements. These exceptions are imposed by the statistical nature of the interference process, the limited equipment facility, the spectral energy distribution of the interfering signals, etc.

The changes that had to be done are listed below:

3.1 MEASUREMENT SET A: Q-PSK-SCPC

3.1.1 *Set of Measurements A1 - No changes.

3.1.2 *Set of Measurements A2 - The range of Co/N is reduced to vary from +10 dB to +17 dB instead of +6 dB to 35 dB; due to equipment limits and time of measurement limits.

3.1.3 *Set of Measurements A3 - Due to the spectrum of the full-field color-bar video signal, the test was performed at the worst case frequency separation (f_c = 1.64 MHz) for no error was observed at $f_c \leq$ 500 kHz and $C_o/Iu \geq$ -11 dB. The range of Co/Iu in this case is from 0 dB to +8 dB instead of +10 dB to +35 dB. (See spectrum photographs No. 1 and No. 2).

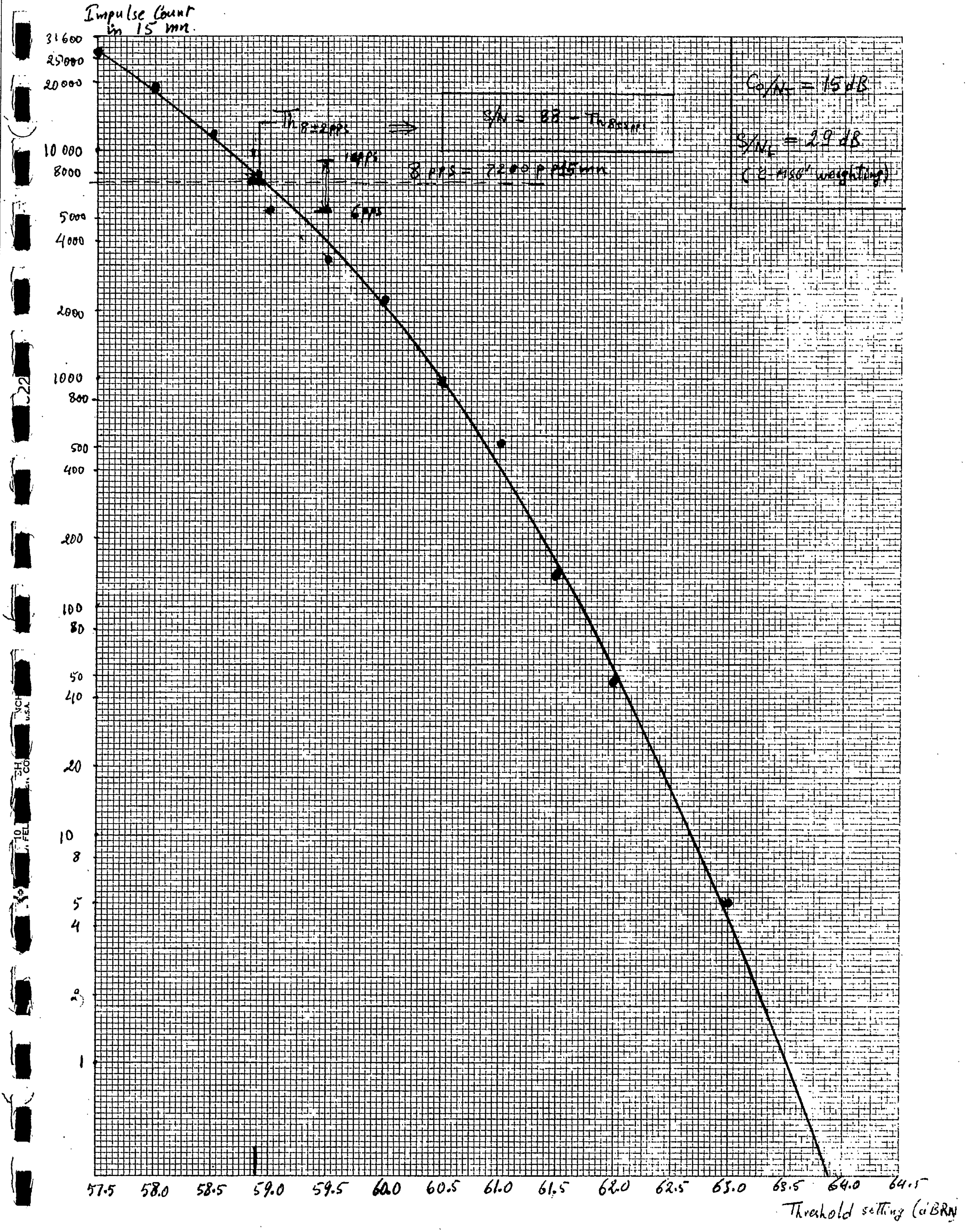
3.1.4 *Set of Measurements A4 - Since the energy dispersal waveform (EDW) have to be synchronized with the video signal because of very practical reasons (see remark ***) and since this signal does not contain a steady 100 Hz component, the measurement set with f_L = 100 Hz was omitted and replaced by f_L = 7.875 kHz. Measurements with f_c = 10 kHz were replaced by f_c = 22.5 kHz for all the carriers are AFC operated and the 70 MHz occurs halfway between two digital SCPC channels separated by 45 kHz. The range of C_o/I_D is shifted down to -12 dB to +9 dB instead of +10 dB to +35 dB for the worst BER at C_o/I_D = +9 dB was 5×10^{-7}. The frequency separation f_c = 3.6 MHz was added to the f_c range in order to show the effect of the color carrier. Another value of f_c, that of the worst case, was included in the results.

3.1.5 *Set of Measurements A5 - The same changes as for A4 are applied.

3.1.6 *Set of Measurements A6 - These tests were made at f_c = 10 kHz only for the following reasons:

**The spectrum envelope of the radar signal is proportional to

$$S = \left[PRF * PW * \frac{\sin(\pi * f_c * PW)}{(\pi * f_c * PW)} \right]^2$$


Impulse Count in 15 mn.
31 600
25 000
20 000
10 000
8000
5000
4000
2000
1000
800
500
400
200
100
80
50
40
20
10
8
5
4
1
Co/Nt = 15 dB
S/Nt = 29 dB
S/N = 88 - Th
8 pps = 7200 p
6 pps
57.5
58.0
58.5
59.0
59.5
60.0
60.5
61.0
61.5
62.0
62.5
63.0
63.5
64.0
64.5
Threshold setting

because of the sine function , the spectrum presents gaps at the frequencies where (see spectrum photographs)

$\pi * f_c * PW = K * \pi$ $K = \pm 1, \pm 2 \ldots\ldots$

i.e. $f_c = K/PW$; and

— for PW = 10μs and 30μs, gaps occur at f_c = 100 kHz, 500 kHz, 1 MHz and 2 MHz.

— for PW = 1 μ s and 3 μ s, gaps occur at f_c = 1 MHz and 2 MHz.

Therefore measurements at 1 and 2 MHz frequency separations were omitted. **The main envelope peak level, at f_c = 0, is 20 log (PRF * PW) dB below the CW power Ip. The first side peak is 13.46 dB below the main peak. Thus, and as seen in the results, the interference is very weak for relatively high frequency separation i.e. i.e. $f_c \geqslant$ 100 kHz.

3.1.7 *Set of Measurements A7* - Ths same changes as for A6 are applied.

*** Remark: The energy dispersal waveform (EDW) of frequency f_L should be synchronized with the video signal in order to eliminate any possible very low frequency beating, in which case the interfering signal fluctuates noticeably.

On the other hand, it is useless to think of a video signal dispersed with EDW of frequency other than a harmonic, or a sub-harmonic of either the line rate or the frame rate, for it is impossible, cost-effectively, to extract the image from the dispersed signal.

3.2 MEASUREMENT OF SET B: COMPANDED FM-SCPC

In this series of measurement, as well as for four interfering carriers, a major modification concerning the impulse noise count was made.

Because of the very steep slope of the impulse count versus the threshold setting and the very time consuming nature of this type of measurements, it was thought necessary to measure the curve of impulse noise count versus threshold, once and for all, and then proceed to measure a normalized threshold setting (that of 8$\pm$2 pulses per second).

A threshold detector circuit was designed to meet these requirements; for details see "special circuits" attached hereto.

The other changes are:

3.2.1 *<u>Set of Measurements B1</u> - No change.

3.2.2 *<u>Set of Measurements B2</u> - No change

3.2.3 *<u>Set of Measurements B3</u> - A multiburst video signal was used. The Co/Iu range is shifted to cover -30 dB to +10 dB, for the results were steady above Co/Iu = +5 dB.

3.2.4 *<u>Set of Measurements B4</u> - Measurements were made at only f_L = 30 Hz and f_L = 15.75 kHz (see 3.1.4). The range of C_O/I_D is -30 dB to -2 dB for S/N measurements, and -30 dB to +10 dB for the equivalent S/N of the impulse noise measurements.

3.2.5 *<u>Set of Measurements B5</u> - The same changes as in B4 are applied.

3.2.6 *<u>Set of Measurements B6</u> - The same changes as in A6 (3.1.6) are applied, except for the C_O/I_P range: -30 dB to +30 dB.

3.2.7 *<u>Set of Measurements B7</u> - The same changes as in B6 are applied.

3.3 MEASUREMENT SET C - Comp. FM-SCPC with four interfacing carriers.

3.3.1 *<u>Set of Measurements C1</u> - The S/N ratio in this set was measured according to the condition stated in the Contract. (detailed in section 2.2.1 of the SOW) with the exception that

**measurements with f_L = 100 Hz were omitted for the reasons stated earlier in this report (section 3.1.4);

**the frequency separation f_C = 3.6 MHz was added to the f_C range.

**the range of Co/I_D was shifted to cover -20 dB to +20 dB.

3.3.2 *<u>Set of Measurement C2</u> - The equivalent S/N ratio of the impulse noise count is measured in the same conditions as in C1.

3.4 MEASUREMENT SET D - Q-PSK-SCPC with four interfering carriers

One major modification to this set of measurements was made due to very important fluctuations in the BER count; the BER curves were substituted by one point, each, where the interference effect is undoubtedly noticeable over the effect of thermal noise. This point was called the onset of degradation, and was defined as the C_o/I_D ratio at which the BER count is three times that of thermal noise alone. In the present case, the onset of degradation is the C_o/I_D where the BER count equals 10×10^{-6}, in contrast with 3.3×10^{-6} for thermal noise only (C_o/N = 15 dB in the channel bandwidth). The other modifications are the same as in C1. The results of this set of measurements are listed in tabular form.

4. SUPPLEMENTARY RESULTS

Some additional measurements were taken and are included in this report. The results of these measurements are thought to be helpful in the interpretation of the results obtained for the measurements stated in the contract.

4.1 *Set of Measurements S1 - In this set, the interference effect on Q-PSK-SCPC of a single carrier modulated with live TV signal, dispersed with f_L = 30 Hz @ Δf_{pp} = 1 MHz; the carrier to interference ratio was set to C_o/I_D = 0 dB and $C_o/N \rightarrow \infty$. The frequency separations are chosen for the worst possible cases when the SCPC carrier coincides with a spectrum peak of the TV signal (most of the time). The results are given in the form of a chart showing the BER versus real time.

4.2 *Set of Measurements S2 - In this set, the interference effect on Q-PSK-SCPC of an undispersed, unmodulated carrier with frequency separation of f_c = 10 kHz and 22.5 kHz, is pointed out.

4.3 *Set of Measurements S3 - In this set of interference effect on comp. FM-SCPC of a radar-like signal of 30 μ s pulse duration and 3 kHz pulse repetition frequency at different frequency separations is pointed out.

TEST

SET-UP

SCPC/FM & SCPC/PSK

4.4 *Set of Measurements S4 - In this set the interference effect on Comp. FM-SCPC of an unmodulated carrier, dispersed with f_L = 15.75 kHz, 30 Hz and 0 Hz (undispersed) is pointed out, for different f_C, covering the range 10 kHz to 750 kHz by steps of 30 kHz (up to 340 kHz).

5. CONCLUSION

From the obtained results we can conclude the following:

5.1 *The interference effect on a SCPC link is highly dependant of the interfering signal spectrum as well as its power level with respect to the SCPC carrier.

5.2 *The EDW should be synchronized with the video waveform in order to prevent extra bursts of high interference.

5.3 *Higher frequency EDW gives the SCPC more tolerance to interference. The same holds for higher peak-to-peak deviation.

5.4 *Line rate dispersal with triangular waveform operation seems to be not very cost effective and one might suggest operation with saw-tooth waveform instead. It is thought that such waveform gives similar results as the half-line rate triangular waveform (7.875 kHz).

5.5 *The SCPC link shows high immunity to radar-like interference of short pulse duration, but this type of interference affects more adjacent channels than longer pulse duration type does.

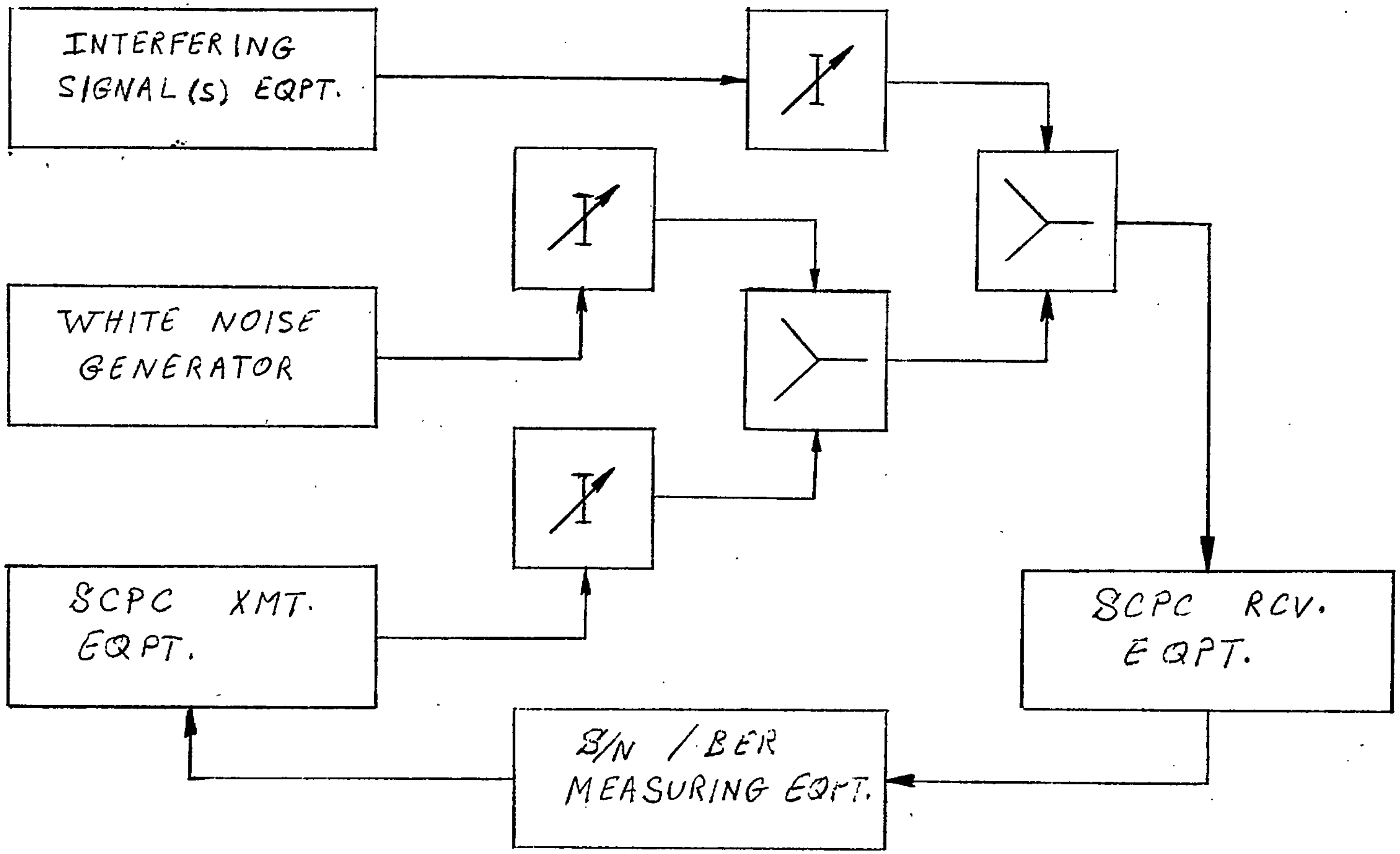
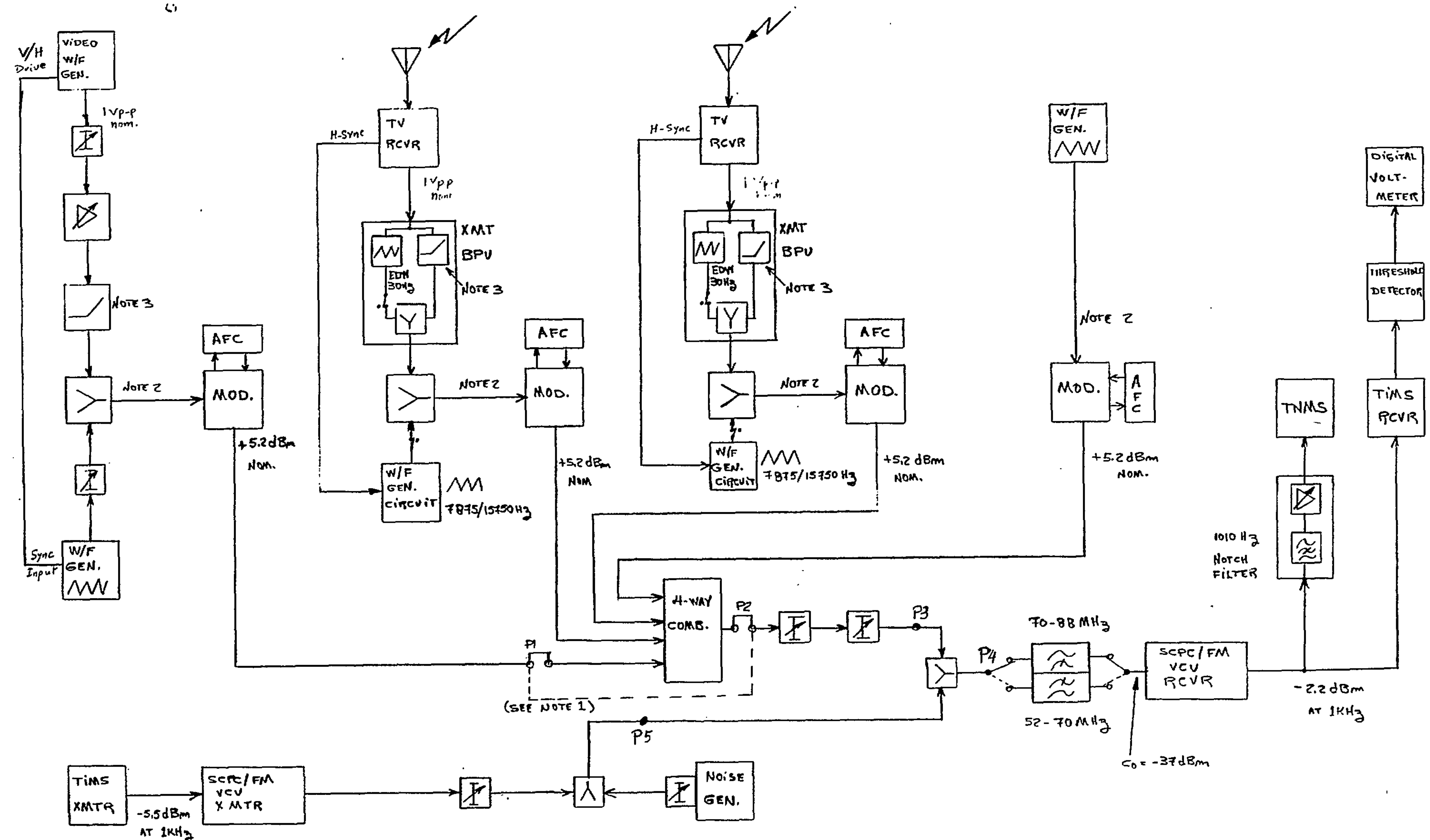


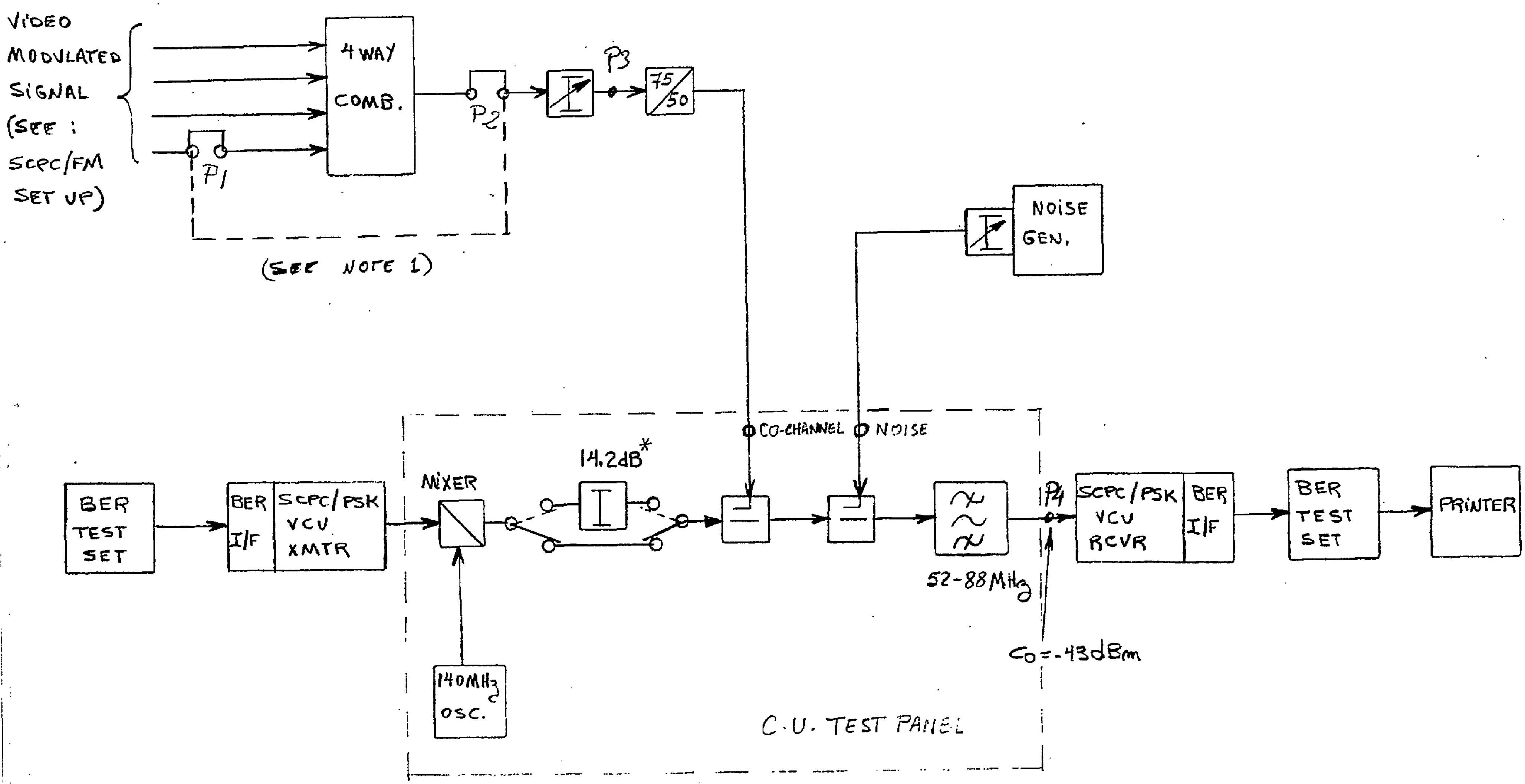
fig 1 - General representation of the interference test set-up



ABBREVIATIONS

BPU : BASEBAND PROCESSING UNIT
EDW : ENERGY DISPERSAL WAVEFORM
TIMS : TRANSMISSION IMPAIREMENT MEASURING SET
TNMS : TEST NOISE MEASUREMENT SET
VCU : VOICE CHANNEL UNIT
W/F : WAVEFORM

Fig 2 - SCPC/FM INTERFERENCE STUDY TEST SET-UP



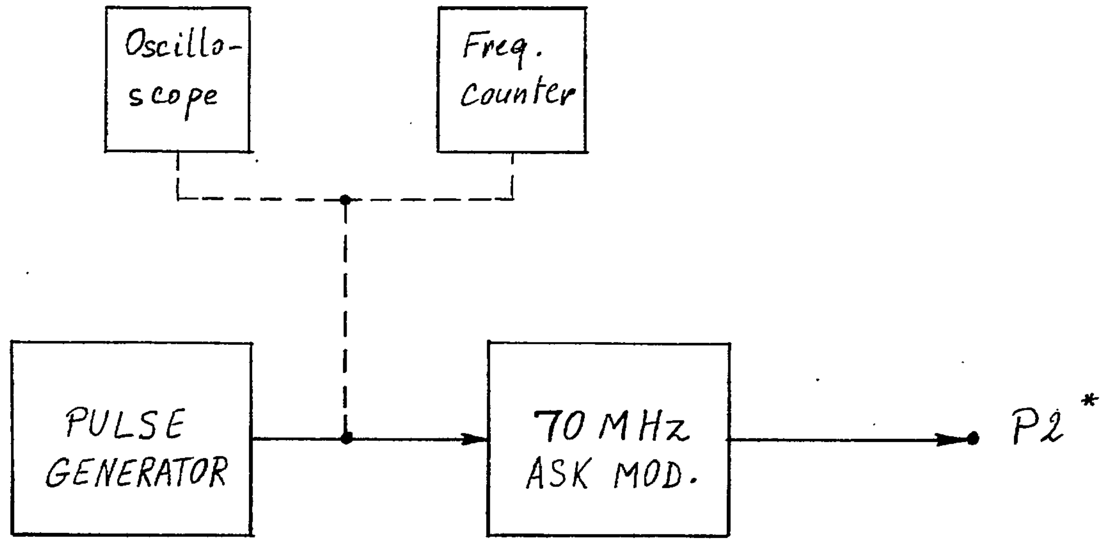
* FOR CALIBRATION PURPOSE

ABBREVIATIONS

- BER : BIT ERROR RATE
- I/F : INTERFACE
- PSK : PHASE SHIFT KEYING
- C.U. : CHANNL UNIT

fig 3 - SCPC / PSK INTERFERENCE STUDY

TEST SET-UP



* To substitute the 4-way splitter in figs 2 and 3 in the case of radar like interference

fig 4 – SCPC / RADAR INTERFERENCE STUDY TEST SET-UP

NOTES ON TEST SET-UP

1- FOR ONE INTERFERING CARRIER TESTS, REMOVE P1 AND P2 AND CONNECT AS SHOWN BY THE DOTTED LINE

2- LEVELS AT MODULATOR BASEBAND INPUT

VIDEO SIGNAL : 165.5 mV P-to-P AT f = 15 kHz FOR A DEVIATION OF 6.8 MHz P-to-P

DISPERSAL SIGNAL : 24.5 mV P-to-P FOR A DEVIATION OF 1.0 MHz P-to-P

MODULATOR SENSITIVITY : -21 dBm FOR 1.0 MHz RMS

3 - PRE-EMPHASIS

525 LINES CONFORMING TO CCIR RECOMMENDATION 405-1

THRESHOLD DETECTOR

AND

WAVEFORM GENERATOR

CIRCUIT

SCHEMATIC DIAGRAMS

THRESHOLD DETECTOR DESCRIPTION

The purpose of this circuit is to provide a quick measurement of the threshold level at which the impulse noise count is 8 ± 2 p.p.s. (pulses per second). Since the slope of the Impulse Count versus the threshold setting is extremely sharp (squared exponential) at this point and since this curve is almost independant of the type of interference, the threshold at 8 ± 2 p.p.s. seems to be a very accurate measurement of the signal to noise ratio.

The input to the threshold detector is connected to the output of the notched C-MSG filter board inside the TIMS (HP2943A).

This input shows a relatively high impedance to the output Op-Amp on the filter board.

The first Op-Amp in the detector circuit provides an adjustable gain to the received noise. This gain is presettable, using P1, to a value between unity and X100.

The next stage provides a log conversion (linear to dB conversion) through the diodes D_2 and D_3.

The third stage is an amplifier that permits scale adjustment through potentiometer P_2.

The last Op-Amp stage compares the incoming impulse noise level to the transistorized peak detector level (consisting basically of Q1, C_5 and R_{11}) filtered through R_{10} and C_4.

Component values and time constants are experimentally selected to provide 8 ± 2 current spikes through Q1 per second.

R_{12} and C_6 deliver a smoothly filtered dc output level that is to be measured with a DVM.

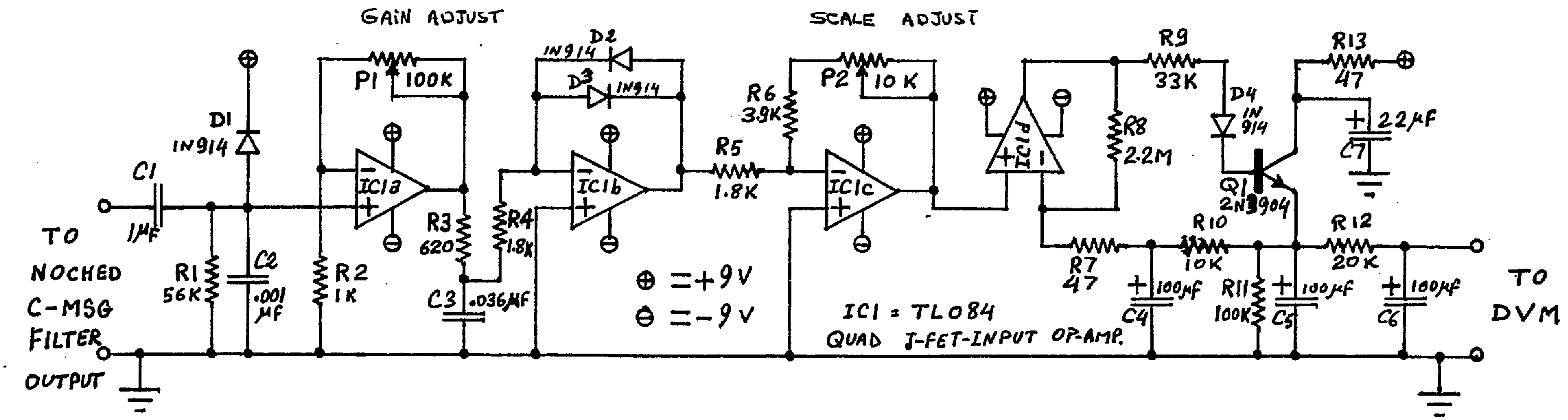
Calibration: it was observed that when white noise only was interfering with FM-SCPC, the threshold setting for the same impulse count was to be varied dB/dB in step with Co/N. Hence this procedure was used to calibrate the scaling of the threshold detector (i.e. by varying Co/N in the range of interest). Potentiometer P_2 is set to provide 20 mV/dB, and P_1 is set when $Co \gg I_D$, to output 2.00 Vdc.

When in operation, to determine the Th_{8pps} (dBRN), the following equation is used:

$$Th_{8pps}\Big|_{C_o/I_D}(\text{dBRN}) = \frac{\text{DVM Reading (V)} - 2.00\ \text{(V)}}{0.02\ \text{(V/dB)}} + 59\ (\text{dBRN})$$

And the signal to impulse noise is (for C-MSG Filtering)

$$S/N\ (\text{dB}) = 88\ (\text{dB}) - Th_{8pps}\ (\text{dBRN})$$



CIR. 1 – TRESHOLD DETECTOR

TRIANGULAR W/F GENERATOR

The purpose of this circuit is to provide a 15.75 kHz/7.875 kHz triangular waveform synchronized with the TV signal line with adjustable phase and amplitude to serve as energy dispersive waveform.

The input to this generator is connected to the horizontal sync test point inside the TV monitor. It takes an input voltage swing of 8 to 50 Vpp.

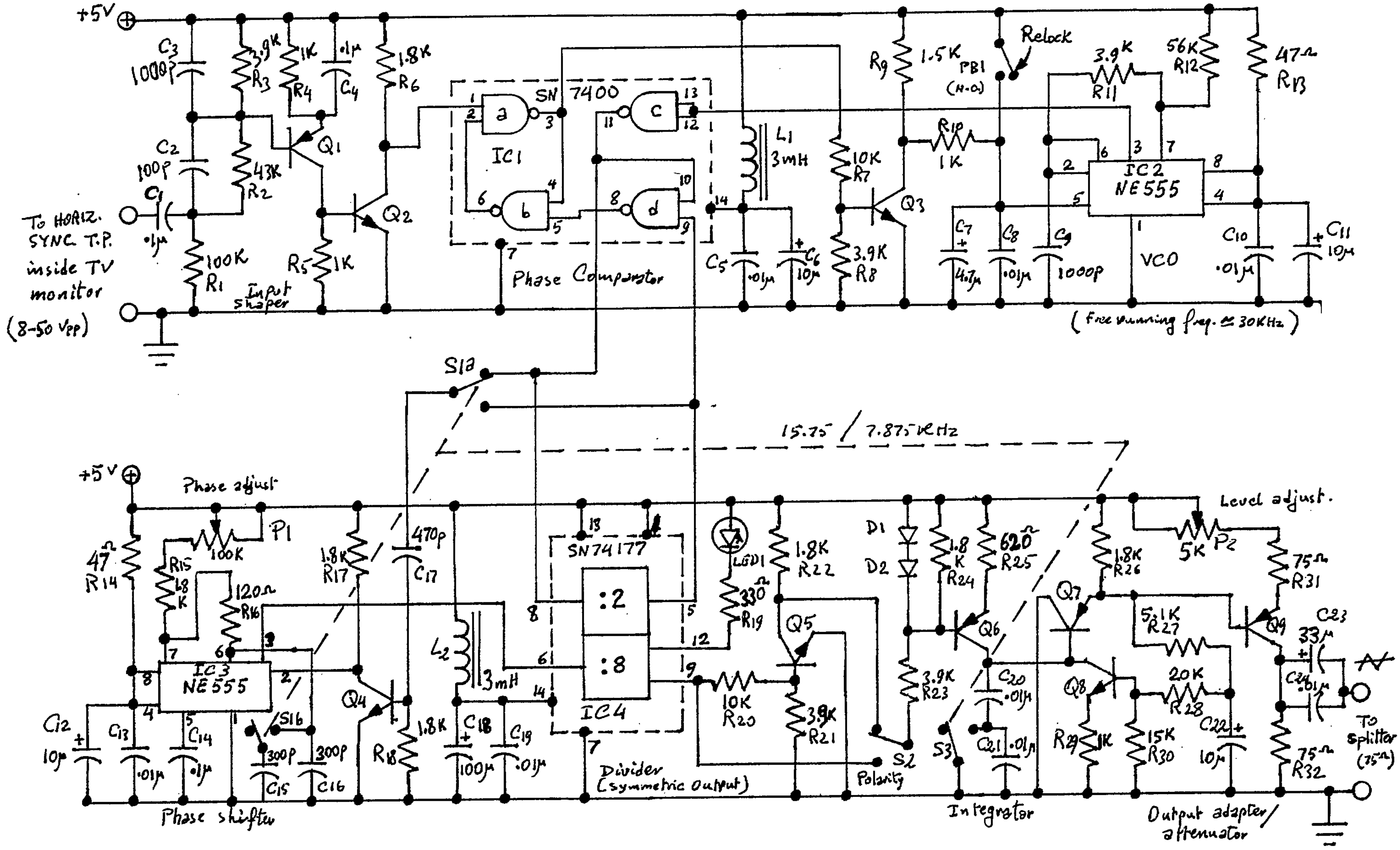
The input waveform is shaped in Q1 and transformed to TTL level in Q_2. Its phase is compared to that of the VCO in the NAND Gates of IC_1, and the phase difference is amplified in Q_3, filtered through R_{10} and C_7 and fed-back to the VCO (IC_2) as frequency control voltage.

The free running frequency of the VCO is approximately 30 kHz; and its locking frequency is divided by 2 (or 4) in IC_4 to provide 15.75 kHz (or 7.875 kHz) symmetrical squarewave after being delayed in IC_3 by an adjustable phase shift presettable through P1.

The inverter Q_5 and the switch S2 provide a selectable polarity.

The square-wave is then integrated in C_{20} and C_{21} (or C_{20} only) to give a triangular waveform that is attenuated to an adjustable level (through P2) and converted into a current source with source impedance of 75 Ω through Q9 and R32; C23 provides ac coupling to the 75 ohm load (the splitter). An automatic dc level control to the triangular waveform is provided, through Q_8, R28, R29, R30 and C_{22}, in order to maintain maximum linearity.

The swing at the collector of Q_8 is 1.6 V p-p, which provides an output swing of 12 to 800 mV p-p when loaded, i.e. -27.2 to +9.3 dBm into 75 ohm load.

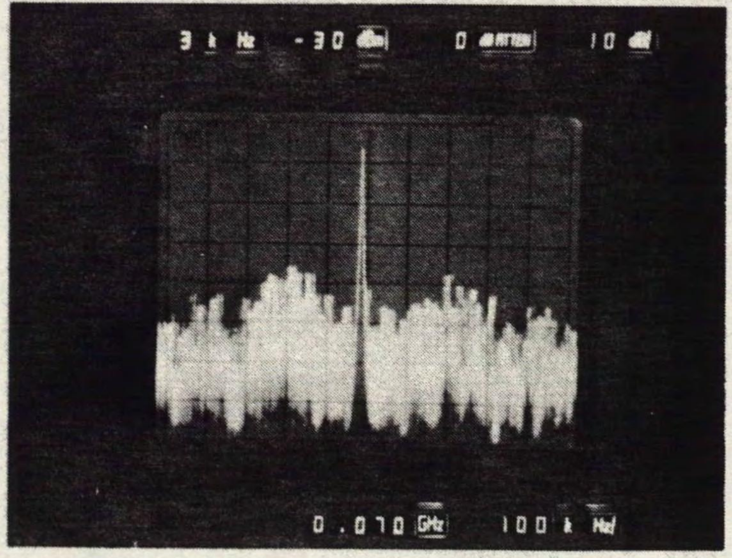


CIR. 2- CIRCUIT DIAGRAM OF SYNCRONIZED 15.75/7.875 KHz TRIANGULAR W/F GENERATOR

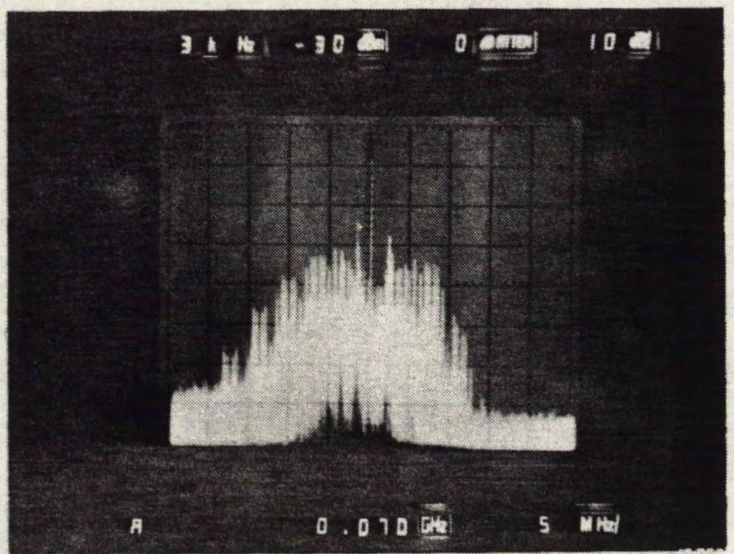
SPECTRUM

PHOTOGRAPHS.

FM MODULATED SIGNAL WITH COLOR BAR



SP-1

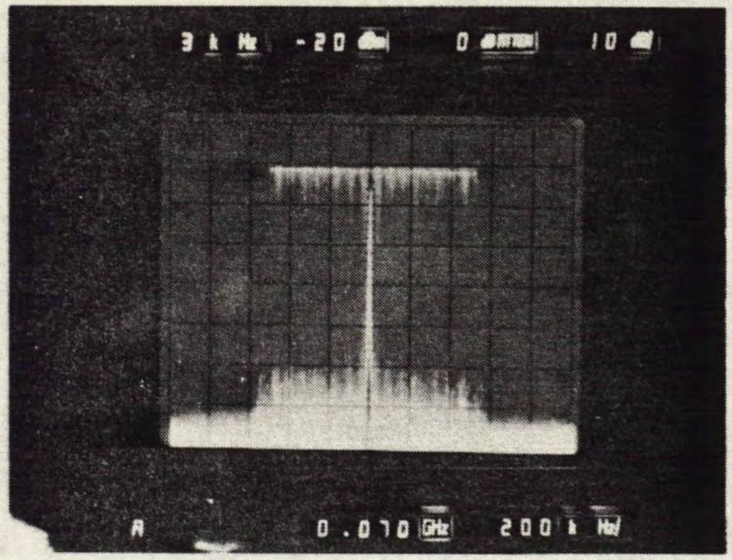


SP-2

f_c = 10 kHz

C_0/I_U = 0 dB

I_U : MODULATED WITH COLOR BAR AT 6.8 MHz P-to-P DEVIATION



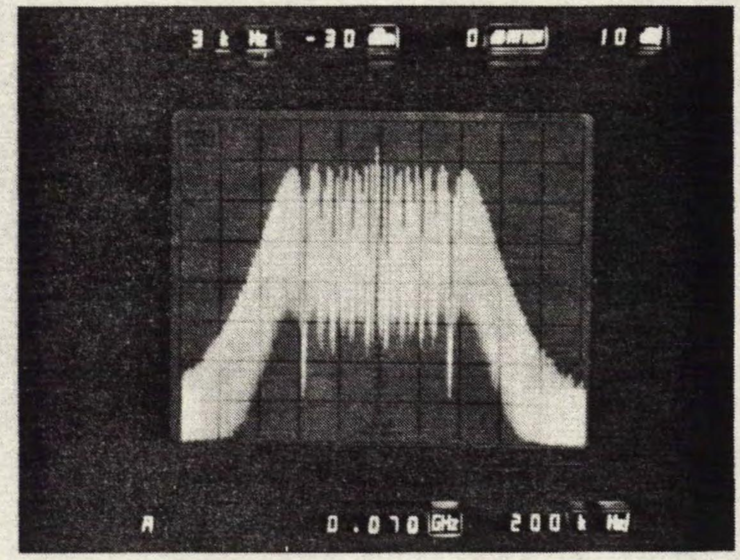
$C_0/I_D = -10$ dB

$f_L = 30$ Hz

$\Delta f_{PP} = 1$ MHz P-to-P

$f_C = 10$ kHz

SP-3



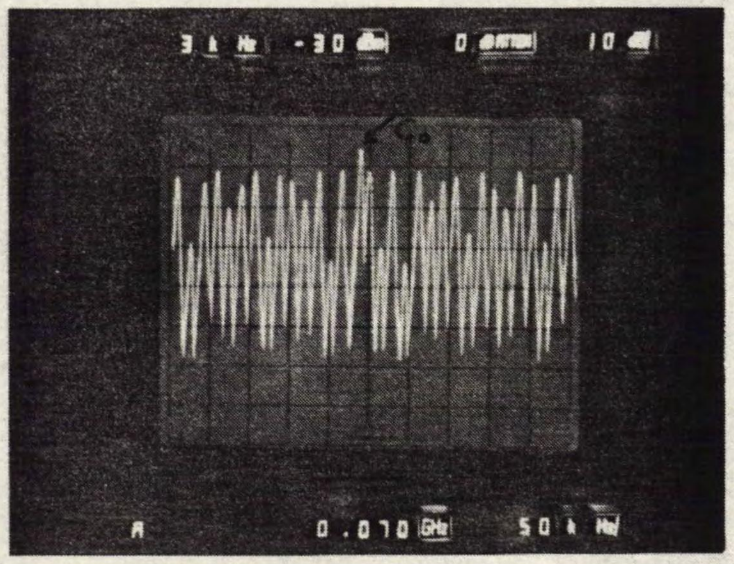
$C_0/I_D = -10$ dB

$f_L = 15.75$ kHz

$\Delta f_{PP} = 1$ MHz P-to-P

$f_C = 10$ kHz

SP-4



$C_0/I_D = -10$ dB

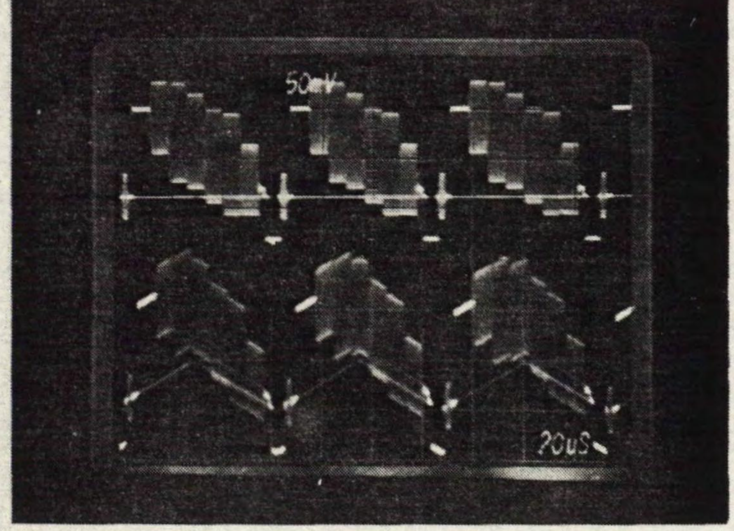
$f_L = 15.75$ kHz

$\Delta f_{PP} = 1$ MHz P-to-P

$f_C = 10$ kHz

SP-5

DISPERSED COLOR BAR VIDEO SIGNALS

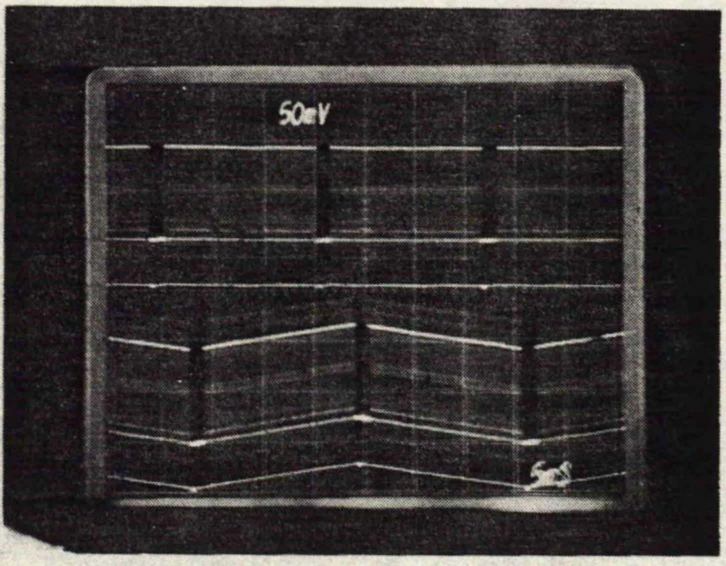


FULL FIELD COLOR BAR SIGNAL DISPLAYED AT LINE RATE
LEVEL = 165.6 mV P-to P
NO PRE-EMPHASIS

FULL FIELD COLOR BAR SIGNAL DISPLAYED AT FIELD RATE AND DISPERSED WITH TRIANGULAR W/F. f_L = 15.75 kHz
Δf_{PP} = 2 MHz P-to-P

SP-6

NO PRE-EMPHASIS



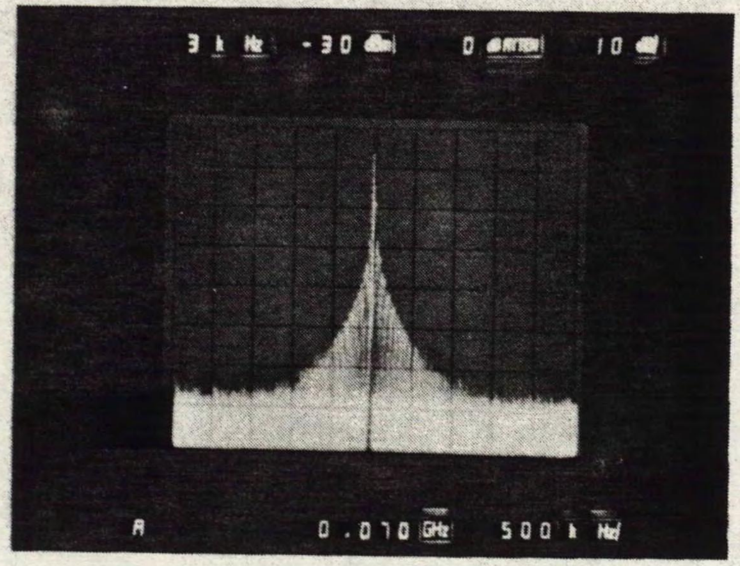
FULL FIELD COLOR BAR SIGNAL DISPLAYED AT FRAME RATE
LEVEL = 165.6 mV P-to-P
NO PRE-EMPHASIS

FULL FIELD COLOR BAR SIGNAL DISPLAYED AT FRAME RATE AND DISPERSED WITH TRIANGULAR W/F. f_L = 30 Hz
Δf_{PP} = 2 MHz P-to-P

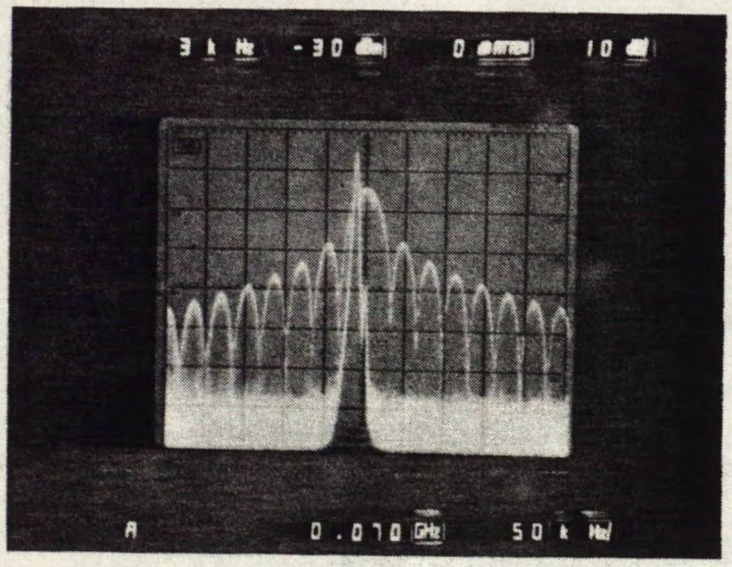
SP-7

NO PRE-EMPHASIS

RADAR-LIKE SIGNAL



SP-8



SP-9

C_o/I_p = -10 dB

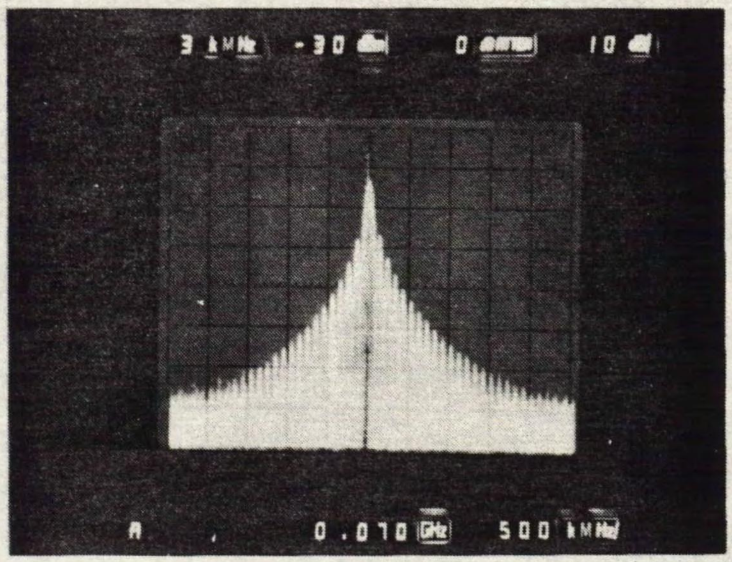
f_c = 10 kHz

PW = 30 μs

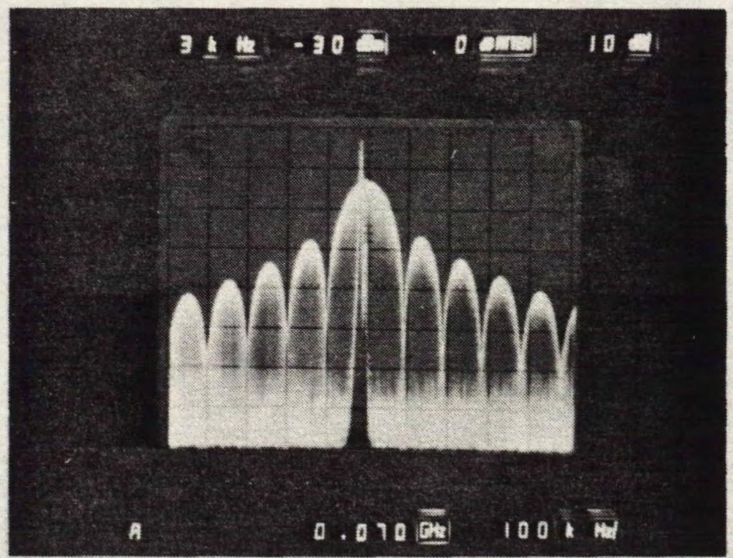
PRF = 0.3 kHz

Note: 1st side-band peak is 14 dB below main peak

RADAR - LINE SIGNAL



SP-10



SP-11

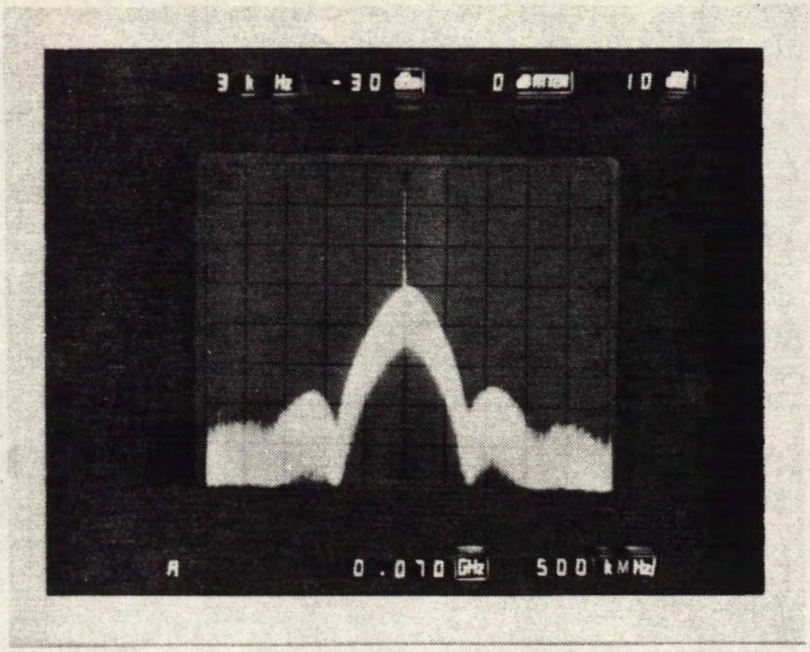
C_o/I_p = -20dB

f_c = 10 kHz

PW = 10 μsec

PRF = 1.0 kHz

RADAR-LIKE SIGNAL



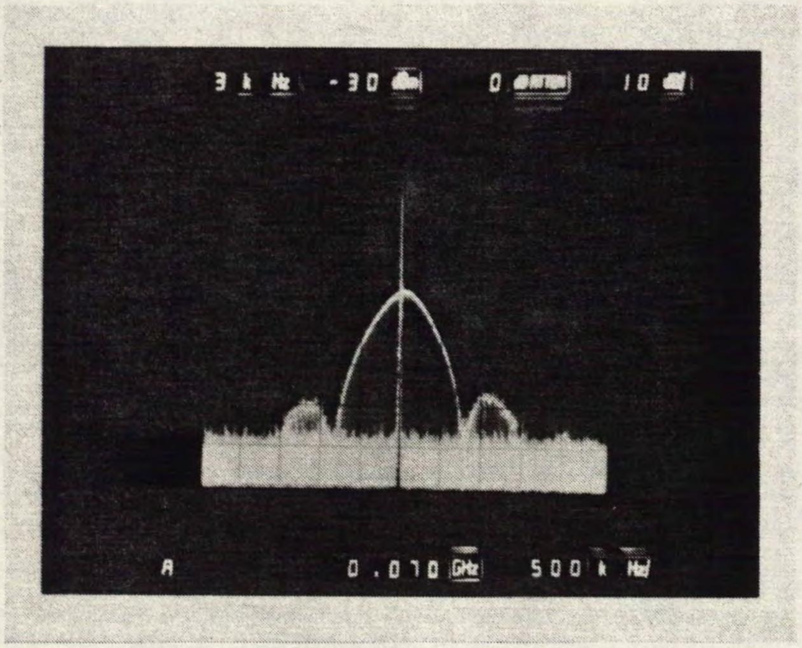
C_o/I_p = -20 dB

f_c = 10 kHz

PW = 1 μsec

PRF = 3 kHz

SP-12



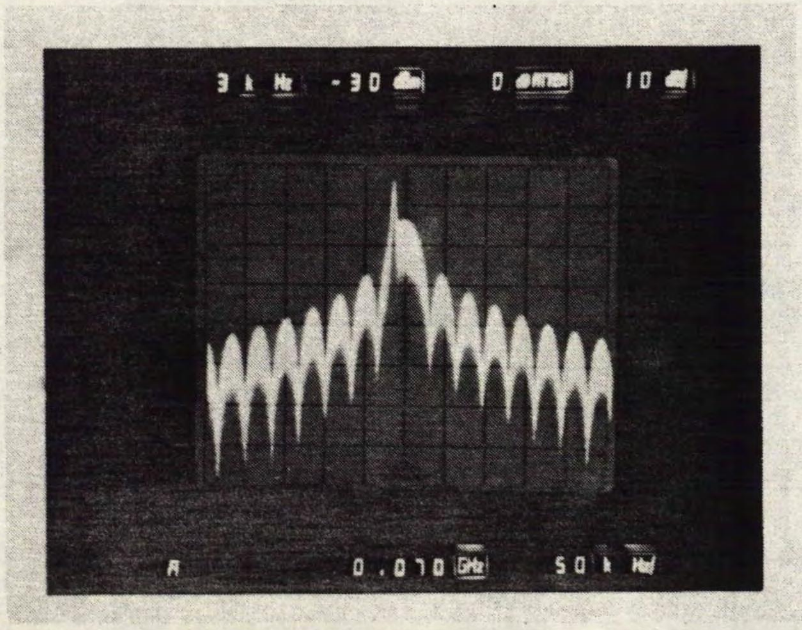
C_o/I_p = -20 dB

f_c = 10 kHz

PW = 1 μsec

PRF = 0.3 kHz

SP-13



C_o/I_p = -10 dB

f_c = 10 kHz

PW = 30 μsec

PRF = 3 kHz

SP-14

A1

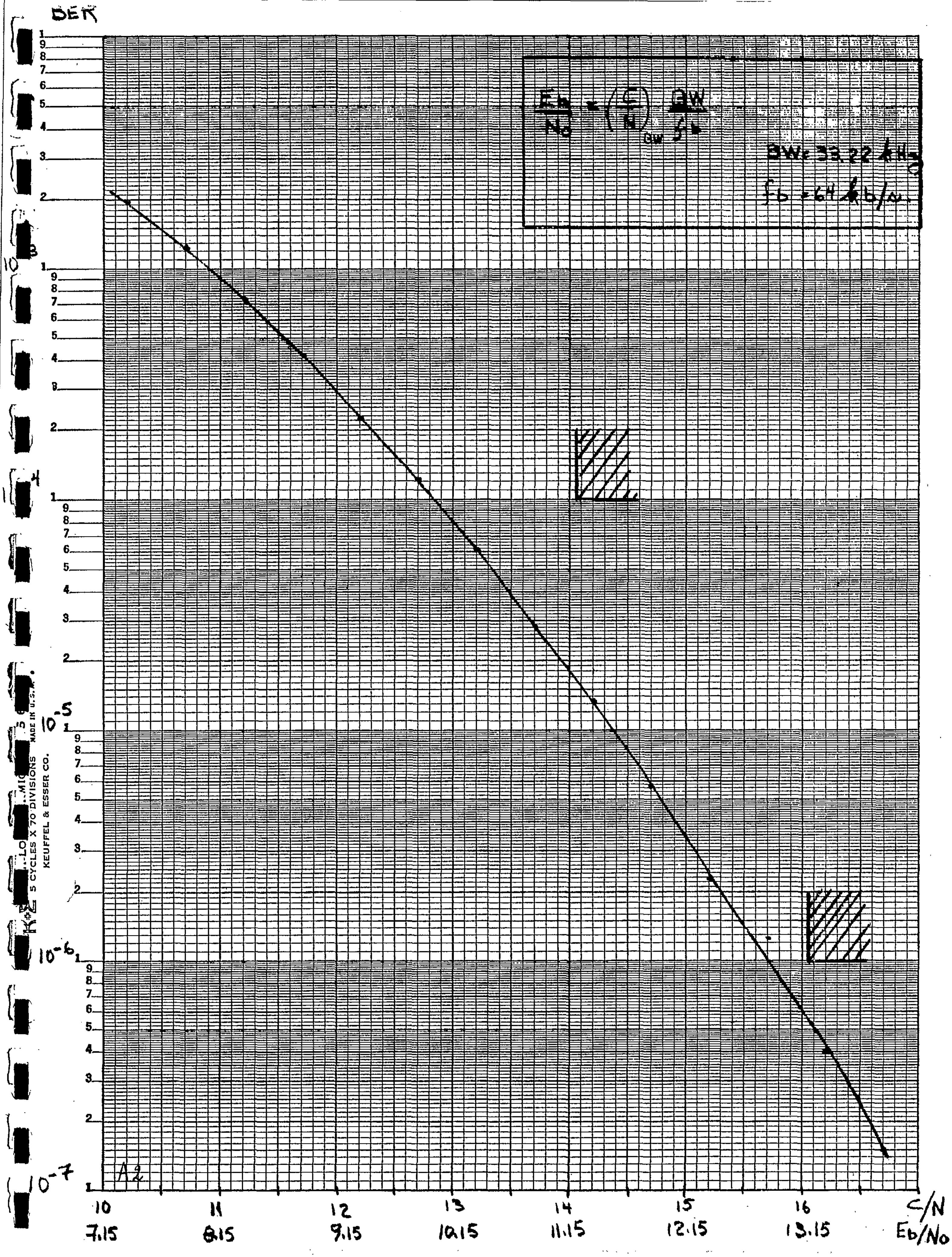
BIT ERROR RATE (BER) VS CARRIER LEVEL (C)

NO THERMAL NOISE AND NO INTERFERING CARRIER

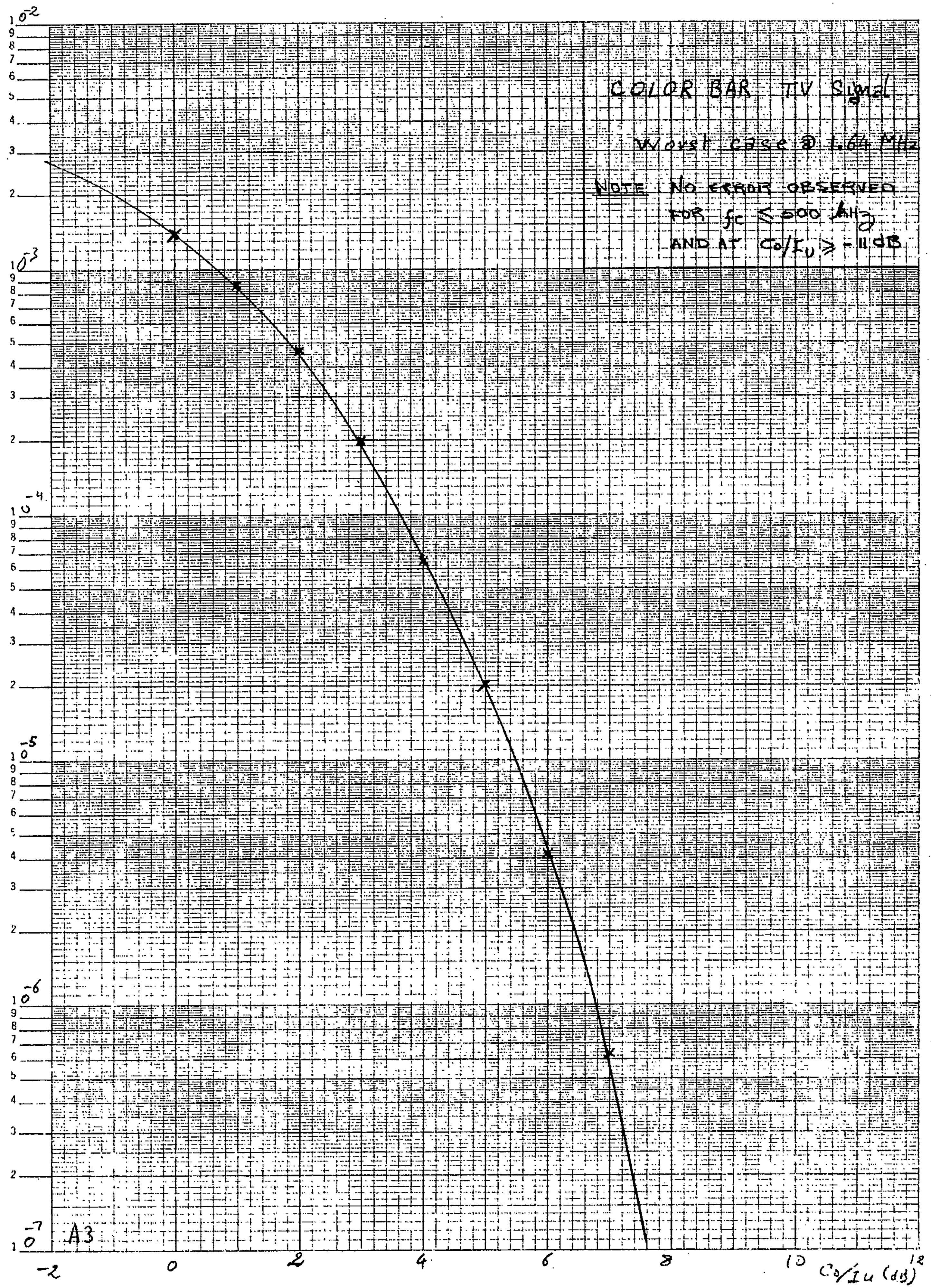
CARRIER LEVEL (C) (dBm)	BER
-35	1.23×10^{-7}
-37	NO ERROR OBSERVED
-39	↑
-41	│
-43 (NOTE 1)	│
-45	│
-47	│
-49	│
-51	│
-53	↓
-54	NO ERROR OBSERVED
-55	LOSS OF DATA

NOTE 1 : NOMINAL CARRIER LEVEL (C_o)

A2


BER
Eb/No = (C/N)BW · BW/fb
BW = 33.22 kHz
fb = 64 kb/s
10-3
10-4
10-5
10-6
10-7
A2
10 11 12 13 14 15 16 C/N
7.15 8.15 9.15 10.15 11.15 12.15 13.15 Eb/No
5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.

A3

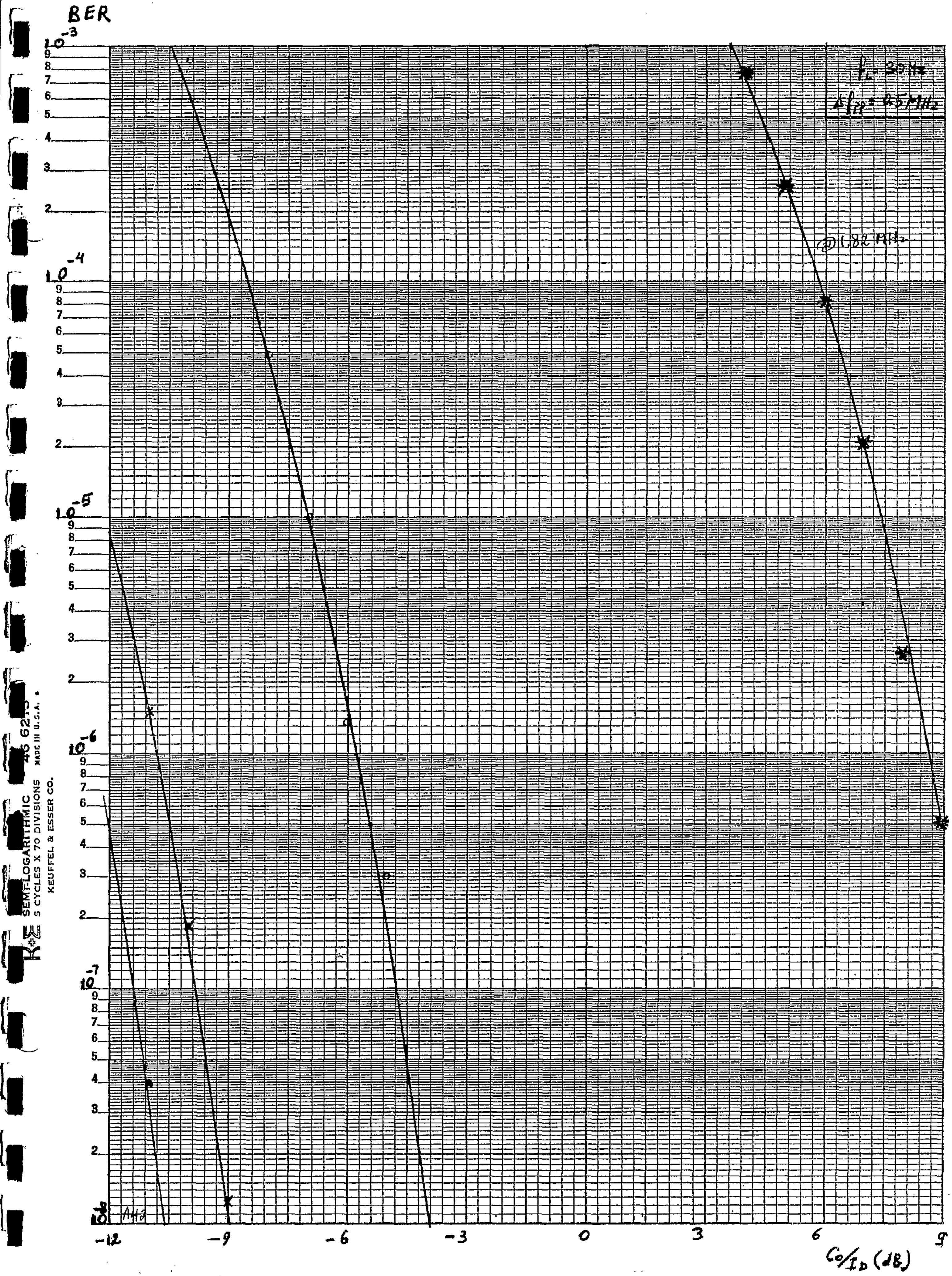

COLOR BAR TV Signal
Worst case @ 1.64 MHz
NOTE NO ERROR OBSERVED FOR fc ≤ 500 kHz AND AT Co/Iu ≥ -11 dB
A3
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
-2
0
2
4
6
8
10
12
Co/Iu (dB)

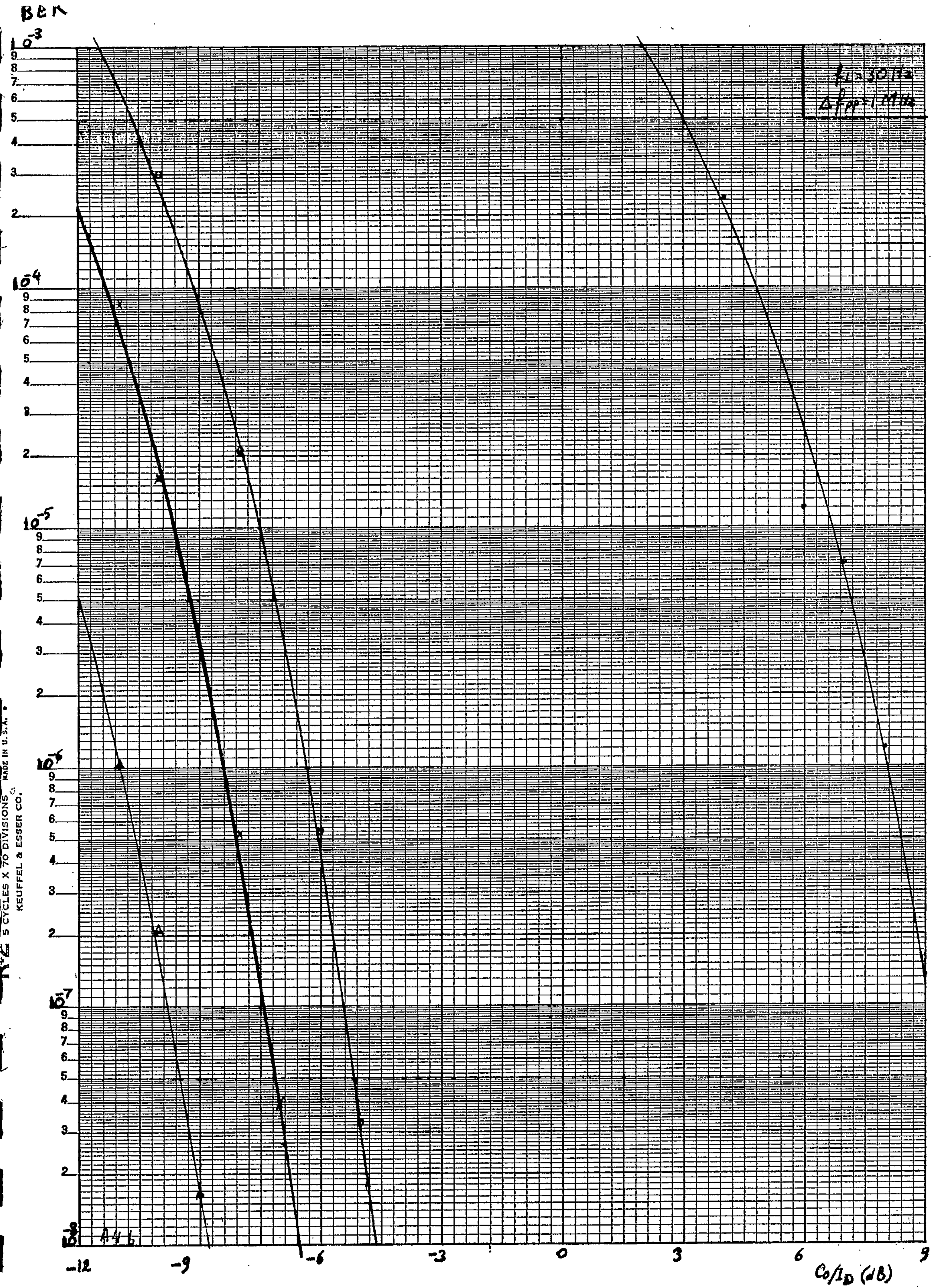
LEGEND:

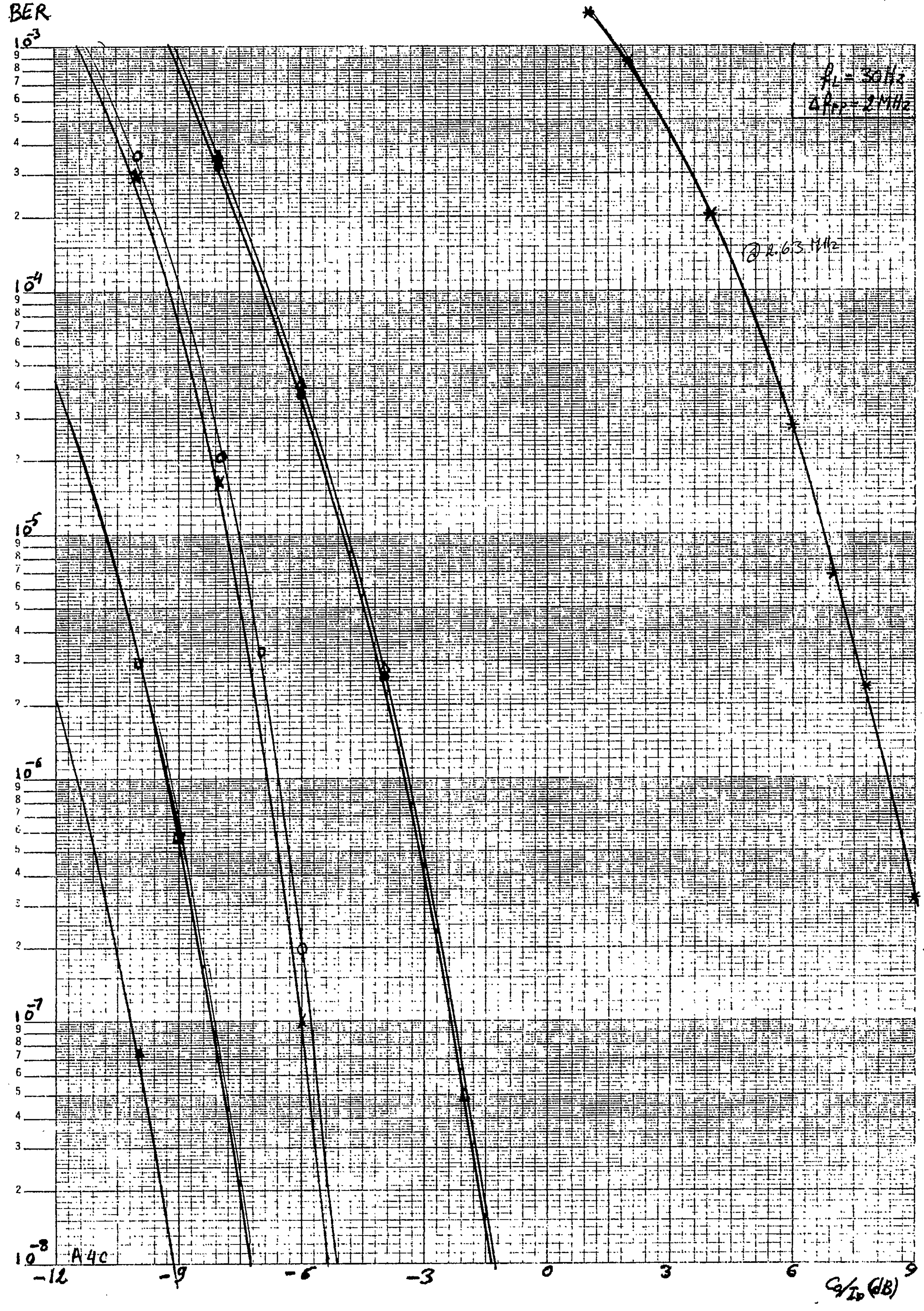
*	WORST CASE f_c
○	f_c = 3.6 MHz
×	f_c = 3 MHz
●	f_c = 2 MHz
Δ	f_c = 1 MHz
□	f_c = 500 kHz
▲	f_c = 100 kHz
■	f_c = 22.5 kHz

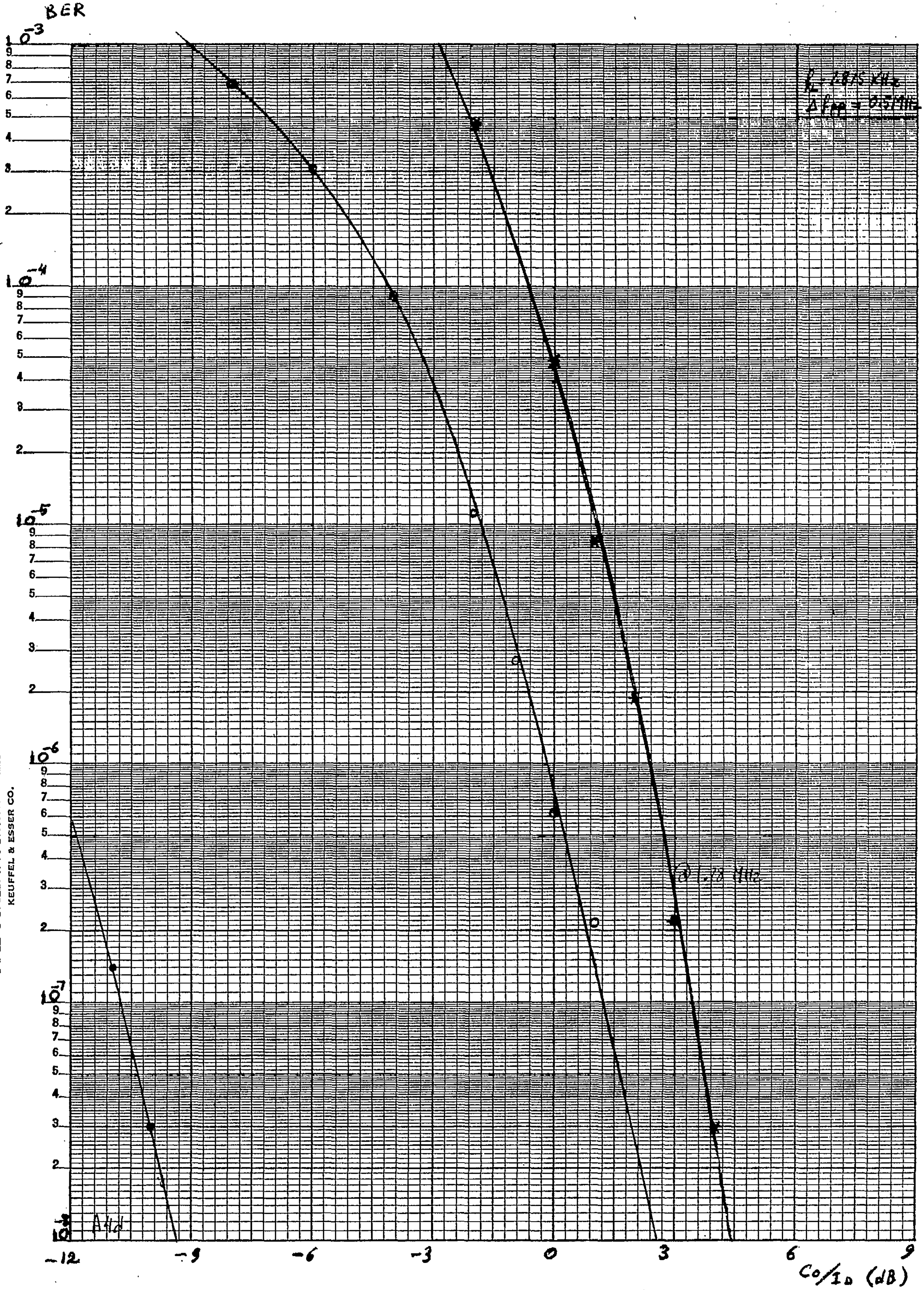
I_D modulated by Color bar signal

$C_o/N \rightarrow \infty$

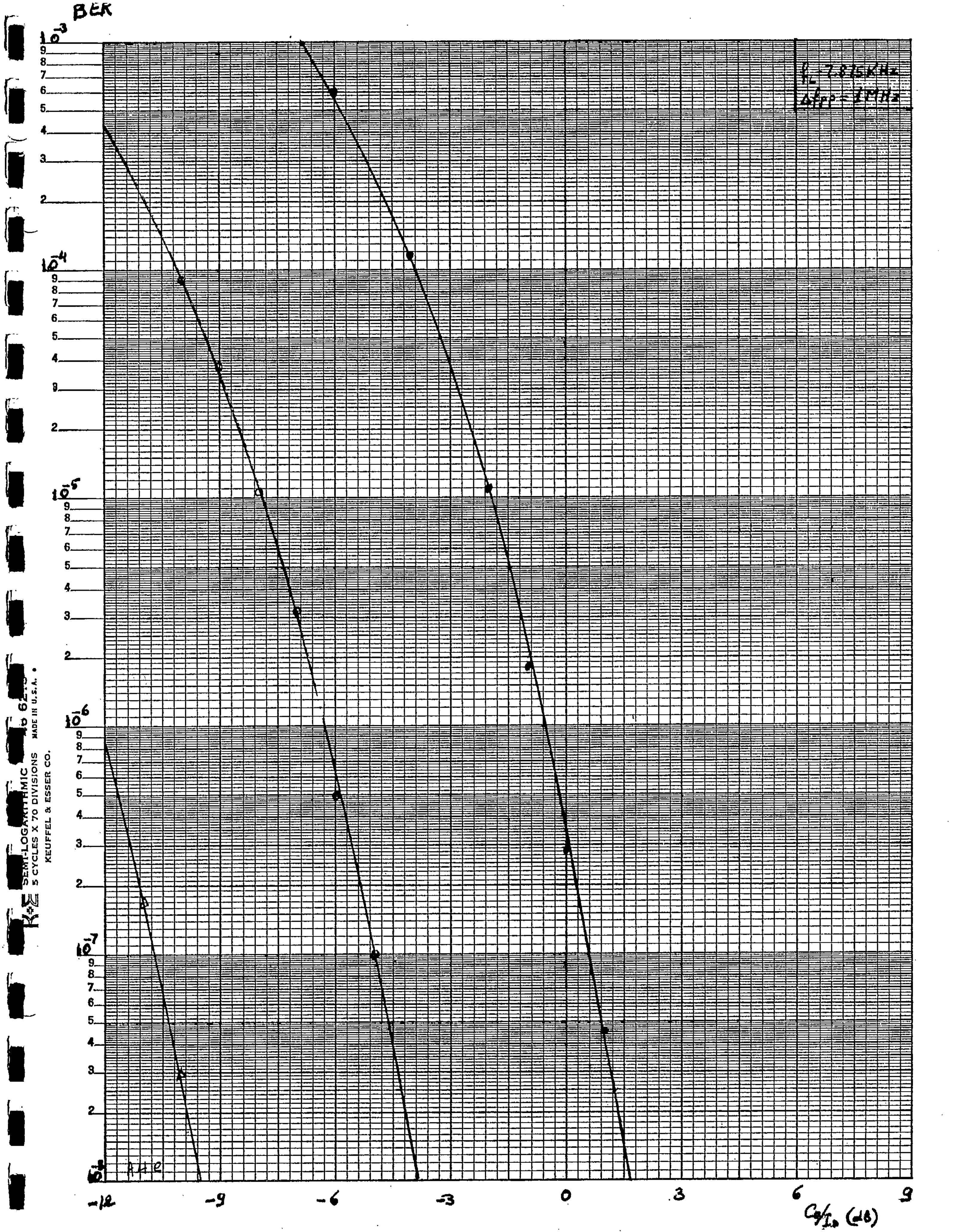

BER
@1.82 MHz
-12
-9
-6
-3
0
3
6
9
Co/ID (dB)
SEMI-LOGARITHMIC
5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.

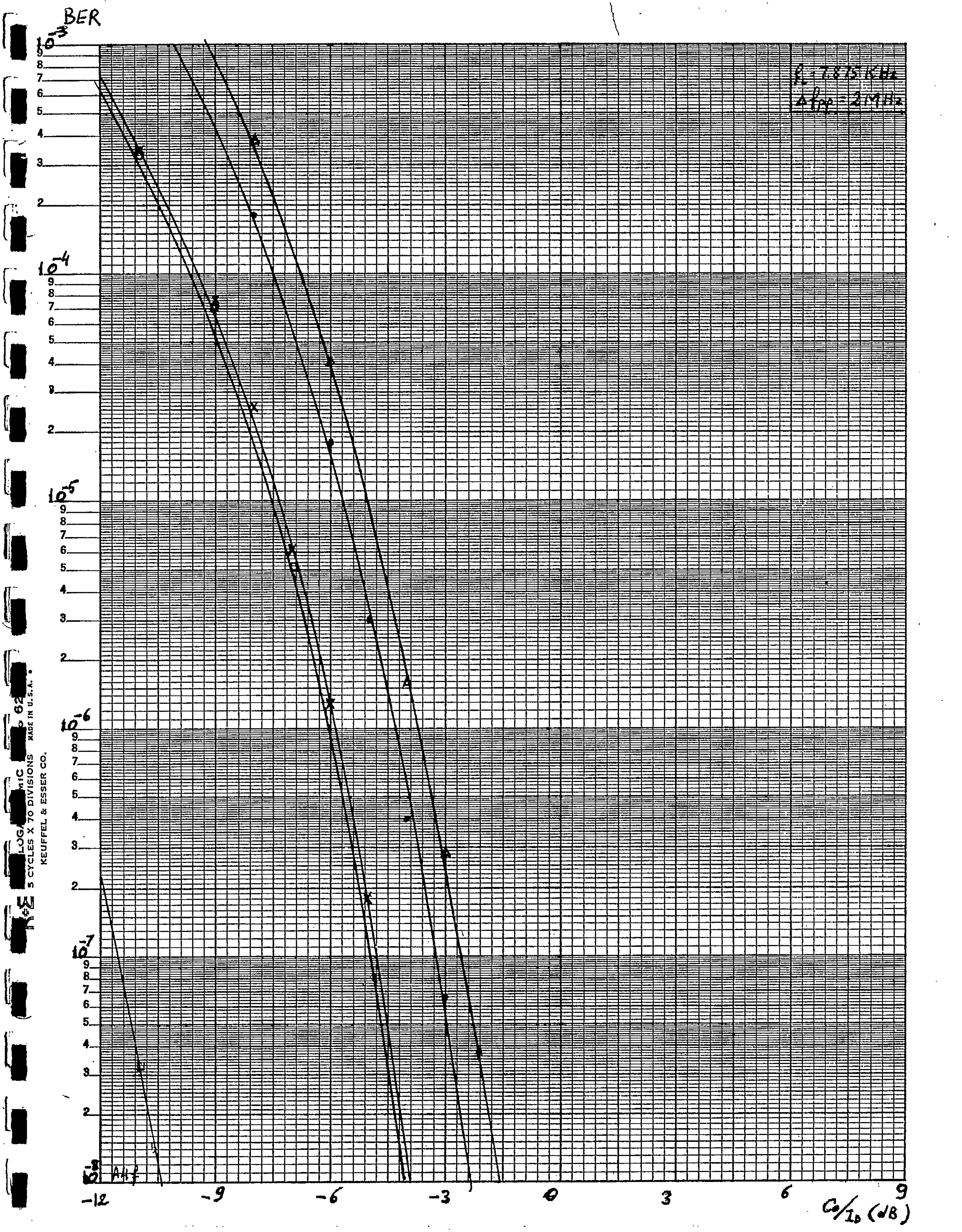

BER
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
-12
-9
-6
-3
0
3
6
9
C_o/I_D (dB)
f_i = 50 Hz
Δf_{pp} = 1 MHz
A4b
5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.

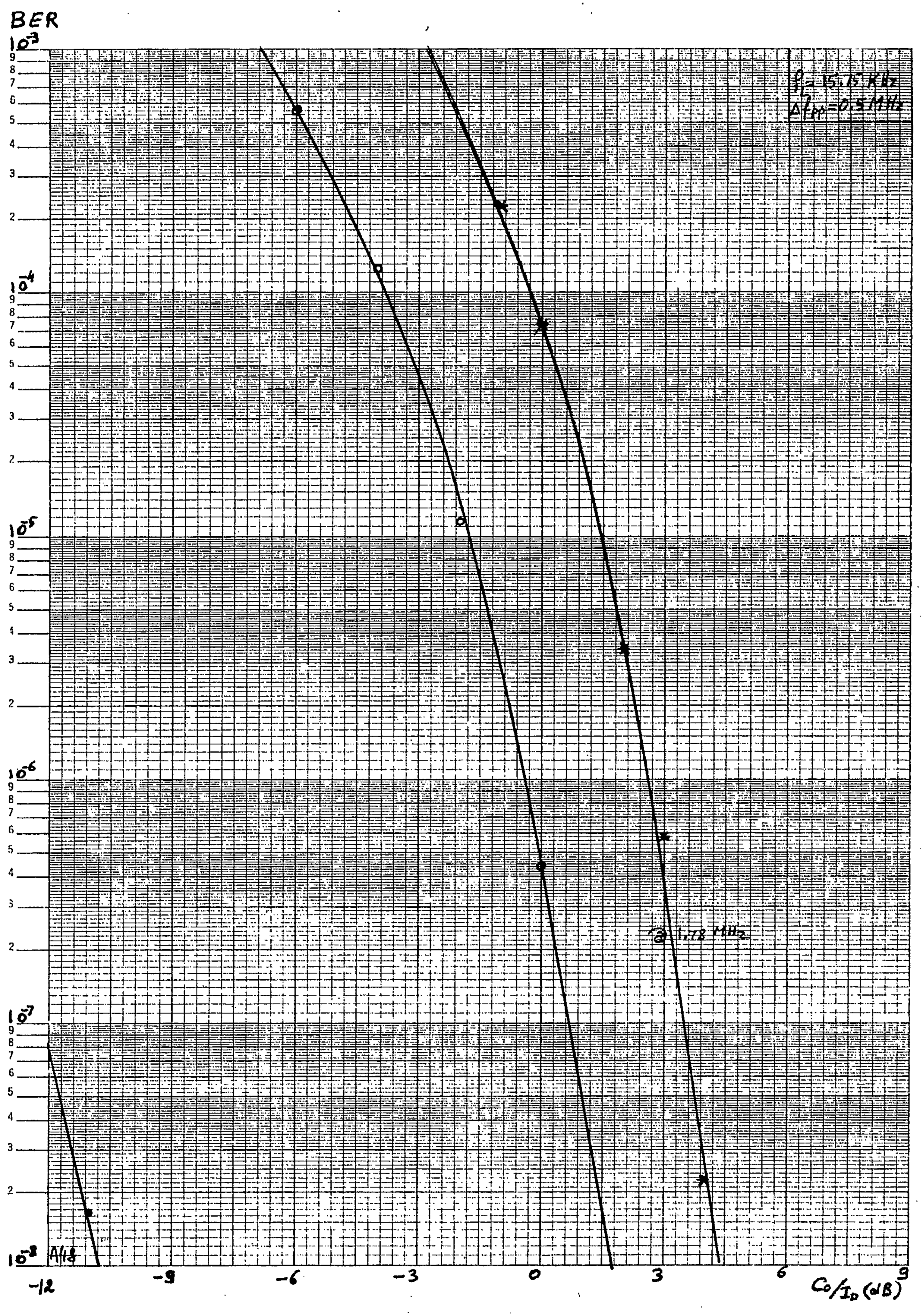

BER
10^-3
10^-4
10^-5
10^-6
10^-7
10^-8
A4C
-12
-9
-6
-3
0
3
6
9
C/I_D (dB)
f_L = 30 Hz
Δf_pp = 2 MHz
@2.63 MHz

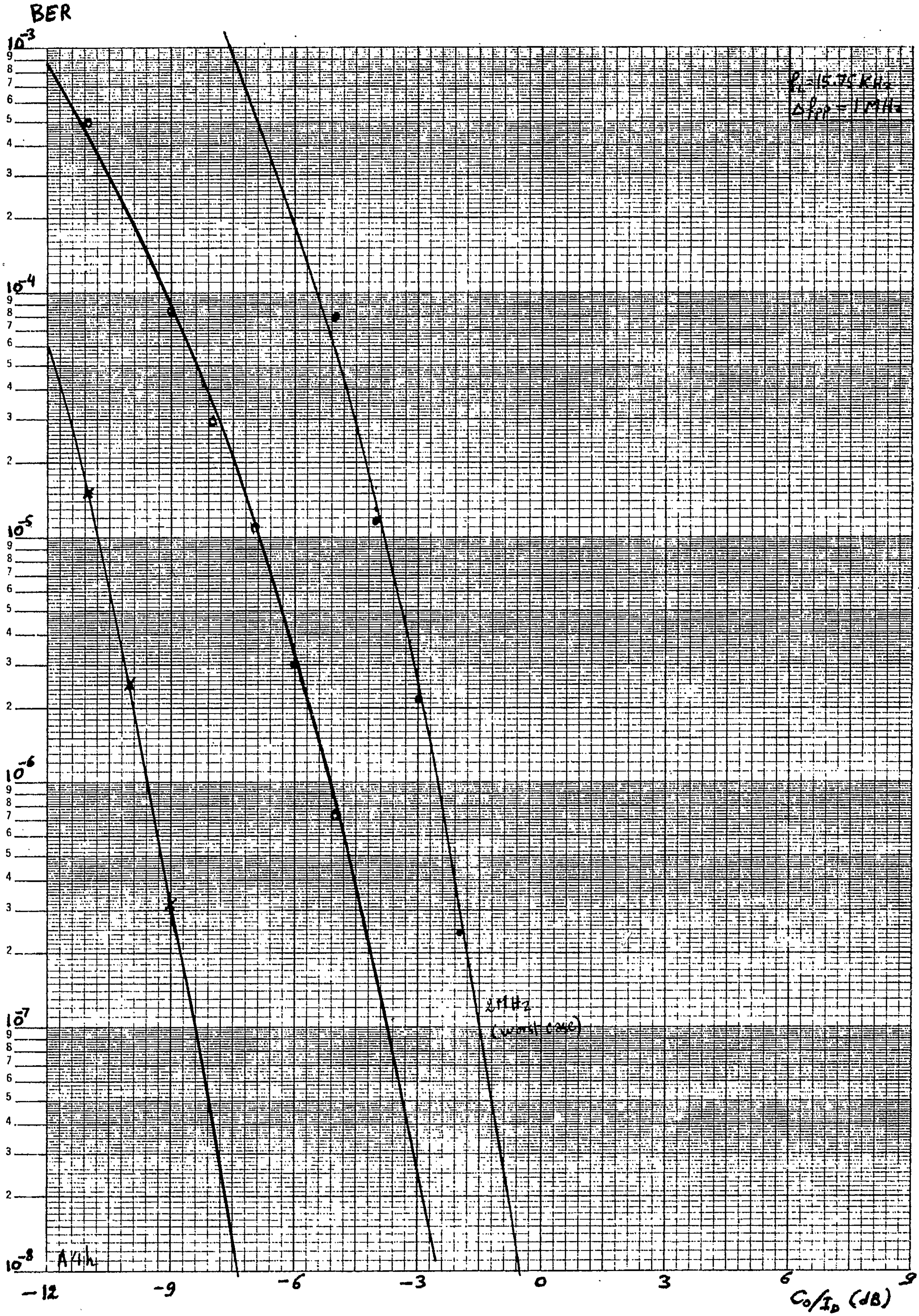


BER
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
@ 1.78 MHz
-12
-9
-6
-3
0
3
6
9
Co/ID (dB)

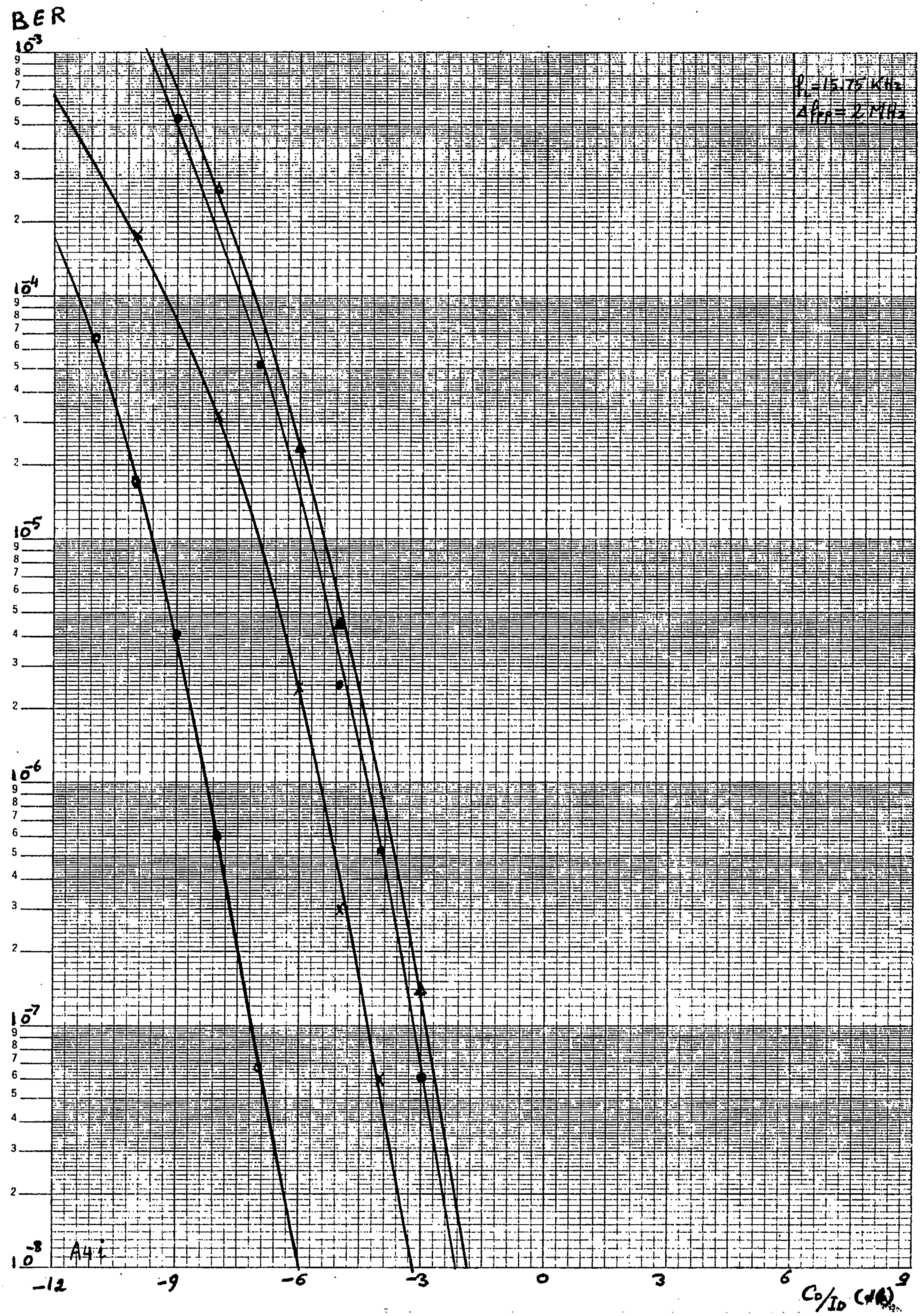

BER
f_L = 7.875 KHz
Δf_{PP} = 1 MHz
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
-12
-9
-6
-3
0
3
6
9
C_0/I_0 (dB)
AHE
SEMI-LOGARITHMIC
5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.


BER
10^-3
10^-4
10^-5
10^-6
10^-7
10^-8
f_c = 7.875 KHz
Δf_pp = 21 MHz
-12
-9
-6
-3
0
3
6
9
Co/Io (dB)
5 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO.
MADE IN U.S.A.


BER
10⁻³
10⁻⁴
10⁻⁵
10⁻⁶
10⁻⁷
10⁻⁸
fr = 15.75 KHz
Δfpp = 0.5 MHz
@ 1.78 MHz
A48
-12
-9
-6
-3
0
3
6
9
Co/ID (dB)



BER
$f_L = 15.75$ KHz
$\Delta f_{PP} = 1$ MHz
±1 MHz
(worst case)
C_o/I_D (dB)
A'4h


BER
$f_L = 15.75$ KHz
$\Delta f_{PP} = 2$ MHz
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
10^{-8}
-12
-9
-6
-3
0
3
6
9
C_0/I_D (dB)
A41

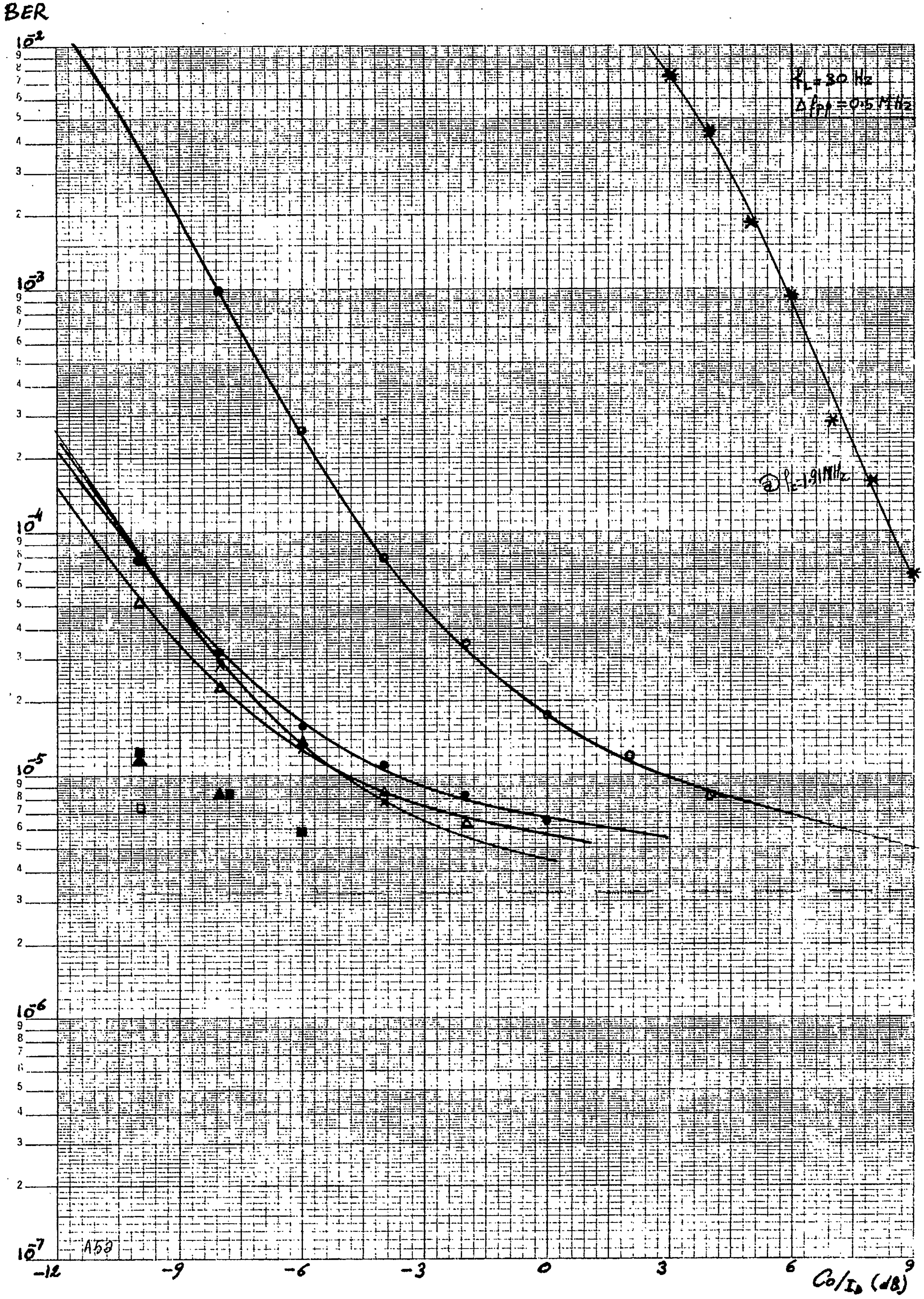
A5

LEGEND:

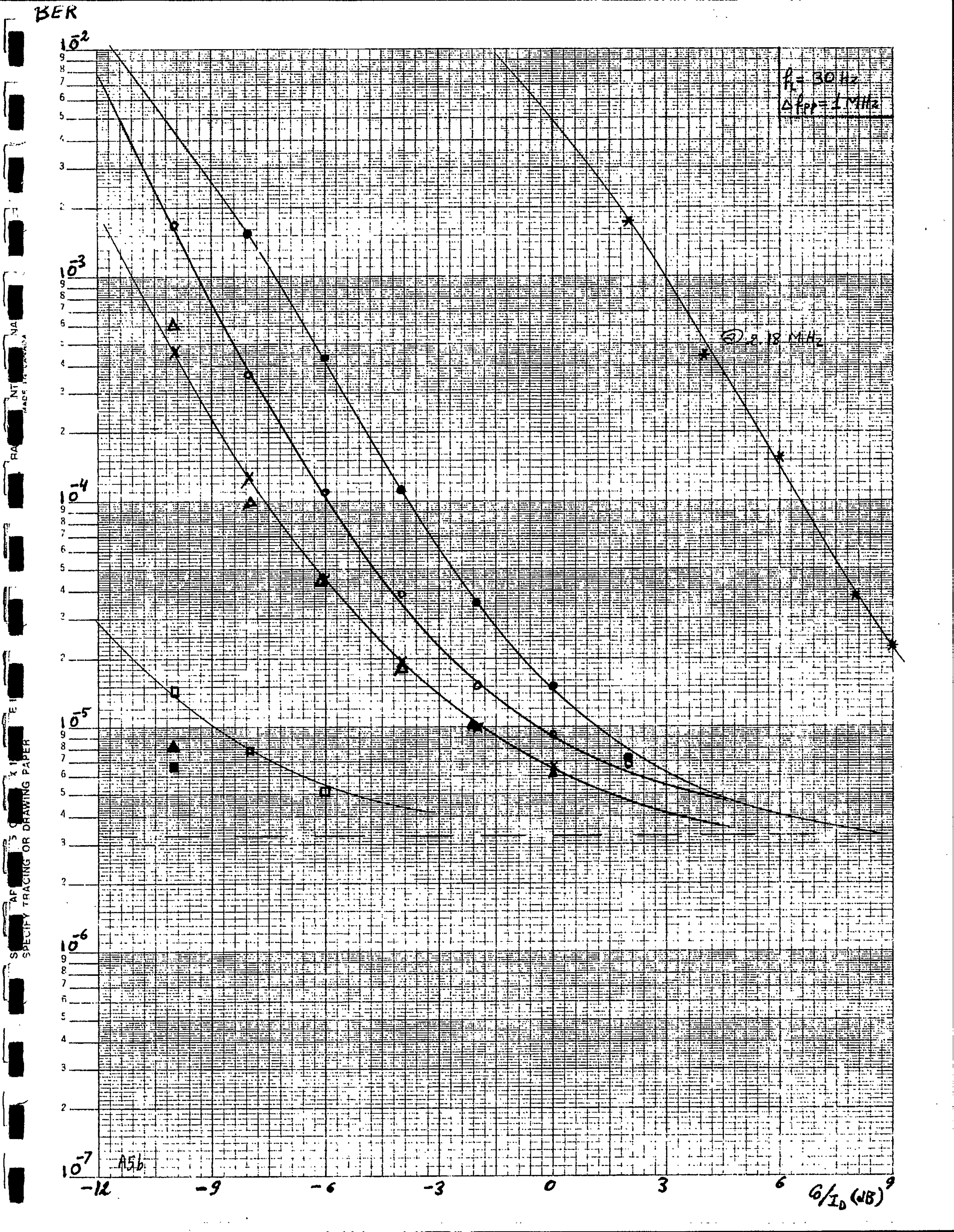
SYMBOL	fc
*	WORST CASE
o	3.6 MHz
X	3.0
●	2.0
Δ	1.0 MHz
□	500 kHz
▲	100 kHz
■	22.5 kHz

I_D modulated by color bar signal

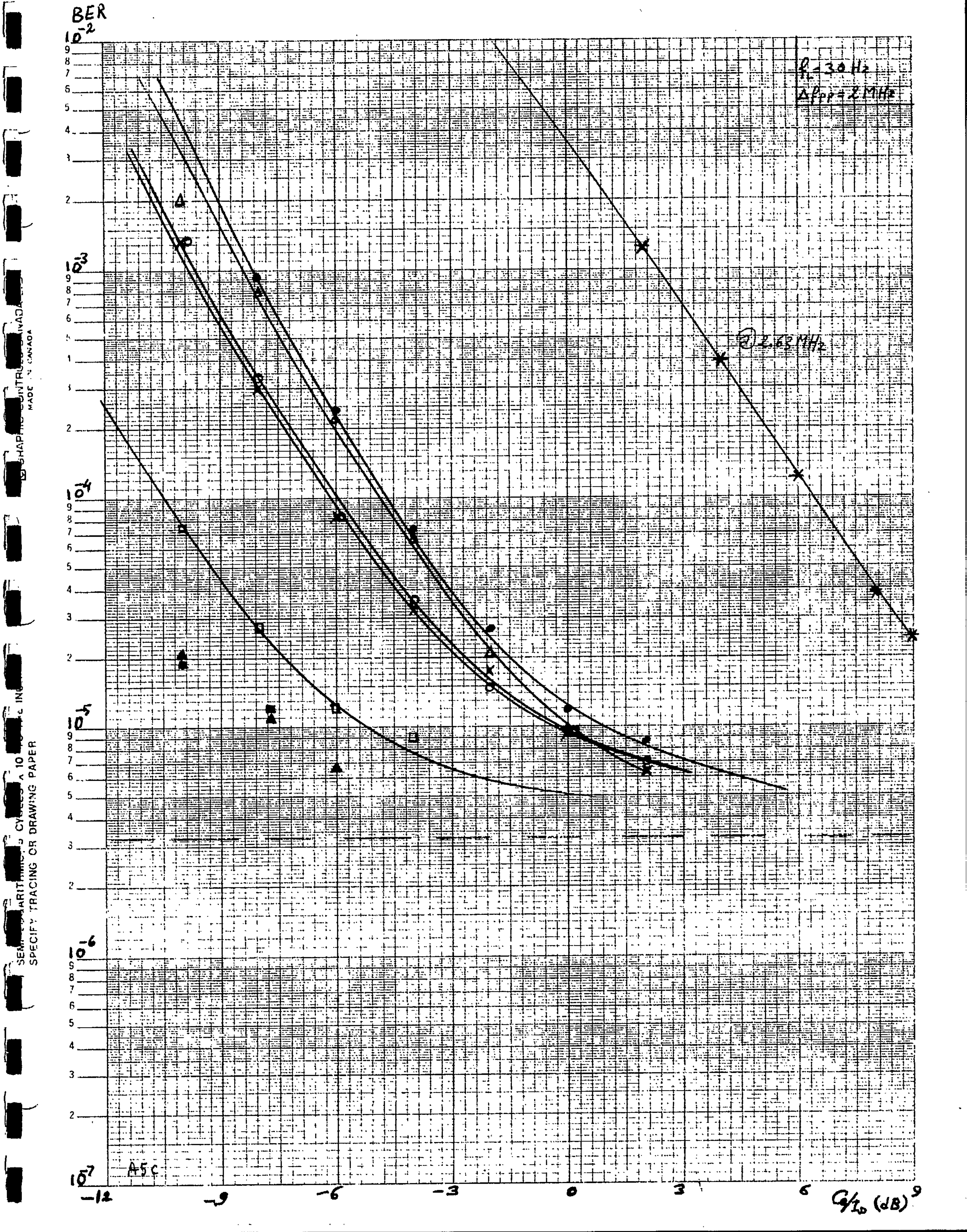
$C_o/N = 15\,dB$

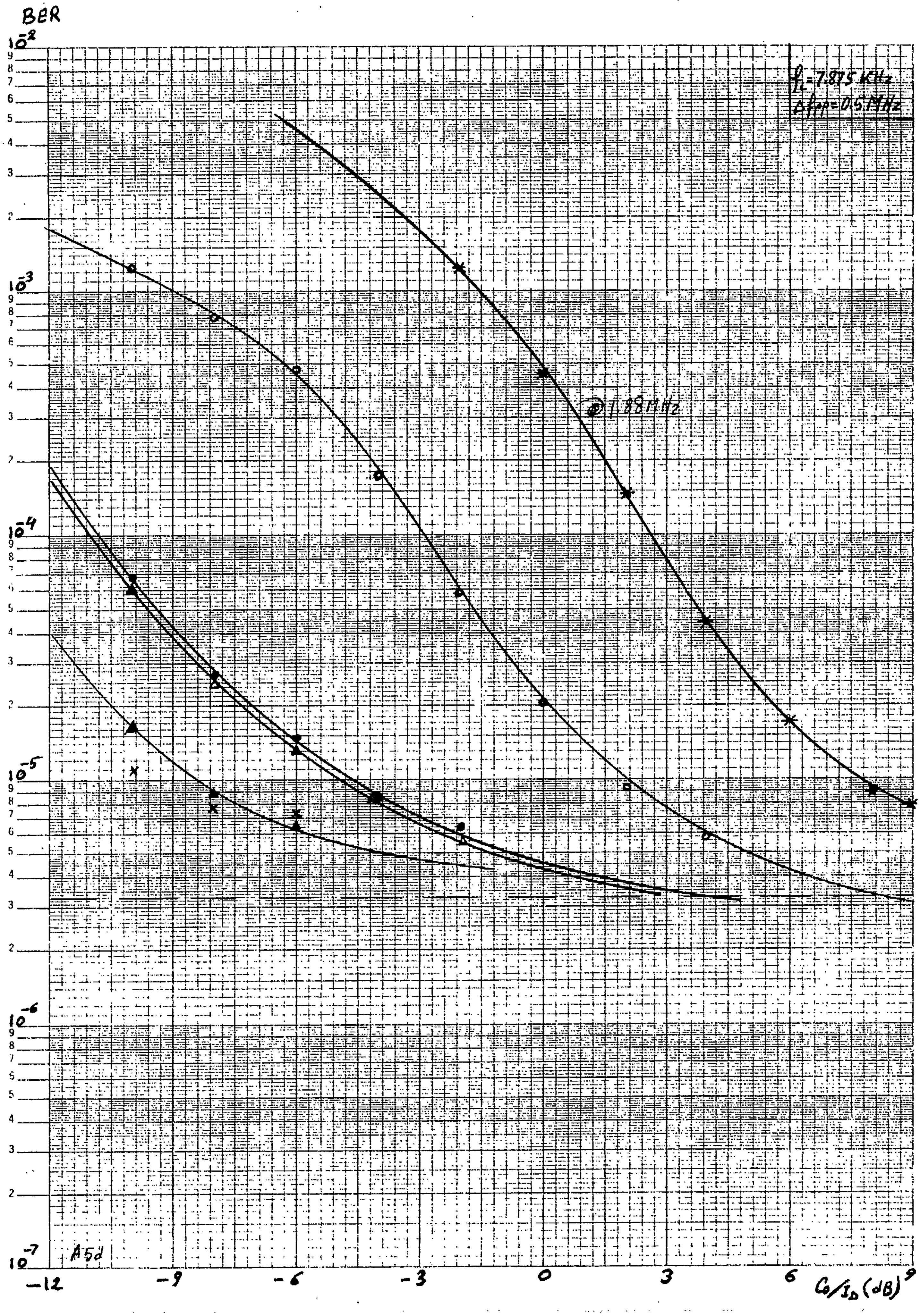


BER
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
$f_L = 30$ Hz
$\Delta f_{pp} = 0.5$ MHz
-12
-9
-6
-3
0
3
6
9
C_o/I_o (dB)
A53

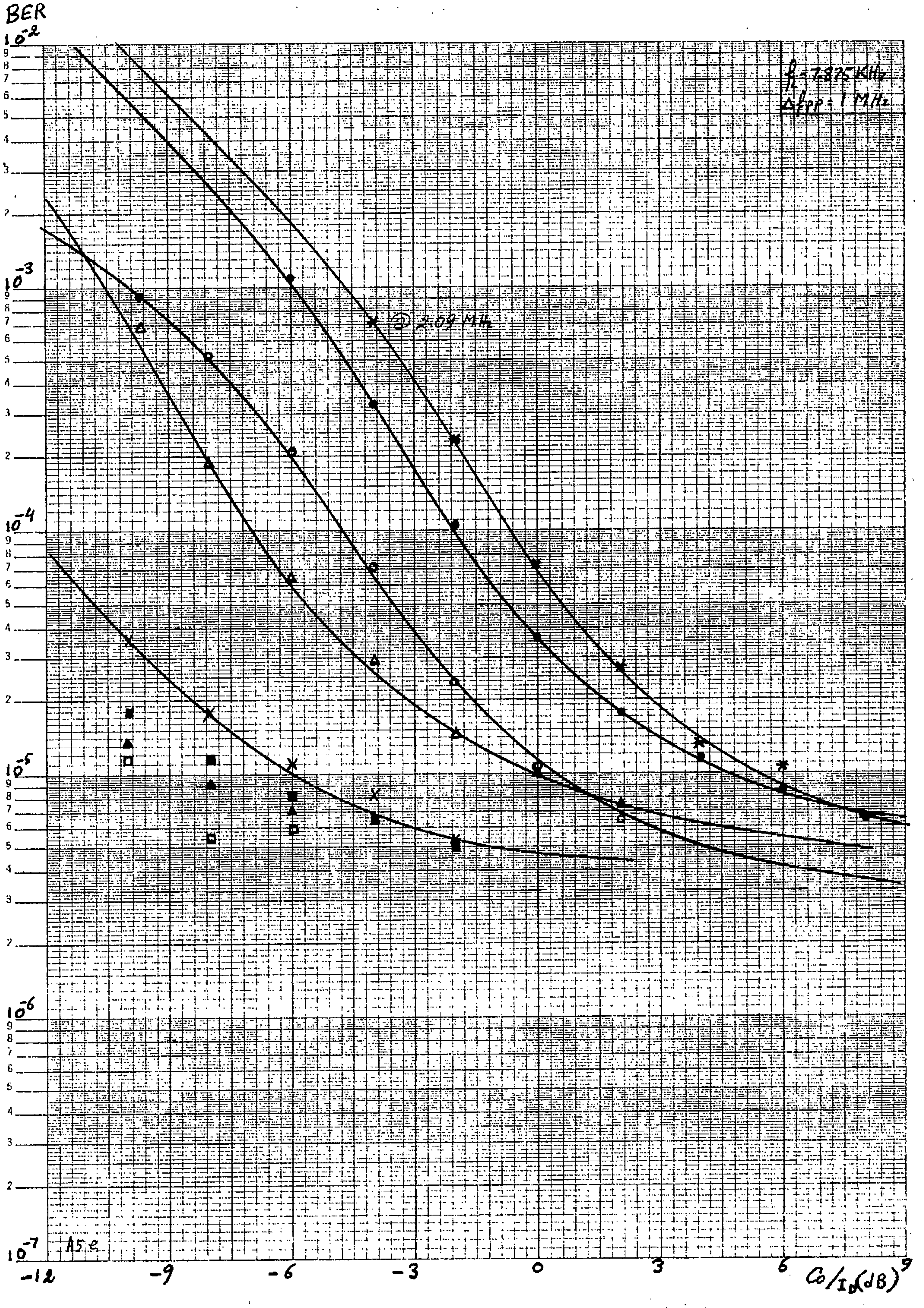


BER
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
$f_L = 30$ Hz
$\Delta f_{PP} = 1$ MHz
@ 2.18 MHz
A5b
-12
-9
-6
-3
0
3
6
9
G/I_D (dB)
SPECIFY TRACING OR DRAWING PAPER

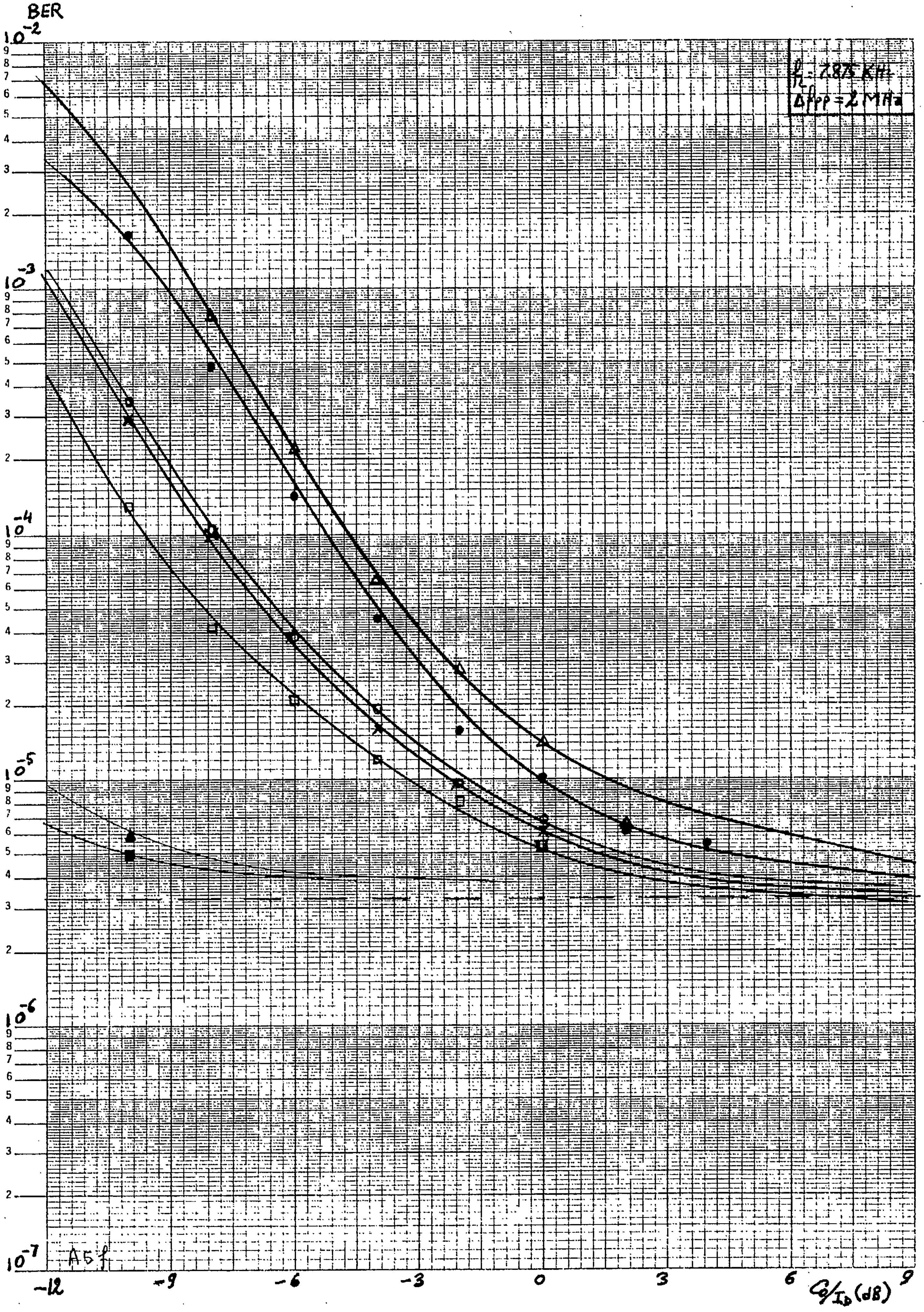

BER
fL = 30 Hz
Δfpp = 2 MHz
2.63 MHz
A5c
C/N0 (dB)
-12
-9
-6
-3
0
3
6
9
10^-2
10^-3
10^-4
10^-5
10^-6
10^-7
GRAPHIC CONTROLS CANADA
MADE IN CANADA
SEMI-LOGARITHMIC 5 CYCLES X 10 TO THE INCH
SPECIFY TRACING OR DRAWING PAPER



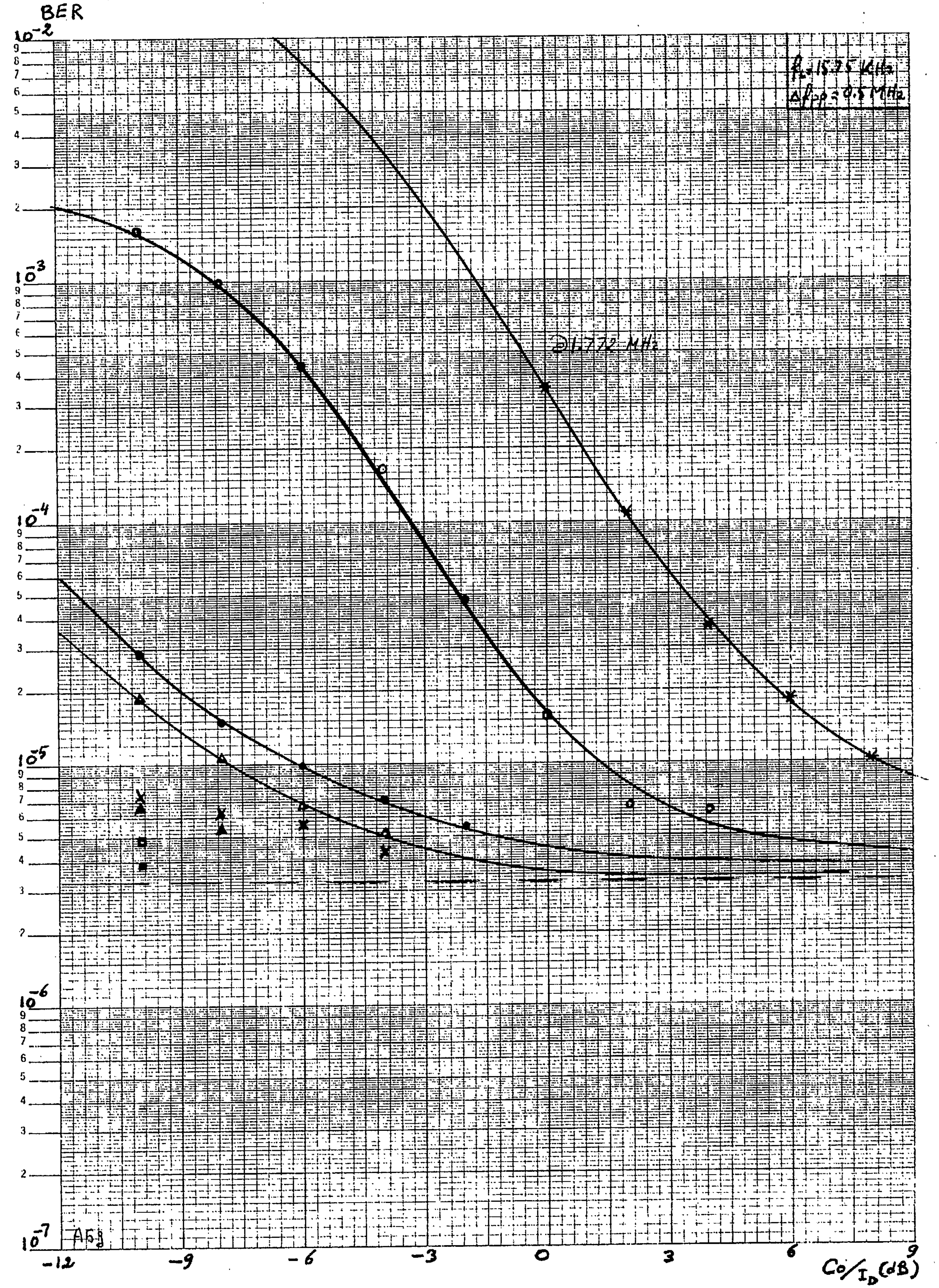
BER
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
f_L = 7.875 KHz
Δf_{op} = 0.5 MHz
@ 1.88 MHz
A5d
-12
-9
-6
-3
0
3
6
9
C_0/I_D (dB)
SPECIFY TRACING OR DRAWING PAPER
MADE IN CANADA

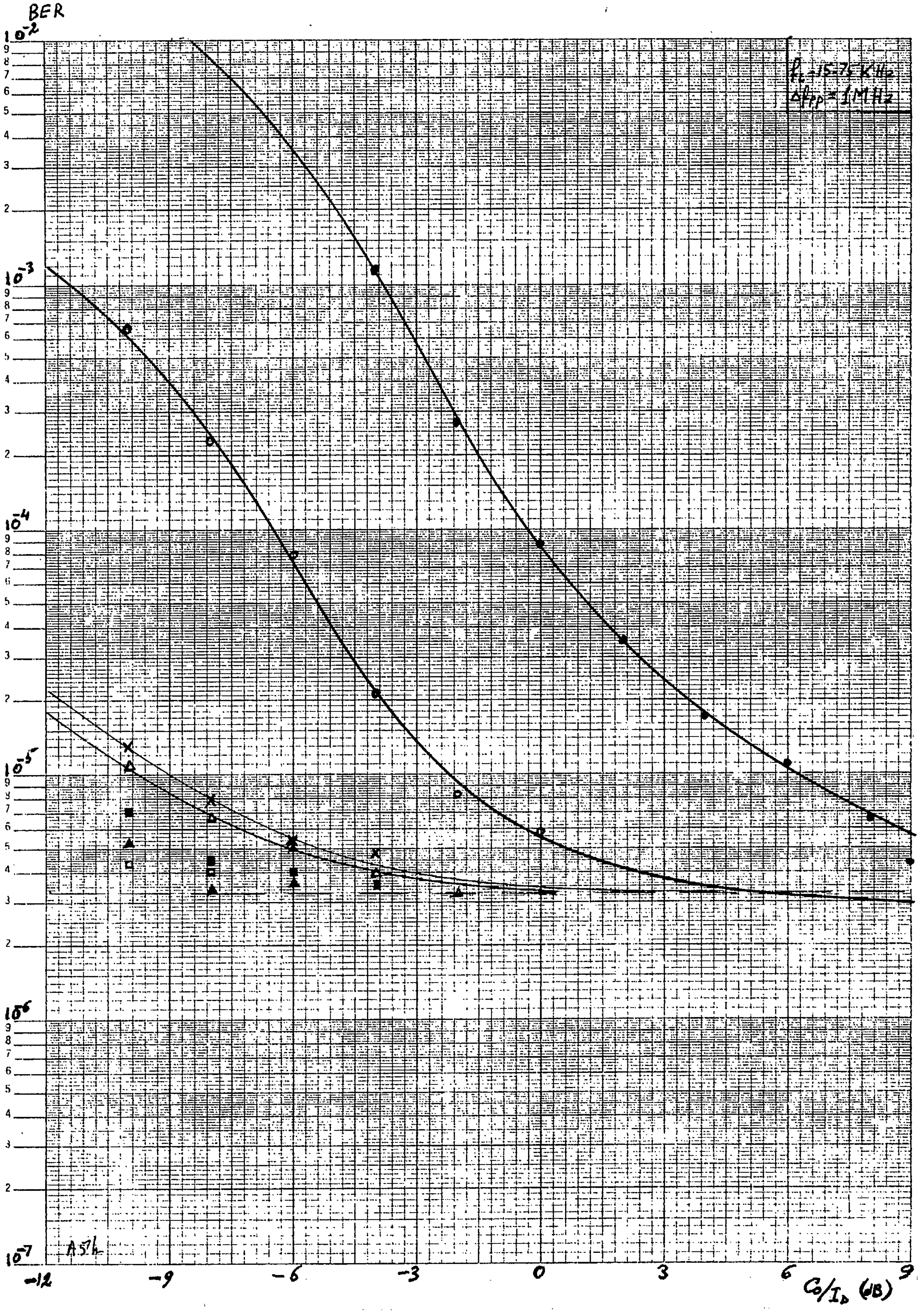


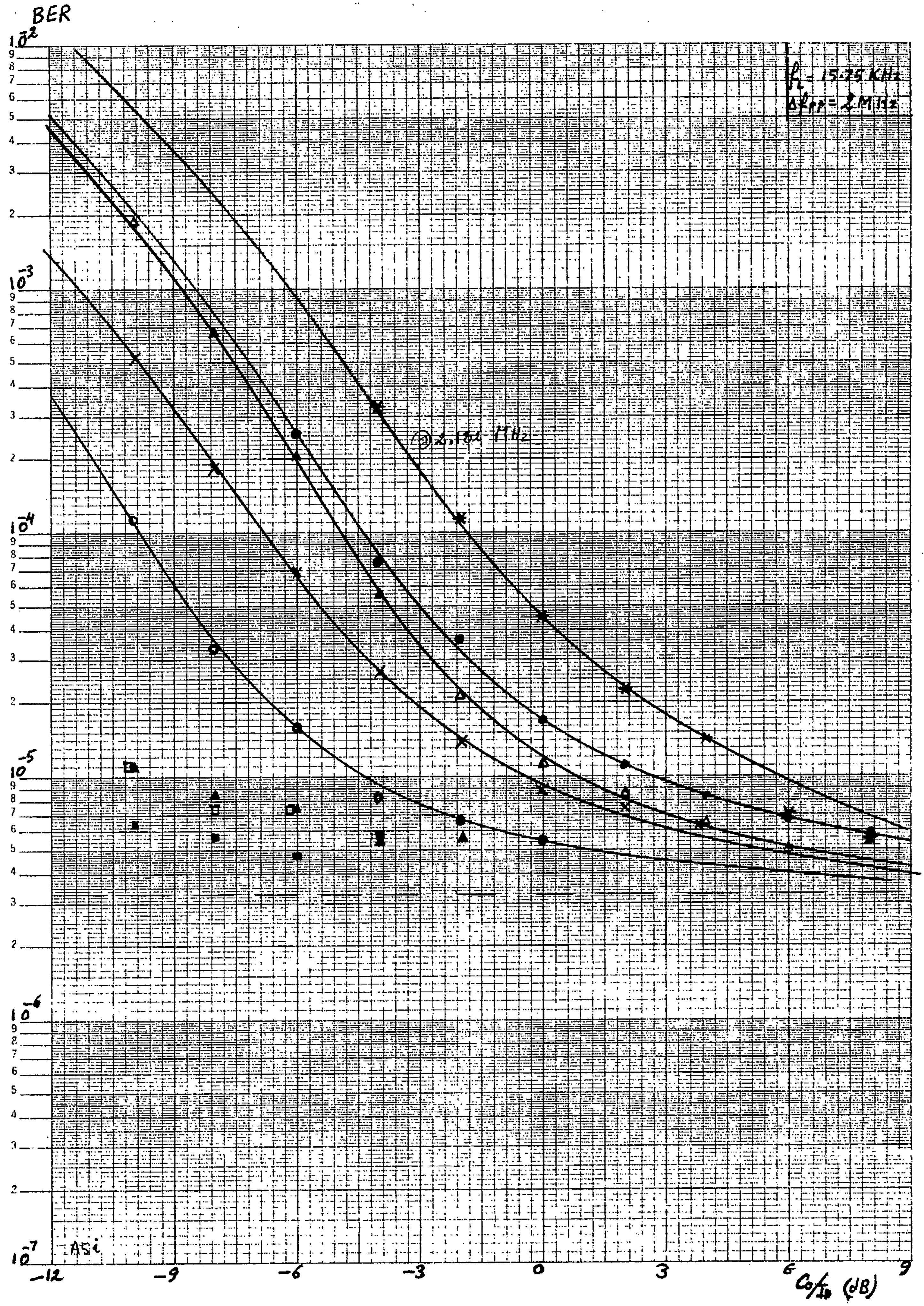
BER
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
f_h = 7.875 KHz
Δf_{pp} = 1 MHz
② 2.09 MHz
A5 e
-12
-9
-6
-3
0
3
6
9
C_0/I_D (dB)
SPECIFY TRACING OR DRAWING PAPER
MADE IN CANADA



BER
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
$f_c = 7875$ KHz
$\Delta f_{pp} = 2$ MHz
-12
-9
-6
-3
0
3
6
9
C_0/I_D (dB)
A5f


BER
10^-2
10^-3
10^-4
10^-5
10^-6
10^-7
fL=15.75 KHz
Δfpp=0.5 MHz
@1.772 MHz
A6
-12
-9
-6
-3
0
3
6
9
Co/ID(dB)


BER
fc = 15.75 KHz
Δfpp = 1 MHz
-12
-9
-6
-3
0
3
6
9
Co/ID (dB)
A56


BER
fi = 15.75 KHz
Δfpp = 2 MHz
2.182 MHz
ASi
-12
-9
-6
-3
0
3
6
9
Co/Io (dB)

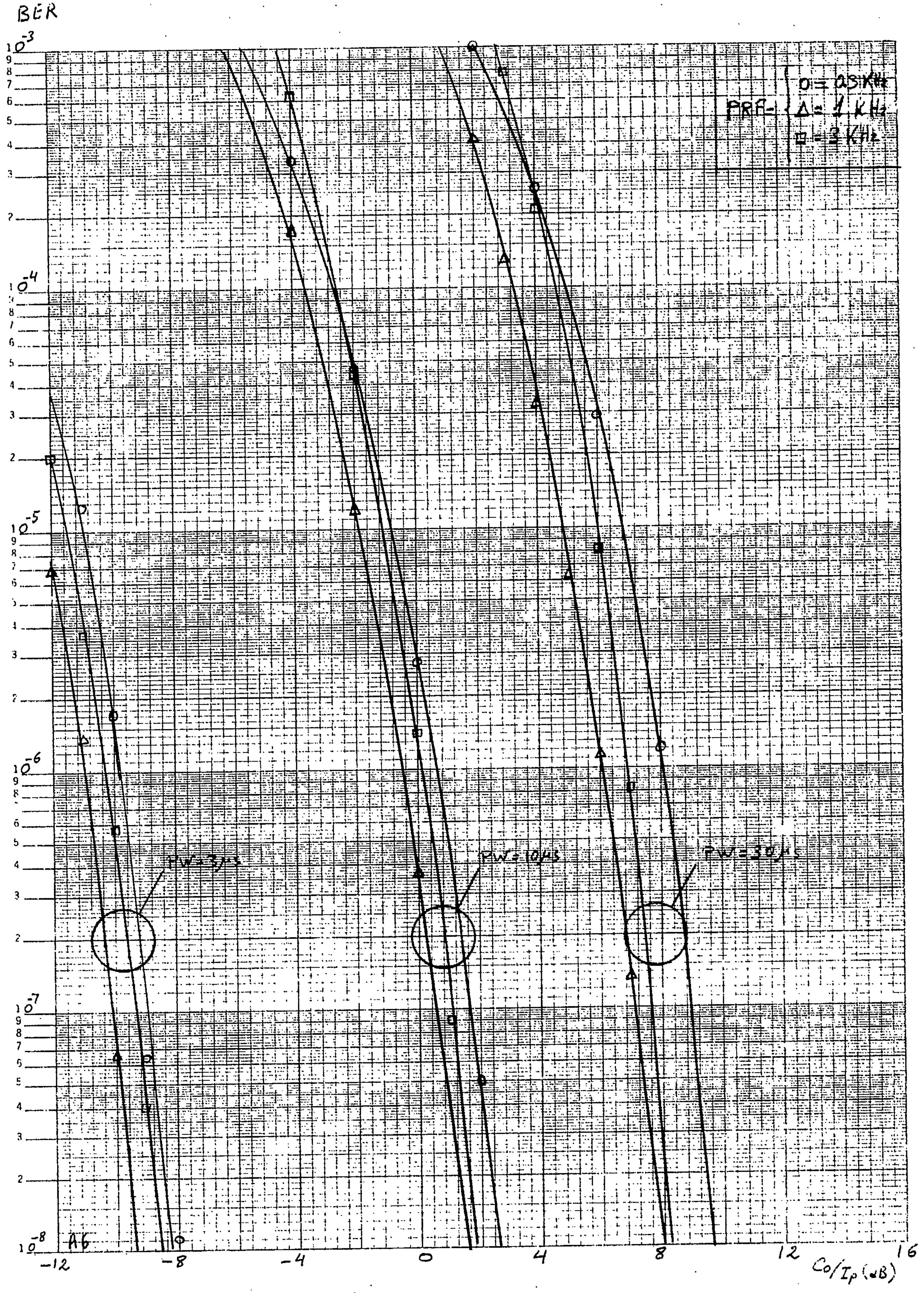
A6

SYMBOL	PRF (kHz)
○	0.3
△	1.0
□	3.0

Radar-like Interfering signal

$C_o/N \longrightarrow \infty$

$f_c = 10$ KHz


BER
PRF - O = 0.5 KHz, Δ = 1 KHz, □ = 3 KHz
PW = 3 μs
PW = 10 μs
PW = 30 μs
A6
-12
-8
-4
0
4
8
12
16
Co/Ip (dB)

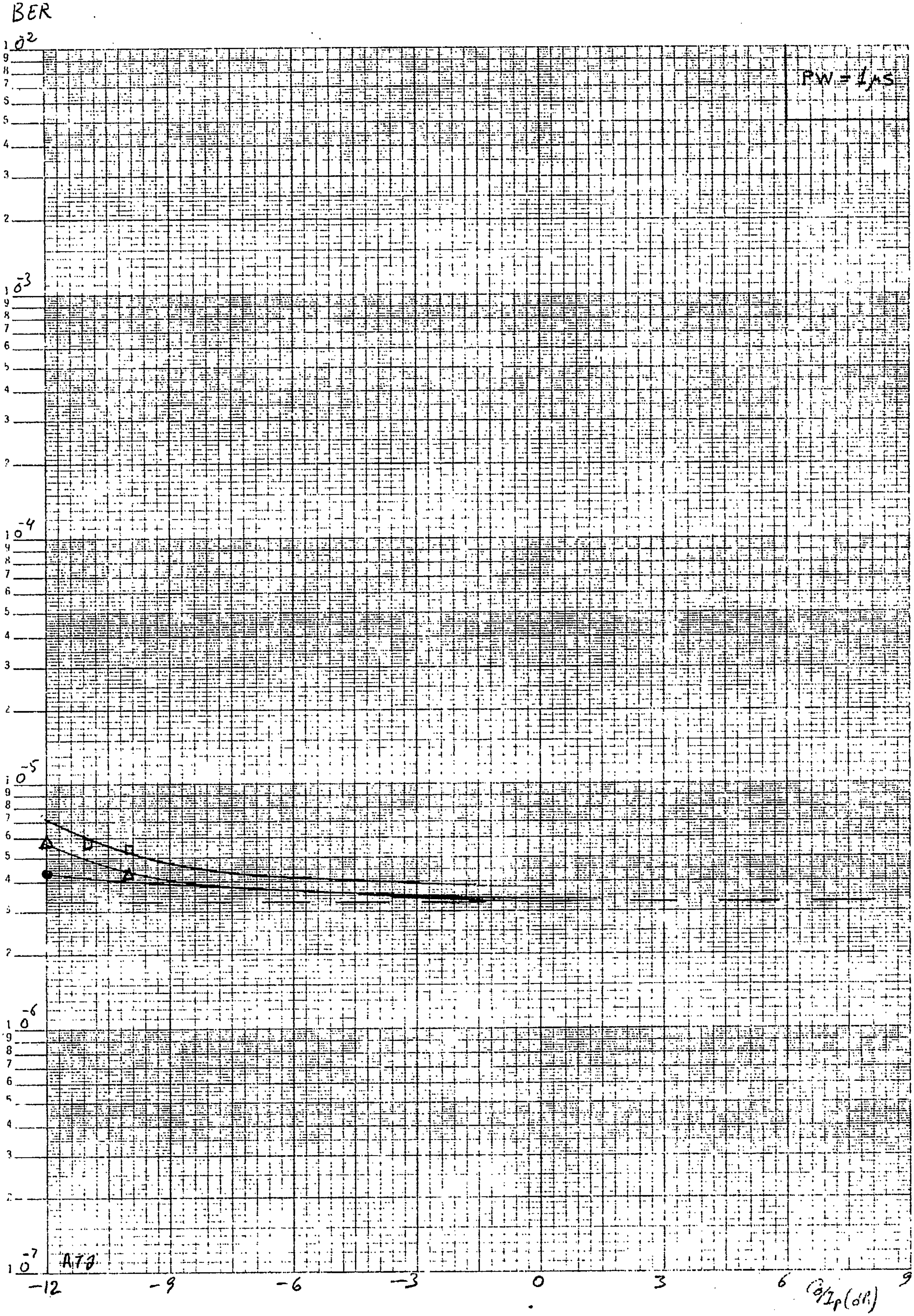
A7

SYMBOL	PRF (kHz)
○	0.3
△	1.0
□	3.0

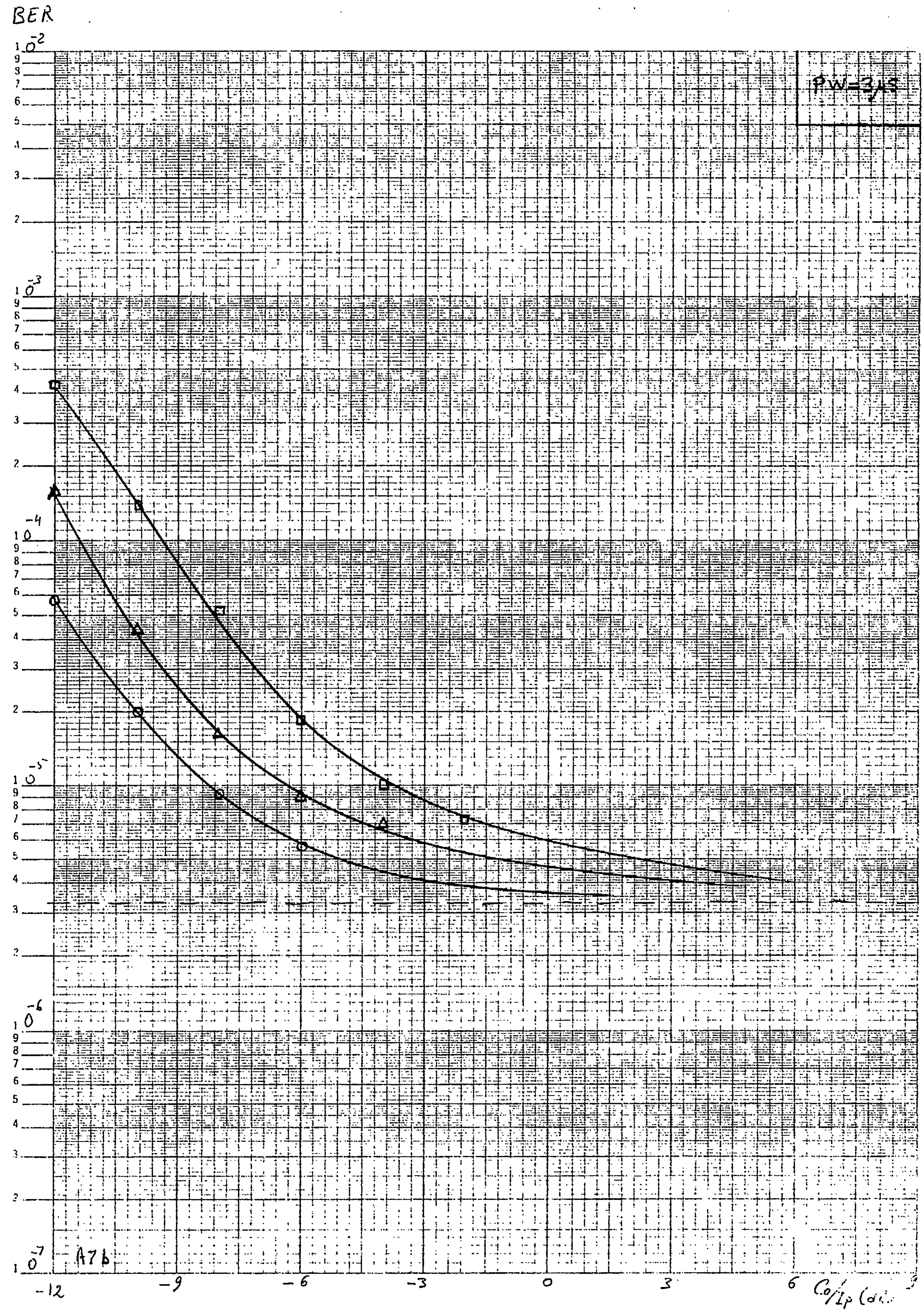
Radar-Like Interfering signal

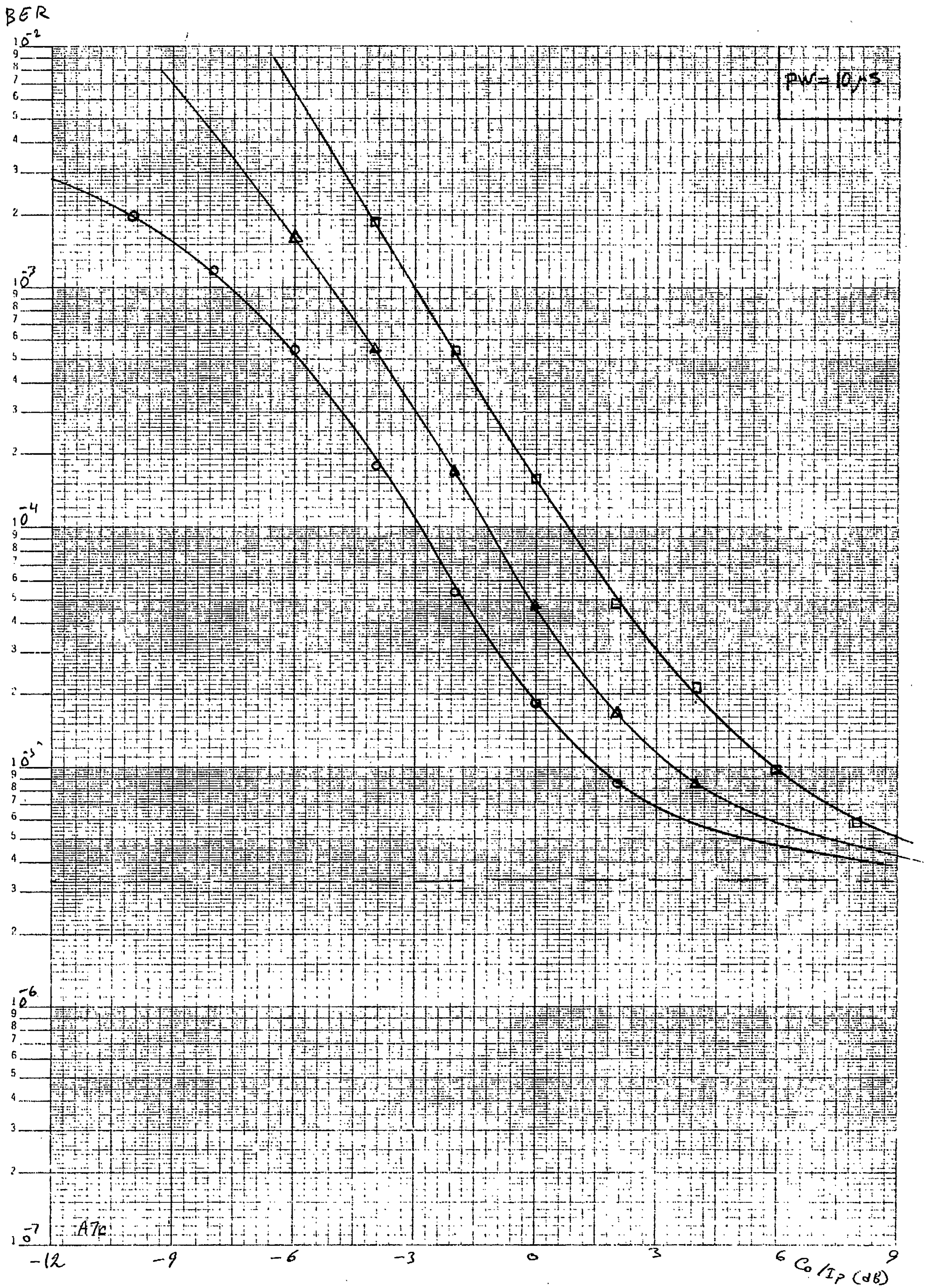
$C_o/N = 15$ dB

$f_c = 10$ KHz

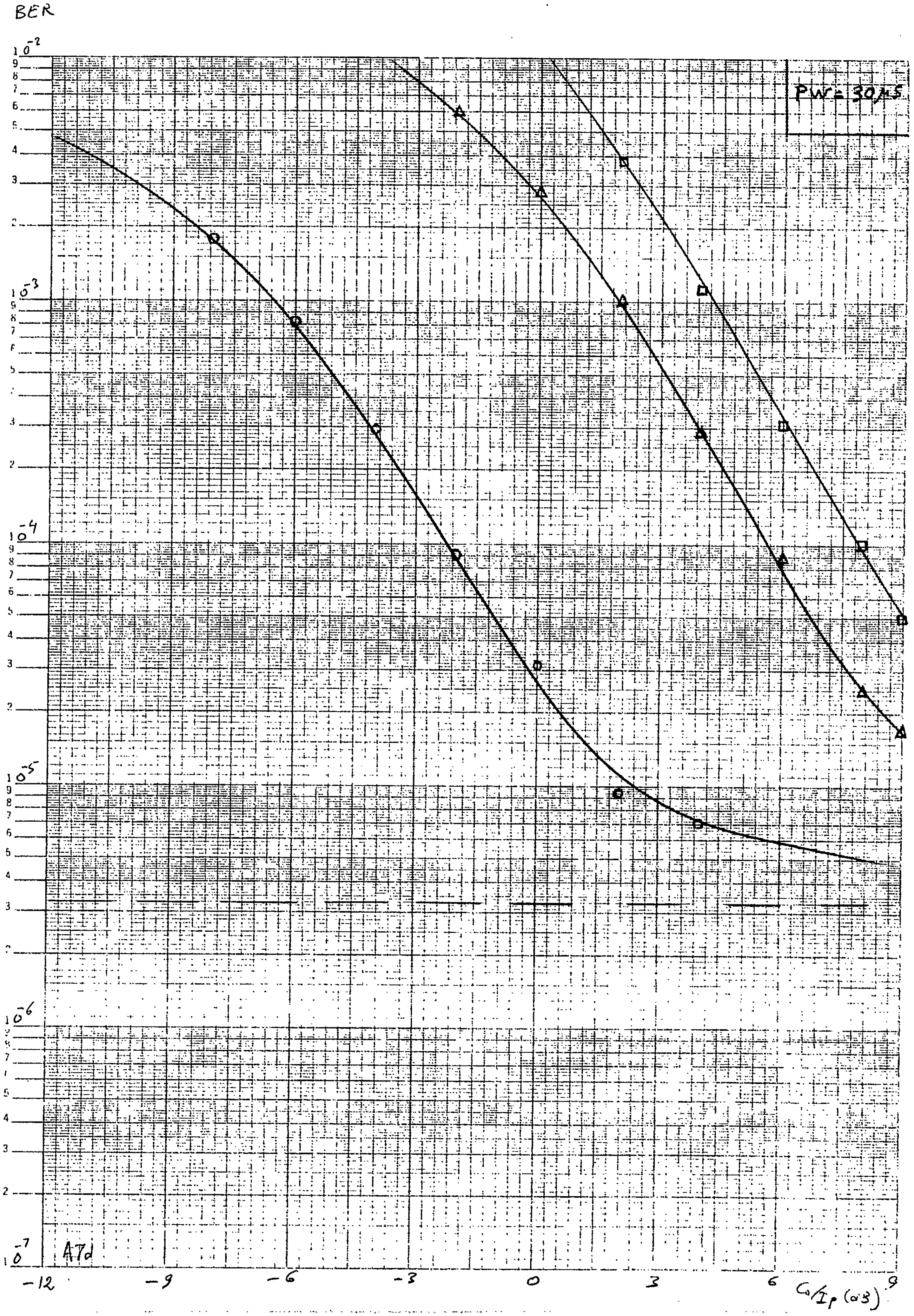


BER
PW = 1μs
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
A7a
-12
-9
-6
-3
0
3
6
9
C/I_p (dB)
SPECIFY TRACING OR DRAWING PAPER


BER
PW=3μs
A7b
-12
-9
-6
-3
0
3
6
Co/Ip

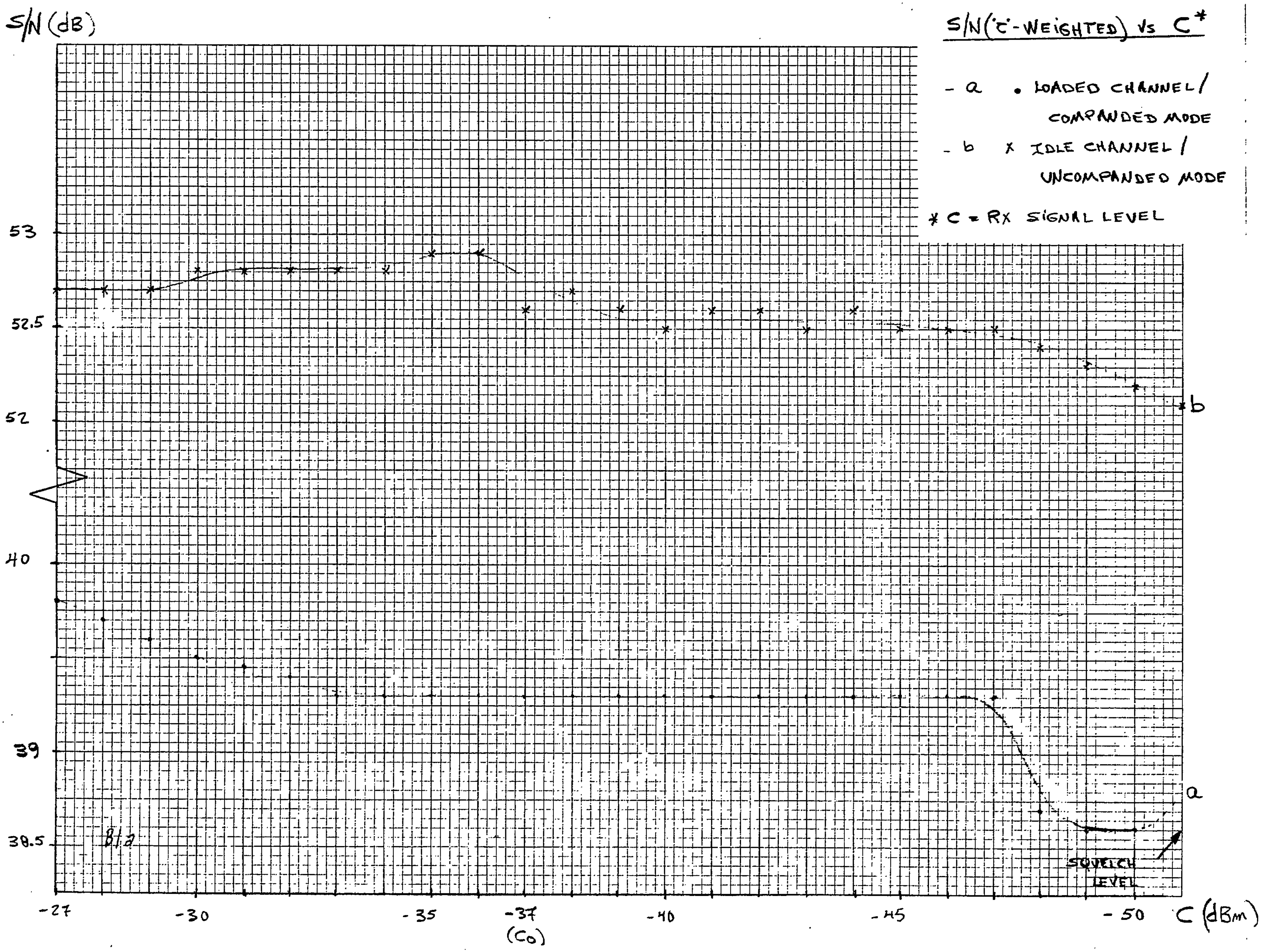


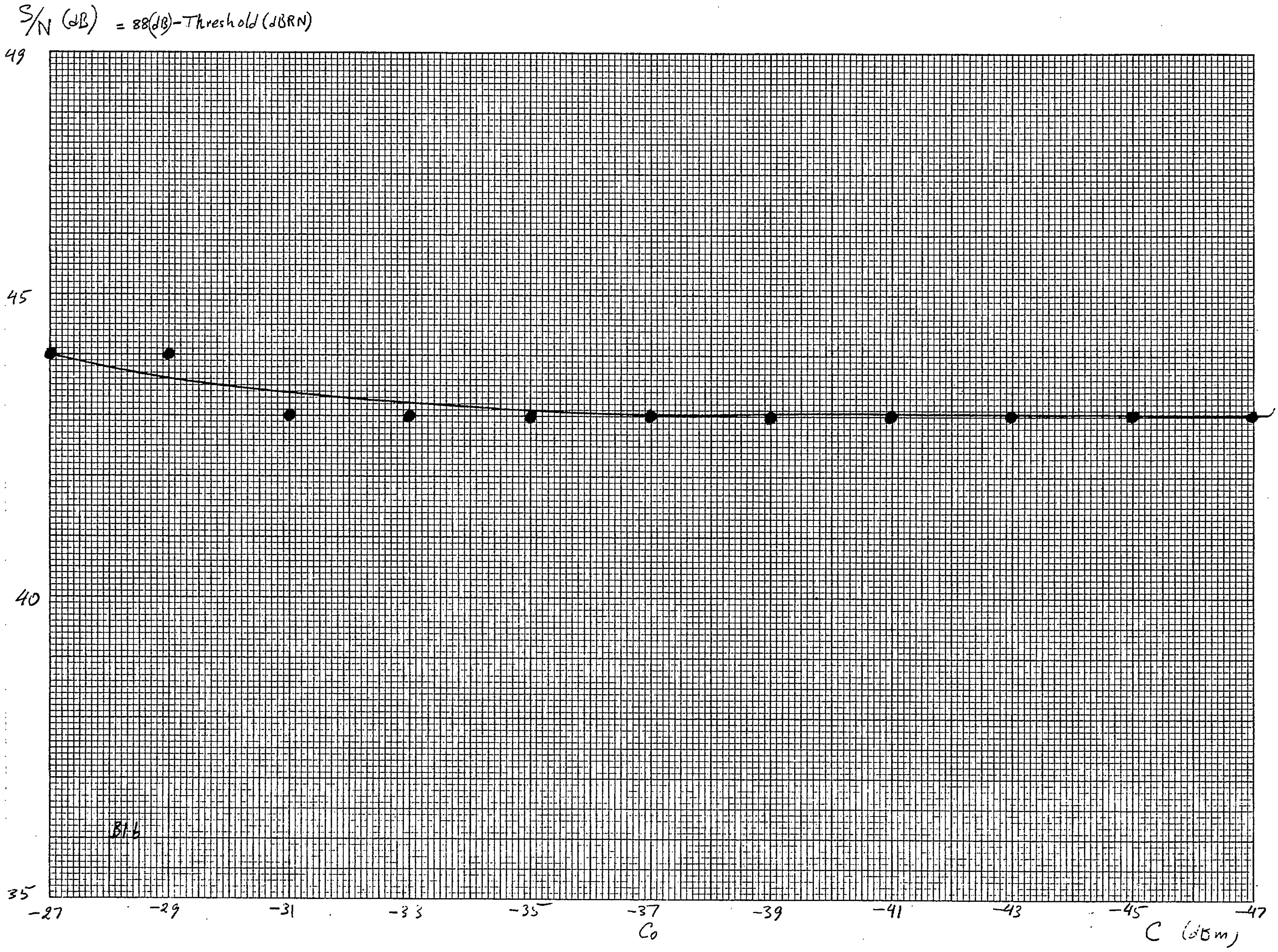
BER
PW = 10 μs
A7c
C_o/I_P (dB)



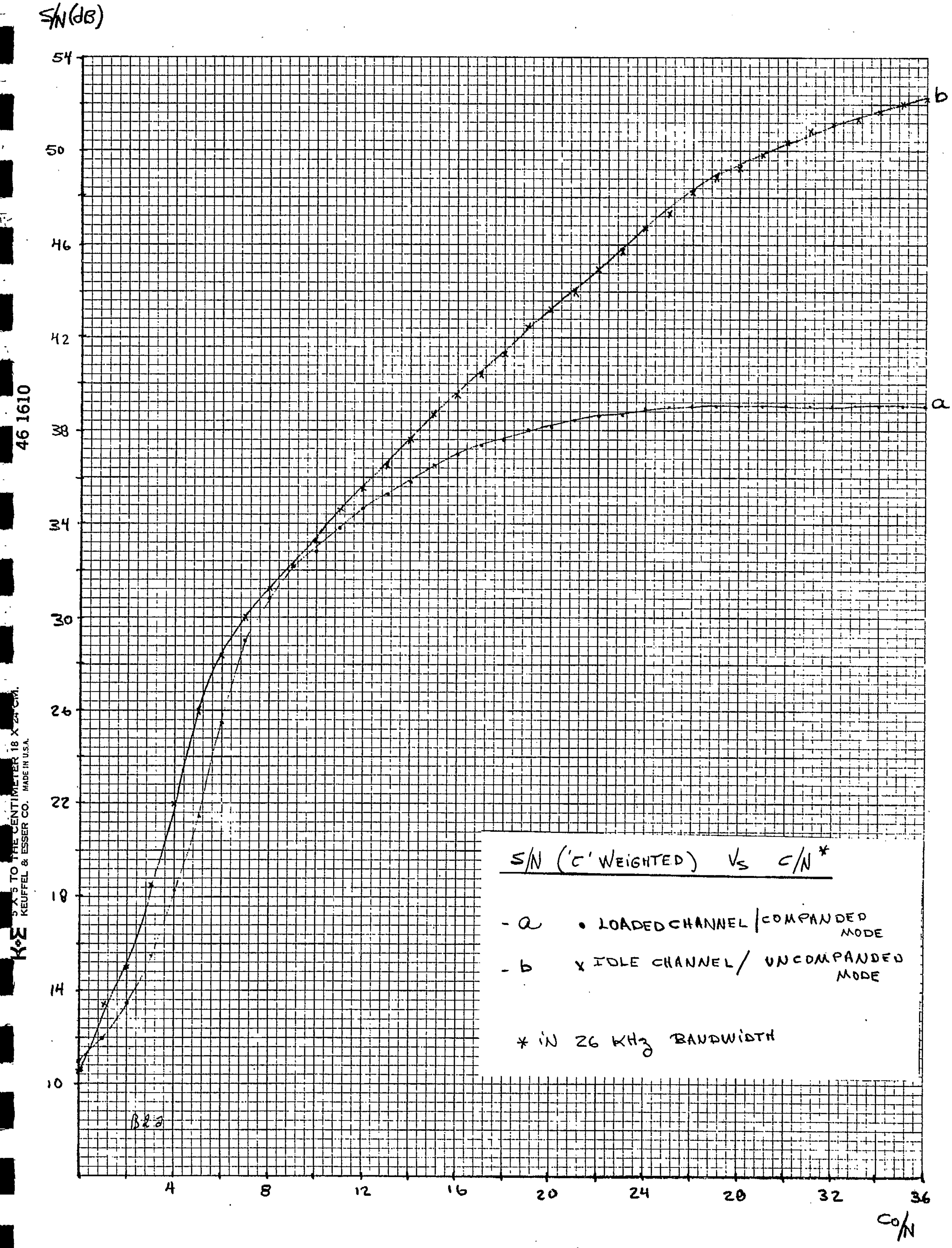
BER
10^{-2}
10^{-3}
10^{-4}
10^{-5}
10^{-6}
10^{-7}
PW = 30 μs
A7d
-12
-9
-6
-3
0
3
6
9
C_0/I_p (dB)

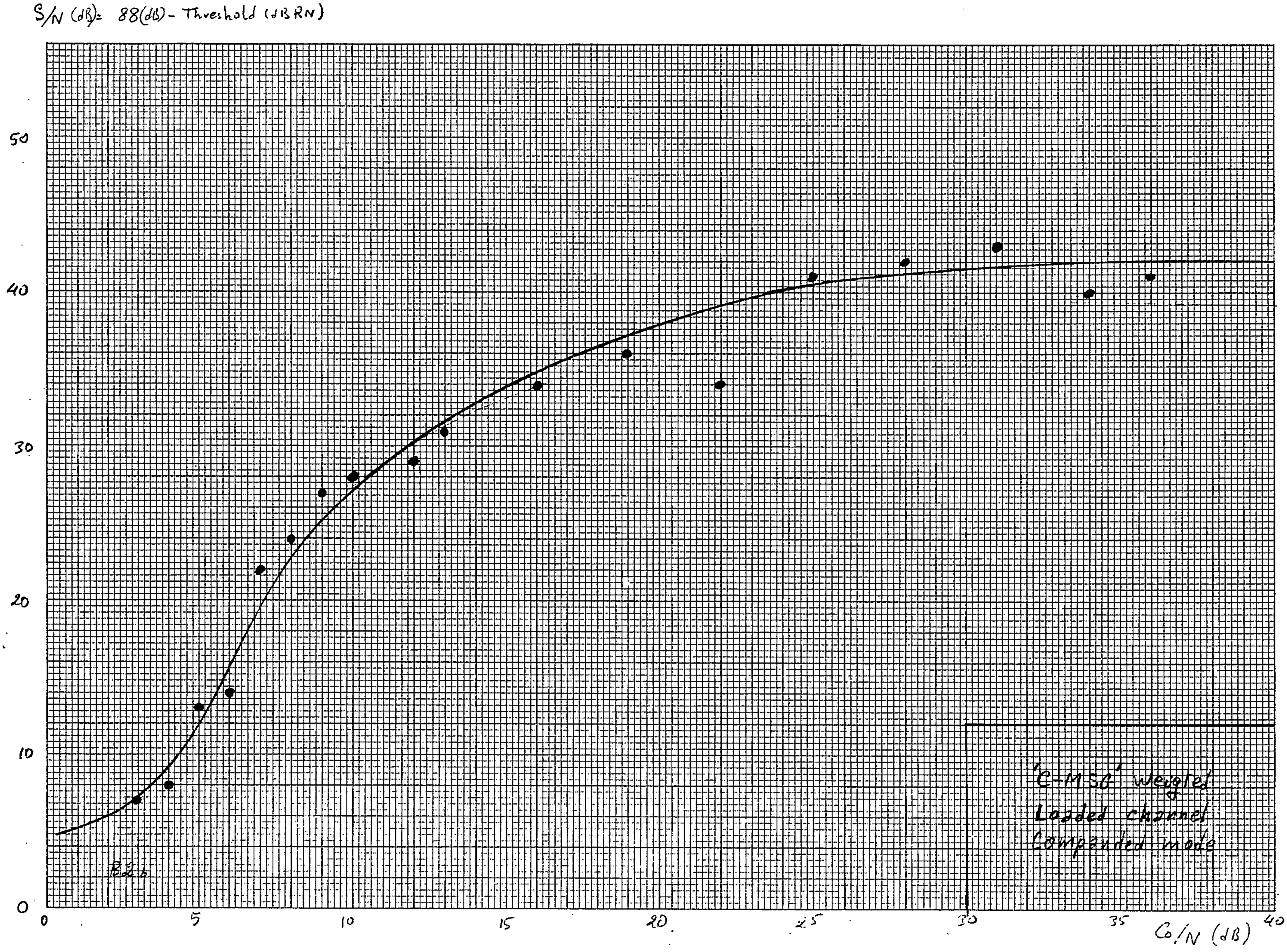
B1


S/N (dB)
S/N ('C'-WEIGHTED) vs C*
- a • LOADED CHANNEL / COMPANDED MODE
- b x IDLE CHANNEL / UNCOMPANDED MODE
* C = RX SIGNAL LEVEL
53
52.5
52
40
39
38.5
b
a
SQUELCH LEVEL
B/2
-27
-30
-35
-37
(Co)
-40
-45
-50
C (dBm)


S/N (dB) = 88(dB)-Threshold (dBRN)
49
45
40
35
-27
-29
-31
-33
-35
-37
-39
-41
-43
-45
-47
C_0
C (dBm)
B1b

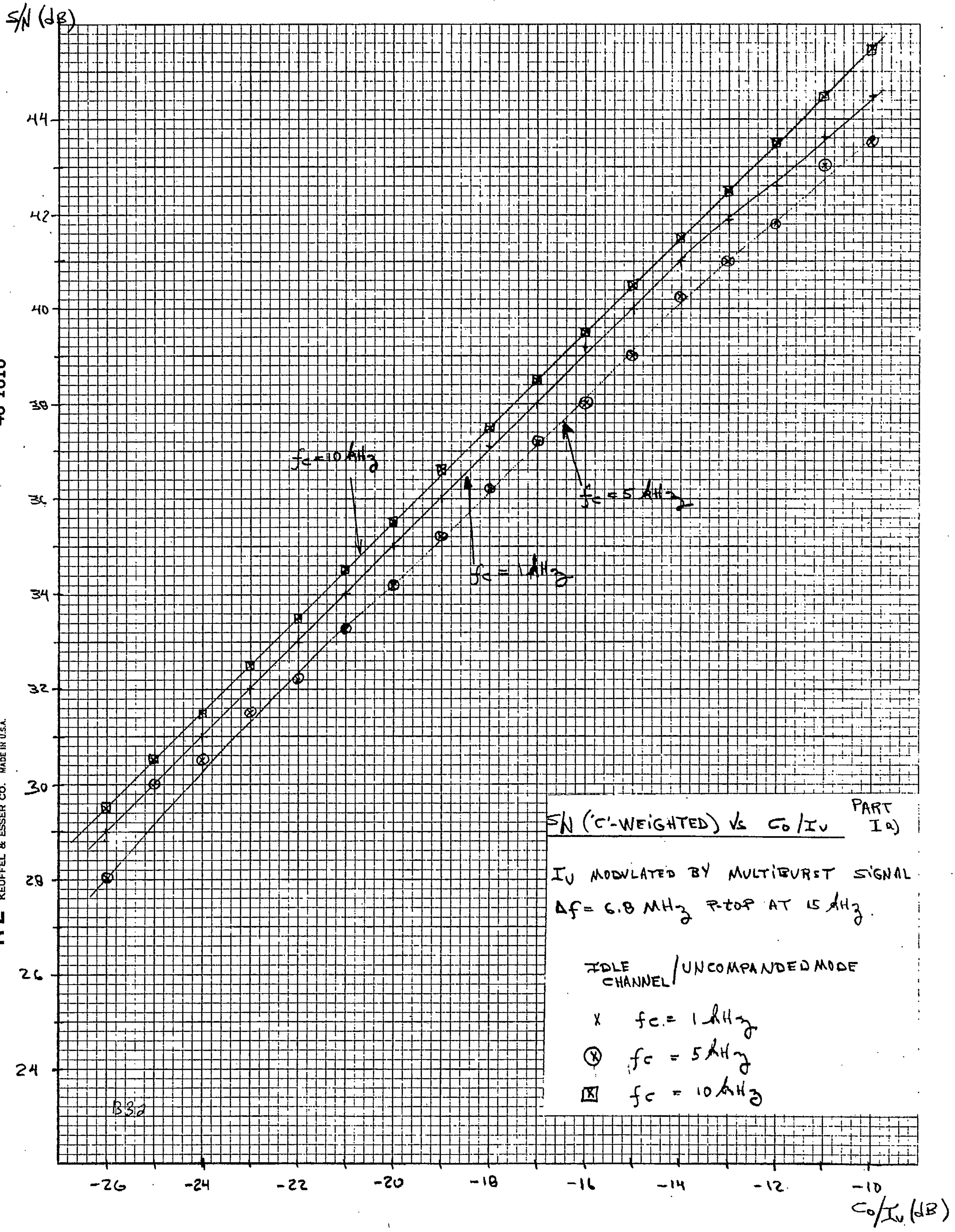
B2


S/N (dB)
54
50
46
42
38
34
30
26
22
18
14
10
4
8
12
16
20
24
28
32
36
Co/N
b
a
S/N ('C' WEIGHTED) Vs C/N *
- a • LOADED CHANNEL / COMPANDED MODE
- b x IDLE CHANNEL / UNCOMPANDED MODE
* IN 26 KHz BANDWIDTH
K+E 5 X 5 TO THE CENTIMETER 18 X 24 CM.
KEUFFEL & ESSER CO. MADE IN U.S.A.
46 1610

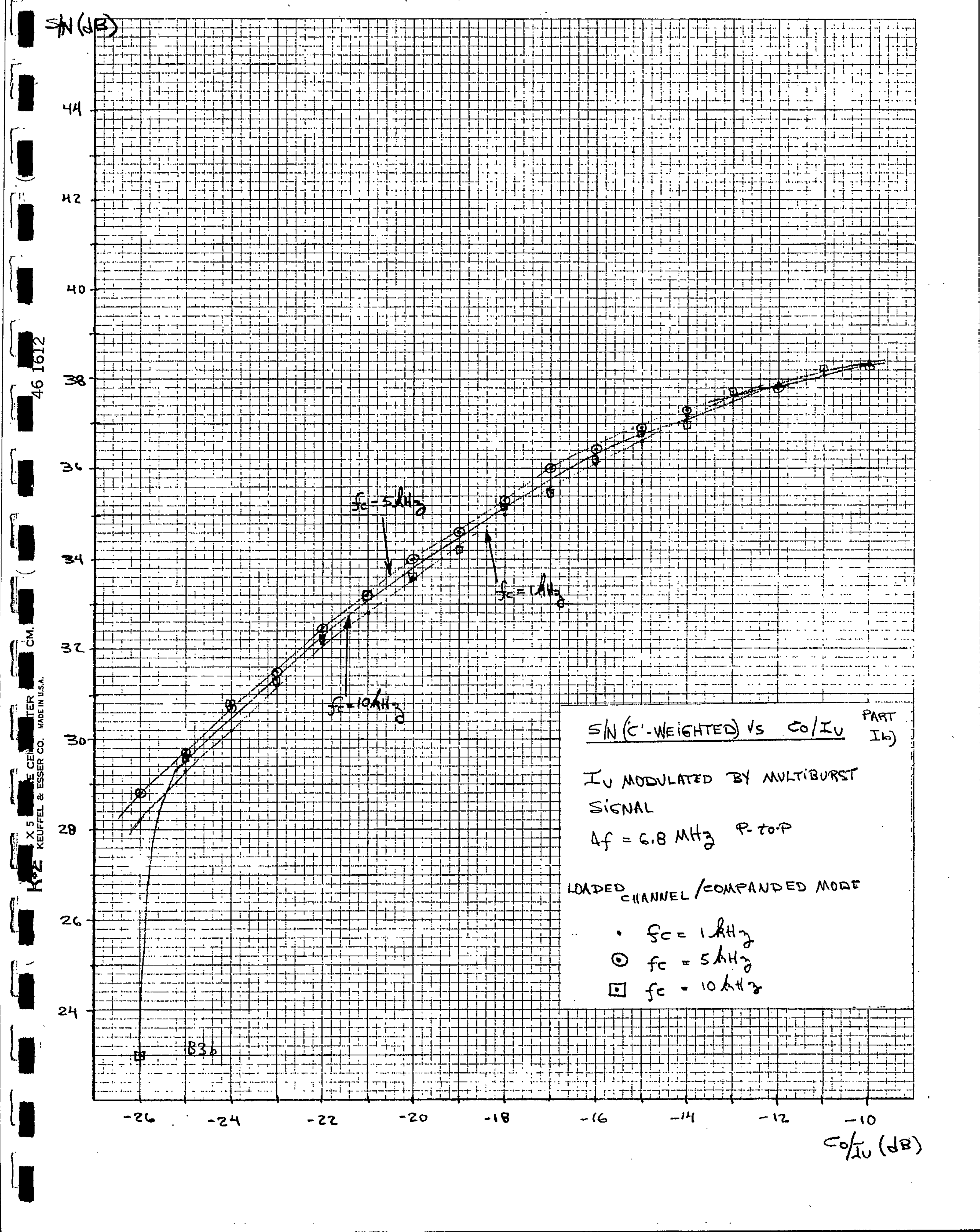


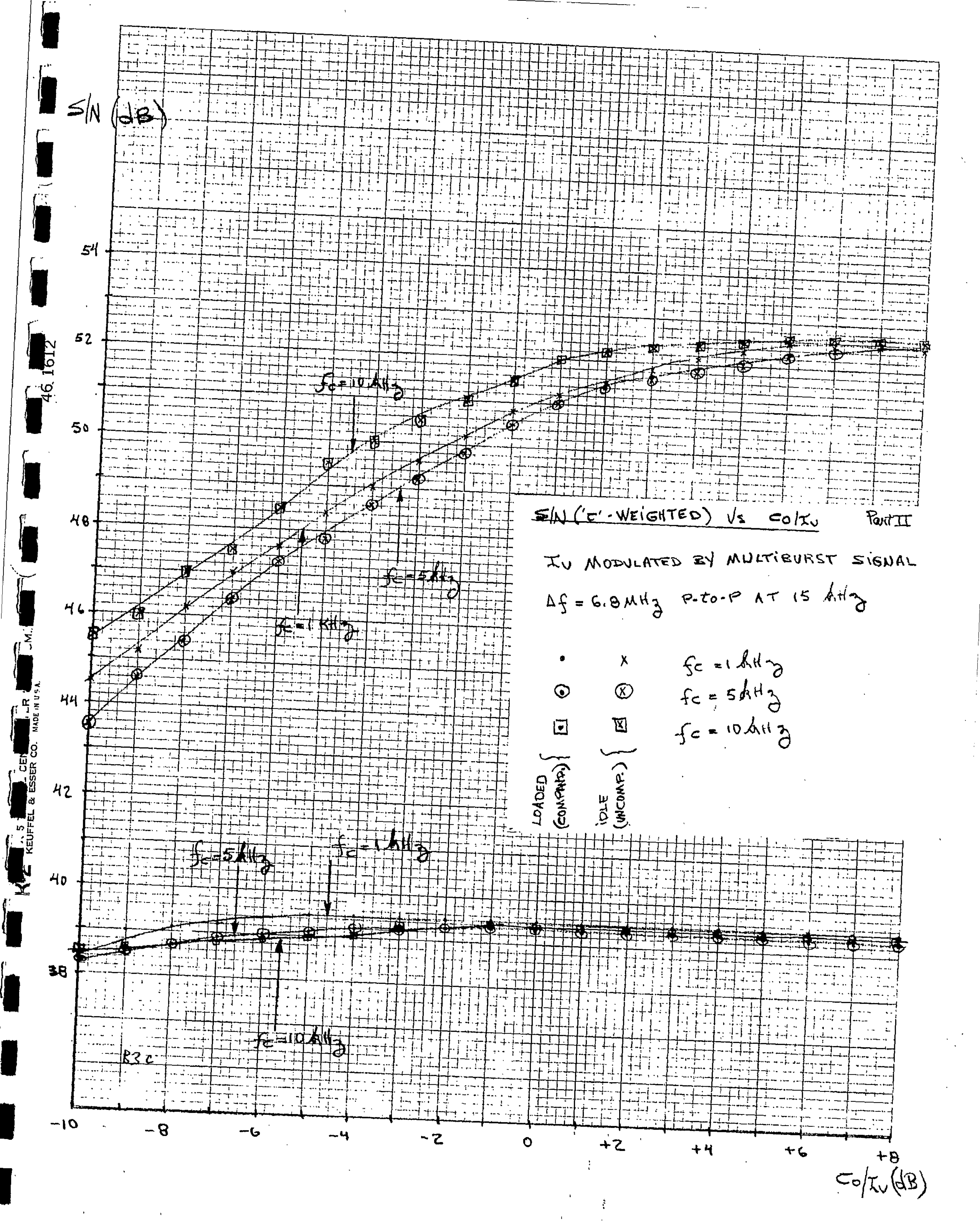
S/N (dB) = 88(dB) - Threshold (dBRN)
50
40
30
20
10
0
0
5
10
15
20
25
30
35
40
Co/N (dB)
'C-MSG' weighted
Loaded channel
Companded mode
B2b

B3



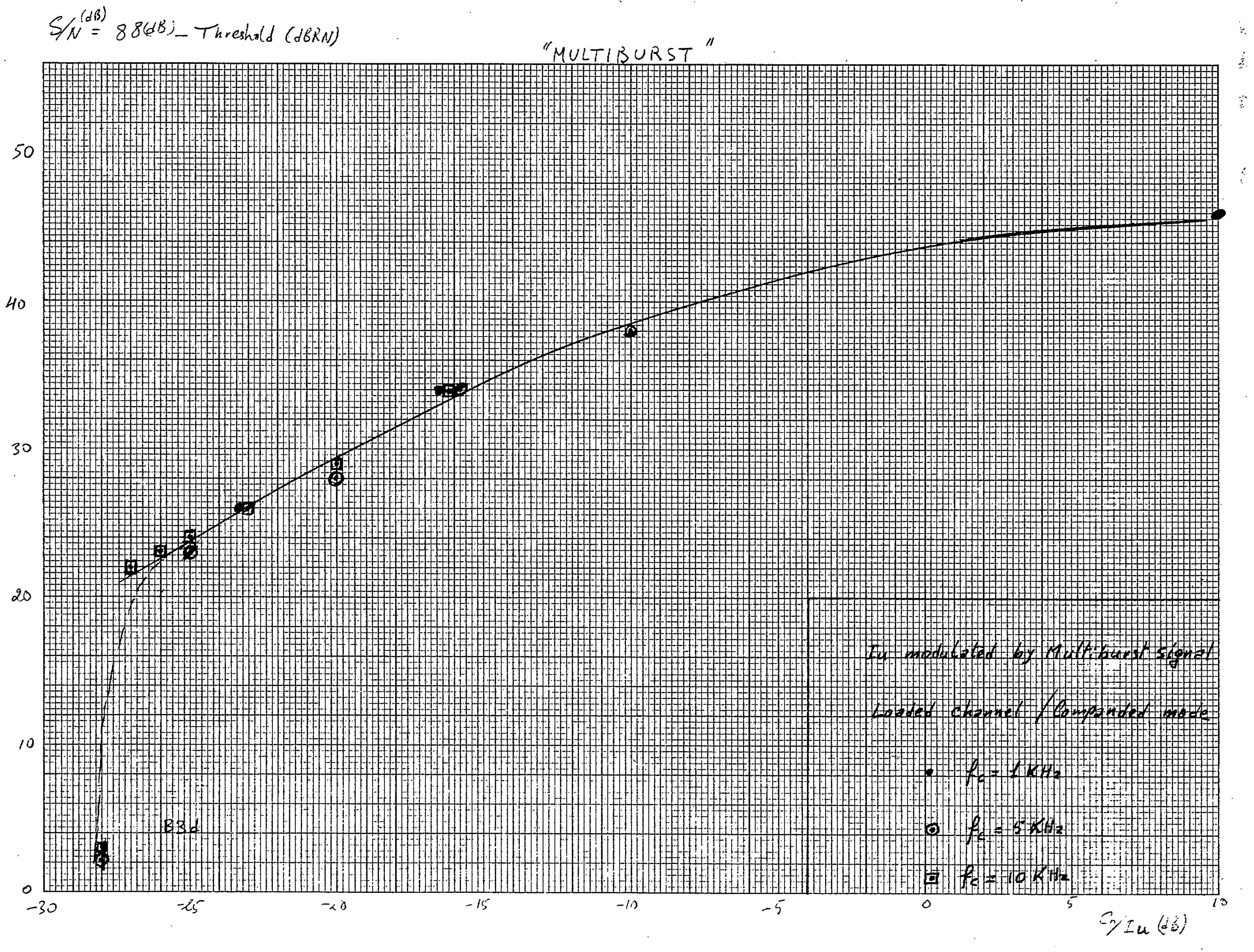
S/N (dB)
44
42
40
38
36
34
32
30
28
26
24
fc=10 kHz
fc = 1 kHz
fc = 5 kHz
S/N ('C'-WEIGHTED) Vs Co/Iv
PART I a)
Iv MODULATED BY MULTIBURST SIGNAL
Δf = 6.8 MHz P-TOP AT 15 kHz.
IDLE CHANNEL / UNCOMPANDED MODE
x fc = 1 kHz
⊗ fc = 5 kHz
⊠ fc = 10 kHz
B32
-26
-24
-22
-20
-18
-16
-14
-12
-10
Co/Iv (dB)


S/N (dB)
44
42
40
38
36
34
32
30
28
26
24
fc = 5 kHz
fc = 1 kHz
fc = 10 kHz
S/N ('C'-WEIGHTED) VS Co/Iu
PART Ib)
Iu MODULATED BY MULTIBURST SIGNAL
Δf = 6.8 MHz P-to-P
LOADED CHANNEL / COMPANDED MODE
• fc = 1 kHz
⊙ fc = 5 kHz
⊡ fc = 10 kHz
B3b
-26
-24
-22
-20
-18
-16
-14
-12
-10
Co/Iu (dB)
46 1612
KEUFFEL & ESSER CO. MADE IN U.S.A.

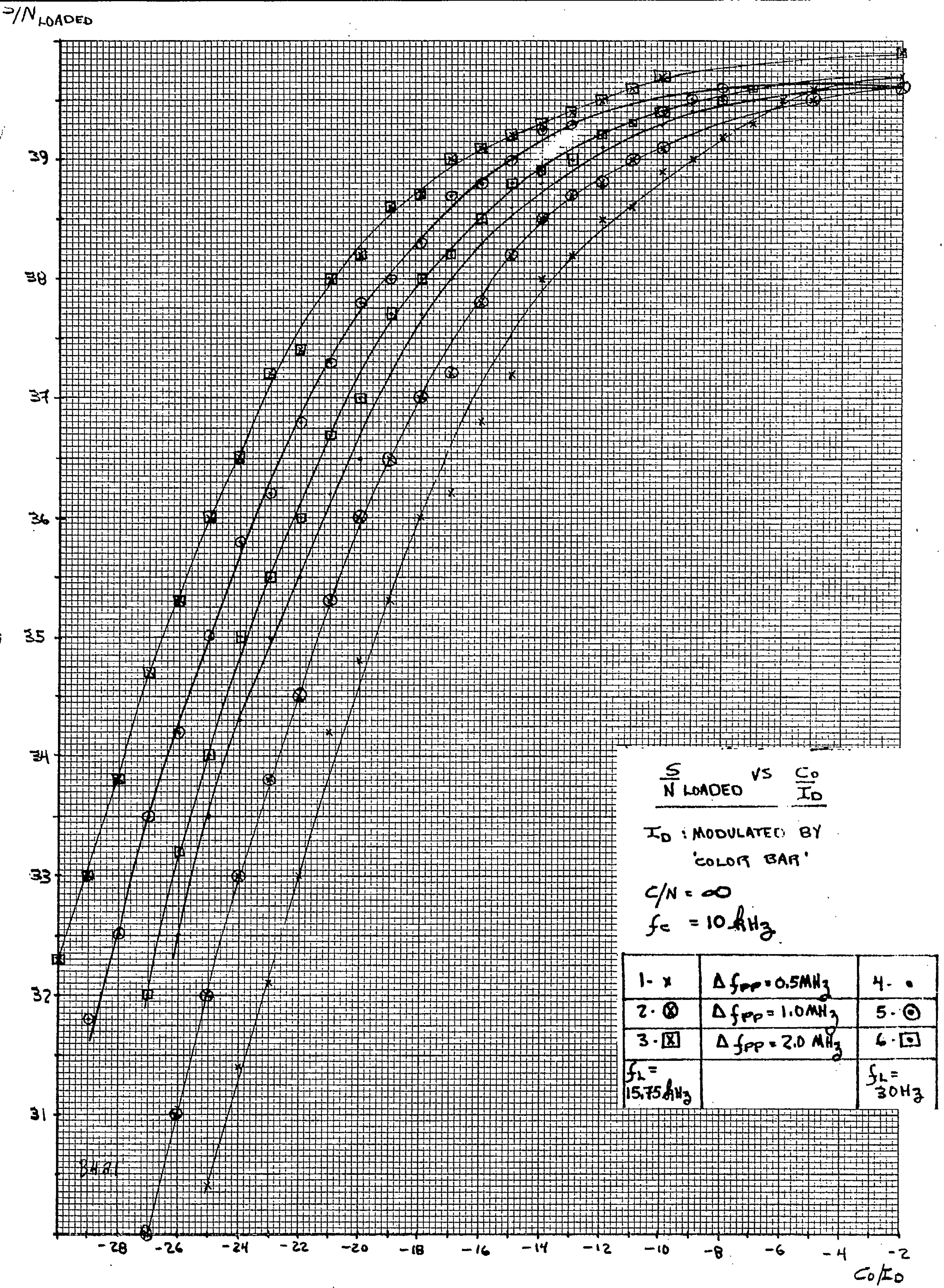


S/N (dB)
S/N ('C'-WEIGHTED) Vs Co/Iv PART II
Iv MODULATED BY MULTIBURST SIGNAL
Δf = 6.8 MHz P-to-P AT 15 kHz
fc = 1 kHz
fc = 5 kHz
fc = 10 kHz
LOADED (COMPAND.)
IDLE (UNCOMP.)
fc = 10 kHz
fc = 5 kHz
fc = 1 kHz
fc = 5 kHz
fc = 1 kHz
fc = 10 kHz
R3c
54
52
50
48
46
44
42
40
38
-10
-8
-6
-4
-2
0
+2
+4
+6
+8
Co/Iv (dB)
46 1612
KEUFFEL & ESSER CO. MADE IN U.S.A.

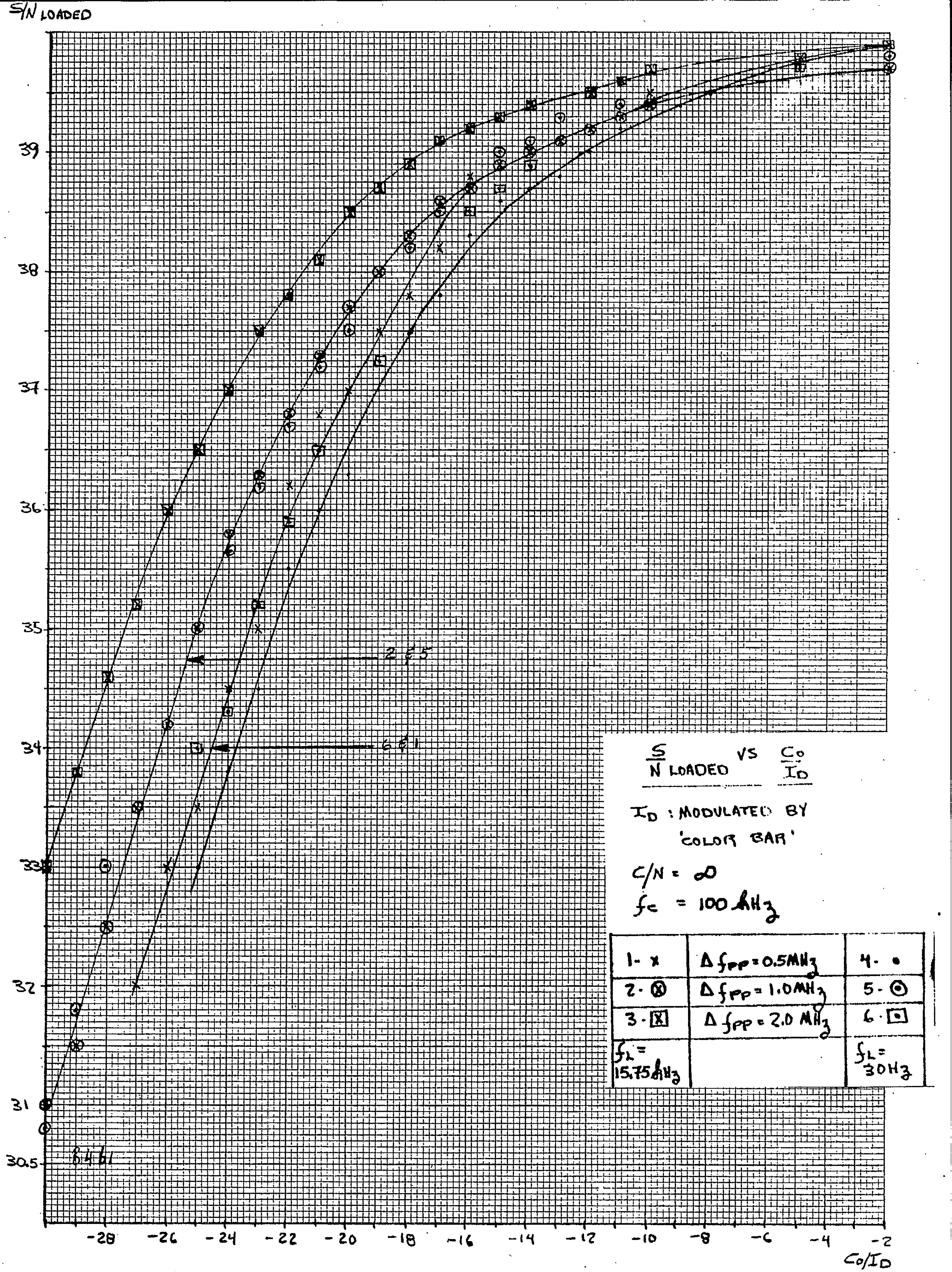
K+E [redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted] 46 1331



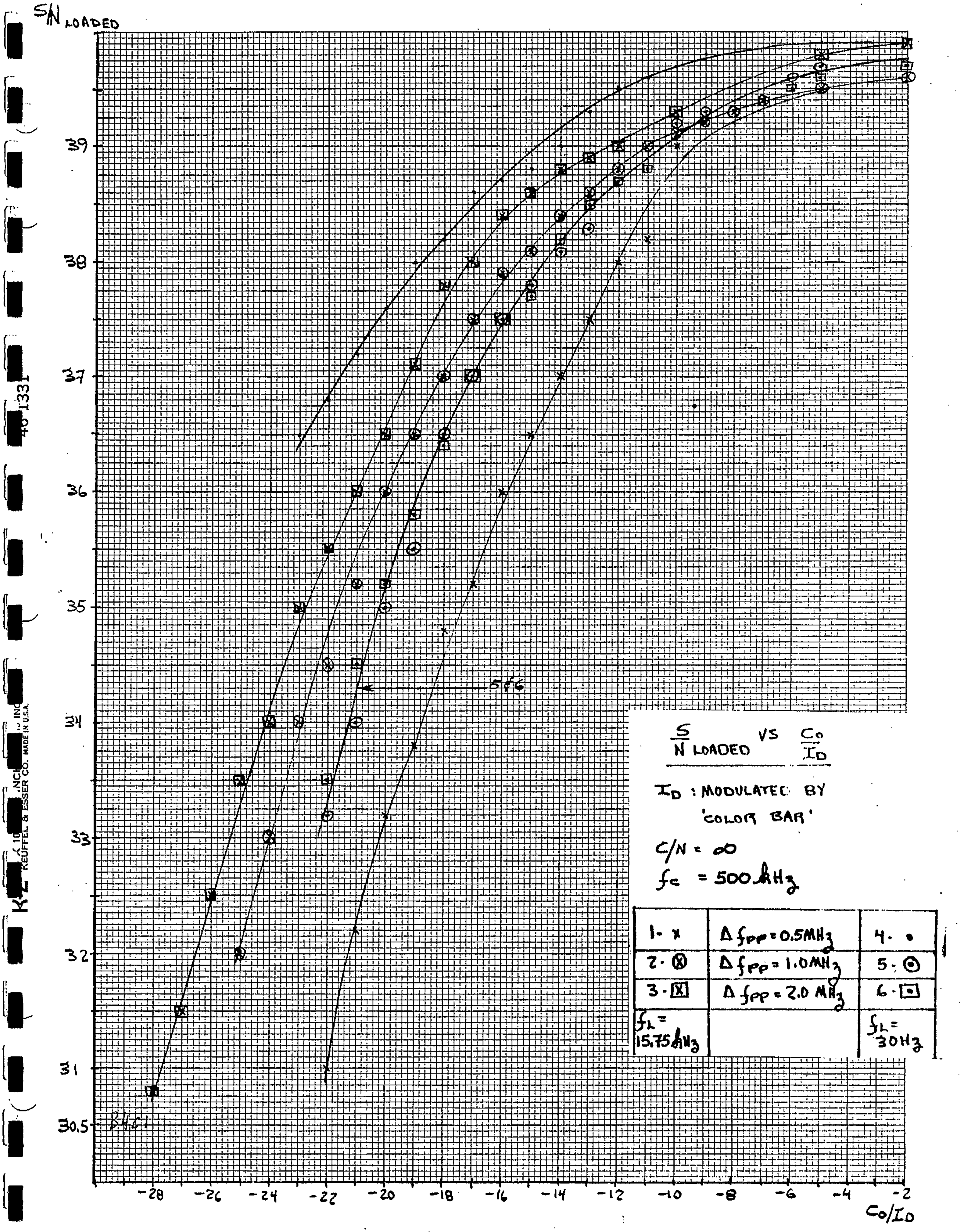
B4

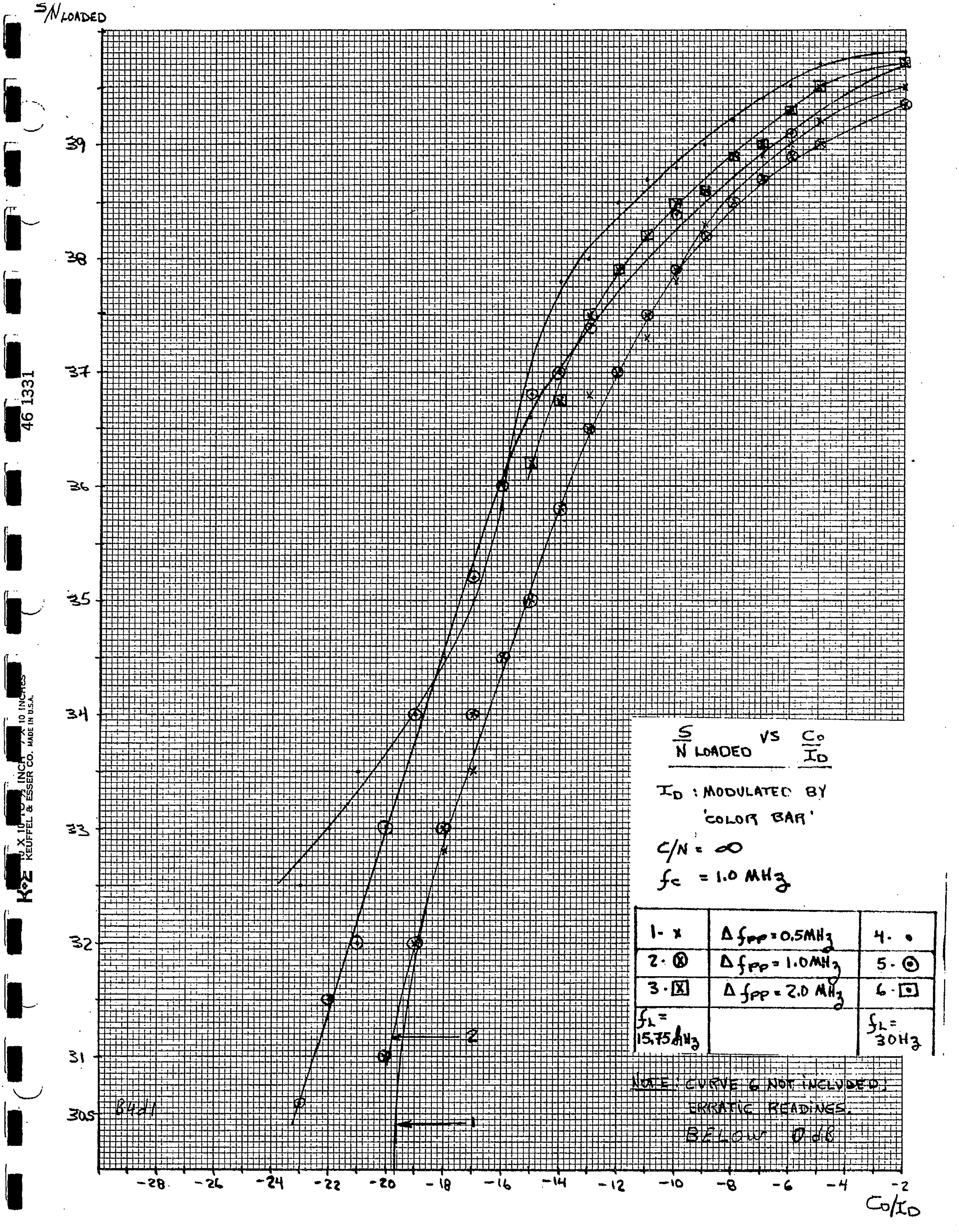


S/N LOADED
39
38
37
36
35
34
33
32
31
-28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2
Co/ID
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = ∞
fc = 10 kHz
1- x
2- ⊗
3- ⊠
Δ fpp = 0.5 MHz
Δ fpp = 1.0 MHz
Δ fpp = 2.0 MHz
4- •
5- ⊙
6- ⊡
fL = 15.75 kHz
fL = 30 Hz

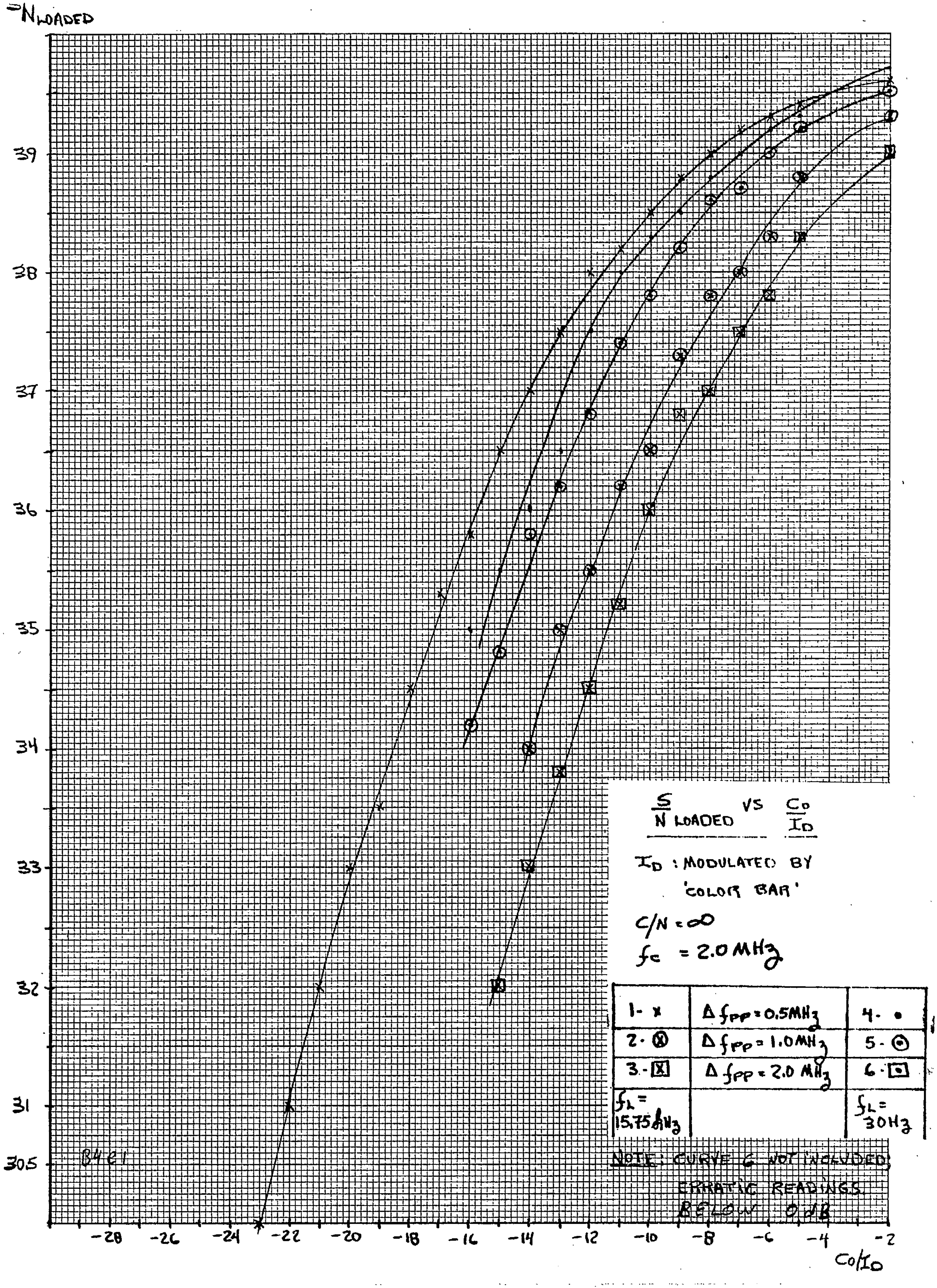


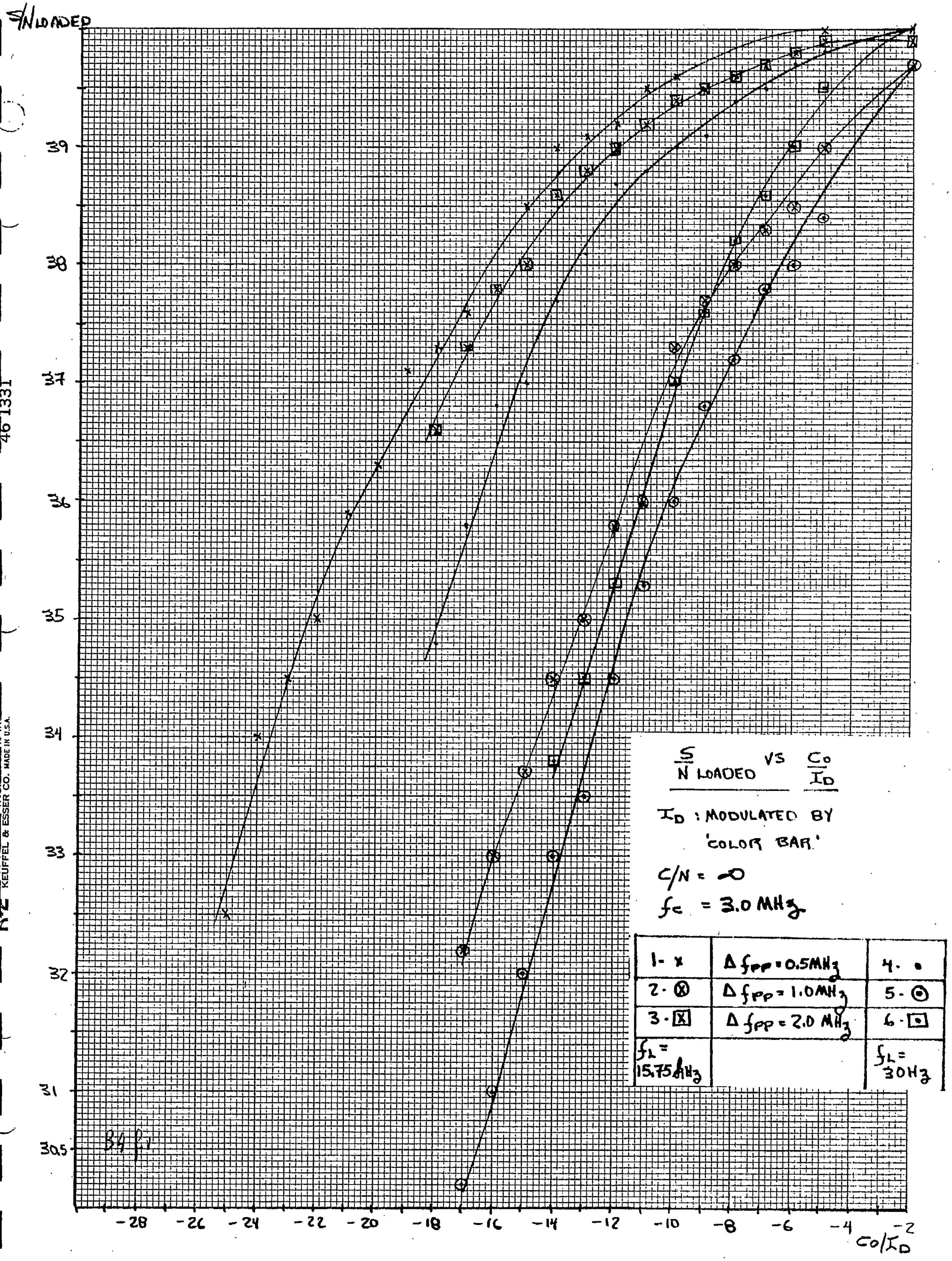
S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
2 & 5
6 & 1
8461
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = ∞
fc = 100 kHz
1- x
Δ fpp = 0.5 MHz
4- •
2- ⊗
Δ fpp = 1.0 MHz
5- ⊙
3- ⊠
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fL = 30 Hz


S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
5&6
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = ∞
fc = 500 kHz
1- x
Δ fpp = 0.5MHz
4- •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ⊠
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fL = 30Hz
BHC1
KEUFFEL & ESSER CO. MADE IN U.S.A.

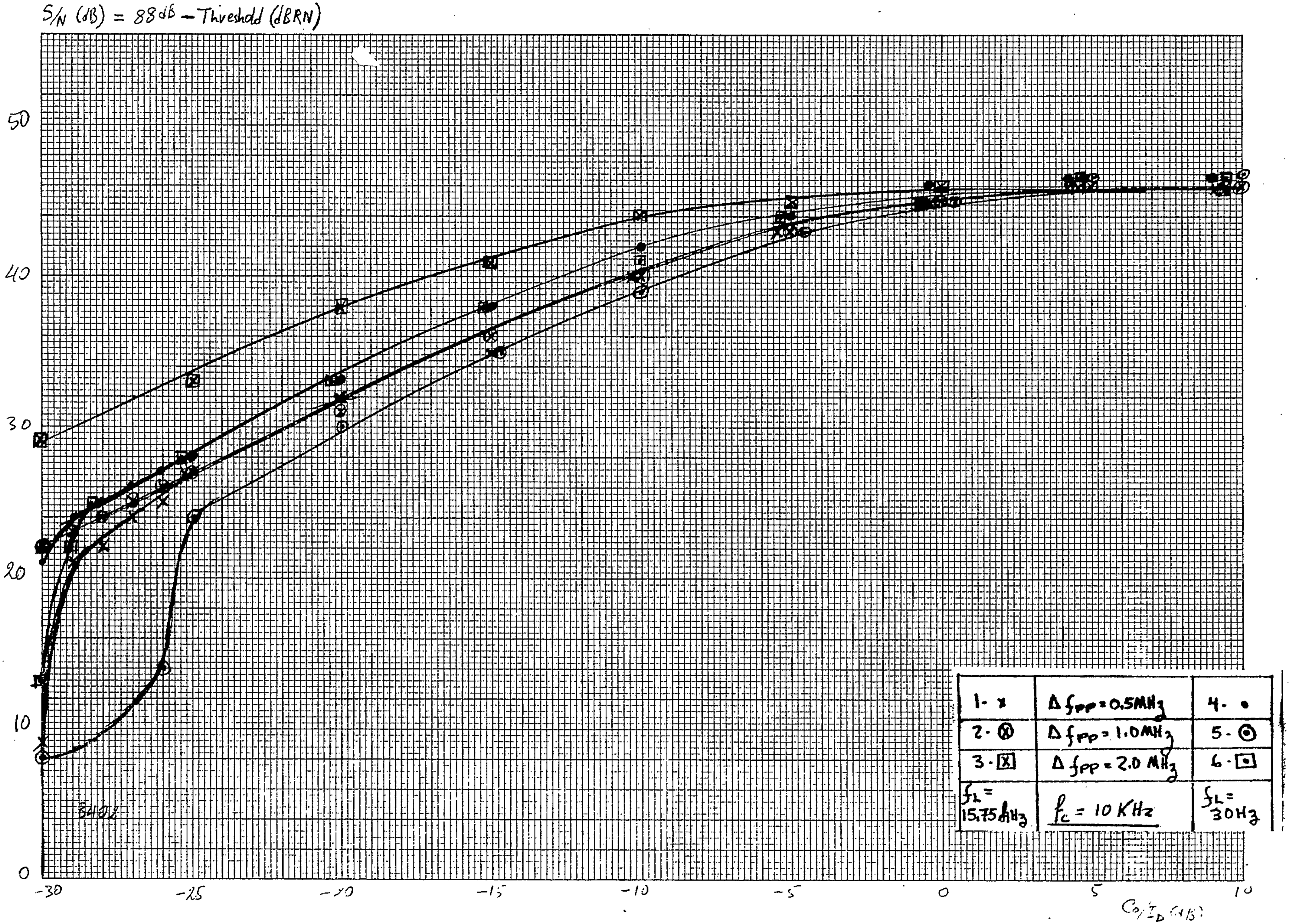


S/N LOADED
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = ∞
fc = 1.0 MHz
1- x | Δfpp = 0.5MHz | 4. •
2. ⊗ | Δfpp = 1.0MHz | 5. ⊙
3. ⊠ | Δfpp = 2.0 MHz | 6. ⊡
fL = 15.75 kHz | fL = 30Hz
NOTE: CURVE 6 NOT INCLUDED; ERRATIC READINGS. BELOW 0 dB
Co/ID
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
2
1
84d1
46 1331
K+E 10 X 10 TO 1/2 INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.

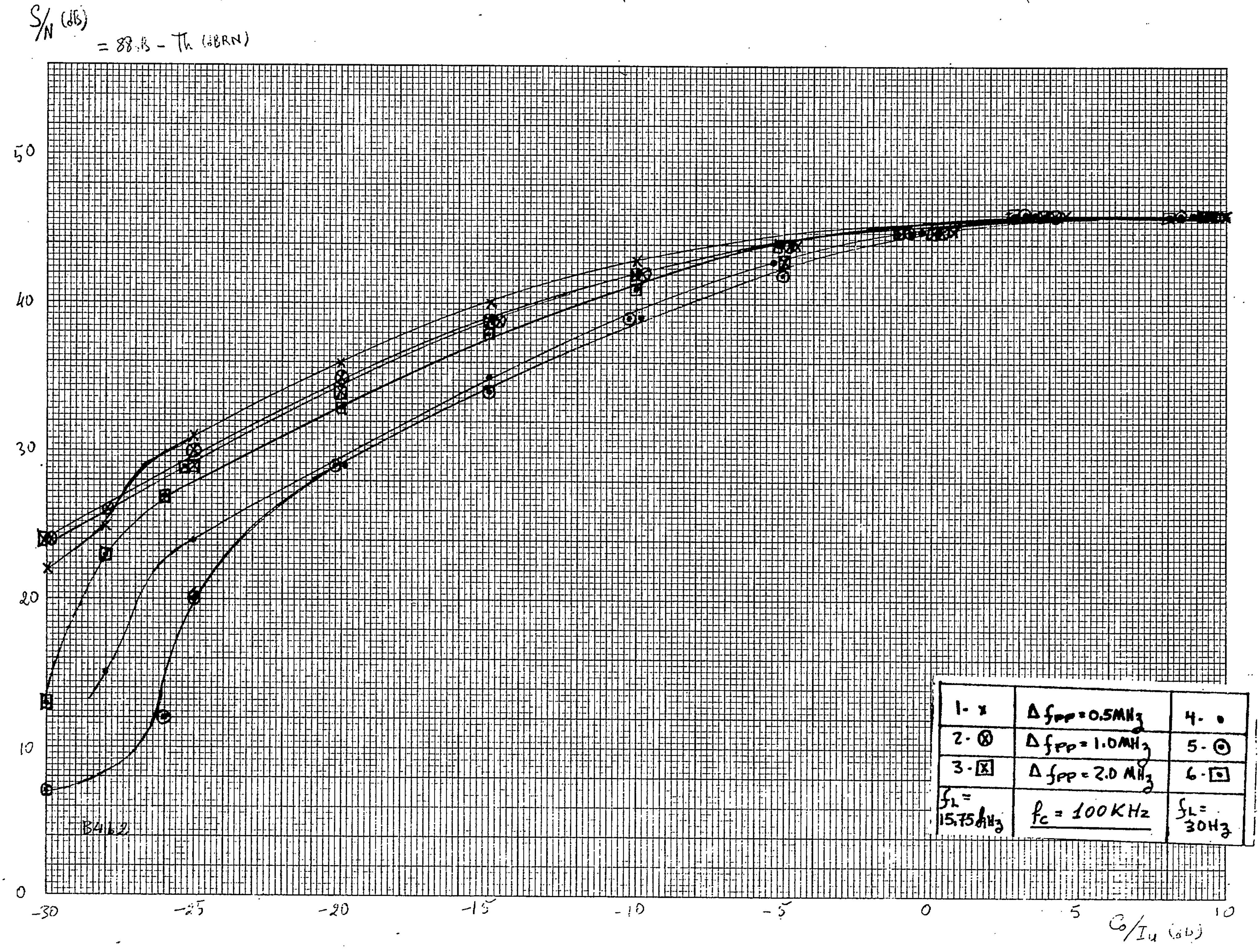

S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28 -26 -24 -22 -20 -18 -16 -14 -12 -10 -8 -6 -4 -2
Co/Io
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = ∞
fc = 2.0 MHz
1- x | Δfpp = 0.5MHz | 4- •
2- ⊗ | Δfpp = 1.0MHz | 5- ⊙
3- ⊠ | Δfpp = 2.0 MHz | 6- ⊡
fL = 15.75 kHz
fL = 30Hz
NOTE: CURVE 6 NOT INCLUDED; ERRATIC READINGS BELOW 0 dB
84 E1
KEUFFEL & ESSER CO. MADE IN U.S.A.



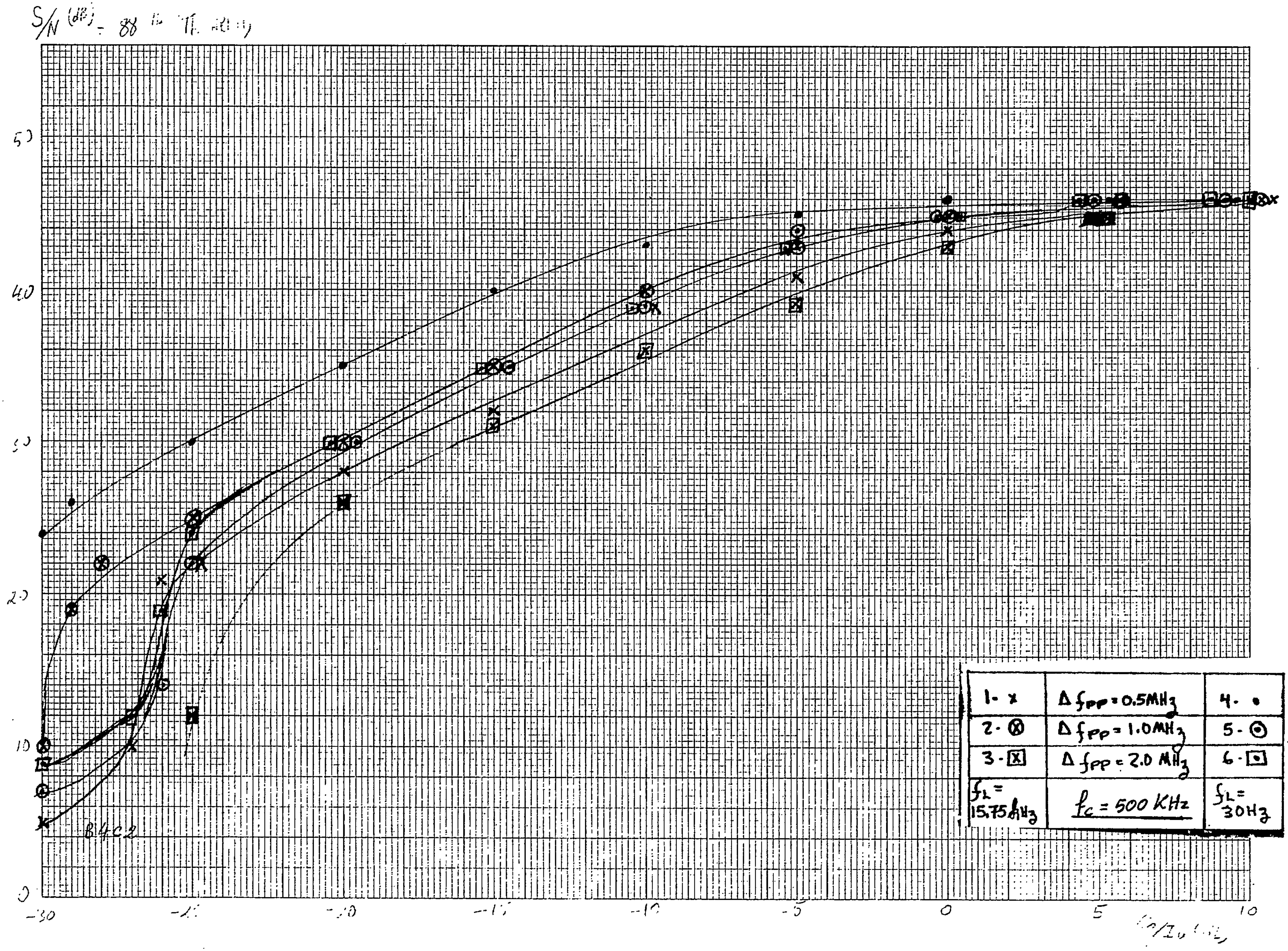
S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = ∞
fc = 3.0 MHz
1- x
Δ fpp = 0.5MHz
4. •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ⊠
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 KHz
fL = 30Hz
46 1331
KEUFFEL & ESSER CO. MADE IN U.S.A.


S/N (dB) = 88 dB − Threshold (dBRN)
50
40
30
20
10
0
−30
−25
−20
−15
−10
−5
0
5
10
Co/ID (dB)
1 - x
Δ fpp = 0.5 MHz
4 - •
2 - ⊗
Δ fpp = 1.0 MHz
5 - ⊙
3 - ⊠
Δ fpp = 2.0 MHz
6 - ⊡
fL = 15.75 kHz
fc = 10 KHz
fL = 30 Hz

[redacted] K+E [redacted] X 10 [redacted] INCH [redacted] INC [redacted] 46 1331
KEUFFEL & ESSER CO. MADE IN U.S.A.

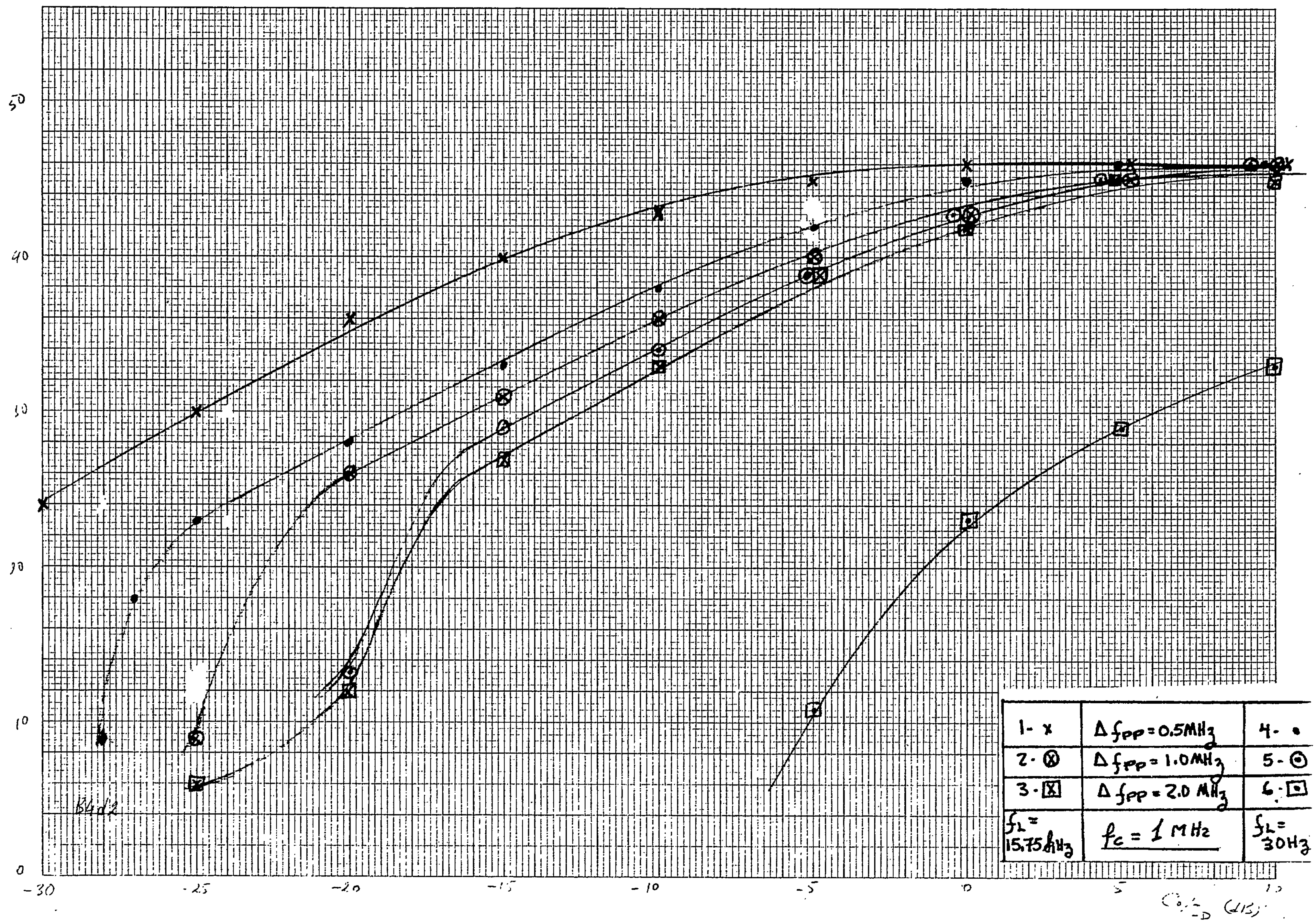


[redacted] K [redacted] X 10 [redacted] INCH [redacted] INC [redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted] 1331 [redacted]

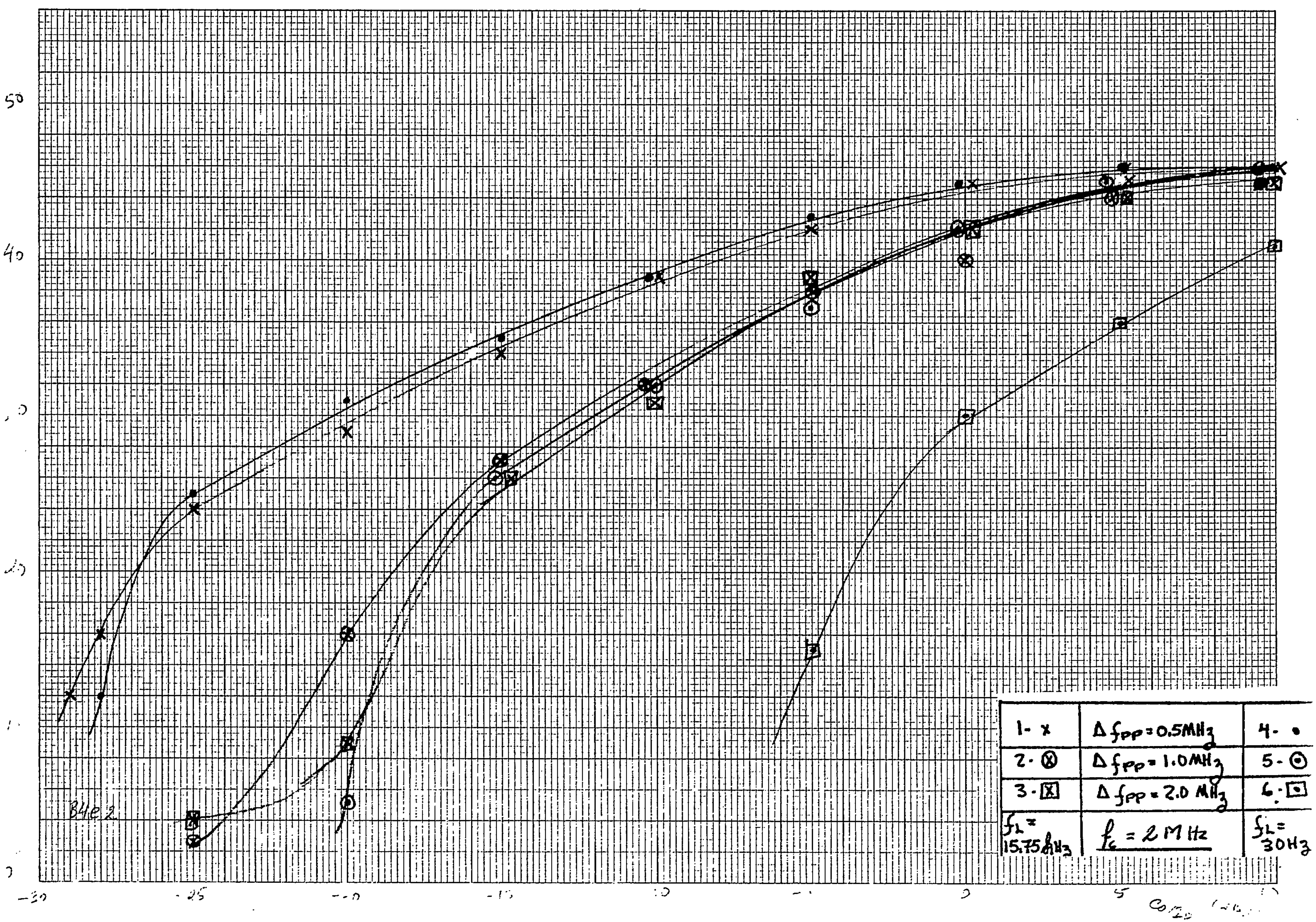


K&E 10 X 10 TO THE INCH KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1331

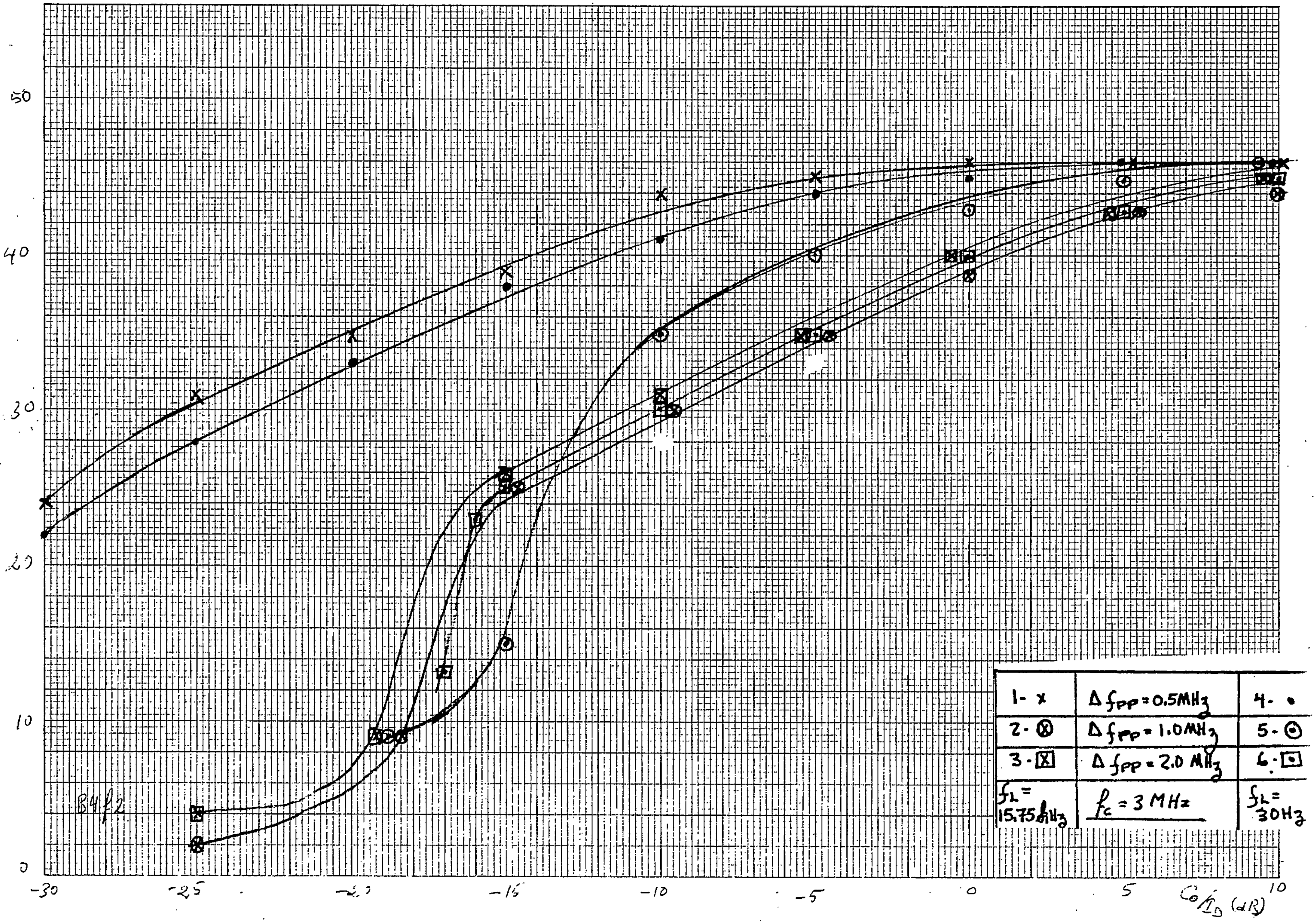
S/N (dB) = 88 dB - T...



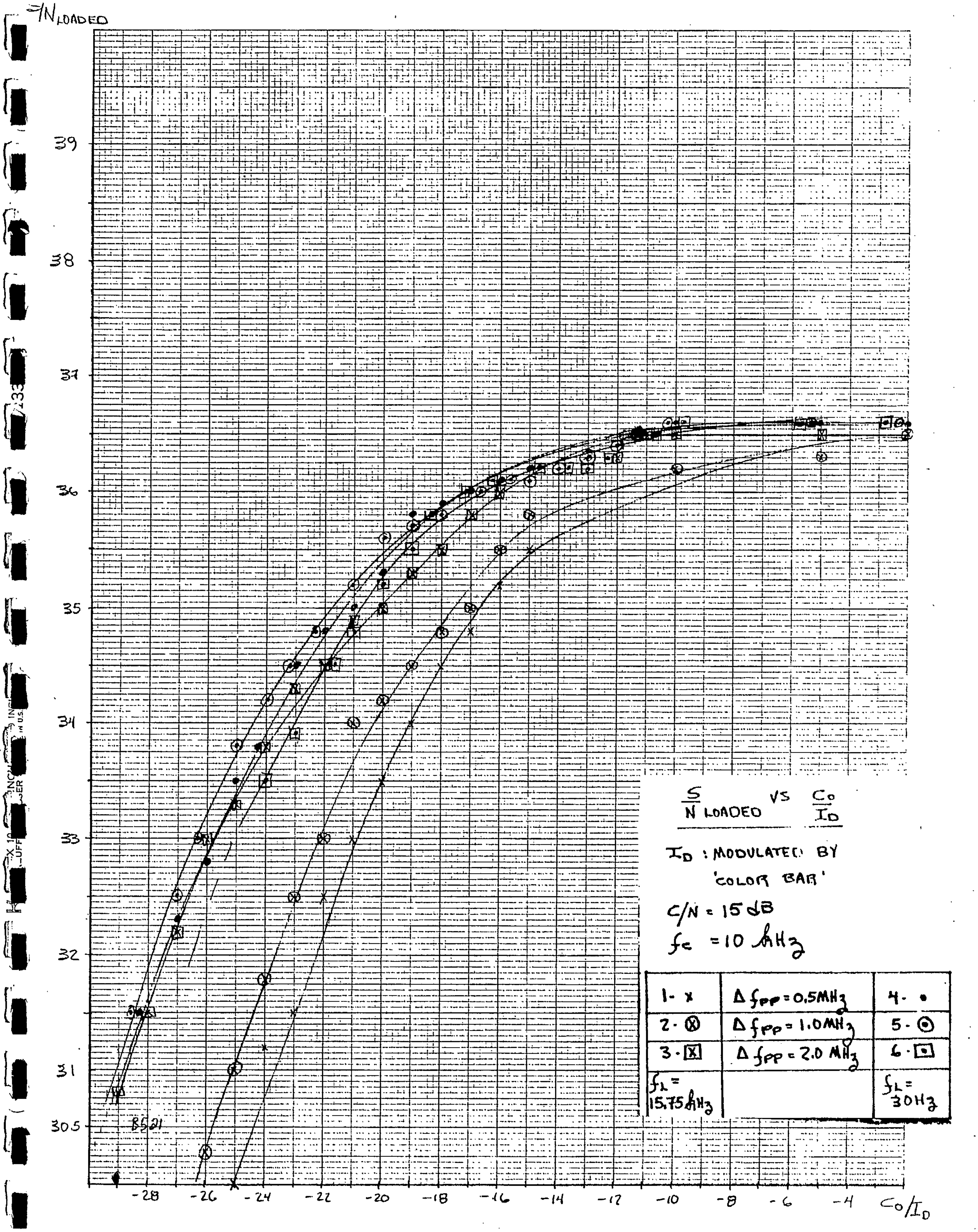
S/N (dB) = 89VB-Ti (dBRN)

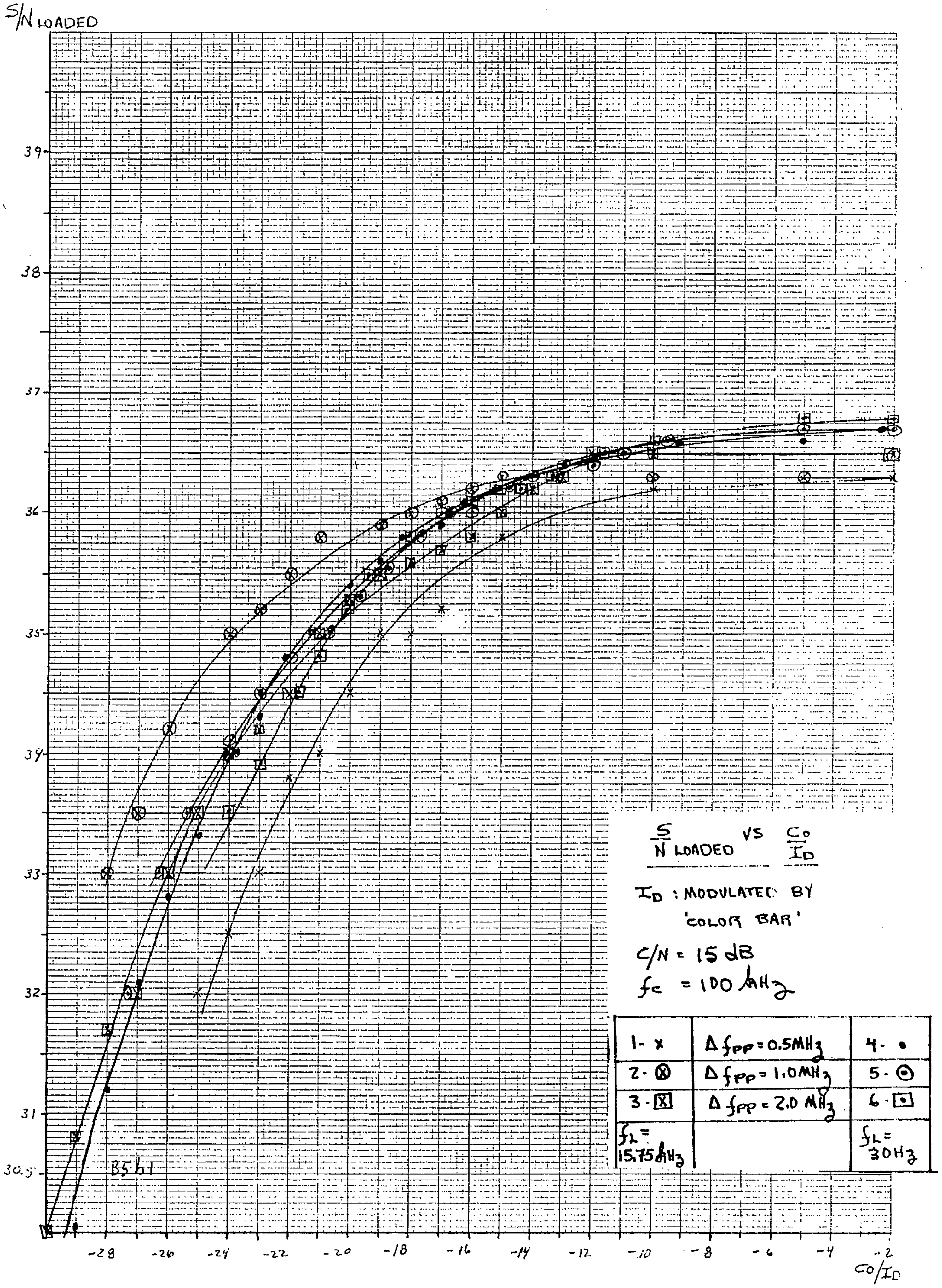


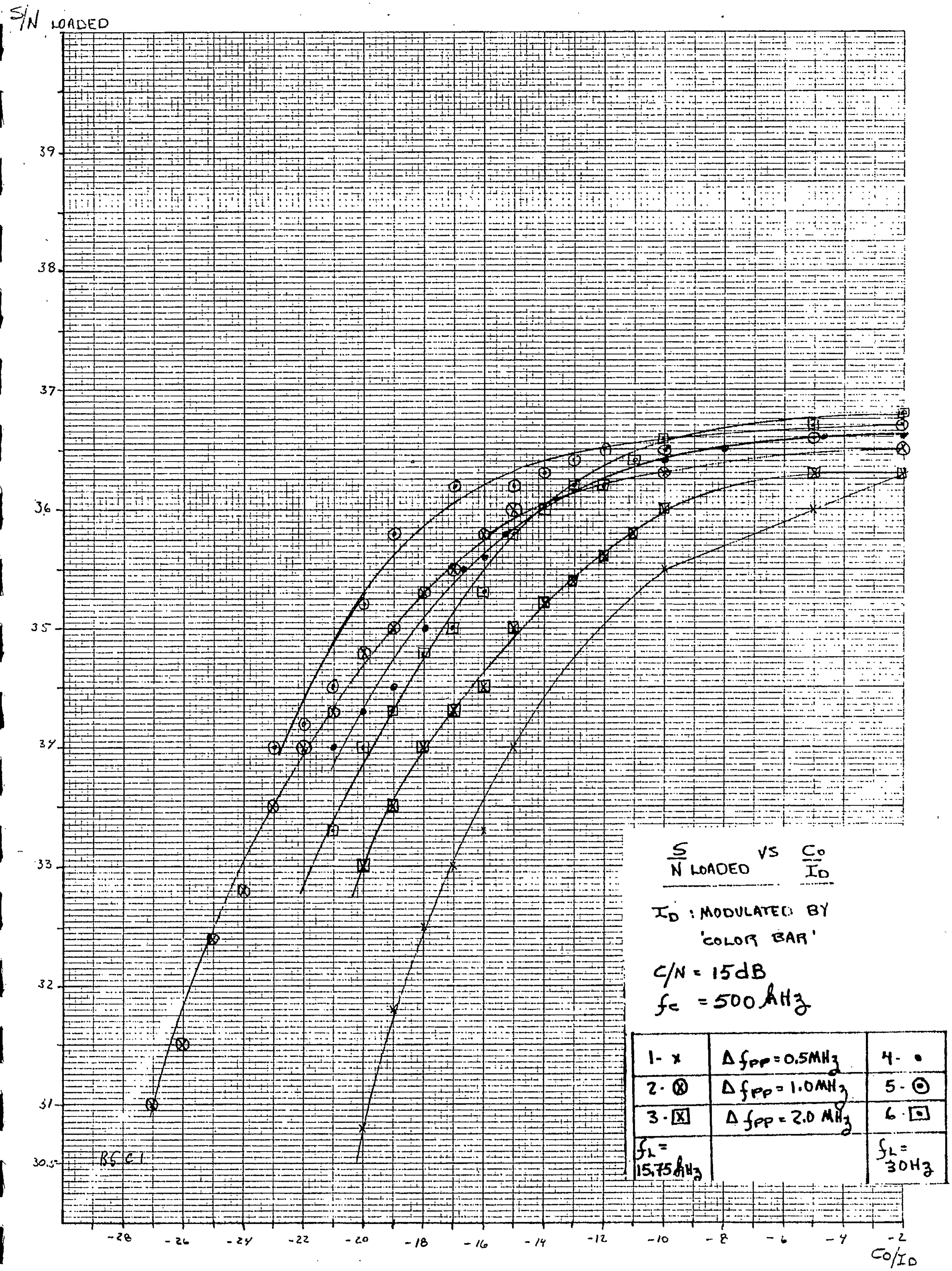
S/N (dB) = 88(dB) - Th...(RN)



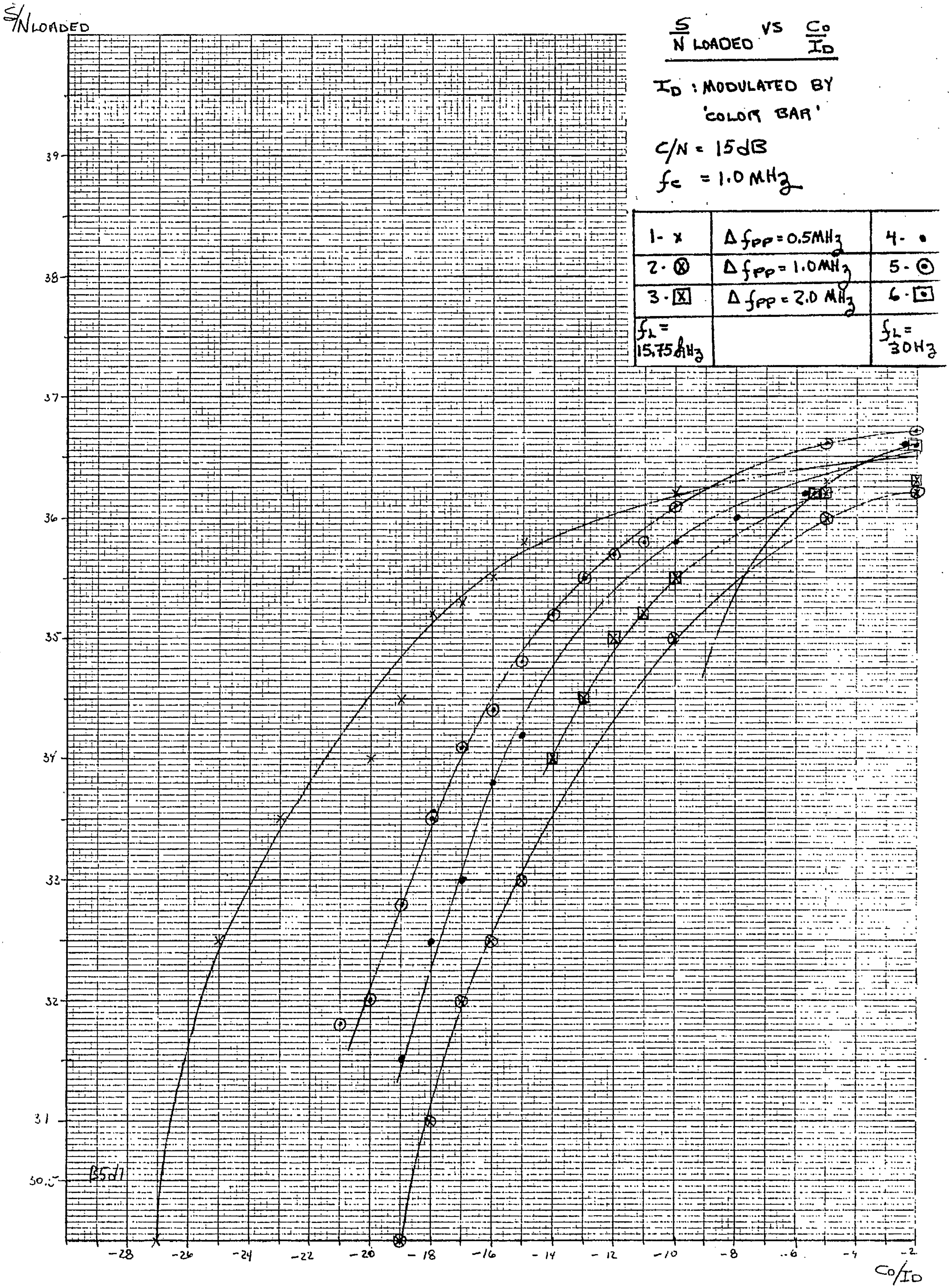
B5


S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
Co/ID
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = 15 dB
fc = 10 kHz
1 - x
Δ fpp = 0.5 MHz
4 - •
2 - ⊗
Δ fpp = 1.0 MHz
5 - ⊙
3 - ⊠
Δ fpp = 2.0 MHz
6 - ⊡
fL = 15.75 kHz
fL = 30 Hz
BS21

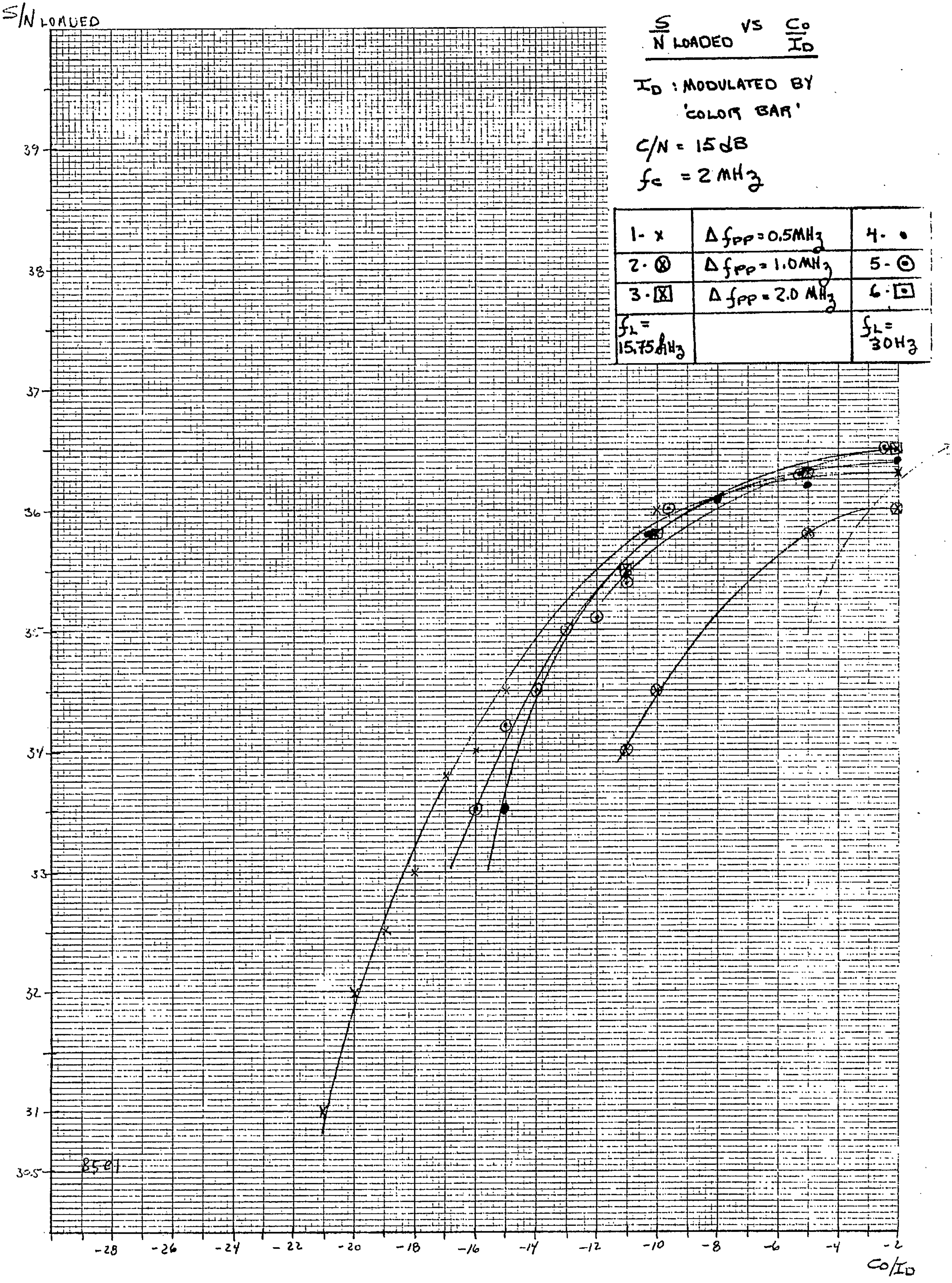

S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = 15 dB
fc = 100 MHz
1- x
Δ fpp = 0.5MHz
4- •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ⊠
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fL = 30Hz
B5 61



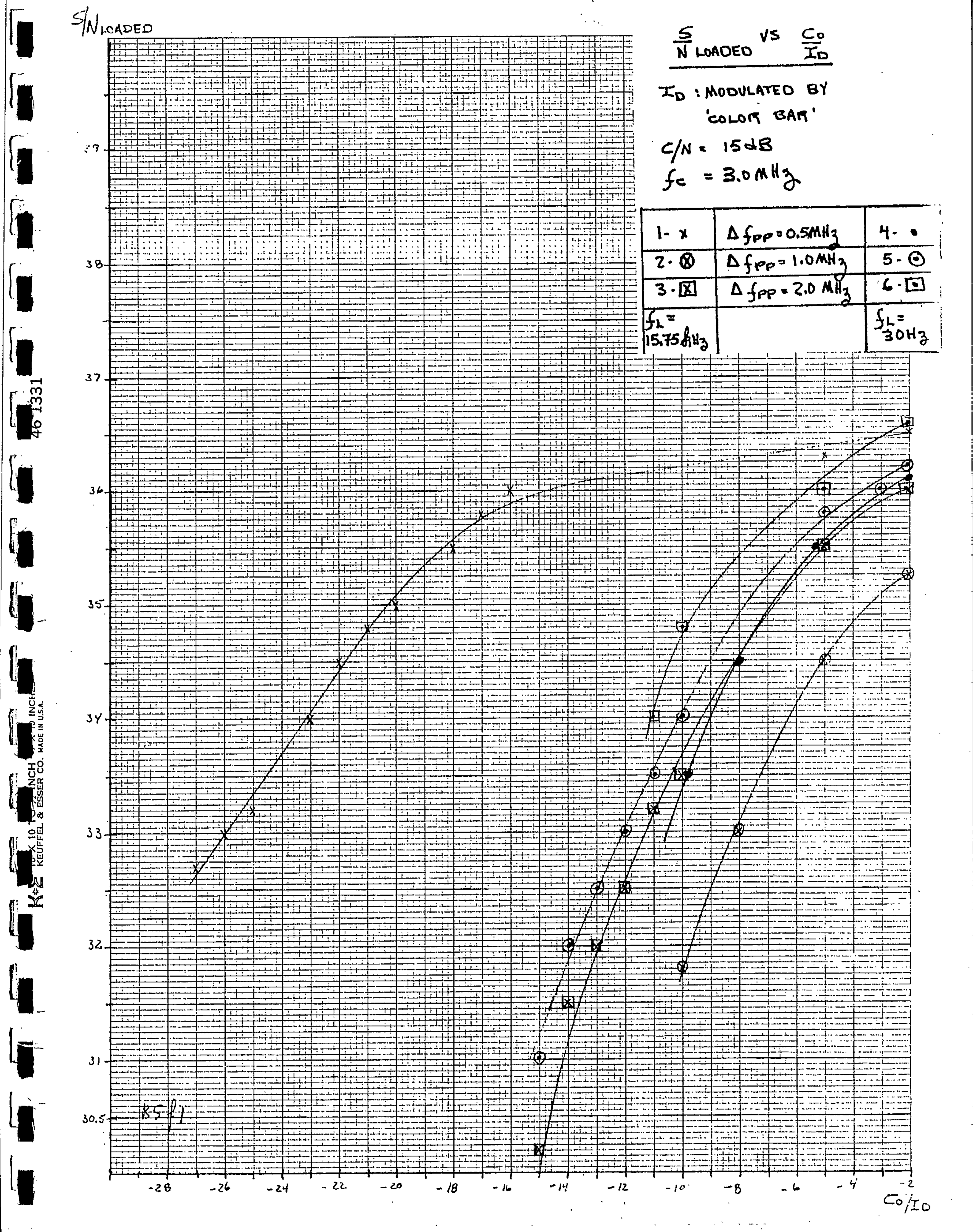
S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = 15dB
fc = 500 kHz
1- x
2- ⊗
3- ⊠
Δ fpp = 0.5MHz
Δ fpp = 1.0MHz
Δ fpp = 2.0 MHz
4- •
5- ⊙
6- ⊡
fL = 15.75 kHz
fL = 30Hz



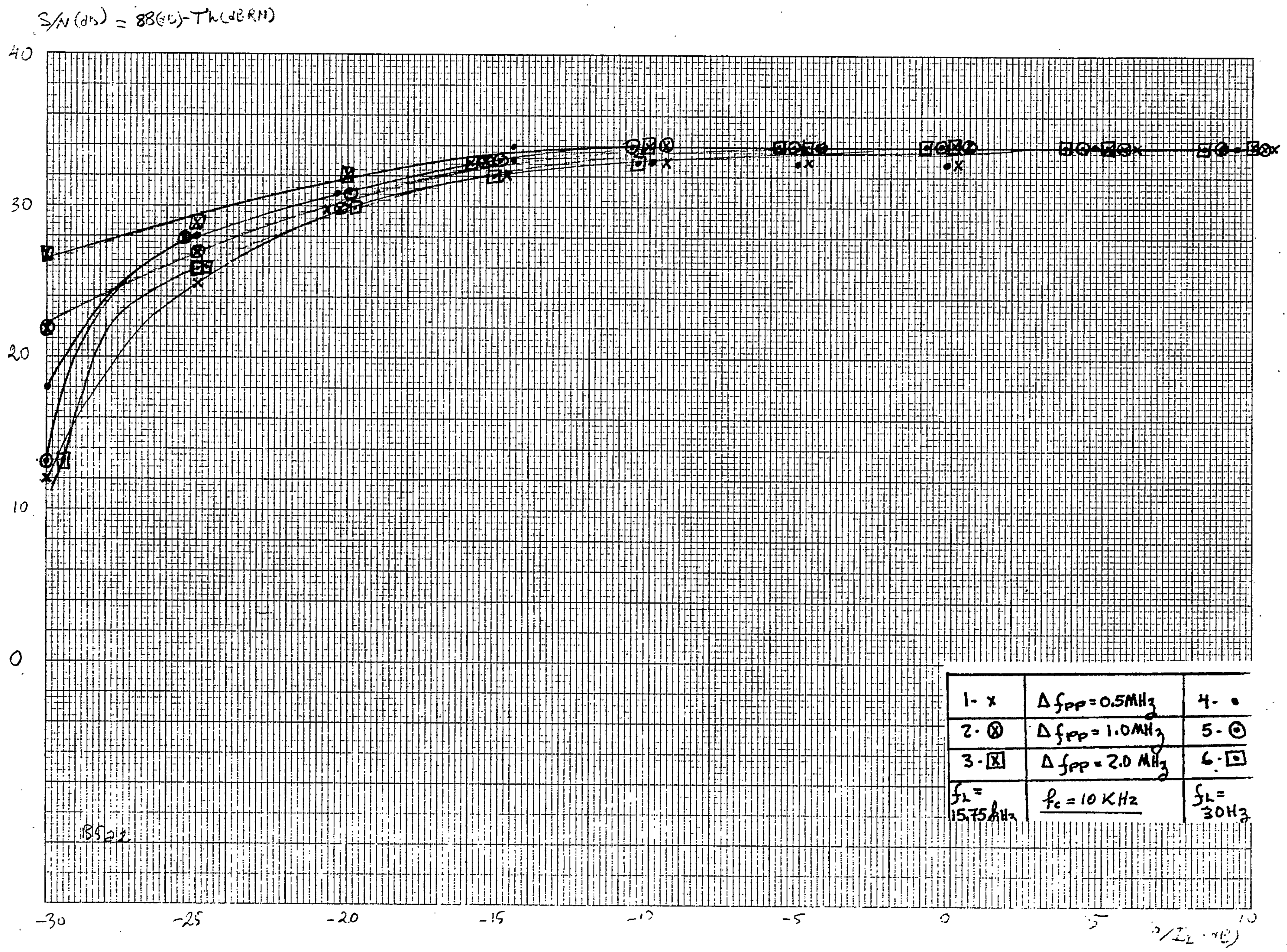
46 1331
10 X 10 TO ½ INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

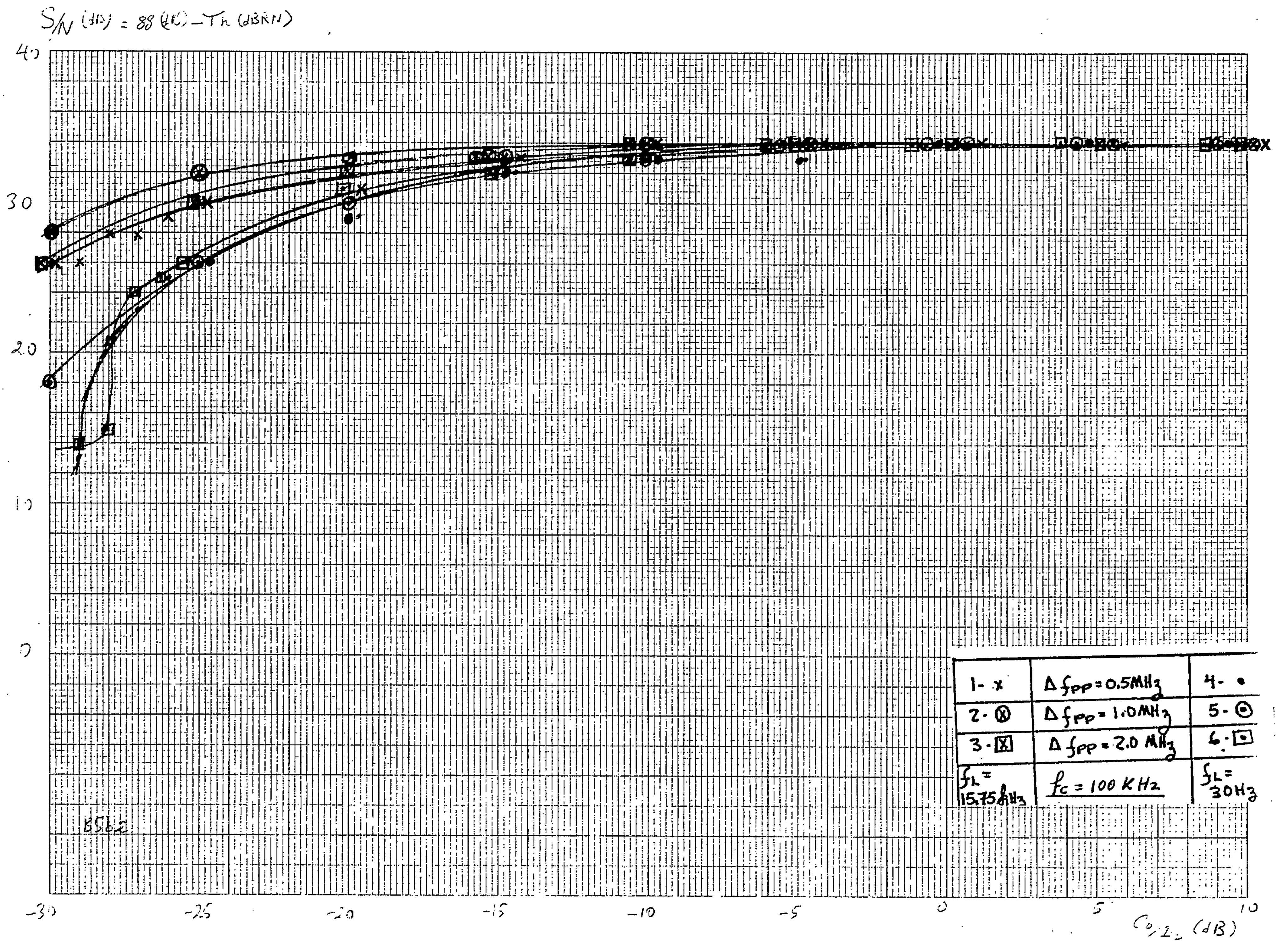


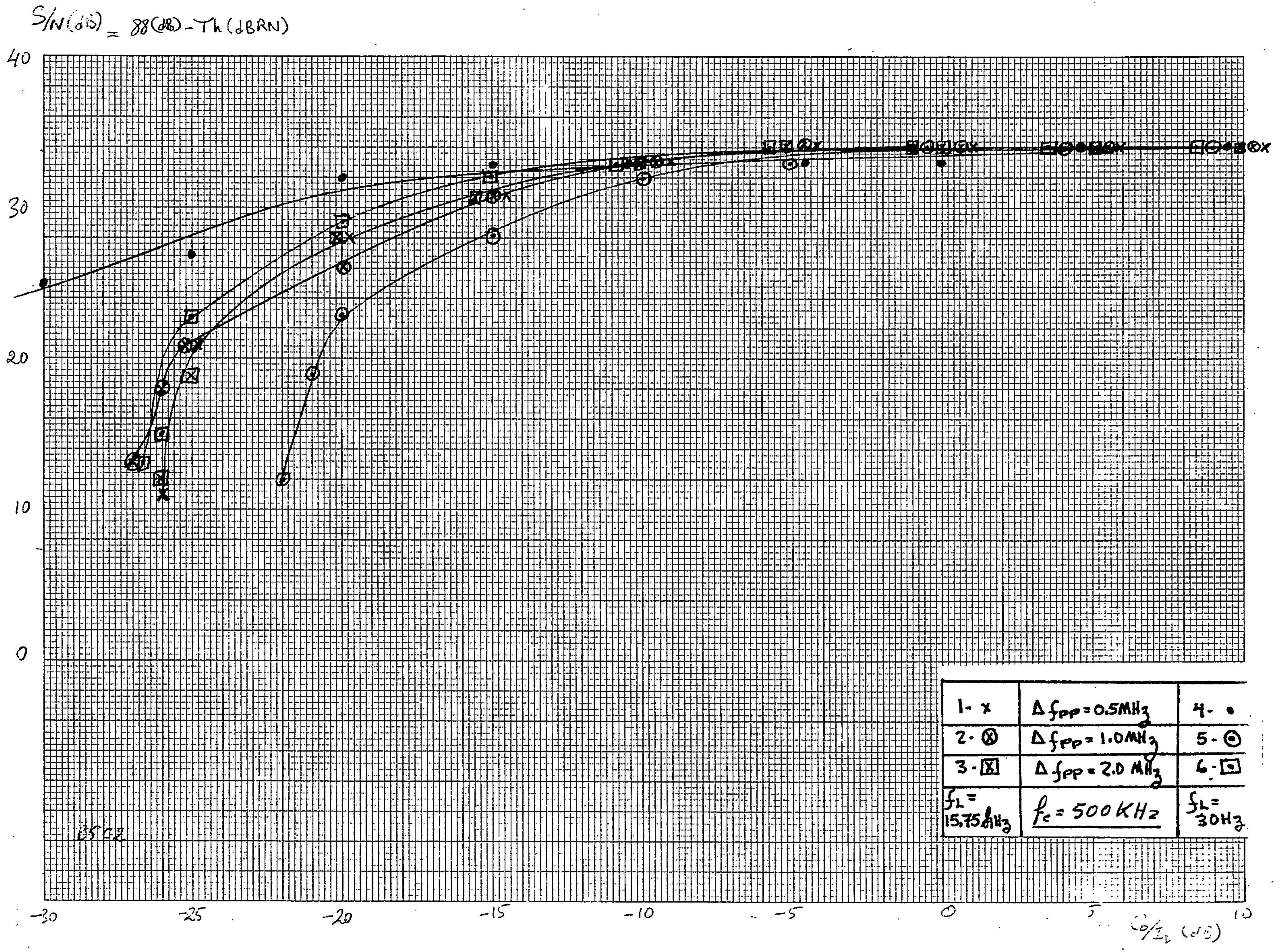
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = 15dB
fc = 2MHz
1- x | Δfpp = 0.5MHz | 4- •
2- ⊗ | Δfpp = 1.0MHz | 5- ⊙
3- ⊠ | Δfpp = 2.0 MHz | 6- ⊡
fL = 15.75 kHz
fL = 30Hz
S/N LOADED
39
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
8561

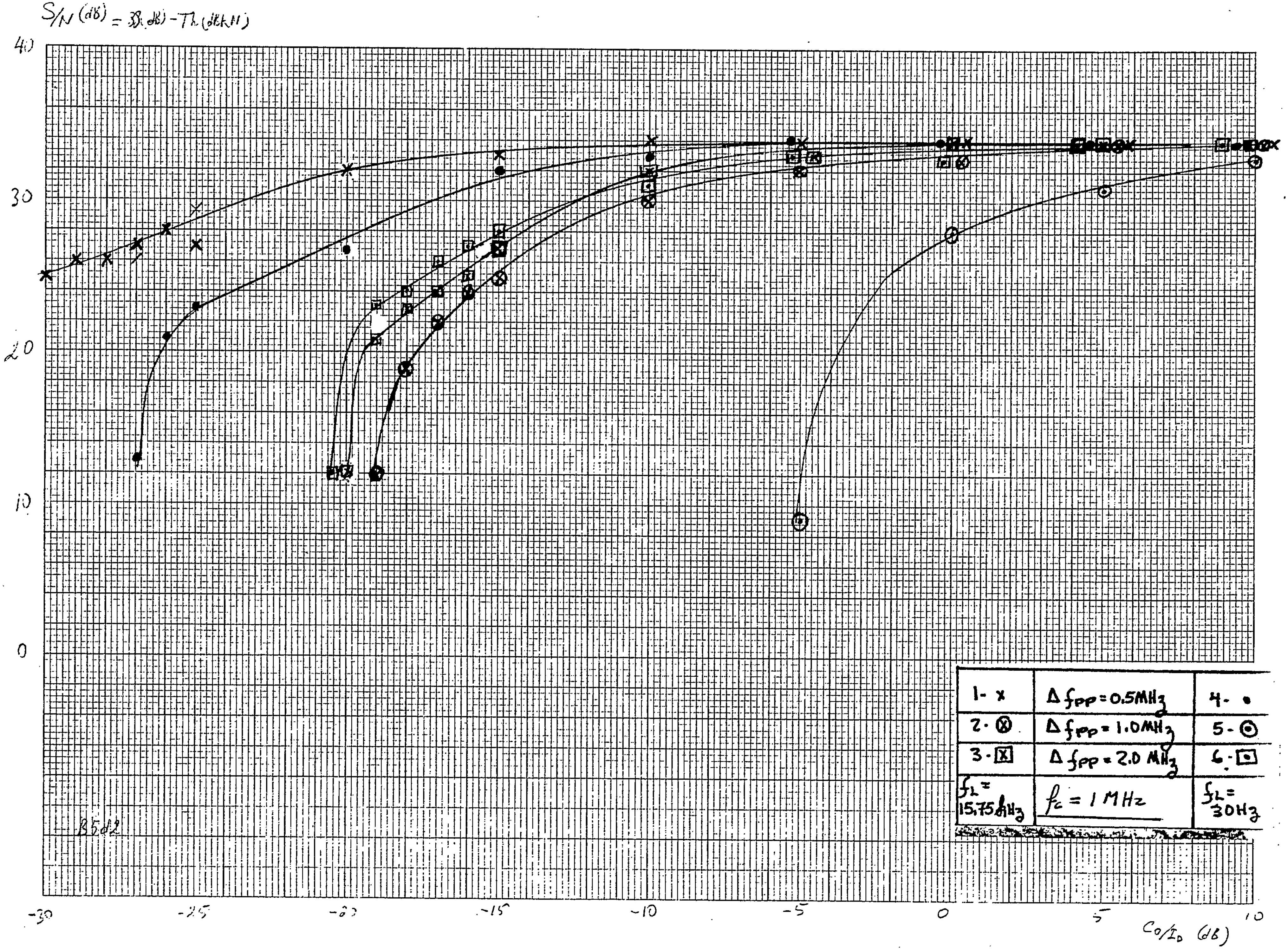


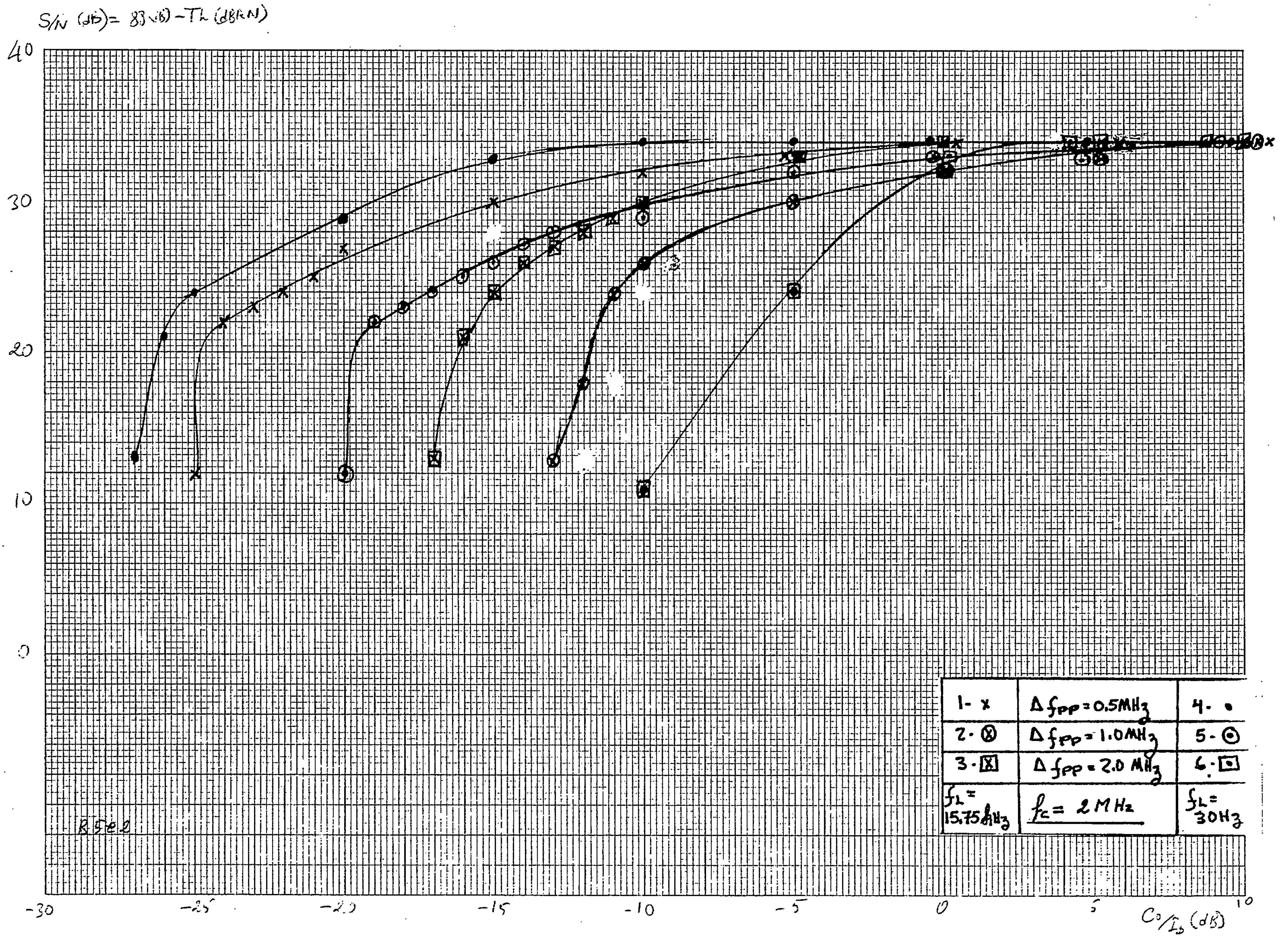
S/N LOADED VS Co/ID
ID : MODULATED BY 'COLOR BAR'
C/N = 15dB
fc = 3.0 MHz
1- x
Δ fpp = 0.5MHz
4- •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ⊠
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fL = 30Hz
S/N LOADED
38
37
36
35
34
33
32
31
30.5
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
Co/ID
46 1331
K+E 10 X 10 TO THE INCH 7 X 10 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.

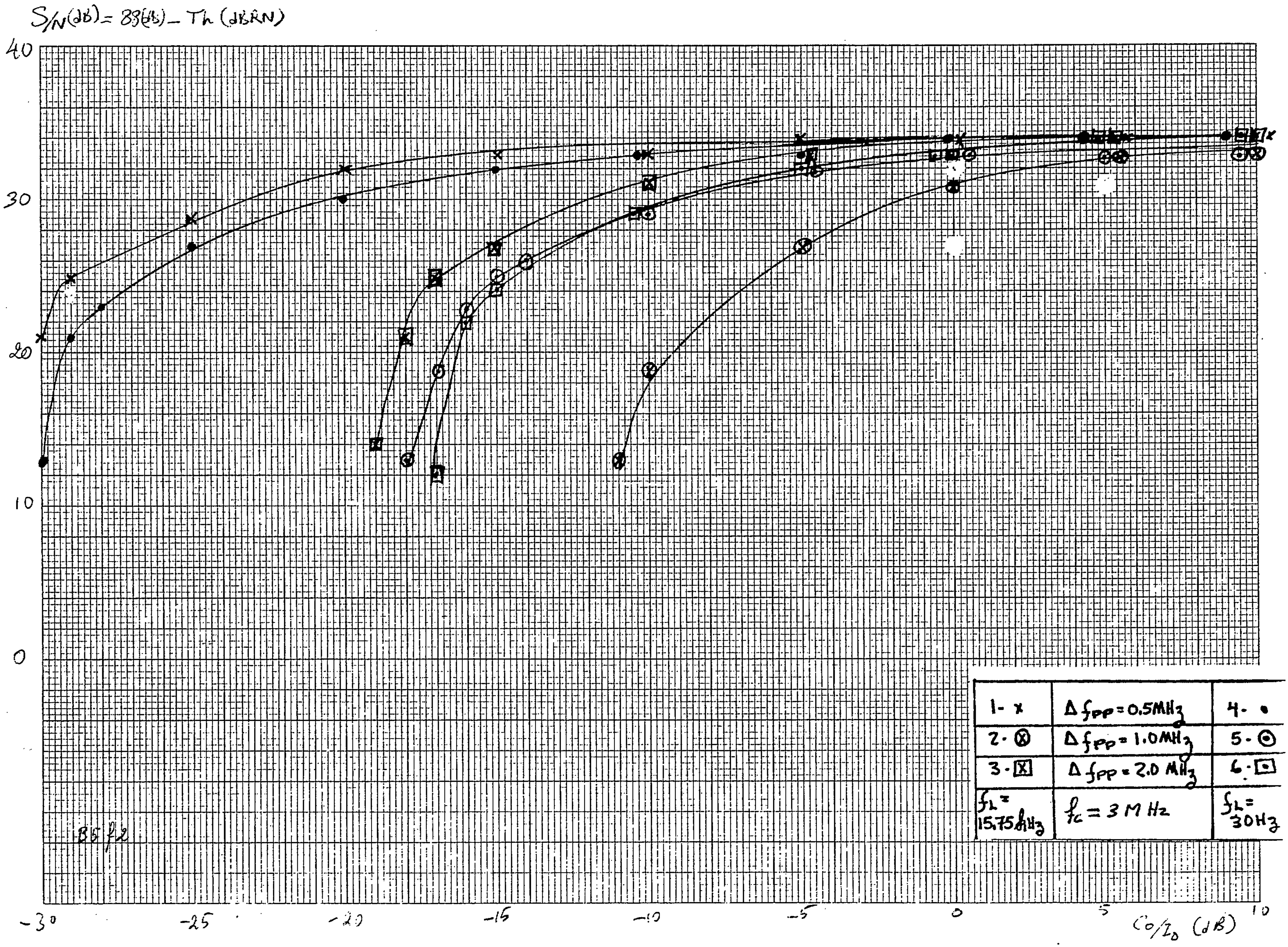

S/N (dB) = 88(dB) - Th(dBRN)
40
30
20
10
0
-30
-25
-20
-15
-10
-5
0
5
10
1- x
Δ fpp = 0.5MHz
4- •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ☒
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fc = 10 KHz
fL = 30Hz
B5 22


S/N (dB) = 88 (dB) − Th (dBRN)
40
30
20
10
0
-30
-25
-20
-15
-10
-5
0
5
10
Co/I (dB)
1- x
Δ fpp = 0.5MHz
4- •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ☒
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fc = 100 KHz
fL = 30Hz


S/N(dB) = 88(dB) - Th(dBRN)
40
30
20
10
0
-30
-25
-20
-15
-10
-5
0
5
10
C/I (dB)
1- x
2- ⊗
3- ⊠
Δf_pp = 0.5MHz
Δf_pp = 1.0MHz
Δf_pp = 2.0 MHz
4- •
5- ⊙
6- ⊡
f_L = 15.75 kHz
f_c = 500 KHz
f_L = 30Hz
BSC2


S/N (dB) = 33(dB) - Th (dBkH)
40
30
20
10
0
-30
-25
-20
-15
-10
-5
0
5
10
Co/I_D (dB)
1 - x
Δ f_PP = 0.5 MHz
4 - •
2 - ⊗
Δ f_PP = 1.0 MHz
5 - ⊙
3 - ☒
Δ f_PP = 2.0 MHz
6 - ⊡
f_L = 15.75 kHz
f_c = 1 MHz
f_L = 30 Hz
B5d2


S/N (dB) = 83 dB - Th (dBRN)
40
30
20
10
0
-30
-25
-20
-15
-10
-5
0
5
10
Co/Is (dB)
1- x
Δ fpp = 0.5 MHz
4- •
2- ⊗
Δ fpp = 1.0 MHz
5- ⊙
3- ⊠
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fc = 2 MHz
fL = 30 Hz


S/N(dB) = 88(dB) – Th (dBRN)
40
30
20
10
0
–30
–25
–20
–15
–10
–5
0
5
10
Co/Io (dB)
1- x
Δ fpp = 0.5MHz
4- •
2- ⊗
Δ fpp = 1.0MHz
5- ⊙
3- ☒
Δ fpp = 2.0 MHz
6- ⊡
fL = 15.75 kHz
fc = 3 MHz
fL = 30Hz
BB f2

B6

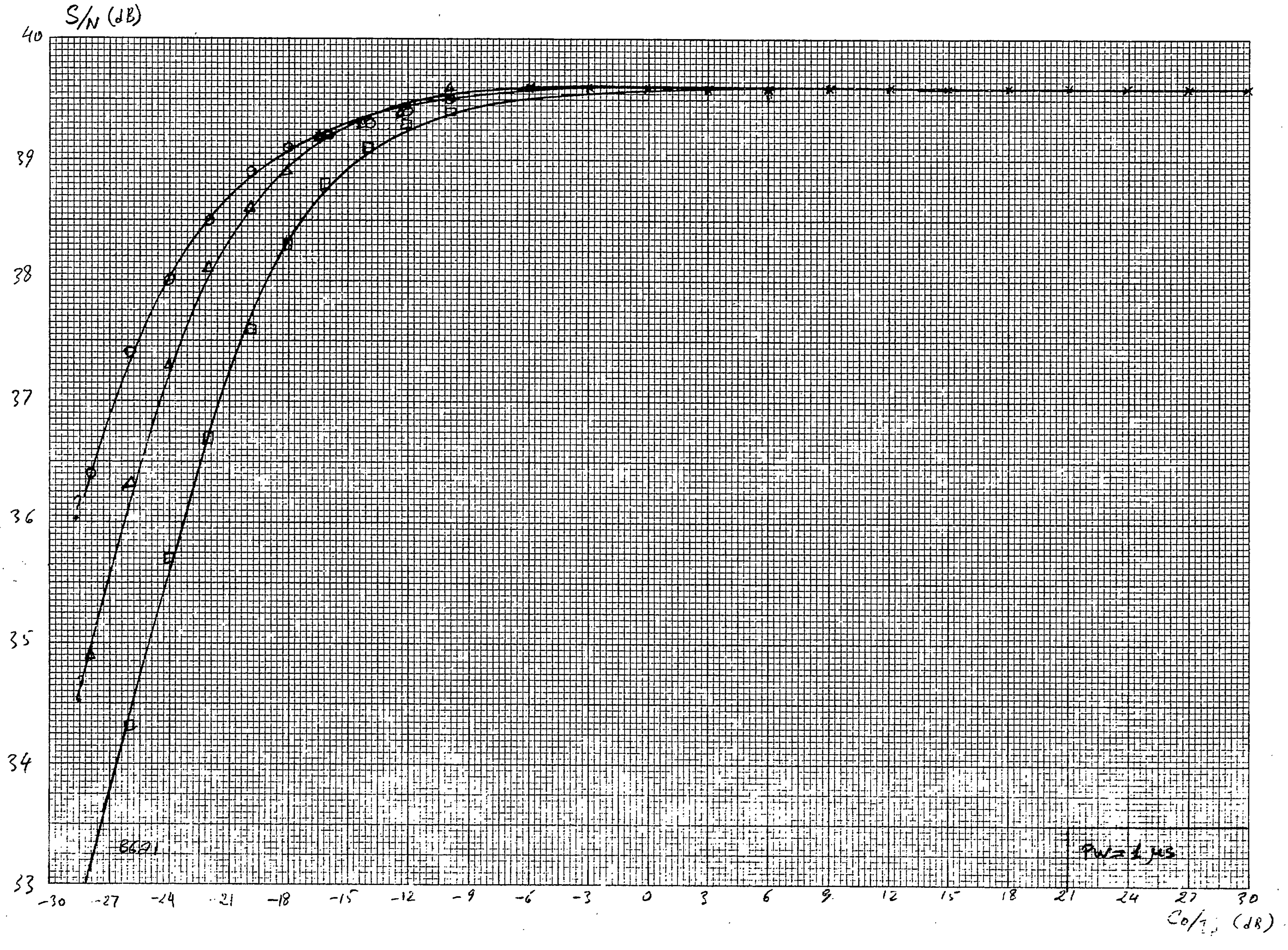
SYMBOL	PRF (kHz)
○	0.3
△	1.0
□	3.0
*	ALL ABOVE

? = ERRATIC READINGS

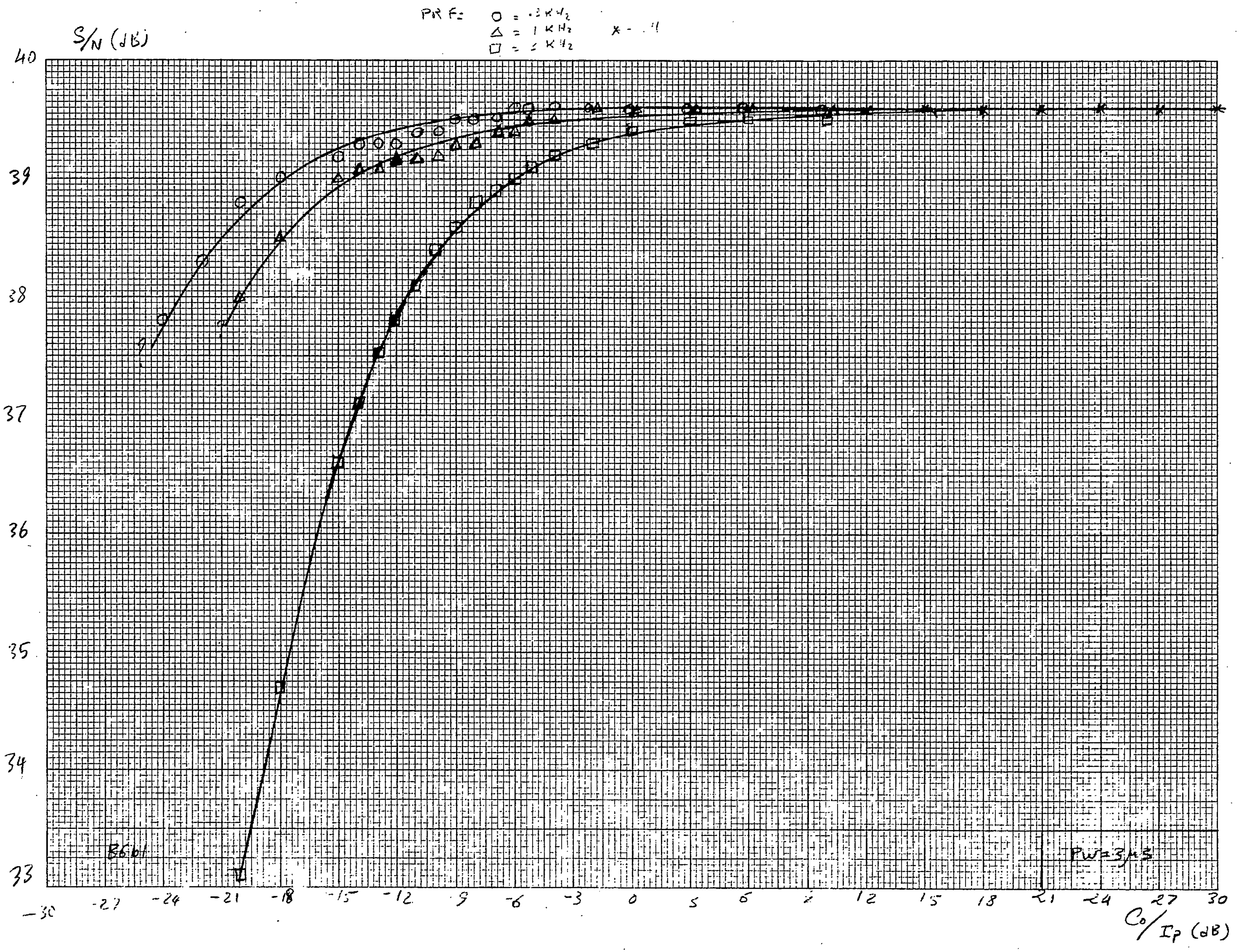
Radar-like Interfering signal

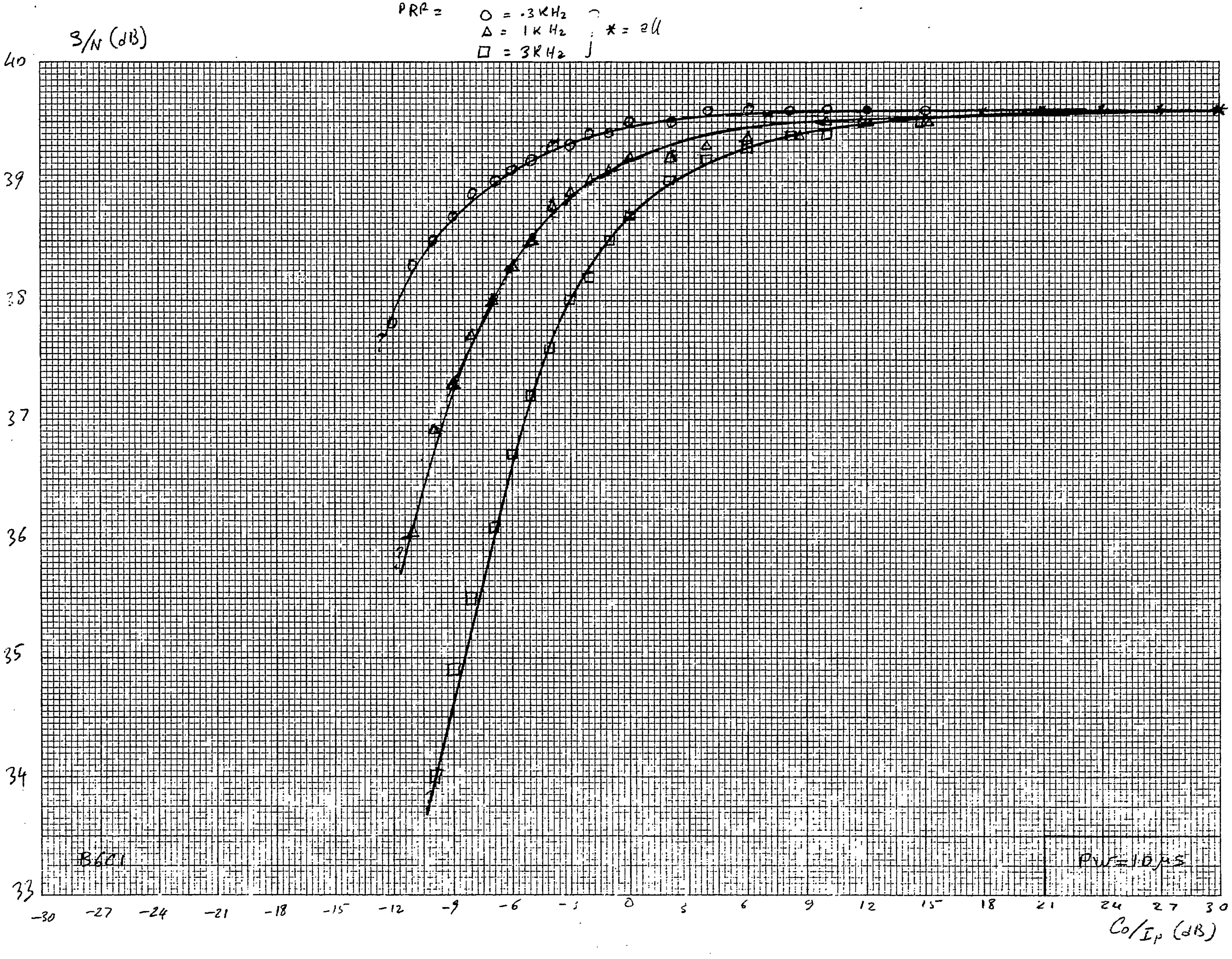
$S/N \rightarrow \infty$

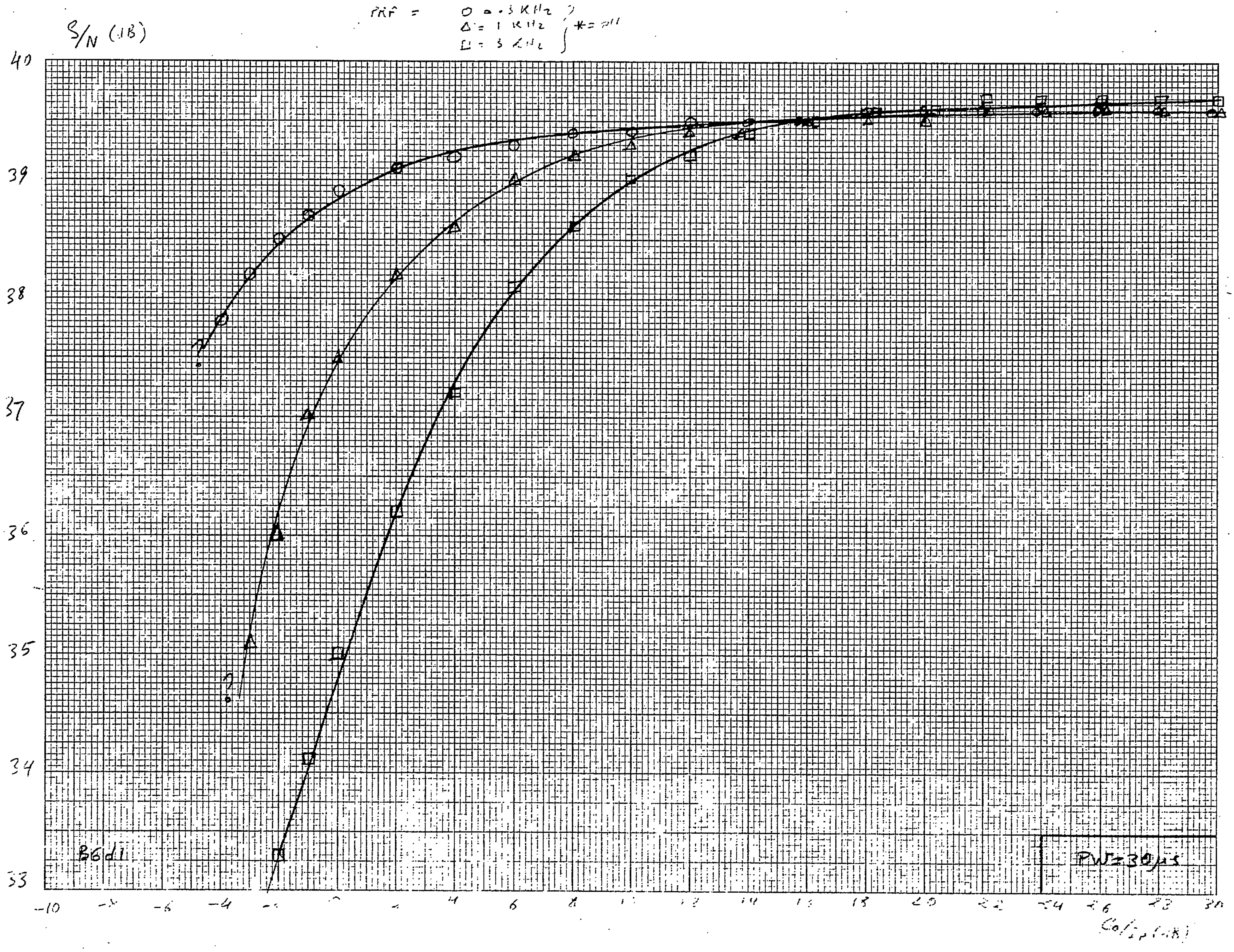
$f_c = 10$ KHz



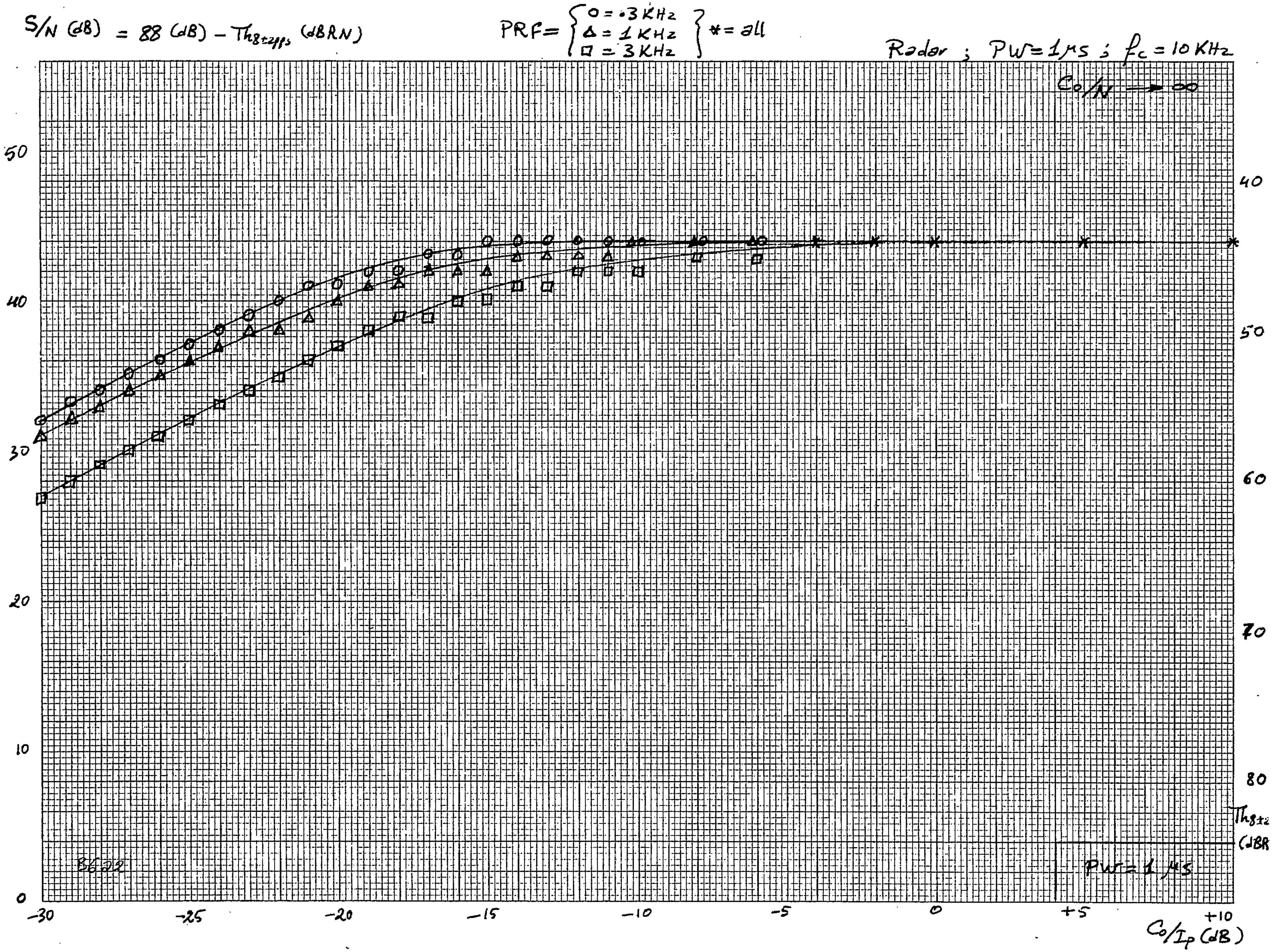
S/N (dB)
40
39
38
37
36
35
34
33
-30
-27
-24
-21
-18
-15
-12
-9
-6
-3
0
3
6
9
12
15
18
21
24
27
30
Co/I (dB)
PW = 1 μs


PRF:
S/N (dB)
40
39
38
37
36
35
34
33
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
Co/Ip (dB)
PW=3μs

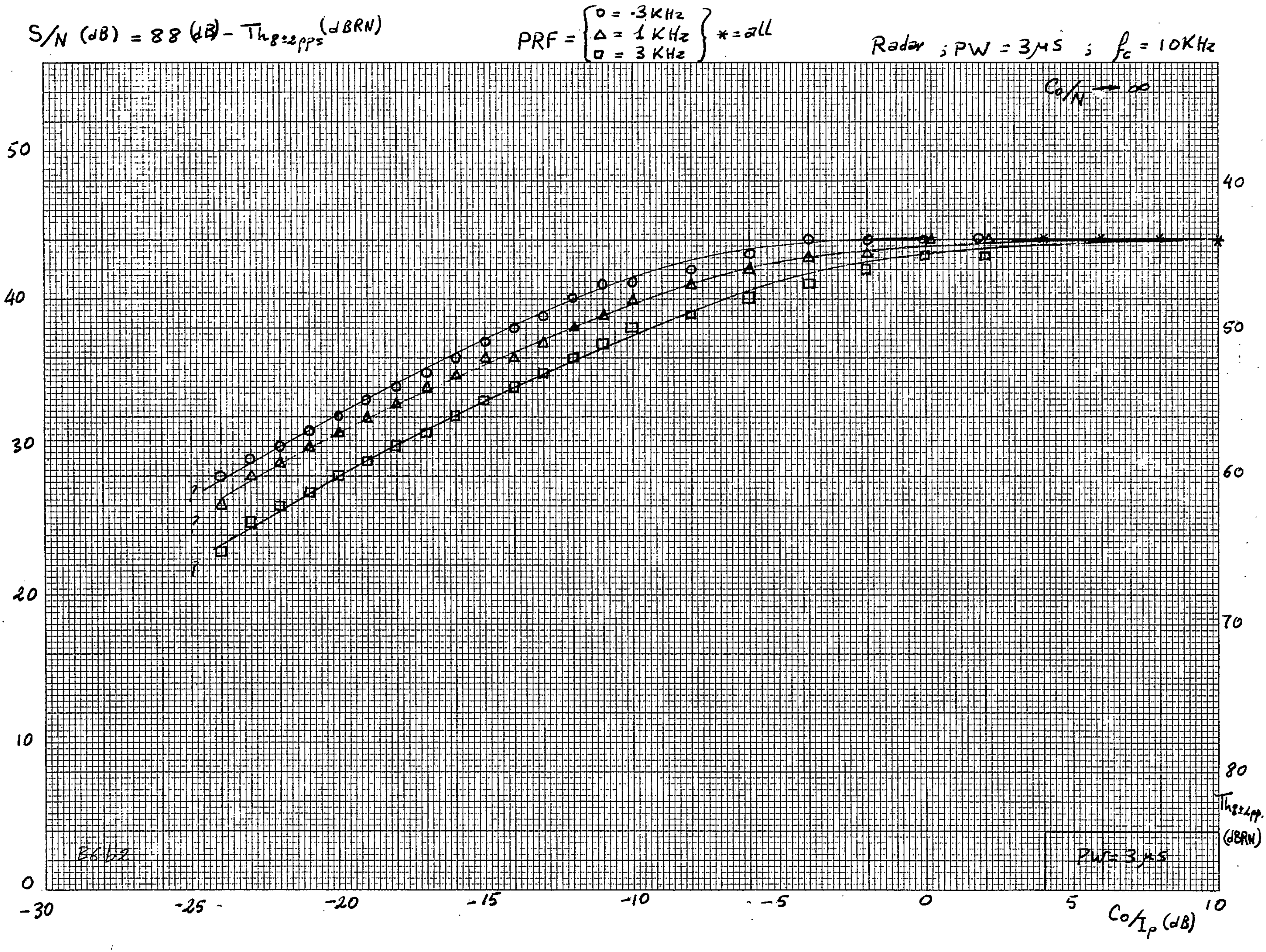

PRF = ○ = .3KHz
△ = 1KHz
□ = 3KHz
* = all
S/N (dB)
40
39
38
37
36
35
34
33
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
Co/Ip (dB)
B6C1
PW=10μs

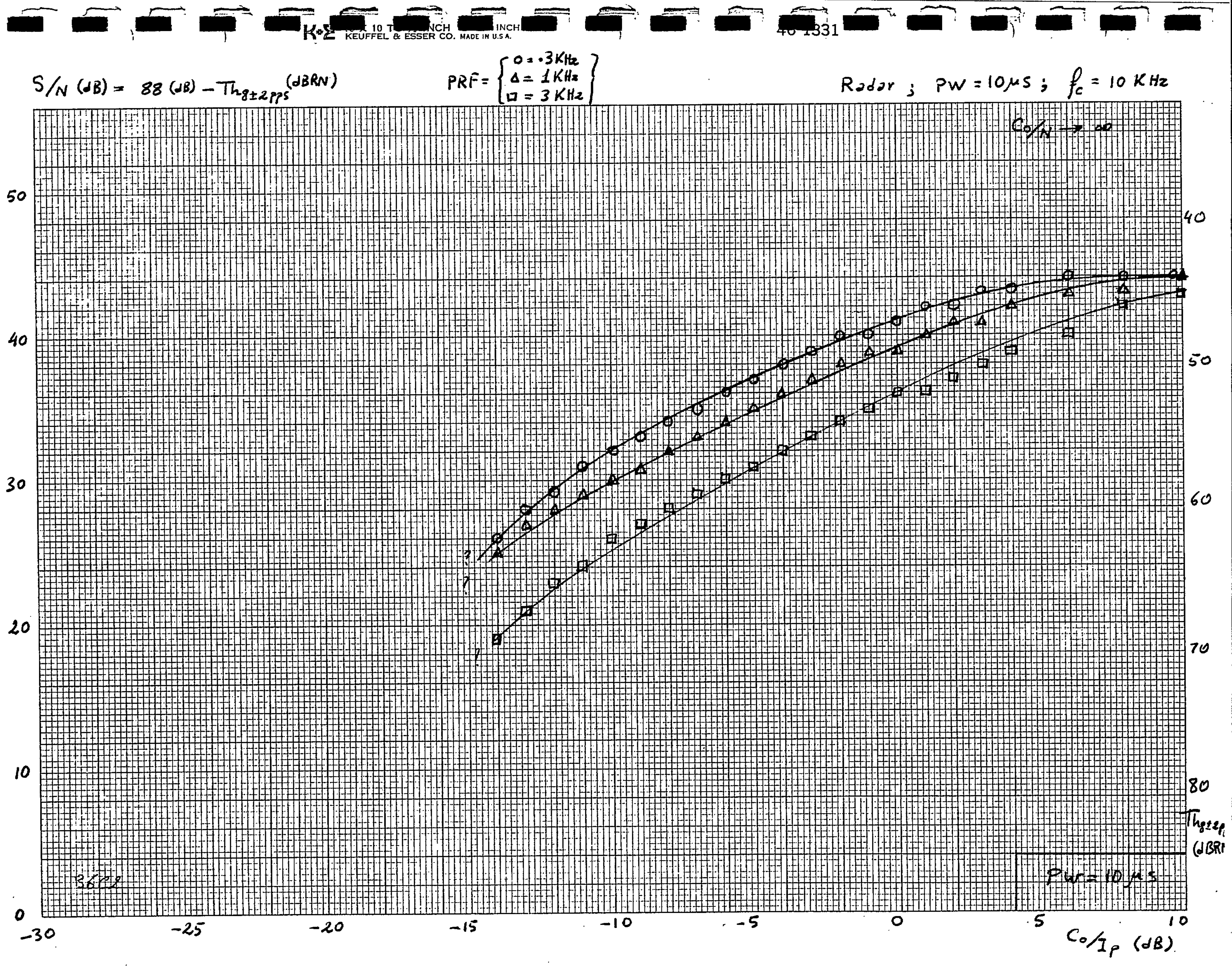

S/N (dB)
PRF = ○ = .3 KHz
△ = 1 KHz
□ = 3 KHz
40
39
38
37
36
35
34
33
B6d1
PW = 30 µs
-10
-6
-4
6
8
18
26
30

K+E 10 X 10 TO ½ INCH 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1331

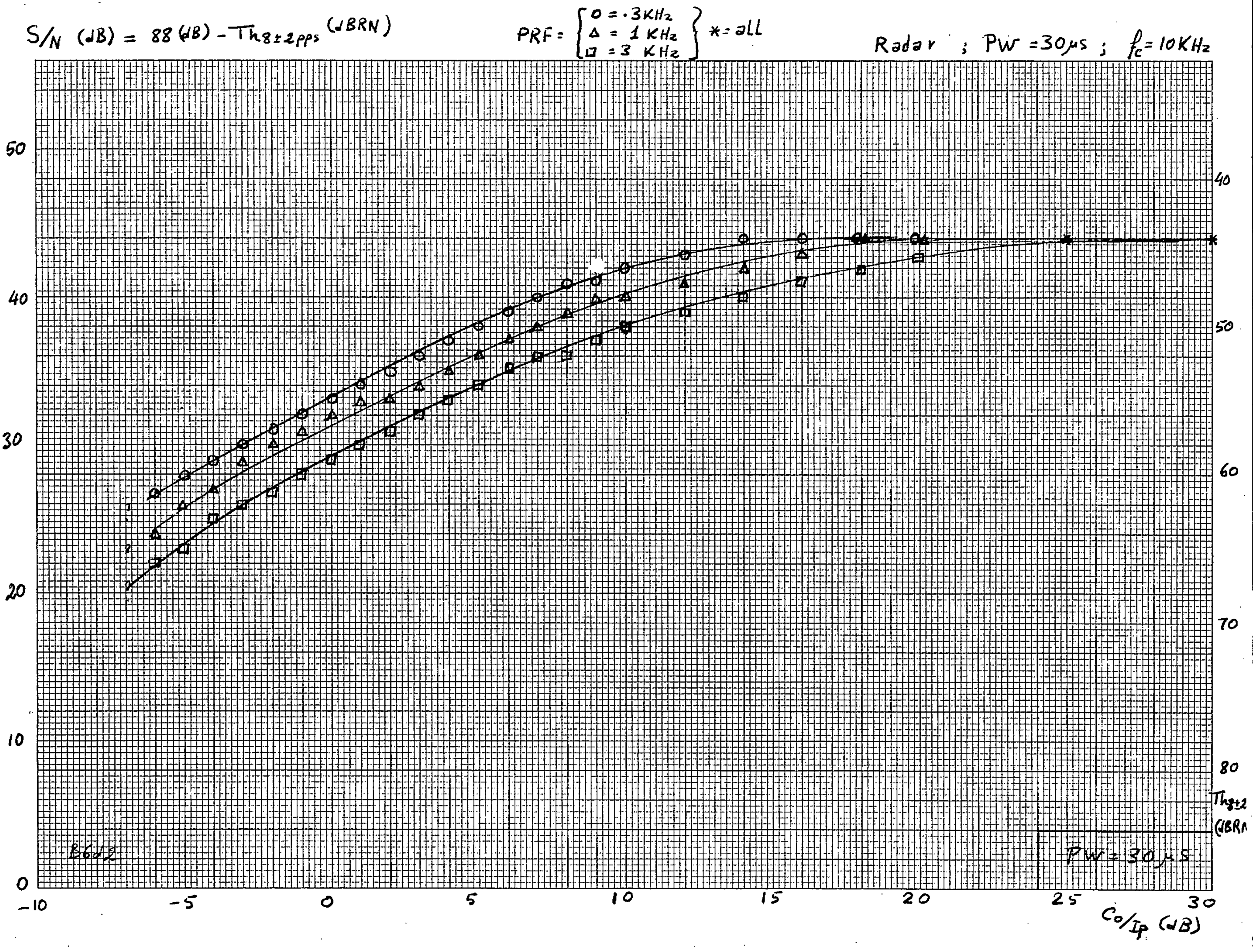


[redacted] K+E [redacted] 10 T[redacted]CH [redacted] INCHE[redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1331 [redacted]




K+E KEUFFEL & ESSER CO. MADE IN U.S.A.
S/N (dB) = 88 (dB) − Th_{8±2pps} (dBRN)
PRF = { o = .3 KHz, Δ = 1 KHz, □ = 3 KHz }
Radar ; PW = 10 μS ; f_c = 10 KHz
Co/N → ∞
50
40
30
20
10
0
40
50
60
70
80
Th_{8±2pps} (dBRN)
PW = 10 μS
−30
−25
−20
−15
−10
−5
0
5
10
Co/I_P (dB)

[redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted] 1331 [redacted]



B7

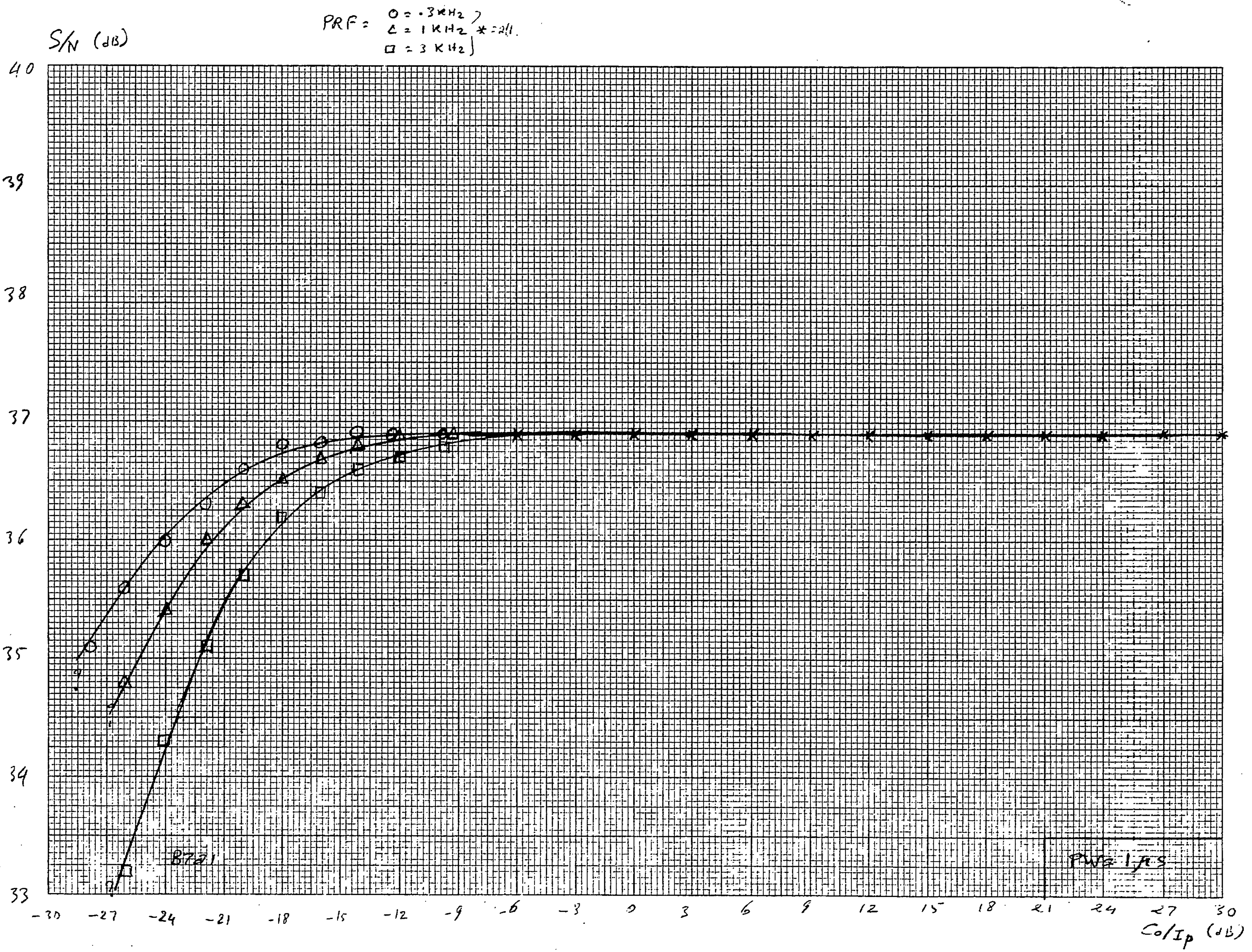
SYMBOL	PRF (kHz)
O	0.3
Δ	1.0
□	3.0
*	ALL ABOVE

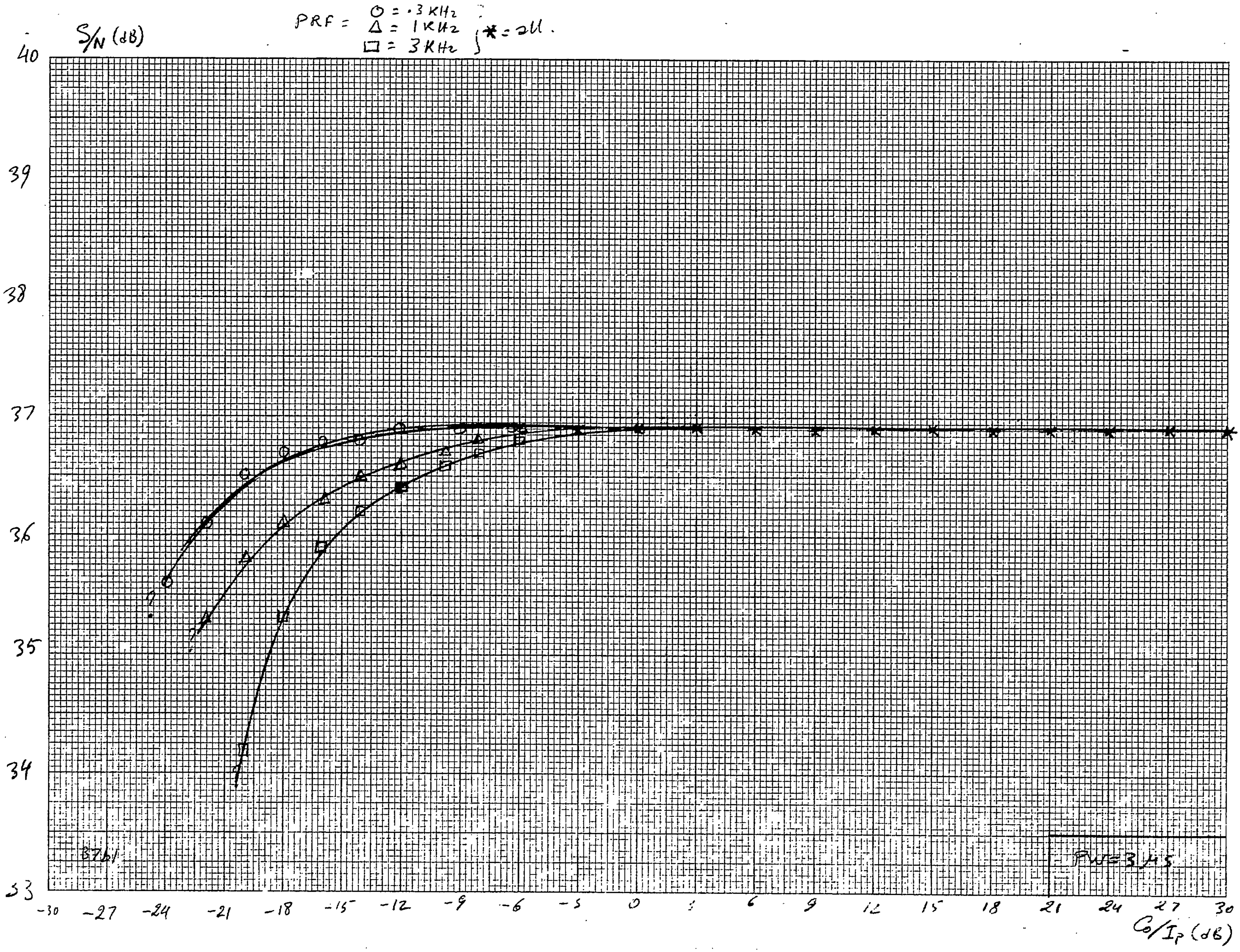
? = ERRATIC READINGS

Radar-Like Interfering signal

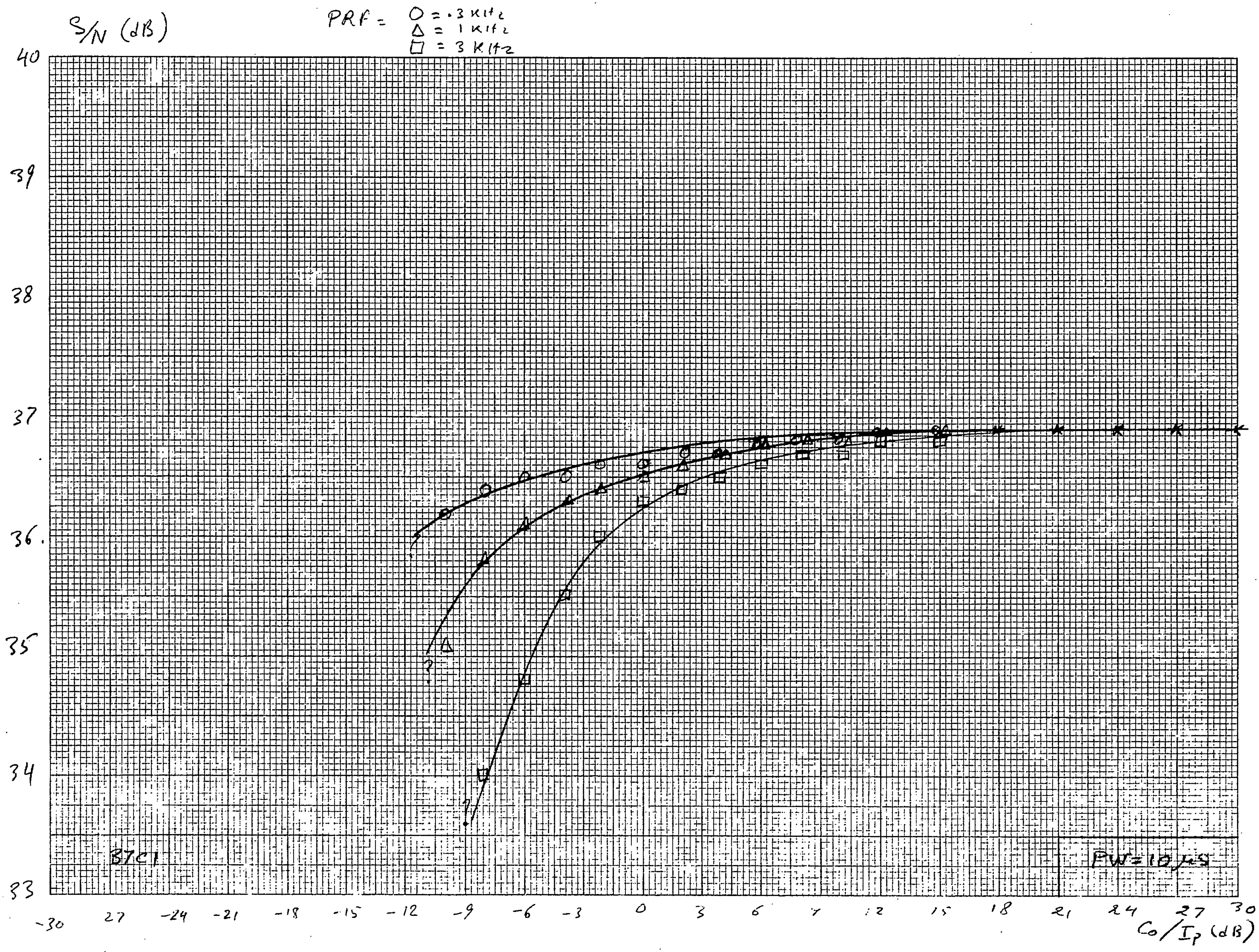
$C_o/N = 15$ dB

$f_c = 10$ KHz

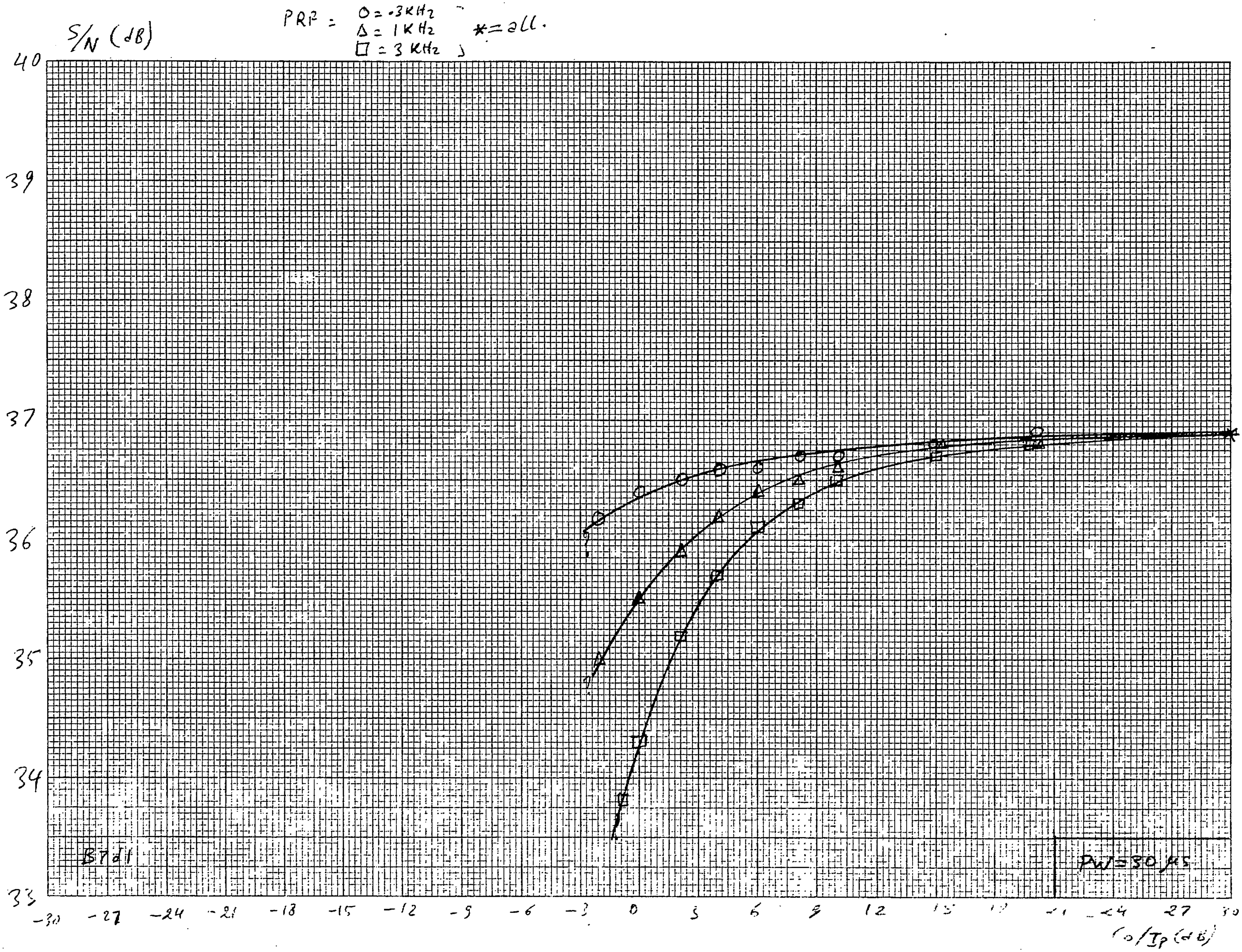

PRF = O = .3 KHz
Δ = 1 KHz
□ = 3 KHz
* = all
S/N (dB)
40
39
38
37
36
35
34
33
-30
-27
-24
-21
-18
-15
-12
-9
-6
-3
0
3
6
9
12
15
18
21
24
27
30
Co/Ip (dB)
PW = 1 μs

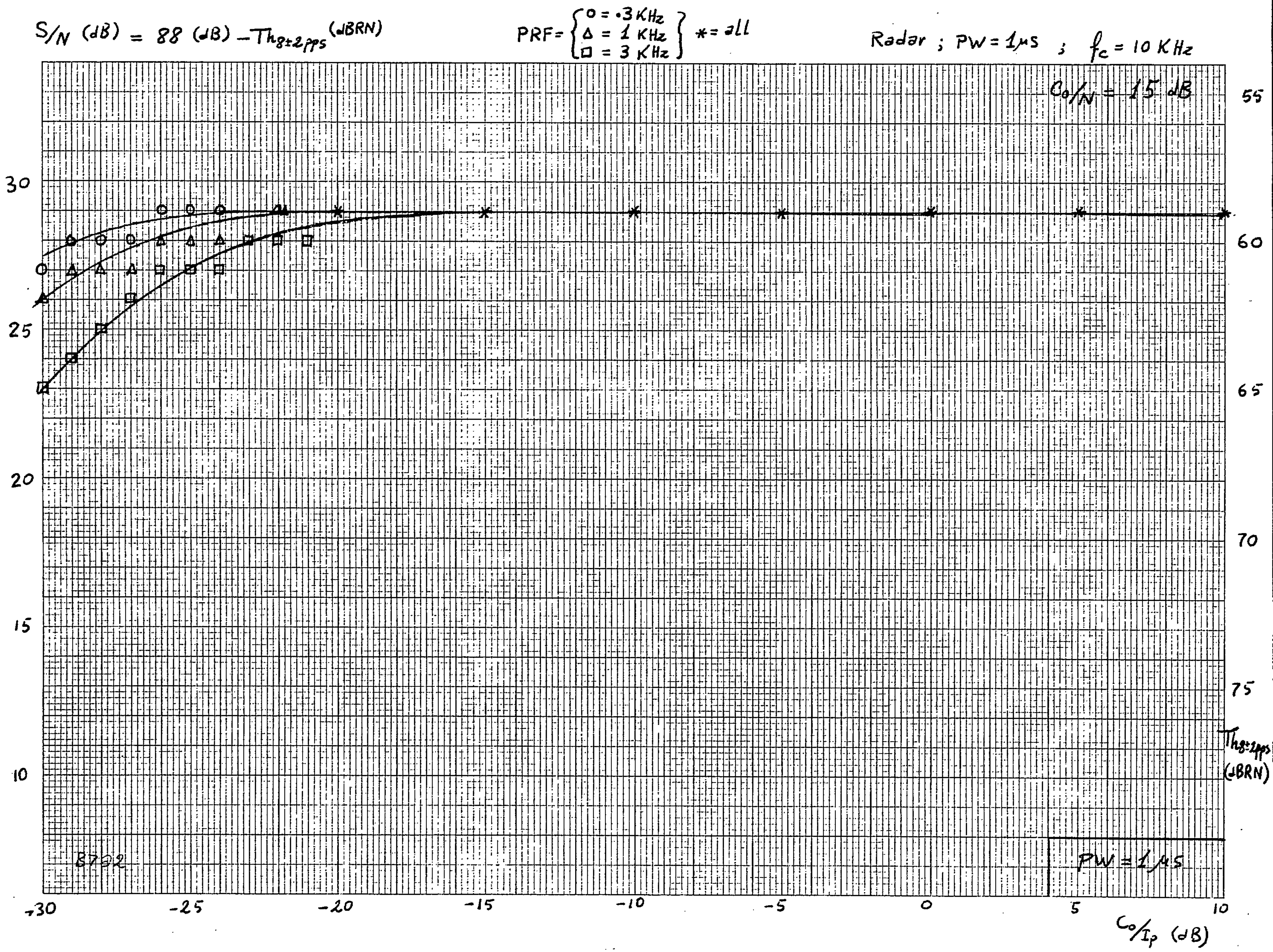

PRF = ○ = .3 KHz
△ = 1 KHz
□ = 3 KHz
✱ = all
S/N (dB)
40
39
38
37
36
35
34
33
-30
-27
-24
-21
-18
-15
-12
-9
-6
-3
0
3
6
9
12
15
18
21
24
27
30
C_o/I_p (dB)
PW = 3 μs

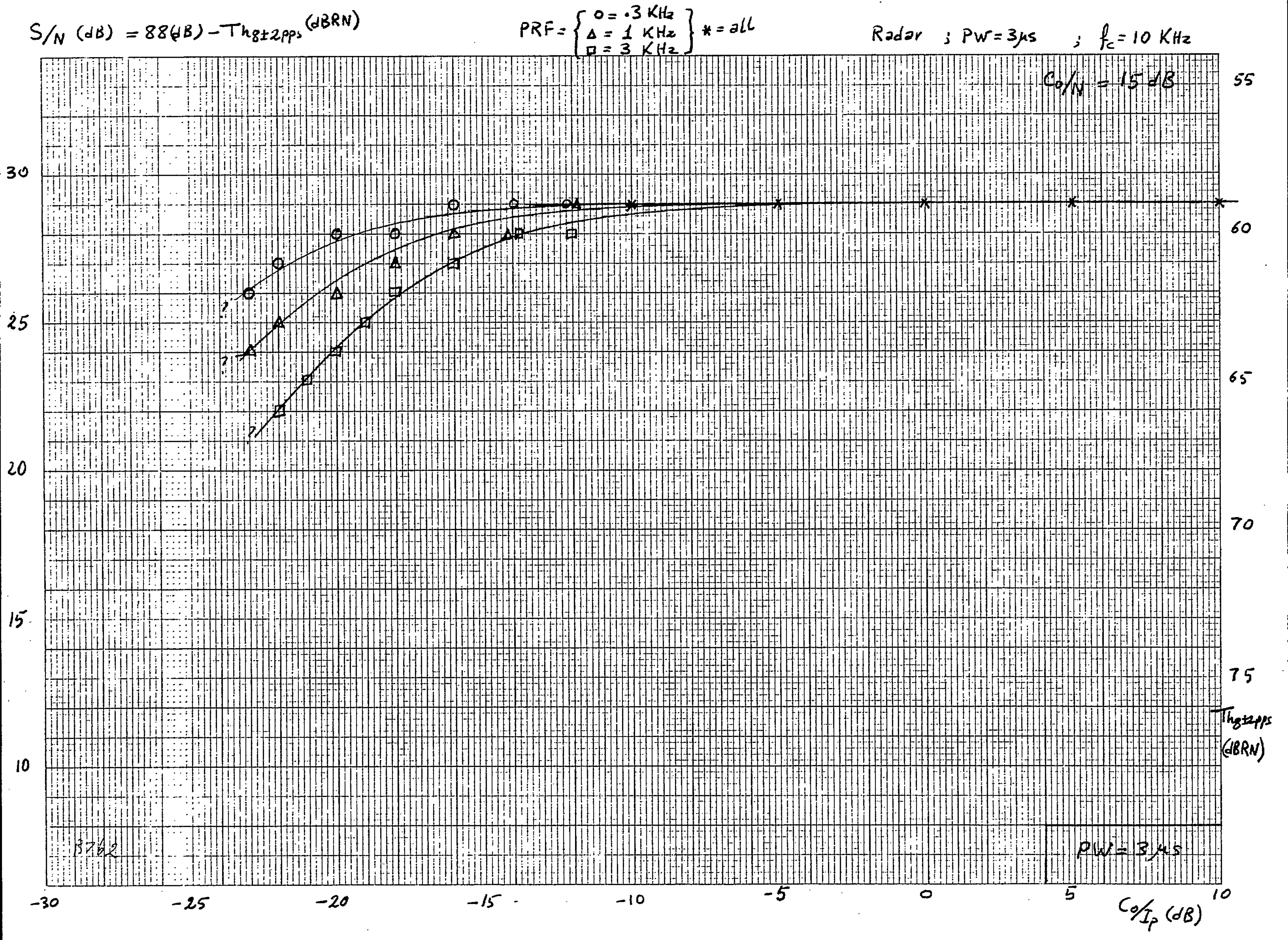
[redacted] K[redacted] 10[redacted] INCH[redacted] INC[redacted]
KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted] 1323 [redacted]



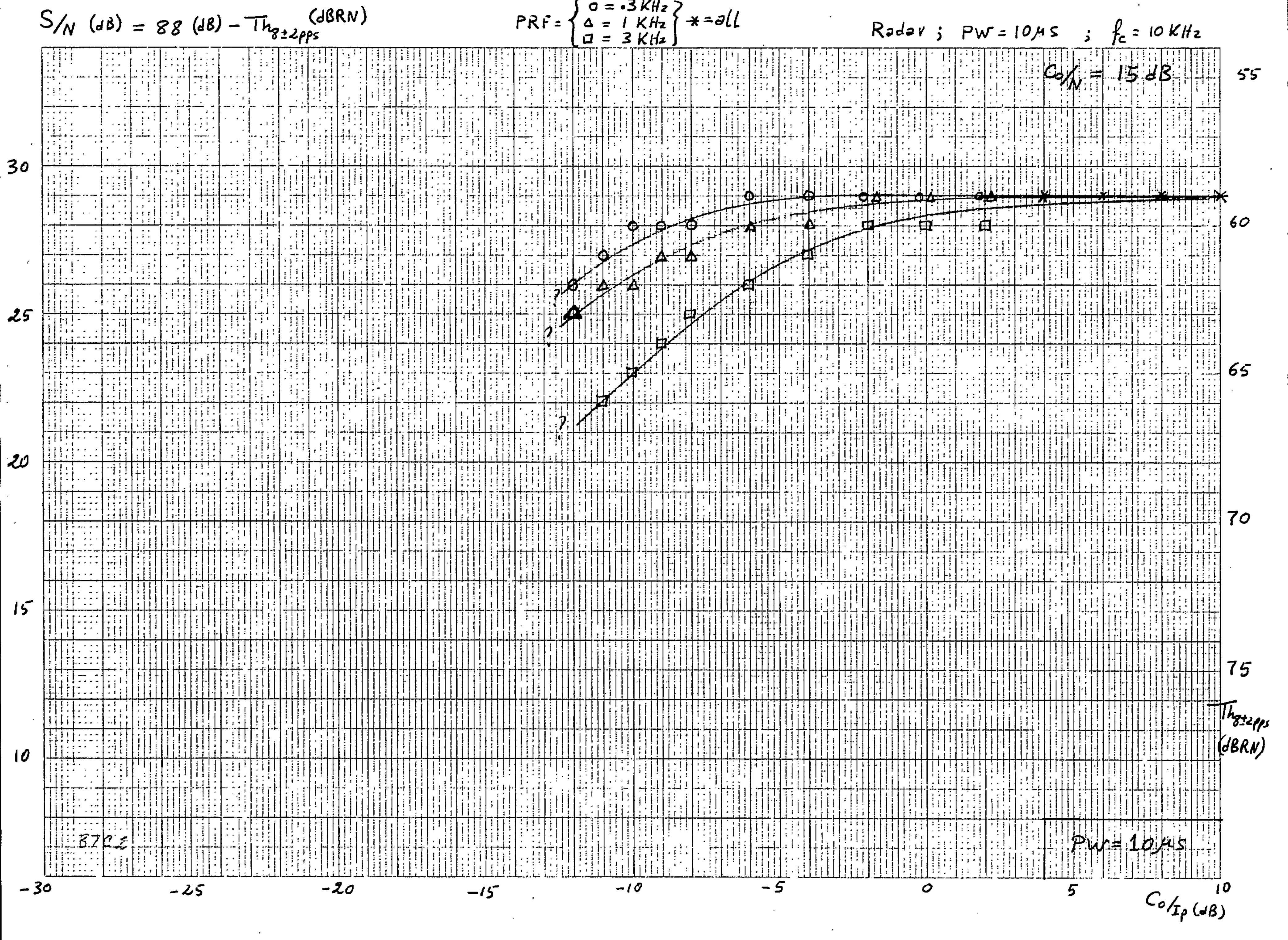
[redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted] 46 1323

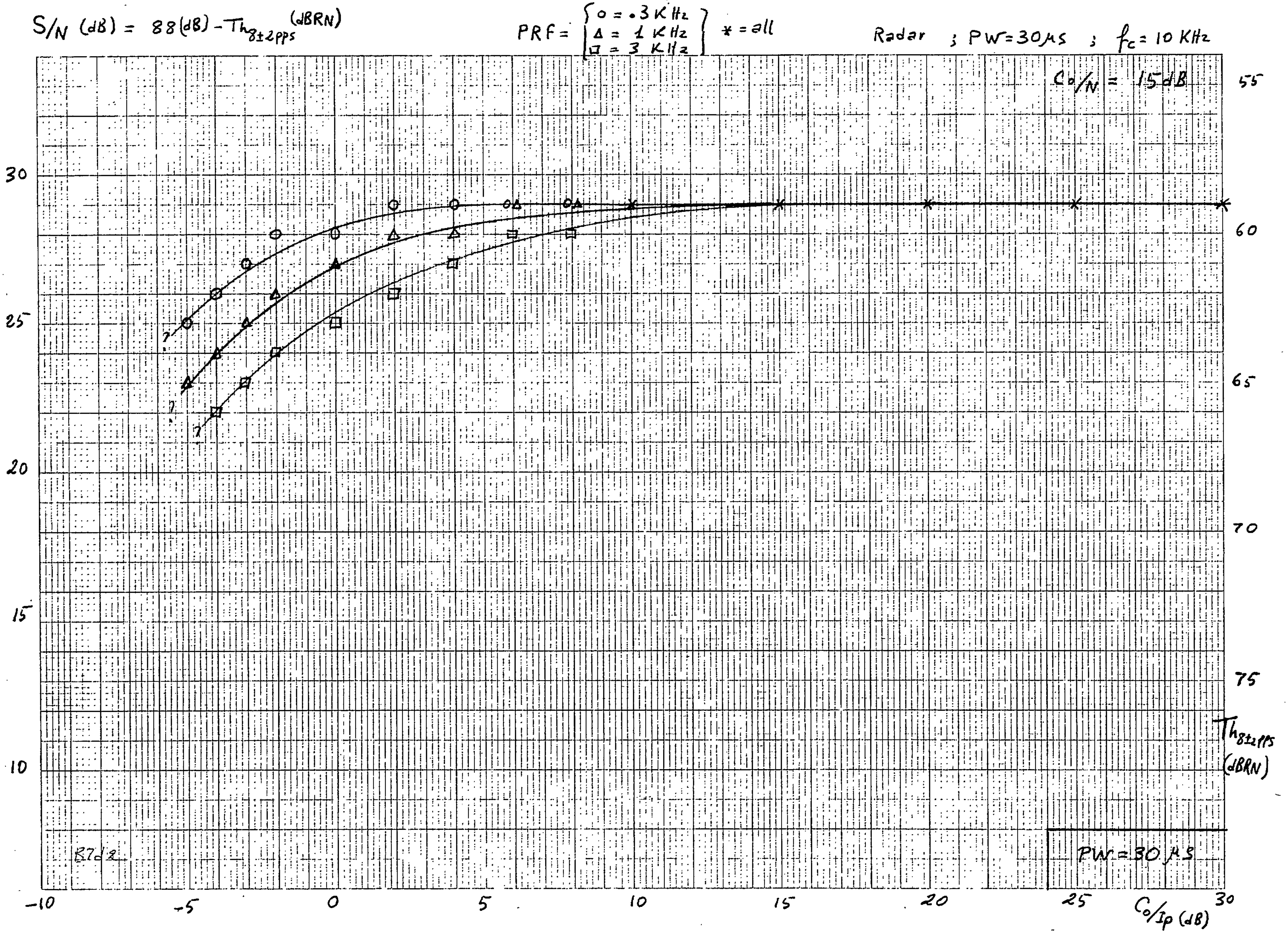



S/N (dB) = 88 (dB) − Th8±2pps (dBRN)
PRF = { o = .3 KHz ; Δ = 1 KHz ; □ = 3 KHz } * = all
Radar ; PW = 1μs ; fc = 10 KHz
Co/N = 15 dB
30
25
20
15
10
55
60
65
70
75
Th8±2pps (dBRN)
8722
PW = 1μs
-30
-25
-20
-15
-10
-5
0
5
10
Co/Ip (dB)


S/N (dB) = 88 (dB) − Th8±2pps (dBRN)
PRF = { o = .3 KHz; Δ = 1 KHz; □ = 3 KHz } * = all
Radar ; PW = 3μs ; fc = 10 KHz
Co/N = 15 dB
55
60
65
70
75
Th8±2pps (dBRN)
30
25
20
15
10
3762
PW = 3μs
-30
-25
-20
-15
-10
-5
0
5
10
Co/Ip (dB)

[redacted] 46 [redacted]





S/N (dB) = 88(dB) - Th 8±2pps (dBRN)
PRF = o = .3 KHz, Δ = 1 KHz, □ = 3 KHz
* = all
Radar ; PW=30μs ; fc = 10 KHz
Co/N = 15dB
30
25
20
15
10
55
60
65
70
75
Th 8±2pps (dBRN)
-10
-5
0
5
10
15
20
25
30
Co/Ip (dB)
PW=30μS

C1 — 4 INTERFERING CARRIERS

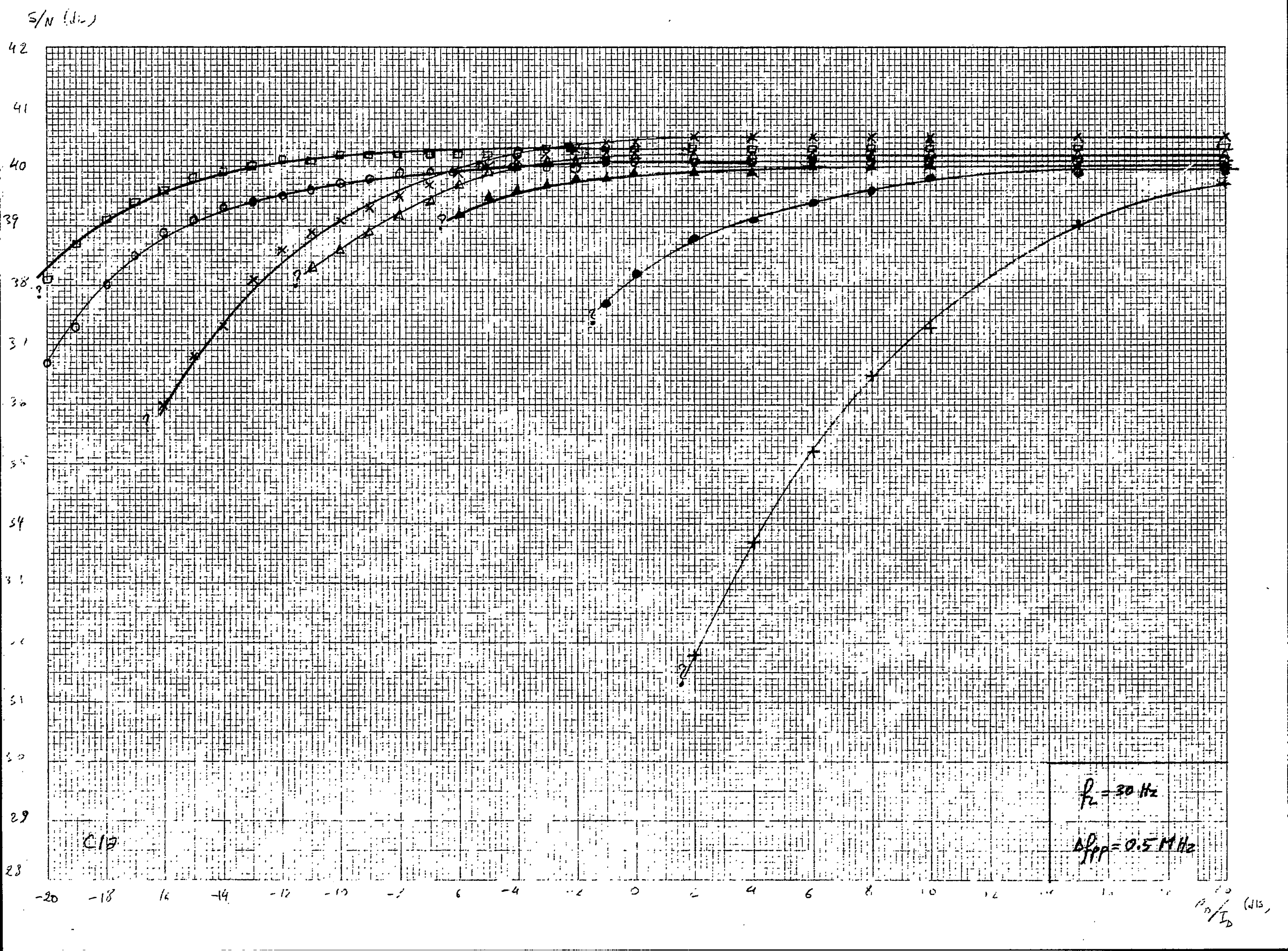
SCPC / FM

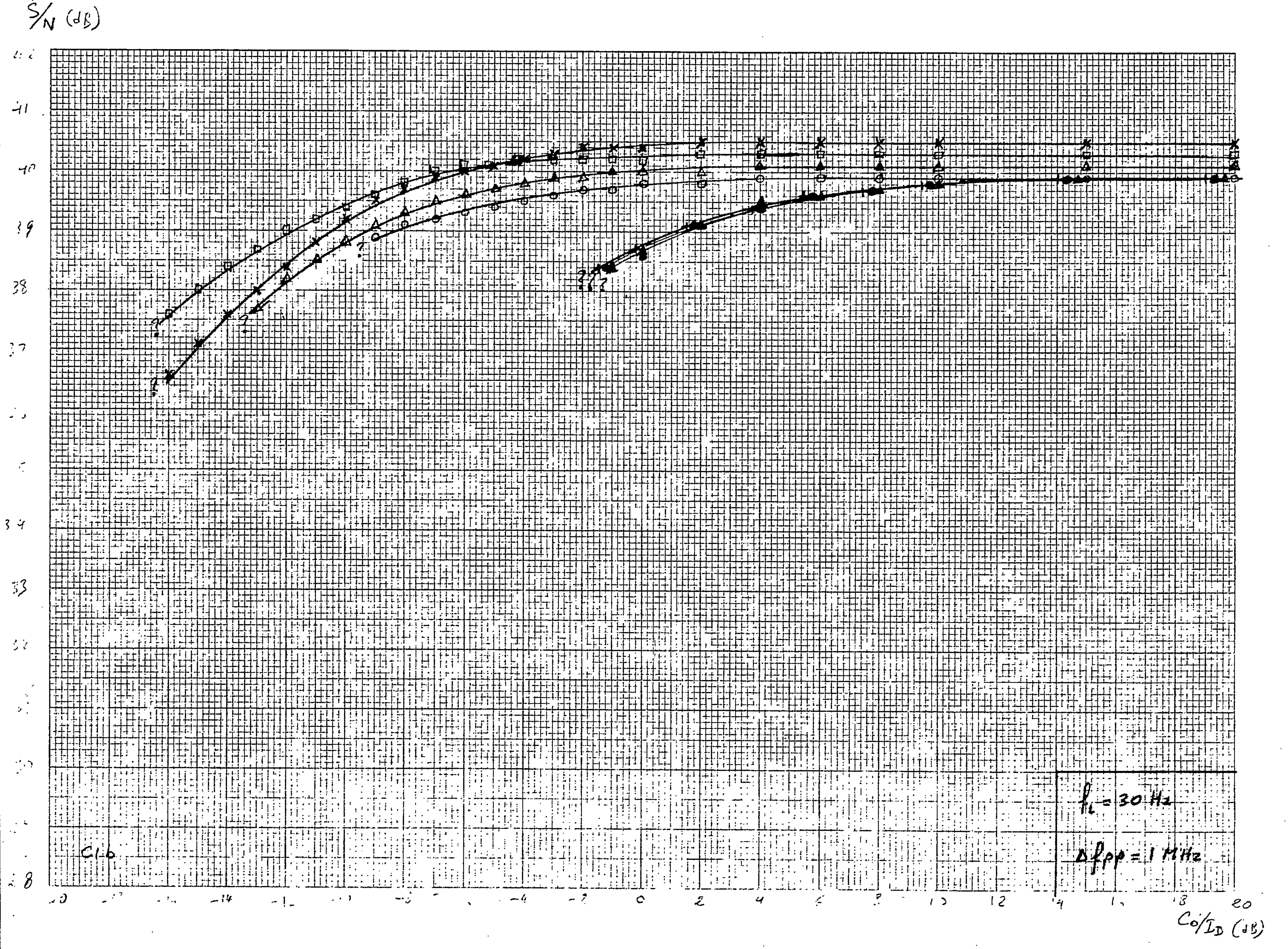
S/N LOADED VS C_o/I_o

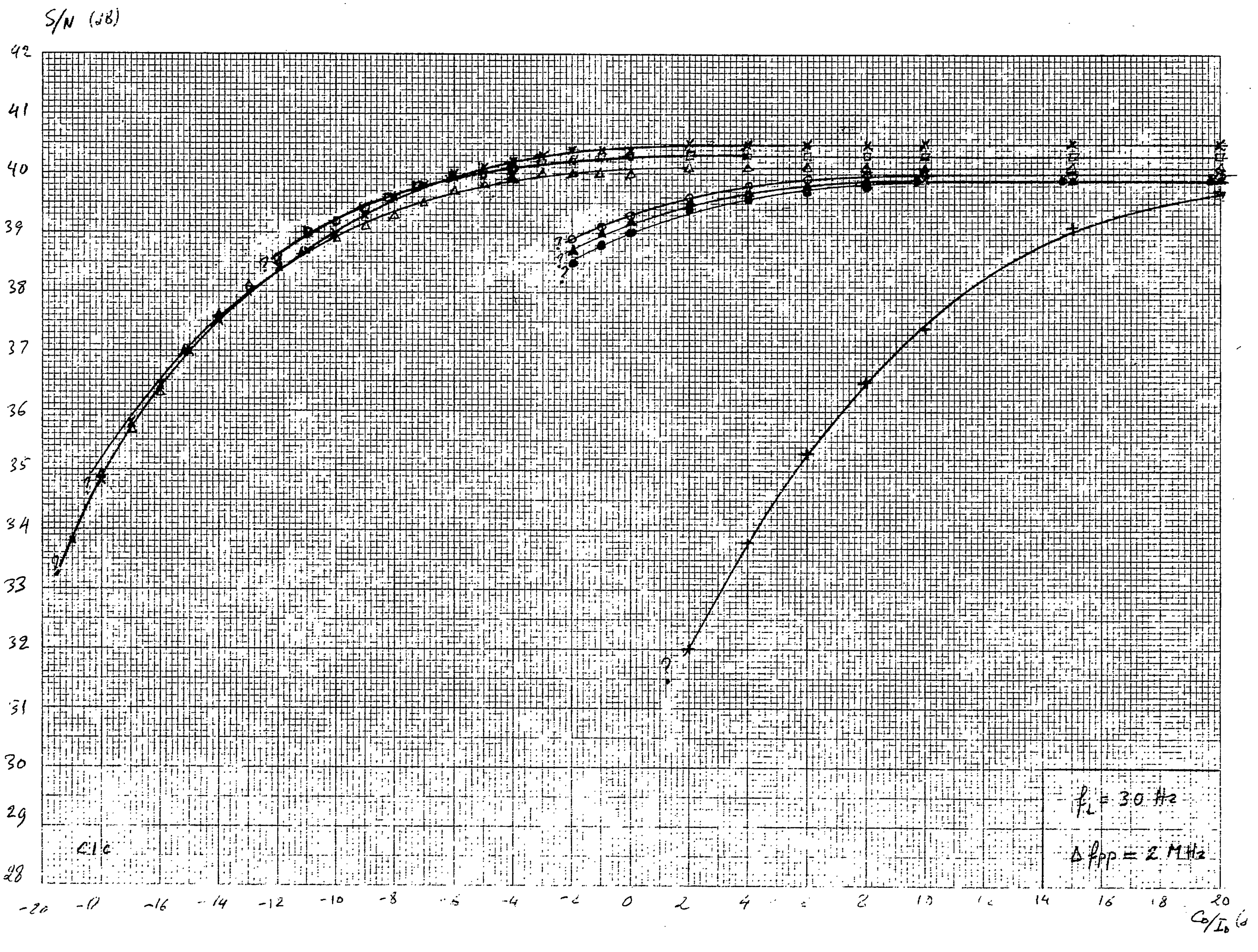
$C/N = \infty$

SYMBOL	fc
X	3.6 MHz
□	3.0 MHz
Δ	2.0 MHz
○	1.0 MHz
▲	500 kHz
●	100 kHz
+	10 kHz

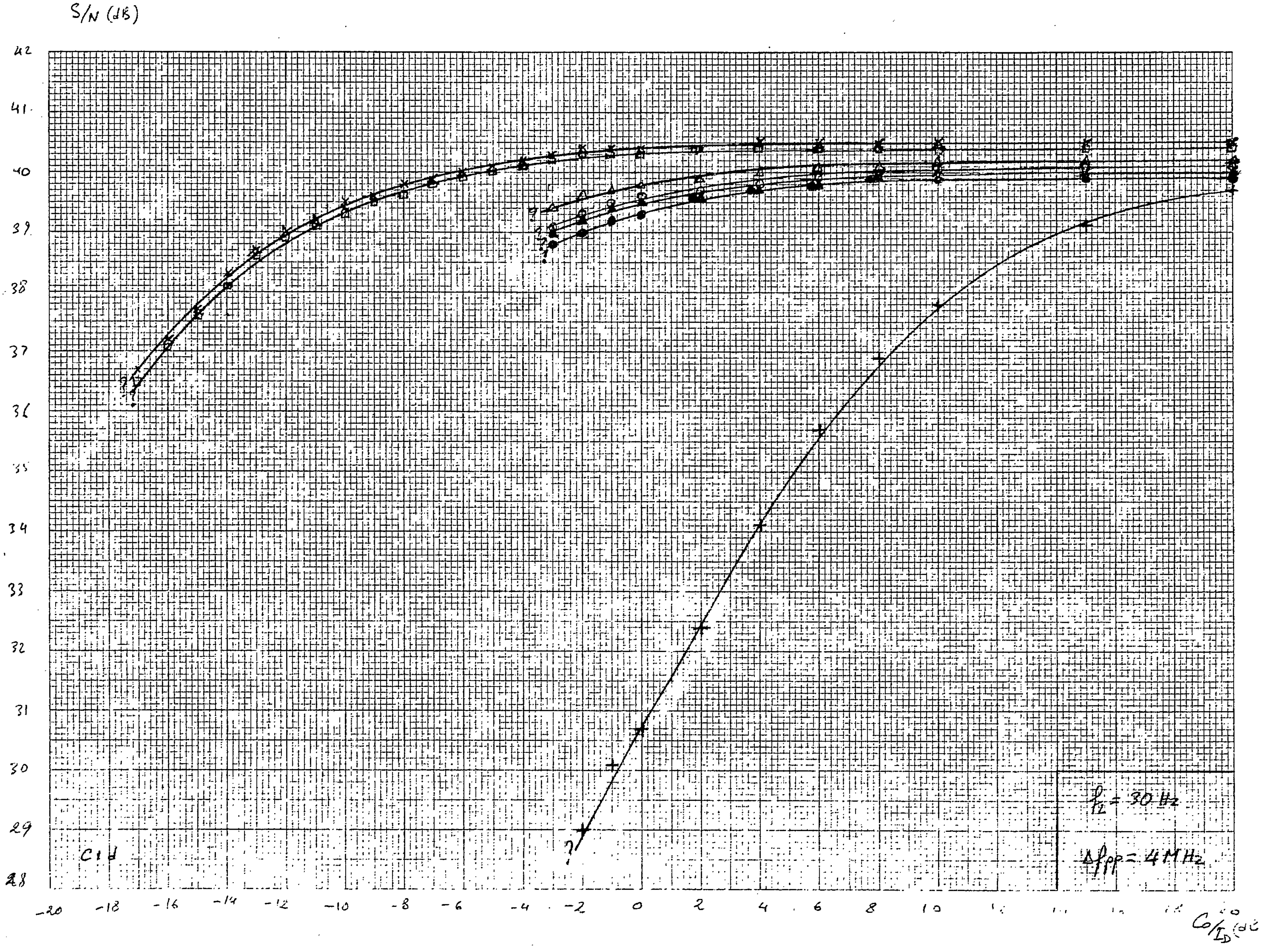
? = ERRATIC READING

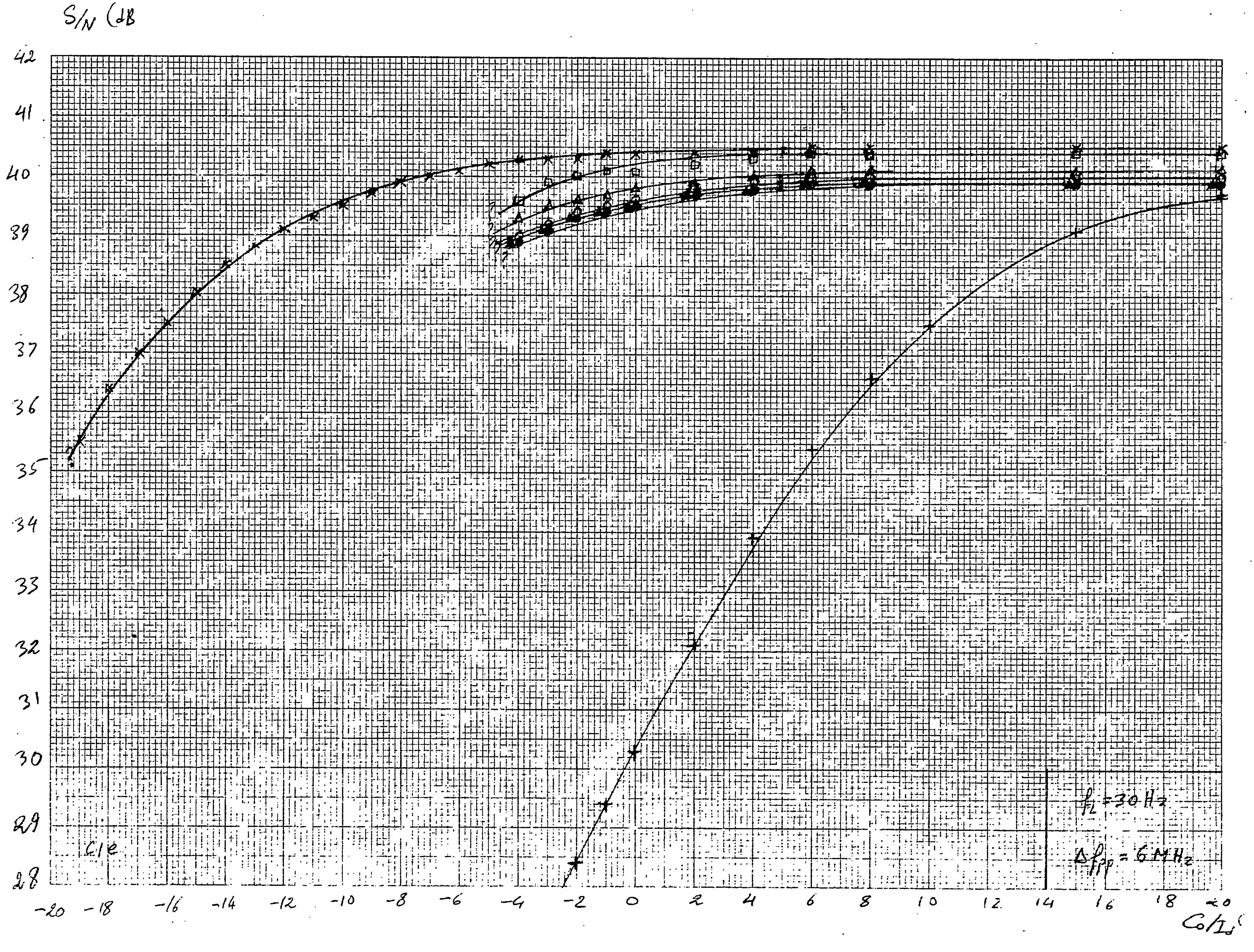

S/N (dB)
42
41
40
39
38
29
28
-20
-18
-14
4
6
P_S/I_D (dB)
C17
f_L = 30 Hz
Δf_pp = 0.5 MHz


S/N (dB)
Co/ID (dB)
fL = 30 Hz
Δfpp = 1 MHz
C1-b



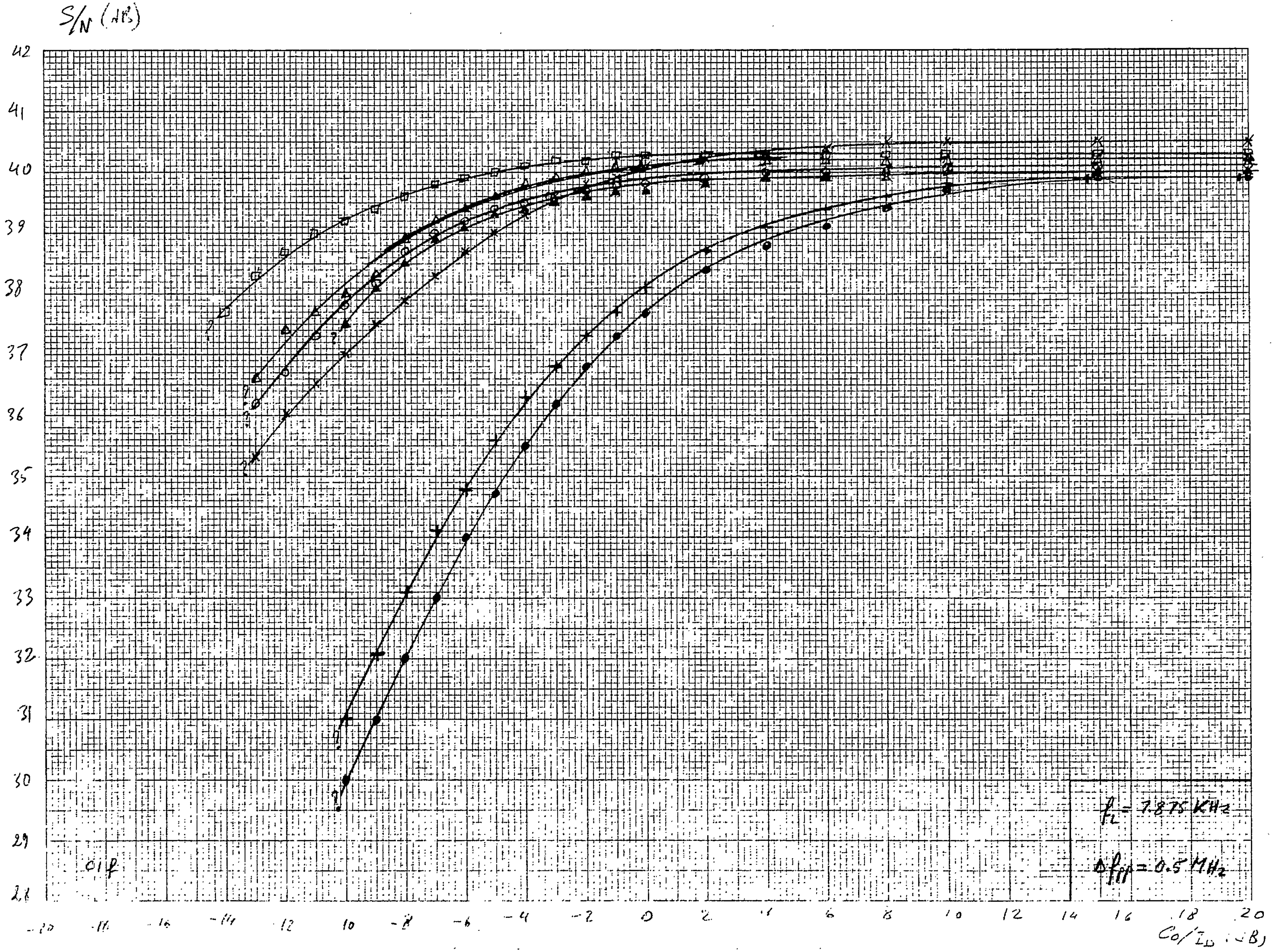
S/N (dB)
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
-20
-18
-16
-14
-12
-10
-8
-4
-2
0
2
4
8
10
14
16
18
20
C_o/I_b
$f_L = 30$ Hz
$\Delta f_{pp} = 2$ MHz

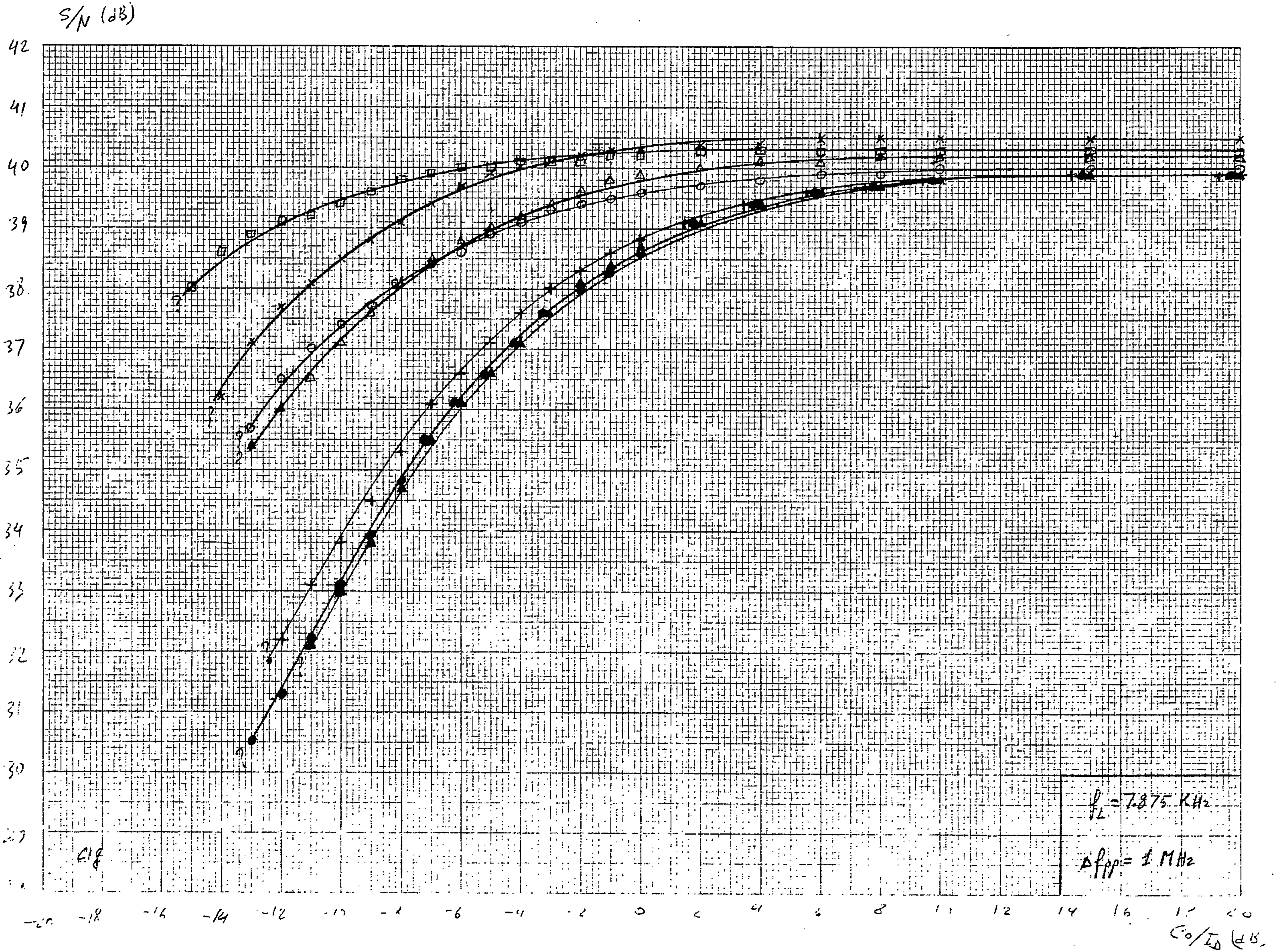

S/N (dB)
42
41
40
39
38
37
36
34
33
32
31
30
29
28
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
C1d
Δf_pp = 4 MHz
C0/ID

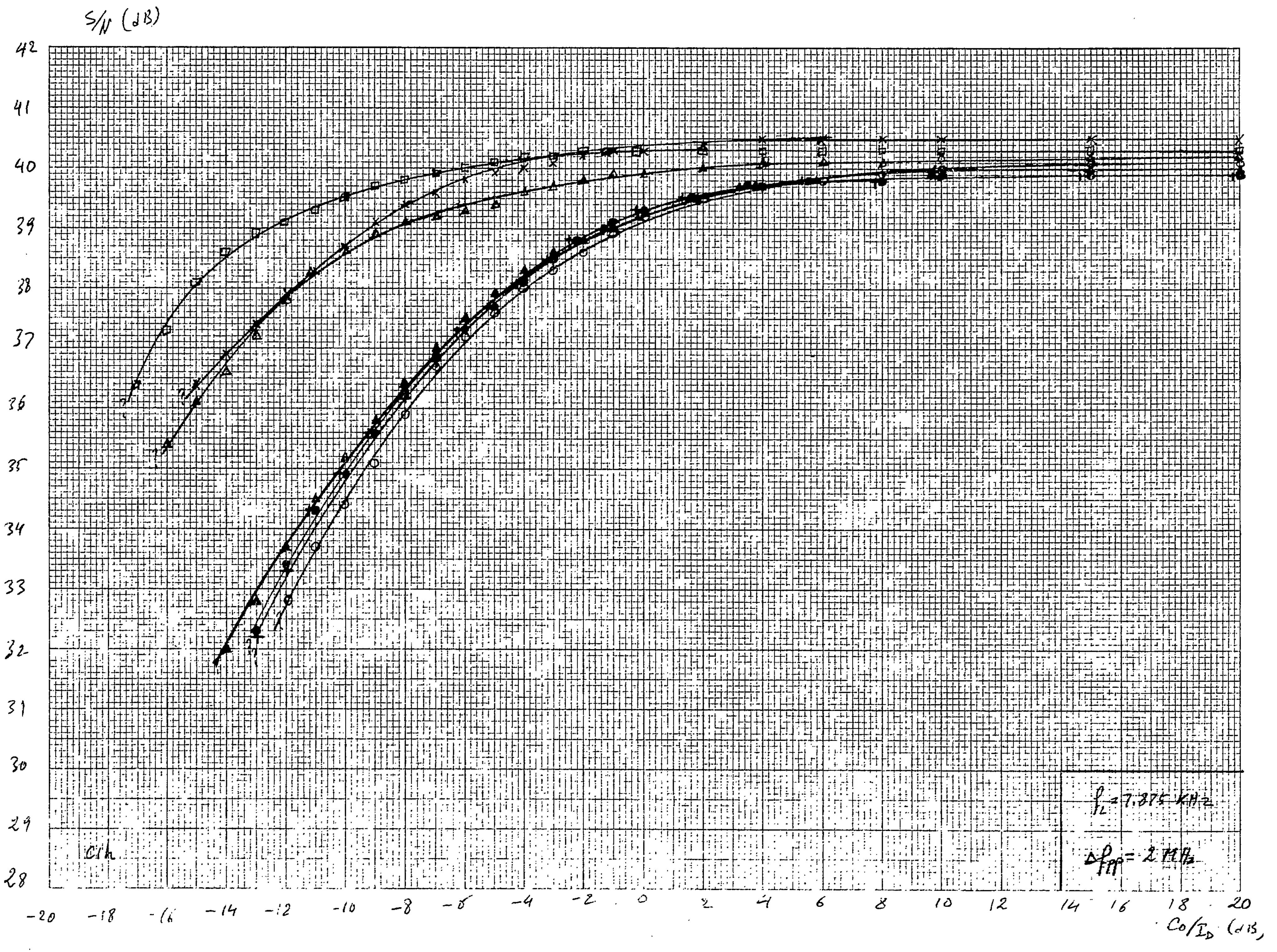


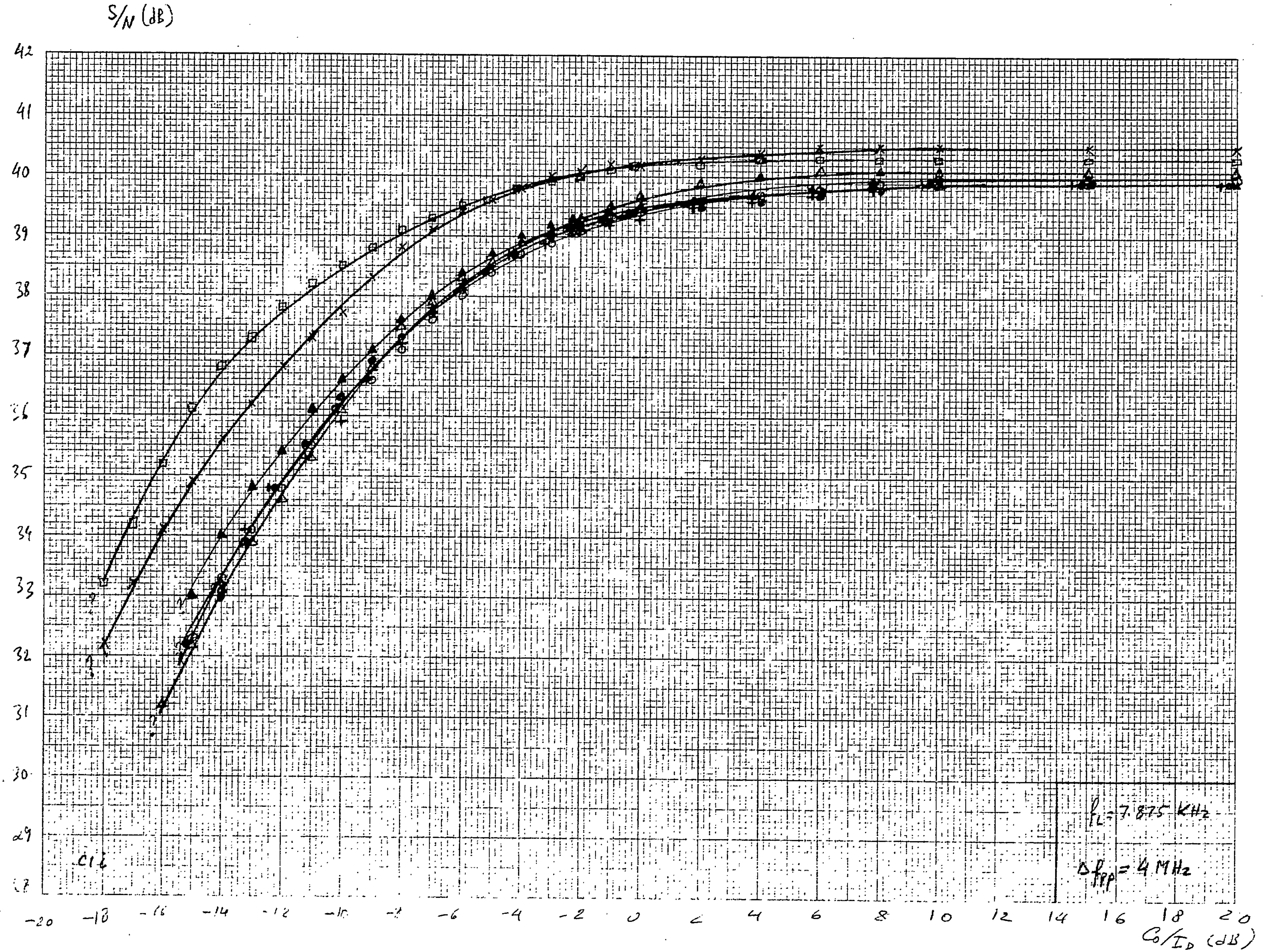
S/N (dB
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
C1e
f_L = 30 Hz
Δf_{pp} = 6 MHz
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
Co/Id

[redacted] K+E [redacted] 322 [redacted]

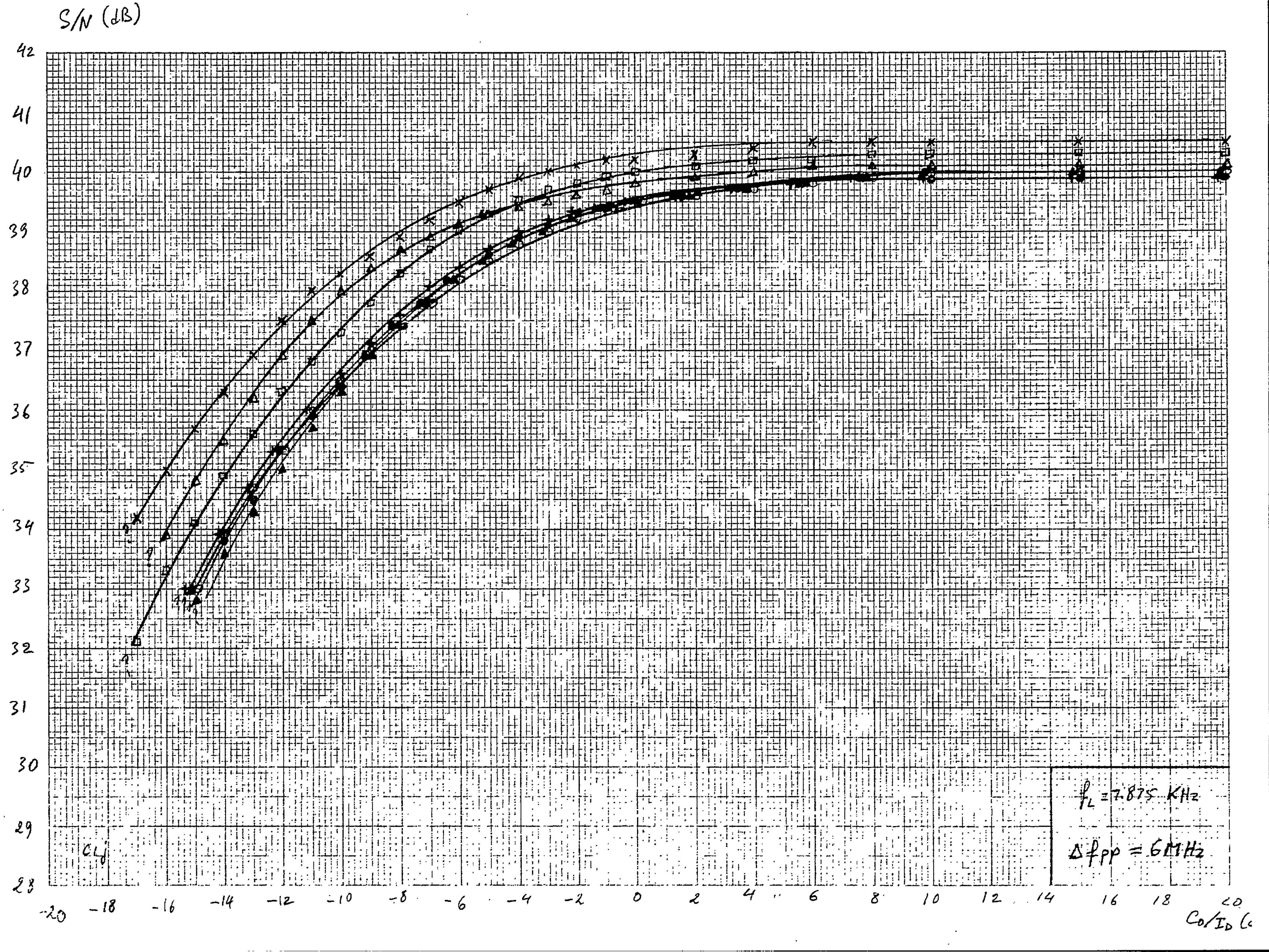


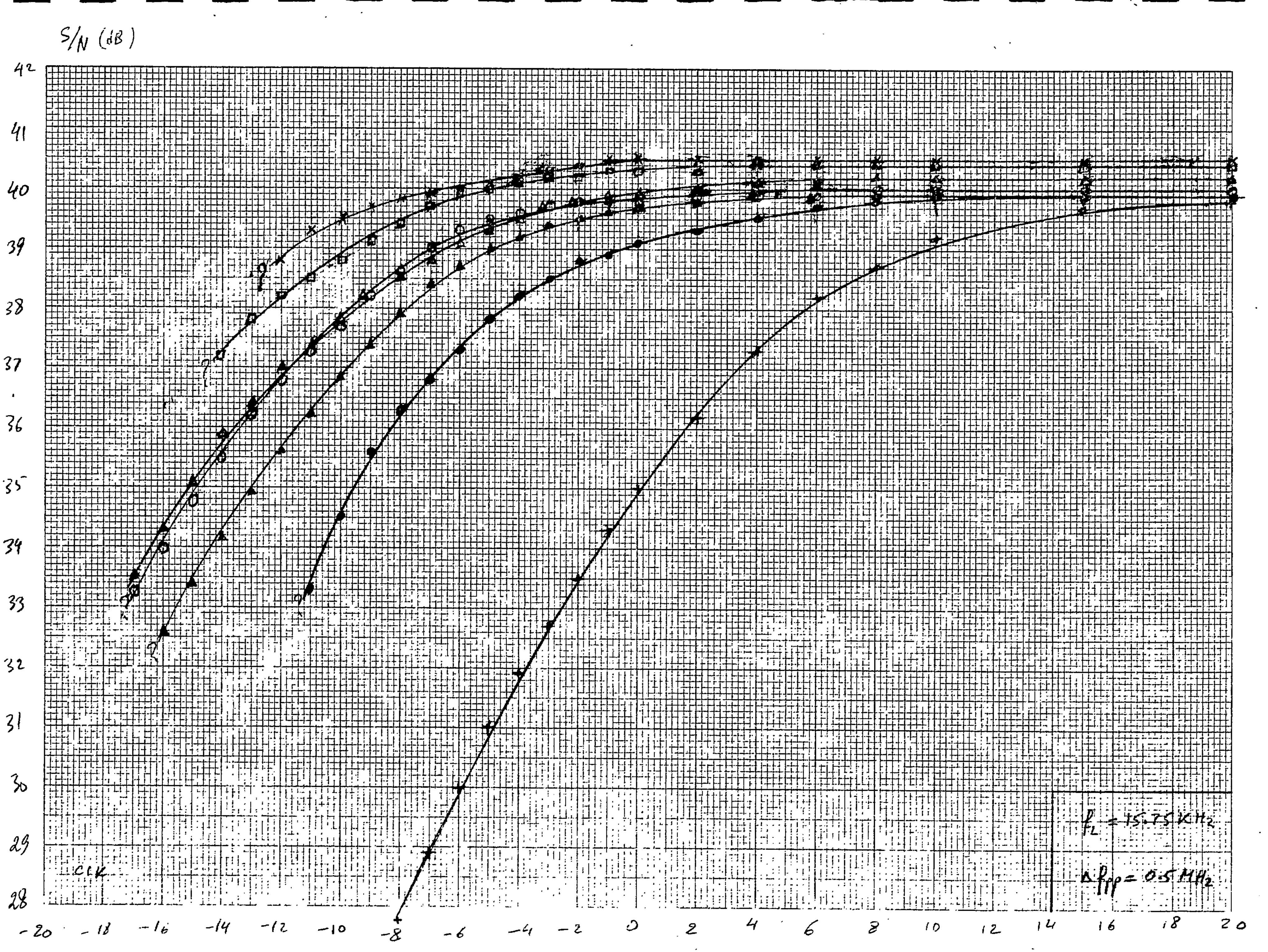

S/N (dB)
42
41
40
39
38
37
36
35
34
33
32
31
30
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
14
16
18
20
C_0/I_D (dB)
f_L = 7.875 KHz
Δf_{pp} = 1 MHz

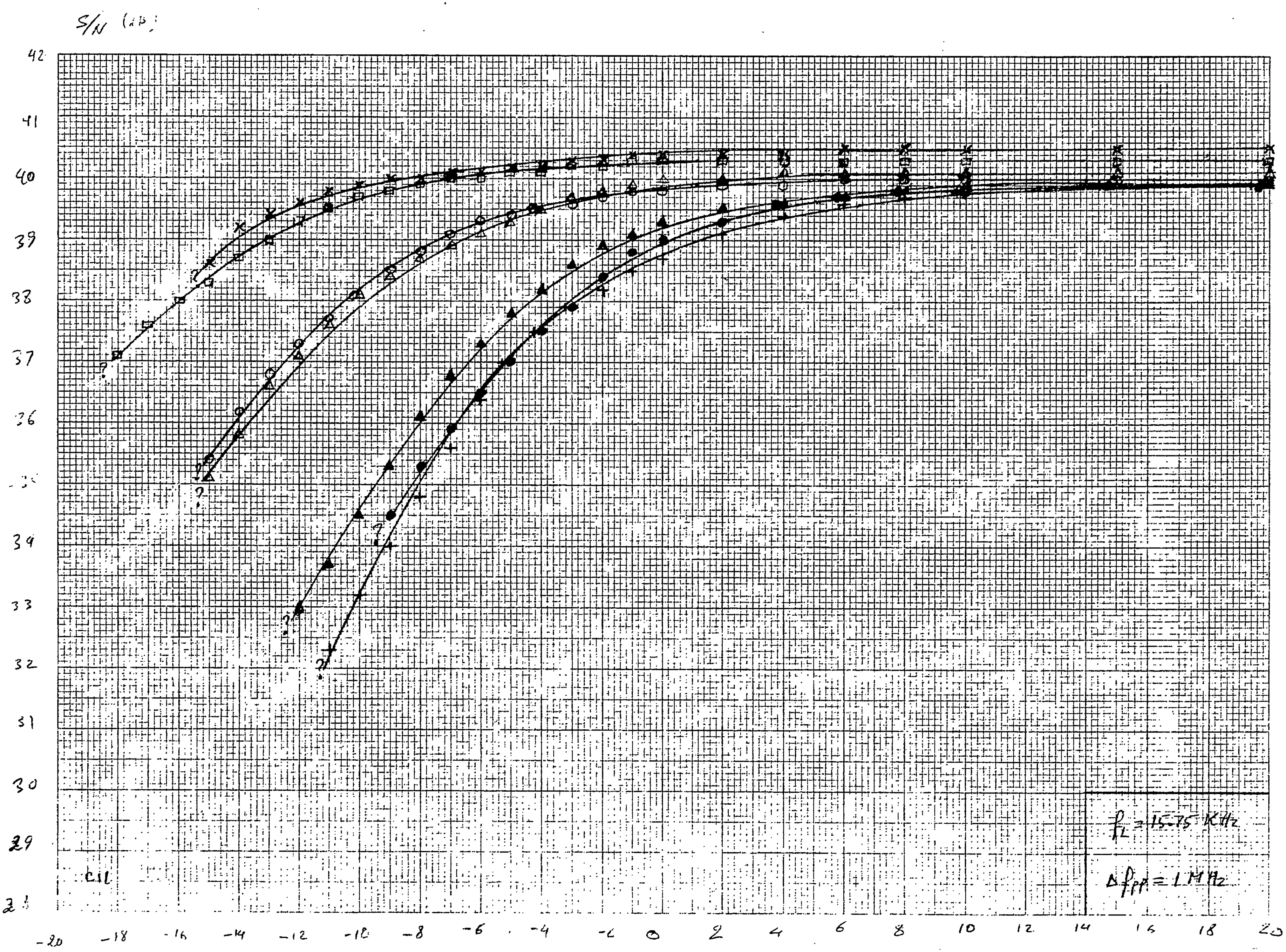

S/N (dB)
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
14
16
18
20
Co/I_D (dB)
f_L = 7.875 KHz
Δf_pp = 2 MHz
C/h


S/N (dB)
42
41
40
39
38
37
36
35
34
33
32
31
30
29
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
12
14
16
18
20
Co/I_D (dB)
f_L = 7.875 KHz
Δf_PP = 4 MHz

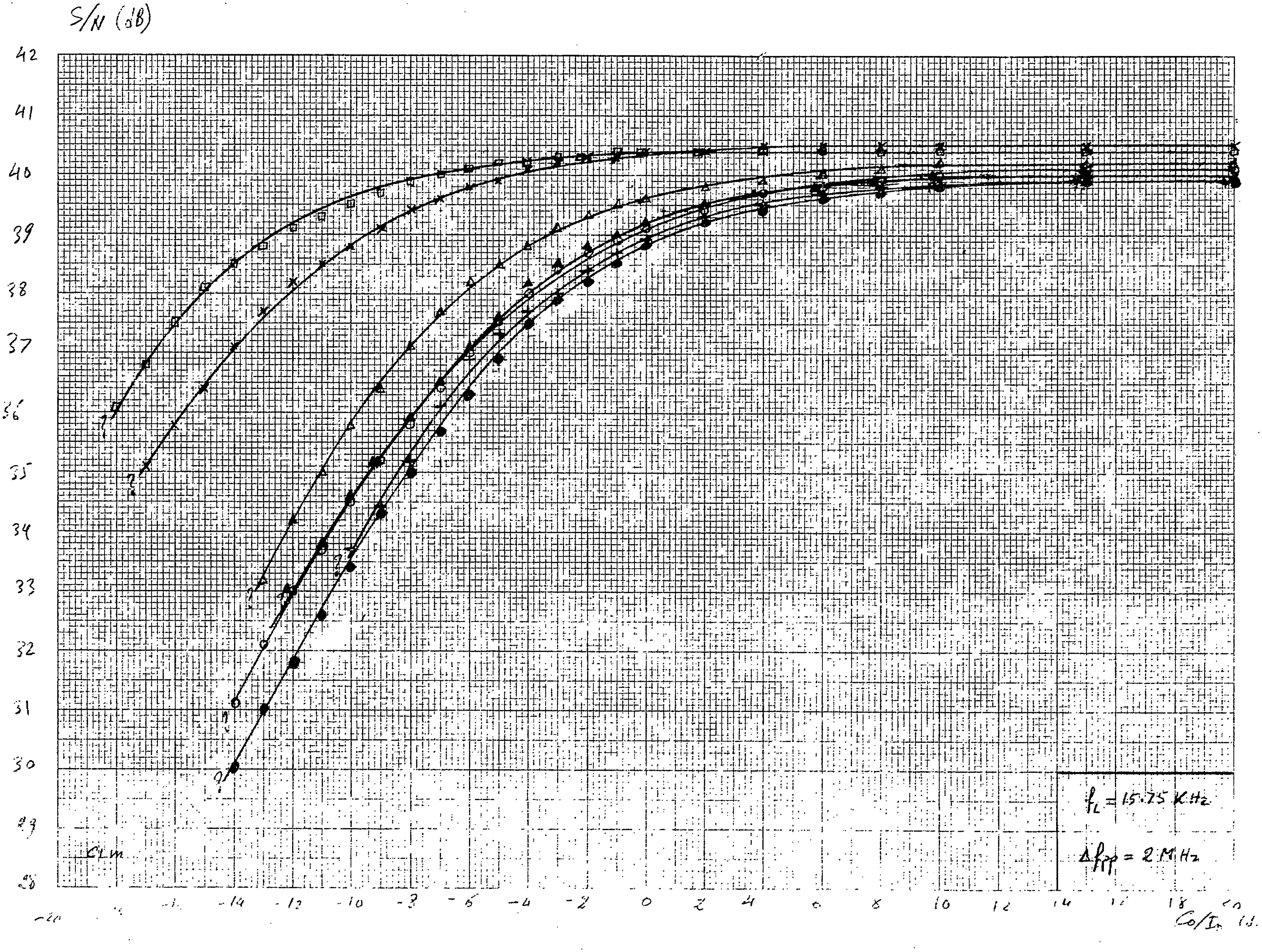
[redacted] K[redacted] 10 [redacted] NCH [redacted] INC [redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted] 1322 [redacted]



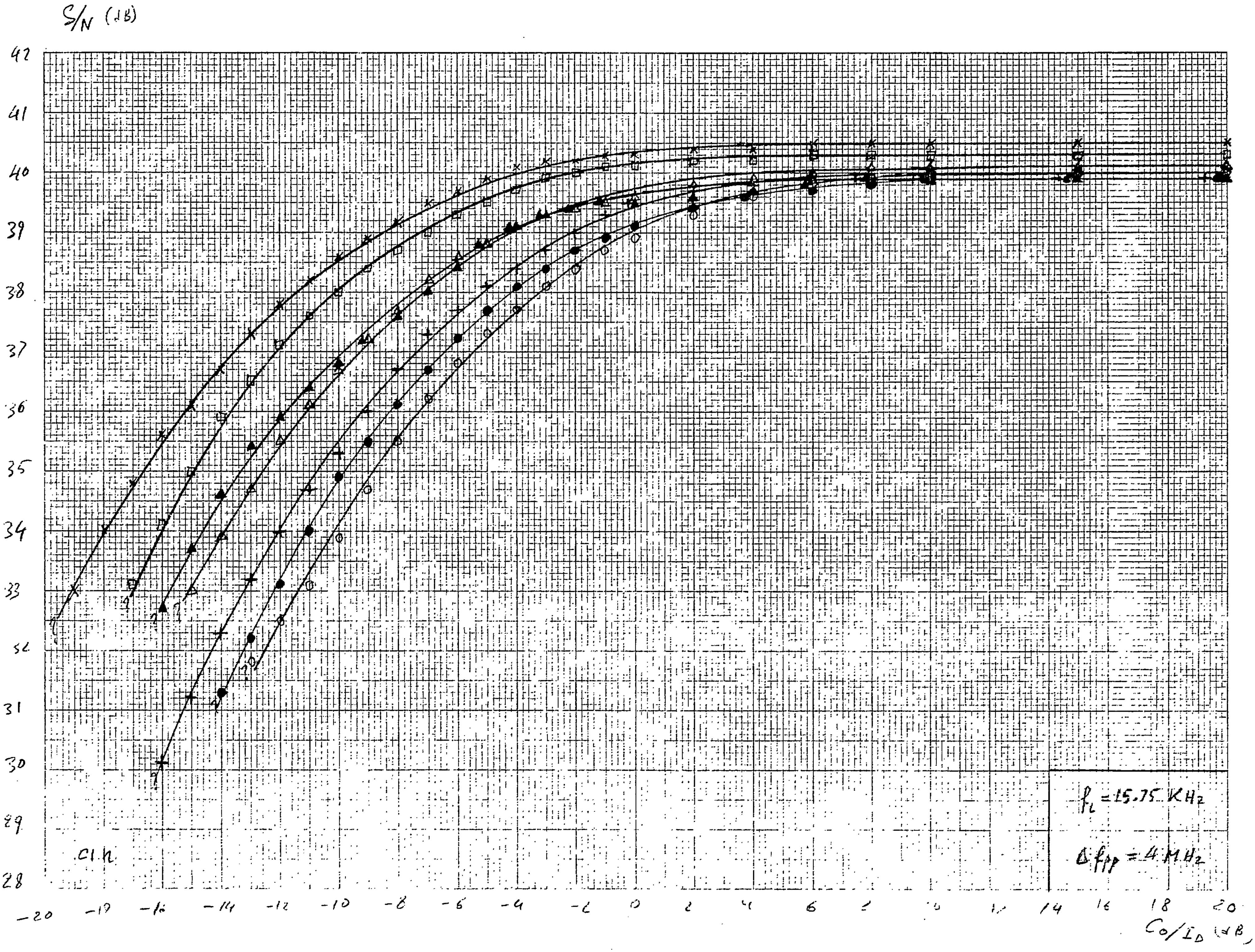

S/N (dB)
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
CLK
f_L = 15.75 KHz
Δf_{pp} = 0.5 MHz

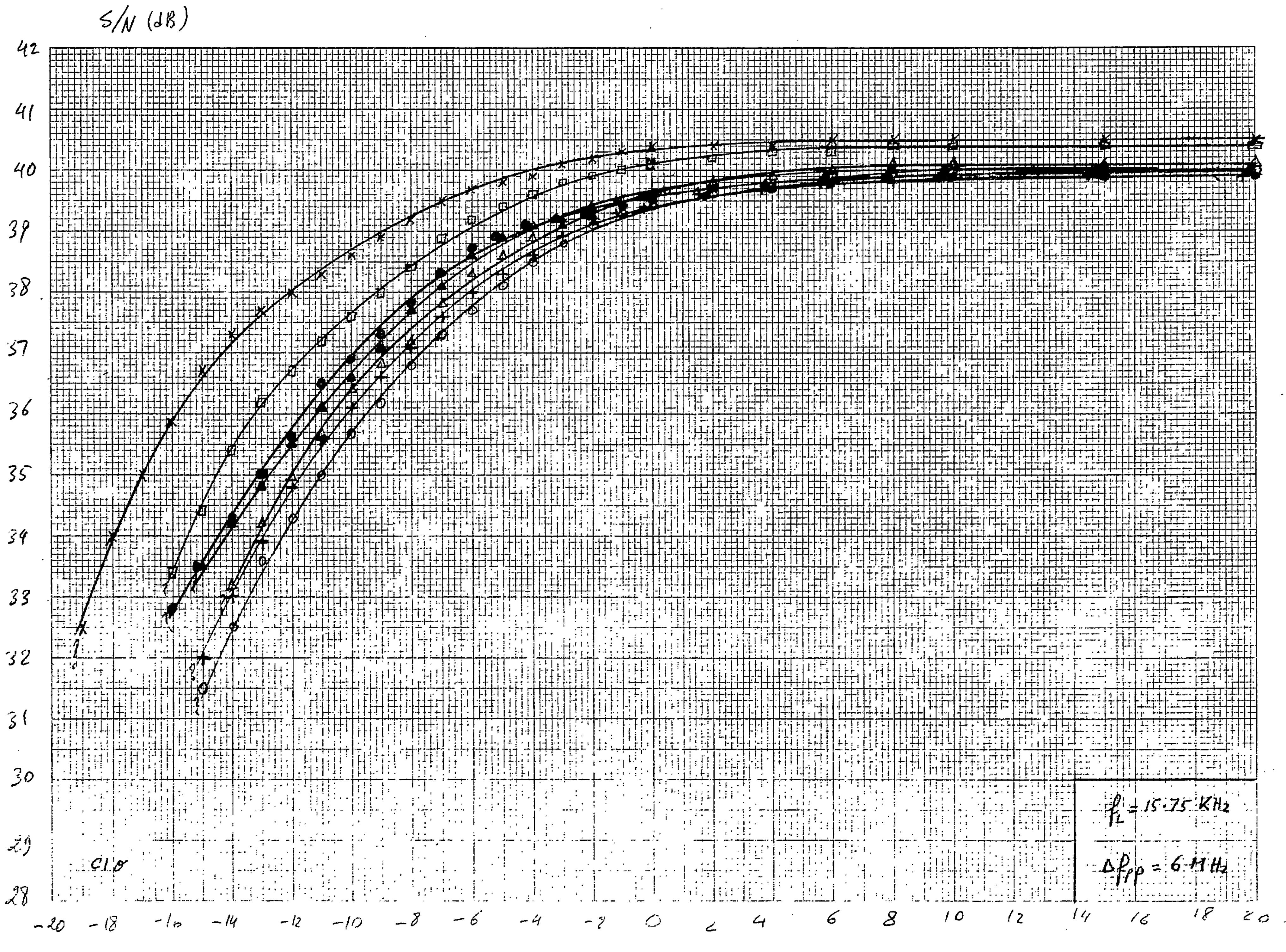

S/N (dB)
42
41
40
39
38
37
36
34
33
32
31
30
29
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
f_L = 15.75 KHz
Δf_pp = 1 MHz

K [redacted] X 10 [redacted] INC [redacted] INC [redacted] 132 [redacted]
[redacted] MADE IN U.S.A.



[redacted] ([redacted] K[redacted] X 10 [redacted] INC[redacted] 9 INC [redacted] 132 [redacted]





S/N (dB)
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
-20 -18 -16 -14 -12 -10 -8 -6 -4 -2 0 2 4 6 8 10 12 14 16 18 20
f_L = 15.75 KHz
Δf_pp = 6 MHz

C2

4 INTERFERING CARRIERS

IMPULSE NOISE THRESHOLD V/S

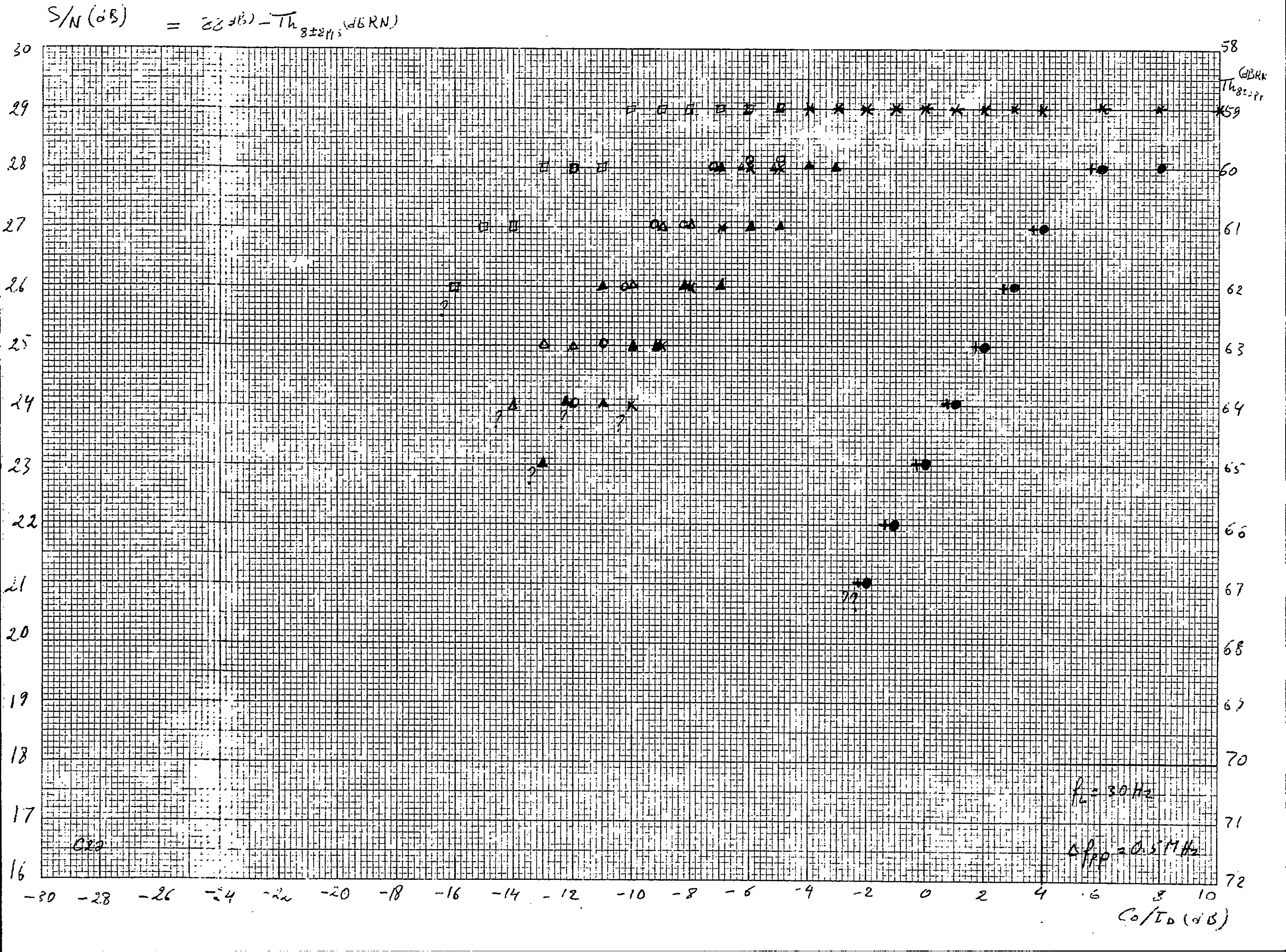
C_o/I_D

WITH C/N = 15 dB

SYMBOL	f_c
X	3.6 MHz
□	3.0 MHz
Δ	2.0 MHz
○	1.0 MHz
▲	500 kHz
●	100 kHz
+	10 kHz

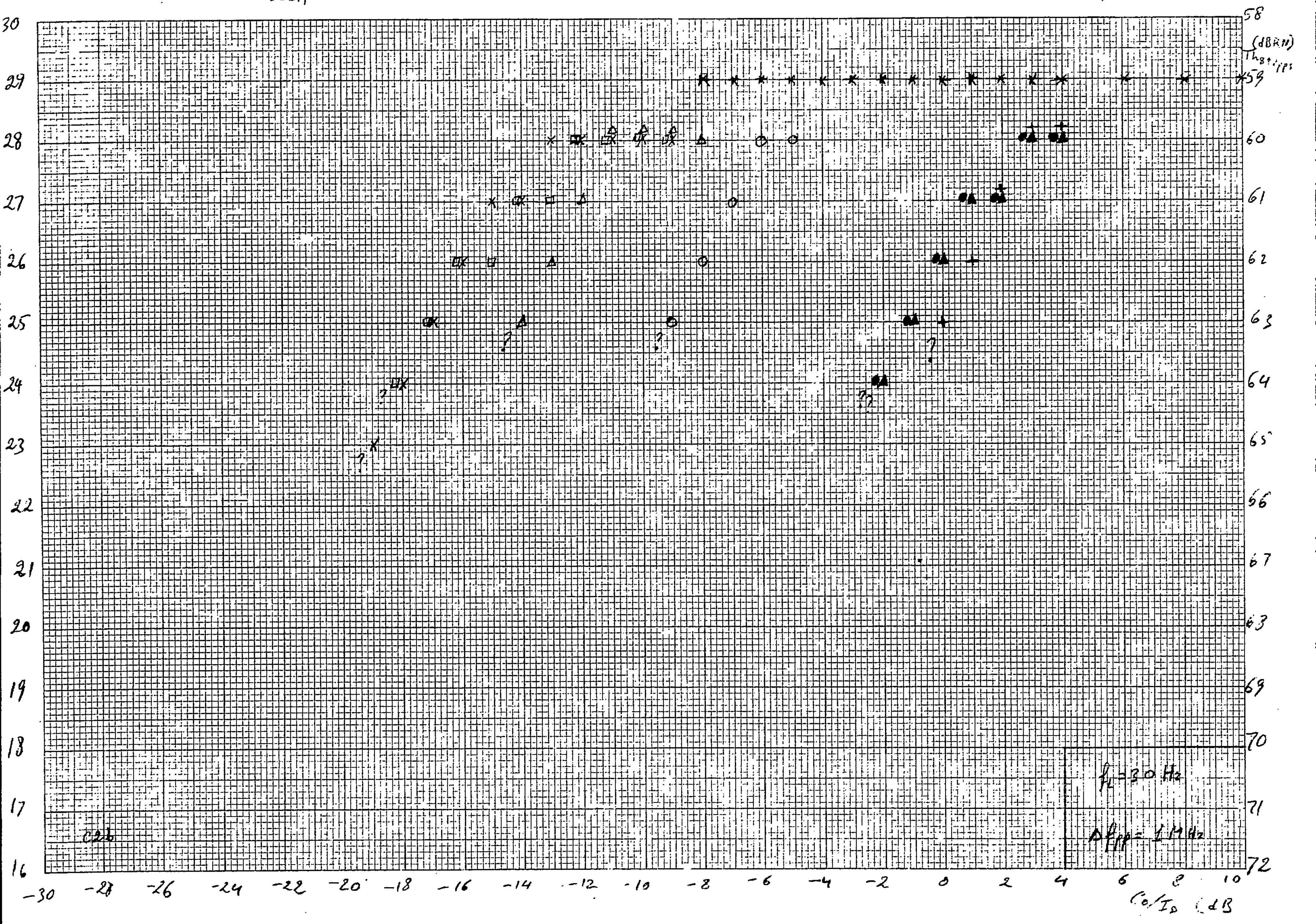
? = ERRATIC READING

[redacted]



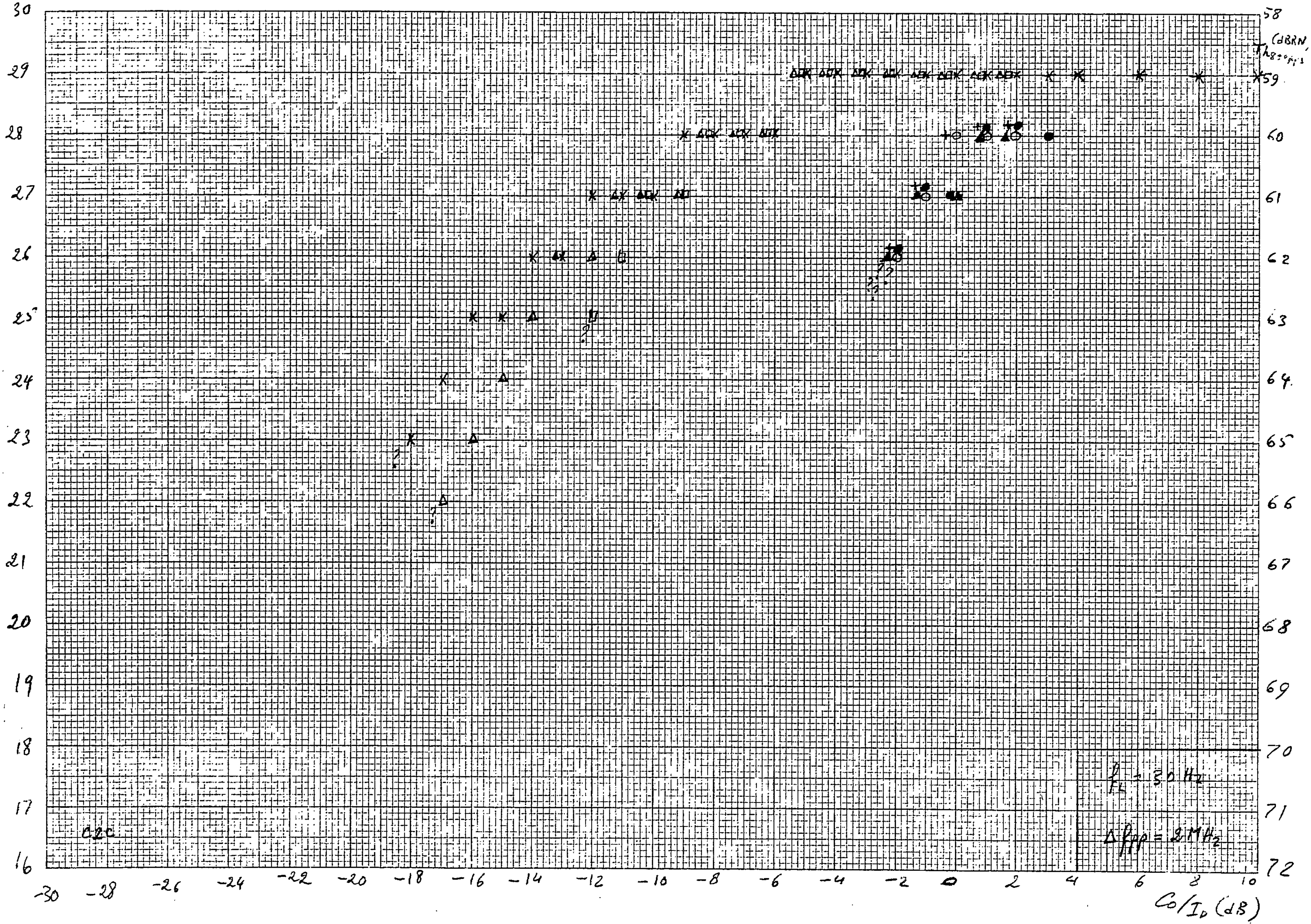
S/N (dB) = 22(dB) − Th 8±2MHz (dBRN)
Th 8±2MHz (dBRN)
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
58
59
60
61
62
63
64
65
66
67
68
70
71
72
−30 −28 −26 −24 −22 −20 −18 −16 −14 −12 −10 −8 −6 −4 −2 0 2 4 6 8 10
Co/ID (dB)
fL = 30 Hz
Δfpp = 0.5 MHz
C22

S/N (dB) = 8 (dB) − Th8±2rps (dBRN)

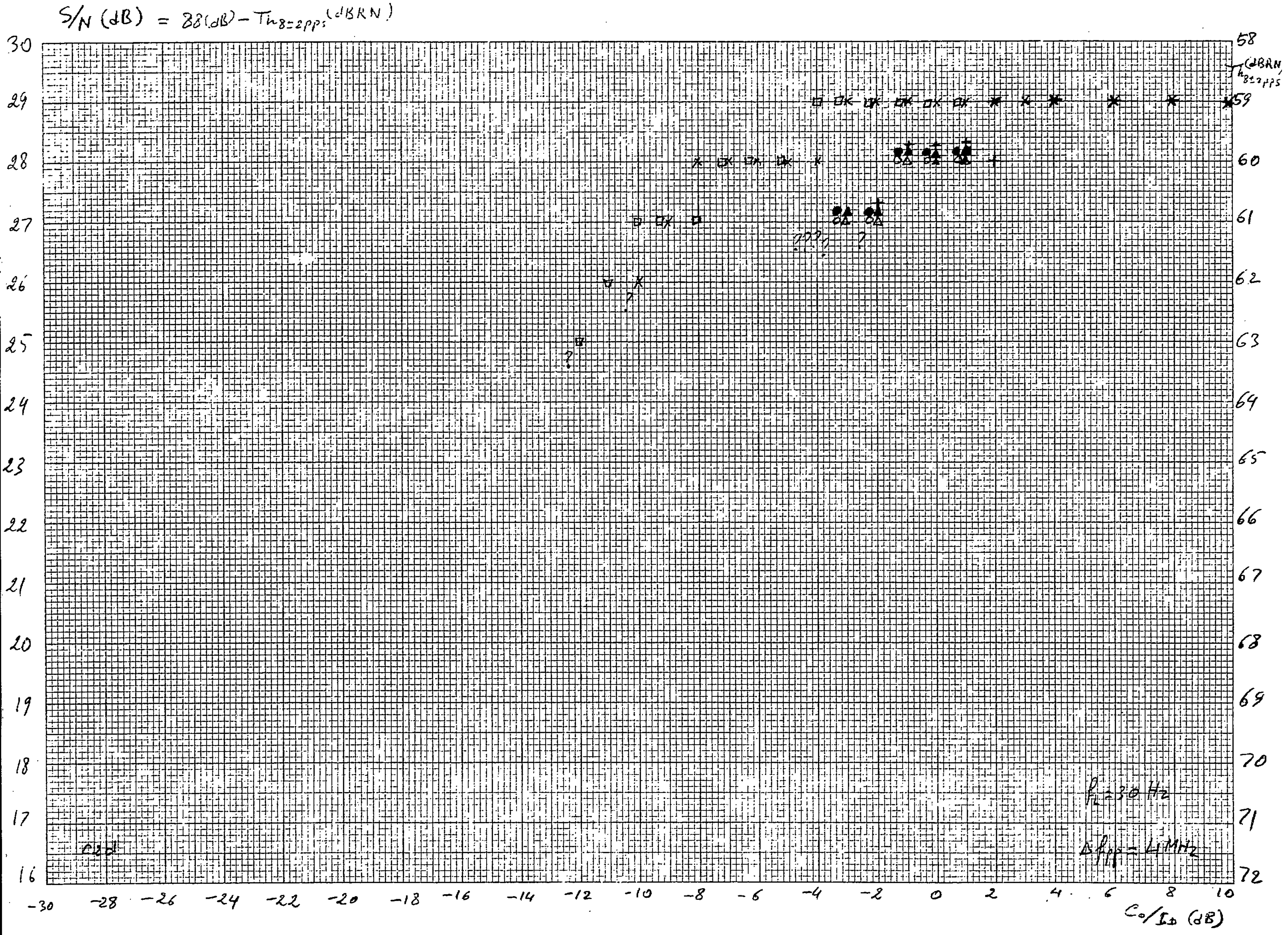


[redacted]

$S/N\,(dB) = 83\,(dB) - Th_{812\,pps}\,(dBRN)$

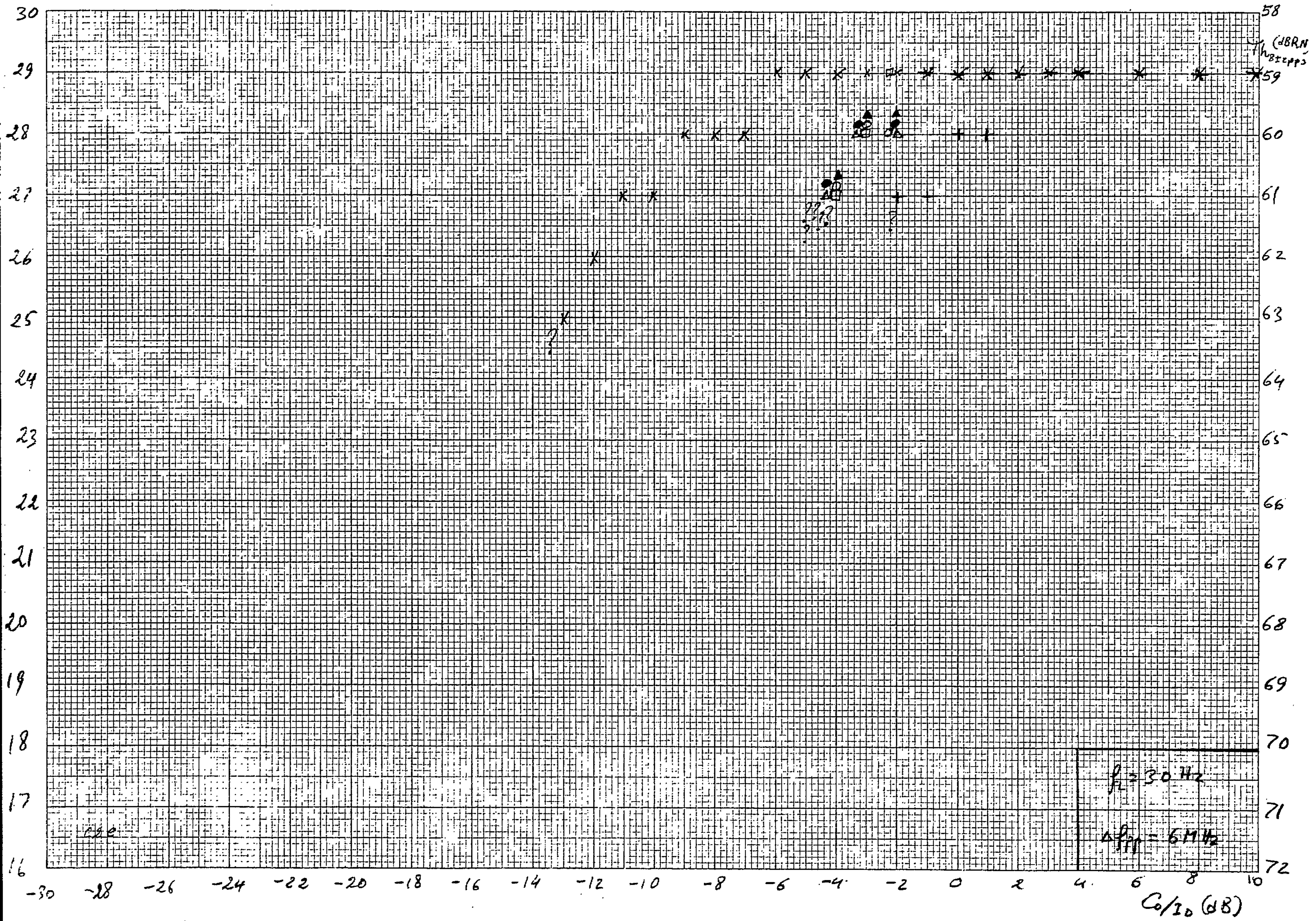


[redacted] TO [redacted] 7 [redacted] HES [redacted] 46 [redacted] 3 [redacted]



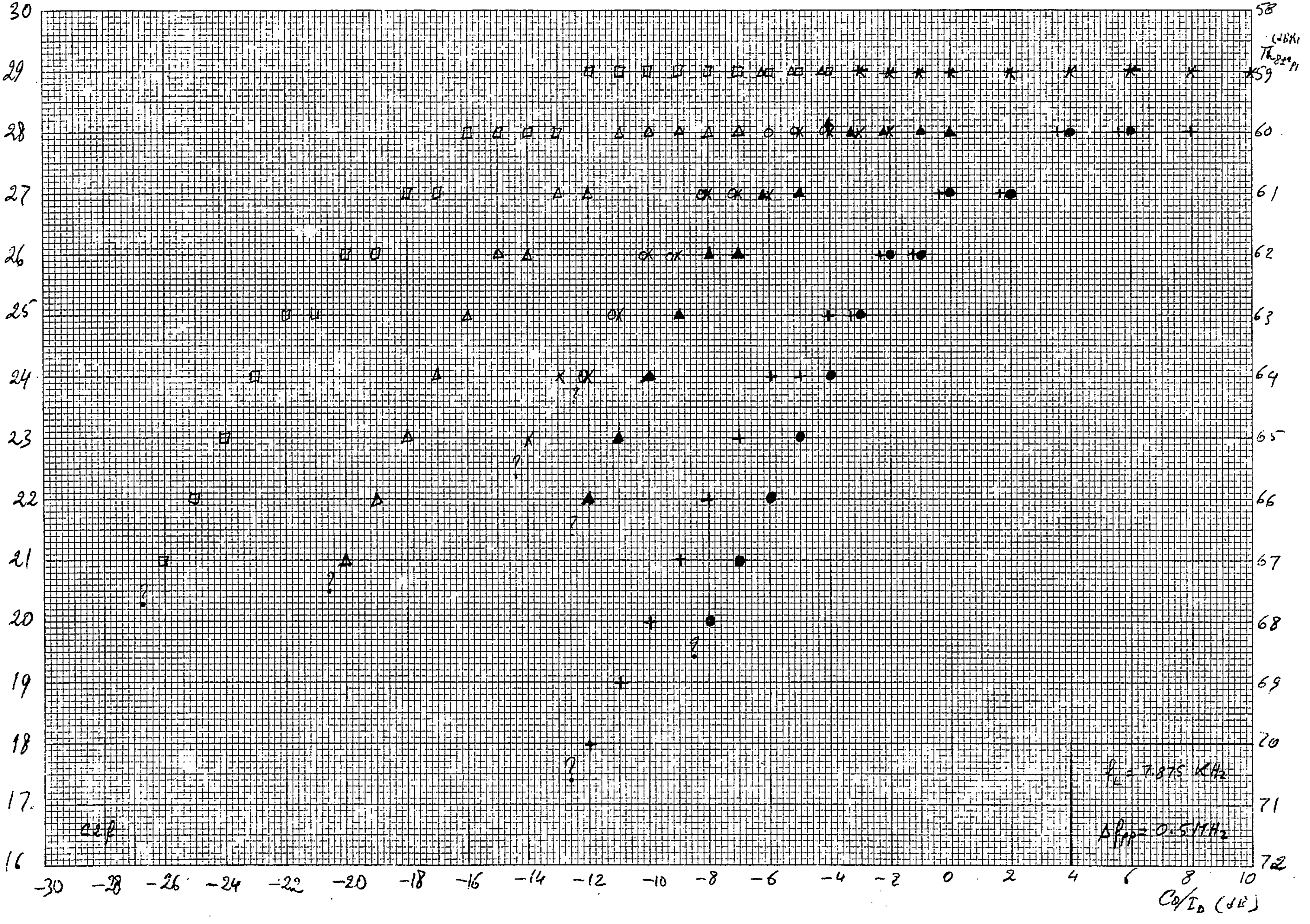
KEUFFEL & ESSER CO. MADE IN U.S.A. 46 1323

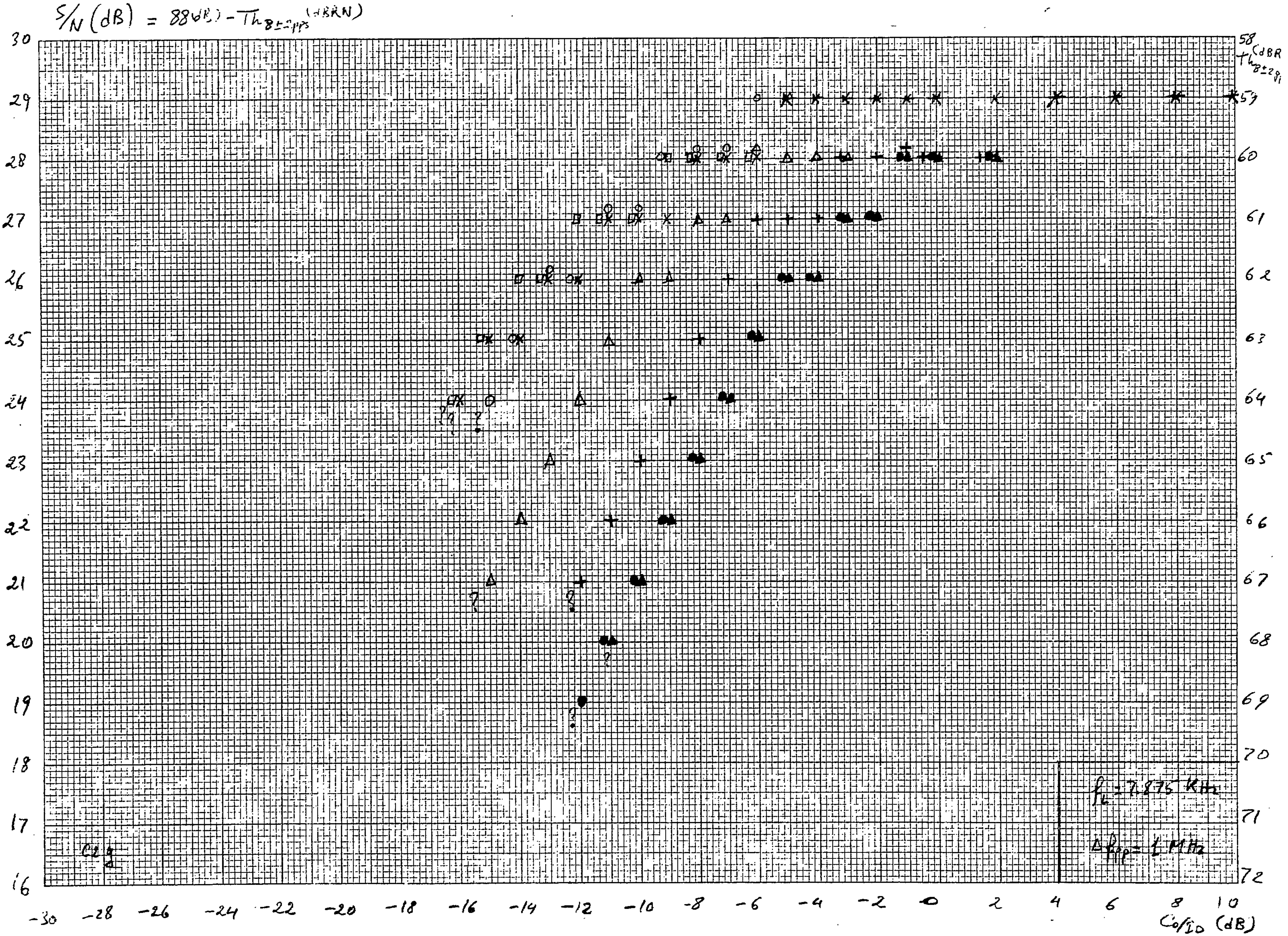
$S/N\,(dB) = 82(dB) - Th_{8\pm2pps}(dBRN)$



[redacted] KEUFFEL & ESSER CO. [redacted]

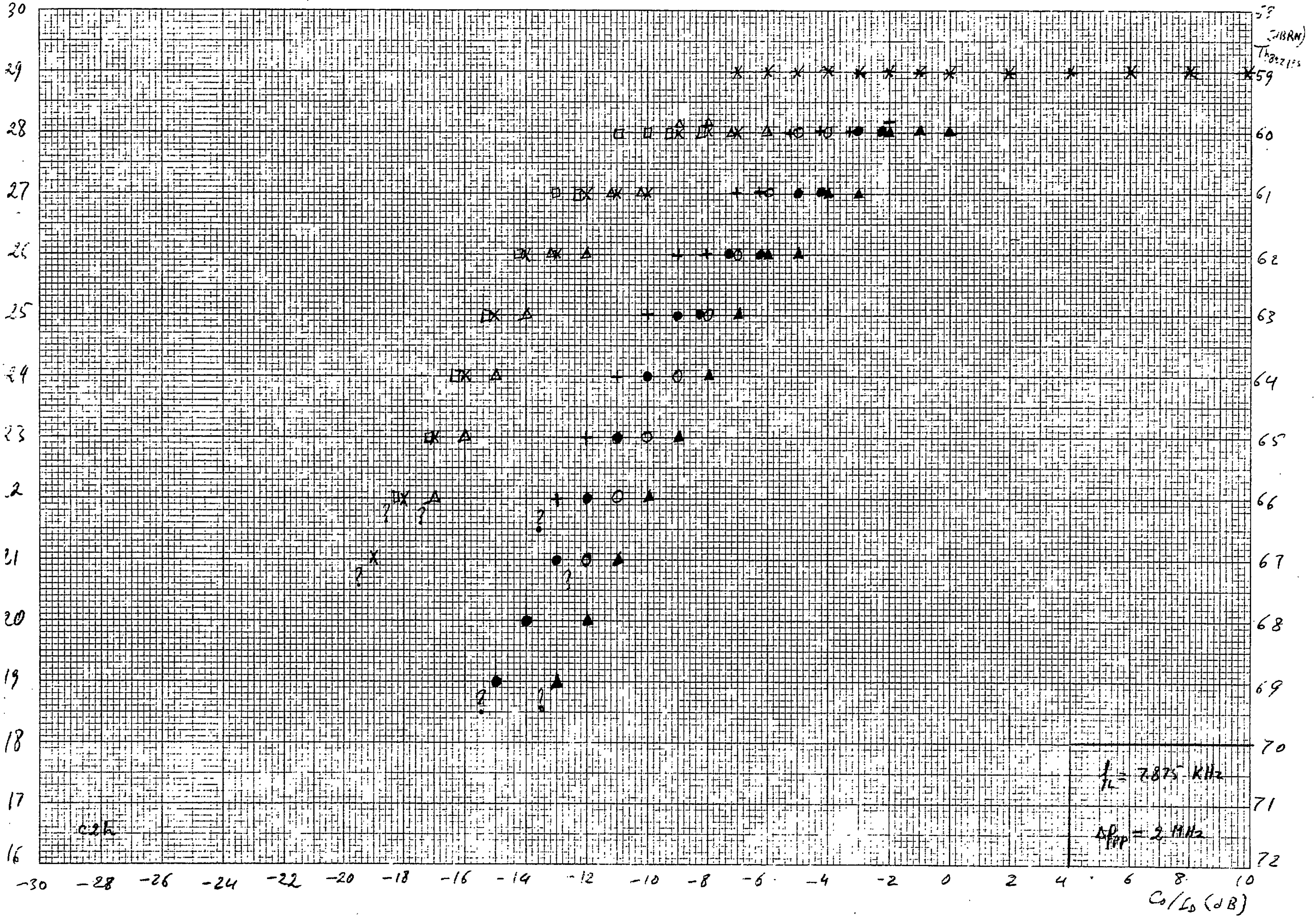
S/N (dB) = 83 dB − Th (dBRN)




S/N (dB) = 88 dB - Th8±2pps (dBRN)
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
58 dBR Th8±2pps
59
60
61
62
63
64
65
66
67
68
69
70
71
72
-30
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
Co/Io (dB)
fL = 7.875 KHz
Δfpp = 1 MHz

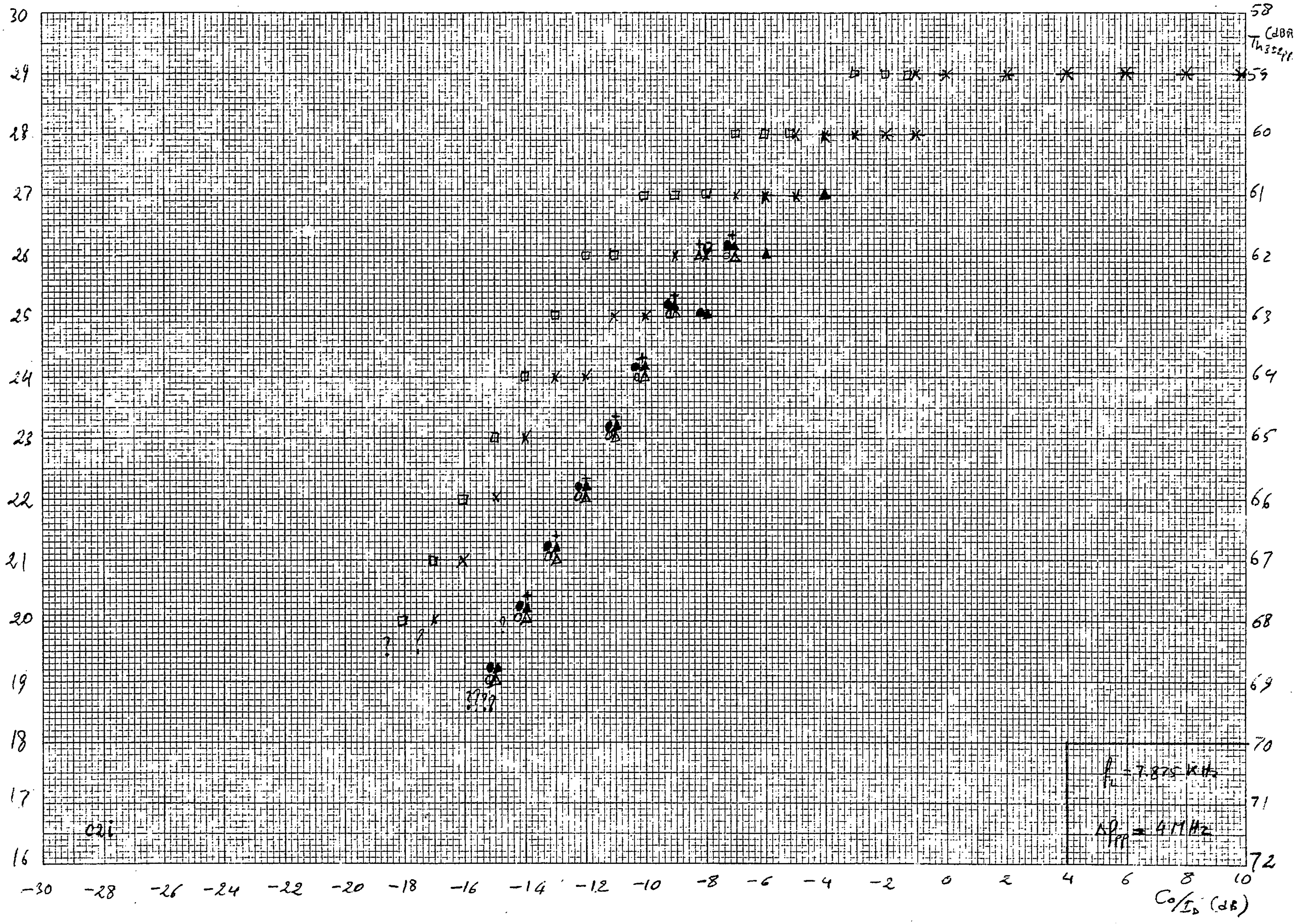
[redacted]

$S/N\ (dB) = 88\ (dB) - Th_{8\pm2\,pps}\ (dBRN)$

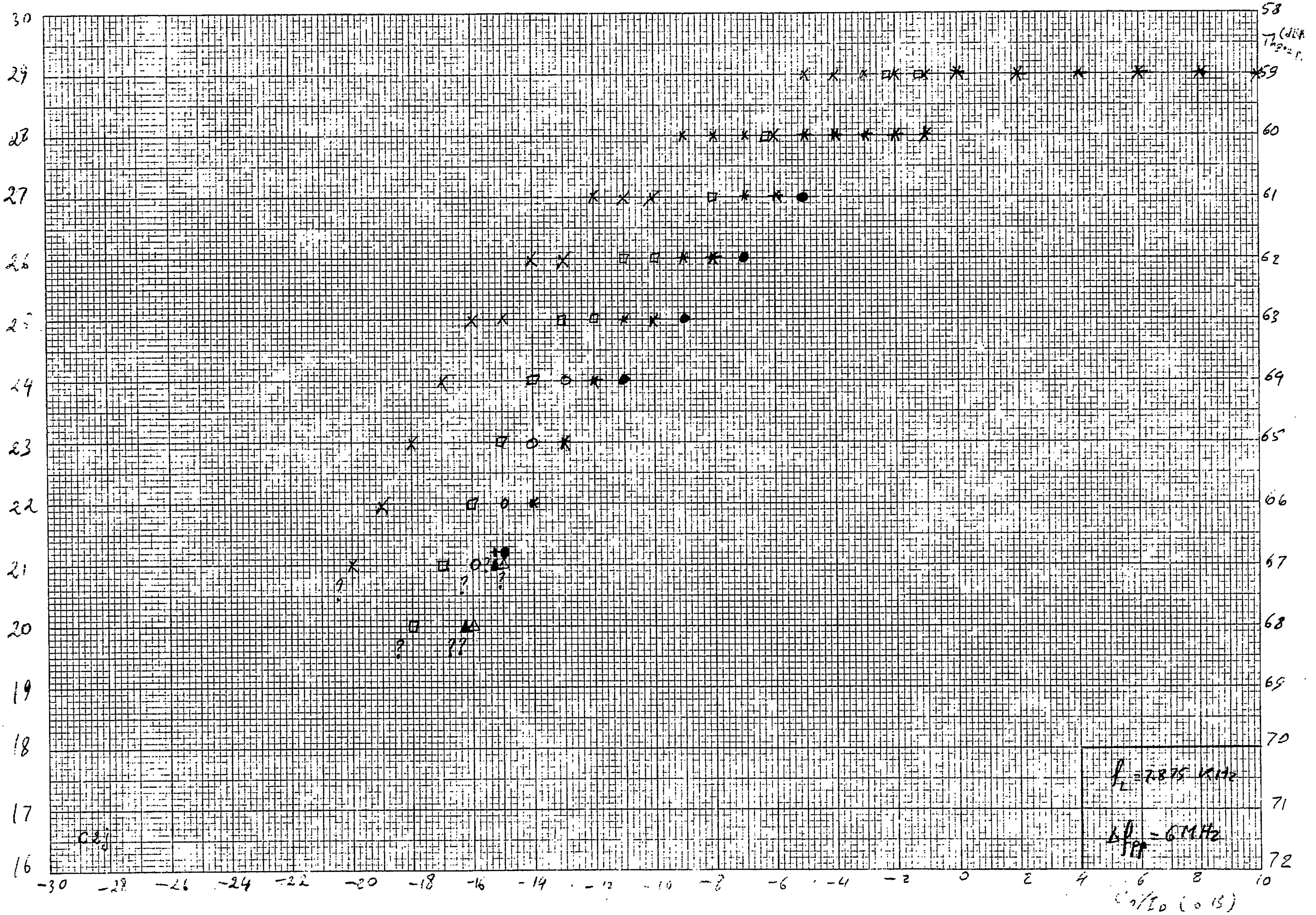


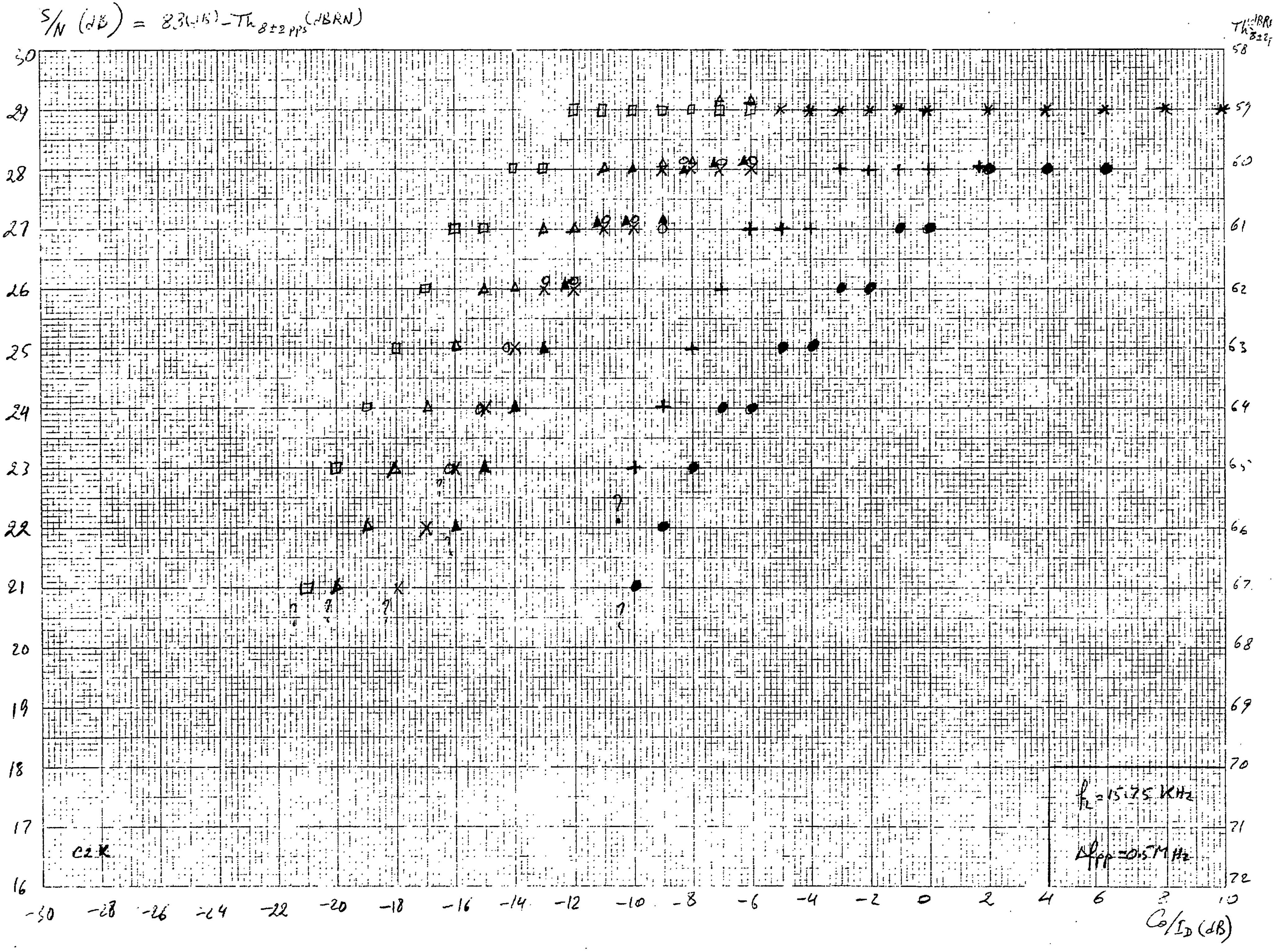
[redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted]

S/N (dB) $= 83$ dB $- Th_{3\pm2pp}$ (dBRN)



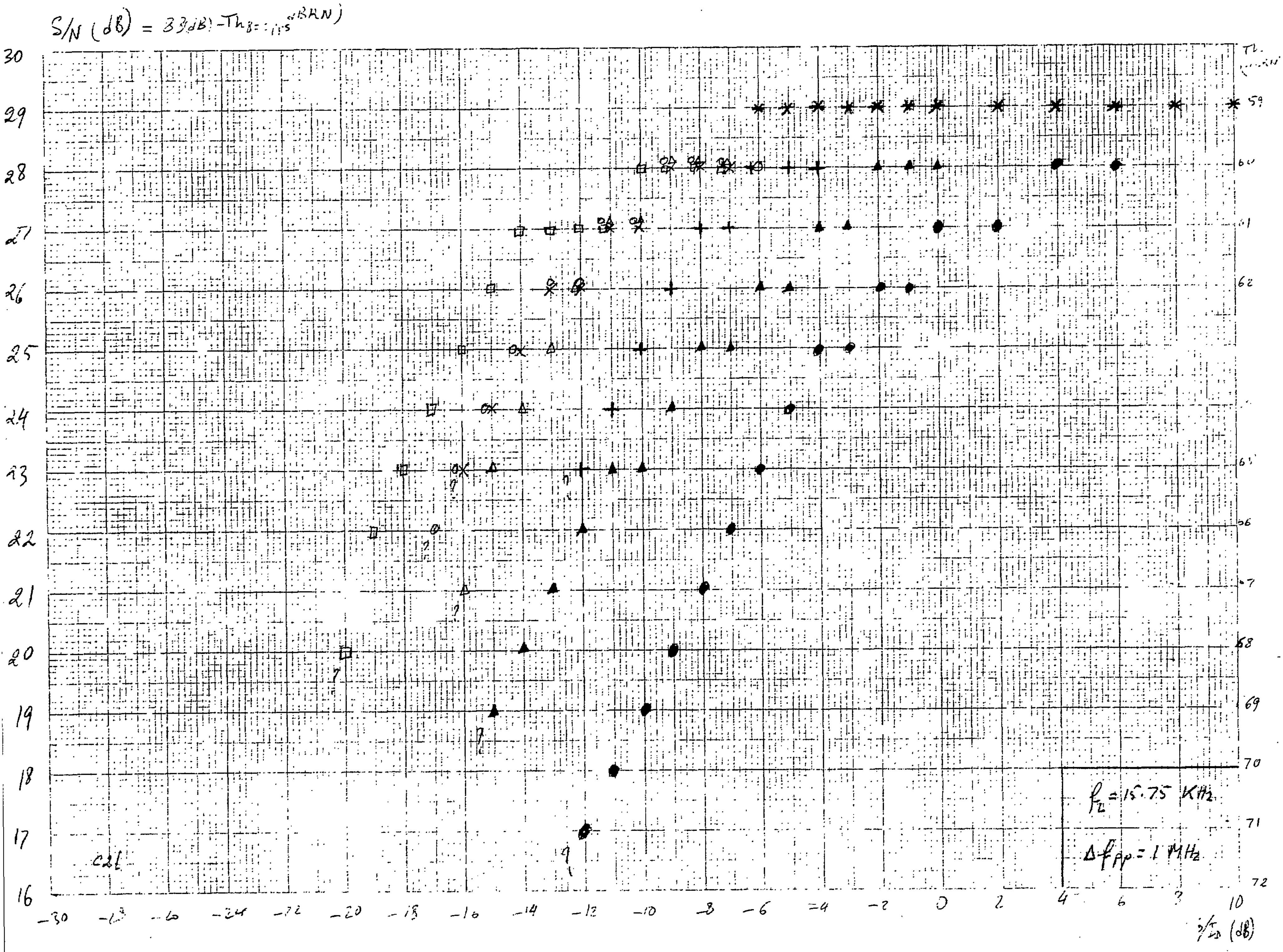
$S/N(dB) = 33(dB) - Th_{8\pm 2pp}(dBRN)$





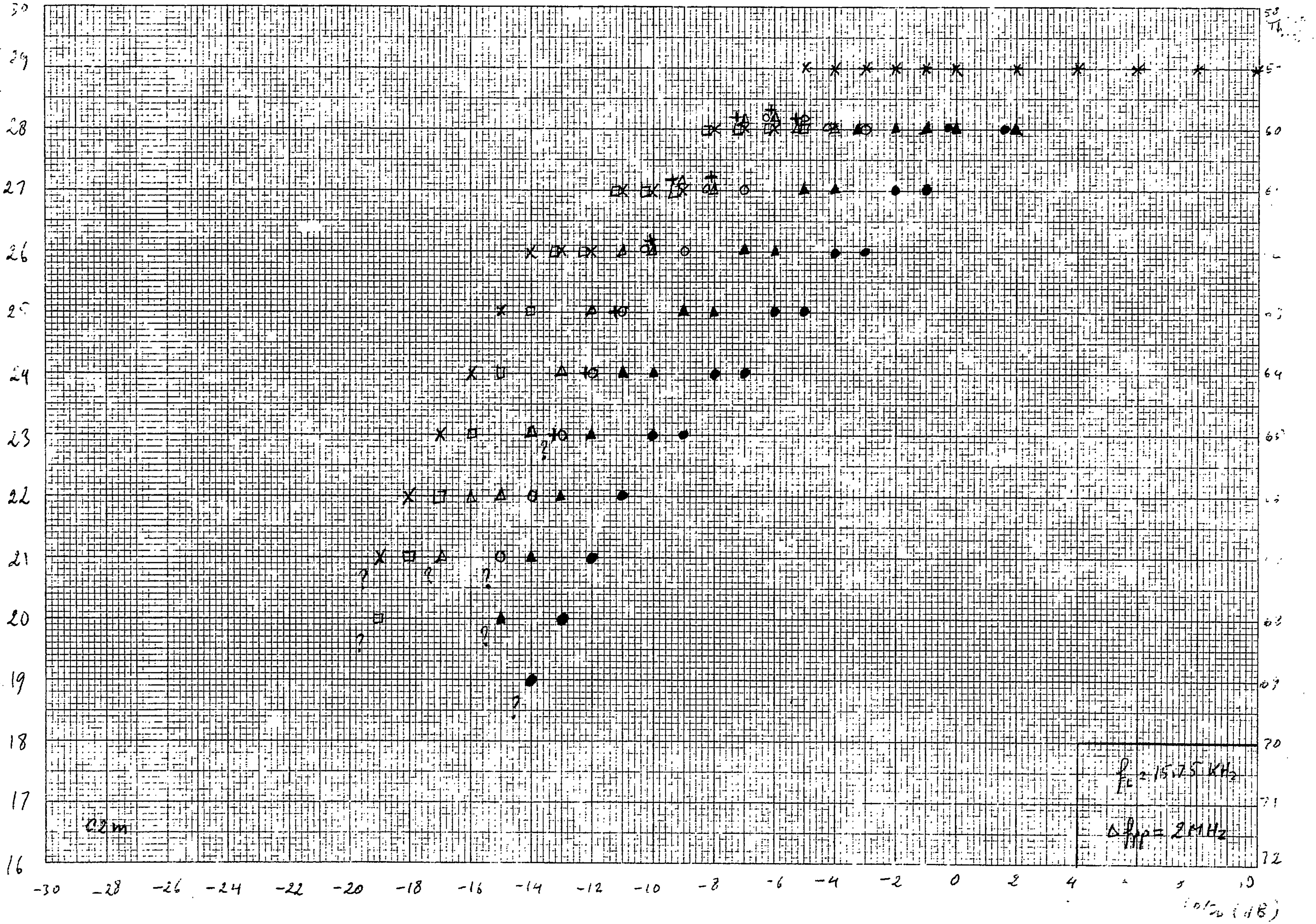
S/N (dB) = 83(dB) - Th 8±2 pps (dBRN)
Th 8±2 (dBRN)
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
58
59
60
61
62
63
64
65
66
67
68
69
70
71
72
-30
-28
-26
-24
-22
-20
-18
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
8
10
Co/ID (dB)
fL = 15.75 KHz
Δfpp = 0.5 MHz
C2K

[redacted]



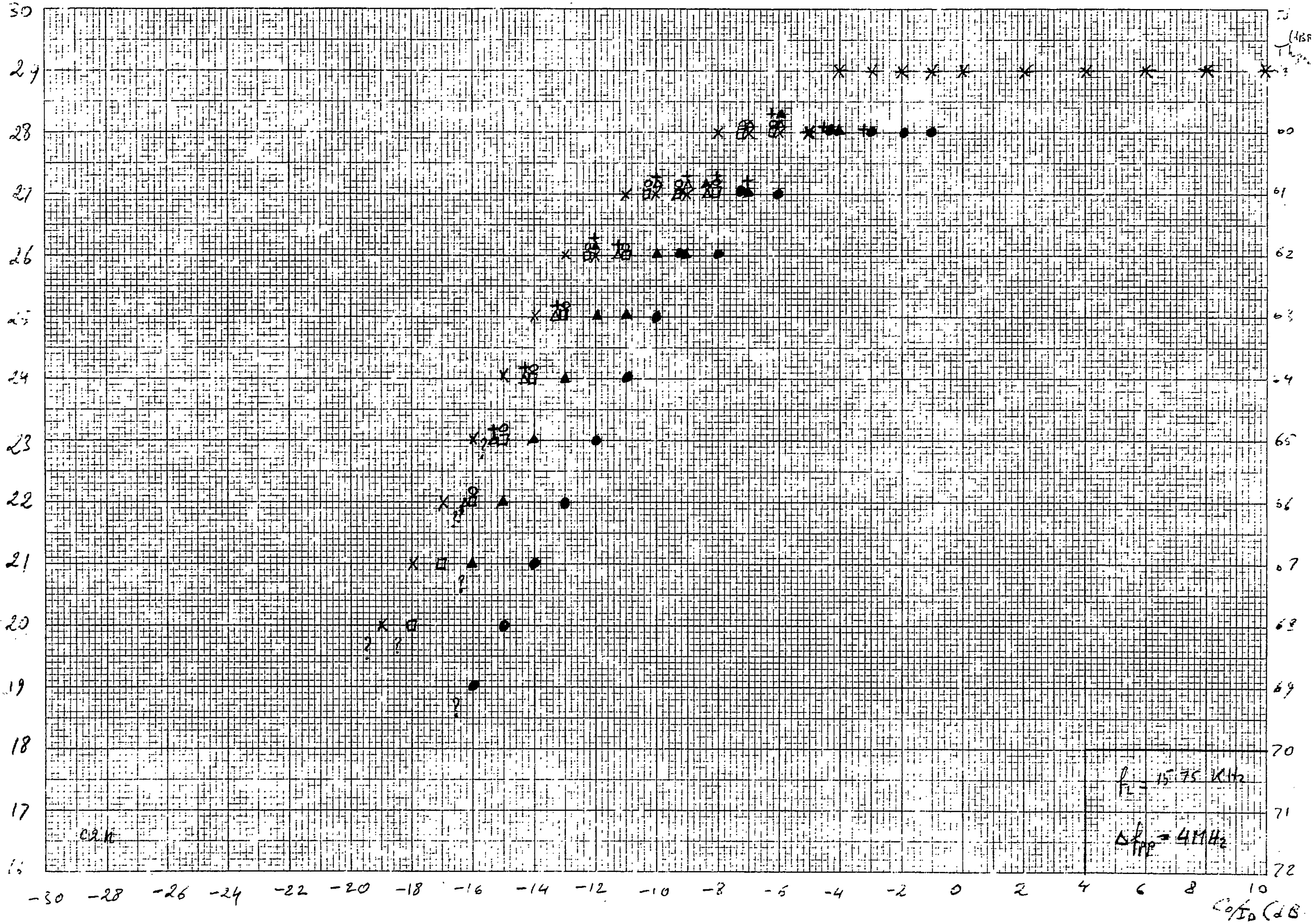
S/N (dB) = 33(dB) - Th
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
59
60
61
62
66
67
68
69
70
71
72
-30
-16
-14
-12
-10
-8
-6
-4
-2
0
2
4
6
10
f_L = 15.75 KHz
Δf_{pp} = 1 MHz
S/I (dB)

$S/N\,(dB) = 35(dB) - Th_{822ips}\,(dBRN)$

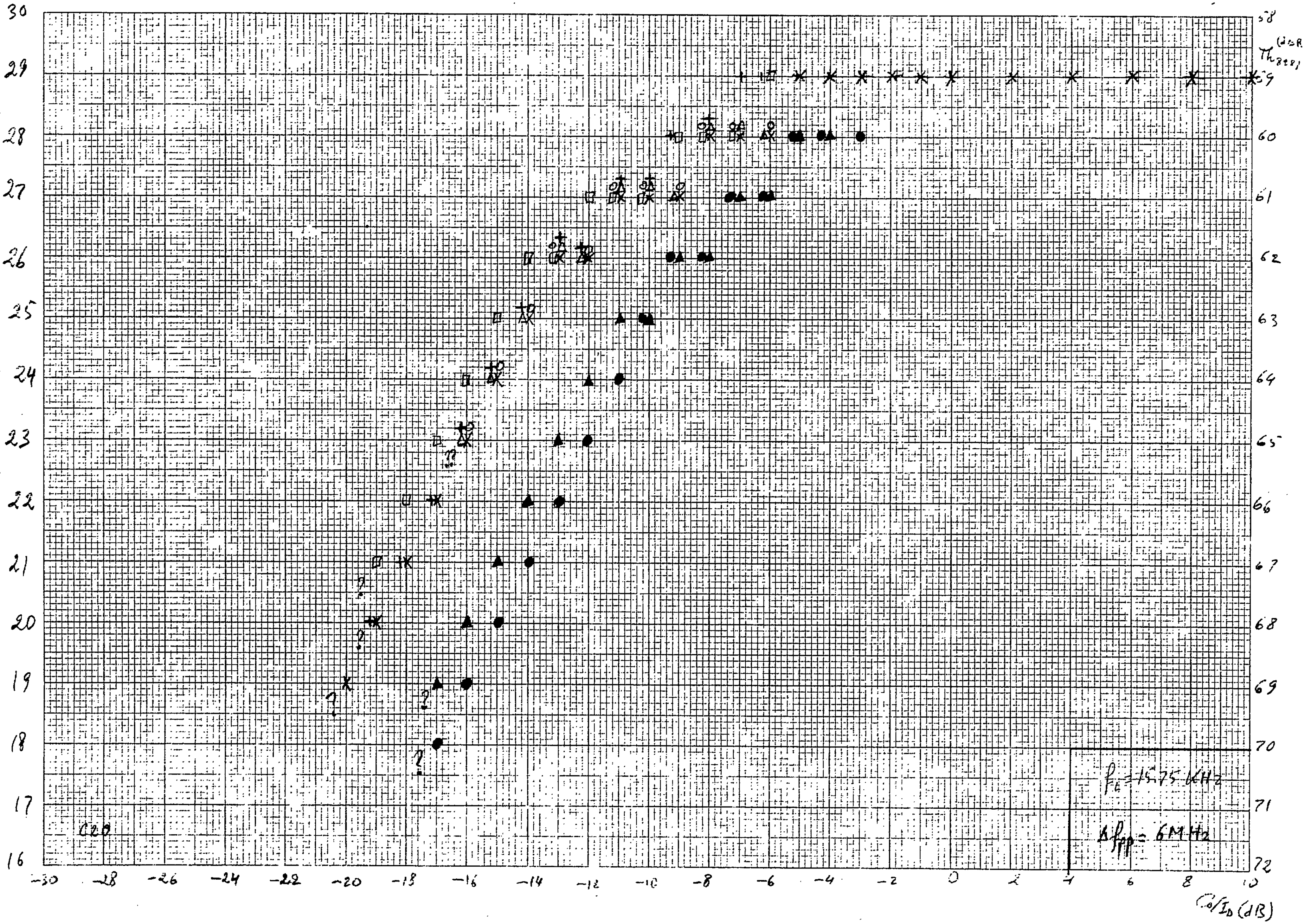


[redacted] KEUFFEL & ESSER CO. MADE IN U.S.A. [redacted]

$S/N\ (dB) = 33\ dB - Th_{8\pm2\ pps}\ (dBRN)$



$S/N(dB) = 83(dB) - Th_{8881}$ (dBRN)



D1 4 INTERFERING CARRIERS

SCPC / PSK

Offset Degradation - defined as the Co/I_D at which the BER is three times greater than that produced by thermal noise alone at the level Co/N = 15 dB in 33.22 kHz (Channel bandwidth)

$BER_{noise\ only} = 3.3 \times 10^{-6}$; $BER_{I+N} = 10 \times 10^{-6} \pm 10\%$

f_c		22.5 kHz	100 kHz	500 kHz	1 MHz	2 MHz	3 MHz	3.6 MHz
Δfpp	f_L							
0.5 MHz	30 Hz	+8.5 dB	+8.5 dB	+1 dB	+1.5 dB	+1 dB	-2.5 dB	-1 dB
	7.875 kHz	+7 dB	+7 dB	+1 dB	0 dB	-5 dB	-4.2 dB	-1 dB
	15.75 kHz	+4 dB	+5.2 dB	-1 dB	-2 dB	-4 dB	-7 dB	-4 dB
1 MHz	30 Hz	+6.5 dB	+6.5 dB	+7 dB	0 dB	0 dB	-3 dB	
	7.875 kHz	+5 dB	+5 dB	+3 dB	-1 dB	-0.5 dB	-3 dB	-4 dB
	15.75 kHz	+3 dB	+3 dB	0 dB	-3 dB	-2 dB	-6.2 dB	-5 dB
2 MHz	30 Hz	+5 dB	+5 dB	+5 dB	+6 dB	-1 dB	+1 dB	-3.5 dB
	7.875 kHz	+2 dB	+2 dB	+2 dB	+1.5 dB	-2 dB	-4 dB	-4 dB
	15.75 kHz	+0.5 dB	+1 dB	+1 dB	-1 dB	-3 dB	-7 dB	-5 dB
4 MHz	30 Hz	+4 dB	+4 dB	+4 dB	+4 dB	+4 dB	+1 dB	+3 dB
	2.875 kHz	+1 dB	+1.5 dB	0 dB	-1 dB	+0.5 dB	-4.5 dB	-3 dB
	15.75 kHz	-0.5 dB	-0.5 dB	-0.5 dB	-0.5 dB	-0.5 dB	-5 dB	-5 dB
6 MHz	30 Hz	+3 dB	+3 dB	+3.5 dB	+3 dB	+3 dB	+3 dB	-5.5 dB
	7.875 kHz	-0.5 dB	0 dB	+2 dB	0 dB	-1 dB	-1 dB	-6 dB
	15.75 kHz	-1.5 dB	-1.5 dB	-2 dB	-2 dB	-4 dB	-2 dB	-5 dB

S1 LIVE TV SIGNAL INTERFERENCE

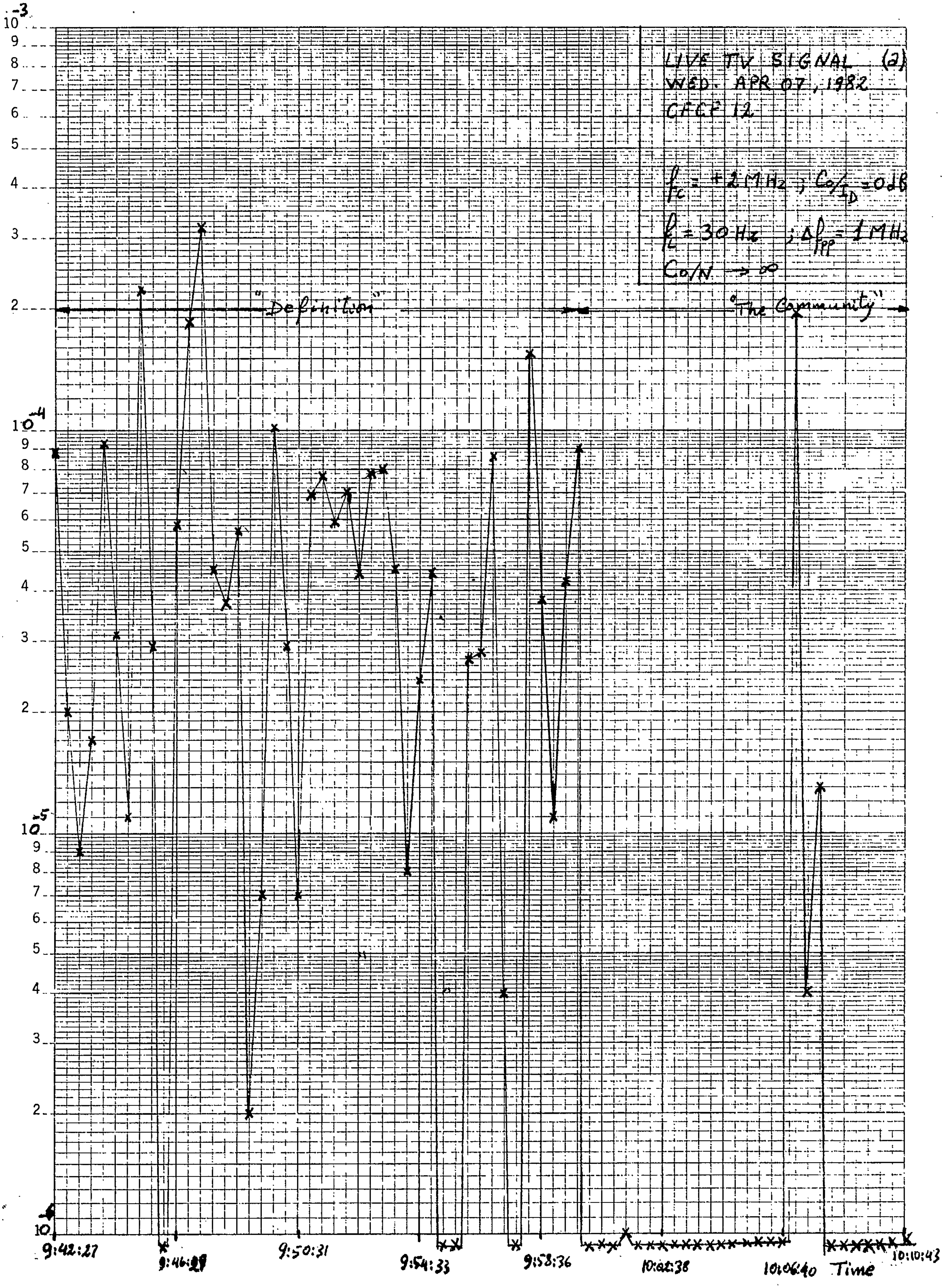
$f_L = 30$ Hz ; $\Delta f_{pp} = 1$ MHz

$C_0/I_D = 0$ dB ; $C_0/N \rightarrow \infty$

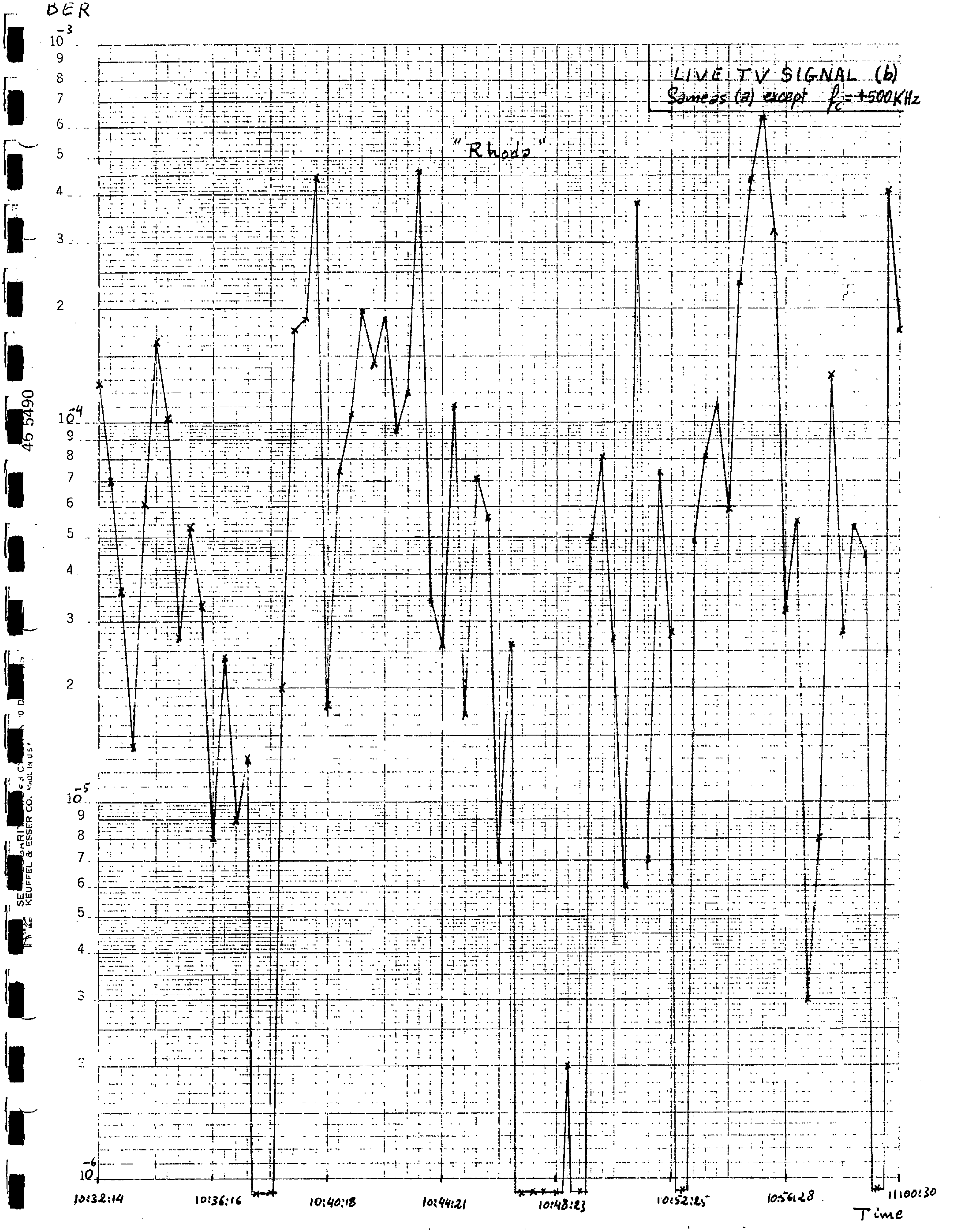
$f_c =$
- a) +2 MHz
- b) +500 KHz
- c) −1 MHz

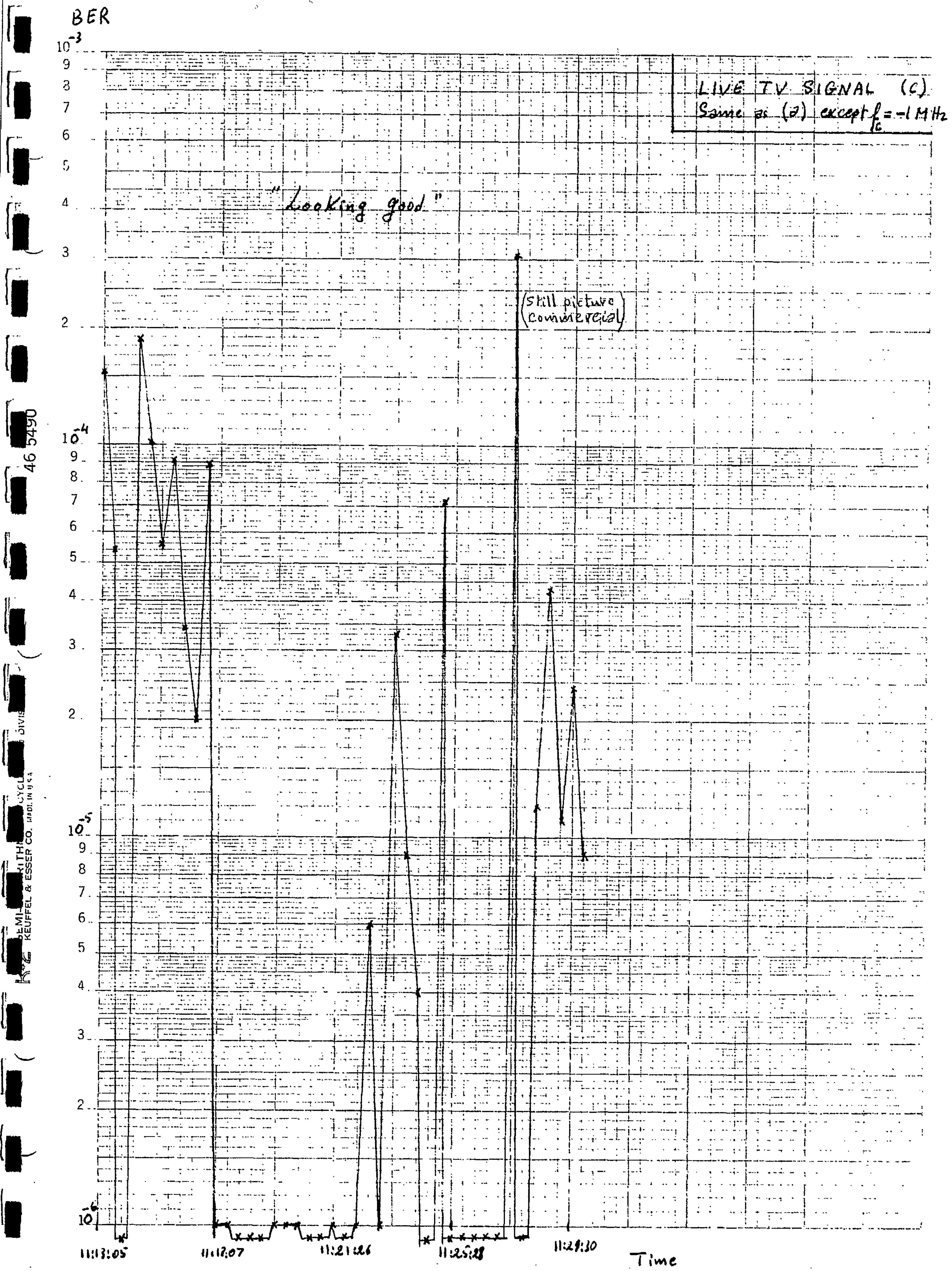
} ~20 sec count time

- d) −1 MHz } ≈ 3 min count time.



LIVE TV SIGNAL (2)
WED. APR 07, 1982
CFCF 12
$f_c = +2\,MHz$; $C_o/I_D = 0\,dB$
$f_L = 30\,Hz$; $\Delta f_{pp} = 1\,MHz$
$C_o/N \to \infty$
"Definition"
"The Community"
10^{-3}
10^{-4}
10^{-5}
10^{-6}
9:42:27
9:46:29
9:50:31
9:54:33
9:58:36
10:02:38
10:06:40
10:10:43
Time

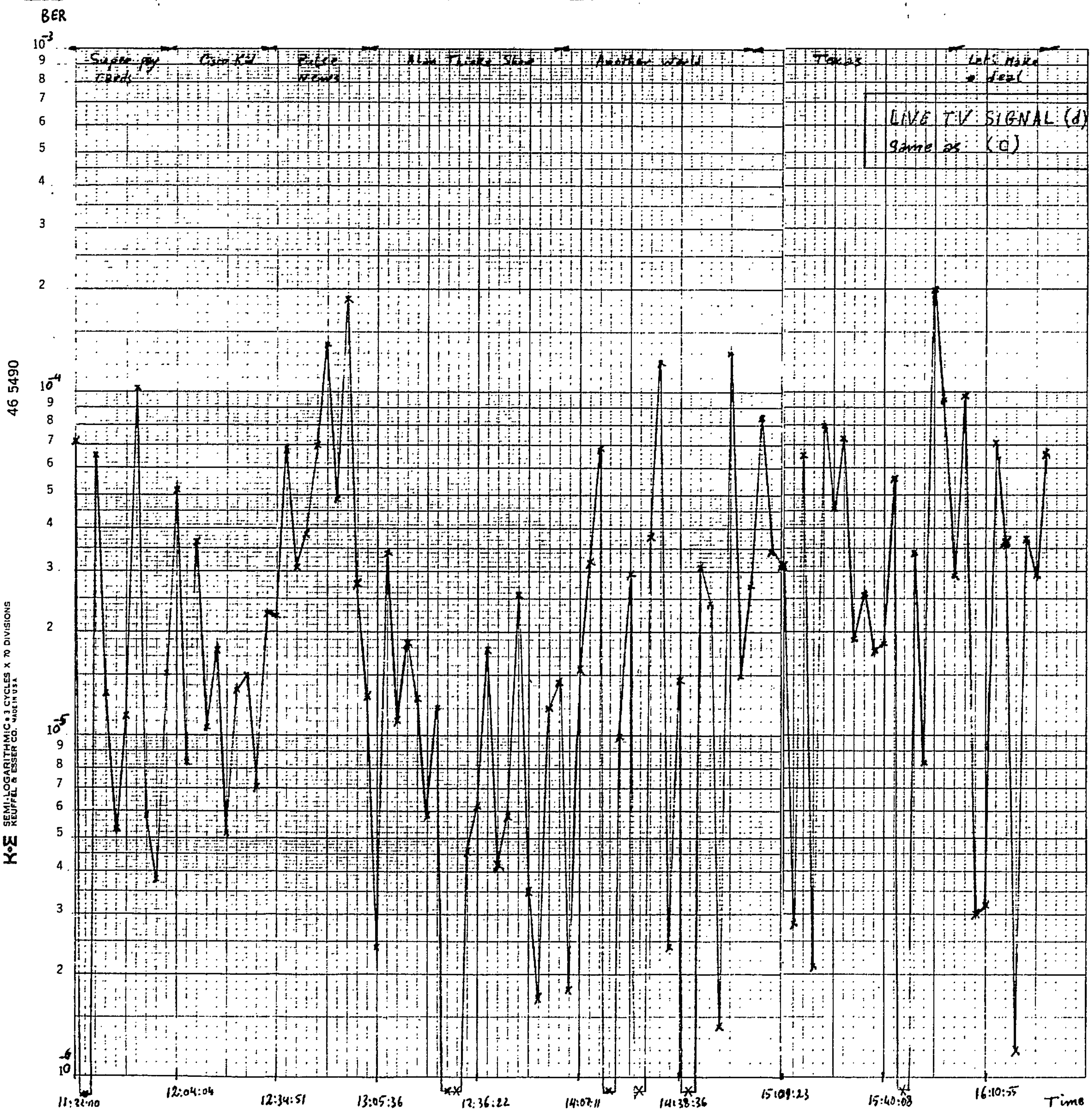

BER
LIVE TV SIGNAL (b)
Same as (a) except f_c = +500 KHz
"Rhoda"
10:32:14
10:36:16
10:40:18
10:44:21
10:48:23
10:52:25
10:56:28
11:00:30
Time
46 5490
KEUFFEL & ESSER CO. MADE IN U.S.A.

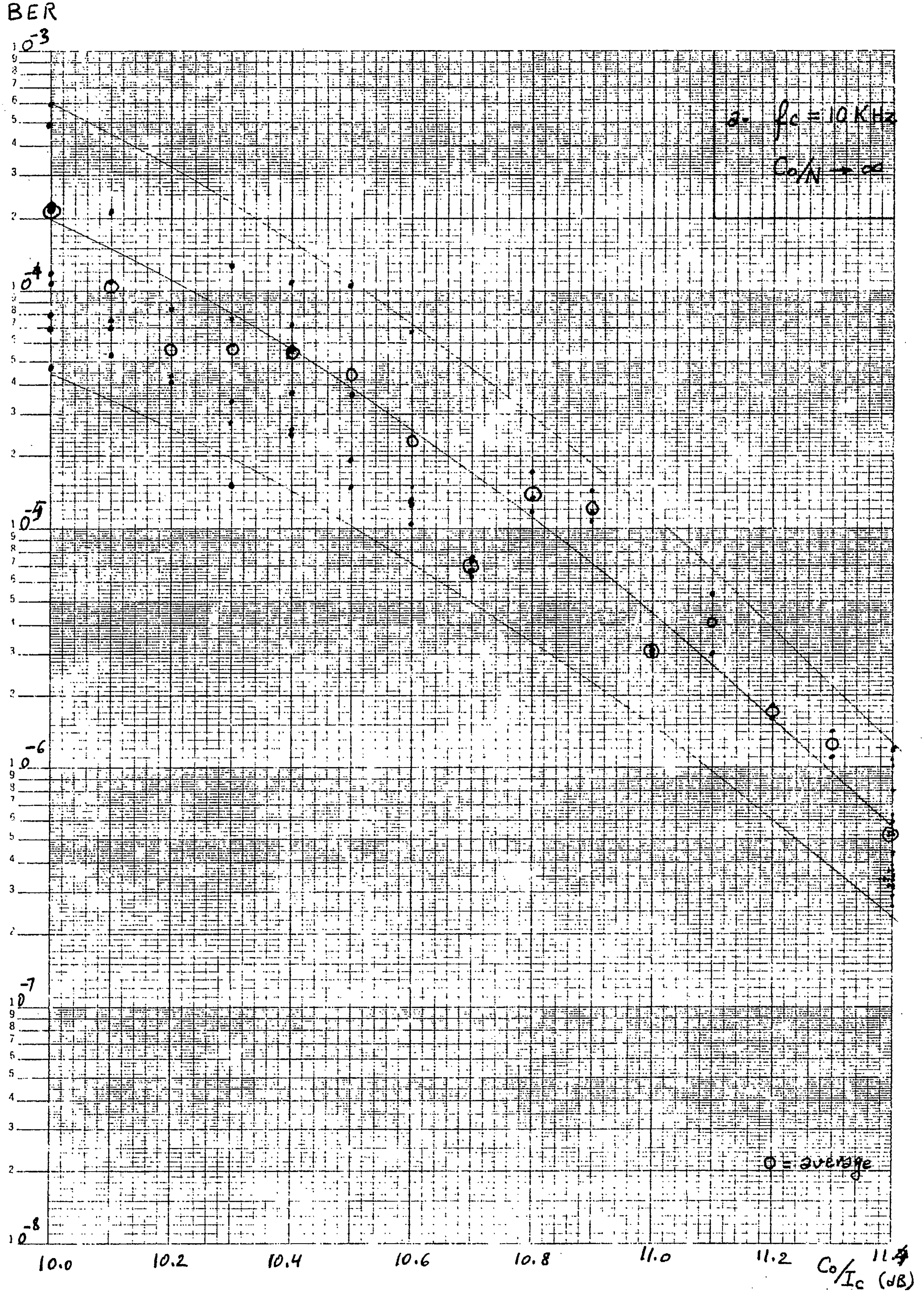


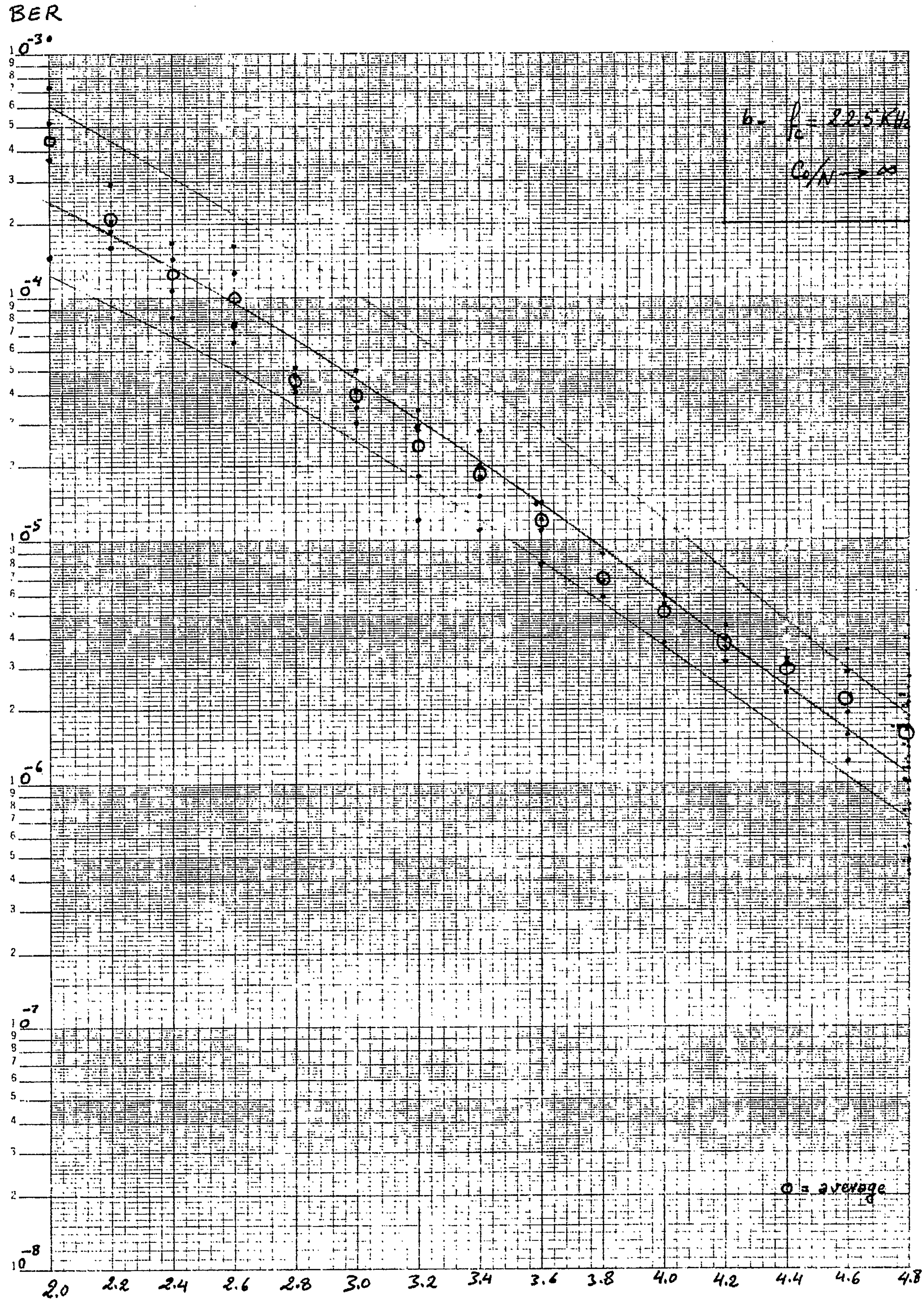
BER
LIVE TV SIGNAL (c)
Same as (a) except f_c = -1 MHz
"Looking good"
(Still picture commercial)
11:13:05
11:17:07
11:21:26
11:25:28
11:29:30
Time

S2 UNMODULATED, UNDISPERSED INTERFERING CARRIER a- f_c = 10 KHz

b- f_c = 22.5 KHz


BER
LIVE TV SIGNAL (d)
same as (c)
Another World
12:04:04
12:34:51
13:05:36
12:36:22
14:07:11
14:38:36
15:09:23
15:40:08
16:10:55
Time
46 5490
K+E SEMI-LOGARITHMIC 3 CYCLES X 70 DIVISIONS
KEUFFEL & ESSER CO. MADE IN USA


BER
10^-3
10^-4
10^-5
10^-6
10^-7
10^-8
2- fc = 10 KHz
Co/N → ∞
O = average
10.0
10.2
10.4
10.6
10.8
11.0
11.2
11.4
Co/Ic (dB)

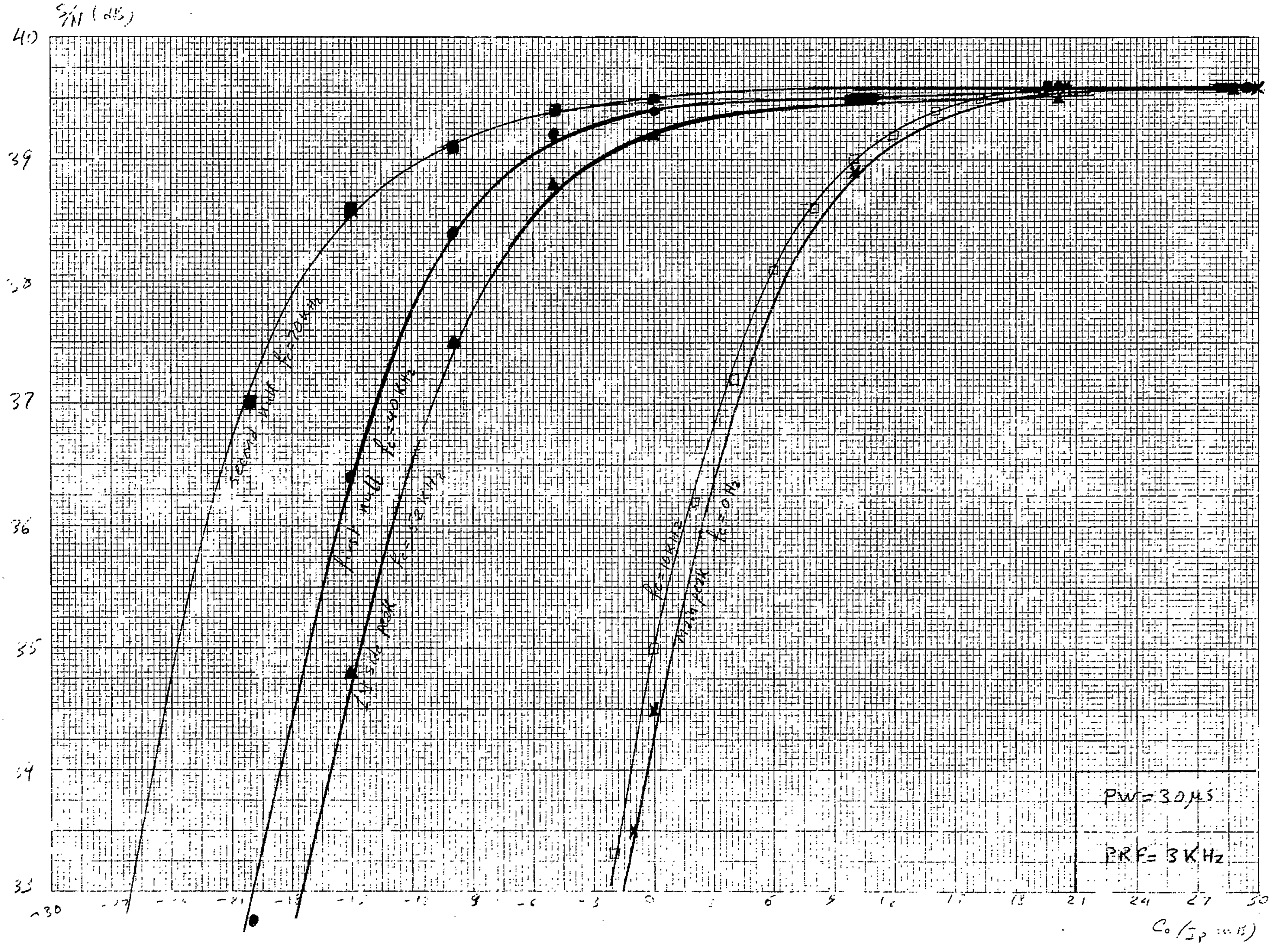

BER
10-3
10-4
10-5
10-6
10-7
10-8
b- fc = 22.5 KHz
Co/N → ∞
o = average
2.0
2.2
2.4
2.6
2.8
3.0
3.2
3.4
3.6
3.8
4.0
4.2
4.4
4.6
4.8

S3

RADAR LIKE INTERFERING SIGNAL

PW = 30 μs
PRF. = 3 kHz

SYMBOL	fc (kHz)
X	0 (MAIN PEAK)
●	40 (1st NULL)
▲	52 (1st SIDE PEAK)
■	70 (2nd NULL)
□	10 KHz


S/N (dB)
PW = 30 µs
PRF = 3 KHz

S4

S/N_{LOADED} Vs $C_0/I_{D/U}$

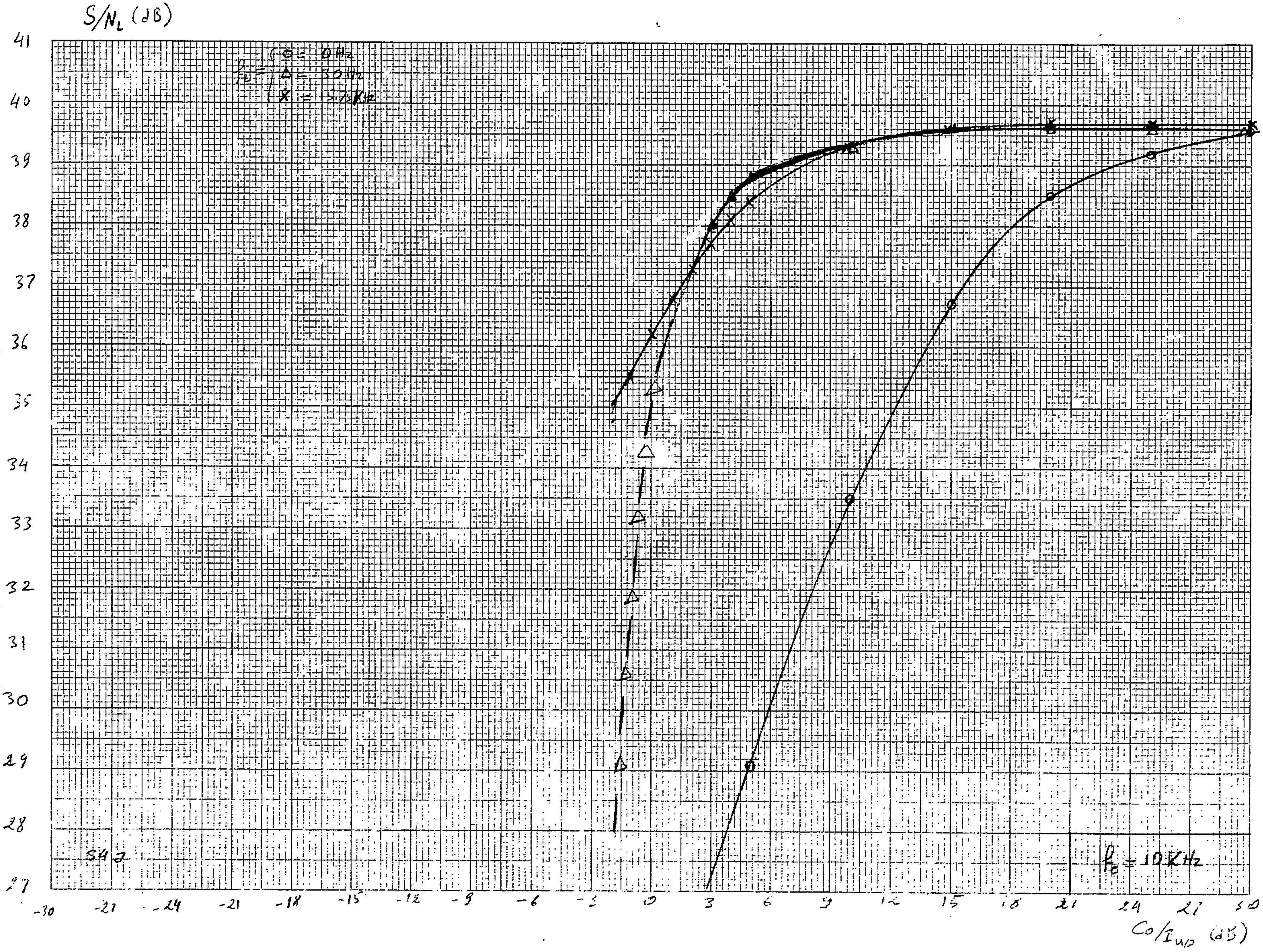
I_D : MODULATED BY DISPERSAL SIGNAL ONLY

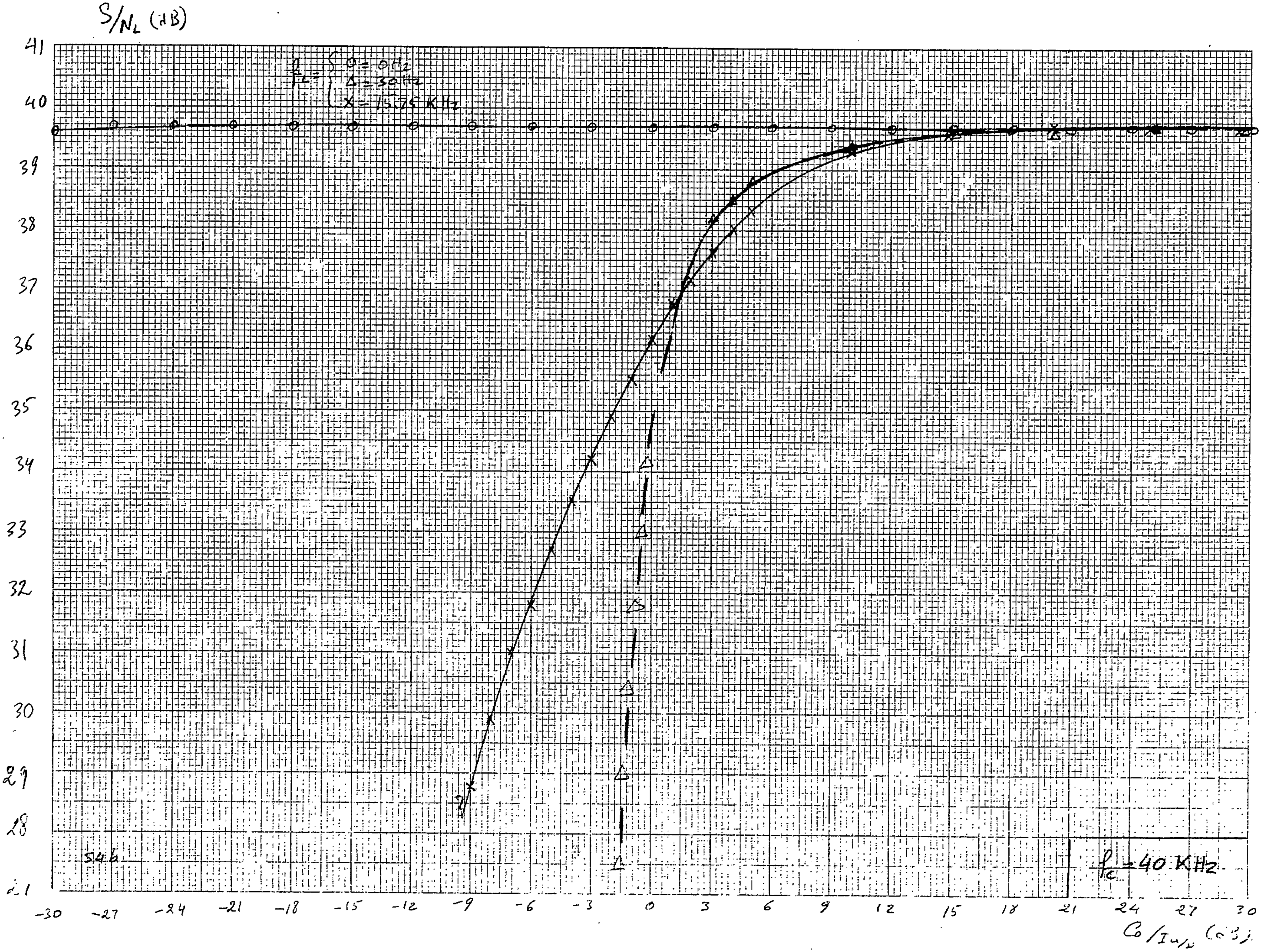
I_U : NO MODULATION AT ALL

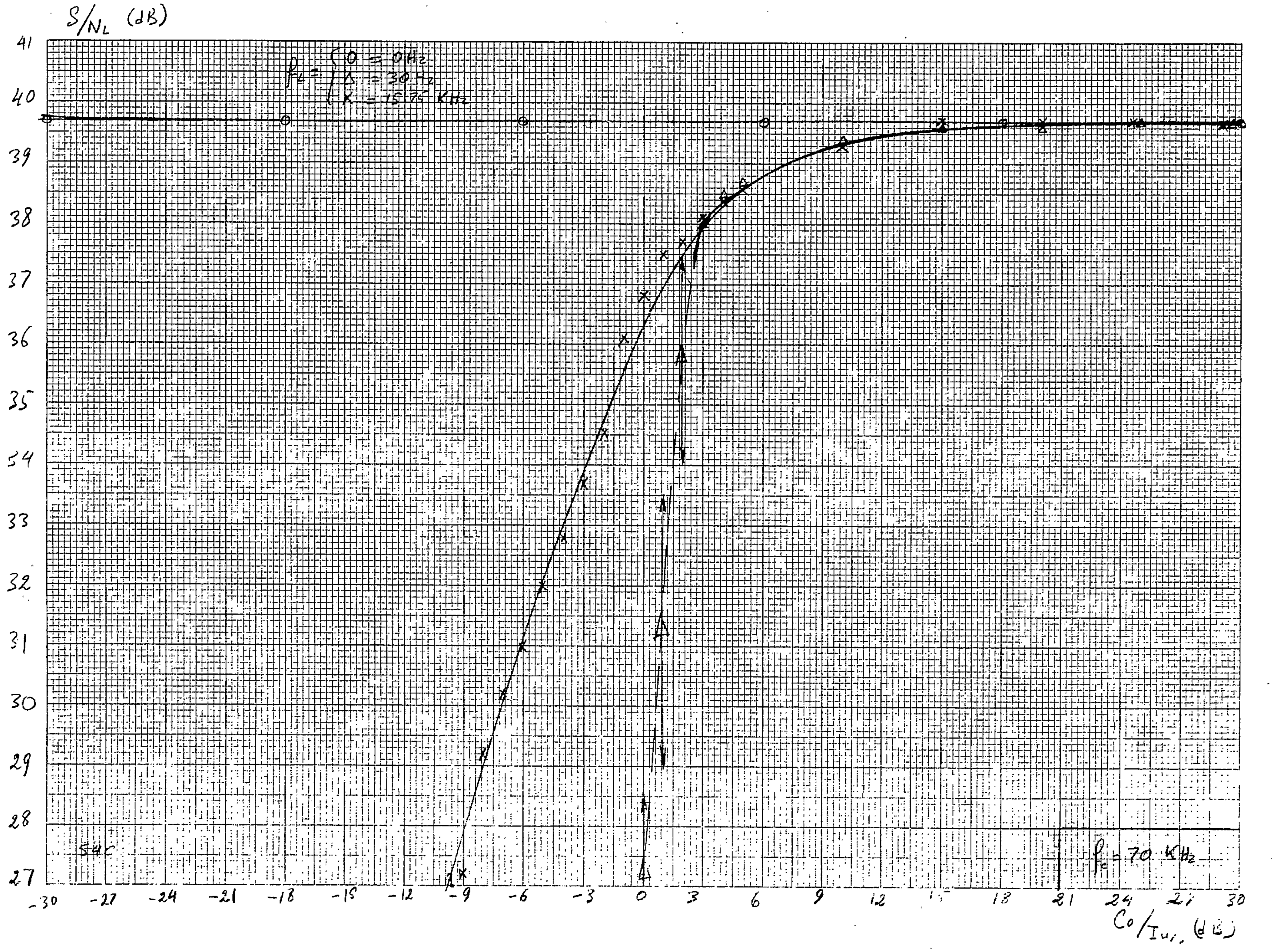
SYMBOL	LEGEND
O	NO MODULATION AT ALL
Δ	f_L = 30 Hz
X	f_L = 15.75 kHz

? = ERRATIC READINGS

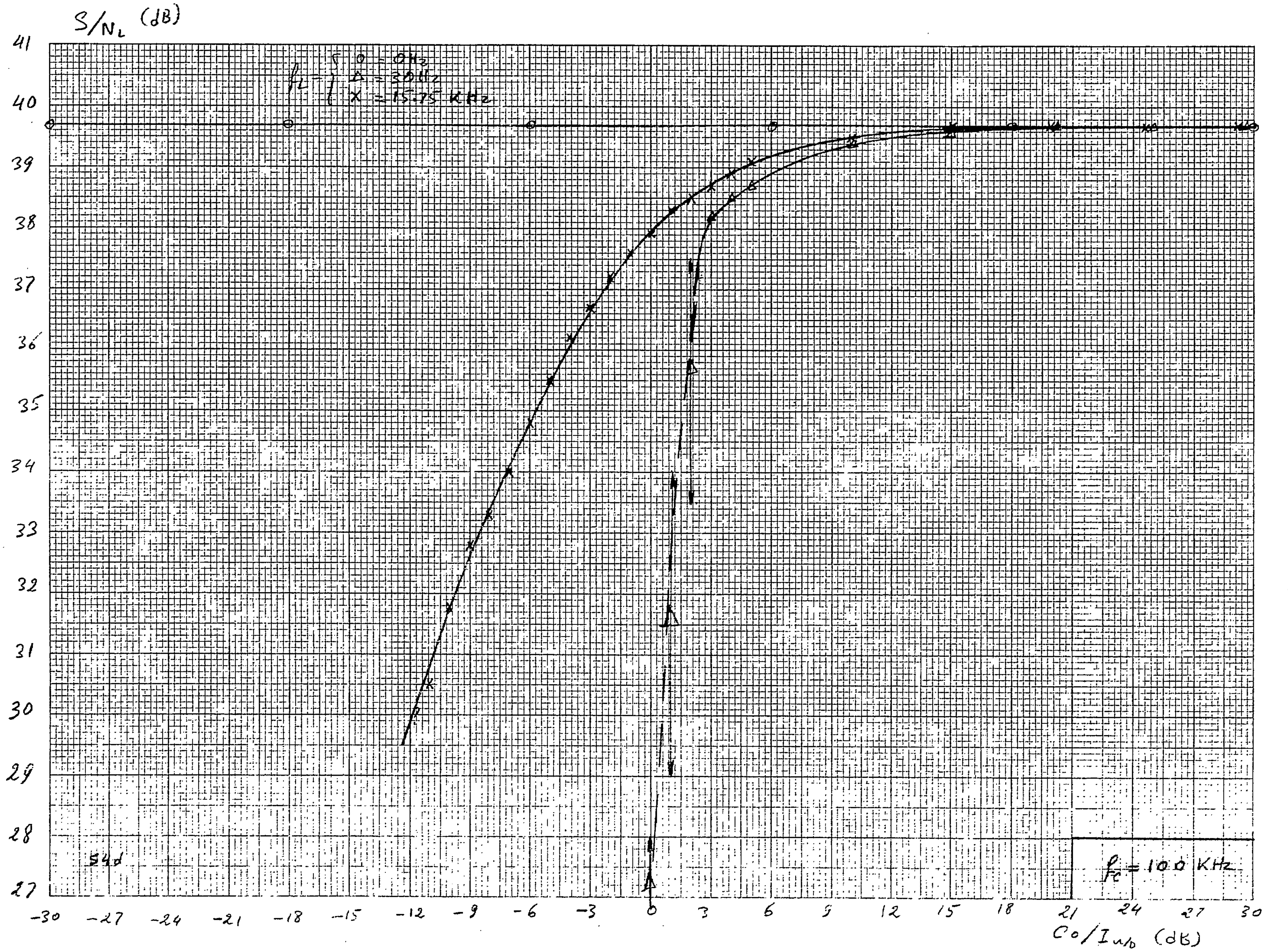
$\Delta f_{pp} = 1$ MHz

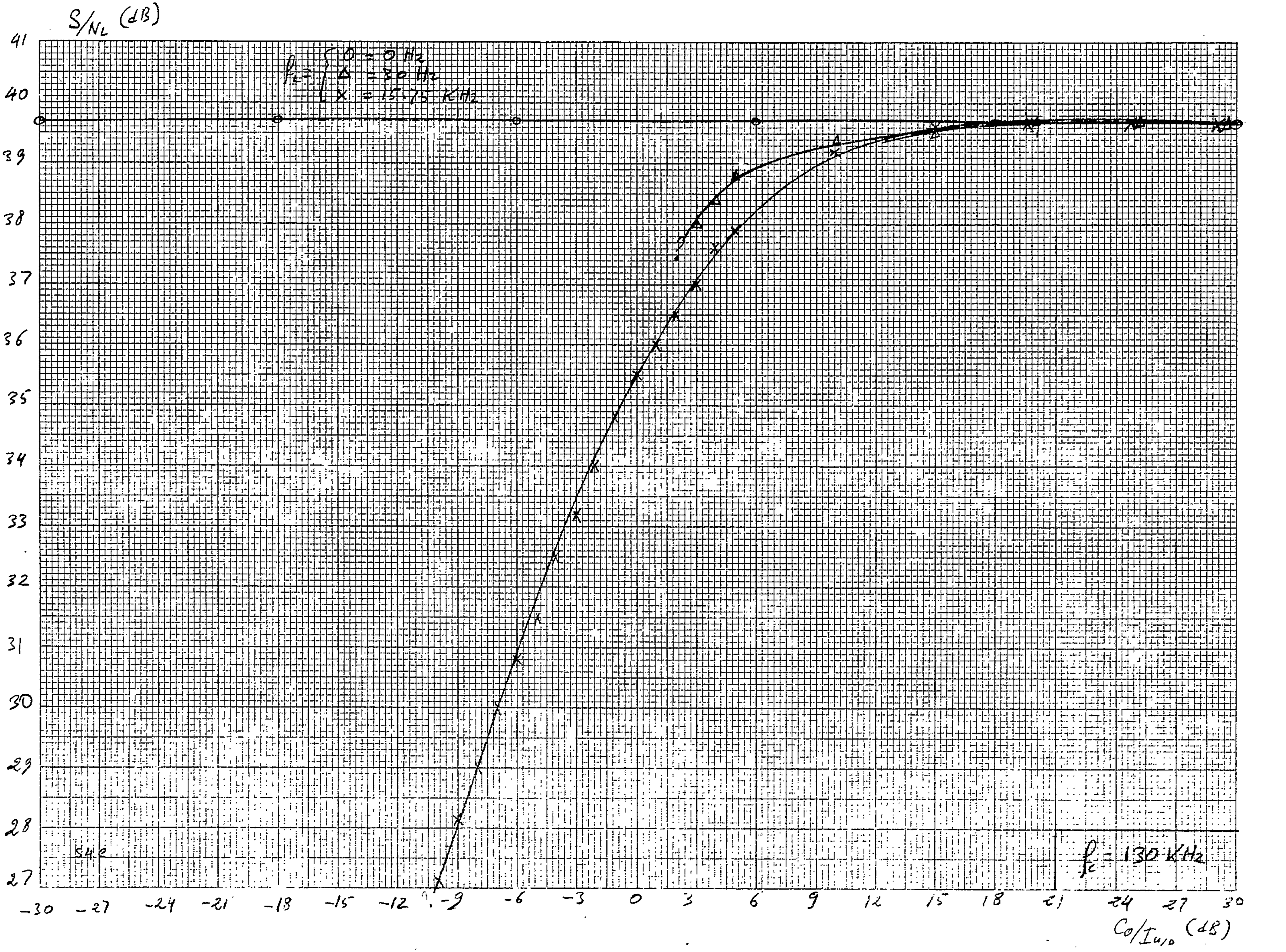

S/N_L (dB)
f_2 = ⊖ = 0 Hz
Δ = 30 Hz
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
-30
-27
-24
-21
-18
-15
-12
-9
-6
-3
0
3
6
9
12
15
18
21
24
27
30
Co/I_u/p (dB)
f_c = 10 KHz
542


S/N_L (dB)
f_L = { ⊙ = 0 Hz, Δ = 30 Hz, X = 15.75 KHz }
41
40
39
38
37
36
35
34
33
32
31
30
29
28
54b
f_c = 40 KHz
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
C_o/I_{u/2} (dB)

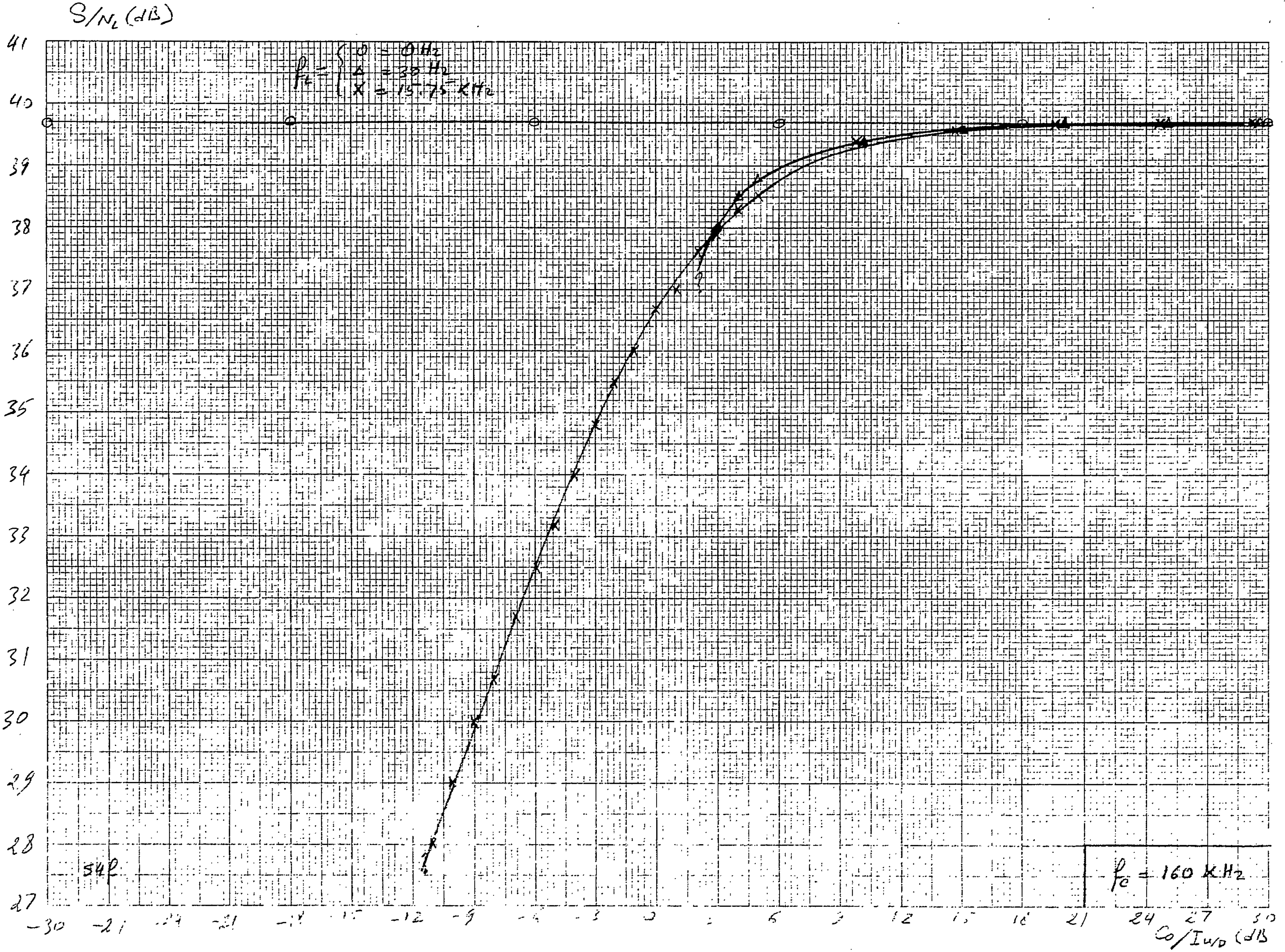


S/N_L (dB)
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
f_L = { O = 0 Hz, Δ = 30 Hz, X = 15.75 KHz
f_c = 70 KHz
54c
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
Co/I_U, (dB)

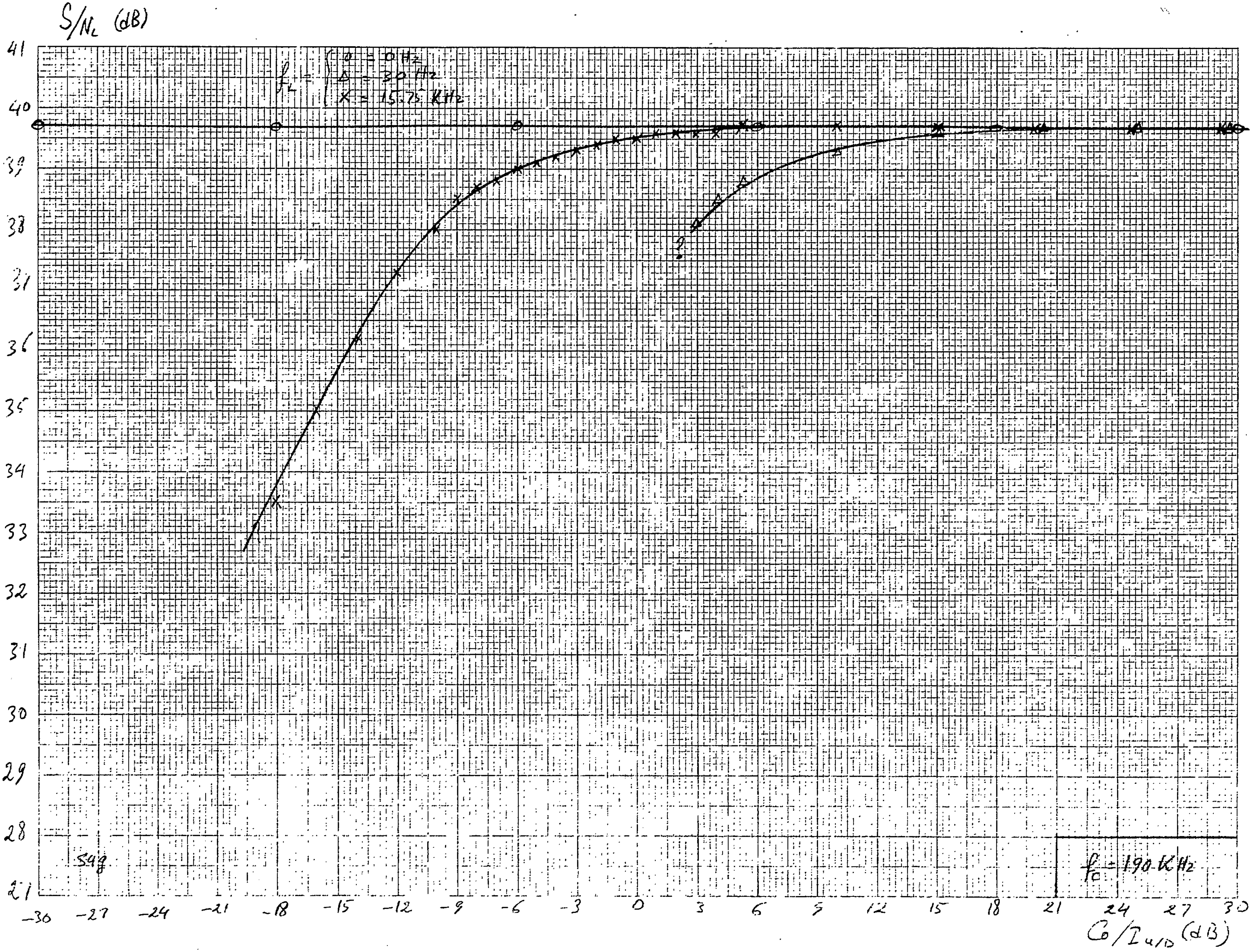

S/N_L (dB)
X = 15.75 KHz
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
54d
f_c = 10.0 KHz
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
Co/I_u/b (dB)



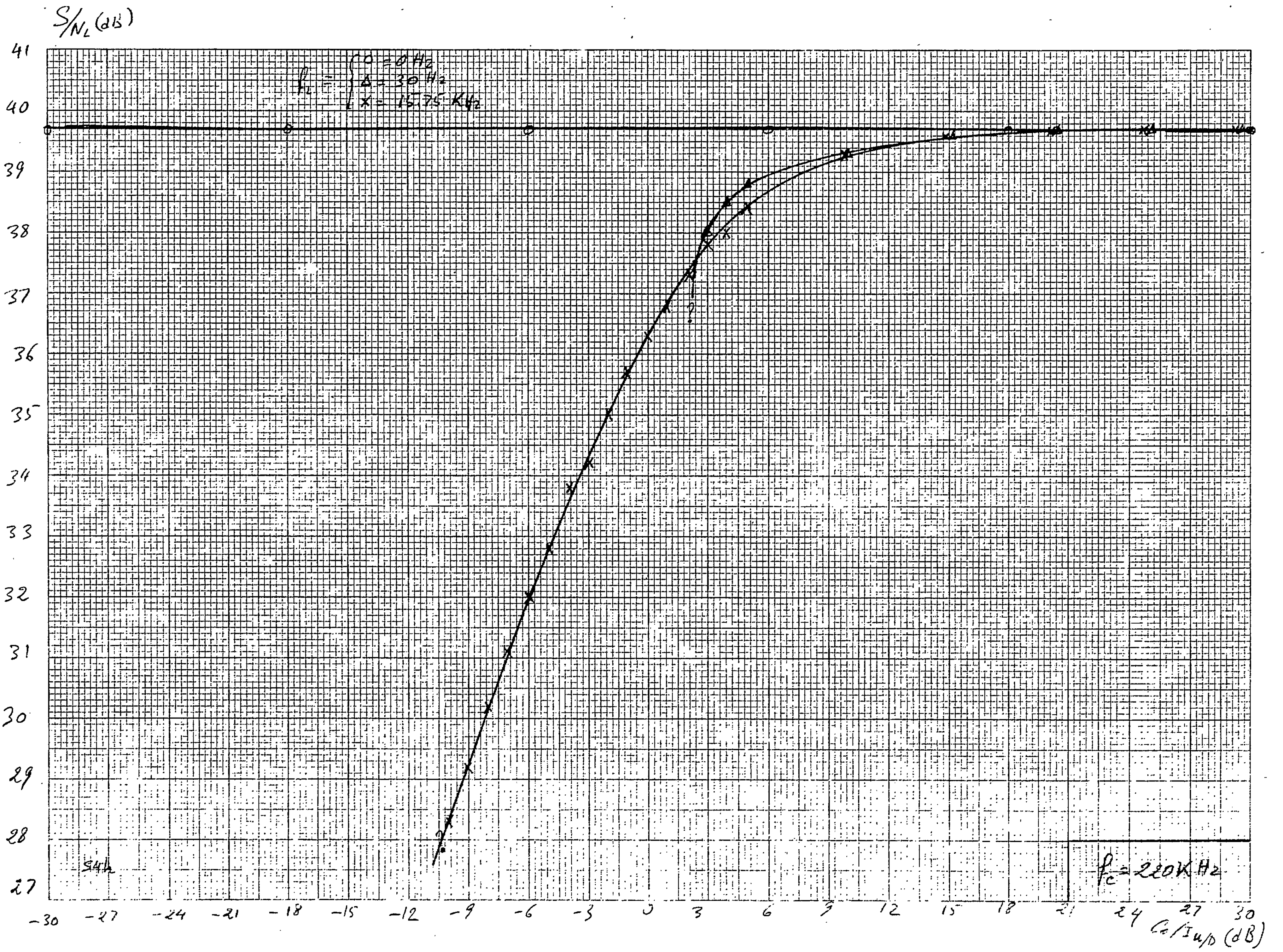
S/N_L (dB)
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
f_L = O = 0 Hz
Δ = 30 Hz
X = 15.75 KHz
f_c = 130 KHz
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
C_0/I_u/D (dB)

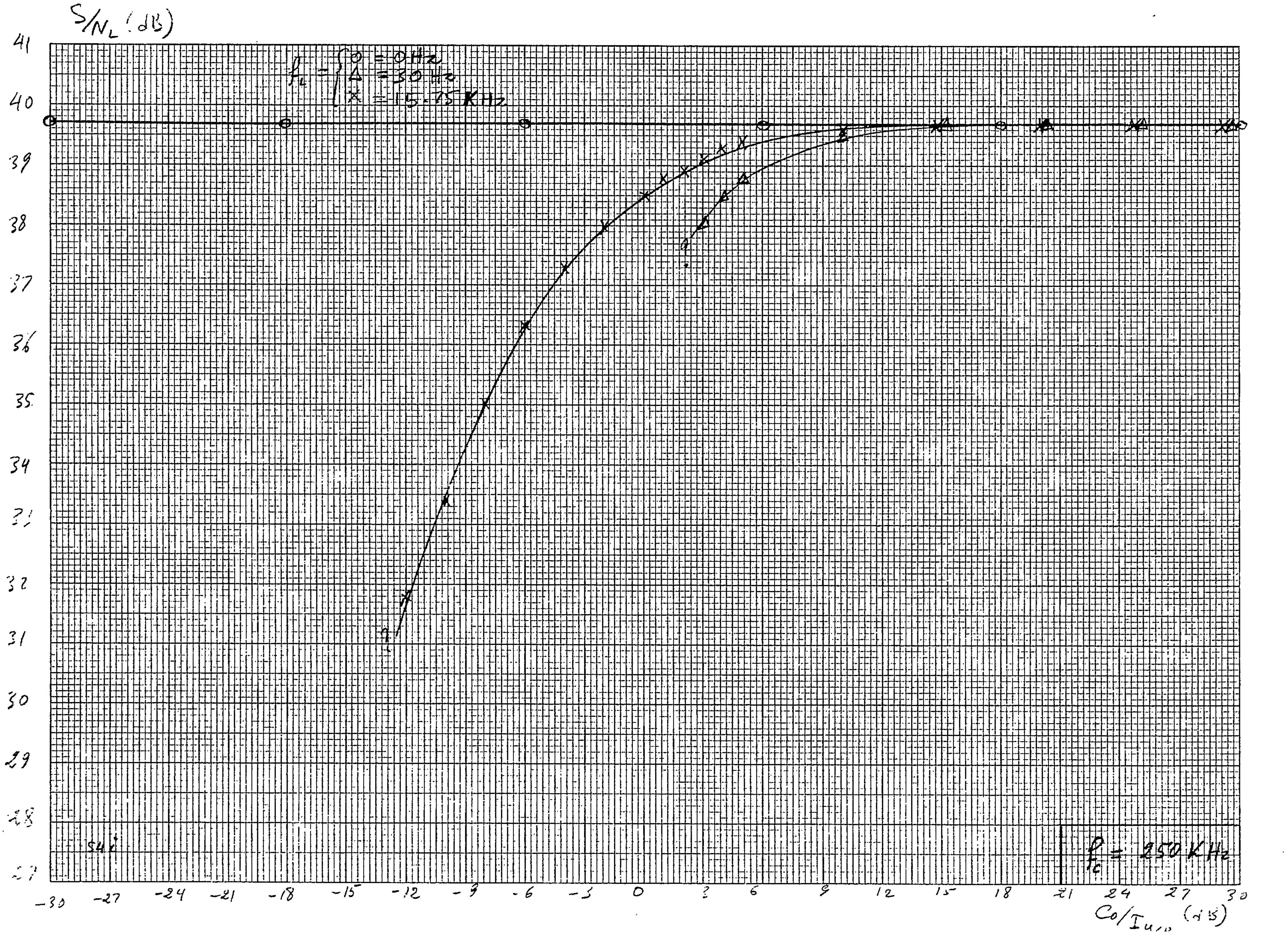


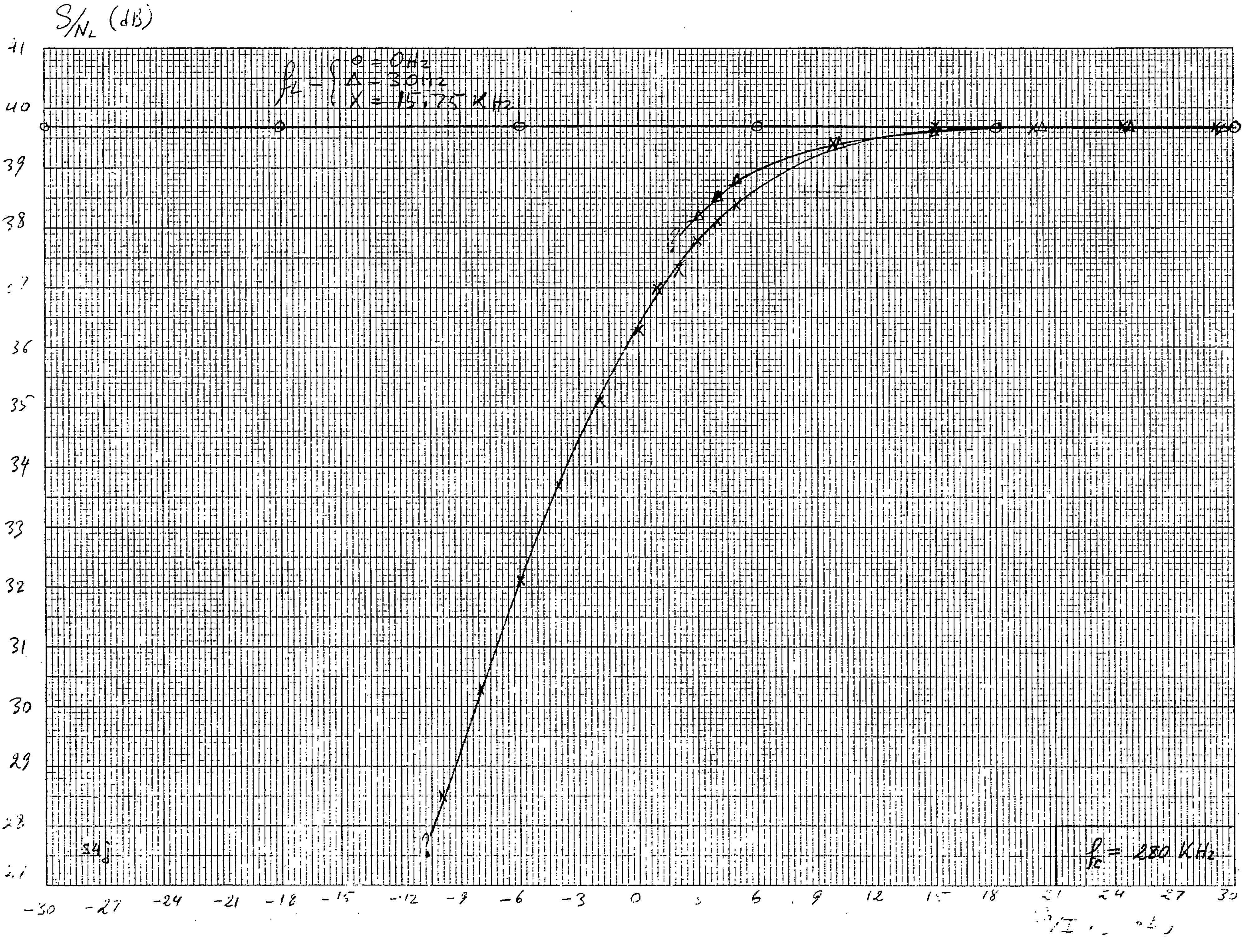
S/N_L (dB)
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
f_t = { O = 0 Hz, Δ = 30 Hz, X = 15.75 KHz
54ℓ
f_c = 160 KHz
-30
-21
-9
-6
-3
0
6
12
21
24
27
30
Co/I_u/D (dB)



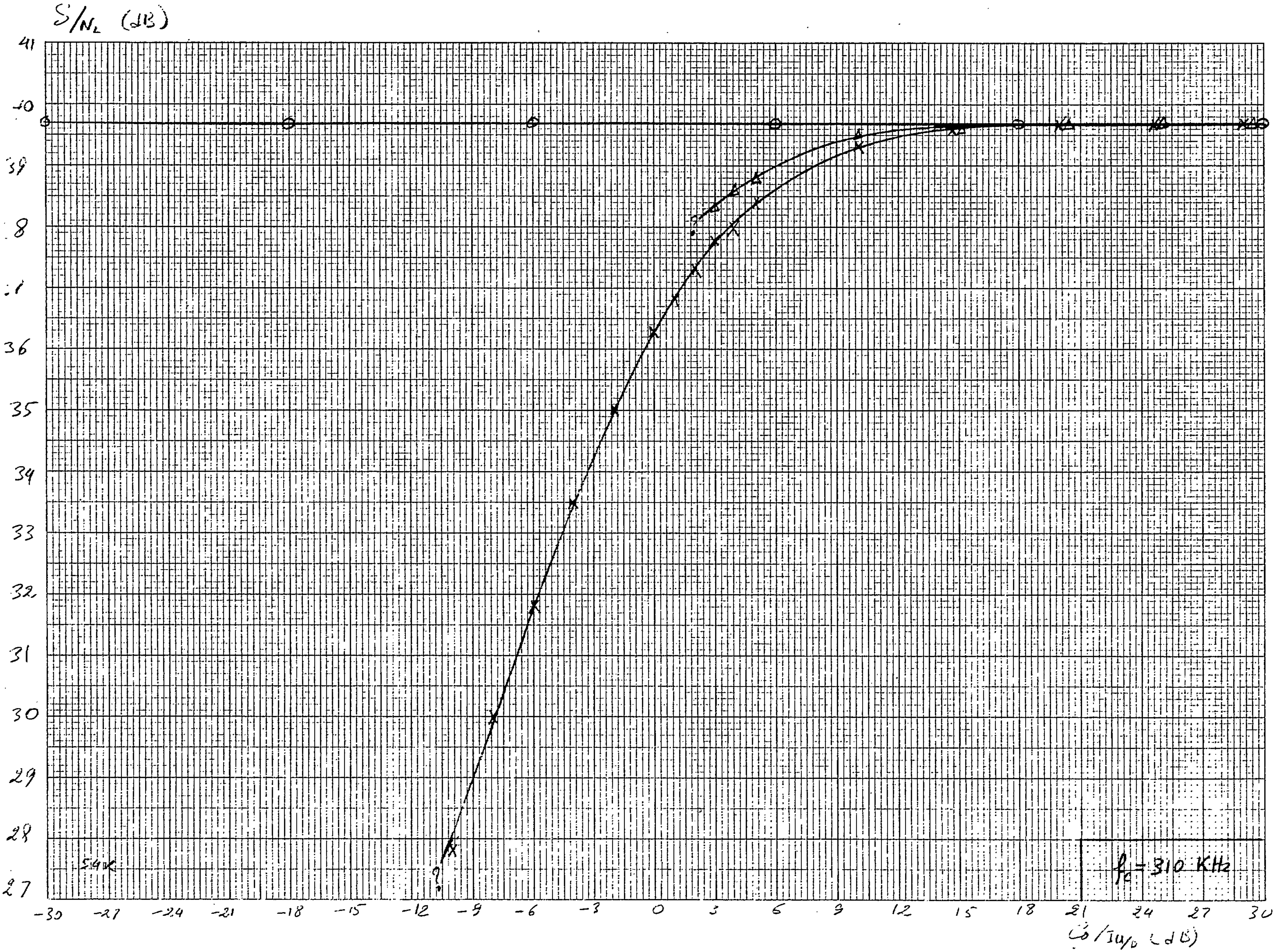
S/N_L (dB)
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
f_L = { o = 0 Hz
Δ = 30 Hz
X = 15.75 KHz
f_c = 190 KHz
S49
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
C_o/I_u/D (dB)

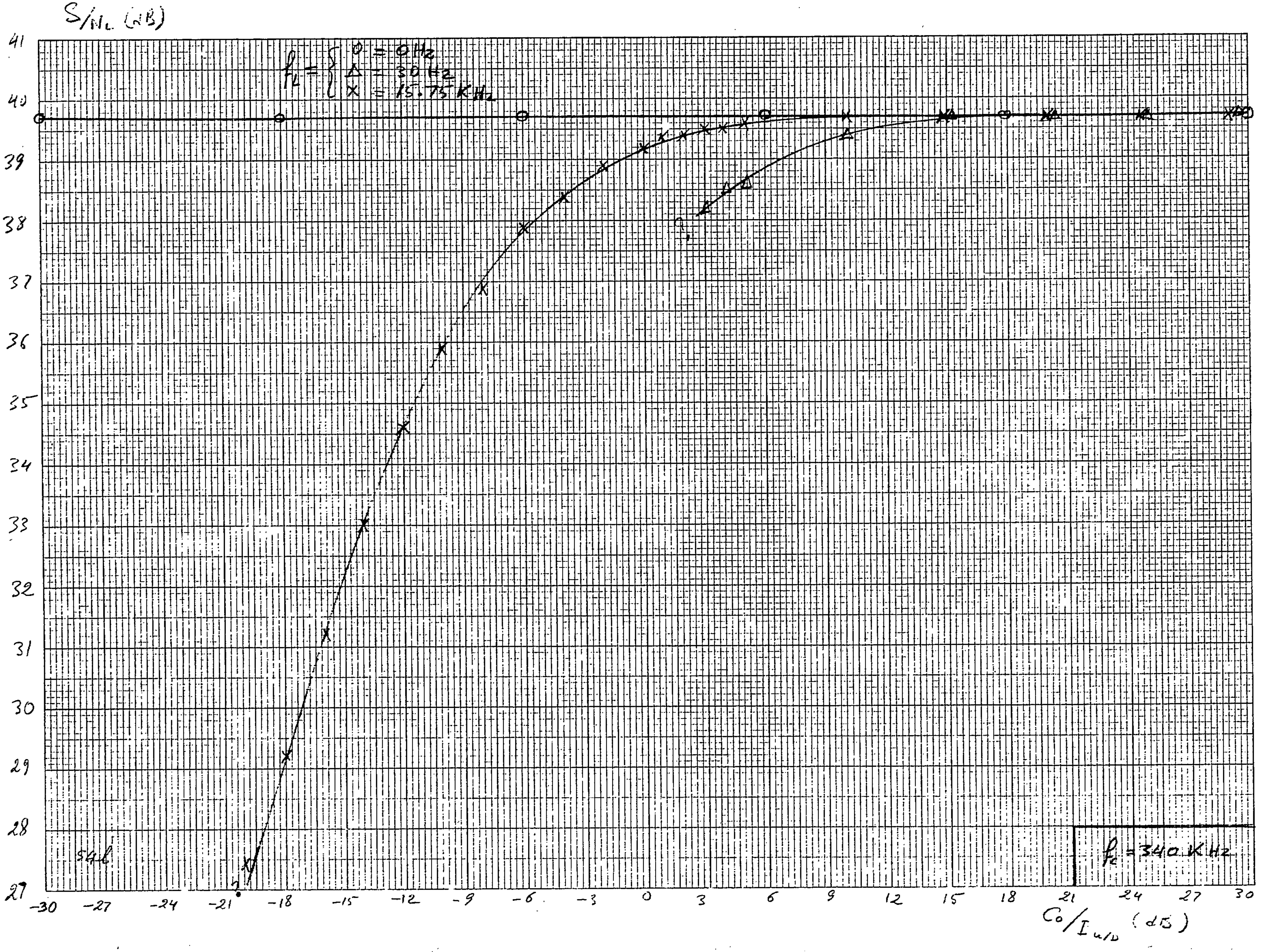

S/N_L (dB)
f_L = { O = 0 Hz
Δ = 30 Hz
X = 15.75 KHz
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
C/I u/D (dB)
f_c = 220 KHz

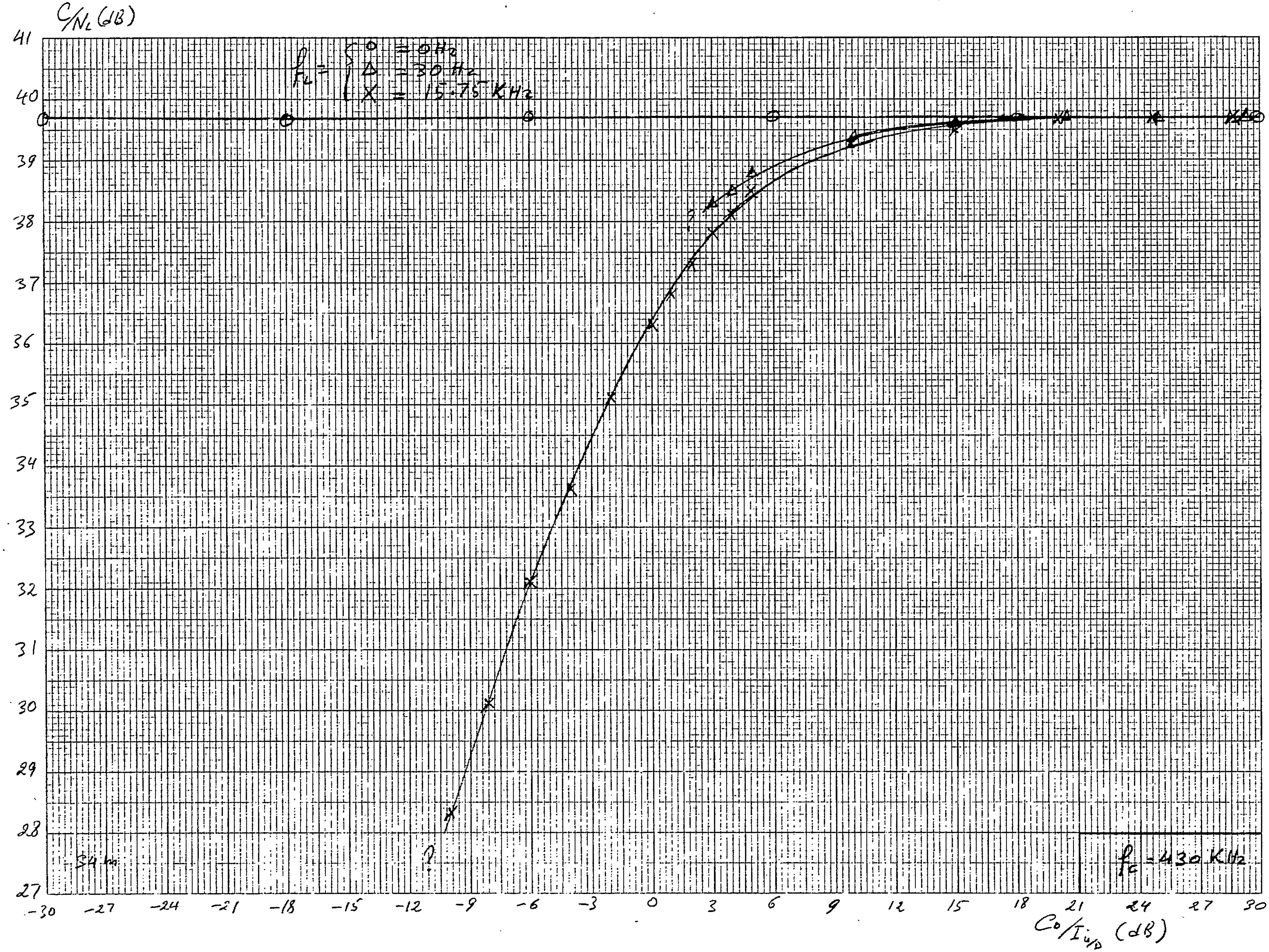

S/N_L (dB)
f_L = { O = 0 Hz, Δ = 30 Hz, X = 15.75 KHz
f_c = 250 KHz
Co/I_u,n (dB)
41
40
39
38
37
36
35
34
32
31
30
29
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30

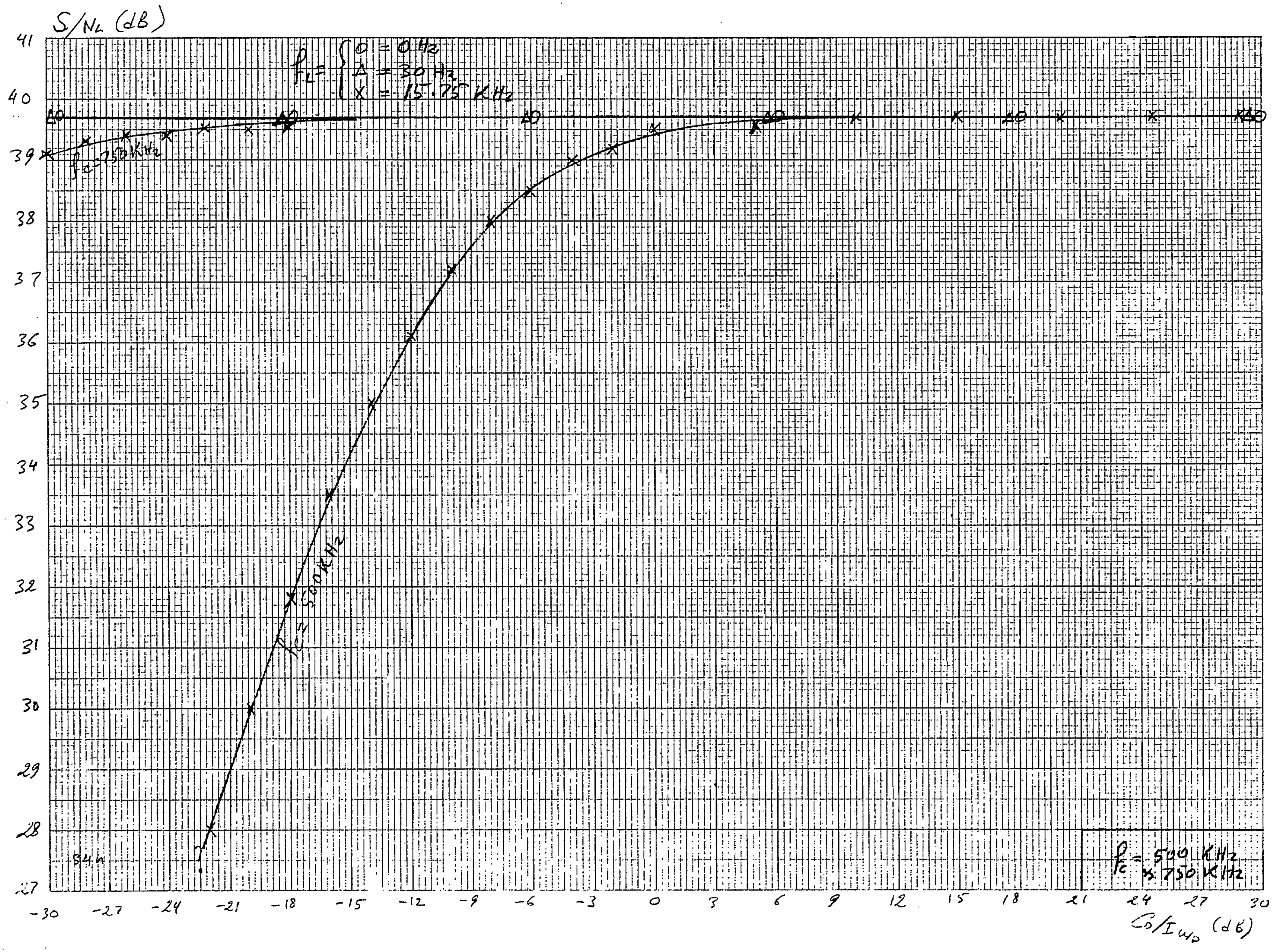


S/N_L (dB)
f_L = { o = 0 Hz, Δ = 30 Hz, X = 15.75 KHz
41
40
39
38
36
35
34
33
32
31
30
29
28
f_c = 280 KHz
-30
-27
-24
-21
-18
-15
-12
-9
-6
-3
0
6
9
12
15
18
24
27
30


S/N_L (dB)
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
C₀/I_{u/D} (dB)
54K
f_c = 310 KHz


S/N (dB)
f = { O = 0 Hz, Δ = 30 Hz, X = 15.75 KHz }
f = 340 KHz
Co/I (dB)
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30


C/N_L (dB)
f_L = { O = 0 Hz
Δ = 30 Hz
X = 15.75 KHz
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
-30 -27 -24 -21 -18 -15 -12 -9 -6 -3 0 3 6 9 12 15 18 21 24 27 30
C0/I_U/D (dB)
f_c = 430 KHz



S/N_L (dB)
f_L = { O = 0 Hz, Δ = 30 Hz, X = 15.75 KHz }
f_c = 750 KHz
f_c = 500 KHz
f_c = 500 KHz
x 750 KHz
41 … 27
-30 … 30
C_D/I_WD (dB)

SCPC INTERFERENCE STUDY: TEST RESULTS.