COMPILATION OF MOMENTS OF SPIN MAXIMA OF THE INTERMEDIATE POLAR EX HYA

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ABSTRACT. We present a compilation of the spin maxima of the intermediate polar EX Hya determined using the same methods for our own observations from the Tzec Maun observatory, published observations from the SuperWASP, ASAS and AAVSO databases. For completeness, published data published by other authors are used. We obtained the ephemeris of the spin maxima T_{max}=2437699.89079(59) +0.0465464808(69)·E-6.3(2)·$10^{-13}E^2$, which corresponds to the characteristic time of acceleration of rotation (spin-up) of 4.67(14)·10^6 years.

Key words: Stars: binaries: close - stars: novae, cataclysmic variables - stars: individual (EX Hya)

EX Hya is a magnetic cataclysmic variable. Such binary systems consist of a red dwarf filling its Roche lobe and a magnetic white dwarf. The sub-class of intermediate polars is characterized by a spin period of the white dwarf, which is shorter than the orbital period (cf. Warner 1996, Hellier 2001). Typically, the spin periods of white dwarfs are close to an "equilibrium value", i.e. to the period of the Kepler rotation of the inner part of the accretion disk around the white dwarf at a distance equal to the radius of magnetosphere. However, this "classical" model corresponds not to all intermediate polars. Detailed analysis shows that, in some systems, the magnetosphere is large enough to prevent formation of the accretion disk, similarly to "asynchronous polars" (Andronov 1987). Norton et al. (2004) split intermediate polars into "disk-fed" and "stream-fed" and suggested EX Hya as a "stream-fed" system. Andronov and Breus (2013) presented a detailed discussion of the parameters of period variations of this system and made estimates of the system parameters which are self-consistent. Breus et al. (2012) discussed a group of intermediate polars.

In this paper, we present a complete list of the spin maxima determined using a multi-periodic (spin+orbital) fit using the software MCV (Andronov and Baklanov 2004). The accuracy estimates for a single timing for the AAVSO data range from 0.00014^d to 0.00152^d (mean 0.00059^d), for the Tzec Maun data – close to 0.003^d. The statistically optimal fit is a parabola. Its parameters are listed in the abstract.

Table 1. Moments of the spin maxima of EX Hya in B JD-2400000 and corresponding reference

Time	Ref.	Time	Ref.
37699.89200	1	43970.48200	3
37699.93700	1	43971.50700	3
37736.94000	1	43972.43100	3
37737.92000	1	45404.06400	4
37755.74600	1	45404.11000	4
37755.80100	1	45404.15400	4
37755.83800	1	45433.05800	4
37755.88300	1	45433.10400	4
37755.92900	1	45433.14800	4
37786.74200	1	45433.19900	4
37786.79300	1	45443.02100	4
37789.71900	1	45443.06800	4
37789.77600	1	45443.11500	4
37791.73100	1	45443.16400	4
37791.77200	1	45445.15500	4
37793.77400	1	45473.09200	4
37813.69700	1	44653.73960	5
37813.74000	1	44662.67250	5
37816.72600	1	44662.72020	5
37821.70500	1	44663.69980	5
37821.74800	1	44665.65370	5
37822.72900	1	44665.69680	5
38083.10200	1	44675.60960	5
38083.15600	1	44675.70510	5
38083.20100	1	44686.63200	5
38084.03600	1	44686.64440	5
38084.08100	1	44686.73300	5
38084.12500	1	45032.71110	5
38084.17700	1	45032.76250	5
38084.22000	1	45104.44180	5
38087.06800	1	45104.48980	5
38174.66500	1	45104.53360	5
38174.70600	1	45104.58600	5
38410.00100	1	45105.51510	5
38493.83400	1	45105.55700	5

38496.81400	1
38497.79200	1
39147.02500	1
39175.92700	1
39175.97400	1
39176.01500	1
39176.94800	1
39176.98800	1
39229.73300	1
39533.92000	1
39625.70200	1
40009.67200	1
40035.87500	1
40035.91500	1
40049.88100	1
40049.92800	1
41333.63100	1
41361.87800	1
41362.91400	1
41368.86900	1
41369.79700	1
41369.84600	1
41370.86600	1
41371.85100	1
41372.81900	1
41372.87100	1
41392.78800	1
41392.83800	1
41392.88200	1
41393.68100	1
41393.72200	1
41393.77100	1
41393.81700	1
41393.86600	1
41394.84100	1
41394.88800	1
41397.72900	1
41397.77600	1
41397.82400	1
41397.86700	1
41399.77500	1
41399.81600	1
41399.86900	1
41441.52600	1
41441.57300	1
41442.59400	1
41444.55500	1
41444.59900	1
41447.52800	1
41449.53000	1
41860.99600	1
41865.89000	1
41865.94100	1
42125.57400	1
42125.61500	1
42125.66600	1
42125.71100	1
42125.76600	1
42125.80700	1
42125.85000	1
42126.64600	1
42126.69000	1
45121.47750	5
45121.52400	5
45122.45920	5
45122.50080	5
45122.54960	5
45433.61860	5
45434.50290	5
45455.49410	5
45455.53800	5
45455.58240	5
45455.63250	5
45456.47410	5
45456.51900	5
45456.57020	5
45456.61680	5
45538.43840	5
45538.48720	5
45732.67780	5
45732.77260	5
45733.73200	5
45734.68520	5
45734.73050	5
45734.77390	5
45752.74410	5
45753.76120	5
45754.73920	5
45754.78610	5
45771.54110	5
45771.58890	5
45771.63790	5
45812.50210	5
45812.55170	5
45848.43410	5
45848.52760	5
45887.44100	5
46313.07100	6
46317.95920	6
46321.07300	6
46499.94810	6
46499.99600	6
46500.04570	6
46500.08430	6
46500.12550	6
46506.04400	6
46506.96970	6
46507.02500	6
46507.07050	6
46507.10730	6
46507.15340	6
46513.02930	6
46521.12270	6
46521.17060	6
46534.10910	6
46534.16020	6
46536.07300	6
46536.11140	6
46536.15620	6
46558.92470	6
46558.97440	6
46561.94120	6
46561.98590	6
46564.87830	6
42126.73400	1
42126.73900	1
42126.78700	1
42126.82800	1
42126.87200	1
42127.62000	1
42127.67100	1
42127.71500	1
42127.76100	1
42127.80900	1
42127.85700	1
42128.65000	1
42128.68900	1
42128.78900	1
42128.83800	1
42128.87500	1
42129.62800	1
42129.66800	1
42129.71200	1
42129.76100	1
42129.81000	1
42776.80300	1
42870.87100	1
42872.73600	1
42872.78100	1
42873.57400	1
42873.61900	1
42872.36100	2
42872.40300	2
42872.45700	2
42872.49800	2
42872.54800	2
42872.59800	2
44320.83200	2
44322.64700	2
44322.70000	2
44322.74500	2
44322.79000	2
44322.83800	2
44324.70000	2
44324.74500	2
44324.79200	2
44324.84000	2
43960.04800	3
43960.70100	3
43960.75500	3
43960.79600	3
43961.35600	3
43961.40900	3
43961.45500	3
43961.68300	3
43961.89400	3
43962.42700	3
43962.47600	3
43962.51900	3
43962.57000	3
43963.07000	3
43963.59200	3
43963.64100	3
43963.73100	3
43963.78500	3
43963.82600	3
46564.91990	6
46564.97180	6
46565.01570	6
46565.06060	6
46565.85090	6
46565.90280	6
46565.94960	6
46565.99630	6
46566.04100	6
46592.85450	6
46597.88570	6
46597.92800	6
46597.97120	6
48267.58240	7
48268.56290	7
48268.61000	7
48269.54300	7
48269.58070	7
48272.51230	7
48272.56350	7
48272.60850	7
48273.58610	7
48274.56870	7
48274.60960	7
48275.54160	7
48275.58940	7
48276.57300	7
48276.60810	7
48278.56230	7
48278.60980	7
45546.44500	8
46261.30440	8
46261.34710	8
46261.39280	8
46261.44500	8
46261.49050	8
46261.53530	8
46261.57890	8
46261.62390	8
46261.67300	8
46261.72180	8
46261.76360	8
46261.81480	8
46262.37070	8
46262.42270	8
46262.46680	8
46262.51300	8
46262.55520	8
47328.79044	8
47328.88757	8
47328.98132	8
47329.02481	8
47329.16375	8
47329.30569	8
49185.47425	8
49502.17402	8
50193.99031	8
51683.27876	8
51687.51537	8
52364.81020	8
52364.86080	8
52366.72760	8

43963.87000	3	52366.77590	8
43963.89800	3	53027.76780	8
43963.91700	3	53027.81170	8
43963.96800	3	53030.83890	8
43964.10000	3	53922.24075	9
43964.14900	3	53924.23738	9
43964.19900	3	54235.21476	8
43964.38100	3	54237.96000	8
43964.42900	3	54240.38080	8
43964.61300	3	54243.03427	8
43964.66600	3	54301.68235	8
43964.71100	3	55242.04153	10
43964.75400	3	55243.86350	10
43964.85100	3	55245.96115	10
43964.94300	3	55266.16346	10
43964.99200	3	55278.96482	10
43965.03000	3	55720.03332	10
43965.08000	3	53517.19677	11
43965.12700	3	51979.68379	11
43965.36800	3	52724.98354	11
43965.40200	3	53086.64265	11
43965.45400	3	53477.91196	11
43965.50400	3	53517.19677	11
43965.54200	3	53807.97021	11
43965.58800	3	54230.51766	11
43965.63900	3	54566.29857	11
43965.68900	3	54920.42192	11
43965.73200	3	54306.05891	9
43965.78000	3	52739.27160	12
43965.82700	3	52741.27171	12
43965.87700	3	52746.43884	12
43965.91400	3	52747.46381	12
43965.97200	3	52758.95966	12
43966.01100	3	52761.84613	12
43966.05200	3	53020.13009	12
43966.43300	3	53066.16300	12
43966.48400	3	53149.43193	12
43966.52700	3	53150.41352	12
43966.57300	3	53839.43331	12
43966.95400	3	53842.41170	12
43966.99400	3	53863.35822	12
43967.03500	3	54191.04295	12
43967.45600	3	54192.01924	12
43967.50000	3	54192.01953	12
43967.55000	3	54192.01953	12
43968.94600	3	54192.01971	12
43968.98600	3	54217.99108	12
43969.04000	3	54218.96889	12
43969.08800	3	54219.94688	12
43969.12700	3	54225.95095	12
43969.18300	3	54226.97509	12
43969.28000	3	54227.95194	12
43969.36800	3	54949.97649	12
43969.41300	3	54955.00266	12
43969.45800	3	54970.36511	12
43969.49500	3	54976.32200	12
43969.55100	3	55061.92956	12
43969.59600	3	55278.97585	12
43969.96400	3	55313.03434	12
43970.01600	3	55340.12068	12
43970.05500	3	55341.70967	12
43970.10900	3	55342.73235	12
43970.15500	3	55343.70633	12
43970.20100	3	55345.74814	12
43970.28600	3	55346.54597	12
43970.34400	3	55353.41999	12
43970.43200	3	55602.64567	12

The data sources:

1	Vogt et al, 1980
2	Gilliland, 1982
3	Sterken et al, 1983
4	Hill et al, 1984
5	Jablonski et al, 1985
6	Bond et al, 1988
7	Hellier et al, 1992
8	Mauche et al, 2009
9	Observations from SuperWASP public archive
10	Observations obtained using telescopes of the TzecMaun Observatory
11	Observations from The All Sky Automated Survey (ASAS) data archive
12	Observations from AAVSO database

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