Magic Rydberg-Rydberg transitions in electric fields: Supplementary material

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This supplementary material lists some the most favorable dc-field-magic Rydberg-Rydberg transitions we have identified in ^{39}K. The tables are ordered according to the ranges of n values and fields. The frequencies of these magic transitions cover the range between 20 GHz and 3 THz with the distribution indicated by Fig. 1.

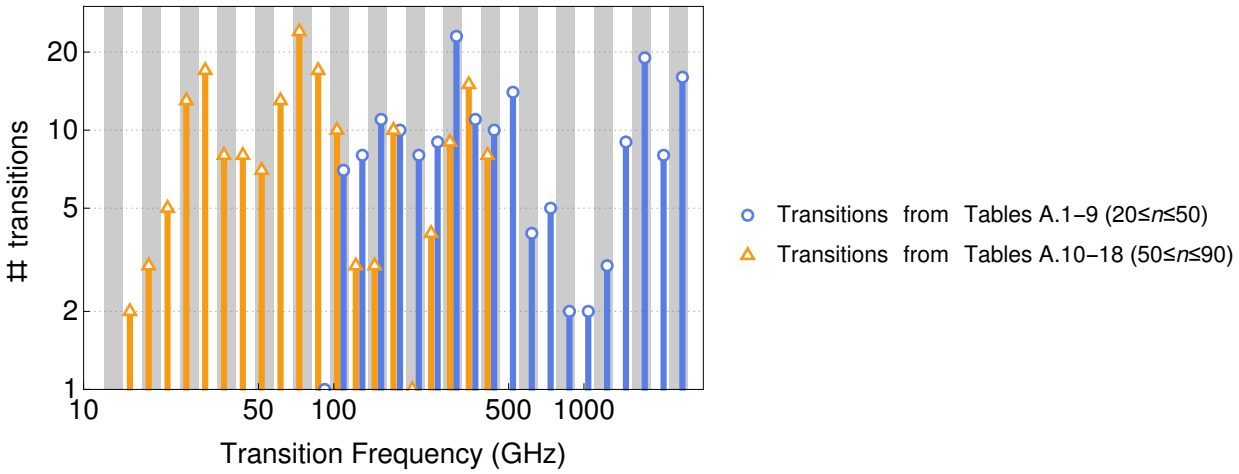

FIG. 1. Distribution of frequencies of the most favorable dc-field-magic Rydberg-Rydberg transitions in ^{39}K.

TABLE A.1. Type I magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 1/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(21, 2, 3/2) \leftarrow (27, 0, 1/2)$[a]	0.014	59.535	2318.354
$(21, 2, 5/2) \leftarrow (27, 0, 1/2)$[a]	0.067	59.767	2318.484
$(25, 2, 5/2) \leftarrow (32, 0, 1/2)$[a]	0.132	200.085	1681.941
$(20, 0, 1/2) \leftarrow (20, 1, 1/2)$	0.225	7.601	521.362
$(21, 0, 1/2) \leftarrow (21, 1, 1/2)$	0.307	10.790	443.507
$(22, 2, 5/2) \leftarrow (28, 1, 1/2)$	0.316	83.504	2208.921
$(23, 2, 3/2) \leftarrow (29, 1, 3/2)$	0.328	111.466	1952.579
$(20, 0, 1/2) \leftarrow (20, 1, 3/2)$	0.360	8.053	524.637
$(22, 0, 1/2) \leftarrow (22, 1, 1/2)$	0.413	15.052	380.413
$(25, 2, 3/2) \leftarrow (32, 0, 1/2)$[a]	0.418	199.583	1681.865
$(22, 2, 3/2) \leftarrow (28, 1, 1/2)$	0.438	83.504	2208.808
$(21, 0, 1/2) \leftarrow (21, 1, 3/2)$	0.487	11.391	446.299
$(20, 1, 3/2) \leftarrow (21, 0, 1/2)$	0.510	9.760	547.209
$(23, 2, 5/2) \leftarrow (29, 1, 3/2)$	0.520	112.163	1952.677
$(27, 2, 3/2) \leftarrow (34, 1, 3/2)$	0.541	336.435	1450.831
$(23, 0, 1/2) \leftarrow (23, 1, 1/2)$	0.547	20.671	328.742
$(20, 1, 1/2) \leftarrow (21, 0, 1/2)$	0.645	9.760	550.484
$(22, 0, 1/2) \leftarrow (22, 1, 3/2)$	0.648	15.838	382.813
$(21, 1, 3/2) \leftarrow (22, 0, 1/2)$	0.680	13.669	467.423
$(24, 0, 1/2) \leftarrow (24, 1, 1/2)$	0.714	27.988	286.020

[a] Two-photon transition

TABLE A.2. Type I magic Rydberg-Rydberg $i(m_j = 3/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(21, 2, 5/2) \leftarrow (26, 1, 3/2)$	0.252	54.308	2082.494
$(25, 2, 3/2) \leftarrow (30, 1, 3/2)$	0.457	150.336	1270.626
$(20, 2, 5/2) \leftarrow (25, 1, 3/2)$	0.480	40.284	2389.332
$(20, 2, 3/2) \leftarrow (24, 1, 3/2)$	0.729	32.427	1832.664
$(24, 2, 3/2) \leftarrow (29, 1, 3/2)$	0.942	117.094	1426.964
$(30, 2, 5/2) \leftarrow (37, 1, 3/2)$	1.363	672.235	1081.774
$(22, 2, 5/2) \leftarrow (27, 1, 3/2)$	1.475	75.103	1826.101
$(25, 2, 5/2) \leftarrow (31, 1, 3/2)$	1.499	188.834	1546.631
$(21, 2, 3/2) \leftarrow (25, 1, 3/2)$	1.547	45.433	1593.165
$(26, 2, 5/2) \leftarrow (32, 1, 3/2)$	1.656	242.863	1385.461
$(32, 2, 3/2) \leftarrow (38, 1, 3/2)$	1.733	818.596	770.668
$(23, 2, 3/2) \leftarrow (28, 1, 3/2)$	1.769	91.033	1610.085
$(22, 2, 3/2) \leftarrow (27, 1, 3/2)$	2.218	70.105	1825.987
$(20, 2, 3/2) \leftarrow (25, 1, 3/2)$	2.342	40.284	2389.180
$(21, 2, 3/2) \leftarrow (26, 1, 3/2)$	2.381	53.439	2082.363
$(26, 2, 3/2) \leftarrow (31, 1, 3/2)$	2.411	196.392	1136.341
$(20, 2, 5/2) \leftarrow (24, 1, 3/2)$	2.590	38.689	1832.817
$(22, 2, 3/2) \leftarrow (26, 1, 3/2)$	2.759	62.616	1393.670
$(20, 2, 3/2) \leftarrow (23, 1, 3/2)$	3.103	32.427	1195.889
$(23, 2, 5/2) \leftarrow (28, 1, 3/2)$	3.385	102.477	1610.184

TABLE A.3. Type I magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(26, 0, 1/2) \leftarrow (21, 2, 3/2)$[a]	0.017	45.451	1860.521
$(24, 2, 3/2) \leftarrow (30, 1, 3/2)$	0.092	149.511	1733.781
$(25, 1, 3/2) \leftarrow (20, 2, 5/2)$	0.100	39.009	2389.332
$(20, 0, 1/2) \leftarrow (20, 1, 3/2)$	0.337	7.977	524.637
$(25, 1, 1/2) \leftarrow (20, 2, 5/2)$	0.379	38.689	2387.745
$(28, 1, 3/2) \leftarrow (23, 2, 3/2)$	0.382	86.370	1610.085
$(24, 2, 5/2) \leftarrow (30, 1, 3/2)$	0.399	150.670	1733.868
$(21, 0, 1/2) \leftarrow (21, 1, 3/2)$	0.486	11.388	446.299
$(28, 1, 1/2) \leftarrow (23, 2, 3/2)$	0.487	84.995	1608.982
$(21, 0, 1/2) \leftarrow (20, 1, 3/2)$	0.533	9.760	547.209
$(25, 0, 1/2) \leftarrow (20, 2, 3/2)$[a]	0.559	34.314	2137.201
$(27, 1, 1/2) \leftarrow (22, 2, 3/2)$	0.560	64.554	1824.748
$(30, 1, 1/2) \leftarrow (24, 2, 5/2)$	0.591	138.136	1732.982
$(30, 1, 3/2) \leftarrow (24, 2, 5/2)$	0.601	139.926	1733.868
$(35, 1, 3/2) \leftarrow (28, 2, 5/2)$	0.618	410.308	1311.353
$(28, 0, 1/2) \leftarrow (22, 2, 5/2)$[a]	0.642	77.187	2035.447
$(20, 2, 3/2) \leftarrow (25, 1, 3/2)$	0.655	42.475	2389.180
$(22, 0, 1/2) \leftarrow (21, 1, 3/2)$	0.681	13.669	467.423
$(22, 0, 1/2) \leftarrow (22, 1, 3/2)$	0.688	15.974	382.813
$(20, 2, 5/2) \leftarrow (25, 1, 3/2)$	0.710	42.664	2389.332

[a] Two-photon transition

TABLE A.4. Type II magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 1/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(20, 12, j^+) \leftarrow (24, 10, j^-)$	1.583	4673.752	2513.039
$(39, -1, j^-) \leftarrow (41, -1, j^+)$	1.601	747.546	205.870
$(38, 14, j^+) \leftarrow (41, 13, j^+)$	2.043	10 667.501	321.205
$(41, -1, j^-) \leftarrow (43, -1, j^+)$	2.073	758.664	177.817
$(37, -1, j^-) \leftarrow (39, -1, j^+)$	2.076	736.475	240.149
$(39, 35, j^-) \leftarrow (40, 34, j^+)$	2.132	27 420.733	106.794
$(38, 14, j^-) \leftarrow (41, 13, j^-)$	2.199	10 618.558	321.205
$(45, -1, j^-) \leftarrow (47, -1, j^+)$	2.215	788.687	135.321
$(47, -1, j^-) \leftarrow (49, -1, j^+)$	2.247	820.925	119.092
$(43, -1, j^-) \leftarrow (45, -1, j^+)$	2.459	771.253	154.639
$(35, 13, j^+) \leftarrow (38, 12, j^+)$	2.512	9143.319	407.296
$(22, 18, j^+) \leftarrow (27, 15, j^-)$	2.543	8093.515	2284.347
$(38, 34, j^-) \leftarrow (39, 33, j^+)$	2.547	25 988.137	115.336
$(22, 16, j^-) \leftarrow (27, 13, j^+)$	2.622	7039.742	2284.348
$(21, 7, j^+) \leftarrow (24, 6, j^-)$	2.673	2696.818	1748.405
$(40, 14, j^-) \leftarrow (43, 13, j^+)$	2.740	11 165.618	276.893
$(41, -1, j^-) \leftarrow (45, -1, j^+)$	2.763	764.726	332.456
$(27, 23, j^-) \leftarrow (33, 19, j^+)$	2.771	12 636.393	1491.819
$(24, 18, j^-) \leftarrow (29, 15, j^-)$	2.815	8705.105	1799.684
$(35, 13, j^-) \leftarrow (38, 12, j^-)$ [b]	2.818	9099.998	407.296

[b] Example of Type II magic transition given in the article.

TABLE A.5. Type II magic Rydberg-Rydberg $i(m_j = 3/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(20, 10, j^-) \leftarrow (24, 8, j^+)$	0.860	3687.713	2513.040
$(40, 12, j^-) \leftarrow (43, 11, j^+)$	1.267	9417.084	276.893
$(39, -17, j^-) \leftarrow (42, -16, j^+)$	1.479	13 173.851	297.954
$(40, 26, j^-) \leftarrow (41, 25, j^+)$	1.656	20 427.153	99.075
$(35, 23, j^-) \leftarrow (36, 22, j^+)$	1.831	15 864.350	147.125
$(36, 18, j^-) \leftarrow (40, 16, j^+)$	1.837	12 754.868	482.300
$(23, 13, j^-) \leftarrow (27, 11, j^-)$	1.945	5765.939	1706.145
$(28, 24, j^-) \leftarrow (35, 19, j^+)$	2.017	13 326.405	1510.621
$(35, -1, j^-) \leftarrow (37, -1, j^+)$	2.136	750.056	282.483
$(38, 14, j^+) \leftarrow (41, 13, j^+)$	2.165	10 618.811	321.205
$(30, 20, j^-) \leftarrow (31, 19, j^+)$	2.169	11 836.989	232.024
$(40, -6, j^-) \leftarrow (49, -5, j^-)$	2.251	4730.899	685.945
$(41, 27, j^-) \leftarrow (42, 26, j^+)$	2.351	21 724.843	92.083
$(22, -2, j^+) \leftarrow (24, -2, j^-)$	2.404	1266.867	1085.653
$(23, 17, j^-) \leftarrow (28, 14, j^-)$	2.419	7674.389	2022.728
$(33, -1, j^-) \leftarrow (35, -1, j^+)$	2.504	735.081	335.385
$(31, 21, j^-) \leftarrow (32, 20, j^+)$	2.575	12 848.816	210.613
$(35, 29, j^-) \leftarrow (37, 27, j^+)$	2.671	20 023.745	282.483
$(37, 1, j^+) \leftarrow (39, 1, j^-)$	2.686	755.439	240.149
$(36, -16, j^-) \leftarrow (39, -15, j^+)$	2.715	11 544.807	375.508

TABLE A.6. Type II magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(24, 8, j^-) \leftarrow (20, 10, j^-)$	0.860	3687.713	2513.040
$(36, 20, j^+) \leftarrow (35, 21, j^-)$	1.232	14 478.457	147.125
$(43, 11, j^-) \leftarrow (40, 12, j^-)$	1.391	9417.084	276.893
$(39, -17, j^+) \leftarrow (42, -16, j^+)$	1.482	13 174.038	297.954
$(32, 18, j^+) \leftarrow (31, 19, j^-)$	1.566	11 609.676	210.613
$(20, 12, j^+) \leftarrow (24, 10, j^+)$	1.584	4673.731	2513.039
$(41, -1, j^+) \leftarrow (39, -1, j^+)$	1.584	747.436	205.870
$(41, 25, j^-) \leftarrow (40, 26, j^-)$	1.708	20 427.153	99.075
$(36, 22, j^-) \leftarrow (35, 23, j^-)$	1.830	15 864.350	147.125
$(40, -18, j^-) \leftarrow (43, -17, j^+)$	1.840	14 294.749	276.893
$(40, 16, j^-) \leftarrow (36, 18, j^-)$	1.846	12 754.711	482.300
$(42, 6, j^+) \leftarrow (37, 7, j^-)$	1.847	5080.389	538.101
$(40, 22, j^+) \leftarrow (39, 23, j^-)$	1.910	17 629.354	106.794
$(43, -1, j^+) \leftarrow (41, -1, j^+)$	2.003	758.373	177.817
$(47, -1, j^+) \leftarrow (45, -1, j^+)$	2.005	787.472	135.321
$(35, 19, j^-) \leftarrow (28, 24, j^-)$	2.016	13 326.405	1510.620
$(39, -1, j^+) \leftarrow (37, -1, j^+)$	2.075	736.452	240.149
$(37, -1, j^-) \leftarrow (35, -1, j^-)$	2.131	750.056	282.483
$(40, 34, j^+) \leftarrow (39, 35, j^+)$	2.151	27 420.866	106.794
$(38, 14, j^-) \leftarrow (41, 13, j^+)$	2.155	10 618.811	321.205

TABLE A.7. Type III magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 1/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(42,0,j^+) \leftarrow (44,0,j^-)$	1.526	112.157	165.689
$(40,0,j^+) \leftarrow (42,0,j^-)$	2.108	94.061	191.159
$(38,0,j^+) \leftarrow (40,0,j^-)$	2.797	75.480	222.130
$(36,0,j^+) \leftarrow (38,0,j^-)$	3.289	57.524	260.171
$(44,0,j^+) \leftarrow (46,0,j^-)$	3.806	132.700	144.551
$(34,0,j^+) \leftarrow (36,0,j^-)$	3.881	64.599	307.422
$(46,0,j^-) \leftarrow (48,0,j^-)$	4.549	118.923	126.861
$(46,0,j^+) \leftarrow (48,0,j^+)$	4.608	149.776	126.861
$(44,0,j^-) \leftarrow (46,0,j^-)$	4.776	118.923	144.551
$(32,0,j^+) \leftarrow (34,0,j^-)$	4.876	82.514	366.847
$(42,0,j^+) \leftarrow (46,0,j^-)$	5.886	118.923	310.240
$(36,0,j^-) \leftarrow (38,0,j^-)$	5.952	57.524	260.171
$(34,0,j^-) \leftarrow (36,0,j^-)$	5.987	67.054	307.422
$(42,0,j^-) \leftarrow (44,0,j^-)$	6.013	110.294	165.689
$(44,0,j^+) \leftarrow (46,0,j^+)$	6.145	147.237	144.551
$(38,0,j^-) \leftarrow (40,0,j^-)$	6.222	75.480	222.130
$(40,0,j^-) \leftarrow (42,0,j^-)$	6.391	94.061	191.159
$(34,0,j^+) \leftarrow (36,0,j^+)$	6.478	64.599	307.422
$(30,0,j^+) \leftarrow (32,0,j^-)$	6.552	107.078	442.638
$(48,0,j^+) \leftarrow (50,0,j^+)$	6.623	149.776	111.944

TABLE A.8. Type III magic Rydberg-Rydberg $i(m_j = 3/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(44, 0, j^-) \leftarrow (46, 0, j^-)$	1.711	37.493	144.551
$(42, 0, j^-) \leftarrow (44, 0, j^-)$	2.318	36.769	165.689
$(46, 0, j^-) \leftarrow (48, 0, j^-)$	2.402	37.493	126.861
$(30, 0, j^+) \leftarrow (32, 0, j^-)$	2.659	111.117	442.638
$(32, 0, j^+) \leftarrow (34, 0, j^-)$	2.686	85.648	366.847
$(40, 0, j^-) \leftarrow (42, 0, j^-)$	2.774	40.208	191.159
$(38, 0, j^-) \leftarrow (40, 0, j^-)$	3.131	49.418	222.130
$(44, 0, j^-) \leftarrow (48, 0, j^-)$	3.530	36.769	271.412
$(34, 0, j^+) \leftarrow (38, 0, j^-)$	3.599	67.066	567.592
$(36, 0, j^-) \leftarrow (38, 0, j^-)$	3.638	61.420	260.171
$(42, 0, j^-) \leftarrow (46, 0, j^-)$	3.907	37.493	310.240
$(36, 0, j^+) \leftarrow (42, 0, j^-)$	3.986	53.256	673.459
$(34, 0, j^+) \leftarrow (36, 0, j^-)$	4.365	67.066	307.422
$(46, 0, j^+) \leftarrow (48, 0, j^+)$	4.488	120.511	126.861
$(34, 0, j^-) \leftarrow (36, 0, j^-)$	4.527	77.291	307.422
$(36, 0, j^+) \leftarrow (40, 0, j^-)$	4.654	53.256	482.300
$(28, 0, j^+) \leftarrow (30, 0, j^-)$	4.733	146.768	540.840
$(36, 0, j^+) \leftarrow (44, 0, j^-)$	4.862	53.256	839.148
$(44, 0, j^+) \leftarrow (46, 0, j^+)$	4.917	120.511	144.551
$(42, 0, j^-) \leftarrow (48, 0, j^-)$	4.956	33.046	437.101

TABLE A.9. Type III magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $20 \leq n \leq 50$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $10\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(42,0,j^+) \leftarrow (44,0,j^+)$	1.501	112.157	165.689
$(40,0,j^+) \leftarrow (42,0,j^+)$[c]	2.184	94.494	191.159
$(30,0,j^+) \leftarrow (32,0,j^-)$	2.375	107.078	442.638
$(30,0,j^-) \leftarrow (32,0,j^-)$	2.658	111.094	442.638
$(32,0,j^-) \leftarrow (34,0,j^-)$	2.689	85.631	366.847
$(38,0,j^+) \leftarrow (40,0,j^+)$	2.833	75.667	222.130
$(28,0,j^+) \leftarrow (30,0,j^-)$	3.111	141.470	540.840
$(36,0,j^+) \leftarrow (38,0,j^+)$	3.298	57.588	260.171
$(44,0,j^+) \leftarrow (46,0,j^+)$	3.404	132.700	144.551
$(34,0,j^-) \leftarrow (38,0,j^-)$	3.599	67.054	567.592
$(34,0,j^+) \leftarrow (36,0,j^+)$	3.879	64.599	307.422
$(32,0,j^+) \leftarrow (34,0,j^-)$	3.978	82.514	366.847
$(36,0,j^-) \leftarrow (42,0,j^-)$	3.983	53.247	673.459
$(32,0,j^+) \leftarrow (36,0,j^-)$	4.200	82.514	674.269
$(34,0,j^-) \leftarrow (36,0,j^-)$	4.369	67.054	307.422
$(46,0,j^-) \leftarrow (48,0,j^+)$	4.390	118.923	126.861
$(34,0,j^+) \leftarrow (38,0,j^-)$	4.505	64.599	567.592
$(34,0,j^+) \leftarrow (40,0,j^-)$	4.591	64.599	789.722
$(46,0,j^-) \leftarrow (44,0,j^+)$	4.632	118.923	144.551
$(36,0,j^-) \leftarrow (40,0,j^-)$	4.652	53.247	482.300

[c] Example of Type III magic transition given in the article.

TABLE A.10. Type I magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 1/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E_{\mathrm{Stark}}^{(i,f)}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu_{i,f}^0$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E_{\mathrm{Stark}}^{(i,f)}/h\right\|$ (MHz)	$\nu_{i,f}^0$ (GHz)
$(50,0,1/2) \leftarrow (50,1,3/2)$	0.575	48.413	27.827
$(51,0,1/2) \leftarrow (51,1,3/2)$	0.621	55.501	26.159
$(52,0,1/2) \leftarrow (52,1,3/2)$	0.666	63.451	24.623
$(53,0,1/2) \leftarrow (53,1,3/2)$	0.709	72.345	23.204
$(50,0,1/2) \leftarrow (50,1,1/2)$	0.729	48.980	27.649
$(60,0,1/2) \leftarrow (60,1,3/2)$	0.737	169.193	15.782
$(54,0,1/2) \leftarrow (54,1,3/2)$	0.748	82.271	21.892
$(55,0,1/2) \leftarrow (55,1,3/2)$	0.780	93.321	20.678
$(59,0,1/2) \leftarrow (59,1,3/2)$	0.784	150.867	16.626
$(56,0,1/2) \leftarrow (56,1,3/2)$	0.803	105.595	19.551
$(58,0,1/2) \leftarrow (58,1,3/2)$	0.808	134.249	17.532
$(57,0,1/2) \leftarrow (57,1,3/2)$	0.814	119.200	18.505
$(51,0,1/2) \leftarrow (51,1,1/2)$	0.853	56.349	25.992
$(52,0,1/2) \leftarrow (52,1,1/2)$	1.002	64.678	24.465
$(53,0,1/2) \leftarrow (53,1,1/2)$	1.186	74.082	23.055
$(50,2,3/2) \leftarrow (63,1,3/2)$	1.314	240.351	454.802
$(50,1,1/2) \leftarrow (51,0,1/2)$	1.373	53.458	30.685
$(54,0,1/2) \leftarrow (54,1,1/2)$	1.413	84.689	21.752
$(51,1,1/2) \leftarrow (52,0,1/2)$	1.513	61.262	28.864
$(50,1,3/2) \leftarrow (51,0,1/2)$	1.526	53.458	30.507

TABLE A.11. Type I magic Rydberg-Rydberg $i(m_j = 3/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E_{\mathrm{Stark}}^{(i,f)}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu_{i,f}^0$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E_{\mathrm{Stark}}^{(i,f)}/h\right\|$ (MHz)	$\nu_{i,f}^0$ (GHz)
$(50, 2, 3/2) \leftarrow (59, 1, 3/2)$	0.496	183.805	328.233
$(50, 2, 5/2) \leftarrow (61, 1, 3/2)$	0.525	233.560	394.728
$(51, 2, 3/2) \leftarrow (60, 1, 3/2)$	1.577	211.141	310.384
$(51, 2, 5/2) \leftarrow (62, 1, 3/2)$	2.435	268.804	373.569
$(52, 2, 3/2) \leftarrow (61, 1, 3/2)$	3.002	242.044	293.808
$(54, 2, 3/2) \leftarrow (64, 1, 3/2)$	3.860	328.922	291.935
$(53, 2, 3/2) \leftarrow (62, 1, 3/2)$	4.760	276.945	278.394
$(52, 2, 5/2) \leftarrow (63, 1, 3/2)$	4.764	308.597	353.900
$(53, 2, 3/2) \leftarrow (63, 1, 3/2)$	4.967	293.425	307.688
$(52, 2, 3/2) \leftarrow (62, 1, 3/2)$	5.773	261.247	324.597
$(52, 2, 5/2) \leftarrow (64, 1, 3/2)$	5.966	328.922	381.794
$(51, 2, 3/2) \leftarrow (61, 1, 3/2)$	6.339	232.233	342.771
$(50, 2, 3/2) \leftarrow (60, 1, 3/2)$	6.707	206.120	362.331
$(50, 2, 3/2) \leftarrow (58, 1, 3/2)$	6.741	183.805	292.302
$(54, 2, 3/2) \leftarrow (63, 1, 3/2)$	6.904	316.327	264.040
$(51, 2, 5/2) \leftarrow (63, 1, 3/2)$	7.261	293.425	402.863
$(53, 2, 5/2) \leftarrow (64, 1, 3/2)$	7.582	353.471	335.590
$(50, 2, 5/2) \leftarrow (62, 1, 3/2)$	8.224	261.247	425.517
$(50, 2, 5/2) \leftarrow (60, 1, 3/2)$	8.380	233.560	362.340
$(51, 2, 3/2) \leftarrow (59, 1, 3/2)$	8.620	211.141	276.286

TABLE A.12. Type I magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E_{\mathrm{Stark}}^{(i,f)}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu_{i,f}^0$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E_{\mathrm{Stark}}^{(i,f)}/h\right\|$ (MHz)	$\nu_{i,f}^0$ (GHz)
$(62,1,3/2) \leftarrow (51,2,3/2)$	0.315	211.593	373.560
$(51,0,1/2) \leftarrow (50,1,3/2)$	0.825	56.205	30.507
$(62,1,1/2) \leftarrow (50,2,5/2)$	0.899	234.631	425.425
$(52,2,5/2) \leftarrow (64,1,3/2)$	0.932	331.667	381.794
$(60,1,1/2) \leftarrow (50,2,3/2)$	0.994	183.805	362.230
$(63,1,3/2) \leftarrow (50,2,5/2)$	1.001	235.990	454.811
$(52,0,1/2) \leftarrow (51,1,3/2)$	1.024	64.675	28.697
$(53,0,1/2) \leftarrow (52,1,3/2)$	1.261	74.227	27.027
$(51,2,5/2) \leftarrow (63,1,3/2)$	1.311	293.425	402.863
$(52,0,1/2) \leftarrow (50,1,3/2)$	1.538	61.262	85.363
$(54,0,1/2) \leftarrow (53,1,3/2)$	1.541	84.974	25.485
$(53,0,1/2) \leftarrow (51,1,3/2)$	1.628	70.019	80.347
$(63,1,3/2) \leftarrow (52,2,3/2)$	1.660	242.044	353.892
$(60,0,1/2) \leftarrow (58,1,3/2)$	1.700	166.848	54.247
$(54,0,1/2) \leftarrow (52,1,3/2)$	1.709	79.824	75.716
$(55,0,1/2) \leftarrow (53,1,3/2)$	1.777	90.778	71.434
$(59,0,1/2) \leftarrow (57,1,3/2)$	1.800	148.366	57.204
$(61,1,3/2) \leftarrow (50,2,3/2)$	1.802	189.379	394.718
$(61,1,1/2) \leftarrow (51,2,3/2)$	1.806	211.141	342.675
$(56,0,1/2) \leftarrow (54,1,3/2)$	1.827	102.989	67.470

TABLE A.13. Type II magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 1/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(60, 52, j^-) \leftarrow (61, 51, j^+)$	0.118	6159.894	29.716
$(59, -1, j^-) \leftarrow (61, -1, j^+)$	0.162	115.412	60.956
$(60, 20, j^-) \leftarrow (63, 19, j^+)$	0.168	2360.003	84.959
$(57, -1, j^-) \leftarrow (59, -1, j^+)$	0.179	114.217	67.484
$(61, 53, j^-) \leftarrow (62, 52, j^+)$	0.182	6380.012	28.290
$(59, 21, j^+) \leftarrow (62, 20, j^+)$	0.206	2444.996	89.246
$(58, 12, j^-) \leftarrow (63, 11, j^+)$	0.207	1369.273	149.069
$(59, 51, j^-) \leftarrow (60, 50, j^+)$	0.209	5943.467	31.240
$(63, 21, j^-) \leftarrow (66, 20, j^+)$	0.212	2600.384	73.640
$(69, -1, j^-) \leftarrow (73, -1, j^+)$	0.223	121.811	73.650
$(57, 19, j^-) \leftarrow (60, 18, j^+)$	0.223	2130.366	98.724
$(61, -1, j^-) \leftarrow (63, -1, j^+)$	0.225	116.609	55.243
$(59, 21, j^-) \leftarrow (62, 20, j^-)$	0.226	2437.886	89.246
$(62, 22, j^+) \leftarrow (65, 21, j^+)$	0.231	2689.152	77.176
$(55, -1, j^-) \leftarrow (57, -1, j^+)$	0.239	113.055	74.979
$(63, 13, j^-) \leftarrow (68, 12, j^+)$	0.244	1611.472	117.412
$(50, 46, j^-) \leftarrow (58, 40, j^-)$	0.245	4574.767	337.977
$(51, 45, j^-) \leftarrow (52, 44, j^+)$	0.246	4554.097	48.179
$(62, 22, j^-) \leftarrow (65, 21, j^-)$	0.247	2681.485	77.176
$(71, -1, j^-) \leftarrow (75, -1, j^+)$	0.248	124.229	67.755

TABLE A.14. Type II magic Rydberg-Rydberg $i(m_j = 3/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(62, 18, j^-) \leftarrow (65, 17, j^+)$	0.176	2171.965	77.176
$(55, 33, j^-) \leftarrow (60, 30, j^+)$	0.195	3541.205	173.704
$(64, 12, j^-) \leftarrow (69, 11, j^+)$	0.207	1494.035	112.184
$(61, 29, j^-) \leftarrow (65, 27, j^+)$	0.208	3446.416	105.466
$(57, 37, j^-) \leftarrow (58, 36, j^+)$	0.214	4113.898	34.615
$(72, -12, j^-) \leftarrow (79, -11, j^-)$	0.214	1670.175	107.479
$(62, 40, j^-) \leftarrow (63, 39, j^+)$	0.223	4831.278	26.953
$(59, 21, j^+) \leftarrow (62, 20, j^+)$	0.226	2437.902	89.246
$(52, 34, j^-) \leftarrow (53, 33, j^+)$	0.227	3451.499	45.478
$(62, 22, j^+) \leftarrow (65, 21, j^+)$	0.243	2681.525	77.176
$(50, 46, j^+) \leftarrow (58, 40, j^+)$	0.245	4574.769	337.977
$(54, 16, j^-) \leftarrow (57, 15, j^+)$	0.247	1681.127	115.631
$(67, -9, j^-) \leftarrow (76, -8, j^-)$	0.251	1171.961	163.294
$(51, 45, j^-) \leftarrow (59, 39, j^-)$	0.261	4488.412	319.748
$(65, -11, j^-) \leftarrow (72, -10, j^-)$	0.265	1392.747	144.044
$(55, 1, j^+) \leftarrow (57, 1, j^-)$	0.268	106.094	74.979
$(53, 1, j^+) \leftarrow (55, 1, j^-)$	0.270	100.414	83.627
$(59, 21, j^-) \leftarrow (62, 20, j^-)$	0.285	2413.541	89.246
$(69, -17, j^-) \leftarrow (79, -15, j^-)$	0.293	2274.933	163.862
$(52, 36, j^-) \leftarrow (58, 32, j^+)$	0.298	3655.565	238.699

TABLE A.15. Type II magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(63, 25, j^+) \leftarrow (59, 27, j^-)$	0.137	3103.873	116.199
$(61, -1, j^+) \leftarrow (59, -1, j^+)$	0.161	115.407	60.956
$(63, 19, j^+) \leftarrow (60, 20, j^+)$	0.170	2360.003	84.959
$(65, 17, j^-) \leftarrow (62, 18, j^-)$	0.175	2171.924	77.176
$(59, -1, j^+) \leftarrow (57, -1, j^+)$	0.178	114.216	67.484
$(61, 33, j^+) \leftarrow (55, 37, j^-)$	0.179	3971.532	203.420
$(58, 28, j^+) \leftarrow (53, 31, j^-)$	0.181	3205.718	193.221
$(62, 36, j^+) \leftarrow (55, 41, j^-)$	0.189	4402.304	231.710
$(69, 11, j^-) \leftarrow (64, 12, j^-)$	0.191	1493.924	112.184
$(60, 30, j^-) \leftarrow (55, 33, j^-)$	0.195	3541.198	173.704
$(51, 1, j^+) \leftarrow (53, 1, j^-)$	0.196	95.034	93.657
$(56, 30, j^+) \leftarrow (50, 34, j^-)$	0.203	3319.921	266.876
$(65, 27, j^-) \leftarrow (61, 29, j^-)$	0.203	3446.373	105.466
$(63, 11, j^+) \leftarrow (58, 12, j^+)$	0.207	1369.273	149.069
$(73, -1, j^+) \leftarrow (69, -1, j^+)$	0.209	121.732	73.650
$(66, 20, j^+) \leftarrow (63, 21, j^+)$	0.218	2600.406	73.640
$(63, -1, j^+) \leftarrow (61, -1, j^+)$	0.222	116.596	55.243
$(60, 18, j^+) \leftarrow (57, 19, j^+)$	0.224	2130.366	98.724
$(59, 21, j^-) \leftarrow (62, 20, j^+)$	0.226	2437.902	89.246
$(62, 20, j^-) \leftarrow (59, 21, j^+)$	0.226	2437.886	89.246

TABLE A.16. Type III magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 1/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(62,0,j^+) \leftarrow (64,0,j^-)$	0.105	12.380	52.653
$(60,0,j^+) \leftarrow (62,0,j^-)$	0.127	10.381	58.006
$(64,0,j^+) \leftarrow (66,0,j^-)$	0.148	14.545	47.940
$(58,0,j^+) \leftarrow (60,0,j^-)$	0.172	8.655	64.110
$(56,0,j^+) \leftarrow (58,0,j^-)$	0.224	8.634	71.100
$(66,0,j^+) \leftarrow (68,0,j^-)$	0.259	16.770	43.772
$(54,0,j^+) \leftarrow (56,0,j^-)$	0.283	9.996	79.146
$(52,0,j^+) \leftarrow (54,0,j^-)$	0.355	11.638	88.453
$(68,0,j^+) \leftarrow (72,0,j^-)$	0.406	18.947	76.855
$(72,0,j^-) \leftarrow (74,0,j^-)$	0.424	18.746	33.839
$(68,0,j^+) \leftarrow (70,0,j^-)$	0.434	18.947	40.074
$(50,0,j^+) \leftarrow (52,0,j^-)$	0.446	13.631	99.278
$(66,0,j^+) \leftarrow (70,0,j^-)$	0.453	17.380	83.846
$(74,0,j^+) \leftarrow (76,0,j^+)$	0.463	23.886	31.203
$(74,0,j^-) \leftarrow (76,0,j^-)$	0.484	18.746	31.203
$(70,0,j^-) \leftarrow (72,0,j^-)$	0.513	18.457	36.781
$(76,0,j^+) \leftarrow (78,0,j^+)$	0.515	23.886	28.834
$(72,0,j^+) \leftarrow (74,0,j^+)$	0.552	23.644	33.839
$(64,0,j^+) \leftarrow (68,0,j^-)$	0.573	15.841	91.712
$(68,0,j^-) \leftarrow (70,0,j^-)$	0.593	17.380	40.074

TABLE A.17. Type III magic Rydberg-Rydberg $i(m_j = 3/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(72,0,j^-) \leftarrow (74,0,j^-)$	0.171	5.890	33.839
$(70,0,j^-) \leftarrow (72,0,j^-)$	0.185	5.890	36.781
$(68,0,j^-) \leftarrow (70,0,j^-)$	0.224	5.710	40.074
$(74,0,j^-) \leftarrow (76,0,j^-)$	0.254	5.688	31.203
$(66,0,j^-) \leftarrow (68,0,j^-)$	0.258	5.376	43.772
$(64,0,j^-) \leftarrow (66,0,j^-)$	0.283	6.083	47.940
$(62,0,j^-) \leftarrow (64,0,j^-)$	0.304	6.910	52.653
$(60,0,j^-) \leftarrow (62,0,j^-)$	0.329	7.883	58.006
$(70,0,j^-) \leftarrow (74,0,j^-)$	0.338	5.710	70.621
$(58,0,j^-) \leftarrow (60,0,j^-)$	0.362	9.032	64.110
$(72,0,j^-) \leftarrow (76,0,j^-)$	0.403	5.890	65.043
$(68,0,j^-) \leftarrow (72,0,j^-)$	0.404	5.890	76.855
$(56,0,j^-) \leftarrow (58,0,j^-)$	0.410	10.400	71.100
$(72,0,j^+) \leftarrow (74,0,j^+)$	0.435	19.053	33.839
$(76,0,j^-) \leftarrow (78,0,j^-)$	0.449	5.136	28.834
$(50,0,j^+) \leftarrow (54,0,j^-)$	0.466	14.168	187.730
$(74,0,j^+) \leftarrow (76,0,j^+)$	0.475	19.053	31.203
$(54,0,j^-) \leftarrow (56,0,j^-)$	0.477	12.036	79.146
$(52,0,j^+) \leftarrow (56,0,j^-)$	0.479	12.098	167.598
$(66,0,j^-) \leftarrow (70,0,j^-)$	0.481	5.710	83.846

TABLE A.18. Type III magic Rydberg-Rydberg $i(m_j = 1/2) \leftarrow f(m_j = 3/2)$ transitions involving states with $50 \leq n \leq 90$ in ^{39}K. The transitions are sorted by increasing standard deviation $\sigma_{i,f}$ of the transition frequency $\nu_{i,f}(F)$ between 0 and $1\,\mathrm{V\,cm^{-1}}$. $\left|\Delta E^{(i,f)}_{\mathrm{Stark}}\right|$ gives the maximal Stark shift of the two individual Rydberg states involved and $\nu^0_{i,f}$ the transition frequency at $0\,\mathrm{V\,cm^{-1}}$.

$i \leftarrow f$	$\sigma_{i,f}$ (MHz)	$\left\|\Delta E^{(i,f)}_{\mathrm{Stark}}/h\right\|$ (MHz)	$\nu^0_{i,f}$ (GHz)
$(62,0,j^+) \leftarrow (64,0,j^+)$	0.102	12.380	52.653
$(60,0,j^+) \leftarrow (62,0,j^+)$	0.128	10.400	58.006
$(64,0,j^+) \leftarrow (66,0,j^+)$	0.133	14.545	47.940
$(58,0,j^+) \leftarrow (60,0,j^+)$	0.173	8.664	64.110
$(56,0,j^+) \leftarrow (58,0,j^+)$	0.224	8.634	71.100
$(66,0,j^+) \leftarrow (68,0,j^+)$	0.233	16.770	43.772
$(54,0,j^+) \leftarrow (56,0,j^+)$	0.283	9.996	79.146
$(52,0,j^+) \leftarrow (54,0,j^+)$	0.354	11.638	88.453
$(68,0,j^+) \leftarrow (70,0,j^+)$	0.392	18.947	40.074
$(68,0,j^+) \leftarrow (72,0,j^+)$	0.400	18.947	76.855
$(74,0,j^-) \leftarrow (72,0,j^+)$	0.407	18.746	33.839
$(50,0,j^+) \leftarrow (52,0,j^+)$	0.445	13.631	99.278
$(74,0,j^-) \leftarrow (76,0,j^+)$	0.453	18.746	31.203
$(72,0,j^-) \leftarrow (74,0,j^+)$	0.463	19.053	33.839
$(50,0,j^-) \leftarrow (54,0,j^-)$	0.466	14.166	187.730
$(66,0,j^+) \leftarrow (70,0,j^+)$	0.475	17.529	83.846
$(52,0,j^-) \leftarrow (56,0,j^-)$	0.480	12.096	167.598
$(72,0,j^-) \leftarrow (70,0,j^+)$	0.486	18.457	36.781
$(50,0,j^-) \leftarrow (52,0,j^-)$	0.496	14.166	99.278
$(50,0,j^+) \leftarrow (54,0,j^-)$	0.499	13.631	187.730