AUSTRALIAN COMMUNICATIONS INDUSTRY FORUM

INDUSTRY GUIDELINE

HFC NETWORK RF SIGNAL EGRESS MONITORING

ACIF G545 MARCH 2000

Industry Guideline – ***HFC Network RF Signal Egress Monitoring***

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Explanatory Statement

This document specifies:

(i) Radio frequency egress limits for fibre or coaxial cable distribution networks. The document requires industry participants to monitor their egress levels and take corrective action when specified thresholds are exceeded. The aim is to minimise interference with services which use the radio spectrum and therefore ensure that industry participants comply with the ACA's radio egress regulations.

(ii) A list of frequencies for the correct identification of a carrier, used within cable networks so they do not interfere with signals used within another carrier's cable network.

This Industry Guideline has been prepared by ACIF Network Reference Panel's Working Committee 4 to outline the basic principles involved in achieving the minimum benchmark for signal egress from HFC networks at the time the Guideline was written. The Industry Guideline may be followed unless there is a better alternative course of action which achieves the same or lower levels of egress. It is acknowledged that different measurement and monitoring techniques can be used. This Industry Guideline is not intended for Registration with the ACA.

This Industry Guideline does not stipulate prescriptive details on the measurement and monitoring of egress. Individual Carriers and Carriage Service Providers may produce their own detailed manuals and work procedures, with due regard to relevant benchmarks and industry guidelines which may or may not be referenced in this Guideline.

This Industry Guideline comes into effect on the day of publication. The Industry Guideline is designed to be used in conjunction with safety legislation but does not have the same legal force. A person or company cannot be prosecuted for failing to comply with the Industry Guideline. However, in proceeding under any Act or regulations, failure to observe a relevant approved Industry Guideline can be used as evidence that a person or company has failed to comply with the provisions of the Act or regulations.

In summary the INDUSTRY GUIDELINE FOR HFC NETWORK RF SIGNAL EGRESS MONITORING:

(a) gives the RF signal egress threshold which must not be exceeded.

(b) gives practical guidance on how the requirements of ensuring that the RF signal egress of a HFC network is kept below limits that may cause interference to other radiocommunications users;

(c) may be followed, unless there is an alternative course of action which achieves the same or lower level of egress;

(d) may be used by Operators to work co-operatively on egress management with each other;

(e) provides the basic fundamentals for measuring egress from a HFC network;

INDUSTRY GUIDELINE

CONTENTS

1 SCOPE AND OBJECTIVES

1.1 Scope

1.1.1 This Industry Guideline is intended to provide guidance to Carriers and Carriage Service Providers for monitoring and measuring RF signal egress from Coaxial Cable Distribution Networks.

1.2 Objectives

1.2.1 This Industry Guideline considers:

i) the maximum permissible levels of egress

ii) techniques for identification of network signals

iii) monitoring guidelines

iv) equipment calibration

v) fault rectification

vi) training

1.2.2 Where applicable, cross-reference to relevant benchmarks and industry guidelines is made to give more specific guidance. These are appended to this Guideline, but will be maintained separate to the Guideline.

2 PARTICIPANTS

Representative	Organisation
Colin Elston	C&W Optus
Ron Facciol	Telstra

James Duck of ACIF supplied project management support.

Notes:

1 Broad representation on the Working Committee was sought by ACIF during the development of this Draft Guideline.

2 Staff of the Australian Communications Authority and a representative of the Broadcasting Industry Technical Advisory Group contributed to the development of this Draft Guideline.

3 REFERENCES

3.2 STANDARDS AND GUIDELINES RELATING TO COMMUNICATION CABLES AND ELECTRICAL EQUIPMENT

3.2.1 The standards and publications listed below (and any associated amendments) are relevant to this Guideline but do not necessarily represent all the standards that may need to be consulted in meeting the requirements of this Guideline. The publication dates for the reference documents listed below are correct at the time of publication of this Guideline, however they should be checked before use to ensure that they are still the most current and appropriate issue, and that all associated amendments are considered.

3.2 RELEVANT ACTS AND REGULATIONS

3.2.2 The Acts and Regulations listed below (and any associated amendments) are relevant to this Guideline but do not necessarily represent all the Acts and Regulations that may need to be consulted in meeting the requirements of this Guideline. The publication dates for the reference documents listed below are correct at the time of publication of this Guideline, however they should be checked before use to ensure that they are still the most current and appropriate issue, and that all associated amendments are considered.

Acts (Commonwealth and State Acts unless otherwise specified)

Telecommunications Act (Commonwealth)	1997
Telecommunications Code of Practice (Commonwealth)	1997
Telecommunications (Low-impact Facilities) Determination	1997

4 DEFINITIONS AND ABBREVIATIONS

4.1.1 **AS** means a current Australian Standard, as published and amended by Standards Australia;

4.1.2 **Asset** means any part or parts of a network, system or facility belonging to a Utility;

4.1.3 **Carrier** means a registered company, person, or other body, holding a communications carrier licence under the Telecommunications Act 1997;

4.1.4 **Guideline or Industry Guideline** means this document entitled "Industry Guideline for HFC Network RF Signal Egress Monitoring" including the preamble, schedules and appendices (if any)

4.1.5 **Communication Cable** means Communication Line and Customer Lead;

4.1.6 **Communication Line** means a coaxial cable, including any Strand Wire and other types of strength bearer, joint closures, supports and fittings owned by the Carrier which accommodates communication services, but excluding Customer Lead.

4.1.7 **Communication Network** means a Carrier's external cable network system which includes, but not limited to, Communication Lines, Customer Leads, Electrical Equipment, pits and pipe, switching, , , used for the provision of communication services and other services, but excludes Supporting Structures;

4.1.8 **Customer Lead** means an underground or aerial lead connecting a Communication Line to the customer's Premises. The lead may provide PSTN service or broadband network service, or both

4.1.9 **Employee** means a person in the employment of an Employer (whether under a contract of employment or apprenticeship) and includes a contractor, and a person employed by a contractor, who carries out work for an Employer;

4.1.10 **Employer** means a Carrier or the owner or lessee of a Communication Network on which work to which the Guideline applies is carried out;

4.1.11 **Point of Attachment** means the point at which a Communication Cable is fixed to a Supporting Structure;

4.1.12 **Potential Gradient** means the rate of change of potential difference between unit distance contours of equal potential in a conductive body carrying current, ie. a voltage difference between two points a distance apart. This may be uniform as in a uniform conductor carrying current or non-uniform as in the case of the spread of current in the earth from an injection point.

4.1.13 **Premises** means any house, building or structure including the land associated with it;

4.1.14 **PSTN** means Public Switched Telephone Network. That part of the public telecommunications network which enables any customer to call and communicate with any other customer either automatically or with operator assistance. The PSTN has a nominal transmission bandwidth of 3 KHz

4.1.15 **Roadway** means any part of a thoroughfare ordinarily used by vehicular traffic;

4.1.16 **Shared Trench** or **Shared Trenching** means a single trench to accommodate two or more underground Utility infrastructures;

4.1.17 **Strand Wire** means a separately constructed metallic, non-insulated suspension wire to which Communication Network cable and equipment is or may be subsequently attached;

4.1.18 **Supporting Structure** means a structure such as, but not limited to, a pole, building or customer Premises which will enable the attachment and support of Communication Network assets, but which may not necessarily belong to the Carrier attaching to it;

4.1.19 **Tag** means a unique (low) frequency that is assigned to a particular network and unambiguously identifies that network. The hardware used for the detection of egress will usually be specifically tuned to a particular tag to identify any egress. The tag frequency is modulated over an existing carrier in such a manner so as not to interfere with the actual program content on that carrier.

4.1.20 **Telecommunications Act** means the Telecommunications Act (Commonwealth), 1997.

4.1.21 **Telecommunications Code of Practice** means the Telecommunications Code of Practice 1997

4.1.22 **Utility** means a registered company, person or other body providing a communication, electricity, gas, water, drainage, public transport, or any combination of such, service to the general public.

5. INTERPRETATION

5.1 In this Guideline, unless the context requires otherwise

(a) the singular includes the plural and vice versa;

(b) the index (if any) and the headings are used for convenience only and do not affect the interpretation of this Guideline;

(c) a reference to a thing includes a reference to a part of that thing;

(d) a reference to any statute, proclamation, rule, regulation or ordinance including any amendment, consolidation, modification, re-enactment or reprint of it or any statute, proclamation, rule, regulation or ordinance replacing it. A reference to a specific section, clause, paragraph, schedule or item of any statute, proclamation; rule, regulation or ordinance means a reference to the equivalent section of the statute, proclamation; rule, regulation or ordinance which is for the time being in force;

(e) the word “person” includes a firm, a body corporate, an unincorporated association or an authority;

(f) a reference to a person includes a reference to the person’s executors, administrators, successors, permitted substitutes (including, without limitation, persons taking by novation) and permitted assigns;

(g) The word “must” indicates provisions that are mandatory.

(h) The word “should” indicates provisions that are normally and generally practical for the specified conditions.

6. GENERAL CONDITIONS

6.1 It is necessary to limit the potential for signal egress from coaxial cable distribution networks to interfere with other services that utilise the radio frequency spectrum. These other services include not only the emergency services, safety of life, aeronautical and radio navigation services, but also the broadcasting (eg. FTA Television, FM Radio) and amateur radio services.

6.2 Carriers and Carriage Service Providers need to ensure that they can demonstrate that they have taken EMC issues into consideration and have a process in place to ensure on-going compliance with the spirit and intent of the ACA EMC Regime.

6.3 Although Carriers and Carriage Service Providers endeavour to minimise the potential for RF network signal egress through their attention to network design, equipment specification, installation and maintenance practices, there are a number of factors that may contribute overtime and result in an unacceptable level of RF egress from coaxial networks. These factors include:

(a) ageing and deterioration of equipment, cable and components due to exposure to adverse environmental and stress conditions.

(b) improper installation or disconnection of a service.

(c) customer tampering with operator provided customer cabling and customer premises equipment.

(d) unauthorised and illegal extensions of customer premises wiring and outlets with inferior and substandard cable and components.

(e) unauthorised and illegal extensions of customer premises wiring and outlets with inferior and substandard cable and components.

6.4 Signal egress is indicative of the physical integrity of the cable plant, and as such, offers a valuable tool in averting the potential for customer dissatisfaction as a result of service interruptions or picture quality deterioration.

6.5 Carriers and Carriage Service Providers should measure, monitor and record RF signal egress to:

(a) Minimise the potential for interfering with “safety of life” and other services including entertainment that share the radio frequency spectrum.

(b) Assist in pro-active maintenance activities to maximise the service life of the network (reduce operational costs) and minimise customer dissatisfaction.

(c) Manage Public Perception - provide hard irrefutable data that they are responsible public RF (egress) managers.

7 GUIDELINE RULES

7.1 General

7.1.1 A Communication Network should be designed and constructed in such a way as to take all reasonable steps to ensure that it is suitable for the environment in which it will operate. The Communication Network must be maintained in such a way as minimise the occurrence of excessive RF egress.

7.2 RF Action Limits

7.2.1 A Communication Network must be maintained to limit RF egress to less than 20 uV/m, when measured in accordance with section 8.2. Instances of RF egress should be repaired with the following priorities.

High Priority	20 uV/m or greater.
Medium Priority	10 to 19 uV/m.
Low Priority (routine)	<10 uV/m.

7.3 Measurement Frequencies

7.3.1 At least one unique carrier frequency should be used by each Carrier to reliably monitor RF signal egress. The carrier must be tagged to allow discrimination by the receiver.

7.3.2 The carrier frequencies currently in use by Carriers and Carriage Service Providers at the time of preparation of this Guideline are shown in Appendix A to avoid their use by other Carriers and Carriage Service Providers.

7.3.3 New Cable TV Operators must negotiate with existing Carriers and Carriage Service Providers to determine an acceptable unique carrier frequency and Tag combination which allow discrimination of the source of RF egress between networks.

7.3.4 Regardless of the receiver technology (AM or FM) a Carrier chooses, the onus is on the Carrier to implement a system which ensures that RF signal egress from its network is accurately measured, and any egress above the prescribed limits are corrected.

8 GUIDELINE COMPLIANCE PROCESS

8.1 General

8.1.1 Communication Cables, including any Supporting Structures, fittings and accessories should be maintained in a safe operating condition, including avoiding contact with Electrical Apparatus. The integrity of Insulated Communication Cables should be maintained.

8.1.2 The Communications Network owner must have in place a maintenance program that includes testing for RF egress and repair of Communications Cables where such egress is detected according to the priorities noted in Section 6.2.

8.1.3 A system of maintenance for Communication Networks Assets, including any Supporting Structures belonging to the Communication Network owner, should consist of:

(a) inspection and/or testing programs;

(b) maintenance programs; and

(c) replacement programs for components approaching the end of their serviceable life.

8.1.4 Where appropriate a system of maintenance should consist of the following elements:

(a) a record of network Assets and their respective locations;

(b) a schedule of maintenance activities; and

(c) a record of maintenance work carried out.

8.2 Testing Arrangements

8.2.1 Methods of measurement may depend on:

(a) the type of construction - Aerial or Underground

(b) SDU, MDUs and

(c) network plant

8.2.2 The following thresholds are recommended for the equipment when set up to display the signal strength at 3m from RF egress:

High Priority	20 μV/m or greater.
Medium Priority	10 to 19 μV/m.
Low Priority (routine)	10 μV/m.

8.2.3 All prioritisation of jobs to fix the faults should be based on the recorded egress level.

8.2.4 Carrier staff conducting measurements should –

(a) use an accurate, calibrated signal-egress measuring instrument with a dipole antenna to measure signal egress. The instrument must be able to detect and measure a 20 μV/M egress at 3 metres;

(b) measure any egress at 3 metres, if possible (If not, measure as close to the egress as possible and note the estimated distance to the expected source);

(c) rotate the dipole about the vertical axis to obtain the highest possible reading (i.e., peak out the signal); and

(d) maintain an accurate log of all egress found that exceeds 20 μV/M at 3 metres.

8.3 Hazard Assessment

8.3.1 An appropriate egress assessment should be completed after any work undertaken, in accordance with Carrier approved procedures.

8.3.2 The hazard assessment must be regularly audited by the Carrier to ensure compliance.

8.4 Risk Control and Emergency Procedures

8.4.1 Appropriate risk control measures and emergency procedures must be adopted for any identified hazard in accordance with Carrier approved procedures.

8.4.2 If a hazard is identified at the work site a hazard assessment should be undertaken prior to commencing work.

8.5 Monitoring Equipment

8.5.1 The Employer must ensure that the RF egress monitoring equipment used can accurately determine the level of egress:

8.5.2 All RF egress monitoring equipment must be periodically inspected and calibrated to ensure its accuracy;

8.5.3 The Employee must use the appropriate RF egress monitoring equipment provided by the Employer;

8.5.4 Any defective RF egress monitoring equipment must be withdrawn from service; and

8.5.5 The Employee must not use any suspected defective RF egress monitoring equipment.

9 TRAINING

9.1 General

9.1.1 This section applies to Employee training for any work activities on Communication Networks, for which the “Scope” of this Guideline applies.

9.2 Qualifications and Training

9.2.1 General Requirements

No work to which this Guideline applies must be carried out unless the Employee has received training which is appropriate for the work concerned has received appropriate practical and theoretical instruction so that the procedures are thoroughly understood.

9.2.2 Employer Responsibility

The Employer must determine that appropriate training courses have been undertaken for the respective Employees to ensure that they can carry out the required tasks competently. The following should be considered

(a) accreditation of the courses;

(b) accreditation of the trainer;

(c) the relevance to the tasks to be performed;

(d) national competency benchmarks or industry equivalent;

(e) the course syllabi;

(f) the facilities for training;

(g) assessment criteria for the issue of certificates; and

(h) whether the training provider has a Quality Assurance system in place

(i) the facilities for training;

(j) assessment criteria for the issue of certificates; and

(k) whether the training provider has a Quality Assurance system in place.

APPENDIX A: RF Measurement Frequencies

1 Telstra

Tagged Carrier Frequency - 124.2375 MHz Tag AM

2 Cable and Wireless Optus

Tagged Carrier Frequencies -	131.2375 MHz	Tag FM or AM
	131.2625 Mhz	Tag FM or AM

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The primary role of ACIF is to develop and administer Technical Standards, Industry Codes and industry support services that promote both the long-term interest of end-users and the efficiency and international competitiveness of the Australian communications industry.

ACIF is an industry initiative, funded and resourced by the industry, with a membership that encompasses all industry sectors. ACIF comprises a Board, Advisory Assembly, Executive, six standing Reference Panels and a number of task-specific Working Committees.

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