

Estimating hydrogen envelope mass of KIC 010670103 - a pulsating sdB star

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Table 1: The frequency list of KIC 10670103 (a sample from on-line version of the full list). Numbers in parentheses are the 1- σ fitting errors of the last digits. Frequencies without errors were not fitted. The asterisks mark low amplitude peaks with $S/N \leq 4.5$. Identification remarks are in column six (Rem): M - from multiplet, F - from period spacing, s - single frequency ? -uncertain. Columns seven and eight provide the l and m identification.

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m
1	2.6740 (7)	373966.07	0.046 (6)	5.9	s	-	-
2	5.4627 (8)	183058.60	0.041 (6)	5.3	s	-	-
3	8.1310 (7)	122986.70	0.044 (6)	5.7	s	-	-
4	10.7880 (8)	92695.61	0.040 (6)	5.1	s	-	-
l_1 cut-off	17.36	57219	~ 16 hours		cut-off frequency		
5	23.4957 (7)	42561.05	0.046 (6)	5.9	s	1 ?	
6	28.37435 (31)	35243.10	0.110 (6)	14.1	M?	1 ?	
7	28.9657 (5)	34523.63	0.060 (6)	7.7	} M?	1? {	-
8	29.0183 (9)	34461.07	0.037 (6)	4.8			-
l_2 cut-off	30.32	32977	~ 9.2 hours		cut-off frequency		
9	34.6589 (5)	28852.59	0.064 (6)	8.2	s	1?	
10	34.96948 (23)	28596.37	0.144 (6)	18.5	} M?	1 {	-
11	35.01202 (33)	28561.62	0.099 (6)	12.7			-
12	39.0821 (7)	25587.19	0.047 (6)	6.0	M?	-	
13	39.9056 (6)	25059.12	0.054 (6)	6.9	} M?	2 {	-
14	40.2955 (8)	24816.65	0.042 (6)	5.4			?
15	40.87310 (25)	24465.97	0.128 (6)	16.5	} M?	2 {	0 ?
16	40.9991 (7)	24390.80	0.046 (6)	5.9			+1 ?

Table 1: continued

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m	
17	43.85961 (34)	22800.02	0.097 (6)	12.5	}	M?	-	-
18	43.9270 (6)	22765.05	0.054 (6)	6.9				-
19	43.96055 (36)	22747.67	0.093 (6)	12.0				-
20	44.0076 (7)	22723.33	0.048 (6)	6.2	}	M?	2	-
21	45.3271 (8)	22061.87	0.039 (6)	5.0				-1 ?
22	45.43652 (13)	22008.73	0.246 (6)	31.6				0 ?
23*	46.2801 (10)	21607.55	0.034 (6)	4.4	}	M?	2	?
24	46.5019 (6)	21504.51	0.056 (6)	7.2				-
25	46.6379 (9)	21441.80	0.036 (6)	4.6				-
26*	47.5067 (10)	21049.67	0.031 (6)	4.0	s	-	-	
27	48.73669 (39)	20518.42	0.090 (6)	11.6	}	M?	1	-
28	48.81338 (34)	20486.19	0.094 (6)	12.1				-
29	50.1027 (6)	19959.00	0.052 (6)	6.7				-1 ?
30	50.21650 (12)	19913.78	0.265 (6)	34.1	}	M	2	0 ?
31	50.3368 (9)	19866.17	0.035 (6)	4.5				+1 ?
32	51.3034 (5)	19491.87	0.060 (6)	7.7				-1 ?
33	51.6655 (9)	19355.28	0.037 (6)	4.8	}	M?	2?	+2 ?
34	53.5289 (7)	18681.49	0.048 (6)	6.2				-
35	53.7632 (7)	18600.08	0.046 (6)	5.9				?
36	54.6552 (6)	18296.52	0.055 (6)	7.1	}	M	2	-
37	54.77816 (46)	18255.45	0.071 (6)	9.1				-
38	54.9619 (8)	18194.41	0.043 (6)	5.5				?
39	56.5324 (6)	17688.96	0.052 (6)	6.7	F	1?	-	
40	57.29520 (37)	17453.47	0.088 (6)	11.3	F	1?	-	
41	57.99498 (30)	17242.87	0.109 (6)	14.0	F?	1?	-	
42	59.35077 (28)	16848.98	0.116 (6)	14.9	}	M	2?	-
43	59.46088 (20)	16817.78	0.166 (6)	21.4				-
44	59.63160	16769.63	0.147	18.9				-
45	60.1892 (5)	16614.27	0.062 (6)	8.0	}	FM?	1?	-1
46	60.33048 (25)	16575.37	0.133 (6)	17.1				+1
47	61.1508 (6)	16353.03	0.055 (6)	7.1				-1
48	61.30754 (30)	16311.21	0.109 (6)	14.0	}	FM?	2?	0 ?
49	61.4237 (6)	16280.37	0.051 (6)	6.6				+1
<i>Period spacing mode identification not reliable above this line</i>								
50	62.07881 (19)	16108.55	0.182 (6)	23.4	}	FM?	1?	-
51	62.18768 (47)	16080.36	0.069 (6)	8.9				-
52	62.83566 (25)	15914.53	0.131 (6)	16.8	sF	1?	-	
53	63.23550	15813.89	0.045	5.8	-	-	-	

Table 1: continued

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m
54	63.57150	15730.31	0.041		5.3	-	-
55	64.31686 (31)	15548.02	0.103 (6)		13.2	} FM?	2 {
56	64.42431 (43)	15522.09	0.075 (6)		9.6		
57	65.06504 (18)	15369.24	0.191 (6)		24.6	}	}
58	65.10084 (23)	15360.78	0.147 (6)		18.9		
59	65.14070 (8)	15351.38	0.421 (6)		54.1	}	}
60	65.17848 (6)	15342.49	0.595 (6)		76.5		
61	65.21623 (8)	15333.61	0.390 (6)		50.2	}	}
62	65.25869 (25)	15323.63	0.141 (6)		18.1		
63	65.29495 (20)	15315.12	0.174 (6)		22.4	}	}
64	65.95210 (49)	15162.52	0.067 (6)		8.6		
65	66.49522 (38)	15038.67	0.087 (6)		11.2	}	}
66	66.52963 (32)	15030.90	0.103 (6)		13.2		
67	66.6098 (7)	15012.80	0.050 (6)		6.4	}	}
68	66.7737 (5)	14975.95	0.063 (6)		8.1		
69	66.8478 (8)	14959.37	0.042 (6)		5.4	}	}
70	67.67836 (33)	14775.77	0.098 (6)		12.6		
71	67.7220 (6)	14766.26	0.054 (6)		6.9	}	}
72	67.7804 (6)	14753.53	0.055 (6)		7.1		
73	67.8389 (9)	14740.81	0.036 (6)		4.6	}	}
74	68.77692 (46)	14539.76	0.070 (6)		9.0		
75	68.82207 (42)	14530.22	0.078 (6)		10.0	}	}
76	69.2469 (5)	14441.08	0.061 (6)		7.8		
77	70.0093 (7)	14283.82	0.045 (6)		5.8	s	-
78	71.09534 (29)	14065.62	0.113 (6)		14.5	sF	1
79	71.13175 (10)	14058.42	0.337 (6)		43.3	}	}
80	71.19953 (23)	14045.04	0.142 (6)		18.3		
81	71.23759 (15)	14037.53	0.222 (6)		28.6	}	}
82	71.3429 (5)	14016.82	0.062 (6)		8.0		
83	72.3812 (5)	13815.74	0.063 (6)		8.1	}	}
84	72.45265 (15)	13802.12	0.217 (6)		27.9		
85	72.55575 (16)	13782.50	0.208 (6)		26.8	}	}
86	72.64215 (45)	13766.11	0.072 (6)		9.3		
87	73.08601 (41)	13682.51	0.080 (6)		10.3	}	}
88	73.1238 (5)	13675.44	0.063 (6)		8.1		
89	74.67982 (34)	13390.50	0.101 (6)		13.0	}	}
90	75.05173 (28)	13324.14	0.118 (6)		15.2		
91	75.09577 (28)	13316.33	0.116 (6)		14.9	}	}
92	75.3255 (6)	13275.73	0.052 (6)		6.7		

Table 1: continued

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m	
132	97.42465 (39)	10264.34	0.083 (6)	10.7			+1	
133	98.9696 (5)	10196.96	0.045 (6)	5.8	s	-		
134	98.06840	10104.11	0.065	8.4	M?	2		
135	99.85962 (39)	10014.06	0.084 (6)	10.8	}	FM	1 {	
136	99.98106 (17)	10001.90	0.189 (6)	24.3				-1
137	100.15965 (26)	9984.06	0.123 (6)	15.8	F	2?	+1	
138	101.6910 (6)	9833.72	0.055 (6)	7.1	FM	2		
139	102.38816 (23)	9766.75	0.139 (6)	17.9	}	FM	1 {	
140	102.43594 (18)	9762.20	0.181 (6)	23.3				-1
141	102.49343 (26)	9756.72	0.125 (6)	16.1			0	
142	104.94406 (48)	9528.89	0.068 (6)	8.7	F	2?	+1	
143	105.200877 (20)	9505.62	1.868 (6)	240.3	}	FM	1 {	
144	105.25787 (11)	9500.48	0.296 (6)	38.1				-1
145	105.30408 (31)	9496.31	0.106 (6)	13.6			0	
146	106.3302 (5)	9404.67	0.064 (6)	8.2	}	FM	2 {	
147	106.56263 (29)	9384.15	0.112 (6)	14.4				-1?
148	107.89770 (9)	9268.04	0.378 (6)	48.6	}	FM	1 {	
149	107.95945 (5)	9262.74	0.620 (6)	79.7				-1
150	108.02910 (35)	9256.77	0.092 (6)	11.8			0	
151	108.6026 (7)	9207.88	0.047 (6)	6.0	s	-	+1	
152	109.23691 (27)	9154.41	0.121 (6)	15.6	}	FM	2 {	
153	109.34726 (12)	9145.18	0.265 (6)	34.1				-1
154	109.46384 (22)	9135.44	0.146 (6)	18.8			0	
155	110.924738 (30)	9015.12	1.126 (6)	144.8	}	FM	1 {	
156	110.99073 (6)	9009.76	0.575 (6)	74.0				+1
157	112.00938 (40)	8927.82	0.081 (6)	10.4	sF?	2?		
158	114.13026 (7)	8761.92	0.437 (6)	56.2	}	FM	1 {	
159	114.19804 (13)	8756.72	0.246 (6)	31.6				0
160	117.49304 (34)	8511.14	0.095 (6)	12.2	sF	1	+1	
161	119.05056 (47)	8399.79	0.069 (6)	8.9	}	FM	2 {	
162	119.14810	8392.91	0.061	7.8				-
163	121.06507 (21)	8260.02	0.155 (6)	19.9	}	FM	1 {	
164	121.13315 (31)	8255.38	0.106 (6)	13.6				0
165	121.3116 (5)	8243.23	0.065 (6)	8.4		-	+1	
166	121.35084 (49)	8240.57	0.067 (6)	8.6	F	2		
167	123.1987 (8)	8116.97	0.039 (6)	5.0	F	2		
168	124.80927 (12)	8012.23	0.275 (6)	35.4	}	FM	1 {	
169	124.88465 (14)	8007.39	0.241 (6)	31.0				-1
170	124.95522 (37)	8002.87	0.088 (6)	11.3				0

Table 1: continued

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m	
171	127.7394	(8)	7828.44	0.042 (6)	5.4	FM?	2	-
172	127.8417	(7)	7822.18	0.045 (6)	5.8			
173	128.83585	(10)	7761.82	0.326 (6)	41.9	FM	1	0
174	128.91418	(16)	7757.10	0.200 (6)	25.7			
175	129.7319	(7)	7708.20	0.046 (6)	5.9	FM?	2	-2
176	130.1990	(8)	7680.55	0.039 (6)	5.0			
177	133.04955	(48)	7516.00	0.067 (6)	8.6	FM?	2	
178	133.30029	(26)	7501.86	0.127 (6)	16.3	FM	1	-1
179	133.37773	(15)	7497.50	0.221 (6)	28.4			
180	138.008833	(40)	7245.91	0.792 (6)	101.9	FM	1	-1
181	138.090683	(10)	7241.62	4.940 (6)	635.4			
182	138.17185	(6)	7237.36	0.519 (6)	66.8	FM?	2	+1
183	140.7821	(6)	7103.18	0.059 (6)	7.6			
184	142.85279	(10)	7000.21	0.337 (6)	43.3	FM	1	-1
185	142.938457	(10)	6996.02	4.460 (6)	573.6			
186	143.02397	(8)	6991.84	0.395 (6)	50.8	MF	2	+1
187	143.4222	(6)	6972.42	0.056 (6)	7.2			
188	143.51762	(25)	6967.79	0.130 (6)	16.7	MF	2	0
189	143.62834	(37)	6962.41	0.088 (6)	11.3			
190	143.73564	(41)	6957.22	0.080 (6)	10.3	s	-	+2
191	144.01534	(44)	6943.70	0.073 (6)	9.4			
192	146.5934	(6)	6821.59	0.050 (6)	6.4	FM	2	-1
193	146.69673	(42)	6816.78	0.077 (6)	9.9			
194	149.37523	(31)	6694.55	0.105 (6)	13.5	FM?	1	
195	149.9133	(6)	6670.52	0.058 (6)	7.5	FM?	2	-1
196	150.0047	(6)	6666.46	0.055 (6)	7.1			
197	153.27216	(23)	6524.34	0.140 (6)	18.0	FM	2	0 ?
198	153.37415	(20)	6520.00	0.162 (6)	20.8			
199	153.48240	(35)	6515.41	0.092 (6)	11.8	FM	2	-1
200	154.11226	(17)	6488.78	0.189 (6)	24.3			
201	154.20010	(6)	6485.08	0.529 (6)	68.0	FM	1	0
202	156.77796	(45)	6378.45	0.072 (6)	9.3			
203	156.8877	(6)	6373.98	0.057 (6)	7.3	FM	2	0
204*	160.3376	(10)	6236.84	0.033 (6)	4.2			
205	160.43126	(34)	6233.20	0.095 (6)	12.2	FM	2	-1
206	160.55842	(24)	6228.26	0.133 (6)	17.1			
207	160.65244	(43)	6224.62	0.076 (6)	9.8	FM	2	0
208*	160.7548	(10)	6220.65	0.033 (6)	4.2			
209	164.3063	(6)	6086.20	0.057 (6)	7.3	FM	2	+1

Table 1: continued

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m		
210	164.40704 (30)	6082.46	0.110 (6)		14.1		0		
211	164.4993 (8)	6079.05	0.038 (6)		4.9		+1		
212	168.4689 (6)	5935.81	0.052 (6)		6.7	} FM	} 2 {		
213	168.56330 (23)	5932.49	0.139 (6)		17.9			-1	
214	168.6689 (6)	5928.77	0.050 (6)		6.4			0	
215	168.7583 (8)	5925.64	0.040 (6)		5.1			+1	
216	172.8453 (5)	5785.52	0.061 (6)		7.8			+2	
217	177.1198 (5)	5645.90	0.063 (6)		8.1	} FM?	} 2 {		
218	177.22381 (20)	5642.58	0.163 (6)		21.0			-1	
219	177.34296 (37)	5638.79	0.087 (6)		11.2			0	
220	181.80975 (23)	5500.25	0.139 (6)		17.9			+1	
221	181.91112 (20)	5497.19	0.162 (6)		20.8			-2	
222	182.018634 (40)	5493.94	0.788 (6)	101.4	} FM	} 2 {	-1		
223	182.123224 (40)	5490.79	0.754 (6)	97.0			0		
224	182.22941 (20)	5487.59	0.158 (6)	20.3			+1		
225	186.58648 (17)	5359.45	0.191 (6)	24.6			+2		
226	186.68691 (12)	5356.56	0.273 (6)	35.1			-2		
227	186.796974 (30)	5353.41	1.160 (6)	149.2	} FM	} 2 {	-1		
228	186.905263 (30)	5350.30	1.273 (6)	163.7			0		
229	187.01238 (16)	5347.24	0.209 (6)	26.9			+1		
230	191.71908 (43)	5215.96	0.076 (6)	9.8			+2		
231	191.83067 (16)	5212.93	0.207 (6)	26.6			-2		
232	191.94119 (7)	5209.93	0.456 (6)	58.6	} FM	} 2 {	-1		
233	192.04820 (19)	5207.03	0.174 (6)	22.4			0		
234	192.15127 (20)	5204.23	0.166 (6)	21.4			+1		
235	197.36356 (22)	5066.79	0.148 (6)	19.0			+2		
236	197.47246 (9)	5064.00	0.381 (6)	49.0			-2		
237	197.58108 (10)	5061.21	0.334 (6)	43.0	} FM	} 2 {	-1		
238	197.69121 (8)	5058.39	0.433 (6)	55.7			0		
239	197.79762 (14)	5055.67	0.234 (6)	30.1			+1		
240	201.65707 (40)	4958.91	0.082 (6)	10.5			+2		
241	203.15329 (14)	4922.39	0.230 (6)	29.6			sF	1	
242	203.269555 (40)	4919.58	0.741 (6)	95.3	} FM	} 2 {	-1		
243	203.38516 (8)	4916.78	0.436 (6)	56.1			0		
244	209.32185 (45)	4777.33	0.073 (6)	9.4			+1		
245	209.43330 (24)	4774.79	0.137 (6)	17.6			} FM	} 2 {	-1
246	209.54947 (33)	4772.14	0.100 (6)	12.9					0
247	215.8961 (8)	4631.86	0.040 (6)	5.1	+1				
248	216.02450 (19)	4629.10	0.168 (6)	21.6	} FM	} 2 {			-1

Table 1: continued

ID	Frequency [μHz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m	
249	216.14580	(47)	4626.51	0.069 (6)	8.9		+1	
250	232.2333	(7)	4306.01	0.044 (6)	6.8	} M	2 {	
251	232.3409	(10)	4304.02	0.032 (6)	4.9			0
252	253.47726	(42)	3945.13	0.077 (6)	11.8	sF	1	
253	256.2490	(9)	3902.45	0.037 (6)	5.7	sF	2	
254	272.8932	(6)	3664.44	0.052 (6)	8.0	} FM	2 {	
255	272.98627	(48)	3663.19	0.068 (6)	10.5			-2
256	273.11100		3661.51	0.058	8.9			-1
257	273.2164	(5)	3660.10	0.060 (6)	9.2			0
258*	273.3410	(12)	3658.43	0.028 (6)	4.3			+1
<i>Period spacing mode identification not reliable below this line</i>								
259	281.0299	(6)	3558.34	0.057 (6)	8.8	sF	2?	
260	286.9540	(9)	3484.88	0.035 (6)	5.4	sF	1?	
261	306.6940	(6)	3260.58	0.053 (6)	8.2	} M	2 {	
262	306.80382	(44)	3259.41	0.074 (6)	11.4			-2
263	306.9128	(7)	3258.25	0.047 (6)	7.2			-1
264	307.02558	(43)	3257.06	0.075 (6)	11.5			0
265	307.1500	(8)	3255.74	0.044 (6)	6.8			+1
266	324.9173	(6)	3077.71	0.053 (6)	8.2	s	-	
267	329.7370	(11)	3032.72	0.030 (6)	4.6	s	-	
268*	330.4265	(12)	3026.39	0.027 (6)	4.2	s	-	
269	336.2247	(6)	2974.20	0.050 (6)	7.7	} M?	2 {	
270	336.3738	(8)	2972.88	0.045 (6)	6.9			-2
271	336.5002	(7)	2971.77	0.047 (6)	7.2			-1
272*	341.3629	(11)	2929.43	0.029 (6)	4.5	s	-	
273	349.1232	(6)	2864.32	0.053 (6)	8.2	M?	2	
274*	364.0269	(12)	2747.05	0.027 (6)	4.2	s	-	
275	368.81521	(46)	2711.38	0.070 (6)	10.8	s	-	
276*	369.7018	(12)	2704.88	0.026 (6)	4.0	s	-	
277	373.5898	(8)	2676.73	0.040 (6)	6.2	s	-	
278*	373.9594	(11)	2674.09	0.029 (6)	4.5	s	-	
279	378.7375	(6)	2640.35	0.050 (6)	7.7	s	-	
280	381.7119	(9)	2619.78	0.037 (6)	5.7	s	-	
281	384.37755	(30)	2601.61	0.106 (6)	16.3	s	-	
282	389.5155	(6)	2567.29	0.050 (6)	7.7	} M?	2? {	
283	389.8465	(6)	2565.11	0.053 (6)	8.2			-2
284	390.06690		2563.64	0.031	4.8			0
285	395.1629	(6)	2530.60	0.050 (6)	7.7	s	+1	

Table 1: continued

ID	Frequency [μ Hz]	Period [sec]	Amplitude [ppt]	S/N	Rem	l	m
286	398.1913	(11)	2511.36	0.030 (6)	4.6	s	-
287	400.8623	(9)	2494.62	0.036 (6)	5.5	s	-
288	419.0290	(7)	2386.47	0.046 (6)	7.1	s	-
289*	424.1746	(11)	2357.52	0.029 (6)	4.5	s	-
290	427.1467	(7)	2341.12	0.049 (6)	7.5	s	-
291	429.8226	(9)	2326.54	0.035 (6)	5.4	s	-
292	441.6632	(10)	2264.17	0.033 (6)	5.1	s	-
293*	464.4685	(11)	2153.00	0.028 (6)	4.3	s	-
294	468.0442	(8)	2136.55	0.041 (6)	6.3	s	-
295	501.8388	(7)	1992.67	0.044 (6)	6.8	s	-
296	503.1189	(8)	1987.60	0.039 (6)	6.0	s	-
297	505.3366	(6)	1978.88	0.056 (6)	8.6	M?	2?
298	539.1473	(10)	1854.78	0.032 (6)	4.9	s	-
299	546.2182	(10)	1830.77	0.032 (6)	4.9	s	-
300	574.57679	(37)	1740.41	0.091 (6)	14.0	s	-
301	574.6041	(7)	1740.33	0.049 (6)	7.5	s	-
302	580.0091	(9)	1724.11	0.036 (6)	5.5	s	-
303	598.0836	(10)	1672.01	0.032 (6)	4.9	s	-
304	602.97816	(41)	1658.43	0.079 (6)	12.2	} M?	2? { 0 ? +1
305*	603.1145	(12)	1658.06	0.027 (6)	4.2		
306*	603.5345	(12)	1656.91	0.027 (6)	4.2	s	-
307	637.9855	(7)	1567.43	0.046 (6)	7.1	s	-
308	672.9800	(30)	1485.92	0.072 (8)	11.1	s	-

Acknowledgements. This project was supported by Polish National Science Centre grant 2011/03/D/ST9/01914