

DVB-T Parameters

**Rick Peterson, WA6NUT
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Introduction

Walter Fischer's book, *Digital Video and Audio Broadcasting Technology* has come to be regarded as the authoritative reference for digital television. And, for DVB-T, chapter 20 contains very useful tables describing parameters for the DVB-T signal for the 6 MHz, 7 MHz, and 8 MHz channel bandwidths used in European commercial broadcasting. Parameters such as:

- IFFT sampling frequency
- Subcarrier spacing (Table 20.5)
- Symbol durations (Table 20.6)
- Signal bandwidths (Table 20.7)
- Total symbol durations, including guard interval (Table 20.8)
- Symbol rates (Table 20.9)
- Gross data rates (Table 20.10), and
- Net data rates, accounting for FEC (Tables 20.11 – 20.13)

are calculated and listed in chapter 20, Tables 20.5 – 20.13.

Unfortunately for the amateur DATV enthusiast, Tables 20.5 – 20.13 cover only one channel bandwidth used by amateurs (6 MHz), with no mention of narrower bandwidths also in common use (66 kHz – 4 MHz).

See Figures 1 and 2 for a spreadsheet with calculated DVB-T parameters for channel bandwidths from 66 kHz to 8 MHz.

Using the Spreadsheet for other Channel Bandwidths

The DVB-T Parameters .zip folder includes the DVB-T Calculator .ods file, which can be run (or edited) with Calc (or compatible equivalent), part of the Open Office software suite.

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The .ods file can be edited, adding a row to the spreadsheet for any desired channel bandwidth. Each column builds on values in previous columns, starting with column A. For example, to build a new row 29, one can enter values or formulae in columns A through K as follows:

For cell: Type (be sure to include the = "equals" sign):

A29 =Your channel bandwidth in kHz

B29 =A29*8/7

C29 =B29/2048

D29 =1000/C29

E29 =1705*C29

F29 =1.03125*D29

G29 =1000/F29

H29 =Your channel bandwidth in kHz (same as A29)

I29 =1512*G29

J29 =2*1512*G29

K29 =(188/204)*(2/3)*J29

The above formulae assume QPSK, mode = 2K, guard interval = 1/32, and FEC = 2/3. See the book by W. Fischer for parameter calculations with 16QAM, 64QAM, mode = 8K, and other guard interval and/or FEC values.

Another version of the spreadsheet is also included in the .zip folder. The .xls version of DVB-T Calculator will be useful for those who use Excel, part of the Windows Office software suite.

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DVB-T Parameters Calculator

Assumes QPSK, Mode = 2K, Guard = 1/32, FEC = 2/3

See Fischer, pp. 381-388

Channel BW (kHz)	f sample IFFT (kHz)	Subcarrier Spacing Δf 2K kHz (20.5)	Symbol Length Δt symbol μ S (20.6)	Signal BW f signal DVB-T kHz (20.7)	Total_symbol _duration* μ S (20.8)	Each Subcarrier symbol_rate kS/s (20.9)
66	75.42857143	0.036830357	27151.51515	62.79575893	28000	0.035714286
100	114.2857143	0.055803571	17920	95.14508929	18480	0.054112554
125	142.8571429	0.069754464	14336	118.9313616	14784	0.067640693
150	171.4285714	0.083705357	11946.66667	142.7176339	12320	0.081168831
250	285.7142857	0.139508929	7168	237.8627232	7392	0.135281385
333	380.5714286	0.185825893	5381.381381	316.8331473	5549.54955	0.180194805
350	400	0.1953125	5120	333.0078125	5280	0.189393939
500	571.4285714	0.279017857	3584	475.7254464	3696	0.270562771
1000	1142.857143	0.558035714	1792	951.4508929	1848	0.541125541
1500	1714.285714	0.837053571	1194.666667	1427.176339	1232	0.811688312
2000	2285.714286	1.116071429	896	1902.901786	924	1.082251082
3000	3428.571429	1.674107143	597.3333333	2854.352679	616	1.623376623
4000	4571.428571	2.232142857	448	3805.803571	462	2.164502165
5000	5714.285714	2.790178571	358.4	4757.254464	369.6	2.705627706
6000	6857.142857	3.348214286	298.6666667	5708.705357	308	3.246753247
7000	8000	3.90625	256	6660.15625	264	3.787878788
8000	9142.857143	4.464285714	224	7611.607143	231	4.329004329

Note:

* Includes guard interval = 1/32

Figure 1: DVB-T Parameters Spreadsheet (Sheet 1)

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Channel BW (kHz)	Combined Subcarriers gross_ symbol_rate kS/s	Combined Subcarriers gross_data_ rate** Kb/s (20.10)	Combined Subcarriers net_data_ rate*** Kb/s (20.11-20.13)
66	54	108	66.35294118
100	81.81818182	163.6363636	100.5347594
125	102.2727273	204.5454545	125.6684492
150	122.7272727	245.4545455	150.802139
250	204.5454545	409.0909091	251.3368984
333	272.4545455	544.9090909	334.7807487
350	286.3636364	572.7272727	351.8716578
500	409.0909091	818.1818182	502.6737968
1000	818.1818182	1636.363636	1005.347594
1500	1227.272727	2454.545455	1508.02139
2000	1636.363636	3272.727273	2010.695187
3000	2454.545455	4909.090909	3016.042781
4000	3272.727273	6545.454545	4021.390374
5000	4090.909091	8181.818182	5026.737968
6000	4909.090909	9818.181818	6032.085561
7000	5727.272727	11454.54545	7037.433155
8000	6545.454545	13090.90909	8042.780749

Notes:

** QPSK: 2 bits/symbol

*** Accounts for FEC = 2/3. Note that, for assumed QPSK, Mode, Guard and FEC values, net_data_rate is approximately equal to Channel BW.

Figure 2: DVB-T Parameters Spreadsheet (Sheet 2)