APPENDIX 8 : **Coordination of DRCS Outstations with Point-to-Point Links**

1.1 INTRODUCTION 2
1.2 DRCS NETWORK TOPOLOGY 2
1.3 DRCS CELL PLAN AND INTRA-SYSTEM COORDINATION 3
1.4 INTERFERENCE POTENTIAL TO/FROM POINT-TO-POINT LINKS 3
1.5 METHODOLOGY 3
1.5.1 Interference from a point-to-point link transmitter to a DRCS outstation receiver 4
1.5.2 Interference from a DRCS outstation transmitter to a point-to-point link receiver 4
1.6 DETAILED COORDINATION 4

Annex A 1.5 GHz DRCS OUTSTATION CHARACTERISTICS

1.1 Introduction

This document provides information and guidance for the coordination between 1.5 GHz Digital Radio Concentrator System (DRCS) point-to-multipoint services and point-to-point systems. As outlined in Part 3 of RALI FX-3, DRCS systems provide public telecommunication services in rural and remote areas. The majority of Australian DRCS rural telephony networks utilise the 1.5 GHz (1427-1535 MHz) DRCS band, although in some areas 500 MHz[1] and "hybrid" 500/1500 MHz systems may also operate. Spectrum within the band 1427-1535 MHz[2] is shared between DRCS and regular point-to-point fixed services and, in accordance with the (Appendix 1) RF Channel Arrangements, separate but overlaid arrangements are specified for point-to-point and DRCS multipoint systems.

Given the inherent spectrum denial of DRCS hub stations (due to omnidirectional antennas) and the unpredictable nature of potential interference between point-to-point links and uncoordinated DRCS outstations, the deployment of 1.5 GHz point-to-multipoint systems is not normally permitted within designated HSDA. Operation in other areas with high point-to-point link densities should also be avoided. All applications seeking point-to-multipoint operation within the band 1427-1535 MHz and which encroach upon designated HSDA must be referred to the Manager, Spectrum Planning Team, Spectrum Planning and Standards Group for policy advice.

1.2 DRCS Network Topology

The DRCS is essentially a low-traffic density wireless local loop system, providing radio based customer access network connections between a population of customer units and a parent telephone exchange (TDM Concentrator).

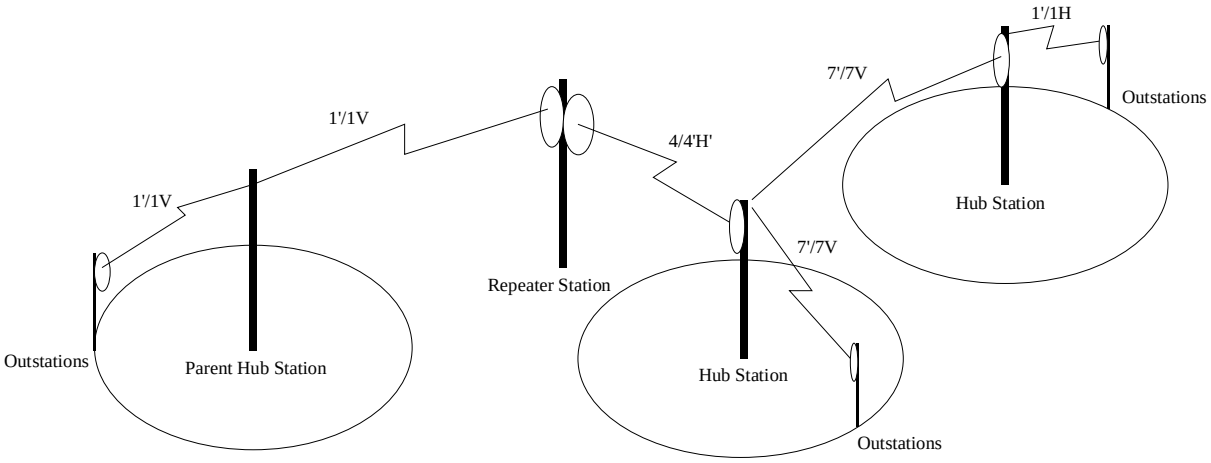

Fig. 8.1 An arbitrary example of a small DRCS network.

A DRCS hub station utilises an omnidirectional antenna to communicate with a population of outstations (ie. customer terminals) and where necessary to the next hub/repeater station. A hub/repeater station receives the downward (ie. originating from the parent exchange) transmission and, following baseband regeneration, re-transmits this signal on another frequency through an omnidirectional antenna to customers and to any subsequent hub/repeater stations. Hub stations may be daisy-chained in this manner enabling a service area of hundreds of kilometres to be

[1] 500 MHz coordination arrangements are different and are detailed in *"Radiocommunication Advisory Guidelines (Coordinating the operation of transmitters in the 500 MHz bands)"*

[2] Note: The operation of DRCS and other 1.5 GHz radiocommunication services is subject to the provisions of the "*1.5 GHz Band Plan*", December 1996.

covered from the single parent switching centre. Customer stations are fitted with directional antennas, typically grid reflector or grid parabolic types depending upon the required system gain. The downward transmissions follow a continuous (TDM) RF carrier format, but the outstations (ie. upward transmissions to the parent exchange) operate in burst mode (TDMA). Further discussion regarding the general characteristics of radio concentrator systems is given in ITU-R Recommendation F.756 "*TDMA Point-to-Multipoint Systems Used as Radio Concentrators*".

1.3 DRCS Cell Plan and Intra-system Coordination

DRCS networks are designed to facilitate frequency re-use based on a cellular frequency plan. Accordingly, protection from intrasystem interference is principally afforded through geographic separation inherent to the DRCS cell plan, where each hub station is allocated a channel which results in acceptable co-channel and adjacent channel interference from other DRCS sites.

1.4 Interference Potential to/from Point-to-Point links

DRCS backbone repeaters and hub stations comprise a fixed network and may be coordinated using the information recorded in the ACMA's RADCOM assignment database and regular (eg. RALI FX-3 Part 4) coordination methodologies. However, DRCS customer station numbers and locations are dynamic and (of necessity) must be managed on an operational basis. Consequently, DRCS outstations operating in rural and remote areas are not individually coordinated and records are not normally maintained in the ACMA assignment database for such outstations.

The uncoordinated customer outstations around the DRCS parent and repeater hub stations represent a potential interference risk with respect to frequency sharing with regular point-to-point links. Since DRCS networks are normally confined to rural and remote areas where demand for point-to-point links is relatively modest, that risk is considered small and frequency coordination with non-DRCS point-to-point links does not normally represent a significant problem. Nevertheless, situations may arise where potential interference to/from outstations needs to be taken into account. The following sections define a coordination model and procedures for the assessment of interference between DRCS customer outstations and point-to-point fixed services.

1.5 Methodology

In cases where 1.5 GHz point-to-point links need to be coordinated with DRCS point-to-multipoint service outstations, for which detailed coordination data (ie. geographic coordinates & antenna type/azimuth) is unavailable, the following coordination model & methodology may be used. For outstation frequency coordination purposes:

- a minimum coordination radius of 200 km is defined for each corresponding hub station;
- a notional customer outstation, representative of all of the customer outstations within the service area of a particular hubstation, is assumed to be collocated with the hubstation.
- a notional hubstation to outstation path length of 35 km may be assumed; and
- unless otherwise determined, boresight azimuth may be assumed for the outstation antenna in relation to potential interference path(s). Outstation antenna RPE and detailed equipment parameters are provided in Annex A to this document.

In all other respects the methodology is consistent with the basic method of coordination (ref. Part 4 of RALI FX-3) and the application of the co / adjacent channel protection ratios given in the

(Attachment 1) assignment instructions. Accordingly, an outstation interference assessment that satisfies coordination at the hubstation location is deemed to satisfy the coordination requirements of the population of outstations serviced by that hubstation.

1.5.1 Interference from a point-to-point link transmitter to a DRCS outstation receiver

1. Determine the receive frequencies of co / adjacent channel DRCS outstations, noting that outstation receive frequencies correspond to the associated hubstation transmit frequencies (ie. all hubstation are coordinated and their details recorded in the ACMA assignment database);

2. Search within 200 km of the proposed point-to-point link transmitter for the locations of any DRCS hubstations[3] operating on the frequencies determined in Step 1;

3. Applying the basic method of coordination described in Part 4 of RALI FX-3 and the outstation model criteria defined in this Appendix, determine whether the interference from the proposed point-to-point link(s) to the notional outstation located at the hubstation location is acceptable;

1.5.2 Interference from a DRCS outstation transmitter to a point-to-point link receiver

1. Determine the transmitting frequencies of any co / adjacent channel DRCS outstations, noting that outstation transmit frequencies correspond to hubstation receive frequencies;

2. Search within 200 km of the proposed point-to-point system receiver for the locations of any DRCS hubstations[3] receiving on frequencies determined in Step 1;

3. Applying the basic method of frequency coordination and the outstation model criteria described in this Appendix, determine whether the interference from the notional outstation transmitter located at the hubstation location is acceptable at the proposed point-to-point link receiver location.

1.6 Detailed Coordination

Situations may arise where the above procedure may not yield a sufficient degree of confidence. In such cases additional information concerning particular outstation locations/criteria may be sought from the DRCS system licensee.

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[3] Hubstations may be identified in the ACMA assignment database using the antenna type field - hubstation omnidirectional antennas are designated "U", with repeater network sections using parabolic ("MP") antennas.