Recommendation T/R 22-07 E (Montreux 1993)

FREQUENCY BANDS, PLANNING AND CO-ORDINATION FOR SYSTEMS USING THE DCS 1800 STANDARDS

Recommendation proposed by the Working Group "Frequency Management" (FM)

Text of the Recommendation adopted by the "European Radiocommunications Committee" (ERC):

The European Conference of Postal and Telecommunications Administrations,

considering:

a) that the frequency bands 1710 - 1785 MHz/1805 - 1880 MHz are allocated to the Mobile Service and the Fixed Service on a co-primary basis

b) that the ETSI has developed standards for digital cellular mobile systems (DCS 1800) in the bands 1710 - 1785 MHz and 1805 - 1880 MHz

c) that there is a need for such systems in some countries in Europe

d) that in the implementation of DCS 1800 systems it is necessary to take account of national policies for the use of the frequency bands in question

e) that national frequency planning for the DCS 1800 systems is carried out by the operators and approved by the Radio-regulatory Administrations or carried out by such Administrations in co-operation with the operators

f) that frequency planning in border areas will be based on co-ordination between Radio-regulatory Administrations

noting:

a) that the DCS 1800 system is not intended to be a pan European System and therefore might be implemented only on a national basis

b) that in many CEPT member countries these frequency bands are used for fixed services both analogue and digital

c) that frequency co-ordination procedure and interservice sharing is necessary both between countries operating DCS 1800 systems and between those countries and countries operating other services in accordance with Radio Regulations

recommends:

1. that frequency co-ordination between DCS 1800 systems in border areas shall be based on the concept of preferential frequencies

2 that frequency co-ordination between DCS 1800 systems and other systems in neighbouring countries shall be based on bilateral agreements

3. that the national DCS 1800 systems should use all or parts of the frequency bands 1710 - 1785 MHz and 1805 - 1880 MHz in accordance with the relevant ETSI standards

4 that in order to ease frequency co-ordination introduction of DCS 1800 should start in the upper parts of the bands

5. that frequency co-ordination between DCS 1800 systems in border areas is based on the following concept:

5.1 Preferential frequencies or preferential frequency bands shall be agreed between Administrations concerned. Preferential frequencies may be used without co-ordination with a neighbouring country if the field strength of each carrier produced by the base station does not exceed a value of 25 dB μV/m at a height of 3 m above ground at a distance of 15 km inside the neighbouring country. When blocks of preferential frequencies are allocated to different countries in border areas one RF channel in each end of the blocks shall be treated as non preferential frequencies, in order to take account of adjacent channel interference.

5.2 All other frequencies are subject to co-ordination between Administrations if the interfering field strength produced by the base station exceeds 25 dB μV/m at a height of 3 m above ground at the border line between two countries.

5.3 Frequency planning in coastal areas is based on the concept of preferential frequencies and co-ordinated frequencies assuming a middleline between the countries involved. Other principles for frequency planning and frequency co ordination in coastal areas may be agreed between the Administrations concerned.

5.4 Propagation criteria for calculating the interfering field strength are described in Annex 1.

5.5 For adding multiple interferers the simplified algorithm described in Annex 2 can be used.

6. that the technical parameters described in Annex 3 are used in the frequency co-ordination for the DCS 1800 system

7. that the following frequency co-ordination procedure for co-ordination between DCS 1800 systems is used:

7.1 When requesting co-ordination the relevant characteristics of the base station shall be forwarded using the co-ordination form indicated in recommendation T/R 25-08 E. Administrations may diverge from the use of this form by common agreement but at least the following characteristics should be forwarded to the Administrations affected:

a) frequency in MHz
b) name of transmitter station
c) country of location of transmitter station
d) geographical co-ordinates
e) effective antenna height
f) antenna polarisation
g) antenna azimuth

h) directivity in antenna systems
i) effective radiated power
j) expected coverage zone
k) date of entry into service

7.2 The Administration affected shall evaluate the request for co-ordination and shall within 30 days notify the result of the evaluation to the Administration requesting co-ordination.

7.3 If in the course of the co-ordination procedure the Administration affected requires additional information, it may request such information.

7.4 If no reply is received by the Administration requesting co-ordination within 30 days it may send a reminder to the Administration affected. An Administration not having responded within 30 days following communications of the reminder shall be deemed to have given its consent and the frequency may be put into use with the characteristics given in the request for co-ordination.

7.5 The periods mentioned above may be extended by common consent.

8. In general Administrations may diverge from the technical parameters and procedures described in this Recommendation subject to bilateral agreements.

ANNEX 1

Propagation curves

The curves attached to this Annex should be used to determine the interfering Field strength. Administrations may agree on other curves, e.g. the latest version of CCIR Report 567.

Correction factors

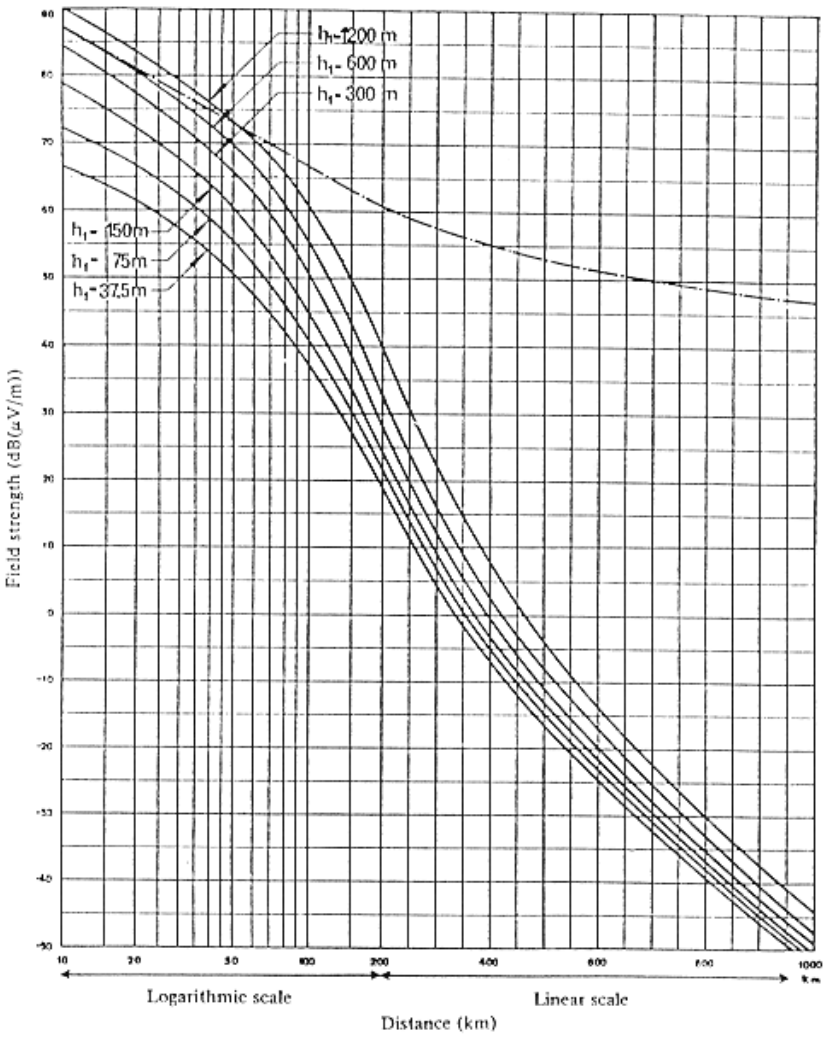
A general correction factor of - 9 dB is used in the 1800 MHz band.

Correction factor for receiving antenna from 10 m to 3 m: Distance
< 50 km: -10 dB
Distance > 100 km: -3 dB

Linear interpolation is used for intermediate distances.
For sea path propagation the correction factor for receiving antenna from 10 m to 3 m is -10 dB.

Effective antenna height

The effective antenna height used to determine interfering field strength is the difference between the physical height of the antenna and the average height of the terrain. The evaluation of the average height of the terrain may be subject to agreement between Administrations.

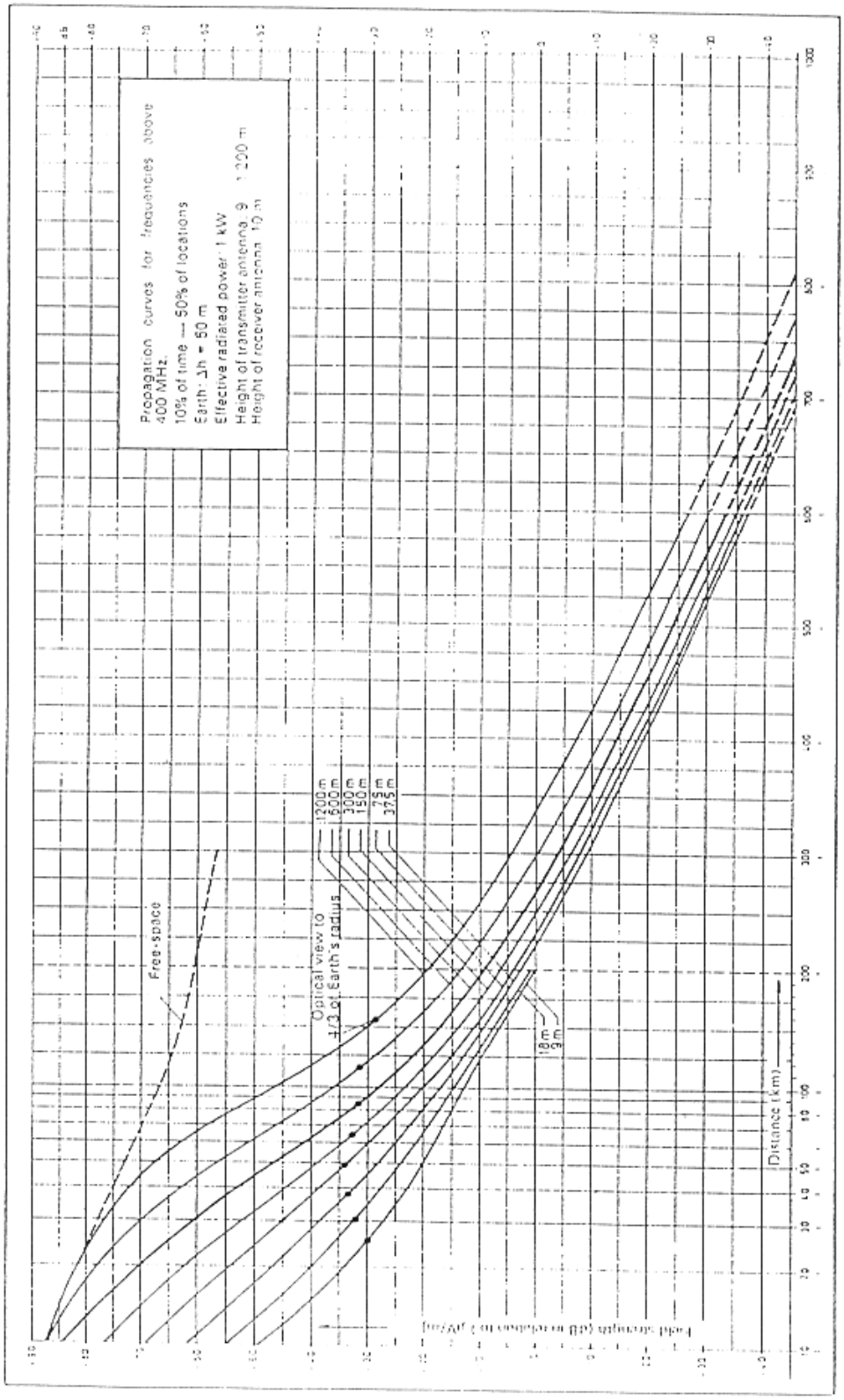


Field strength (dB (μV/m)) for 1 kW e.r.p.

Frequency: 450 to 1000 MHz (Bands IV and V) – Cold sea – 10% of the time – 50% of the locations – h_2 = 10 m

– · – · – Free space

PROPAGATION CURVES FOR FREQUENCIES ABOVE 400 MHz



Annex 2

1. Simplified algorithm for frequency co-ordination

1.1 Notation

P = e.i.r.p of wanted transmitter in direction of receiver (dBm)
L = Isotropic path loss from wanted transmitter to receiver (dB)
P_i = e.i.r.p of interfering transmitter i in direction of receiver (dBm)
L_i = Isotropic path loss from interfering transmitter i to receiver (dB)
α = Receiver antenna gain towards wanted transmitter (dBi)
α_i = Receiver antenna gain towards interfering transmitter i (dBi)
β_i = Gain due to receiver filter selectivity on interference from transmitter i (dB)
γ = Estimated shadowing margin to be allowed on C/I value (dB)
C = Total wanted carrier power at receiver input (dBm)
I_i = Effective interfering power due to transmitter i at receiver input (allowing for the effect of receiver filtering) (dBm)
I = Total effective interfering power at receiver input (allowing for shadowing margin) (dBm)
λ = C/I threshold value

1.2. Base-mobile Path Algorithm

(a) For each cell in question, take one or more "worst case" mobile station MS locations. These are locations at which the C/I is known, or believed to be, lowest.

(b) Calculate the wanted carrier power at the receiver input:
$C = P - L + \alpha$

(c) Calculate the effective interfering power due to each potentially interfering transmitter (whether co-channel or adjacent channel) at the receiver input (allowing for the effect of receiver filtering):
$I_i = P_i - L_i + \alpha_i + \beta_i$

(d) Sum the interfering powers at the receiver and allow for the shadowing margin:
$I = 10 \log_{10} \Sigma 10^{(I_i/10)} + \gamma$

(e) Check the effective C/I ratio (C-I) against the threshold value λ.

1.3. Mobile-base Path Algorithm

(a) Take each cell that has a potentially interfering mobile station (MS). If N is the number of carrier frequencies allocated to that cell that can cause potential interference to the base station (BS), assume there are N MS's, one radiating each carrier, in that cell.

A proportion of the total number of MS's so identified (e.g. 20%) should be assumed to be at the worst case locations of their cells and the rest at the mid-point of their cells.

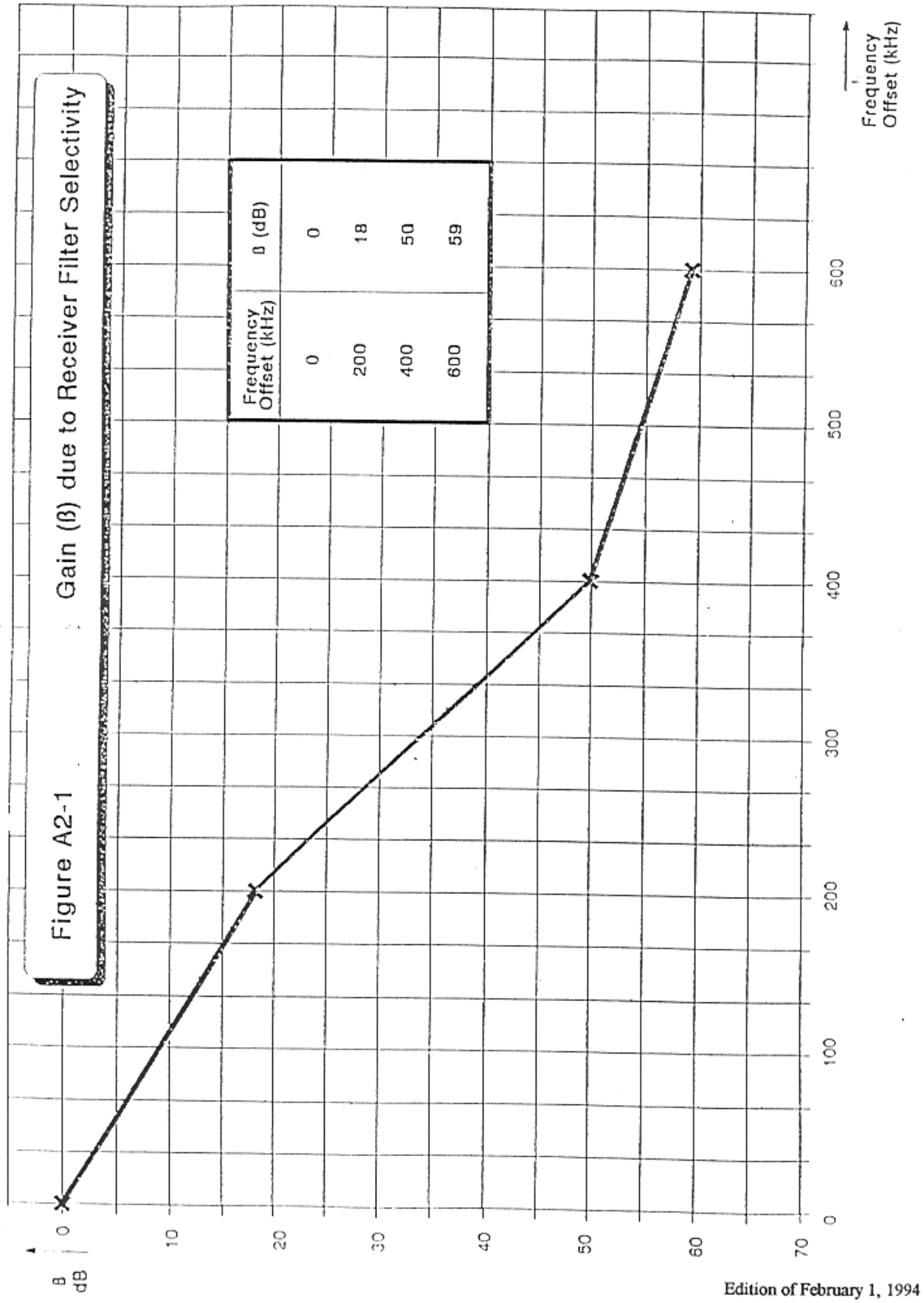


Figure A2-1
Gain (β) due to Receiver Filter Selectivity
Frequency Offset (kHz)
Frequency Offset (kHz) | β (dB)
0 | 0
200 | 18
400 | 50
600 | 59
β dB
0
10
20
30
40
50
60
70
0
100
200
300
400
500
600

ANNEX 3

Technical parameters of the DCS-1800 system

C/1 ratios

The C/I ratio is the ratio between signal power to interfering signal power at the receiver input during the active part of the DC S-1800 timeslot including multiple interferers.

The following C/I ratios apply

Wanted	Interferer	Co-channel	200 kHz	400 kHz	600 kHz
DCS-1800[1)]	DCS-1800	9 dB	- 9 dB	- 41 dB	- 49 dB

A curve indicating C/I values for intermediate values of frequency offset are attached to this Annex.

Notes :

Minimum field strength to be protected (E_{min}) :

(50 % of location - 50 % of time)

DCS-1800 MS 42 dB μV/m[1)]

DCS-1800 BS 38 dB μV/m[1)]

[1] Values from GSM recommendation 05-05 (Version 4.3.0)

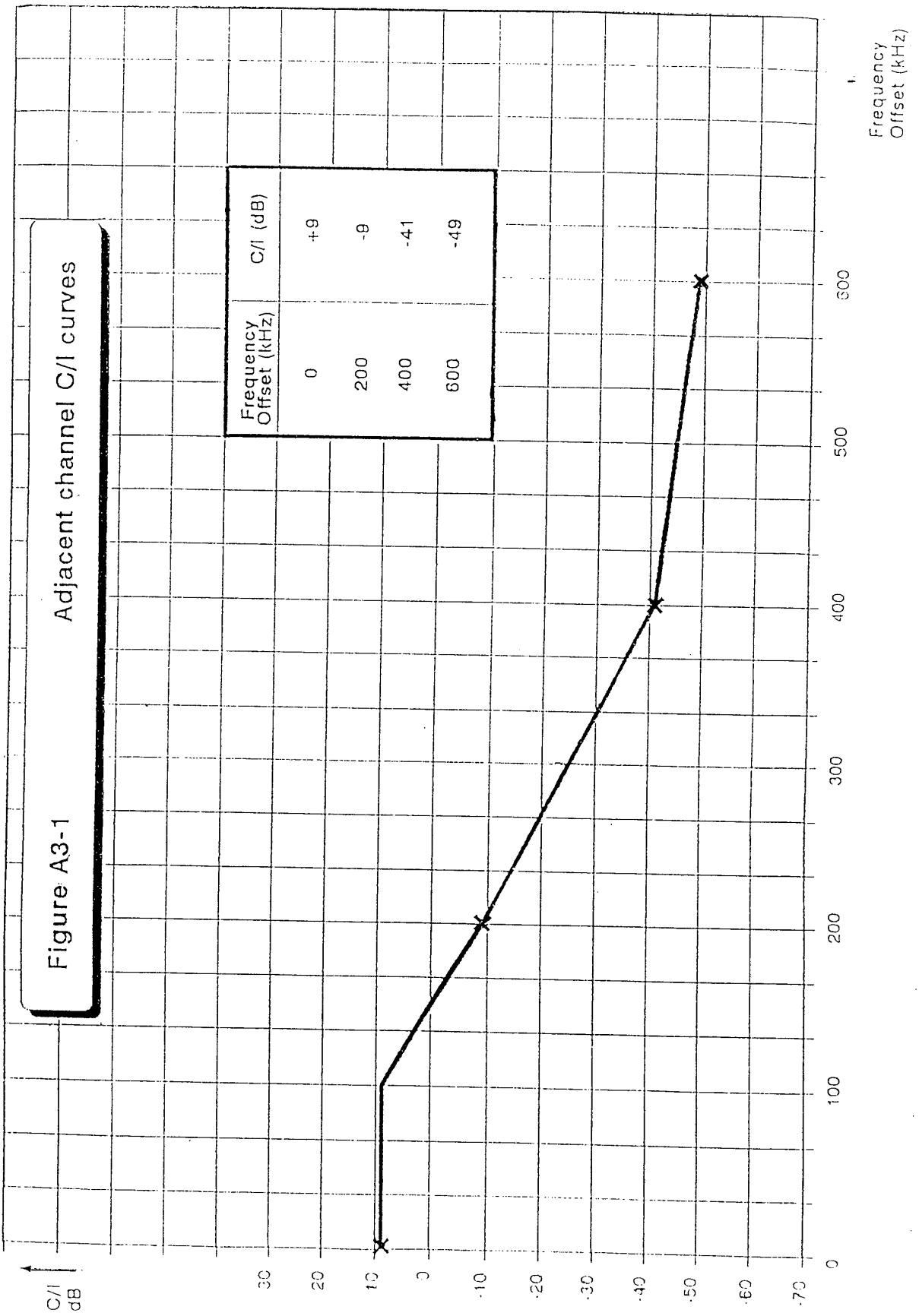


Figure A3-1
Adjacent channel C/I curves
C/I (dB)
Frequency Offset (kHz)
0
200
400
600
+9
-9
-41
-49
C/I dB
30
20
10
0
-10
-20
-30
-40
-50
-60
-70
0
100
200
300
400
500
600
Frequency Offset (kHz)