GTech Surveys Limited

Baseline Television Signal Survey

IFA2 Converter

CHANGE HISTORY

Issue	Date	Details of Changes
0.1	21/08/17	Working Draft
1.0	31/08/17	First Draft Issue
1.0	07/08/17	First Issue – Minor editing
Author: G Phillips		Reviewer: O Lloyd

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GTech Surveys Limited

GTech Surveys is a Midlands based broadcast and telecommunications consultancy conducting projects throughout the entire UK. We undertake mobile phone network, television and radio reception surveys (signal surveys), conduct broadcast interference and reception investigations, and support telecommunications planning work for wind farm developers, construction companies, architects, broadcasters and Local Planning Authorities.

In addition to these broadcast services, we review and prepare ES & EIA Telecommunications Chapters and documents, liaising with telecommunication providers, and advising developers with respect to associated Section 106 (Town and Country Planning Act 1990) and Section 75 (Town and Country Planning Act 1997, Scotland) agreements and other planning conditions. We also verify television transmitter coverage and performance and are actively involved with the current UK Digital Television Upgrade project, working with Digital UK, Ofcom, Arqiva and at800.

GTech Surveys is a Consultant Member of the Confederation of Aerial Industries and the RDI - the digital sectors professional body and trade organisation. More information about the Confederation of Aerial Industries and CAI consultants can be found on their website - www.cai.org.uk. Only professional broadcast engineers undertake our fully insured products and services. For more information about the current projects we are working on and the companies we work with, visit our TV Reception Surveys, Projects & Clients webpage at - www.gtechsurveys.co.uk.

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This report follows the following structure:

Chapter 1 provides an introduction to the work

Chapter 2 provides a description of available television services in the study area

Chapter 3 provides a description of the pre-construction television reception conditions around the proposed development

1 - Introduction

This report contains the findings of a comprehensive field survey undertaken for National Grid to record the baseline terrestrial television signal conditions in the signal shadow area that could potentially be created by the proposed IFA2 Converter development in Daedalus.

The potential signal shadow area is shown in the Appendix and taken from OVE-IFA2-DRW-002.

A field survey was undertaken in August 2017 to record the pre-construction terrestrial television signal quality at various locations in the signal shadow area. This report details the pre-construction television reception conditions for future reference.

2 - Available Television Broadcast Services

Terrestrial Television Services

Analogue Terrestrial Television

The area around the proposed development is no longer served by analogue television transmissions due to the completed Digital Television Switchover. All analogue services were switched off in the Meridian television region during 2012. Up to date technical information regarding the Meridian TV region and Rowridge transmitter group switchover, can be found on the Digital UK website -

www.digitaluk.co.uk

Digital Terrestrial Television (DTT) - Freeview

The area is served by DTT services from the Rowridge transmitter (NGR SZ 44725 86540), 20km to the southwest of the proposed development. The Rowridge transmitter is shown with respect to the proposed development in Figure 1.

Technical transmission information for each service at the aforementioned transmitter site is detailed in Table A, found in the Appendix.

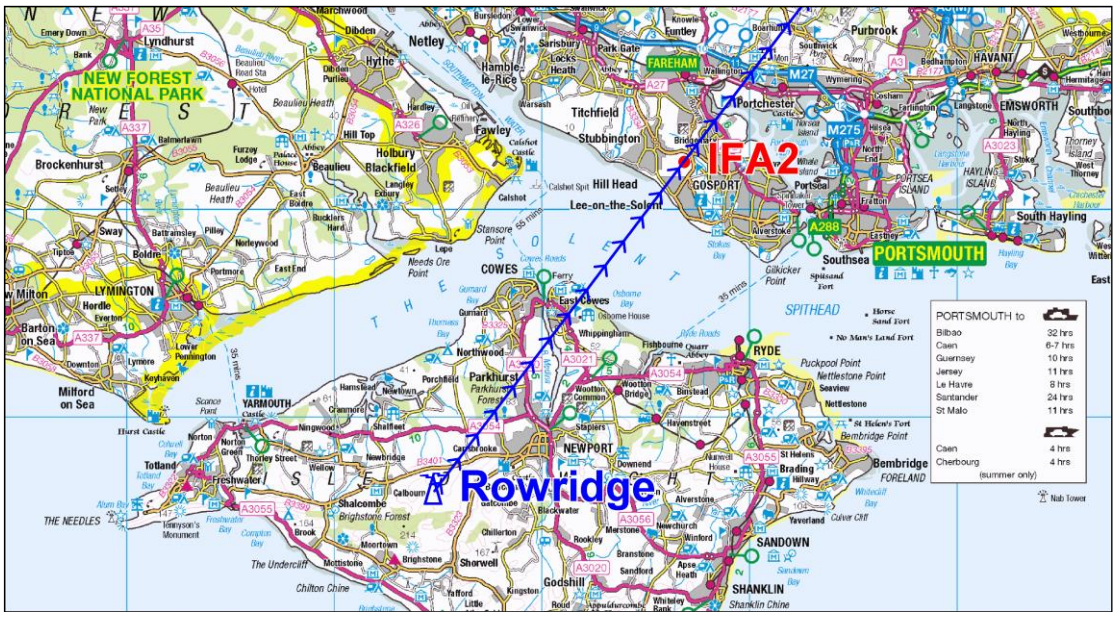


Figure 1 - The Location of the Rowridge Transmitter, the Proposed Development and the direction of the incoming DTT signals at the IFA2 site

Non-Terrestrial Television Services (Digital Satellite Television)

Digital satellite television services are provided by geo-stationary earth orbiting satellites positioned above the equator.

Freesat & Sky

For the reception of the 28.2 degrees east ASTRA satellite cluster (Freesat and Sky services), dish elevations of 25.6 degrees are required at this latitude. Optimal receive dish azimuths are 144.0 degrees with respect to true north.

3 - Description of Baseline (pre-construction) Television Reception Conditions

Study Area & Survey Method

Signal measurements were taken in all areas where predicted (modelled) interference may occur. In this study, field measurements were undertaken up to 1.4 kilometres away from the proposed development.

Survey work was conducted in 4 areas (A-D), as seen in Picture 1 in the Appendix. 29 locations were visited in areas A, B, C and D. Survey work was severely limited due to overhead cables and low trees, busy roads and lack of safe parking at required locations.

These locations are identified in Figures 2a and 2b and the measurements are detailed in Tables B, C and D, found in the Appendix. The survey point IDs reference the survey location they are associated with i.e. A1, A2, B1, B2, C1, C2, D1, D2 etc.

In particular, the following data was recorded:

- Field strength and technical signal measurements of DTT transmissions from the Rowridge transmitter

- GPS information for each surveyed location

All television measurements were carried out using a UHF log-periodic receive antenna, mounted on GTech Surveys's broadcast survey vehicle, at a receive height of 10 metres AGL (above ground level), industry standard height for such work. During the survey, no assessment was made of reception conditions within viewers' homes.

Survey procedures are detailed in the Appendix. Equipment details are detailed in the Appendix.

Survey Results and Observations

In general, reception conditions in the study area are excellent. The Rowridge DTT transmitter provides optimal coverage throughout the area. This is due to the close proximity of the transmitter with respect to the site and the lack of tall buildings in the area. All antennas in the area are directed toward the Rowridge transmitter.

Analogue Terrestrial Television

- Due to the completed Digital Television Switchover, analogue television services are no longer available in the study area.

Digital Terrestrial Television (Freeview)

- DTT services were available at all surveyed locations from the Rowridge transmitter. At all locations, terminated received signal levels[1] were in excess of recommended minimum amounts and the technical quality of received signals was found to be good. DTT services currently provide excellent coverage and service throughout the study area.

[1] - Signal levels as specified by -

- *The Digital TV Group - Digital TV Group R-Book 5, 2005 Edition*
- *The Digital TV Group - UK Digital TV Receiver Recommendations, Version 1.4, dated 18 June 2008*
- *The UK collaboration Centre for Innovation in Digital Media Technology - R-Book 6, 2015*

The BBC A and D3&4 multiplexes operate with 64QAM modulation, coding rate 2/3 & 8K FFT. Minimum recommended receive levels are 50 dBµV.

The SDN, Arqiva A and Arqiva B multiplexes operate with 64QAM modulation, coding rate 3/4 & 8K FFT. Minimum recommended receive levels are 50 dBµV.

The BBC HD, COM 7 and COM 8 multiplexes operate using the DVB-T2 standard - 256QAM modulation, coding rate 2/3 & 32K FFT. Minimum recommended receive levels are 50 dBµV.

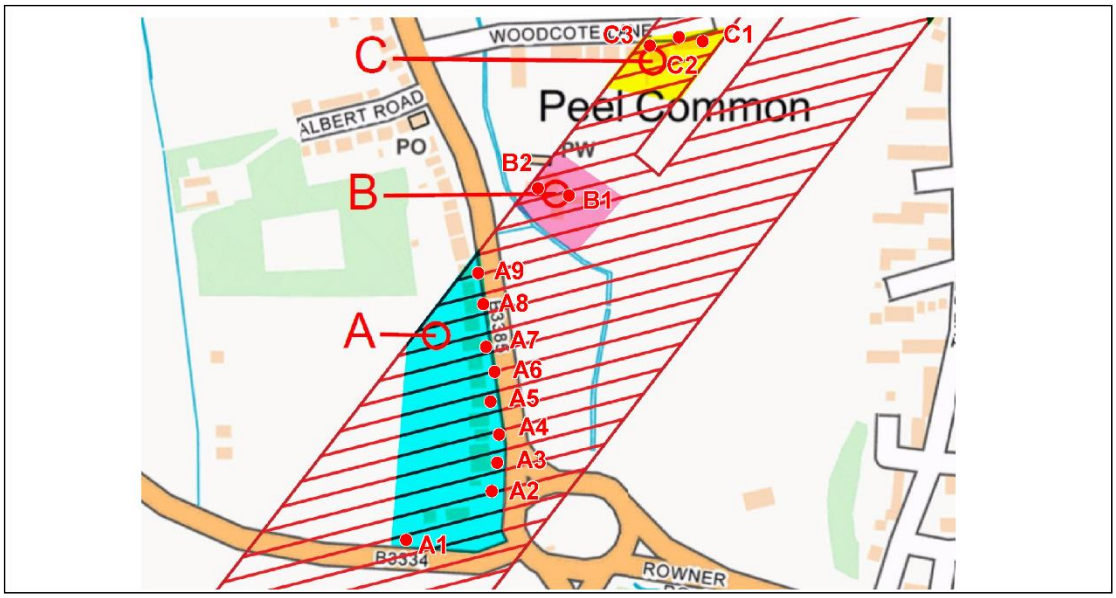


Figure 2a – Survey locations; prefixes A to C

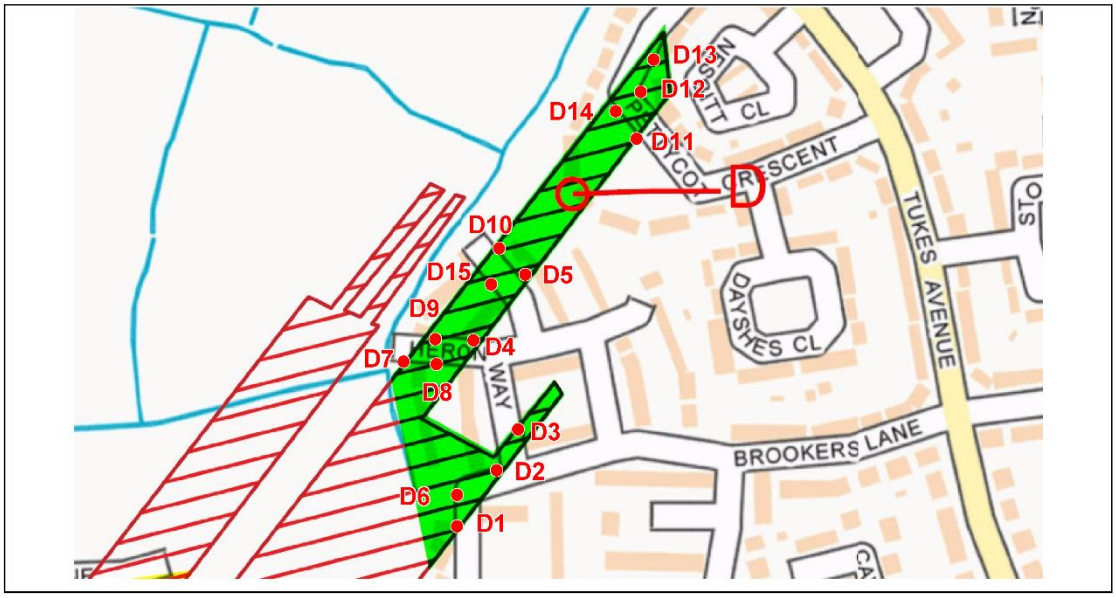


Figure 2b – Survey locations; prefixes D

APPENDIX

Television Transmission Frequencies

Survey Measurements

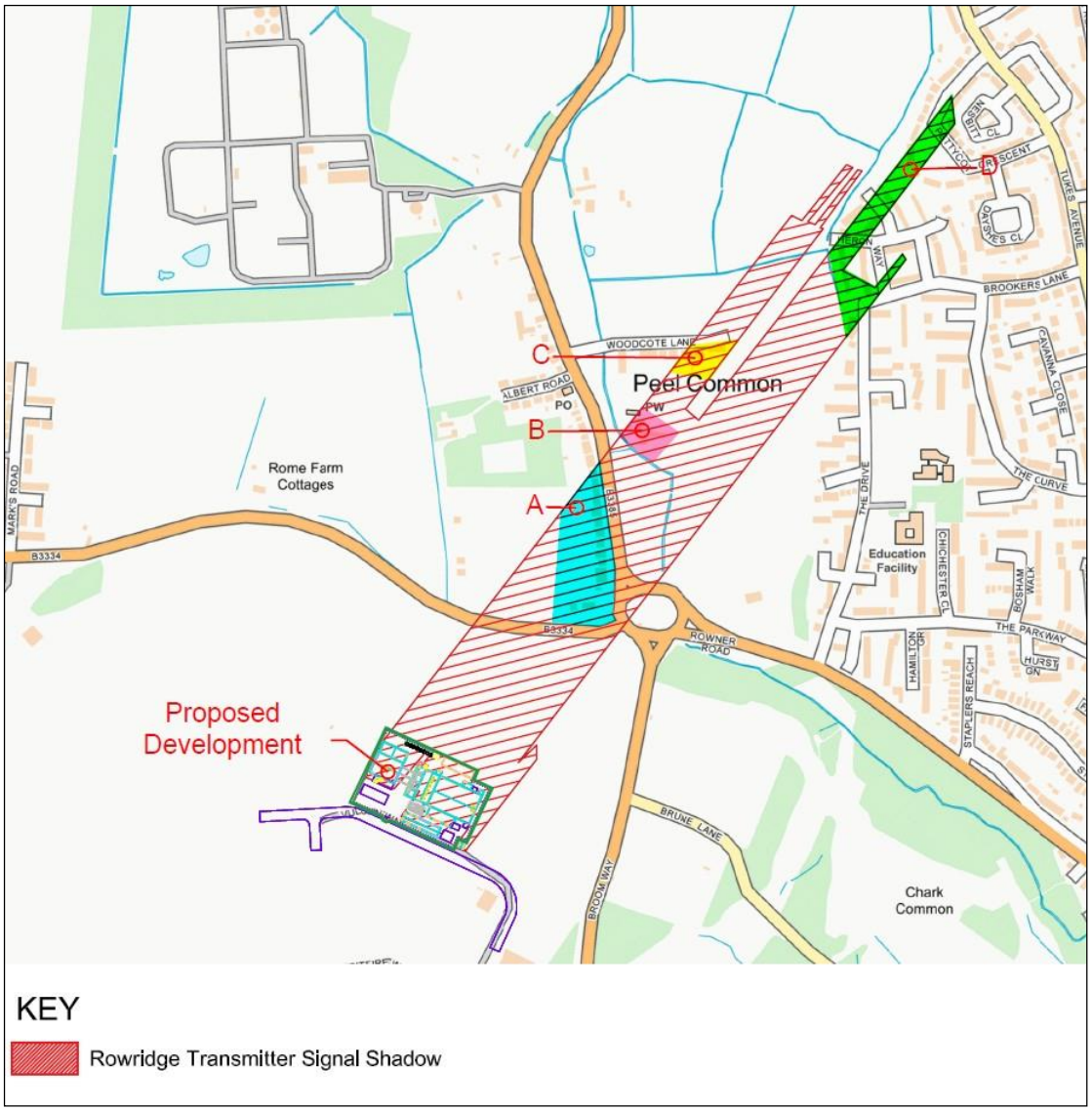
Definitions and an Overview of BER, CBER, CNR and MER Measurements

The Freeview (DVB T2) Signal

Survey Procedures

Survey Equipment

National, Regional and Local Planning Policies regarding Telecommunications, Broadcasting and Construction Schemes



Picture 1 – Terrestrial television signal shadow zones

Digital TV Multiplex	Multiplex Operator	UHF Channel Number *	Channel Frequency Fc (MHz) **	Transmitter Power (kW)
BBC A	BBC	24	498.000	200.00
D3&4	Digital 3 & 4	27	522.000	200.00
BBC B - HD	BBC	21+	474.167	200.00
SDN	SDN	25	506.000	50.00
Arqiva A	Arqiva	22+	482.167	50.00
Arqiva B	Arqiva	28	530.000	50.00
COM7 - HD	Arqiva	31	554.000	24.41
COM8 - HD	Arqiva	27	522.000	18.36
L-SOT	Comux	29	538.000	10.00

Table A – Rowridge Digital Terrestrial Television Services

Public Service Broadcaster (PSB) Digital Multiplexes
Commercial (COM) Digital Multiplexes

* - The nominal channel frequency, Fc (in Megahertz) of the multiplex can be calculated using Fc = 8n+306, where ‘n’ is the UHF channel number.

** - Digital multiplexes with a “+” or “-“ sign operate with a frequency offset making the channel frequency + or - 167 kHz.

Information correct at time of writing. Information provided by DigitalUK and Arqiva

Measurement Point Number	Channel	24	27	21	25	22	28	31	37	29		
	Frequency	498.00	522.00	474.00	506.00	482.00	530.00	554.00	602.00	538.00		
	Service	BBC A	D3&4	BBC B HD (+)	SDN	Arqiva A (+)	Arqiva B	COM 7 HD	COM 8 HD	L-SOT	Easting	Northing
A1	FS	100.1	100.8	100.1	94.7	93.8	93.9	91.7	91.1	85.6	457070	102606
	CSI	17.0	18.0		21.0	24.0	21.0			6.0		
	MER	33.2	32.3		30.1	27.0	32.9			26.0		
A2	FS	99.1	98.8	101.0	95.7	90.5	94.1	93.2	84.8	85.2	457115	102668
	CSI	19.0	18.3		19.2	23.6	23.0			6.4		
	MER	31.7	32.3		29.1	29.0	32.3			23.3		
A3	FS	103.0	101.9	102.6	91.5	92.7	93.0	95.2	83.6	84.2	457119	102692
	CSI	20.8	20.1		20.1	23.3	20.8			6.4		
	MER	32.2	32.7		29.5	31.0	30.6			29.6		
A4	FS	101.3	100.5	100.3	98.5	96.9	95.3	91.7	82.0	81.6	457115	102720
	CSI	19.2	21.8		19.1	24.9	20.0			4.3		
	MER	33.2	32.1		31.0	29.0	32.1			28.1		
A5	FS	101.6	99.2	100.8	98.9	96.6	95.0	91.7	82.7	85.7	457112	102756
	CSI	19.9	21.4		24.2	25.9	21.3			5.6		
	MER	33.2	32.3		29.3	30.0	28.7			29.9		
A6	FS	97.5	102.3	100.1	95.2	91.5	95.7	90.3	83.2	82.2	457108	10278
	CSI	19.2	21.0		17.4	20.1	22.6			6.8		
	MER	32.0	32.0		31.0	30.0	31.0			28.7		
A7	FS	102.4	96.3	101.5	92.6	92.2	94.8	92.1	88.9	86.2	457107	102801
	CSI	21.0	19.8		23.5	23.3	23.9			7.1		
	MER	32.3	32.0		30.9	29.1	32.7			24.9		
A8	FS	98.7	103.4	102.3	90.9	95.0	91.4	89.2	89.6	87.4	457102	102820
	CSI	21.2	19.4		20.3	21.1	22.7			5.7		
	MER	32.1	30.4		30.2	29.0	32.1			27.7		
A9	FS	100.5	99.3	99.1	93.8	92.9	95.4	89.7	83.0	83.1	457098	102843
	CSI	21.0	19.2		23.4	26.7	20.3			6.5		
	MER	32.1	32.1		31.0	30.2	31.2			29.8		
B1	FS	97.6	101.6	95.7	98.1	90.8	92.1	92.6	86.7	82.8	457157	102900
	CSI	20.0	21.2		20.7	20.3	21.6			9.4		
	MER	31.0	32.3		32.2	30.0	31.9			24.8		
B2	FS	101.5	97.4	97.8	94.6	97.8	89.7	90.7	87.1	87.4	457137	102913
	CSI	18.9	21.5		21.9	26.7	21.6			6.1		
	MER	30.0	32.3		31.7	31.0	33.3			24.4		

Table B - Field Strength Measurements of Rowridge Digital Television Services in Areas A and B

Measurement Point Number	Channel	24	27	21	25	22	28	31	37	29		
	Frequency	498.00	522.00	474.00	506.00	482.00	530.00	554.00	602.00	538.00		
	Service	BBC A	D3&4	BBC B HD (+)	SDN	Arqiva A (+)	Arqiva B	COM 7 HD	COM 8 HD	L-SOT	Easting	Northing
C1	FS	98.3	98.8	98.0	93.3	91.2	93.5	88.7	88.3	83.7	457294	103025
	CSI	17.0	18.0		21.0	24.0	21.0			6.0		
	MER	33.0	34.0		30.1	29.0	32.9			26.0		
C2	FS	101.1	98.2	99.2	89.4	91.5	96.2	89.6	85.1	84.3	457278	103013
	CSI	17.5	16.9		17.4	23.8	19.2			8.4		
	MER	30.0	31.4		26.2	30.0	31.5			26.3		
C3	FS	97.0	97.5	101.1	97.3	86.7	92.3	92.8	88.0	85.1	457265	103013
	CSI	16.7	17.3		21.1	24.0	19.4			6.4		
	MER	32.3	32.1		28.7	29.9	31.7			27.3		

Table C - Field Strength Measurements of Rowridge Digital Television Services in Area C

Measurement Point Number	Channel	24	27	21	25	22	28	31	37	29		
	Frequency	498.00	522.00	474.00	506.00	482.00	530.00	554.00	602.00	538.00		
	Service	BBC A	D8&4	BBC B HD(+)	SDN	Arqiva A (+)	Arqiva B	COM 7 HD	COM 8 HD	L-SOT	Easting	Northing
D1	FS	100.3	98.0	99.7	92.2	92.1	93.5	90.1	89.1	86.1	457485	103055
	CSI	17.0	18.0		21.0	24.0	21.0			6.0		
	MER	33.0	34.0		30.1	27.0	32.9			26.0		
D2	FS	99.0	93.6	98.8	92.4	90.5	88.8	90.4	84.6	87.2	457516	103093
	CSI	20.2	18.7		21.1	19.0	20.3			5.4		
	MER	30.1	32.0		30.4	25.1	30.8			25.8		
D3	FS	98.2	97.8	100.9	93.2	91.8	97.0	87.7	91.1	89.0	457528	103115
	CSI	19.4	18.3		18.2	21.0	21.1			9.9		
	MER	32.2	31.2		30.4	28.8	31.5			25.9		
D4	FS	98.9	96.2	100.2	90.6	93.3	90.7	90.8	86.5	85.7	457511	103171
	CSI	17.0	13.7		21.2	20.0	19.0			9.5		
	MER	31.2	32.0		29.9	25.8	30.3			27.9		
D5	FS	103.2	97.1	103.6	89.0	96.4	91.4	91.2	88.3	84.7	457529	103218
	CSI	18.9	19.8		20.1	18.0	19.7			2.8		
	MER	31.2	32.3		30.2	27.3	29.2			29.3		
D6	FS	98.2	95.9	100.7	93.9	90.2	95.9	87.5	90.4	87.5	457489	103081
	CSI	16.8	15.1		23.8	25.8	18.4			7.8		
	MER	33.1	32.5		29.1	31.2	29.3			26.0		
D7	FS	100.3	97.7	94.9	91.9	94.1	94.8	89.6	86.6	86.3	457468	103167
	CSI	16.7	17.0		25.1	25.3	20.5			4.4		
	MER	29.7	32.8		30.2	29.3	32.1			22.6		
D8	FS	103.5	97.0	101.5	92.1	92.4	94.0	90.2	89.4	85.8	457480	103157
	CSI	16.1	22.5		21.0	24.0	20.8			2.1		
	MER	33.3	32.1		28.6	29.3	29.9			24.3		
D9	FS	102.8	98.6	95.3	88.5	93.1	95.4	90.4	87.6	87.0	457492	103173
	CSI	17.0	17.3		20.8	24.7	20.1			4.4		
	MER	31.1	32.3		31.4	30.1	36.0			24.4		
D10	FS	101.4	98.9	101.8	92.3	90.4	96.0	89.0	91.9	86.5	457512	103230
	CSI	19.2	19.0		16.3	26.9	21.4			3.8		
	MER	33.1	32.1		29.2	31.4	30.2			25.0		
D11	FS	101.3	97.1	99.7	88.8	91.1	93.1	91.8	91.9	86.2	457602	103325
	CSI	16.0	14.6		20.2	23.7	19.4			8.2		
	MER	32.1	31.2		30.0	29.1	29.9			27.8		
D12	FS	100.3	97.6	101.4	95.0	91.2	94.6	86.8	90.8	83.4	457606	103349
	CSI	15.6	14.9		18.4	25.8	18.9			3.5		
	MER	29.9	31.2		32.1	28.6	30.3			26.9		
D13	FS	103.2	98.4	102.4	89.3	92.6	95.0	94.1	89.1	83.7	457614	103367
	CSI	13.8	17.0		25.2	27.1	22.3			7.2		
	MER	31.2	32.2		29.4	27.4	31.2			28.2		
D14	FS	103.0	95.9	98.7	92.7	90.0	97.3	90.0	87.7	87.9	457590	103351
	CSI	18.9	17.1		17.9	28.3	20.7			6.5		
	MER	32.3	32.2		30.6	24.6	28.4			26.3		
D15	FS	95.9	101.1	100.2	93.2	88.3	92.1	88.7	92.2	82.7	457509	103217
	CSI	18.9	17.5		20.6	24.4	23.2			3.3		
	MER	32.1	33.1		30.1	26.5	29.8			30.1		

Table D - Field Strength Measurements of Rowridge Digital Television Services in Area D

Key -

Frequencies listed are in MHz
Field Strength (FS) values are indicated in dBμV/m (See Calculation of Received Field Strength)
CSI Channel Status Information (%)
MER Modulation Error Ratio (dB)

Survey Measurements

Signal Level [1]

The first and easiest parameter to check is signal level (also referred to as amplitude or terminated signal strength). In many cases this gives a good indication of the available decoding margin, or the extent of any shortfall.

At the receiver input, the terminated level of a DTT signal is measured in the usual units of dBμV (see Table 1, recommended signal levels) and the relative levels will vary from one transmitter to another. It is helpful to understand that the level of a DTT signal represents the total power of all the carriers in the Coded Orthogonal Frequency Division Multiplexing (COFDM) signal and not the level of each individual COFDM carrier.

	Max Signal Level	Min Signal Level
DTT	70 dBμV	50 dBμV (see notes)

Table 1 – Recommended Terminated Signal Levels*

(1) The 50 dBμV figure applies where the set top box (STB) or integrated digital TV (idTV) is the first item in the radio frequency (RF) distribution chain. (This is the normal arrangement and is strongly recommended) A 5dB higher level is necessary to take into account the typical low gains and high noise figures for any satellite receiver or video cassette recorder (VCR), either operating or in standby mode, used ahead of the STB or idTV.

(2) The recommended signal levels in Table 1 are measured at the outlet plate except where a satellite receiver or VCR is used ahead of the STB or idTV, in which case they are measured at the input to the STB or idTV. They assume a minimum C/N (carrier-to-noise ratio) requirement, including a satisfactory margin, of 26dB for 64-QAM rate 2/3 and 22dB for 16-QAM rate 3/4.

(3) These levels are recommendations and should be used only as a guide. Individual installations may need more or less signal level in order to achieve an acceptable decoding margin, depending on the particular system configuration.

For satisfactory reception of digital signals, it is important that ALL of the signals applied to the receiver are within the ranges shown in Table 1.

These maximum and minimum levels define a so-called window of operation for the receiver.

* - *Recommended Terminated Signal Levels at the Receiver input*

[1] – Source information – "The Digital TV Group - Digital TV Group R Book 2", 2002 Edition

An Overview of, BER, CBER, CNR and MER measurements and definitions in Layman's Terms

Common practice dictates that in order to measure the quality of a received DTT signal we have to look at one or more of the following parameters: Bit-Error Rate (BER), Channel BER (CBER), Carrier-to-Noise Ratio (CNR) and Modulation Error Ratio (MER). The Channel State Information (CSI) feature available in DTT measurement equipment is a very valuable tool providing additional insight into the quality of reception in a typical domestic or professional DTT installation.

Using the BER alone is an ill-advised "hit-or-miss" strategy because of the 'cliff-edge effect' characteristic of any digital TV system. A BER reading below the reference quasi error free (QEF) value of 2×10-4 might wrongly lead us to conclude that the receiving conditions are satisfactory.

However, the BER provides a very narrow signal measurement range. Even for vanishingly small BER readings, a small drop in the level of received DTT signal can push the DTT receiver over the digital cliff edge beyond the point of system failure. The CBER is closely related to the BER providing a wider signal measurement range. Depending on the type(s) of unknown disturbance(s) affecting our DTT installation (noise, co-channel or adjacent PAL, co-channel DTT, etc.), the CBER corresponding to the reference QEF BER of 2×10-4 varies between 4 and 7 in 100 [1]. Unfortunately, the CBER is not a reliable indicator of how far the digital cliff edge is.

DTT engineers need a tool with a wide measurement range that solves the shortcomings of the BER and CBER. This measurement tool should provide some estimate of the noise margin of the DTT installation. A first candidate comes to mind: CNR or, alternatively, its sibling the MER.

The CNR is defined as the ratio of the average RF power of the DTT signal to the power of the noise present in the UHF channel. Similarly, the MER is defined as the ratio of the average power of the DTT signal to the average power of the constellation errors. It can therefore be used to give a more direct indication of decoding margin when, as is often the case, there is co-channel interference as well as noise in the channel. The higher the MER value, the **better** the reception conditions. Our measurement equipment provides a maximum MER measurement value of up to 36 dB.

In situations where there is no multipath propagation so that the channel frequency response remains reasonably flat, CNR and MER are in principle the same thing. In practice, the accuracy of the measured CNR is limited by the noise floor of the measurement equipment and by the presence of other disturbances on adjacent UHF channels. Likewise, both the receiver's noise floor and other issues resulting from its practical implementation degrade the MER estimate.

Channel State Information (CSI)

Some flavour of CSI is used internally by all commercial DTT receivers to achieve the recommended target system performance. The CSI counts the effect of both the noise present in the channel and the shape of the transmission channel itself. In other words, the CSI gives a measure of the reliability of the received DTT signal. We measure the average of the CSI across the UHF channel occupied by the DTT signal. The higher the percentage value of CSI, the **less** reliable DTT reception is.

As explained in [2], the CSI can be used as a means to measure the noise margin in a DTT installation. Let us call CSI_{QEF} the percentage CSI measured at the point where the measurement equipment displays the reference QEF BER. The noise margin in dB is then approximately given by –

$$NM\ (dB) = \frac{CSI_{QEF} - CSI}{2.6}$$

This empirical approximation represents a good estimate for NM below 8dB. The CSI alone, on the other hand, has a wider measurement range, providing meaningful results for NM of up to 15dB.

[2] – Source information – J. Lago-Fernández, "Using Channel State Information (CSI) to Characterize DVB-T Reception", IBC, Amsterdam, 12-17 September 2002

Calculation of Received Field Strength

The Field Strength (dBµV/m) is derived from the Terminated Level (dBµV) as measured at the input of the Promax measurement receiver in the survey vehicle.

Field Strength (dBµV/m) = Terminated Level (dBµV) – Aerial Gain (a) + Dipole Factor (b) + Feeder Loss (c)

where -

Dipole Factor (to matched load)	(b)	$20LOG(\frac{2\pi}{\lambda})$ *Where λ = Transmission Wavelength (m)*
Feeder Loss	(c)	3 dB
Aerial Gain (dB_{dipole})	(a)	10 dB

The Post DSO Freeview Signal

2nd Generation Terrestrial - The World's Most Advanced Digital Terrestrial TV System

What is DVB-T2?

DVB-T2 is the world's most advanced digital terrestrial transmission (DTT) system, offering more robustness, flexibility and at least 50% more efficiency than any other DTT system. It supports SD, HD, mobile TV, or any combination thereof.

Background

DVB-T is the most widely adopted and deployed DTT standard. Since its publication in 1997, over 70 countries have deployed DVB-T services and 45 more have adopted DVB-T. This well-established standard benefits from massive economies of scale and very low receiver prices.

Due to the European analogue switch-off and increasing scarcity of spectrum, DVB drew up Commercial Requirements for a more spectrum-efficient and updated standard. DVB-T2 easily fulfils these requirements, including increased capacity, robustness and the ability to reuse existing reception antennas. The first version was published in 2009 (EN 302 755) and the latest update in 2011 included the T2-Lite subset for mobile and portable reception (BlueBook A122).

How does it work?

Like its predecessor, DVB-T2 uses OFDM (orthogonal frequency division multiplex) modulation with a large number of sub-carriers delivering a robust signal, and offers a range of different modes, making it a very flexible standard. DVB-T2 uses the same error correction coding as used in DVB-S2 and DVB-C2: LDPC (Low Density Parity Check) coding combined with BCH (Bose-Chaudhuri-Hocquengham) coding, offering a very robust signal. The number of carriers, guard interval sizes and pilot signals can be adjusted, so that the overheads can be optimised for any target transmission channel.

The key new technologies in DVB-T2 are:

- Multiple Physical Layer Pipes allow separate adjustment of the robustness of each delivered service within a channel to meet the required reception conditions (for example in-door or roof-top antenna). It also allows receivers to save power by decoding only a single service rather than the whole multiplex of services.
- Alamouti coding is a transmitter diversity method that improves coverage in small-scale single-frequency networks.
- Constellation Rotation provides additional robustness for low order constellations.
- Extended interleaving, including bit, cell, time and frequency interleaving.
- Future Extension Frames (FEF) allow the standard to be compatibly enhanced in the future.

As a result, DVB-T2 can offer a much higher data rate than DVB-T OR a much more robust signal. For comparison, the two bottom rows show the maximum data rate at a fixed C/N ratio and the required C/N ratio at a fixed (useful) data rate.

	DVB-T	**DVB-T2** (new / improved options in red)
FEC	Convolutional Coding+Reed Solomon 1/2, 2/3, 3/4, 5/6, 7/8	LDPC + BCH 1/2, 3/5, 2/3, 3/4, 4/5, 5/6
Modes	QPSK, 16QAM, 64QAM	QPSK, 16QAM, 64QAM, 256QAM
Guard Interval	1/4, 1/8, 1/16, 1/32	1/4, 19/128, 1/8, 19/256, 1/16, 1/32, 1/128
FFT Size	2k, 8k	1k, 2k, 4k, 8k, 16k, 32k
Scattered Pilots	8% of total	1%, 2%, 4%, 8% of total
Continual Pilots	2.6% of total	0.35% of total
Bandwidth	6, 7, 8 MHz	1.7, 5, 6, 7, 8, 10 MHz
Typical data rate (UK)	24 Mbit/s	40 Mbit/s
Max. data rate (@20 dB C/N)	29 Mbit/s	47.8 Mbit/s
Required C/N ratio (@22 Mbit/s)	16.7 dB	8.9 dB

Sourced from

http://www.dvb.org/technology/fact_sheets/DVB-T2_Factsheet.pdf

Survey Procedures

Park survey vehicle in a safe place in a chosen area

Ensure hazard and sidelights are on

Check for overhead power and telephone cables, trees and other hazards

TV Signal Measurements

Raise the mast up to the correct height (10m AGL) and rotate the antenna to the orientation of the incoming transmissions

Ensure reception meter is set for DVB-T transmissions on the correct channel

Peak up the level of the incoming signals by rotating the mast so the receive antenna is optimally aligned to the transmission source

Lock the mast off so it cannot free rotate

Record the values of the received field strengths for all available DVB-T transmissions from the transmitter

Record the values of the MER levels for all available DVB-T transmissions from the transmitter

Record the values of the CSI levels for all available DVB-T transmissions from the transmitter

Repeat all measurements for all other available television transmissions sources

Once all measurements have been undertaken, lower the mast and return it to its forward facing position

Note the percentage of properties with satellite signal receive dishes

Note the viewing preference of all residents

Drive away to the next location only when it is safe to do so and the mast is fully retracted

NB - Whilst a measurement is being undertaken the vehicle should not be left unattended at any time.

Survey Equipment

Survey Vehicle

Survey Vehicle 1 aka ‘Mozart’ – Ford Tourneo, Moondust Silver

Field Strength Measurements for Digital Television Broadcasts

1 x Promax Prolink 4C Premium – Serial Number PK4COPAB11B / 060419030005 Running firmware version 2.48

1 x Sony Wide screen CRT Reference Receiver KV–16TIU – Serial Number 4014480

1 x Professional Broadcast Wideband Log Periodic 8 element antenna – CSA Radiation Systems International

All RF cables, interconnects and systems of professional quality and calibrated to determine feeder losses and antenna gains. These are factored into the results, providing accurate descriptions of actual field strength values at 10m AGL for each surveyed location.

Planning Polices

National Planning Polices

National Planning Policy Framework, March 2012 (Department for Communities and Local Government)

With regards to telecommunications, the National Planning Policy Framework states as an objective in section 5 that,

5. Supporting high quality communications infrastructure

42. Advanced, high quality communications infrastructure is essential for sustainable economic growth. The development of high-speed broadband technology and other communications networks also plays a vital role in enhancing the provision of local community facilities and services.

43. In preparing Local Plans, local planning authorities should support the expansion of electronic communications networks, including telecommunications and high speed broadband. They should aim to keep the numbers of radio and telecommunications masts and the sites for such installations to a minimum consistent with the efficient operation of the network. Existing masts, buildings and other structures should be used, unless the need for a new site has been justified. Where new sites are required, equipment should be sympathetically designed and camouflaged where appropriate.

44. Local planning authorities should not impose a ban on new telecommunications development in certain areas, impose blanket Article 4 directions over a wide area or a wide range of telecommunications development or insist on minimum distances between new telecommunications development and existing development. They should ensure that:

> *they have evidence to demonstrate that telecommunications infrastructure will not cause significant and irremediable interference with other electrical equipment, air traffic services or instrumentation operated in the national interest; and*
>
> *they have considered the possibility of the construction of new buildings or other structures interfering with broadcast and telecommunications services.*

Planning Policy Guidance 8: Telecommunications (23 August 2001) was replaced by this framework.

DISCLAIMER

This Report was completed by GTech Surveys Limited on the basis of a defined programme of work and terms and conditions agreed with the Client. We confirm that in preparing this Report we have exercised all reasonable skill and care taking into account the project objectives, the agreed scope of works, prevailing site conditions and the degree of manpower and resources allocated to the project.

The UK's terrestrial television network is a highly complex engineering system and is constantly being modified, re-designed, upgraded and maintained. The reception conditions detailed in this report were those prevailing at the time of the survey in the study area. Engineering work at transmitter sites, weather conditions and the time of the year will influence the quality and coverage of terrestrial services and their susceptibility to interference. Whilst every effort was made to accurately measure and assess the quality of the available television transmissions and services at the time of the survey, GTech Surveys Limited cannot assume that any part of the television broadcast network or transmission from any transmitter was operating in required specification or correctly to any design criteria.

Digital terrestrial television (Freeview) coverage may vary as a result of engineering works or any frequency changes authorised by Ofcom. We advise that consumers always check future reception predictions (http://www.digitaluk.co.uk/coveragechecker/) before buying TV equipment. GTech Surveys Limited, Ofcom and Digital UK are not responsible for household TV reception arrangements.

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