Testing mass-spin relations implied by models of QPOs

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Frequencies in Kerr geometry

$$\Omega_k = \mathcal{F}(x^{3/2} + j)^{-1} \quad (1)$$

$$\omega_r^2 = \Omega_K^2 \left(1 - \frac{6}{x} + \frac{8j}{x^{3/2}} - \frac{3j^2}{x^2}\right) \quad (2)$$

$$\omega_\theta^2 = \Omega_K^2 \left(1 - \frac{4j}{x^{3/2}} + \frac{3j^2}{x^2}\right) \quad (3)$$

$$\nu_p = \nu_K - \nu_r \quad (4)$$

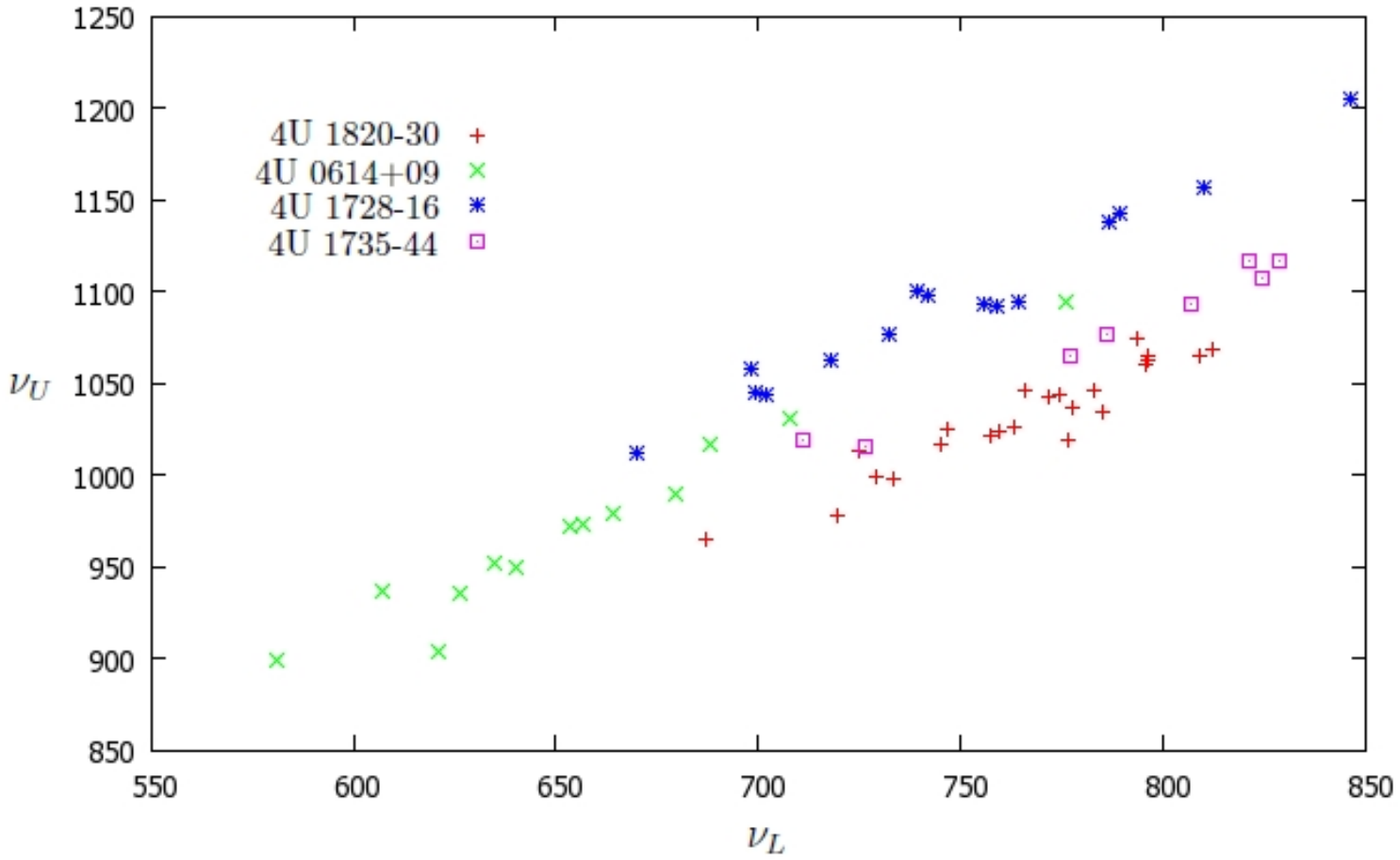
$$\nu_{nod} = \nu_K - \nu_\theta \quad (5)$$

$$\nu_T = \nu_p - \nu_{nod} = \nu_\theta - \nu_r \quad (6)$$

Models

RP model	$\nu_L = \nu_K - \nu_r$	$\nu_U = \nu_K$
TP „1“ model	$\nu_L = \nu_\theta - \nu_r$	$\nu_U = \nu_K$
TP „2“ model	$\nu_L = \nu_\theta - \nu_r$	$\nu_U = \nu_\theta$
VP model	$\nu_L = \nu_K - \nu_r$	$\nu_U = \nu_\theta$
RP2 model	$\nu_L = \nu_K - \nu_r$	$\nu_U = 2\nu_K - \nu_\theta$
WD model	$\nu_L = 2\left(\nu_K - \nu_r\right)$	$\nu_U = 2\nu_K - \nu_r$
TD model	$\nu_L = \nu_K$	$\nu_U = \nu_K + \nu_r$

Sources data



$$M = M_0 \left(1 + \mathrm{K}(j + j^2)\right), \qquad (7)$$

Program outputs

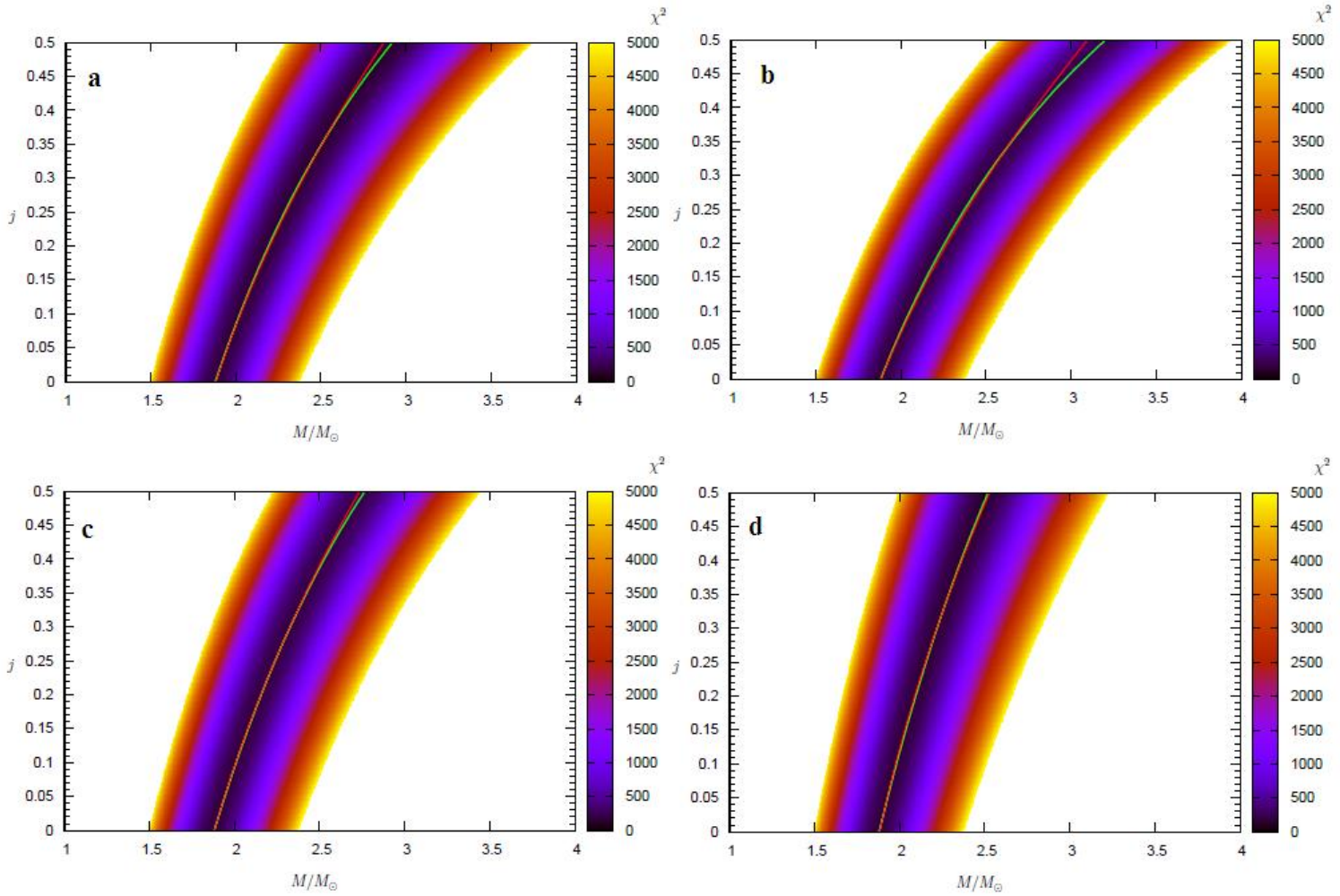
- M_{best}, J_{best} and deviation χ^2_{best}
- M_0, $\chi^2_{M_0}$ and constant K
- χ^2 dependence on the parameters M and J in the 3D maps

Results

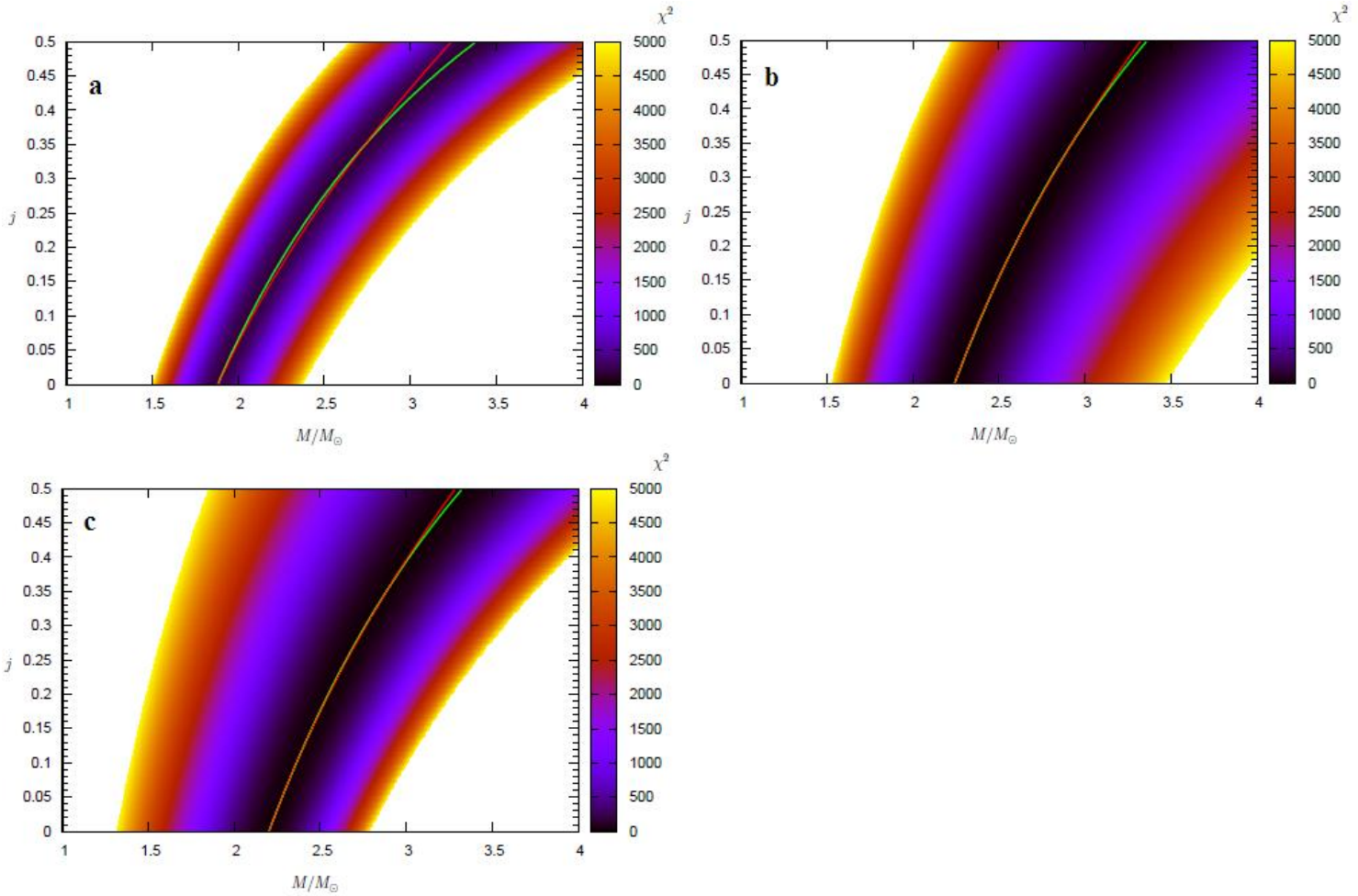
	4U 1728-16						4U 0614+09					
Model	M_0	$\chi^2_{M_0}$	K	M_{best}	J_{best}	χ^2_{best}	M_0	$\chi^2_{M_0}$	K	M_{best}	J_{best}	χ^2_{best}
RP	1,73	87	0,70	2,68	0,50	73	1,88	204	0,70	2,92	0,50	158
TP „1“	1,73	87	0,86	1,73	0,00	87	1,88	204	0,86	1,88	0,00	204
TP „2“	1,73	87	0,61	1,73	0,00	87	1,88	204	0,61	1,88	0,00	204
VP	1,73	87	0,46	2,31	0,50	77	1,88	204	0,46	2,52	0,50	173
RP2	1,73	87	0,97	3,11	0,50	75	1,88	204	0,96	3,38	0,50	165
WD	2,05	33	0,64	2,06	0,00	33	2,24	14	0,64	3,34	0,49	12
TD	2,04	38	0,65	3,06	0,49	35	2,20	32	0,66	3,33	0,50	18

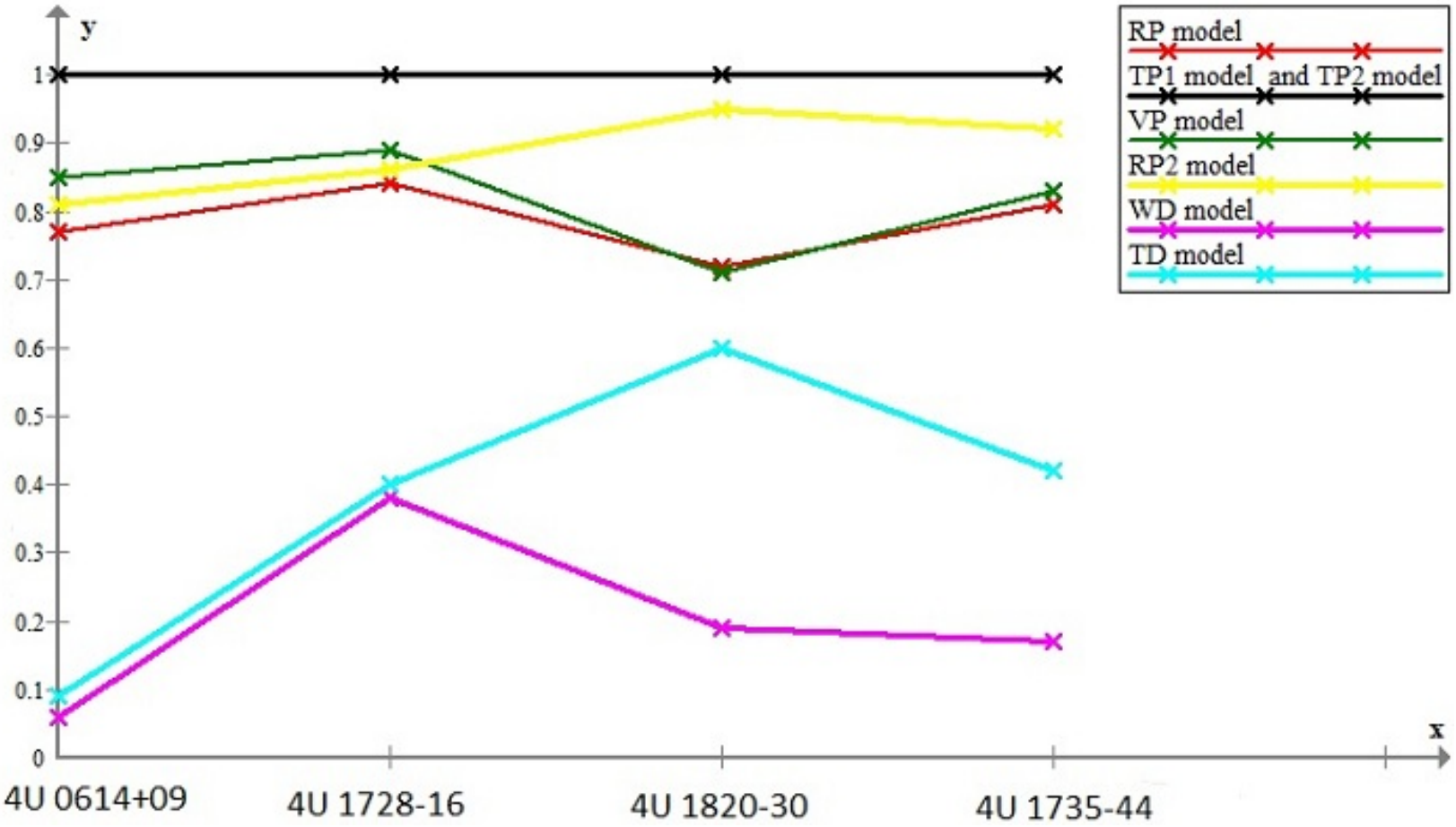
	4U 1820-30						4U 1735-44					
Model	M_0	$\chi^2_{M_0}$	K	M_{best}	J_{best}	χ^2_{best}	M_0	$\chi^2_{M_0}$	K	M_{best}	J_{best}	χ^2_{best}
RP	1,93	2560	0,72	3,03	0,50	1824	1,80	36	0,72	2,82	0,50	29
TP „1“	1,93	2560	0,85	1,94	0,00	2543	1.80	36	0,85	1,80	0,00	36
TP „2“	1,93	2560	0,60	1,94	0,00	2550	1,80	36	0,60	1,80	0,00	36
VP	1,93	2560	0,47	2,60	0,50	1817	1,80	36	0,47	2,42	0,50	30
RP2	1,93	2560	0,98	2,76	0,33	2421	1,80	36	0,98	3,25	0,50	33
WD	2,54	497	0,67	2,56	0,00	494	2.38	6	0.67	2,44	0,04	6
TD	2,38	3735	0,69	3,67	0,50	1520	2,21	25	0,69	3,41	0,50	15

χ^2 dependence on the parameters M and J for 4U 0614+09 and a)RP model b) TP1 model c)TP2 model d)VP model



χ^2 dependence on the parameters M and J for 4U 0614+09 and a)RP2 model b)WD model c)TD model




y
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
x
4U 0614+09
4U 1728-16
4U 1820-30
4U 1735-44
RP model
TP1 model and TP2 model
VP model
RP2 model
WD model
TD model

thanks for your attention