New Zealand Free-to-Air digital broadcasting

Antenna System Specification

- **Digital Terrestrial Transmissions (DTT-UHF); and**
- **Direct To Home (DTH-Satellite)**

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1 Introduction

TVNZ, CanWest MediaWorks, Maori Television and Radio New Zealand have formed the joint venture Freeview Limited and are in the process of establishing a free-to-air (FTA) digital broadcasting network. Every household in New Zealand will be able to access FTA digital broadcasting via either the Digital Terrestrial Transmission (DTT) network or the Direct To Home (DTH) satellite network.

1.1 Scope

This document specifies the minimum requirements of a new Freeview install whether that is via UHF antenna or a satellite receive dish.

This is intended to be a baseline specification and open standard for FTA digital broadcasting receive antenna.

The specification has been divided into 3 main sections:

1. Digital Terrestrial Transmissions (DTT-UHF);
2. Direct To Home (DTH-Satellite); and
3. Cabling and connectors.

This is provided as a set of guidelines to the installation industry in New Zealand. It is not a mandatory requirement as Freeview does not at this time intend to certify antenna equipment or accredit installers.

2 DTT – UHF Antenna

This section details the minimum requirements of a domestic outdoor UHF TV aerial for reliable reception of DTT services. (It does not cover the complete aerial installation).

The DTT signals will be transmitted within New Zealand on TV Band IV and V (502MHz – 806MHZ). Covering transmission channels TV25 – TV62. The signal could either be horizontal or vertical polarised depending on the location of the residence to the DTT transmitter.

There will be a number of transmission or transport streams, which in turn will contain a number of multiplexed TV, radio and data services.

The country will also be broken into a number of geographic regional areas.

2.1 DTT – UHF Antenna Profile

Item No.	Resources	Reference/Detail		Notes
1	**UHF Aerial**	Wideband antenna suitable for receiving signals across Band IV and V (502MHz – 806MHZ), covering transmission channels TV25 – TV62		
1.1	Forward Gain	Equal of greater than 6.5dBd	At 502MHz	
		Equal of greater than 8.2dBd	At 600MHz	
		Equal of greater than 10dBd	At 700MHz	
		Equal of greater than 10dBd	At 806MHz	

Item No.	Resources	Reference/Detail	Notes
1.2	Return Loss	Equal to or greater than 7dB	
1.3	Cross-Polar Protection	Equal to or greater than 15dB	
1.4	Feeder Cable Pickup Rejection	Equal to or greater than 12dB	
1.5	Connector	75 Ω (F Type female)	
1.6	Construction	All housing and plastic fittings to be weather proof and UV stable	
1.7	Colour	Optional	
2.0	**UHF Aerial Mountings**		
2.1	Construction	Galvanised Steel, housings to be weatherproof	
2.2	Type of Mount	Will vary according to fixing, wall and roof types permissible	Gutter mounts not acceptable
2.3	Stays	Mounts over 500mm in height require double stays.	
2.4	Wind speeds	Must be capable of withstanding wind speeds in excess of 120Kkph	

3 DTH – Satellite

This section details the minimum requirements of a domestic outdoor antenna system (consisting satellite dish and LNB) for reliable reception of DTH services. (It does not cover the complete dish installation).

The DTH signals will be transmitted from the Optus D1 satellite. The signals are split between two carrier transmission (or transport streams) for each transponder, which in turn will contain a number of multiplexed TV, radio and data services. Refer to appendix 2 for the Optus D1 EIRP coverage strength.

3.1 DTH - Satellite Dish Profile

Item No.	Resources	Reference/Detail	Notes
1	**Satellite Dish**		
1.1	Reflector Type	Elliptical	
1.2	Focus	Offset	
1.3	Diameter	Equal or greater than 60cm	
1.4	Aperture Efficiency	Equal or greater than 65%	
1.5	KU Band Gain @ 12.5GHz	Equal or greater than 36dBi	
1.6	Antenna Noise Temp.	@30 deg elevation Equal to or less than $45^{o}K$	
1.7	F/D Ratio	0.6	

Item No.	Resources	Reference/Detail	Notes
1.8	Material	Galvanized Steel	
1.9	Finish	Electrostatic Polyester Coating	
1.10	Colour	Optional (Black not recommended – due to high UV levels over NZ can damage plastic fixings over time).	All plastic fittings to be UV stable
2.0	**LNB**		
2.1	Input Frequency	12.25 – 12.75 GHz	
2.2	Output Frequency	950 – 1450 MHz	
2.3	Noise Figure	Equal to or Less than 1dB	
2.4	Conversion Gain	Equal or greater than 54dB	
2.5	L.O. Frequency	11.300GHz	
2.6	L.O. Frequency Stability	Less than ± 2 MHz over a 0^{o}–50^{o}C Range	
2.7	L.O. Phase Noise: @ 1 KHz	-52dBc/Hz	
2.8	L.O. Phase Noise: @ 10 KHz	-80dBc/ Hz	
2.9	L.O. Phase Noise: @ 100 KHz	-95dBc/Hz	
2.10	Cross Pol. Isolation	Equal or greater than 25dB	
2.11	Output Connector	75 Ω [(F type female)	
2.12	Image Rejection	Equal or greater than 40dB	
2.13	Operation Voltage	10 – 19 VDC	
2.14	Operating Temperature Range	-30 - +50°C	
2.15	Output VSWR	Not to exceed 2.5 : 1	
2.16	Gain Flatness over any 54MHz Transponder	Equal or greater than 2.0dB	
2.17	1 dB Output gain compression	Equal or greater than 0dBm	
2.18	LNB Feed Window	The LNB feed window must be made of a suitable material to avoid damage due to the High UV levels in NZ	
2.19	Seal	100% Humidity and Water Proof	
3	**SATELLITE DISH MOUNTINGS**		
3.1	Construction	Galvanised Steel, housings to be weatherproof	Mounting to provide a secure and steady support for the dish.
3.2	Type of Mount	Will vary according to fixing, wall and roof types permissible	Gutter and Fascia mounts not acceptable
3.3	Stays	Double stays required	

Item No.	Resources	Reference/Detail	Notes
3.4	Survival Wind Speed	Must be capable of withstanding wind speeds in excess of 120kph	
3.5	Adjustment Settings	Azimuth 0° - 30° Elevation 30° - 50°	
3.6	Colour	Optional	

Optional: As an alternative of a single LNB there is an optional dual LNB that could be installed capable of receiving programmes from both the Optus D1 (160 degrees east) and a satellite at 156 degrees east.

For a dual LNB the following specifications change:

4.0	**Dual LNB**		**OPTIONAL**
4.1	2nd LNB Frequency Range	11.7GHz – 12.75GHz	
4.2	Output Frequency	950 – 2000 MHz	
4.3	L.O. Frequency	10.750 GHz	

Note: All other LNB specifications remain the same.

4 Cabling and Connectors

This section details the minimum requirements of a domestic aerial cabling and connectors for reliable reception of digital broadcasting services.

4.1 Cabling and Connectors Profile

Item No.	Resources	Reference/Detail	Notes
1	**Coax Cable**		
	Screen		
1.1	Stranding	Solid	
1.2	Conductor Material	18AWG Copper Clad Steel (O.D. 1.02mm / 0.040”)	
1.3	Corrosion Resistance	Belden CoreGuard™ Amphenol TFC LifeTime™	
	Insulation		
1.4	Insulation Material	Gas-injected FPE – Foam Polyethylene	
	Outer Shield		
1.5	Outer Shield Type	Tape/Braid	
1.6	Tape Type	Bonded Aluminium Foil	
1.7	Braid Type	Aluminium	
	Outer Jacket		

Item No.	Resources	Reference/Detail		Notes
1.8	Outer Jacket Material	PVC		
	Electrical Characteristics			
1.9	Characteristic Impedance	75Ω		
1.10	Max attenuation	At 500MHz	6.5dB/30m	Operating Sweep Test to minimum 3.0GHz
		At 1450MHz	8.5dB/30m	
1.11	Max Operating Voltage	300V RMS		
1.12	Colour	Optional		
1.13	**Freeview Type Approved Cables**	Belden RG6 (1829A-C series). Belden Cable Part Number: • YV50797-9 White or • YV50797-10 Black Amphenol TFC D32391-FV RG6 White Amphenol TFC D32360-FV RG6 Black		
2	**Connectors**			
2.1	Type	F Type		
2.2	Crimp Type	Radial		
2.3	Characteristic Impedance	75Ω		
2.4	Corrosion Resistant	Required		
2.5	Water Resistant	Required		
2.6	Internal Sealing	Required		
2.7	External O-Ring	Required		
	Electrical Characteristics			
2.8	Insertion Loss at 700Mhz	Less than 0.3dB		
2.9	Return Loss at 700Mhz	Greater than 30dB		
2.10	Freeview Type Approved Connectors	F Conn Industries BICM K Conn RG6 WRO Gilbert USA – Ultraseal GF-US-6 PPC EX6		

5 Appendix 1

5.1 Glossary

COFDM	Coded Orthogonal Frequency Division Multiplexing. A modulation scheme that divides a single digital signal across 1,000 or more signal carriers simultaneously.
DTH	Direct To Home. Delivery of broadcast services to households via satellite.
DTT	Digital Terrestrial Television. A method of transmitting broadcast services digitally rather than the traditional analogue method.
DVB	Digital Video Broadcasting. A digital transmission standard.
EIRP	Effective Isotropic Radiated Power. The effective radiated power from a satellite transmit dish in the direction of the receiver location. In mathematical terms EIRP = Pt (power Transmitted) x Gt (Effective Gain of Transmitter).
Freeview	Working title for the FTA Digital Broadcast service in NZ.
FTA	Free To Air. A TV or radio service which is not encrypted enabling anyone with the appropriate decoder to access that service.
LNB	Low Noise Block converter. Amplifies received satellite signals and converts them into a lower frequency range.
Mulitplexer	Stream of all digital data consisting of one or more video services into one transport stream.
STB	Set Top Box. Decodes the digital transport stream into an analogue video / audio stream.
UHF	Ultra High Frequency. The frequency band that DTT will be transmitted in New Zealand.

5.2 References

Installing Digital Terrestrial Television (domestic systems): Digital TV Group (UK)

Connectivity Guidelines for Installers and Manufacturers: Digital TV Group (UK)

Professional Dish Installation, by Astra Marketing Ltd

Specification for Upgrades of Existing Communal Aerial (MATV) Systems to Accommodate Digital Terrestrial Television: Digital TV Group (UK)

Improving UK Aerial Installations; Digital TV Group (UK)

Installing Digital Television; Digital TV Group (UK)

Generic Cabling Systems; Telecom (NZ)

6 Appendix 2 - OPTUS D1 EIRP Coverage