

Appendix 1

DAB Parameters for Modes I, II, III and IV

A1.1 System Parameters

Parameter	Mode I	Mode IV	Mode II	Mode III
<i>Sub-carriers</i>				
Number of sub-carriers: K	1536	768	384	192
Sub-carrier spacing: Δf	1 kHz	2 kHz	4 kHz	8 kHz
<i>Time relations</i>				
Transmission frame duration: T_{Frame}	96 ms 196608T*	48 ms 98304T	24 ms 49152T	24 ms 49152T
Symbol duration: $T_{\text{symOFDM}} = T_{\text{guard}} + T_u$	1246 μs 2552T*	623 μs 1276T	312 μs 638T	156 μs 319T
Guard interval duration: T_{guard}	246 μs 504T*	123 μs 252T	62 μs 126T	31 μs 63T
Symbol duration without T_{guard} : $T_u = 1/\Delta f$	1000 μs 2048T*	500 μs 1024T	250 μs 512T	125 μs 256T
Null-symbol duration: T_{null}	1297 μs 2656T*	648 μs 1328T	324 μs 664T	168 μs 345T
<i>OFDM symbols</i>				
OFDM symbols per transmission frame (without null symbol): L	76	76	76	153
OFDM symbols with PR data	1	1	1	1
OFDM symbols with FIC data	3	3	3	8
OFDM symbols with MSC data	72	72	72	144
<i>FIC/MS</i>				
FIC: FIBs per transmission frame	12	6	3	4
FIBs per 24 ms frame	3	3	3	4

(continued)

Parameter	Mode I	Mode IV	Mode II	Mode III
MSC: CIFs per transmission frame	4	2	1	1
CIFs per 24 ms frame	1	1	1	1
FIBs/CIF	3	3	3	4
<i>Transmission frame</i>				
Bit per OFDM symbol	3.072 kbit	1.536 kbit	0.768 kbit	0.384 kbit
Bit per transmission frame (without PR symbol)	230.4 kbit	115.2 kbit	57.6 kbit	58.368 kbit
Transmission frames per second	10.416	20.832	41.666	41.666
<i>Data rates</i>				
FIC data rate (gross, code rate always 1/3)	96 kbit/s	96 kbit/s	96 kbit/s	128 kbit/s
MSC data rate (gross)	2.304 Mbit/s	2.304 Mbit/s	2.304 Mbit/s	2.304 Mbit/s
Max. MSC net data rate for a single sub-channel**	1.824 Mbit/s	1.824 Mbit/s	1.824 Mbit/s	1.824 Mbit/s
Total data rate (with PR Symbol)	2.432 Mbit/s	2.432 Mbit/s	2.432 Mbit/s	2.448 Mbit/s
<i>Network specific parameters</i>				
Maximum echo delay ($\approx 1.2 \times T_{\text{guard}}$)	300 μ s	150 μ s	75 μ s	37.5 μ s
Maximum propagation path difference	≈ 100 km (90 km)	≈ 50 km (45 km)	≈ 25 km (22.5 km)	≈ 12.5 km (11.25 km)
Maximum f_{RF} ***	340 MHz		1.38 GHz	2.76 GHz
****	375 MHz		1.5 GHz	3.0 GHz

* System clock: 2.048 MHz with a period T of 0.48828 μ s.

** The multiplex configuration for maximum data rate is as follows: one sub-channel with 1.824 Mbit/s and code rate 4/5 and a second sub-channel with 16 kbit/s and code rate 3/4. The remaining multiplex capacity of 64 bit per 24 ms frame is equivalent to an uncoded data rate of 8 kbit/s.

*** @ max f_{RF} : maximum S/N-degradation of 4 dB for a BER of 10^{-4} at a speed of 200 km/h and 1 dB at 100 km/h [Le Floch, 1992].

**** @ max f_{RF} : maximum S/N-degradation of 4 dB for a BER of 10^{-4} at a speed of 180 km/h and 1 dB at 90 km/h [Kozamernik, 1992].

A1.2 Important Relations

$$\begin{aligned}
 1 \text{ CU} &= 64 \text{ bits} &&= 8 \text{ bytes} \\
 1 \text{ CIF} &= 864 \text{ CU} = 55.296 \text{ kbits} &&= 6.912 \text{ kbytes} \\
 1 \text{ FIB} &= 256 \text{ bits} &&= 32 \text{ bytes}
 \end{aligned}$$

Where: CU = Capacity Unit

A1.3 Coarse Structure of the Transmission Frame

[Null-symbol | PR | FIC (FIBs) | MSC (CIFs) |

Where: PR = Phase Reference symbol
FIC = Fast Information Channel
FIB = Fast Information Block
MSC = Main Service Channel
CIF = Common Interleaved Frame