Commonwealth of Australia

Radiocommunications Act 1992

Radiocommunications Advisory Guidelines (Co-ordinating the operation of transmitters in the 500 MHz Bands)

I, CHRISTINE MARY GOODE, Spectrum Manager, acting on behalf of the Spectrum Management Agency, make the following instrument under subsection 262 (1) of the *Radiocommunications Act 1992*.

Dated 6th November 1996.

Christine M. Goode
Spectrum Manager

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PART 1—GENERAL INFORMATION

Purpose of these guidelines

The purpose of these advisory guidelines is to provide guidance to spectrum licensees in the 500 MHz bands (between 501-505 MHz and 511-515 MHz) on the operation of transmitters located within range of Telstra radio concentrator systems (RCS). These systems are used to deliver a telecommunications service to rural areas of inland Australia and their presence must be taken into account by spectrum licensees before operating their transmitters.

RCS follow frequency and cell plans that utilise frequencies for base transmitters in both the lower band (501-505 MHz) and upper band (511-515 MHz). Interference within the RCS network is controlled by the use of a cellular frequency re-use plan. Each RCS site is allocated a channel which results in acceptable co-channel and adjacent channel interference from other RCS sites.

Spectrum licensed transmitters do not follow the same cell plans as RCS and need to be specially coordinated in order to manage the level of interference to the RCS network. These advisory guidelines provide coordination procedures that spectrum licensees should follow in order to ensure that the power radiated from their transmitters in the direction of affected RCS sites is kept to an acceptable level.

The SMA does not intend to afford protection to receivers operated under spectrum licences from any interference they may encounter from RCS transmitters operated in accordance with their apparatus licence. The SMA also intends to afford protection, in accordance with these Advisory Guidelines, to RCS receivers from transmitters operated under a spectrum licence. Each case will be assessed on its merits.

Possible interference scenarios

The cellular implementation of RCS is such that an RCS base transmit frequency in one cluster of cells is never used by an RCS customer transmit frequency in another cluster. However, they can operate on either the lower band or the upper band. Table 1 below shows the affected frequency assignments for RCS base station, RCS customer and RCS repeaters.

RCS Parameters	Tx freq (MHz) Note 1	Rx freq (MHz)
Base Station	503.1 (2), 505.5 (4), 511.9 (1'), 514.3 (3')	513.1 (2'), 515.5 (4'), 501.9 (1), 504.3 (3)
Customer Station	501.9 (1), 504.3 (3), 513.1 (2'), 515.5 (4')	511.9 (1'), 514.3 (3'), 503.1 (2), 505.5 (4)
Repeater Station (could use any Tx or Rx frequency)	501.9 (1), 503.1 (2), 504.3 (3), 505.5 (4), 511.9 (1'), 513.1 (2') 514.3 (3'), 515.5 (4')	511.9 (1'), 513.1 (2'), 514.3 (3'), 515.5 (4'), 501.9 (1), 503.1 (2), 504.3 (3), 505.5 (4)

Table 1 RCS frequency assignments

Note 1. Tx frequencies only shown for information purposes
Note 2. (2) Figures in brackets represent RCS channel numbers

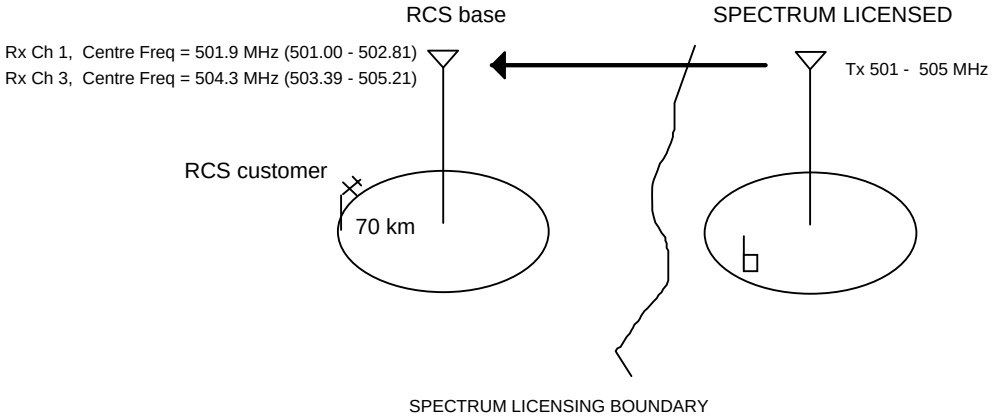
As can be seen from Table 1 there are four affected RCS frequencies (channels) in each of the lower and upper bands. Under spectrum licensing, spectrum licensed transmitters may operate in the lower band or the upper band. This gives rise to two possible interference scenarios:

Scenario 1 Spectrum licensed transmitters operating in the lower band (501 - 505 MHz) with RCS base or repeater or customer receivers; and

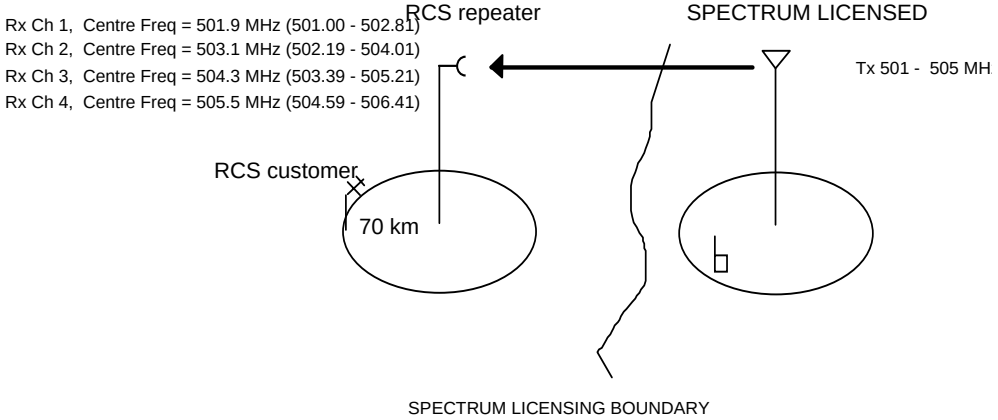
Scenario 2 Spectrum licensed transmitters operating in the upper band (511 - 515 MHz) with RCS base or repeater or customer receivers.

Scenario 1 Co-ordination of spectrum licensed transmitters operating in the lower band (501-505 MHz) with RCS base or repeater or customer receivers.

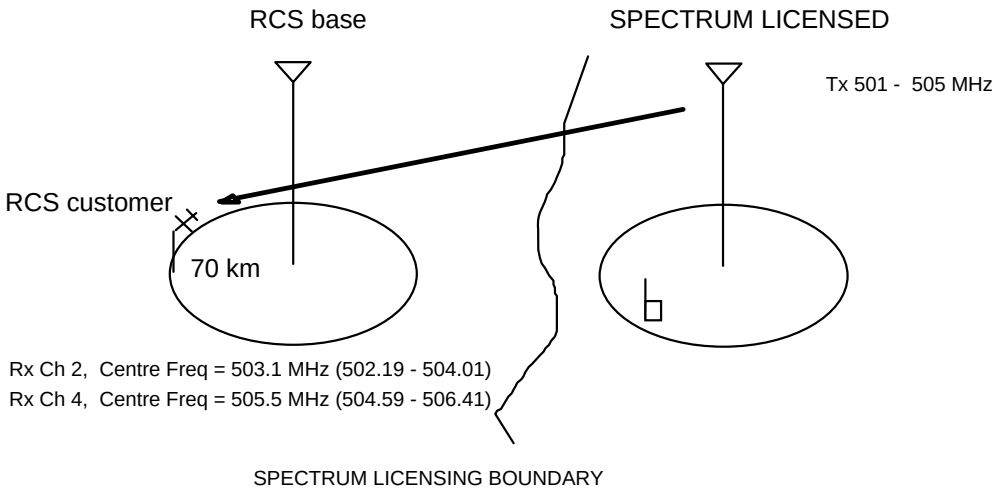
RCS base station receivers with centre frequencies 501.9 MHz (ch 1) and 504.3 MHz (ch 3)



RCS repeater station receivers with centre frequencies 501.9 MHz (ch 1), 503.1 MHz (ch 2), 504.3 MHz (ch 3) and 505.5 MHz (ch 4)

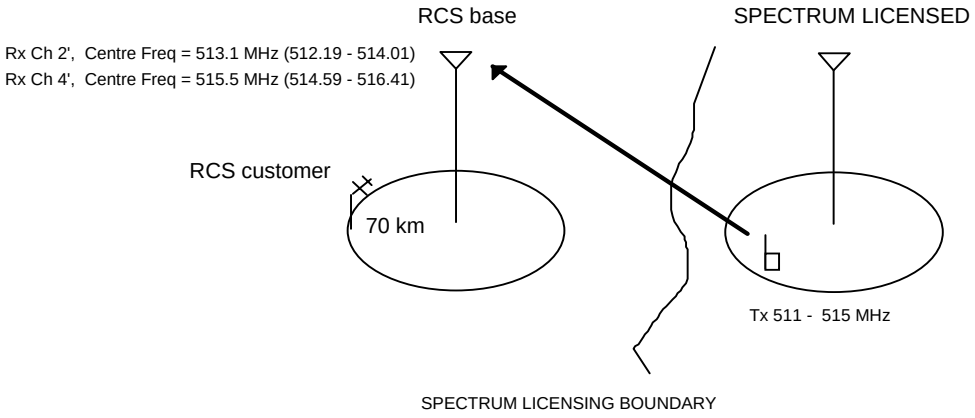


RCS customer station receivers with centre frequencies 503.1 MHz (ch 2) and 505.5 MHz (ch 4)

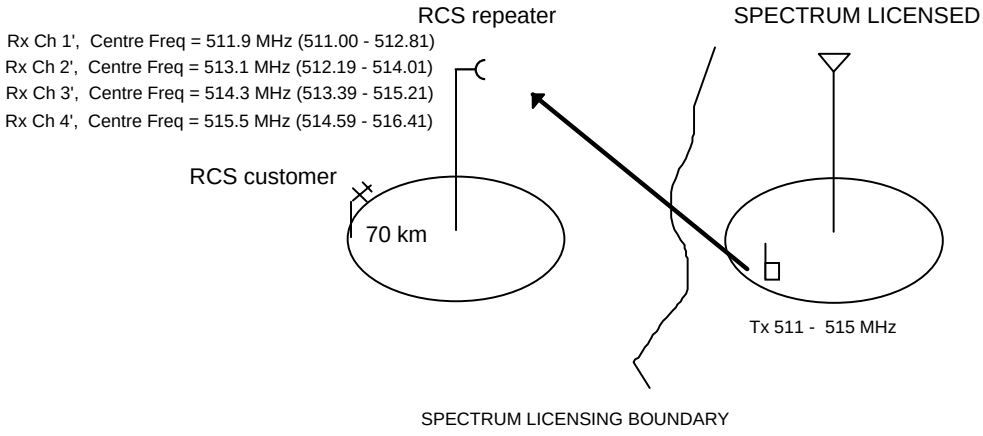


Scenario 2 Co-ordination of spectrum licensed transmitters operating in the upper band (511 - 515 MHz) with RCS base or repeater or customer receivers

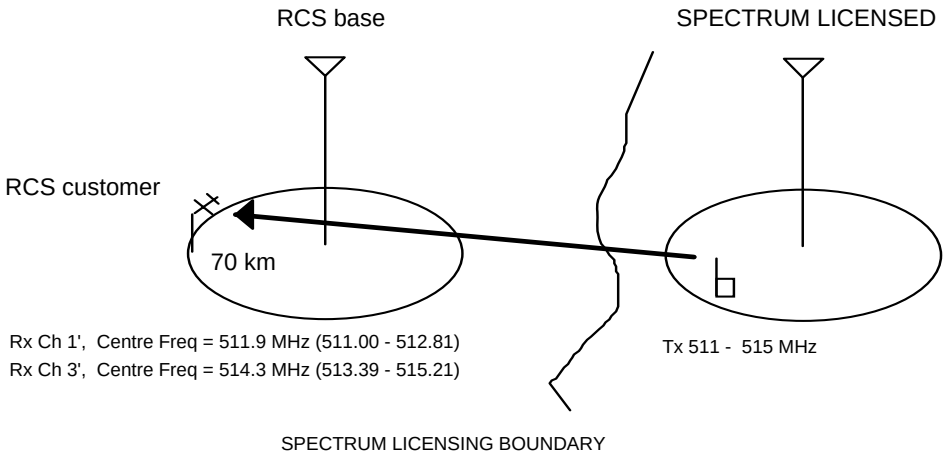
RCS base station receivers with centre frequencies 513.1 MHz (ch 2') and 515.3 MHz (ch 4')



RCS repeater station receivers with centre frequencies 511.9 MHz (ch 1'), 513.1 MHz (ch 2'), 514.3 MHz (ch 3') and 515.3 MHz (ch 4')



RCS customer station receivers with centre frequencies 511.9 MHz (ch 1') and 514.3 MHz (ch 3')



Assessing the potential for interference between a spectrum licensed transmitter and RCS base/repeater/customer receivers under Part 2 of these Advisory Guidelines

Spectrum licensees will, in some cases, be required to assess the level of potential interference from a proposed spectrum licensed transmitter to each affected RCS site. Spectrum licensees will be responsible for ensuring that the level of interference is lower than the maximum long term[1] allowable interference appropriate to RCS receivers. The coordination procedure is set out in Part 2 of these Advisory Guidelines.

In many cases the levels of interference between RCS and spectrum licensed transmitters will be well within acceptable limits, and there will be no need to carry out the detailed coordination procedures set out in Part 2 of these Advisory Guidelines. Spectrum licensees can use the look-up table in Table 2 in Part 2 to determine if there is a need to carry out detailed coordination.

Recommendation ITU-R PN.526-3 should be used for calculating terrain loss between two sites. The interference path loss is modelled by diffraction over spherical earth or diffraction over obstacles (eg knife edge or multiple knife edge obstructions). The method is given in Schedule 2.

[1] 'Long term' is defined as percentage of time ≥ 20%

PART 2—COORDINATION PROCEDURES

Interpretation

1. In this Part:

'effective occupied bandwidth' has the meaning it has in the Radiocommunications Spectrum Marketing Plan (500 MHz Band) 1996;

'EIRP' means equivalent isotropically radiated power;

'horizontally radiated power' has the meaning it has in Radiocommunications Spectrum Marketing Plan (500 MHz Band) 1996;

'lower band' has the meaning it has in Radiocommunications Spectrum Marketing Plan (500 MHz Band) 1996;

'minimum distance' means the distance worked out in accordance with clause 2;

'upper band' has the meaning it has in Radiocommunications Spectrum Marketing Plan (500 MHz Band) 1996.

Meaning of "minimum distance"

2. The minimum distance is, for a transmitter that is located at a height nearest to the value set out in an item in the left hand column of Table 2 below, with an EIRP for each 12.5 kHz of bandwidth nearest to the value set out in a column of the top row of the table — the distance in kilometres set out in that column of the item.

Ht (metres above sea level)	EIRP/12.5 kHz (dBm) 49	40	30
20	290	265	245
60	315	295	270
100	330	310	285
200	355	335	310
500	400	380	355
1000	460	435	415
1600	510	485	460

Table 2 Coordination Look-up Table

Coordination of RCS with spectrum licensed transmitters

3. (1) This clause applies to a person who is operating, or intends to operate, under a spectrum licence, a transmitter:

(a) that is located at a point that is at a distance that is equal to or less than the minimum distance from an RCS base receiver that is authorised to operate on the frequency:

(i) 501.9 Megahertz; or

(ii) 503.1 Megahertz; or

(iii) 504.3 Megahertz; or

(iv) 505.5 Megahertz; and

(b) that has its emission centre frequency plus or minus half the effective occupied bandwidth within plus or minus 910 kHz of any of the frequencies referred to in paragraph (a).

[NOTE: A list of RCS base/repeater/customer site coordinates operating in these bands is provided in Schedule 1. The site and frequency convention sense used in Schedule 1 is the same as that of the SMA's RADCOM database. A site name under the field A_SITE will correspond to a site with transmitting frequency A_FREQ and receiving frequency B_FREQ. eg. The receive frequency for site Cheviot Hills would be 511.9 MHz.

The field names A_STREET, B_STREET, A_ANT_TYPE and B_ANT_TYPE used in RADCOM should be used to determine whether A_SITE or B_SITE is an RCS base/repeater or an RCS customer station. eg. field antenna types of site A (A_ANT_TYPE) with U, T are associated with omni antenna, a base station site. Antenna type 4MP associated with 'radio terminal' is a 4 metre parabolic directional repeater antenna. Antenna type 15 1Y associated with 'RCS subscribers' is a 15 element directional customer Yagi antenna.

Only limited RADCOM fields are included in Schedule 1.]

(2) For the purposes of following the procedures set out in this clause, the person should:

(a) if a procedure involves calculations in relation to an RCS customer receiver, assume that the customer receiver:

(i) is located at the site of the RCS base station to which it relates; and

(ii) has an antenna with an antenna gain of 15 dBi and an antenna height of 10 metres;

(b) if a procedure involves calculations in relation to a transmitter that is operated in the upper band under a spectrum licence, assume that the transmitter is located at the site of the base station to which it relates. If there are emissions emanating from other sites that are likely to result in RCS levels of protection being exceeded then these should also be analysed.

(c) if a procedure involves calculations in relation to an RCS repeater station, take account of the directional characteristics of the antenna that is used in conjunction with the repeater station.

(3) The person should calculate the propagation loss in accordance with the following formula:

$L_b = L_{bf} + L_t$

where:

L_b = Propagation loss (dB)

L_{bf} = Free Space Loss (dB)
$32.4 + 20 \log(500 \cdot d)$ where d = separation distance in kilometres

L_t = Terrain Loss modelled by spherical earth or knife edge or multiple knife edge diffractions (dB) as specified in ITU-R 526-3. [NOTE: See Schedule 2]

[NOTE: Apart from FSL, propagation loss associated with terrain will determine the required level of protection to RCS receivers. Long term terrain protection is associated with diffraction loss at an effective Earth's radius or k-factor and can be calculated as shown in Schedule 2. A k-factor of 3 which corresponds to a percentage of time greater than 20% (ITU-R Rec 758 and RALI FX3) is used in the analysis.]

(4) The person should calculate the level of unwanted power from the operation of the transmitter that is received by the RCS base receiver using the following formula:

$$P_u = EIRP_t - L_b + G_r - D_r$$

where:

P_u = Unwanted Power (dBm/12.5 kHz)

$EIRP_t$ = proposed spectrum licensed horizontally radiated power for the transmitter (dBm/12.5 kHz EIRP) that is within the bandwidth of the RCS receiver and in the direction of the RCS receiver

L_b = $L_{bf} + L_t$

G_r = gain of RCS receiver antenna (dBi)

- for RCS base refer to RADCOM database (typically 8/11 dBi)
- for RCS repeater refer to RADCOM database (typically 17/20/23 dBi)
- for customer G_r = 15 dBi

D_r = Antenna Discrimination in the direction of spectrum licence transmitter (dB)

- for RCS base $D_r = 0$
- for RCS repeater refer Schedule 3
- for customer $D_r = 0$ dB (assume that customer antenna is pointing at spectrum licence transmitter)

(5) The level of unwanted power obtained using the formula in subclause (4) should be no greater than - 134.1 dBm/12.5 kHz.

[NOTE: The maximum value for permissible level of interference into a RCS receiver ($I_{RCS)}$ is worked out using the following formula:

I_{RCS}(dBm/12.5 kHz) = RCS thermal noise - Noise for 1 dB degradation - bandwidth adjustment

= -106.5 -6 - 10 log (1820/12.5)

= -134.1 dBm]

SCHEDULE 1

RCS SITE COORDINATES WITHIN 350 KM OF SPECTRUM LICENCE TRANSMITTER

NSW

A_FREQ	B_FREQ	A_SITE	B_SITE	A_STREET	B_STREET	A ZONE	A_EAST	A_NORTH	B_ZONE	B_EAST	B_NORTH
511.9	501.9	ANDERSONS HILL	ANDERSONS HILL	RADIO TERMINAL	ANDERSONS HILL SUBS 60KM	54	662622	6504276	54	662622	6504276
513.1	503.1	BALRANALD	BALRANALD	DRCS SUBSCRIBERS	TELEPHONE EXCHANGE	0	-	-	54	735030	6163751
514.3	504.3	BARRAROO	BARRAROO	RADIO TERMINAL	BARRAROO SUBS 60KM RADIUS	54	682394	6430196	54	682394	6430196
514.3	504.3	BROKEN HILL	THACKARINGA	TELEPHONE EXCHANGE		54	544470	6464905	54	516206	6454058
514.3	504.3	BUCKAMBOOL	BUCKAMBOOL		DRCS SUBSCRIBERS(60 KMS RA	55	373574	6465760	55	373574	6465760
514.3	504.3	BUCKAMBOOL	THE COTTAGE			55	373574	6465760	55	322840	6463406
514.3	504.3	BUCKAMBOOL	THULE HUT			55	373574	6465760	55	381185	6414727
511.9	501.9	COBAR	BUCKAMBOOL	TELEPHONE EXCHANGE		55	389681	6514202	55	373574	6465760
513.1	503.1	CORONGA PEAK	MT BOPPY		TELECOM SITE	55	429517	6577541	55	431630	6509900
511.9	501.9	DARNICK	DARNICK	DRCS REPEATER	DRCS SUBS (60K RADIUS OF)	54	749446	6368523	0	-	-
514.3	504.3	GIRILAMBONE	GIRILAMBONE	DRCS BASE (TDM)	DRCS SUBSCRIBERS	55	490290	6541750	55	400000	6400000
511.9	501.9	HILLSTON	HILLSTON	TELEPHONE EXCHANGE	HILLSTON SUBS 60KM RADIUS	55	363523	6293704	0	-	-
511.9	501.9	HILLSTON	WARANARY HILL	TELEPHONE EXCHANGE	RADIO TERMINAL	55	363523	6293704	55	349950	6342170
511.9	501.9	MAUDE	OXLEY	TELEPHONE EXCHANGE	RADIO TERMINAL	55	252543	6182453	55	238225	6231701
511.9	501.9	MENINDEE	MENINDEE	REPEATER	DRCS SUBS	54	633240	6414793	0	-	-
511.9	501.9	MENINDEE	WILLOTIA	REPEATER LINK	REPEATER LINK	54	633240	6414793	54	623890	6366019
514.3	504.3	MIN MIN	MIN MIN	DRCS BASE	DRCS SUBSCRIBERS	54	770360	6282726	0	-	-
513.1	503.1	MOSSGIEL	MOSSGIEL	DRCS SUBS (60KM RADIUS)	DRCS REPEATER	0	-	-	55	273505	6317358
513.1	503.1	MT BOPPY	MT BOPPY	DRCS SUBSCRIBERS(60KMS RA	TELECOM SITE	55	431630	6509900	55	431630	6509900
513.1	503.1	MT DERING	NUNDOOKA	RADIO TERMINAL	RADIO TERMINAL	54	558025	6516228	54	565191	6587310
513.1	503.1	NETLEY	THACKARINGA			54	541118	6389817	54	516206	6454058
514.3	504.3	NUNDOOKA	WONNAMINTA	RADIO TERMINAL	REPEATER	54	565191	6587310	54	624210	6601004
513.1	503.1	NYMAGEE	MT BOPPY		TELECOM SITE	55	437128	6457327	55	431630	6509900
513.1	503.1	PINE RIDGE	PINE RIDGE	PINE RIDGE SUBS-60KM RAD	RADIO TERMINAL	0	-	-	55	428466	6375911
514.3	504.3	QUAMBONE	BUCKINGUY	DRCS BASE	DRCS BASE	55	582958	6577698	55	544333	6581500
514.3	504.3	QUAMBONE	QUAMBONE	DRCS BASE	DRCS SUBS RADIUS	55	582958	6577698	55	582958	6577698
514.3	504.3	QUAMBONE	WARRINGTON	DRCS BASE	DRCS BASE	55	582958	6577698	55	619710	6605399
513.1	503.1	THACKARINGA	THACKARINGA	SUBSCRIBERS	REPEATER	54	516206	6454058	54	516206	6454058
513.1	503.1	TOTTENHAM	TOTTENHAM	DRCS CUSTOMERS	RATV SITE (HYBRID REPETR)	0	-	-	55	531298	6435146
514.3	504.3	WAKOOL	MOULAMEIN	REPEATER	REPEATER	55	263045	6071841	55	229619	6112910
504.3	504.3	WARANARY HILL	WARANARY HILL	RADIO TERMINAL	RADIO TERMINAL	55	349950	6342170	55	349950	6342170
514.3	504.3	WARREN	WARREN AREA	TELEPHONE EXCHANGE	DRCS SUBSCRIBER STATIONS	55	579363	6492345	0	-	-
511.9	501.9	WARRINGTON	WARRINGTON	DRCS BASE	DRCS SUBS RADIUS	55	619710	6605399	55	619710	6605399
511.9	501.9	WARRINGTON	WARRINGTON	DRCS BASE	DRCS BASE	55	619710	6605399	55	619710	6605399
514.3	504.3	WEEMELAH	WEEMELAH	DRCS BASE	DRCS SUBS RADIUS	55	719610	6788589	55	719610	6788589

513.1	503.1		BUCKINGUY	-- NO RELATED RECORD --	RADIO TERMINAL				55	544333	6581500
514.3	504.3		WARANARY HILL	-- NO RELATED RECORD --	WARANARY HILL SUBS 60KM				55	349950	6342170
515.5	505.5	ANDERSONS HILL	GLEN LYON	RADIO TERMINAL	RADIO TERMINAL	54	662622	6504276	54	618090	6456679
515.5	505.5	BARRAROO	GLEN LYON	RADIO TERMINAL	RADIO TERMINAL	54	682394	6430196	54	618090	6456679
515.5	505.5	COLANE AREA	COLANE	DRCS SUBSCRIBERS		0	-	-	55	523222	6542408
515.5	505.5	COLLARENEBRI	COLLARENEBRI	DRCS SUBS 60KM RADIUS	COLLARENEBRI RATV	55	652899	6730974	55	652899	6730974
515.5	505.5	GLEN LYON	GLEN LYON	GLEN LYON SUBS 60KM RAD	RADIO TERMINAL	0	-	-	54	618090	6456679
515.5	505.5	MACCULLOCHS RANGE	MACCULLOCHS RANGE	DRCS SUBS	REPEATER	54	767113	6489874	54	767113	6489874
515.5	505.5	MARRA	MACCULLOCHS RANGE	REPEATER	REPEATER	54	786249	6559653	54	767113	6489874
515.5	505.5	MENINDEE	GLEN LYON	REPEATER	REPEATER	54	633240	6414793	54	618090	6456679
515.5	505.5	RAVENSFIELD	RAVENSFIELD	RAVENSFIELD SUBS 60KM RAD	RADIO TERMINAL	55	279663	6279160	55	279663	6279160

QLD

A_FREQ	B_FREQ	A_SITE	B_SITE	A_STREET	B_STREET	A ZONE	A_EAST	A_NORTH	B_ZONE	B_EAST	B_NORTH
513.1	503.1	AVONMORE HSTD	AVONMORE HMSD	DRCS SUBS(34KM RADIUS OF)	RADIO TERMINAL (14KM SSW)	55	475500	7349601	55	475500	7349600
513.1	503.1	BRUCEDALE	ROMA	RADIO TERMINAL	RADIO TERMINAL	55	690715	7022291	55	684152	7059394
511.9	501.9	CONNORS RIVER	CONNORS RIVER	RADIO TERMINAL	RADIO TERMINAL	55	704087	7558831	55	704087	7558831
511.9	501.9	COOKTOWN	COOKTOWN	RADIO TERMINAL	DRCS SUBS (16KM RADIUS OF	55	311399	8287620	55	311400	8287600
511.9	501.9	COOKTOWN	MT MISERY	RADIO TERMINAL	RADIO TERMINAL	55	311399	8287620	55	310093	8243486
511.9	501.9	COOKTOWN	MT PIEBALD	RADIO TERMINAL	RADIO TERMINAL	55	311399	8287620	55	294548	8305705
514.3	504.3	DAWES RANGE	CANIA	RADIO TERMINAL	TELECOM SITE	56	284845	7266746	56	295576	7271889
514.3	504.3	DAWES RANGE	DAWES RANGE	MICROWAVE REPEATER	MICROWAVE REPEATER STN AR	56	284847	7266760	56	284850	7266770
513.1	503.1	DRCS SUBSCRIBERS	NEWLANDS	RADIO TERMINAL	RADIO TERMINAL	55	591245	7654288	55	591245	7654288
513.1	503.1	DUNRAVEN	DUNRAVEN	DRCS SUBSCRIBERS 20 KM	RADIO TERMINAL	54	552179	7816691	54	808700	7729700
511.9	501.9	GIDYEA CREEK	GIDYEA CREEK	RADIO TERMINAL	DRCS SUBSCRIBERS 30 KM	55	471539	7625740	55	471539	7625740
511.9	501.9	GLENDON HOMESTEAD	ROSCOE	ROSCOE R/T (2KM W OF)	DRCS SUBS(53KM RADIUS OF)	54	767800	7387800	55	217222	8112222
513.1	503.1	GRAFTON RANGE	ROMA	RADIO TERMINAL	RADIO TERMINAL	55	699400	7088600	55	684152	7059394
513.1	503.1	GULUGUBA	GULUGUBA	DRCS SUBS (28KM RADIUS OF	RADIO TERMINAL 15 KM E OF	56	219722	7089322	56	219700	7089300
513.1	503.1	LESTREE HILL	RECRUIT HOMESTEAD	RADIO TERMINAL	BANCHORY R/T (4KM S OF)	55	468600	7475000	55	500500	7483200
514.3	504.3	LYND RIVER	KELLYS CREEK	RADIO TERMINAL	RADIO TERMINAL	55	275300	8005700	55	262663	7971754
514.3	504.3	LYND RIVER	LYND RIVER	RADIO TERMINAL	DRCS SUBS 34KM RADIUS OF	55	274300	8005700	55	274322	8005722
513.1	503.1	LYND RIVER	MOUNT GARNET	RADIO TERMINAL	RADIO TERMINAL	55	274300	8005700	55	300510	8043470
514.3	504.3	LYND RIVER	MURRAY SPRING CREEK	RADIO TERMINAL	RADIO TERMINAL 2KM SE	55	274300	8005700	55	340452	7993332
514.3	504.3	MOUNT FOX	EWAN	OAK HILLS RD	RADIO TERMINAL	55	375900	7919700	55	373400	7893800
514.3	504.3	MOUNT FOX	HIDDEN VALLEY	OAK HILLS RD	RADIO TERMINAL	55	375900	7919700	55	393350	7902100
514.3	504.3	MOUNT FOX	MT FOX	OAK HILLS RD	DRCS SUBS 15KM RADIUS	55	375900	7919700	55	368900	7929300
514.3	504.3	MOUNT FOX	SANDY CREEK	OAK HILLS RD	RADIO TERMINAL	55	375900	7919700	55	348700	7910750
514.3	504.3	MOUNT FOX	SEAVIEW RANGE	OAK HILLS RD	RADIO TERMINAL	55	375900	7919700	55	366650	7938300
511.9	501.9	MOUNT STURGEON	CHEVIOT HILLS	RADIO TERMINAL	RADIO TERMINAL	55	218800	7778900	55	193800	7832700
511.9	501.9	MOUNT STURGEON	MOUNT STURGEON	RADIO TERMINAL	DRCS SUBSCRIBERS 35 KM	55	218800	7778900	55	218800	7778900
513.1	503.1	MT GARNET	MOUNT GARNET	DRCS SUBS 32KM RADIUS OF	RADIO TERMINAL	55	300500	8043500	55	300510	8043470
513.1	503.1	MT LESWELL	MT LESWELL	DRCS (4KM RADIUS OF)	RADIO TERMINAL	55	321500	8246100	55	321470	8246080

513.1	503.1	MT LYON	MT LYON	DRCS SUBS(24 KM RADIUS OF	MON R/T (6KM SW OF)	55	573422	7249822	55	573400	7249800
513.1	503.1	MT MUNGUNGAL	MT MUNGUNGAL	DRCS SUBS(20KM RADIUS OF)	RADIO TERMINAL	56	239322	7223722	56	239300	7223700
513.1	503.1	NORTH HEAD	NORTH HEAD	DRCS SUBSCRIBERS 30 KM	RADIO TERMINAL	54	726500	7929400	54	726500	7929400
514.3	504.3	OAKY HILL	OAKY CK HILL	OAKY CK R/T (5KM W OF)	DRCS SUBS (12KM RADIUS OF	55	295400	8283300	55	295422	8283322
513.1	503.1	PEAWADDY CK AREA	PEAWADDY CREEK	GROUP SUBSCRIBER SYSTEM	RADIO TERMINAL	55	643250	7272222	55	643300	7275100
513.1	503.1	POTOSI	ROSEBERY DOWNS	RADIO TERMINAL	RADIO TERMINAL	55	271750	7537520	55	257950	7492870
513.1	503.1	RECRUIT HSTD	RECRUIT HOMESTEAD	DRCS SUBS (52KM RADIUS OF	BANCHORY R/T (4KM S OF)	55	500222	7482222	55	500500	7483200
514.3	504.3	ROLLESTON	CRESCENT CREEK	MT OGG RADIO TERMINAL	RADIO TERMINAL	55	665687	7293481	55	679800	7279100
514.3	504.3	ROLLESTON	PEAWADDY CREEK	MT OGG RADIO TERMINAL	RADIO TERMINAL	55	665687	7293481	55	643300	7275100
514.3	504.3	ROLLESTON	ROLLESTON	MT OGG RADIO TERMINAL	GROUP SUBSCRIBER SYSTEM	55	665687	7293481	55	665687	7293481
513.1	503.1	ROMA	ROMA	DRCS SUBS (33KM RADIUS)	RADIO TERMINAL	55	684222	7052222	55	684152	7059394
514.3	504.3	ROSEWOOD	ROSEWOOD HSTD	RADIO TERMINAL	DRCS SUBS 50KM RADIUS OF	55	458276	7158254	55	691222	7472222
513.1	503.1	THE GORGE	PEAWADDY CREEK	RADIO TERMINAL	RADIO TERMINAL	55	631900	7228900	55	643300	7275100
511.9	501.9	WELL CREEK	HAWKWOOD RADIO TERMINAL	HAWKWOOD R/T (3KM E OF)	SUBSCRIBERS (29KM RADIUS)	56	296900	7153800	56	296922	7153822
511.9	501.9	WELL CREEK	SUJEEWONG	HAWKWOOD R/T (3KM E OF)	HOMESTEAD	56	296900	7153800	56	250900	7151000
511.9	501.9	YELLOWBERRY	HOBBLERS BORE	RADIO TERMINAL	CLAUDE RIVER R/T(14KM N)	55	567400	7281800	55	508200	7295200
511.9	501.9	YELLOWBERRY	TANDERRA HSTD	RADIO TERMINAL	DRCS SUBS (27KM RADIUS OF	55	567400	7281800	56	271222	7204222
515.5	505.5	CRESCENT CREEK	CRESCENT CREEK	GROUP SUBSCRIBER SYSTEM	RADIO TERMINAL	55	679822	7279122	55	679800	7279100
515.5	505.5	DAWES RANGE	MONTO	MICROWAVE REPEATER	RADIO TERMINAL	56	284847	7266760	56	310861	7248650
515.5	505.5	GORGE CREEK	GORGE CREEK	DRCS SUBSCRIBERS 40 KM	RADIO TERMINAL	55	798400	7832600	54	798400	7832600
515.5	505.5	HAMPSTEAD CREEK	GORGE CREEK	RADIO TERMINAL	RADIO TERMINAL	54	780500	7806100	54	798400	7832600
515.5	505.5	HEDLEY HILL	MT ROSE	DRCS SUBS 44 KM RADIUS OF	GILBERT RANGE R/T	55	800422	7190522	55	800400	7190500
515.5	505.5	HIDDEN VALLEY	HIDDEN VALLEY	DRCS SUBS 14KM RADIUS OF	RADIO TERMINAL	55	393350	7902100	55	393350	7902100
515.5	505.5	HOBBLERS BORE	HOBBLERS BORE	DRCS SUBS(28KM RADIUS OF)	CLAUDE RIVER R/T(14KM N)	55	508222	7295222	55	508200	7295200
515.5	505.5	MT AMOS	MT AMOS	DRCS SUBS (13KM RADIUS OF	RADIO TERMINAL	55	309222	8272622	55	309200	8272600
515.5	505.5	MUNGALLALA	MUNGALLALA	DRCS SUBS 50 KM RADIUS OF	RT 9 KM NE OF	55	561200	7079000	55	561220	7079008
515.5	505.5	MURRAY SPRING CK	MURRAY SPRING CREEK	DRCS SUBS 39KM RADIUS OF	RADIO TERMINAL 2KM SE	55	340450	7993300	55	340452	7993332
515.5	505.5	OAKLEY	WARREAH	RADIO TERMINAL	RADIO TERMINAL	55	294680	7675490	55	274938	7696778
515.5	505.5	OAKY HILL	MT AMOS	OAKY CK R/T (5KM W OF)	RADIO TERMINAL	55	295400	8283300	55	309200	8272600
515.5	505.5	PALMERVILLE	PALMERVILLE	RADIO TERMINAL	RADIO TERMINAL	55	191200	8228200	55	191200	8228200
515.5	505.5	PELHAM	PELHAM	DRCS SUBSCRIBERS 45 KM	RADIO TERMINAL	54	667800	7881300	54	667800	7881300
515.5	505.5	PICKWICK RADIO TERMINAL	DILULLA HOMESTEAD	DRCS SUBS(38KM RADIUS OF)	PICKWICK RADIO TERMINAL	55	723222	6872222	55	244597	7445713
515.5	505.5	TUTURIN	MT ROSE	RADIO TERMINAL	GILBERT RANGE R/T	55	754900	7231600	55	800400	7190500
515.5	505.5	WALLAM EAST BORE	MUNGALLALA	WALLAM RT 6 KM W OF	RT 9 KM NE OF	55	573700	7021000	55	561220	7079008
515.5	505.5	WARREAH	WARREAH	DRCS SUBSCRIBERS 40 KM	RADIO TERMINAL	55	274938	7696778	55	274938	7696778

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A_FREQ	B_FREQ	A_SITE	B_SITE	A_STREET	B_STREET	A ZONE	A_EAST	A_NORTH	B_ZONE	B_EAST	B_NORTH
511.9	501.9	ARKAROOLA	ARKAROOLA VILLAGE	3 KM E OF VILLAGE	TOURIST VILLAGE	54	341560	6643450	54	339800	6645400
514.3	504.3	BLACK OAK WELL	CALDINA CREEK	2 KM W OF	SANTOS SITE	54	352740	6595250	54	370650	6641440
514.3	504.3	BLACK OAK WELL	WERTALOONA	2 KM W OF	SUBSCRIBERS	54	352740	6595250	0	-	-
513.1	503.1	CHARLIE	ST STEVEN			53	758755	6717996	54	221687	6739945
511.9	501.9	COTABENA	COTABENA	900M S OF RLWY SIDING	CUSTOMERS	54	235915	6488936	0	-	-
514.3	504.3	CROWBAR	CROWBAR AREA		SUBSCRIBERS	54	302768	6633949	0	-	-
513.1	503.1	CROWBAR	HORSESHOE			54	302768	6633949	54	292071	6614315
513.1	503.1	DARRYL	ST STEVEN			54	251749	6780834	54	221687	6739945
511.9	501.9	ERUDINA WOOLSHED	CURNAMONA HSTD	14 K NE OF ERUDINA		54	359456	6523738	54	363100	6497500
511.9	501.9	ERUDINA WOOLSHED	FROME DOWNS HSTD	14 K NE OF ERUDINA		54	359456	6523738	54	383000	6545000
511.9	501.9	FRIDAY	HILTABA		SUBSCRIBERS	53	518064	6437252	0	-	-
511.9	501.9	FRIDAY	WAVERLEY	5 KM E OF MT FRIDAY	8 KM NO OF WAVERLEY HILL	53	518064	6437252	53	493547	6466639
513.1	503.1	GAIRDNER	PETERLUMBO	12 KM NW OF MT GAIRDNER		53	577154	6430035	53	612353	6379993
514.3	504.3	GINA AN	REGAL		9KM S OF COMMONWEALTH HIL	53	455329	6693197	53	420387	6677567
513.1	503.1	HORSESHOE AREA	HORSESHOE	SUBSCRIBERS		0	-	-	54	292071	6614315
511.9	501.9	JUMBUCK	JUMBUCK AREA	4KM W OF JUMBUCK O/S		53	367782	6692324	53	367782	6692324
513.1	503.1	JUMBUCK	REGAL	4KM W OF JUMBUCK O/S	9KM S OF COMMONWEALTH HIL	53	367782	6692324	53	420387	6677567
511.9	501.9	LAURIE HILL AREA	LAURIE HILL		14KM NW OF MT EBA	53	559260	6674627	53	559260	6674627
511.9	501.9	MCDONALD HILL	MCDONALD HILL	RADIO TERMINAL	MCDONALD HILL SUBS 60KM	54	446090	6433940	0	-	-
513.1	503.1	MCDONALD HILL	THACKARINGA	RADIO TERMINAL	RADIO TERMINAL	54	446090	6433940	54	516206	6454058
514.3	504.3	MT EDWARDS	BICKMORE HILL	SUMMIT	SUMMIT	54	388510	6407270	54	352770	6430667
514.3	504.3	MT EDWARDS	MT EDWARDS	SUMMIT	SUBSCRIBERS	54	388510	6407270	0	-	-
514.3	504.3	MT EDWARDS	OAK PARK	SUMMIT	200 M S OF HSTD	54	388510	6407270	54	369307	6365186
513.1	503.1	MT MACDONALD	THACKARINGA	DRCS BASE		54	446090	6433940	54	516206	6454058
514.3	504.3	NONNING WEST	NONNING	10 KM W OF NONNING	SUBSCRIBERS	53	630709	6404278	0	-	-
513.1	503.1	NONNING WEST	PETERLUMBO	10 KM W OF NONNING	10KM E OF PETERLUMBO HILL	53	630709	6404278	53	612353	6379993
513.1	503.1	OAK PARK	OAK PARK	SUBSCRIBERS	200 M S OF HSTD	0	-	-	54	369307	6365186
514.3	504.3	OCHRE CLIFFS	ST STEVEN			54	229434	6696432	54	221687	6739945
513.1	503.1	REGAL AREA	REGAL		9KM S OF COMMONWEALTH HIL	53	420387	6677567	53	420387	6677567
513.1	503.1	SHAGGY RIDGE	HAWKER	SANTOS SITE	TELEPHONE EXCHANGE	54	284070	6482040	54	256013	6469021
514.3	504.3	SHAGGY RIDGE	MARTINS WELL	SANTOS SITE	SANTOS SITE	54	284070	6482040	54	323535	6519760
514.3	504.3	WALLABYNG	SUNDOWN	12KM NE OF WALLABYNG WELL	5 KM NE OF MINTABYNG HUT	53	541899	6605798	53	525671	6653195
514.3	504.3	WALLABYNG	WALLABYNG AREA	12KM NE OF WALLABYNG WELL		53	541899	6605798	53	541899	6605798
515.5	505.5	GINA AN	SOWARD		22KM NE OF MCDOUALL PEAK	53	455329	6693197	53	510896	6707594
515.5	505.5	SOWARD AREA	SOWARD		22KM NE OF MCDOUALL PEAK	53	510896	6707594	53	510896	6707594
515.5	505.5	ARKAROOLA	CALDINA CREEK	3 KM E OF VILLAGE	SANTOS SITE	54	341560	6643450	54	370650	6641440
515.5	505.5	BICKMORE HILL	BICKMORE HILL	SUBSCRIBERS	SUMMIT	0	-	-	54	352770	6430667
515.5	505.5	COTABENA	HAWKER	900M S OF RLWY SIDING	TELEPHONE EXCHANGE	54	235915	6488936	54	256013	6469021
515.5	505.5	HAWKER	HAWKER	CUSTOMERS	TELEPHONE EXCHANGE	0	-	-	54	256013	6469021
515.5	505.5	OCHRE CLIFFS	TOM			54	229434	6696432	54	243476	6655655
515.5	505.5	ROCKY	TOM			53	785837	6663548	54	243476	6655655

515.5	505.5	TOM AREA	TOM	SUBSCRIBERS		0	-	-	54	243476	6655655

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A_FREQ	B_FREQ	A_SITE	B_SITE	A_STREET	B_STREET	A ZONE	A_EAST	A_NORTH	B_ZONE	B_EAST	B_NORTH
513.1	503.1	BEVERLEY SPRINGS	BEVERLEY SPRINGS	SUBSCRIBERS	DRCS REPEATER	0	-	-	51	763050	8148500
511.9	501.9	BLINA	BLINA	MICROWAVE SITE		51	666838	8026284	0	-	-
511.9	501.9	BLINA	ELLENDALE	MICROWAVE SITE	MICROWAVE SITE	51	666838	8026284	51	700927	8013695
513.1	503.1	BROCKMAN AREA	BROCKMAN	SUBSCRIBER GROUP SYSTEM		0	-	-	50	285764	7220146
514.3	504.3	CARRON	CARRON AREA		SUBSCRIBER GROUP SYSTEM	50	641646	6885667	50	641600	6885600
514.3	504.3	CARRON	YOUANMI	CARRON REPEATER	YOUANMI REPEATER	50	641842	6885258	50	674494	6845280
513.1	503.1	CASHMERE AREA	MT MAGNET	SUBSCRIBER GROUP SYSTEM	DRCS RPTR CASHMERE MAGT2	0	-	-	50	747492	6796743
513.1	503.1	CORNISH	BROCKMAN	SSW OF ELLAVALA HSTD		50	238361	7215647	50	285764	7220146
513.1	503.1	ELLENDALE	ELLENDALE		MICROWAVE SITE	0	-	-	51	700927	8013695
513.1	503.1	KALGOORLIE	KALGOORLIE	DRCS SUBS	MICROWAVE REPEATER	0	-	-	51	354698	6598647
514.3	504.3	KALGOORLIE	KALGOORLIE	DRCS REPEATER ORA BANDA	DRCS REPEATER OAKLEY	51	310870	6636308	51	265448	6672221
514.3	504.3	KALGOORLIE	KALGOORLIE	DRCS REPEATER ORA BANDA	DRCS REPEATER OAKLEY	51	310870	6636308	51	265448	6672221
514.3	504.3	KALGOORLIE	MENZIES	DRCS REPEATER ORA BANDA	40 KM WEST OF	51	310870	6636308	51	265448	6672221
513.1	503.1	KALGOORLIE	MT CHARLOTTEE	DRCS REPEATER ORA BANDA	RADIO TERMINAL	51	310870	6636308	51	354698	6598647
514.3	504.3	KALGOORLIE	ORA BANDA	DRCS REPEATER ORA BANDA	ORA BANDA SUBS	51	310870	6636308	0	-	-
513.1	503.1	LEOPOLD	ELLENDALE	MICROWAVE REPEATER	MICROWAVE SITE	51	736870	8009301	51	700927	8013695
514.3	504.3	LEOPOLD	FITZROY	MICROWAVE REPEATER	MICROWAVE REPEATER	51	736870	8009301	51	756589	7984691
514.3	504.3	LEOPOLD	LEOPOLD AREA	MICROWAVE REPEATER	MICROWAVE REPEATER	51	736870	8009301	51	736872	8009303
511.9	501.9	MACDONALD RANGE	AUGUSTUS ISLAND	DRCS REPEATER	DRCS REPEATER	51	704232	8285620	51	668694	8305005
511.9	501.9	MACDONALD RANGE	MACDONALD RANGE	DRCS REPEATER	SUBSCRIBERS	51	704232	8285620	0	-	-
513.1	503.1	MEEKATHARRA	MEEKATHARRA	DRCS RPTR WELD RANGE MK	DRCS RPTR MUNARRA MEEK1	50	561265	7018973	50	615142	7012255
511.9	501.9	MEEKATHARRA	MT HALE	DRCS RPTR MT HALE MEEK1	SUBSCRIBER GROUP SYSTEM	50	524509	7119145	0	-	-
513.1	503.1	MOUNT MAGNET	BURRINGANNA	DRCS CAUDLE MM1		50	382956	7029901	50	416570	6993214
513.1	503.1	MOUNT MAGNET	MT MAGNET	DRCS SUBS BURRINGANNA MM1	DRCS BURRINGARRA MM1	0	-	-	50	416570	6993214
514.3	504.3	MOUNT MAGNET	POONDARIE HILL	DRCS POONDARIE HILL MM1	SUBSCRIBER GROUP SYSTEM	50	427878	6923649	0	-	-
513.1	503.1	MT HARDMAN	ELLENDALE	DRCS REPEATER	MICROWAVE SITE	51	673860	7974494	51	700927	8013695
511.9	501.9	MT MAGNET	CARLAMINDA HILL	DRCS BRACEGONIER MM1		50	528054	6885394	50	474640	6870911
511.9	501.9	MT MCLEAY	KALGOORLIE	DRCS REPEATER	DRCS REPEATER BINTI	51	380334	6628951	51	413489	6657593
513.1	503.1	MT MCLEAY	MT CHARLOTTE	DRCS REPEATER	RADIO TERMINAL	51	380334	6628951	51	354698	6598647
511.9	501.9	MT MCLEAY	MT MCLEAY	DRCS REPEATER	MT MCLEAY SUBS	51	380334	6628951	0	-	-
514.3	504.3	MT YOKINE	PERTH	RADIO TERMINAL OSBORNE RO	RADIOCOM SERVICE DEPOT	50	391496	6472064	50	392500	6465200
513.1	503.1	MUNARRA HILL	MEEKATHARRA	SUBSCRIBER GROUP SYSTEM	DRCS RPTR MUNARRA MEEK1	0	-	-	50	615142	7012255
513.1	503.1	NOWTHANNA HILL	MEEKATHARRA	REPEATER	DRCS RPTR MUNARRA MEEK1	50	664703	7005576	50	615142	7012255
511.9	501.9	NOWTHANNA HILL	MEEKATHARRA	REPEATER	RPTR BARRAMBIE	50	664703	7005576	50	710176	6963328
511.9	501.9	NOWTHANNA HILL	NOWTHANNA HILL	REPEATER	SUBSCRIBER GROUP SYSTEM	50	664703	7005576	0	-	-
513.1	503.1	SYNNOT	BEVERLEY SPRINGS	DRCS REPEATER	BEVERLEY DRCS REPEATER	51	747358	8177382	51	763050	8148500
514.3	504.3	SYNNOT	MT DEBORAH	DRCS REPEATER	DRCS REPEATER	51	747358	8177382	51	724492	8228053
514.3	504.3	SYNNOT	SYNNOT	DRCS REPEATER	SUBSCRIBERS	51	747358	8177382	0	-	-

511.9	501.9		YUNDRA	-- NO RELATED RECORD --					50	505050	7173523
515.5	505.5	BARRAMBIE	BARRAMBIE	SUBSCRIBER GROUP SYSTEM	REPEATER	0	-	-	50	710176	6963328
515.5	505.5	JINGEMARRA AREA	MOUNT MAGNET	SUBSCRIBER GROUP SYSTEM	DRCS JINGEMARRA MM1	0	-	-	50	471635	6920692
515.5	505.5	KALGOORLIE	KALGOORLIE	DRCS REPEATER COLINDINA	DRCS RPTR REBECCA LAKE	51	415504	6764269	51	440228	6701696
515.5	505.5	KOONMARRA	MEEKATHARRA	SUBSCRIBER GROUP SYSTEM	DRCS RPTR KOONMARRA MEEK1	0	-	-	50	574374	7101420
515.5	505.5	MACDONALD RANGE	MT DEBORAH	DRCS REPEATER	DRCS REPEATER	51	704232	8285620	51	724492	8228053
515.5	505.5	MEEKATHARRA	MEEKATHARRA	DRCS MT HALE MEEK1	DRCS RPTR KOONMARRA MEEK1	50	524509	7119145	50	574374	7101420
515.5	505.5	MOUNT MAGNET	MOUNT MAGNET	DRCS MT WITTENOOM MM1	DRCS JINGEMARRA MM1	50	471339	6965154	50	471635	6920692
515.5	505.5	MT DEBORAH	MT DEBORAH	SUBSCRIBERS	DRCS REPEATER	0	-	-	51	724492	8228053
515.5	505.5	MT YOKINE	PERTH	RADIO TRANSMITTER	RADIO SERVICE DEPOT	50	391496	6472064	50	392500	6465200
515.5	505.5	POOLE RANGE AREA	POOLE RANGE	MICROWAVE REPEATER	MICROWAVE REPEATER	51	790467	7906483	51	790467	7906483
515.5	505.5	POOLE RANGE AREA	POOLE RANGE	MICROWAVE REPEATER	MICROWAVE REPEATER	51	790467	7906483	51	790467	7906483
515.5	505.5	REBECCA LAKE	KALGOORLIE	REBECCA LAKE SUBS	DRCS RPTR REBECCA LAKE	0	-	-	51	440228	6701696
515.5	505.5	SORENSON AREA	SORENSON	SUBSCRIBER GROUP SYSTEM		0	-	-	50	236936	7174542

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A_FREQ	B_FREQ	A_SITE	B_SITE	A_STREET	B_STREET	A ZONE	A_EAST	A_NORTH	B_ZONE	B_EAST	B_NORTH
511.9	501.9	BROLGA	BROLGA	DRCS REPEATER	SUBSCRIBERS	52	534603	8187675	0	-	-
514.3	504.3	BUBBLE	BUBBLE	DRCS REPEATER	SUBSCRIBERS	52	534343	8257971	0	-	-
514.3	504.3	BUBBLE	SPENCER	DRCS REPEATER	DRCS REPEATER	52	534343	8257971	52	572576	8277019
511.9	501.9	DELAMERE	DELAMERE	6KM SE OF DELAMERE HSTD	CUSTOMERS	52	787720	8266586	0	-	-
511.9	501.9	DELAMERE	TINKER HILL	6KM SE OF DELAMERE HSTD	COOLIBAH R/T 17KM SE OF	52	787720	8266586	52	814064	8227154
513.1	503.1	DRY RIVER AREA	DRY RIVER			0	-	-	53	188567	8323970
514.3	504.3	FAIRVIEW	FAIRVIEW AREA		CUSTOMERS	52	789593	8427048	0	-	-
514.3	504.3	HAMMOND	ARNOLD			53	375315	8194092	53	423678	8178566
514.3	504.3	HAMMOND	DOWNS HOMESTEAD BULL HILL		27KMS W OF NUTWOOD DOWNS	53	375315	8194092	53	385355	8246398
503.1	503.1	HERTZ	HERTZ	6 KM WEST OF BLYTH RIVER	6 KM WEST OF BLYTH RIVER	53	459242	8635116	53	459242	8635116
511.9	501.9	KATHERINE	REDBANK			53	206550	8398130	53	187660	8379546
511.9	501.9	KATHERINE	VENN			53	206550	8398130	53	233129	8386352
511.9	501.9	MANINGRIDA	HELMHOLTZ			53	416137	8666988	53	424304	8648027
511.9	501.9	MOUNT WEIR	MOUNT WEIR			53	420790	8481688	53	420790	8481688
513.1	503.1	MT CHRISP	MT WARRINGTON	6 KM ENE OF		53	501877	8392284	53	458809	8374609
513.1	503.1	MT WARRINGTON	MT WARRINGTON			53	458809	8374609	53	458809	8374609
511.9	501.9	MUMBO MUMBO CREEK	MUMBO MUMBO CREEK	NUMBULWAR ROAD 14.2KM ENE	NUMBULWAR ROAD 14.2KM ENE	53	544888	8415321	53	544888	8415321
511.9	501.9	PACKSADDLE CREEK	MOUNT LINDSAY	ROPER HIGHWAY 3.1KM WSW		53	382072	8350672	53	421099	8372954
511.9	501.9	PACKSADDLE CREEK	PACKSADDLE CREEK	ROPER HIGHWAY 3.1KM WSW	ROPER HIGHWAY 3.1KM WSW	53	382072	8350672	53	382072	8350672
513.1	503.1	SOMMERFELD	HERTZ	18 KM SE OF FAMINGINING	6 KM WEST OF BLYTH RIVER	53	491546	8625302	53	459242	8635116
514.3	504.3	TANDANGLE HILL	BESWICK		43.5KM NE	53	278045	8394349	53	328296	8419435
514.3	504.3	TANDANGLE HILL	MATARANKA		TELECOM REPEATER 8203	53	278045	8394349	53	291142	8347738
513.1	503.1	TANDANGLE HILL	VENN			53	278045	8394349	53	233129	8386352
514.3	504.3	TOP SPRINGS	MONTEJINNI	RADIO TERMINAL 12KM NE	RADIO TERMINAL 25KM SW	52	807573	8177023	52	774858	8141517
514.3	504.3	TOP SPRINGS	MOOLOOLOO OUTSTATION	RADIO TERMINAL 12KM NE	RADIO TERMINAL 8KM SE	52	807573	8177023	52	773078	8186093
515.5	505.5	ARNOLD	ARNOLD	DRCS GROUP SUBS AREA OF		0	-	-	53	423678	8178566
515.5	505.5	FARM HILL AREA	FARM HILL	CUSTOMERS	TELECOM REPEATER 8107	0	-	-	53	187746	8402456
515.5	505.5	FERGUSSON	FARM HILL	TELECOM REPEATER 8106	TELECOM REPEATER 8107	52	822043	8440479	53	187746	8402456
515.5	505.5	MAIWOK CREEK	BESWICK	BULMAN ROAD 5.1KM E	43.5KM NE	53	355548	8423509	53	328296	8419435
515.5	505.5	ROBB RIDGE AREA	ROBB RIDGE	GROUP SUBSCRIBER SYSTEM	SSW OF GOODILLA SIDI	0	-	-	52	729145	8508456
515.5	505.5	SPENCER AREA	SPENCER	SUBSCRIBERS	DCRS REPEATER	0	-	-	52	572576	8277019
515.5	505.5	TOP SPRINGS	TINKER HILL	RADIO TERMINAL 12KM NE	RADIO TERMINAL 17KM SE	52	807573	8177023	52	814064	8227154
515.5	505.5	TRUSCOTT	ARNOLD			53	468947	8171933	53	423678	8178566

SCHEDULE 2

CALCULATION OF TERRAIN LOSS BETWEEN A SPECTRUM LICENSED TRANSMITTER AND RCS BASE/REPEATER/CUSTOMER RECEIVERS

The terrain loss (L_t) may be calculated by using Method A or Method B below. Method A is only to be used where there are no terrain obstructions between the sites. Otherwise Method B should be used.

Method A: Diffraction over a spherical Earth (or smooth earth diffraction loss)

Terrain loss due to diffraction over a spherical Earth is calculated using the formula below.

$$L_t = -(F(X) + G(Y_1) + G(Y_2)) \quad \text{(dB)}$$

where:

- L_t = smooth earth diffraction loss (dB)
- X = the normalised length of the path between the antennas at normalised heights Y1 and Y2
  - $= 2.2\, f^{1/3}\, a_e^{-2/3}\, d$
- Y_n = $0.0096\, f^{2/3} a_e^{-1/3}\, H_n$

where:

- a_e = k r
- r = 6370 km (earth radius)
- k = equivalent earth radius factor (k=3 which represents > 20% of time)
- Hn = antenna height above spherical earth (m)
- n = 1 for site 1 and 2 for site 2
- d = path length (km)
- f = frequency (MHz)

The distance term F(X) is given by

$$F(X) = 11 + 10 \log (X) - 17.6\, X \quad \text{(dB)}$$

The height gain terms $G(Y_1)$ and $G(Y_2)$ are given by:

$$G(Y_n) = 17.6\, (Y_n - 1.1)^{1/2} - 5 \log (Y_n - 1.1) - 8 \quad \text{for } Y_n > 2$$

$$G(Y_n) = 20 \log(Y_n + 0.1\, Y_n^3) \quad \text{for } Y_n < 2$$

Method B: Diffraction over obstacles and irregular terrain (single and multiple knife edge)

1. Single knife-edge obstacle

$\nu = 0.0316\ h\ (\ (2 / \lambda)\ (d_1 + d_2) / d_1\ d_2)^{1/2}$

where:

d	=	length of path (km)
d_1 and d_2	=	distances of the two ends of the path from the top of the obstacle (km)
h	=	height from the top of the obstacle (h_o) to the straight line joining the two ends of the path. If the obstacle is below this line, h is negative. (m)
h_o	=	fixed terrain height of obstacle (m) + terrain height correction due to k-factor (m). (k=3 which represents > 20% of time)
	=	$(d_1\ d_2)/(12.75\ k)$
λ	=	wavelength (m)

For ν greater than -0.7 an approximate value can be obtained from the expression:

$L_t = 6.9 + 20 \log(\sqrt{((\nu - 0.1)^2 + 1)} + \nu - 0.1)$

2. Single rounded obstacle

$L_t = J(\nu) + T(m,n)$

where:

J(ν) = single knife-edge obstacle loss calculated in 1. above.

T(m,n) = is the additional attenuation due to the curvature of the obstacle.

$= 7.2\ m^{1/2} - (2 - 12.5\ n)\ m + 3.6\ m^{3/2} - 0.8\ m^2$ for $mn \leq 4$

$= -6 - 20 \log(mn) + 7.2\ m^{1/2} - (2 - 17n)m + 3.6\ m^{3/2} - 0.8\ m^2$ for $mn > 4$

where:

m	=	$R\ ((d_1 + d_2)/d_1\ d_2) / (\pi\ R / \lambda)^{1/3}$
n	=	$h\ (\pi\ R / \lambda)^{2/3} / R$
R	=	radius of a rounded obstacle (km)
d	=	length of path (km)
d_1 and d_2	=	distances of the two ends of the path from the top of the obstacle (km)
h	=	height from the top of the obstacle (h_o) to the straight line joining the two ends of the path. If the obstacle is below this line, h is negative. (m)
h_o	=	fixed terrain height of obstacle (m) + terrain height correction due to k-factor (m). (k=3 which represents > 20% of time)
	=	$(d_1\ d_2)/(12.75\ k)$
λ	=	wavelength (m)

3. Double isolated edges

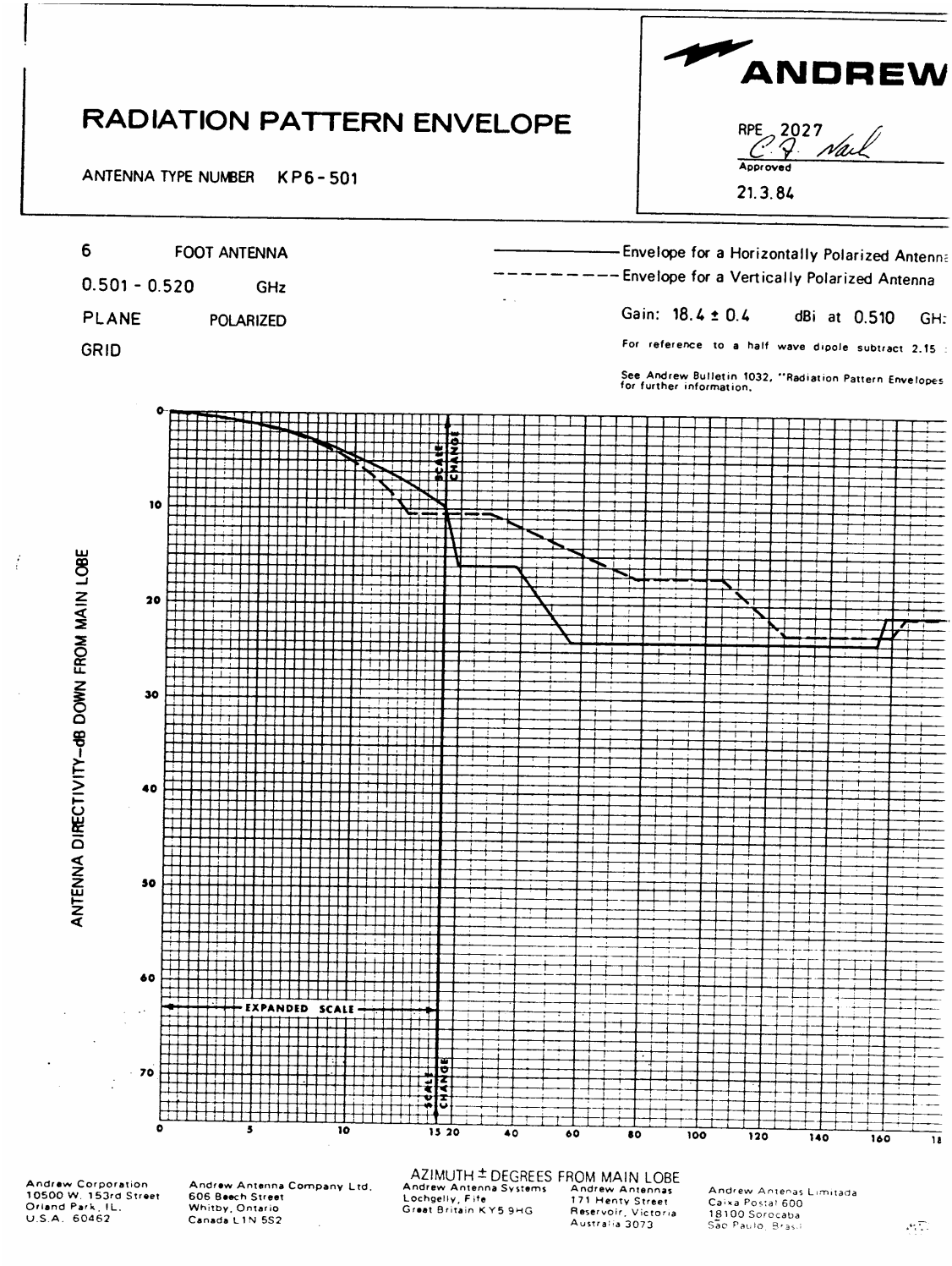
Use Recommendation ITU-R PN.526-3

4. General method for one or more obstacles

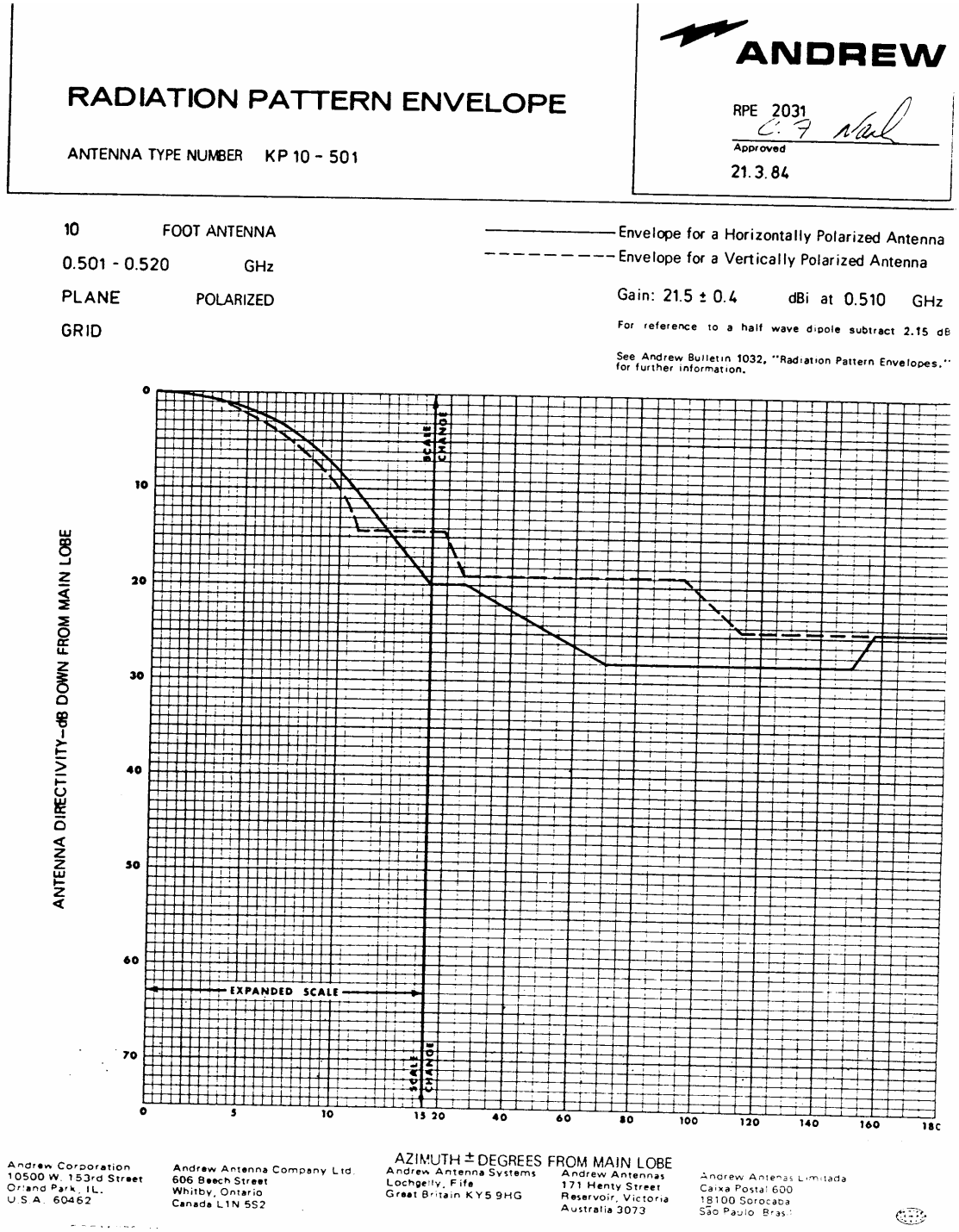
Use Recommendation ITU-R PN.526-3

SCHEDULE 3

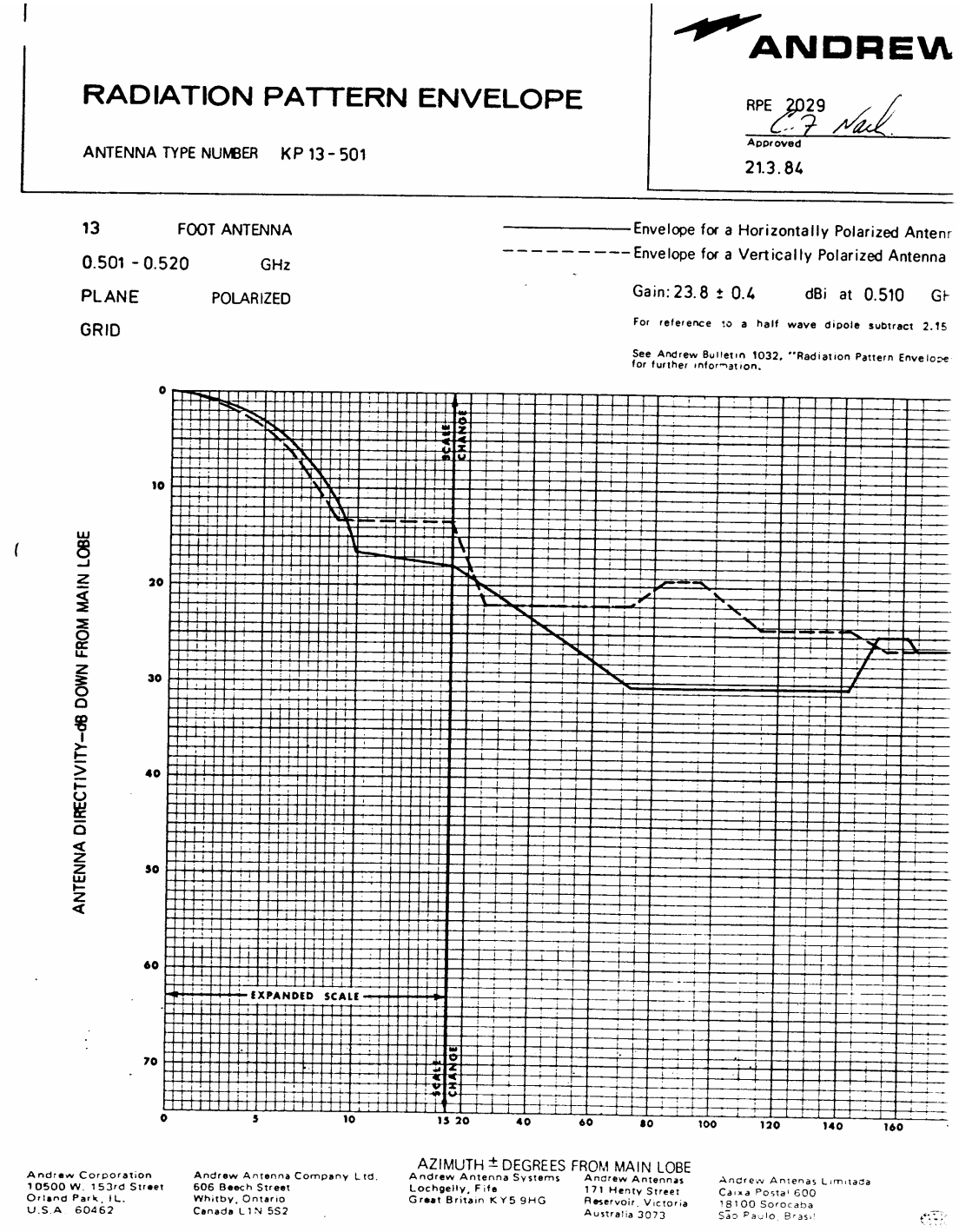
RCS ANTENNA PATTERNS



Radiation Pattern Envelope for a 2MP RCS repeater antenna

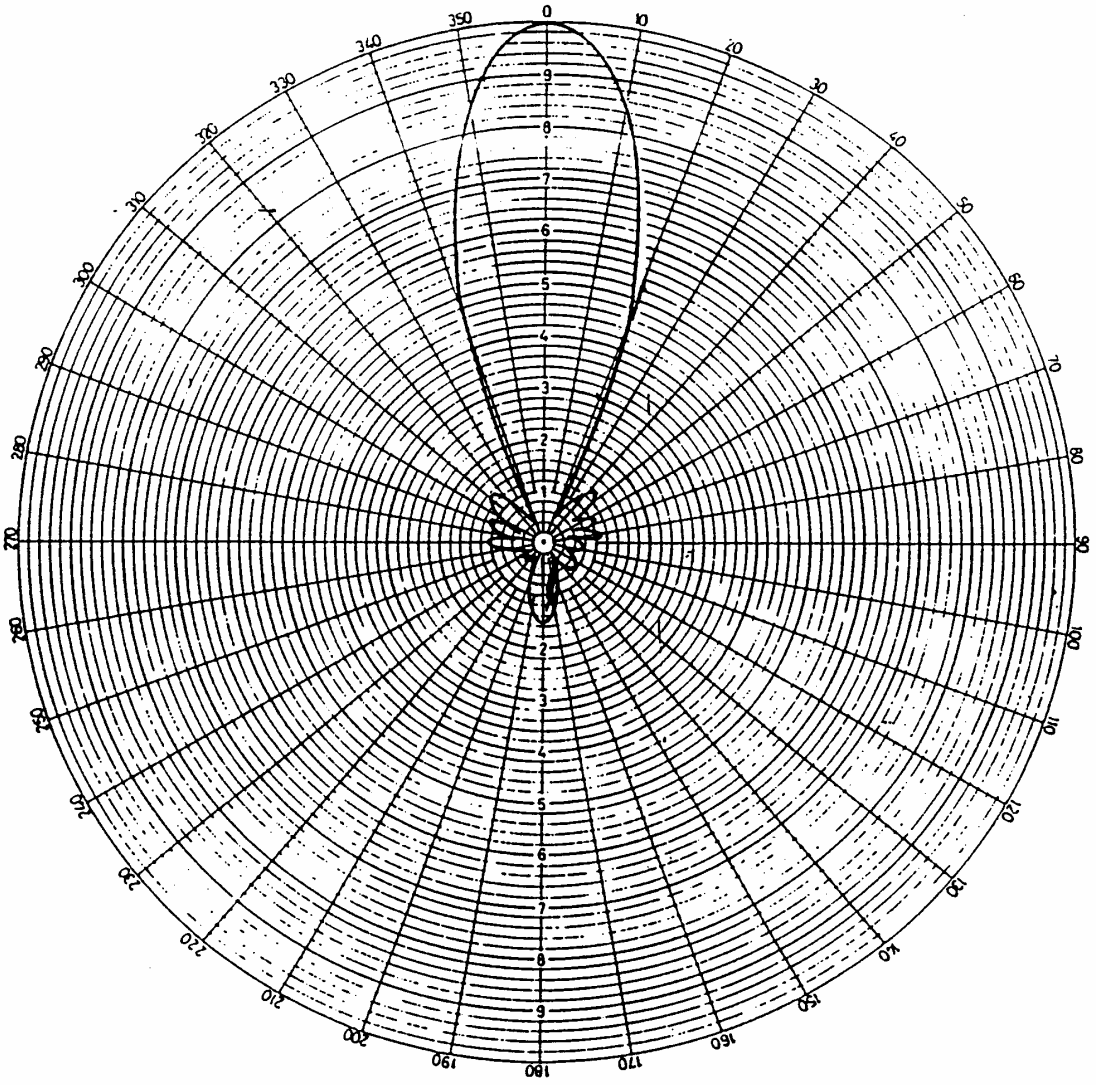


Radiation Pattern Envelope for a 3MP RCS repeater antenna



Radiation Pattern Envelope for a 4MP RCS repeater antenna

RADIATION PATTERN

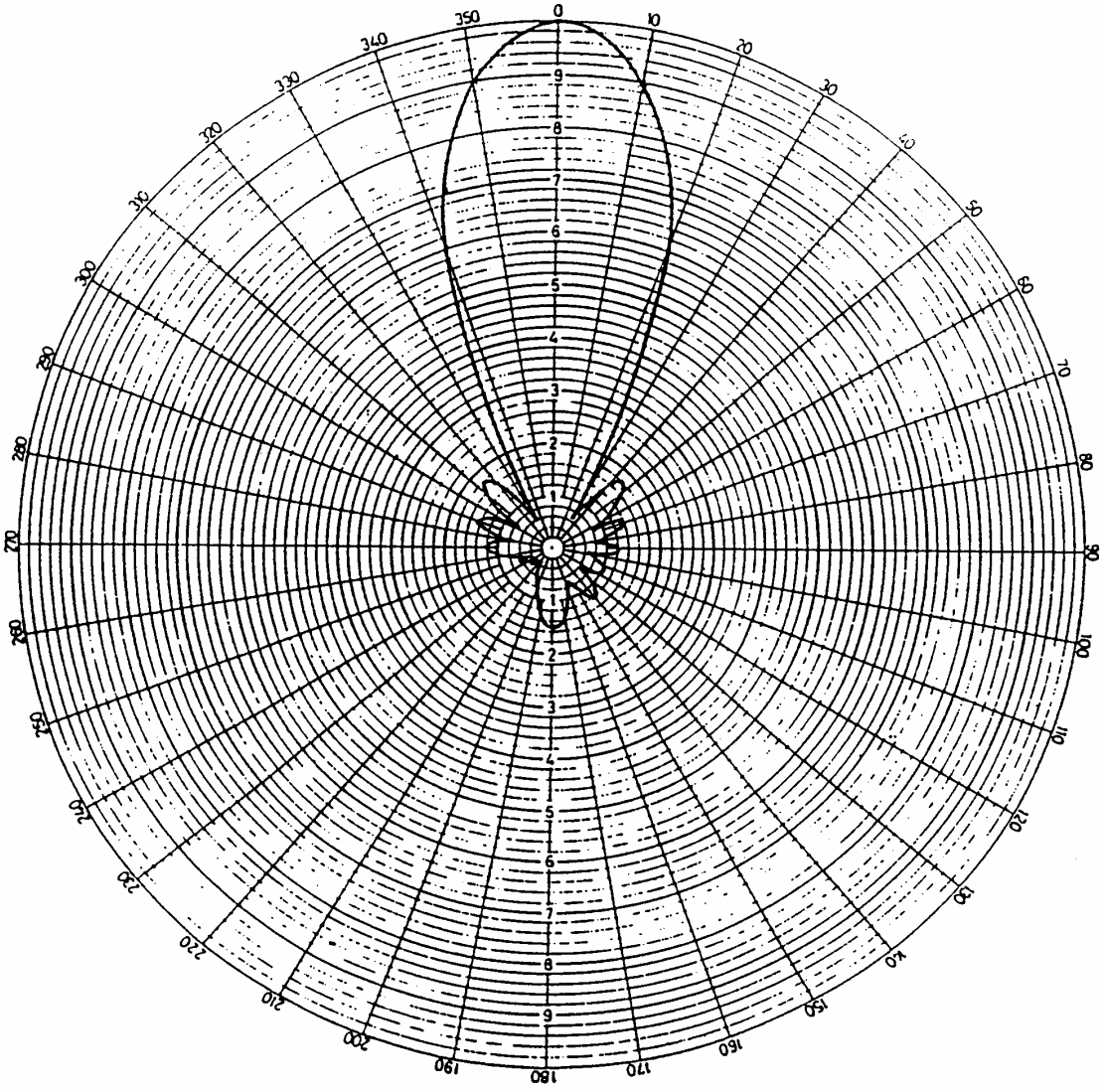


Antenna Model: YU15S
Test Frequency: 460.000MHz
Measured Plane: E Plane
Date: 29/07/80

Radio Frequency Systems Pty Limited
36 Garden Street
Kilsyth Vic. 3137
Tel: +61 3 9761 5700
Fax: +61 3 9761 5711

Radiation Pattern Envelope for a Yagi 15 dBi (E Plane) RCS repeater/customer antenna

RADIATION PATTERN



Antenna Model: YU15S
Test Frequency: 460.000MHz
Measured Plane: H Plane
Date: 29/07/80

Radio Frequency Systems Pty Limited
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Fax: +61 3 9761 5711

Radiation Pattern Envelope for a Yagi 15 dBi (H Plane) RCS repeater/customer antenna