

Digital Backend for Spectral line Observations (DIBAS)

There are 29 modes for spectral line observation. Modes 1-19 belong to single window mode, while modes 20-29 belong to multi-window mode. The details are listed in Table 1.

Table 1 DIBAS spectral line mode

Mode	N_window	Bandwidth (MHZ)	Channels	Spectral resolution (KHz)
1	1	1500	1024	1464.8
2	1	1500	16384	91.553
3	1	500	16384	30.517
4	1	187.5	32768	5.722
5	1	187.5	65536	2.861
6	1	187.5	131072	1.43
7	1	100	32768	3.051
8	1	100	65536	1.526
9	1	100	131072	0.763
10	1	23.4375	32768	0.715
11	1	23.4375	65536	0.358
12	1	23.4375	131072	0.179
13	1	23.4375	262144	0.089
14	1	23.4375	524288	0.045
15	1	11.71875	32768	0.358
16	1	11.71875	65536	0.179
17	1	11.71875	131072	0.089
18	1	11.71875	262144	0.045
19	1	11.71875	524288	0.022
20	8	23.4375	4096	5.722
21	8	23.4375	8192	2.861
22	8	23.4375	16384	1.431
23	8	23.4375	32768	0.715
24	8	23.4375	65536	0.358
25	8	15.625	4096	3.815
26	8	15.625	8192	1.907
27	8	15.625	16384	0.954
28	8	15.625	32768	0.477
29	8	15.625	65536	0.238

N-window: Number of frequency windows.

Due to difference of the intermediate frequency (IF) range and local oscillation (LO) of different receivers and IF filters, the usable modes are different for different receivers. Tables 2-6 list usable modes and radio frequency (RF) range for L, S, C, X and Ku bands, respectively.

1) L band

The frequency ranges from 1.25 GHz to 1.75 GHz. The LO is fixed at 2.268 GHz. The IF

signal is at lower side band.

Table 2 Usable modes for L band observations

MODE	N_win	Bandwidth (MHz)	Nchan	Spectral resolution (KHz)	ΔV for 1667MHz (km/s)	Obs. Frequency range (MHz)
1	1	1500	1024	1464.8	263.6	Fixed /(1250-1750)
2	1	1500	16384	91.553	16.5	Fixed/ (1250-1750)
4	1	187.5	32768	5.722	1.03	Fixed/ (1424.25-1611.75)
5	1	187.5	65536	2.861	0.51	Fixed/ (1424.25-1611.75)
6	1	187.5	13107 2	1.43	0.26	Fixed/ (1424.25-1611.75)
10	1	23.4375	32768	0.715	0.13	Tunable/(1250-1750)
11	1	23.4375	65536	0.358	0.06	Tunable/(1250-1750)
12	1	23.4375	13107 2	0.179	0.03	Tunable/(1250-1750)
13	1	23.4375	26214 4	0.089	0.016	Tunable/(1250-1750)
14	1	23.4375	52428 8	0.045	0.008	Tunable/(1250-1750)
20	8	23.4375	4096	5.722	1.03	Tunable/(1250-1750)
21	8	23.4375	8192	2.861	0.51	Tunable /(1250-1750)
22	8	23.4375	16384	1.431	0.26	Tunable /(1250-1750)
23	8	23.4375	32768	0.715	0.13	Tunable /(1250-1750)
24	8	23.4375	65536	0.358	0.06	Tunable /(1250-1750)

2) S band

The frequency ranges from 2.2 GHz to 2.45 GHz. The LO is fixed at 2.0 GHz.

Table 3 Usable modes for S band observations

MODE	N_win	Bandwidth (MHz)	Nchan	Spectral resolution (KHz)	ΔV for 2.3 GHz (km/s)	Obs. frequency range (MHz)
1	1	1500	1024	1464.8	191	Fixed /(2200-2450)
2	1	1500	16384	91.553	11.9	Fixed /(2200-2450)
3	1	500	16384	30.517	3.98	Fixed /(2200-2450)
7	1	100	32768	3.051	0.40	Fixed /(2350-2450)
8	1	100	65536	1.526	0.20	Fixed /(2350-2450)
9	1	100	131072	0.763	0.10	Fixed /(2350-2450)
10	1	23.4375	32768	0.715	0.09	Tunable/ (2200-2450)
11	1	23.4375	65536	0.358	0.05	Tunable /(2200-2450)
12	1	23.4375	131072	0.179	0.02	Tunable /(2200-2450)
13	1	23.4375	262144	0.089	0.01	Tunable /(2200-2450)
14	1	23.4375	524288	0.045	0.006	Tunable /(2200-2450)
15	1	11.71875	32768	0.358	0.047	Tunable /(2200-2450)
16	1	11.71875	65536	0.179	0.0233	Tunable /(2200-2450)

17	1	11.71875	131072	0.089	0.012	Tunable	/(2200-2450)
18	1	11.71875	262144	0.045	0.006	Tunable	/(2200-2450)
19	1	11.71875	524288	0.022	0.003	Tunable	/(2200-2450)
20	8	23.4375	4096	5.722	0.75	Tunable/	(2200-2450)
21	8	23.4375	8192	2.861	0.37	Tunable	/(2200-2450)
22	8	23.4375	16384	1.431	0.19	Tunable	/(2200-2450)
23	8	23.4375	32768	0.715	0.09	Tunable	/(2200-2450)
24	8	23.4375	65536	0.358	0.047	Tunable	/(2200-2450)
25	8	15.625	4096	3.815	0.50	Tunable	/(2200-2450)
26	8	15.625	8192	1.907	0.25	Tunable	/(2200-2450)
27	8	15.625	16384	0.954	0.12	Tunable	/(2200-2450)
28	8	15.625	32768	0.477	0.06	Tunable	/(2200-2450)
29	8	15.625	65536	0.238	0.03	Tunable	/(2200-2450)

3) C band

The frequency ranges of receiver from 4 GHz to 8 GHz. The LO is tunable.

Limited by the IF filter ranges, the maximum effective bandwidth is 1200 MHz for Mode 1 and 2. Similarly, for Mode 20-24, the frequency ranges of 8 windows should not exceed 1200 MHz. The maximum effective bandwidth is 300 MHz for Mode 3. Similarly, for Mode 25-29, the frequency ranges of 8 windows should not exceed 300 MHz.

Table 4 Usable modes for C band observations

MODE	N_win	Bandwidth (MHz)	Nchan	Spectral resolution (KHz)	ΔV for 4.83 GHz (km/s)	ΔV for 6.67 GHz (km/s)	Obs. frequency range (GHz)
1	1	1500	1024	1464.8	91	66	Tunable/(4-8)
2	1	1500	16384	91.553	5.69	4.12	Tunable/(4-8)
3	1	500	16384	30.517	1.56	1.37	Tunable/(4-8)
4	1	187.5	32768	5.722	0.36	0.26	Tunable/(4-8)
5	1	187.5	65536	2.861	0.18	0.13	Tunable/(4-8)
6	1	187.5	131072	1.43	0.09	0.06	Tunable/(4-8)
7	1	100	32768	3.05	0.16	0.14	Tunable/(4-8)
8	1	100	65536	1.53	0.08	0.07	Tunable/(4-8)
9	1	100	131072	0.76	0.04	0.04	Tunable/(4-8)
10	1	23.4375	32768	0.715	0.04	0.03	Tunable/(4-8)
11	1	23.4375	65536	0.358	0.02	0.02	Tunable/(4-8)
12	1	23.4375	131072	0.179	0.01	0.008	Tunable/(4-8)
13	1	23.4375	262144	0.089	0.0055	0.004	Tunable/(4-8)
14	1	23.4375	524288	0.045	0.0028	0.002	Tunable/(4-8)
15	1	11.7185	32768	0.36	0.02	0.016	Tunable/(4-8)
16	1	11.7185	65536	0.18	0.01	0.008	Tunable/(4-8)
17	1	11.7185	131072	0.089	0.0055	0.004	Tunable/(4-8)
18	1	11.7185	262144	0.045	0.0028	0.002	Tunable/(4-8)

19	1	11.7185	524288	0.022	0.0014	0.001	Tunable/(4-8)
20	8	23.4375	4096	5.722	0.36	0.26	Tunable/(4-8)
21	8	23.4375	8192	2.861	0.18	0.13	Tunable/(4-8)
22	8	23.4375	16384	1.431	0.09	0.06	Tunable/(4-8)
23	8	23.4375	32768	0.715	0.04	0.03	Tunable/(4-8)
24	8	23.4375	65536	0.358	0.02	0.016	Tunable/(4-8)
25	8	15.625	4096	3.815	0.24	0.17	Tunable/(4-8)
26	8	15.625	8192	1.907	0.12	0.085	Tunable/(4-8)
27	8	15.625	16384	0.954	0.06	0.04	Tunable/(4-8)
28	8	15.625	32768	0.477	0.03	0.02	Tunable/(4-8)
29	8	15.625	65536	0.238	0.015	0.01	Tunable/(4-8)

4) X band

The frequency ranges of receiver from 8.2 GHz to 8.9 GHz. The LO is fixed at 8.1 GHz.

Table 5 Usable modes for X band observations

MODE	N_win	Bandwidth h (MHz)	Nchan	Spectral resolution (KHz)	ΔV for 8.716 GHz (km/s)	Obs. frequency range (MHz)
1	1	1500	1024	1464.8	50	Fixed //(8200-9000)
2	1	1500	16384	91.553	3.15	Fixed //(8200-9000)
3	1	500	16384	30.517	1.05	Fixed //(8200-8600)
4	1	187.5	32768	5.722	0.20	Fixed //(8756.25-8943.75)
5	1	187.5	65536	2.861	0.10	Fixed //(8756.25-8943.75)
6	1	187.5	131072	1.43	0.05	Fixed //(8756.25-8943.75)
7	1	100	32768	3.051	0.11	Fixed //(8450-8550)
8	1	100	65536	1.526	0.05	Fixed //(8450-8550)
9	1	100	131072	0.763	0.03	Fixed //(8450-8550)
10	1	23.4375	32768	0.715	0.025	Tunable/ (8200-9000)
11	1	23.4375	65536	0.358	0.0123	Tunable/(8200-9000)
12	1	23.4375	131072	0.179	0.0062	Tunable //(8200-9000)
13	1	23.4375	262144	0.089	0.0031	Tunable //(8200-9000)
14	1	23.4375	524288	0.045	0.0015	Tunable //(8200-9000)
15	1	11.71875	32768	0.358	0.0123	Tunable //(8200-8550)
16	1	11.71875	65536	0.179	0.0062	Tunable/(8200-8550)
17	1	11.71875	131072	0.089	0.0031	Tunable //(8200-8550)
18	1	11.71875	262144	0.045	0.0015	Tunable //(8200-8550)
19	1	11.71875	524288	0.022	0.00076	Tunable //(8200-8550)
20	8	23.4375	4096	5.722	0.197	Tunable/ (8200-9000)
21	8	23.4375	8192	2.861	0.0985	Tunable //(8200-9000)
22	8	23.4375	16384	1.431	0.0493	Tunable //(8200-9000)
23	8	23.4375	32768	0.715	0.0246	Tunable //(8200-9000)
24	8	23.4375	65536	0.358	0.0123	Tunable //(8200-9000)
25	8	15.625	4096	3.815	0.1313	Tunable //(8200-8550)
26	8	15.625	8192	1.907	0.0656	Tunable //(8200-8550)
27	8	15.625	16384	0.954	0.0328	Tunable //(8200-8550)
28	8	15.625	32768	0.477	0.0164	Tunable //(8200-8550)
29	8	15.625	65536	0.238	0.0082	Tunable //(8200-8550)

5) Ku band

The frequency ranges of receiver from 12 GHz to 18.3 GHz. The LO is tunable.

Limited by the IF filter ranges, the maximum effective bandwidth is 1200 MHz for Mode 1 and 2. Similarly, for Mode 20-24, the frequency ranges of 8 windows should not exceed

1200 MHz. The maximum effective bandwidth is 300 MHz for Mode 3. Similarly, for Mode 25-29, the frequency ranges of 8 windows should not exceed 300 MHz.

Table 6 Usable modes for Ku band observations

MODE	N_win	Bandwidth (MHz)	Nchan	Spectral resolution (KHz)	ΔV for 14.48 GHz (km/s)	Obs. frequency range (GHz)
1	1	1500	1024	1464.8	30	Tunable/(12-18.3)
2	1	1500	16384	91.553	1.9	Tunable/(12-18.3)
3	1	500	16384	30.517	0.52	Tunable/(12-18.3)
4	1	187.5	32768	5.722	0.12	Tunable/(12-18.3)
5	1	187.5	65536	2.861	0.06	Tunable/(12-18.3)
6	1	187.5	131072	1.43	0.03	Tunable/(12-18.3)
7	1	100	32768	3.05	0.05	Tunable/(12-18.3)
8	1	100	65536	1.53	0.027	Tunable/(12-18.3)
9	1	100	131072	0.76	0.013	Tunable/(12-18.3)
10	1	23.4375	32768	0.715	0.013	Tunable/(12-18.3)
11	1	23.4375	65536	0.358	0.0065	Tunable/(12-18.3)
12	1	23.4375	131072	0.179	0.003	Tunable/(12-18.3)
13	1	23.4375	262144	0.089	0.0015	Tunable/(12-18.3)
14	1	23.4375	524288	0.045	0.00075	Tunable/(12-18.3)
15	1	11.7185	32768	0.36	0.0065	Tunable/(12-18.3)
16	1	11.7185	65536	0.18	0.003	Tunable/(12-18.3)
17	1	11.7185	131072	0.089	0.0015	Tunable/(12-18.3)
18	1	11.7185	262144	0.045	0.00075	Tunable/(12-18.3)
19	1	11.7185	524288	0.022	0.0004	Tunable/(12-18.3)
20	8	23.4375	4096	5.722	0.12	Tunable/(12-18.3)
21	8	23.4375	8192	2.861	0.06	Tunable/(12-18.3)
22	8	23.4375	16384	1.431	0.03	Tunable/(12-18.3)
23	8	23.4375	32768	0.715	0.013	Tunable/(12-18.3)
24	8	23.4375	65536	0.358	0.0065	Tunable/(12-18.3)
25	8	15.625	4096	3.815	0.08	Tunable/(12-18.3)
26	8	15.625	8192	1.907	0.04	Tunable/(12-18.3)
27	8	15.625	16384	0.954	0.02	Tunable/(12-18.3)
28	8	15.625	32768	0.477	0.015	Tunable/(12-18.3)
29	8	15.625	65536	0.238	0.0075	Tunable/(12-18.3)