Supplementary Materials

Supplementary Table 1: Measured R_F and R_P values for $\Delta J > 0$. Note that the ratio $\frac{f(J_2'-1, J_2')}{f(J_1'-1, J_1')}$ is equal to 0.969, 0.940, 0.913, and 0.888 for $J_1' = 30$, and $\Delta J = +1, +2, +3,$ and $+4$, respectively.

		R_F				R_P			
n_K (10^{15} cm^{-3})	n_{Ar} (10^{15} cm^{-3})	$\Delta J = +1$	$\Delta J = +2$	$\Delta J = +3$	$\Delta J = +4$	$\Delta J = +1$	$\Delta J = +2$	$\Delta J = +3$	$\Delta J = +4$
0.33	1.6						0.000 ± 0.026		
0.31	5.5						0.000 ± 0.026		
0.33	9.3						0.027 ± 0.048		
0.33	15.1						0.037 ± 0.050		
0.31	20.9						0.059 ± 0.057		
0.40	1.5	0.008 ± 0.012	0.014 ± 0.021						
0.42	3.4		0.017 ± 0.018						
0.41	5.3	0.011 ± 0.011	0.024 ± 0.018	0.005 ± 0.008					
0.41	11.0					0.035 ± 0.137			
0.42	11.0						0.046 ± 0.139		
0.40	11.1	0.022 ± 0.015	0.034 ± 0.016	0.008 ± 0.009	0.010 ± 0.010				
0.41	14.8					0.018 ± 0.021 0.032 ± 0.030 0.020 ± 0.018	0.036 ± 0.041 0.041 ± 0.048 0.042 ± 0.051 0.037 ± 0.046 0.039 ± 0.047	0.016 ± 0.053 0.000 ± 0.017	0.000 ± 0.019
0.41	16.7		0.055 ± 0.017	0.010 ± 0.010 0.012 ± 0.009	0.015 ± 0.010				
0.41	20.5		0.056 ± 0.017	0.014 ± 0.010					

		R_F				R_P			
n_K (10^{15} cm^{-3})	n_{Ar} (10^{15} cm^{-3})	$\Delta J = +1$	$\Delta J = +2$	$\Delta J = +3$	$\Delta J = +4$	$\Delta J = +1$	$\Delta J = +2$	$\Delta J = +3$	$\Delta J = +4$
1.8	3.5	0.020 ± 0.009	0.024 ± 0.012	0.007 ± 0.005	0.007 ± 0.007	0.016 ± 0.014	0.019 ± 0.019	0.004 ± 0.009	0.006 ± 0.016
1.8	12.2	0.025 ± 0.008	0.042 ± 0.012	0.010 ± 0.005	0.012 ± 0.005	0.019 ± 0.012	0.023 ± 0.014	0.006 ± 0.008	0.010 ± 0.012
2.0	29.5	0.037 ± 0.009	0.070 ± 0.013	0.018 ± 0.005	0.024 ± 0.007	0.022 ± 0.010	0.039 ± 0.015	0.010 ± 0.009	0.022 ± 0.014
1.8	29.8	0.036 ± 0.009	0.057 ± 0.011	0.017 ± 0.005	0.020 ± 0.006	0.027 ± 0.012	0.036 ± 0.015	0.014 ± 0.013	0.020 ± 0.013
1.7	30.0	0.032 ± 0.008	0.069 ± 0.013	0.018 ± 0.005	0.027 ± 0.008	0.027 ± 0.013	0.051 ± 0.020	0.011 ± 0.011	0.023 ± 0.017
1.8	65.0	0.045 ± 0.010	0.088 ± 0.016	0.025 ± 0.007	0.037 ± 0.010	0.037 ± 0.017	0.058 ± 0.021	0.021 ± 0.017	0.028 ± 0.016
1.7	98.7	0.052 ± 0.011	0.111 ± 0.019	0.027 ± 0.007	0.050 ± 0.012	0.040 ± 0.027	0.082 ± 0.034	0.018 ± 0.019	0.036 ± 0.027
1.9	115.5	0.049 ± 0.010	0.112 ± 0.019	0.027 ± 0.007	0.052 ± 0.012	0.042 ± 0.026	0.068 ± 0.026	0.029 ± 0.026	0.040 ± 0.024
1.8	135.5	0.048 ± 0.011	0.082 ± 0.015	0.033 ± 0.009	0.062 ± 0.014	0.045 ± 0.030	0.097 ± 0.039	0.036 ± 0.029	0.040 ± 0.027
2.2	3.0	0.022 ± 0.014	0.022 ± 0.016			0.016 ± 0.015	0.018 ± 0.020		
2.2	27.3	0.034 ± 0.013	0.056 ± 0.016			0.031 ± 0.013	0.043 ± 0.017		
2.2	133.2	0.053 ± 0.027	0.113 ± 0.035			0.056 ± 0.041	0.097 ± 0.044		
5.2	8.1	0.044 ± 0.010	0.044 ± 0.011	0.015 ± 0.004	0.011 ± 0.004	0.015 ± 0.004	0.010 ± 0.004	0.004 ± 0.003	0.004 ± 0.003
5.4	24.2	0.048 ± 0.009	0.058 ± 0.010	0.019 ± 0.004	0.018 ± 0.005	0.017 ± 0.003	0.017 ± 0.005	0.006 ± 0.003	0.006 ± 0.003
5.0	24.8	0.046 ± 0.009	0.061 ± 0.010	0.017 ± 0.003	0.019 ± 0.005	0.014 ± 0.003	0.018 ± 0.005	0.006 ± 0.003	0.007 ± 0.003
5.0	24.8	0.044 ± 0.009	0.069 ± 0.012	0.019 ± 0.004	0.023 ± 0.006	0.016 ± 0.003	0.018 ± 0.006	0.005 ± 0.003	0.006 ± 0.003
4.9	43.1	0.049 ± 0.009	0.082 ± 0.014	0.022 ± 0.004	0.028 ± 0.007	0.018 ± 0.004	0.025 ± 0.007	0.007 ± 0.003	0.009 ± 0.004
5.3	55.7	0.053 ± 0.009	0.089 ± 0.016	0.024 ± 0.005	0.029 ± 0.008	0.019 ± 0.004	0.028 ± 0.008	0.008 ± 0.003	0.010 ± 0.004
5.2	74.0	0.055 ± 0.009	0.098 ± 0.017	0.026 ± 0.005	0.038 ± 0.009	0.020 ± 0.005	0.030 ± 0.008	0.008 ± 0.004	0.012 ± 0.005
5.1	89.2	0.058 ± 0.010	0.103 ± 0.018	0.028 ± 0.006	0.038 ± 0.009	0.027 ± 0.006	0.040 ± 0.010	0.013 ± 0.005	0.016 ± 0.006
5.0	107.5	0.055 ± 0.009	0.118 ± 0.020	0.030 ± 0.006	0.047 ± 0.010	0.025 ± 0.006	0.040 ± 0.010	0.011 ± 0.005	0.016 ± 0.006
5.1	120.6	0.056 ± 0.009	0.123 ± 0.021	0.031 ± 0.006	0.053 ± 0.012	0.028 ± 0.007	0.047 ± 0.012	0.015 ± 0.006	0.024 ± 0.008

		R_F				R_P			
n_K (10^{15} cm^{-3})	n_{Ar} (10^{15} cm^{-3})	$\Delta J = +1$	$\Delta J = +2$	$\Delta J = +3$	$\Delta J = +4$	$\Delta J = +1$	$\Delta J = +2$	$\Delta J = +3$	$\Delta J = +4$
8.6	12.2	0.053 ± 0.012	0.053 ± 0.012	0.017 ± 0.005	0.015 ± 0.006	0.010 ± 0.002	0.010 ± 0.003	0.003 ± 0.002	0.004 ± 0.003
8.7	18.5	0.055 ± 0.012	0.062 ± 0.012	0.019 ± 0.005	0.019 ± 0.007	0.014 ± 0.003	0.015 ± 0.005	0.004 ± 0.003	0.005 ± 0.003
8.7	21.7	0.056 ± 0.012	0.062 ± 0.012	0.019 ± 0.005	0.018 ± 0.007	0.007 ± 0.002	0.008 ± 0.003	0.003 ± 0.002	0.004 ± 0.002
8.7	36.1	0.056 ± 0.012	0.080 ± 0.016	0.023 ± 0.006	0.026 ± 0.009	0.014 ± 0.003	0.021 ± 0.007	0.004 ± 0.002	0.006 ± 0.003
8.9	50.2	0.056 ± 0.012	0.082 ± 0.017	0.023 ± 0.007	0.026 ± 0.010	0.014 ± 0.003	0.020 ± 0.006	0.005 ± 0.003	0.007 ± 0.003
8.7	82.4	0.059 ± 0.013	0.109 ± 0.024	0.030 ± 0.010	0.043 ± 0.015	0.016 ± 0.004	0.028 ± 0.008	0.007 ± 0.004	0.012 ± 0.005
8.5	114.8	0.060 ± 0.014	0.118 ± 0.026	0.030 ± 0.010	0.054 ± 0.018	0.019 ± 0.006	0.044 ± 0.013	0.011 ± 0.006	0.017 ± 0.007
9.8	10.9	0.051 ± 0.010	0.051 ± 0.011	0.018 ± 0.005	0.015 ± 0.005	0.009 ± 0.002	0.007 ± 0.002	0.003 ± 0.002	0.003 ± 0.003
9.8	36.2	0.056 ± 0.010	0.077 ± 0.014	0.024 ± 0.005	0.027 ± 0.008	0.005 ± 0.001	0.008 ± 0.003	0.002 ± 0.001	0.003 ± 0.002
9.4	81.4	0.061 ± 0.011	0.106 ± 0.021	0.030 ± 0.007	0.039 ± 0.012	0.010 ± 0.003	0.022 ± 0.006	0.007 ± 0.003	0.010 ± 0.004
14.6	0.0	0.059 ± 0.010	0.039 ± 0.007			0.005 ± 0.001	0.004 ± 0.001		
14.7	0.0			0.015 ± 0.004	0.010 ± 0.003			0.005 ± 0.002	
22.9	0.0	0.063 ± 0.010	0.050 ± 0.008	0.017 ± 0.004	0.018 ± 0.005				
28.7	0.0	0.055 ± 0.011	0.048 ± 0.010	0.017 ± 0.006	0.017 ± 0.006	0.002 ± 0.001			
36.2	0.0	0.051 ± 0.015	0.061 ± 0.016	0.010 ± 0.007	0.020 ± 0.011				

Supplementary Table 2: Measured R_F and R_P values for $\Delta J < 0$. Note that the ratio $\frac{f(J_2'-1, J_2')}{f(J_1'-1, J_1')}$ is equal to 1.033, 1.068, 1.105, and 1.145 for $J_1' = 30$, and $\Delta J = -1, -2, -3,$ and -4, respectively.

		R_F				R_P			
n_K (10^{15} cm^{-3})	n_{Ar} (10^{15} cm^{-3})	$\Delta J = -1$	$\Delta J = -2$	$\Delta J = -3$	$\Delta J = -4$	$\Delta J = -1$	$\Delta J = -2$	$\Delta J = -3$	$\Delta J = -4$
0.41	14.8					0.017 ± 0.025 0.017 ± 0.034	0.046 ± 0.055 0.053 ± 0.054	0.000 ± 0.019	0.000 ± 0.019
1.8	3.5	0.021 ± 0.010	0.023 ± 0.013	0.010 ± 0.007	0.007 ± 0.006				
1.8	12.2	0.025 ± 0.008	0.041 ± 0.012	0.012 ± 0.005	0.014 ± 0.006	0.018 ± 0.014	0.033 ± 0.020	0.016 ± 0.021	0.008 ± 0.009
1.8	29.8	0.038 ± 0.008	0.064 ± 0.015	0.022 ± 0.006	0.020 ± 0.007	0.027 ± 0.014	0.044 ± 0.019	0.020 ± 0.019	0.010 ± 0.009
1.8	65.0	0.041 ± 0.009	0.089 ± 0.018	0.027 ± 0.007	0.035 ± 0.009	0.029 ± 0.016	0.062 ± 0.023	0.028 ± 0.025	0.015 ± 0.011
1.7	98.7	0.043 ± 0.010	0.100 ± 0.019	0.033 ± 0.009	0.050 ± 0.012	0.036 ± 0.025	0.091 ± 0.034	0.034 ± 0.033	0.029 ± 0.021
1.9	115.5	0.045 ± 0.010	0.097 ± 0.018	0.033 ± 0.009	0.050 ± 0.011	0.031 ± 0.021	0.078 ± 0.031	0.035 ± 0.034	0.024 ± 0.018
1.8	135.5	0.050 ± 0.012	0.117 ± 0.021	0.034 ± 0.010	0.055 ± 0.013	0.035 ± 0.026	0.099 ± 0.038	0.034 ± 0.034	0.029 ± 0.021
4.8	8.5	0.041 ± 0.010	0.041 ± 0.011	0.016 ± 0.005	0.014 ± 0.005	0.018 ± 0.012	0.016 ± 0.012	0.006 ± 0.004	0.006 ± 0.005
5.2	24.6	0.050 ± 0.009	0.062 ± 0.016	0.023 ± 0.006	0.023 ± 0.007	0.023 ± 0.010	0.029 ± 0.013	0.008 ± 0.004	0.009 ± 0.005
4.9	24.9	0.050 ± 0.009	0.057 ± 0.015	0.021 ± 0.006	0.018 ± 0.006	0.020 ± 0.009	0.026 ± 0.012	0.009 ± 0.005	0.008 ± 0.005
4.8	25.1	0.048 ± 0.009	0.065 ± 0.016	0.023 ± 0.006	0.026 ± 0.007	0.021 ± 0.009	0.029 ± 0.013	0.008 ± 0.004	0.010 ± 0.005
5.1	41.2	0.053 ± 0.009	0.080 ± 0.019	0.028 ± 0.007	0.033 ± 0.009	0.026 ± 0.010	0.041 ± 0.015	0.013 ± 0.006	0.015 ± 0.007
4.8	58.2	0.061 ± 0.011	0.093 ± 0.022	0.033 ± 0.009	0.040 ± 0.011	0.023 ± 0.009	0.042 ± 0.014	0.012 ± 0.006	0.014 ± 0.006
5.0	89.2	0.067 ± 0.012	0.111 ± 0.024	0.042 ± 0.011	0.054 ± 0.014	0.028 ± 0.011	0.062 ± 0.019	0.016 ± 0.008	0.021 ± 0.009
4.9	106.0	0.064 ± 0.012	0.115 ± 0.025	0.045 ± 0.012	0.060 ± 0.015	0.028 ± 0.012	0.062 ± 0.020	0.015 ± 0.008	0.020 ± 0.009
4.9	126.1	0.065 ± 0.014	0.111 ± 0.024	0.047 ± 0.013	0.058 ± 0.015	0.030 ± 0.013	0.072 ± 0.023	0.017 ± 0.010	0.024 ± 0.011

		R_F				R_P			
n_K (10^{15} cm^{-3})	n_{Ar} (10^{15} cm^{-3})	$\Delta J = -1$	$\Delta J = -2$	$\Delta J = -3$	$\Delta J = -4$	$\Delta J = -1$	$\Delta J = -2$	$\Delta J = -3$	$\Delta J = -4$
8.6	12.2	0.041 ± 0.010	0.041 ± 0.012	0.026 ± 0.008	0.015 ± 0.006	0.008 ± 0.005	0.009 ± 0.006	0.003 ± 0.002	0.002 ± 0.001
8.7	21.7	0.041 ± 0.009	0.044 ± 0.013	0.026 ± 0.007	0.016 ± 0.006	0.005 ± 0.003	0.007 ± 0.004	0.003 ± 0.001	0.002 ± 0.001
8.7	36.1	0.042 ± 0.008	0.061 ± 0.018	0.029 ± 0.009	0.025 ± 0.009	0.009 ± 0.004	0.016 ± 0.007	0.005 ± 0.002	0.005 ± 0.002
8.9	50.2	0.043 ± 0.009	0.060 ± 0.017	0.027 ± 0.009	0.024 ± 0.009	0.011 ± 0.005	0.017 ± 0.007	0.005 ± 0.002	0.005 ± 0.002
8.7	82.4	0.046 ± 0.012	0.087 ± 0.024	0.033 ± 0.011	0.039 ± 0.014	0.012 ± 0.005	0.026 ± 0.009	0.008 ± 0.004	0.008 ± 0.004
8.5	114.8	0.047 ± 0.013	0.099 ± 0.027	0.036 ± 0.013	0.045 ± 0.015	0.018 ± 0.008	0.038 ± 0.013	0.009 ± 0.004	0.015 ± 0.006
14.7	0.0	0.037 ± 0.007	0.027 ± 0.006	0.020 ± 0.005	0.009 ± 0.003	0.002 ± 0.001	0.002 ± 0.001	0.003 ± 0.001	0.001 ± 0.001
22.9	0.0	0.033 ± 0.006	0.027 ± 0.005	0.015 ± 0.004	0.011 ± 0.003				
28.7	0.0	0.029 ± 0.005	0.025 ± 0.004	0.013 ± 0.002	0.012 ± 0.003	0.001 ± 0.001			
36.2	0.0	0.019 ± 0.010	0.020 ± 0.009	0.011 ± 0.008	0.012 ± 0.008				

Fig. 1: Fluorescence data, $\Delta J = +1$

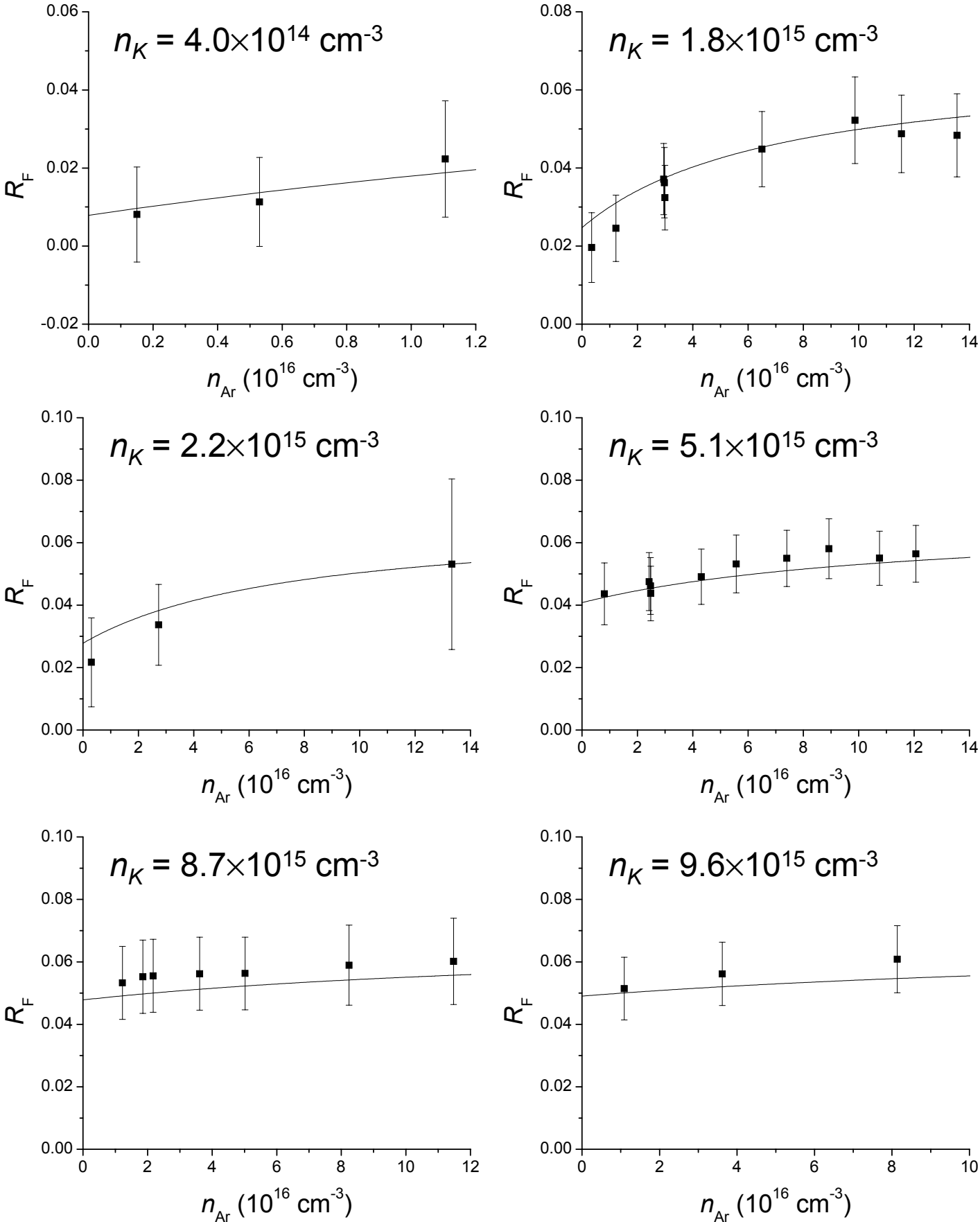


Fig. 1: Fluorescence data, $\Delta J = +1$

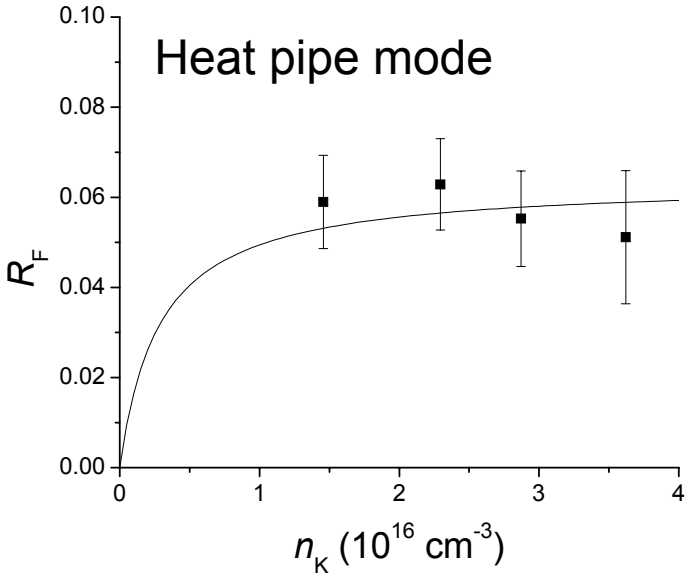
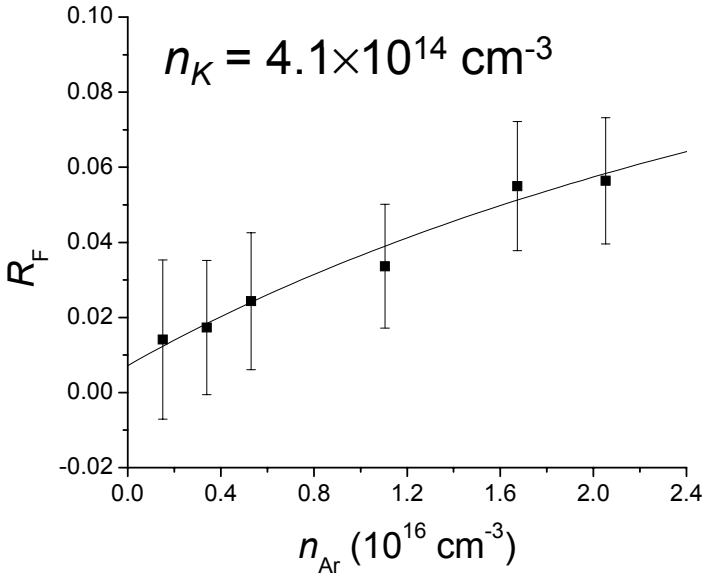
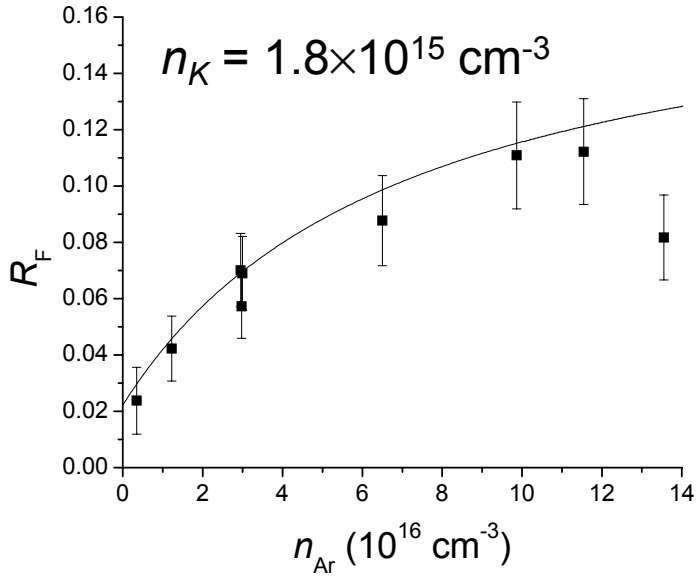
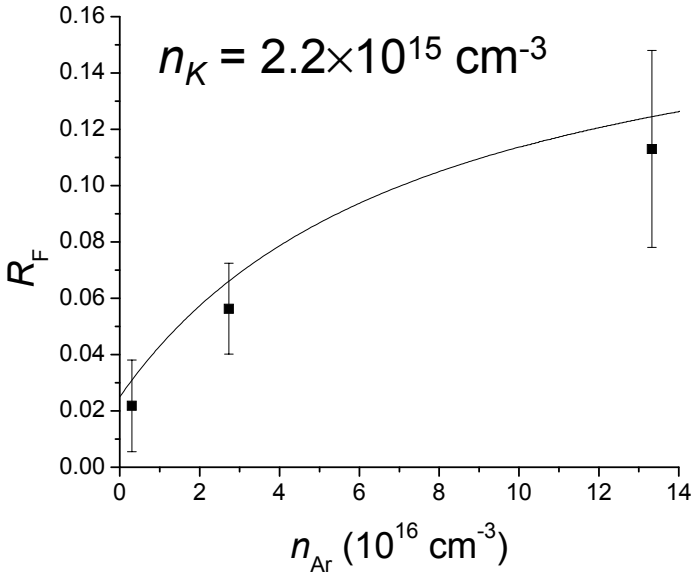
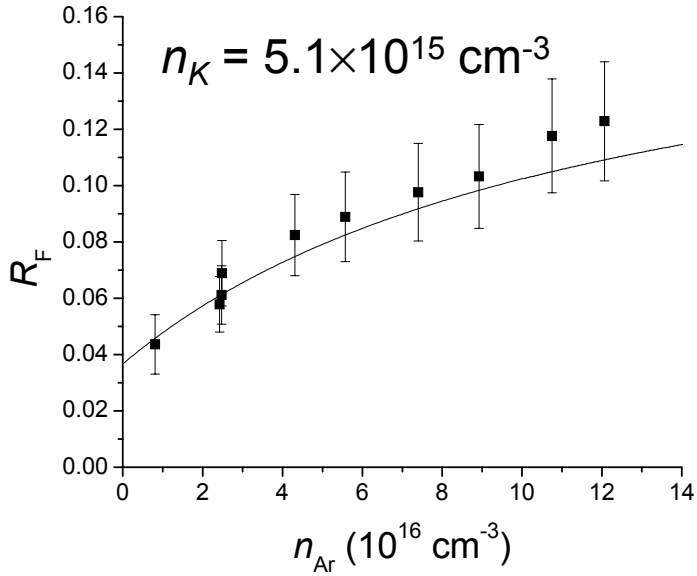


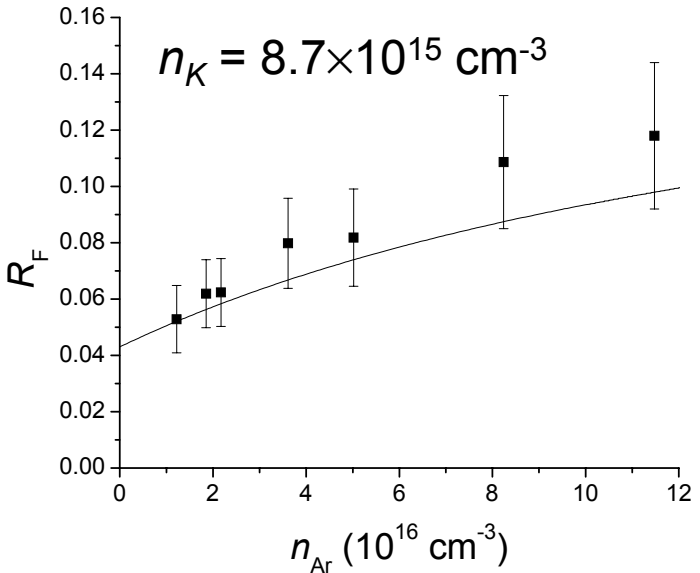
Fig. 2: Fluorescence data, $\Delta J = +2$











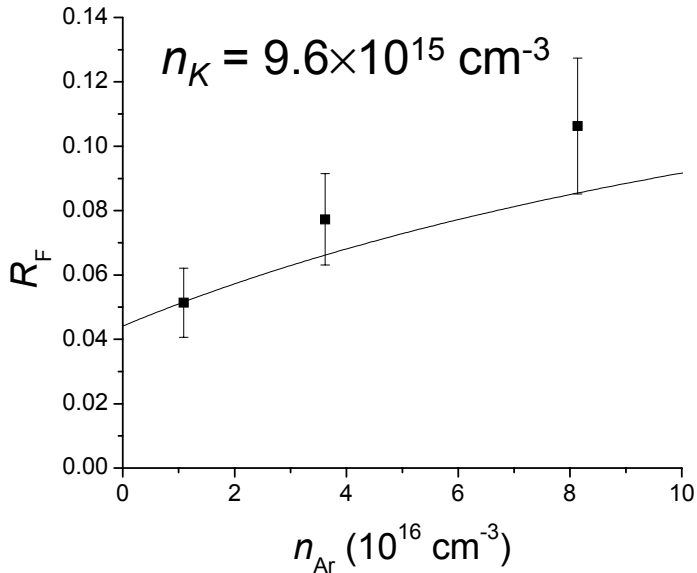


Fig. 2: Fluorescence data, $\Delta J = +2$

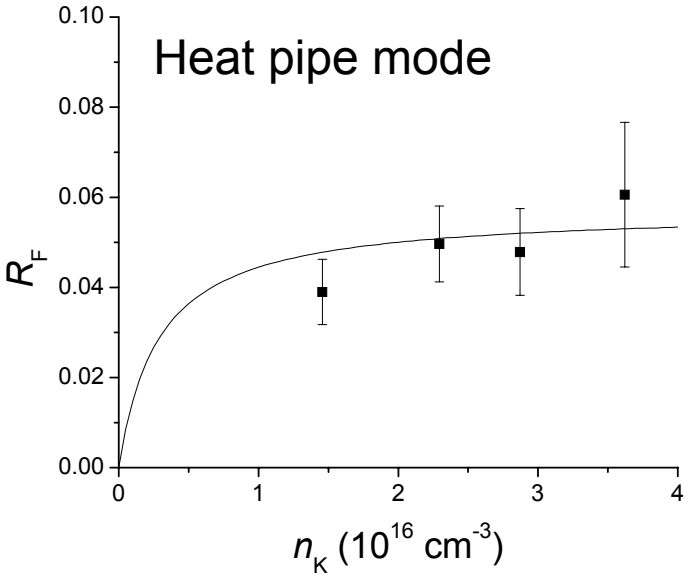
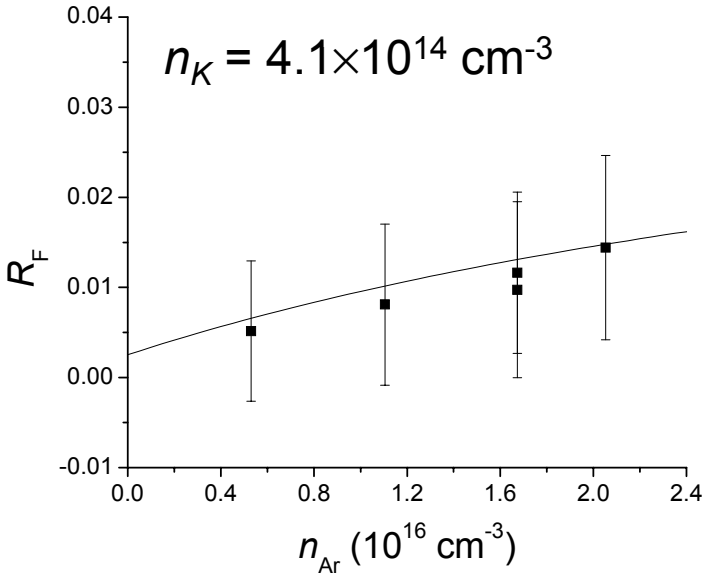
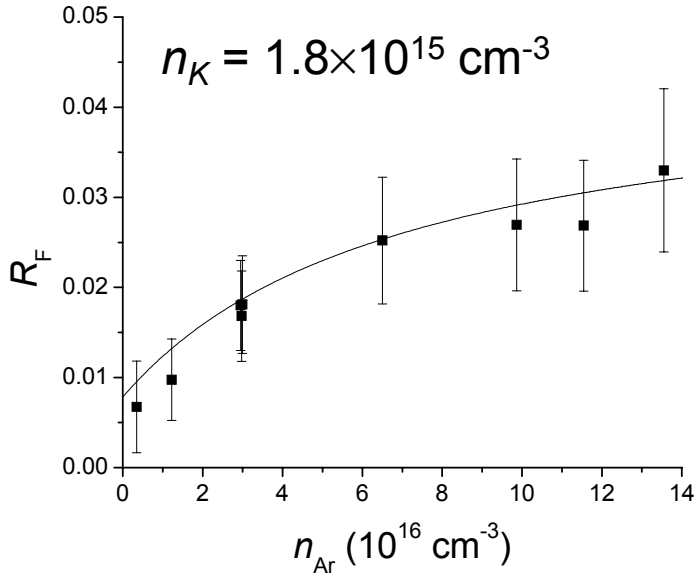
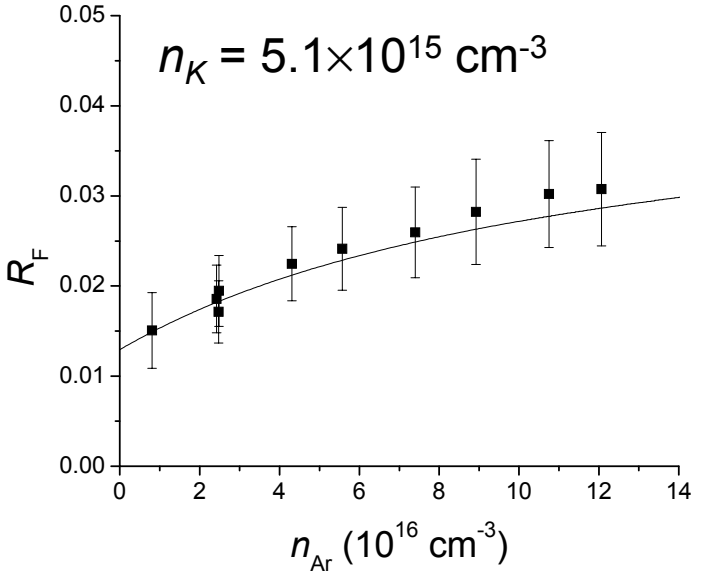
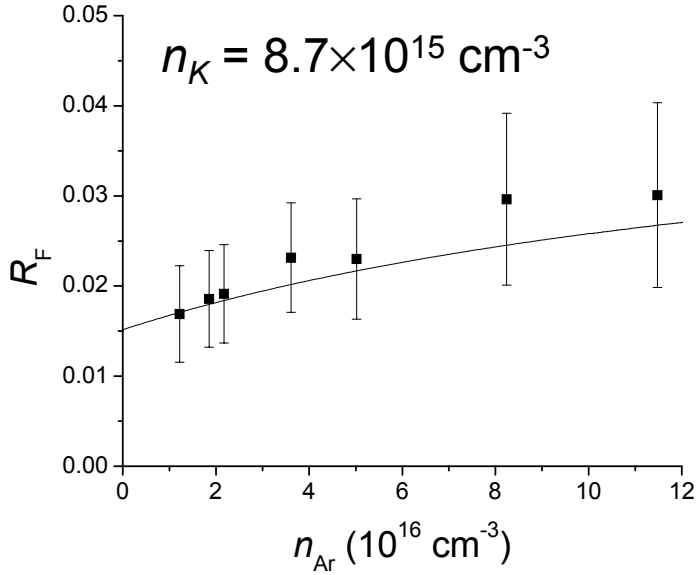


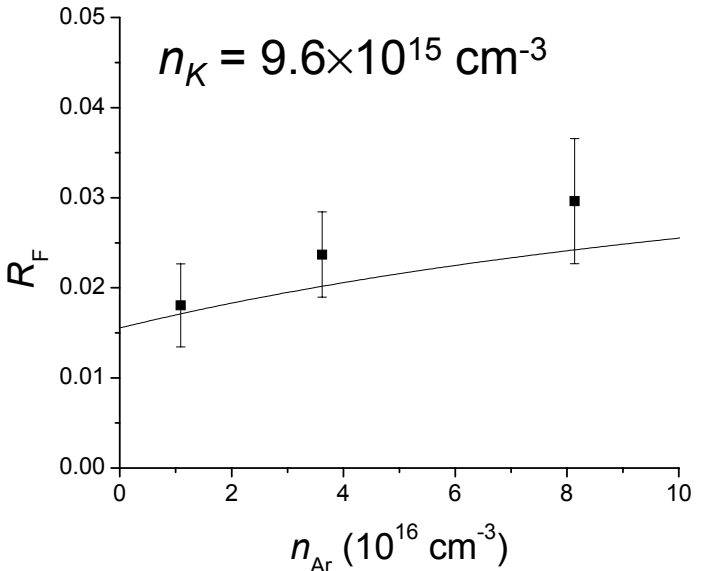
Fig. 3: Fluorescence data, $\Delta J = +3$











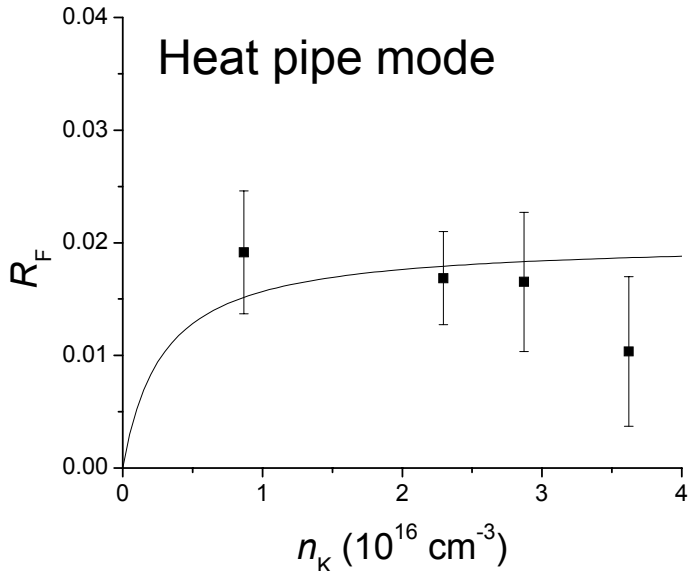
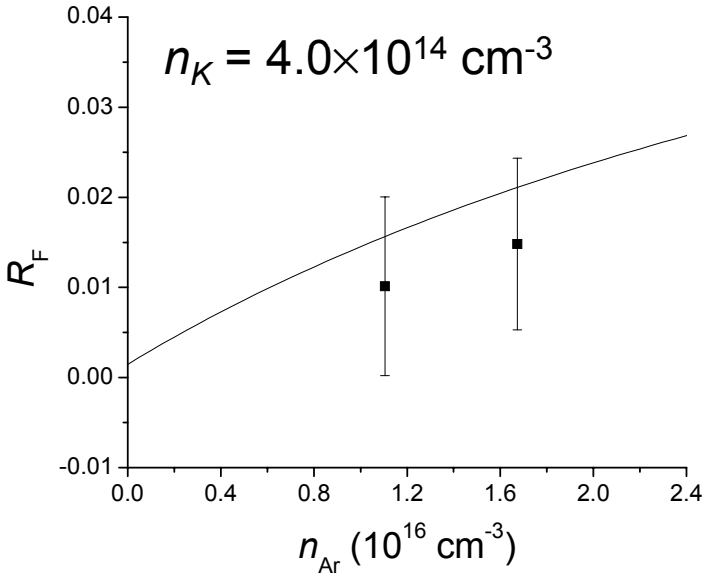
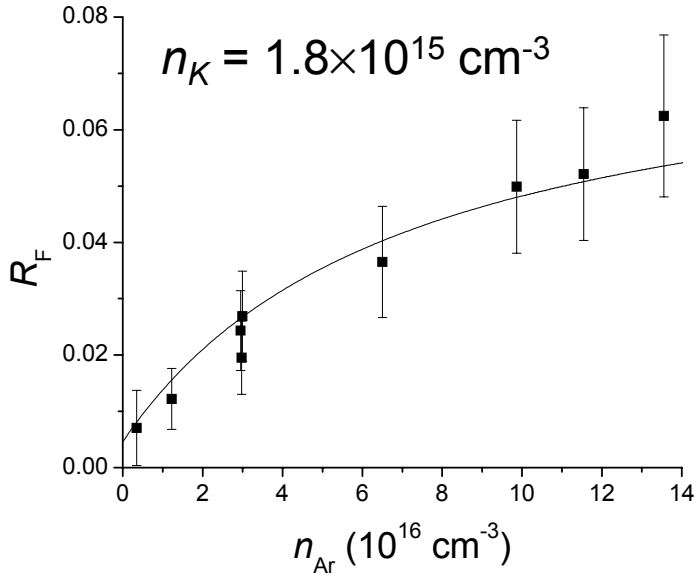
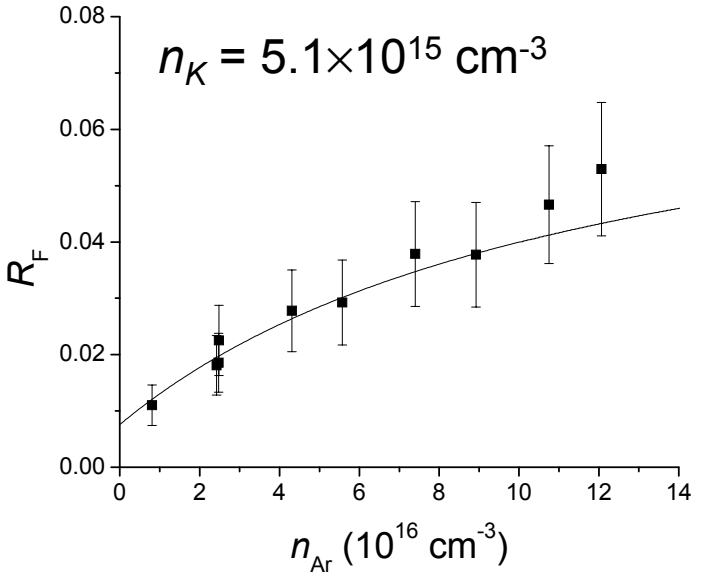
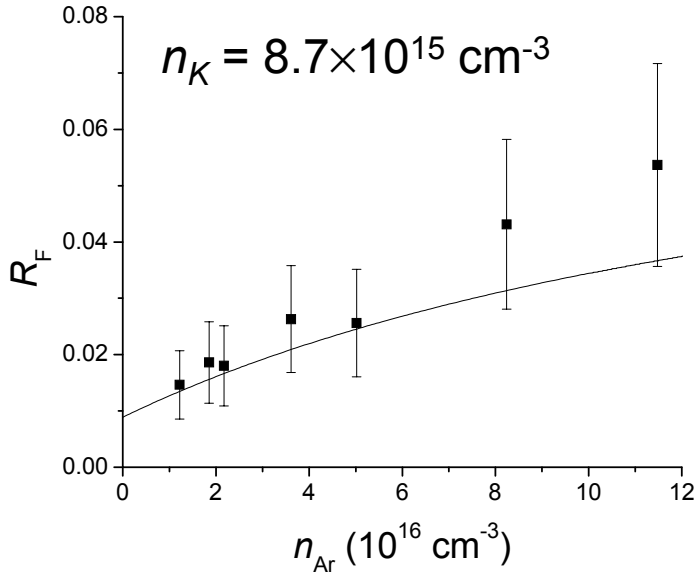


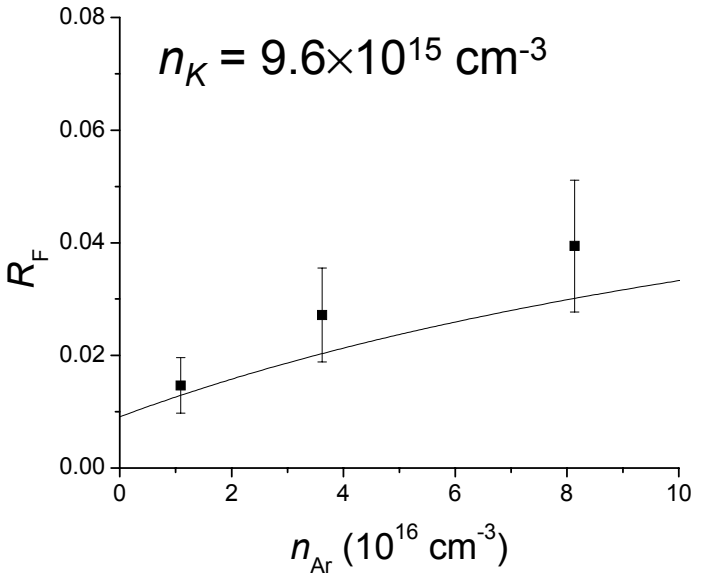
Fig. 4: Fluorescence data, $\Delta J = +4$











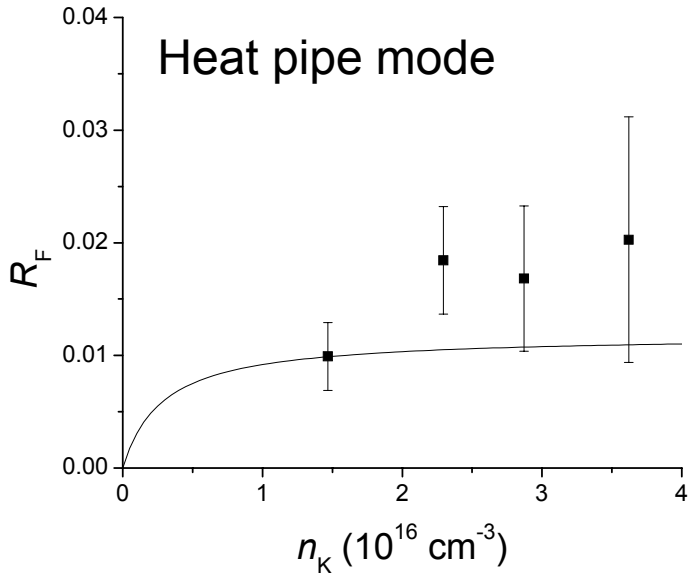
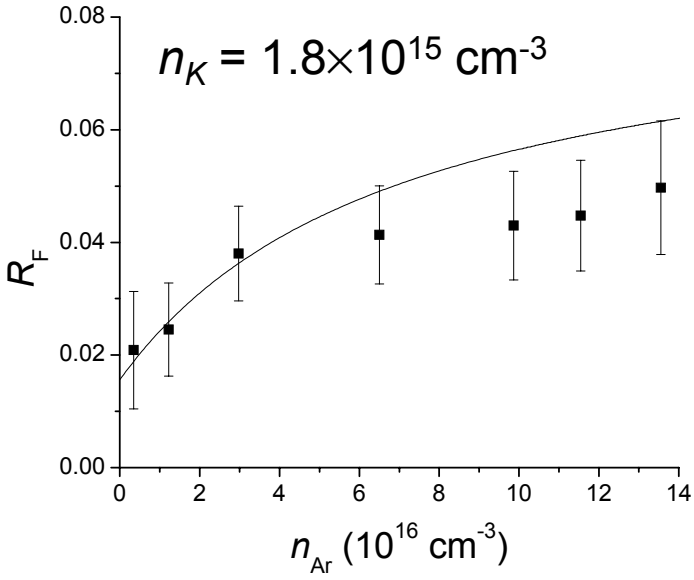
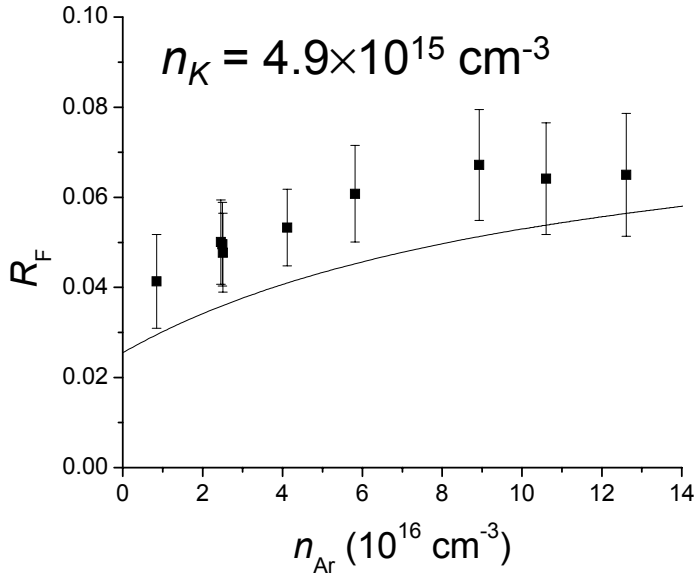
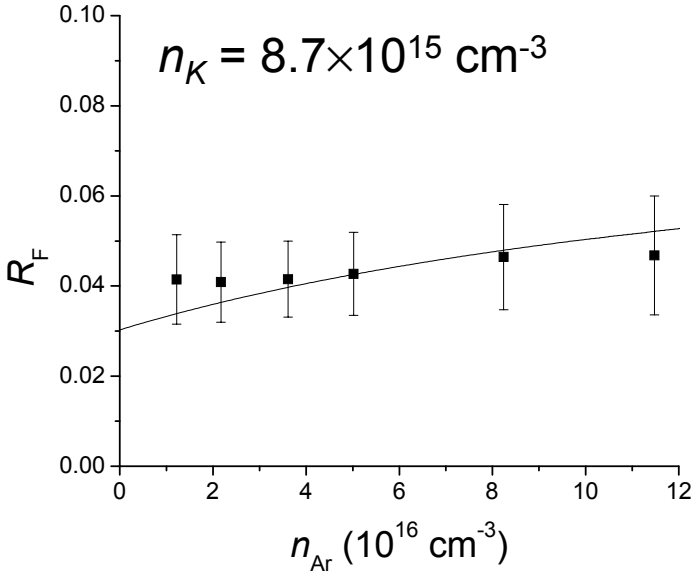


Fig. 5: Fluorescence data, $\Delta J = -1$







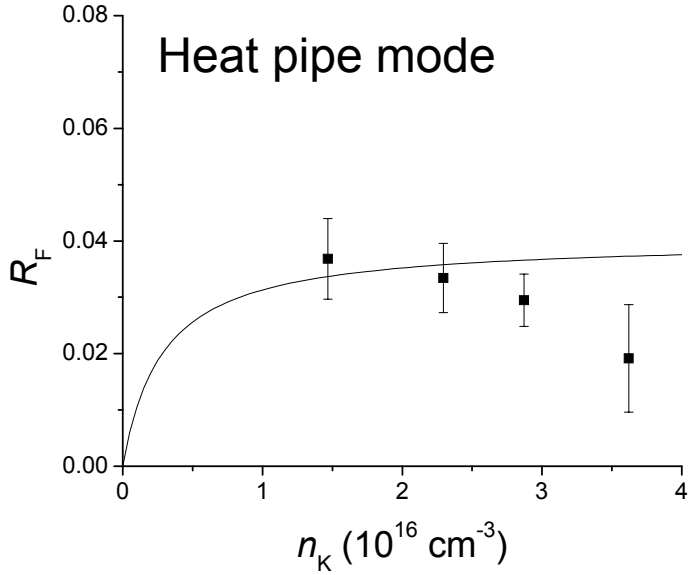
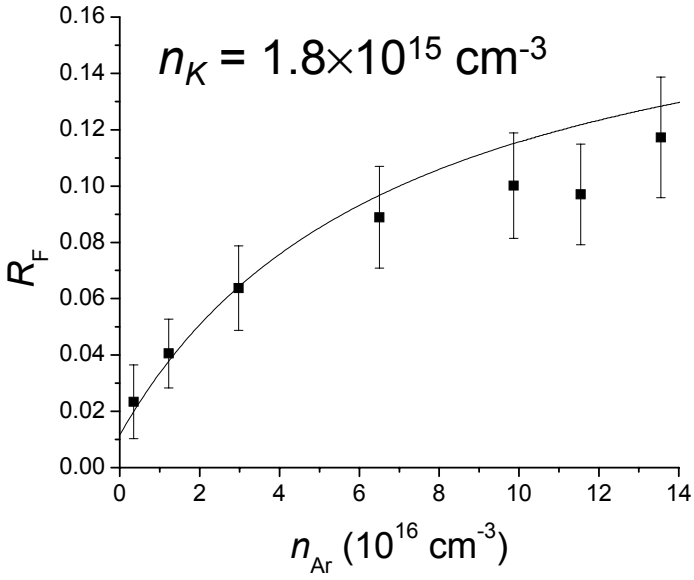
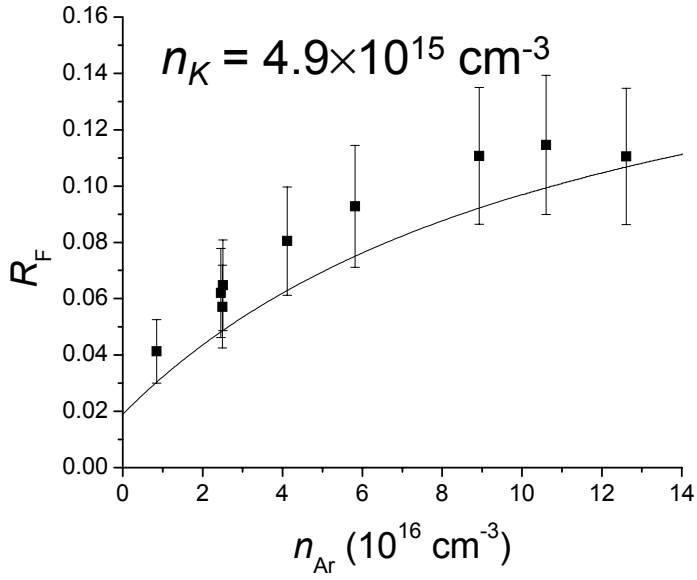
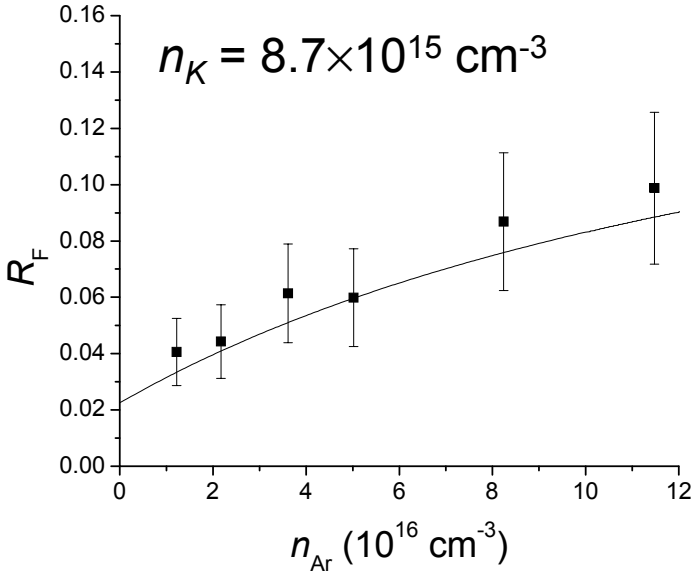


Fig. 6: Fluorescence data, $\Delta J = -2$







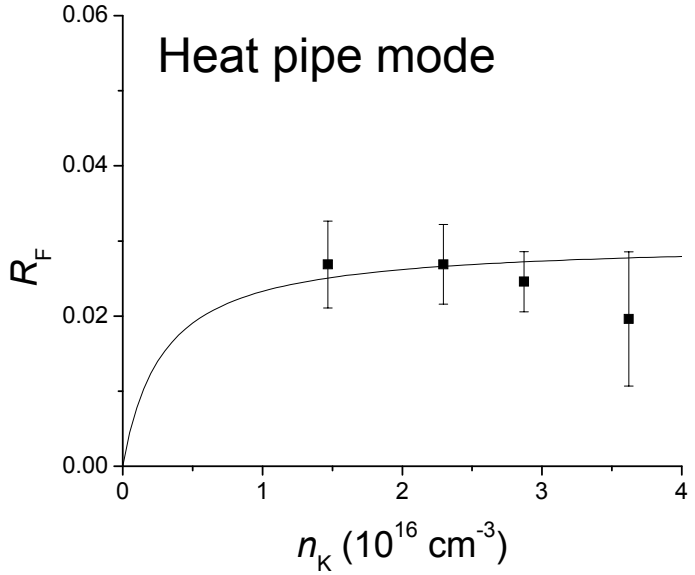
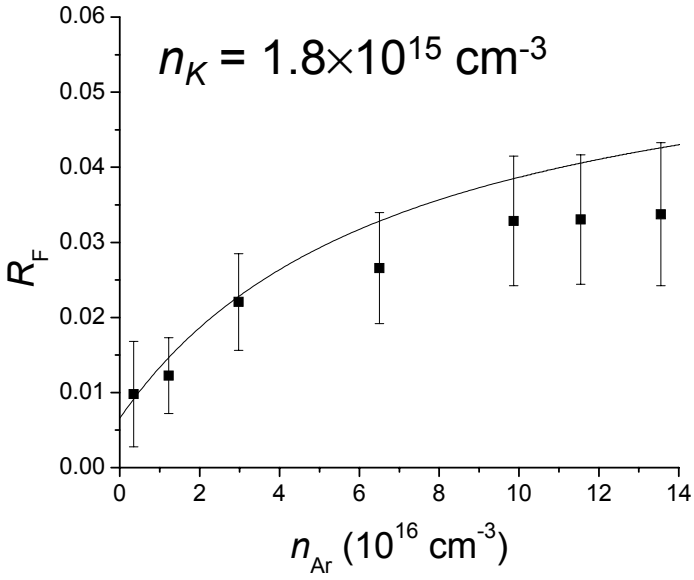
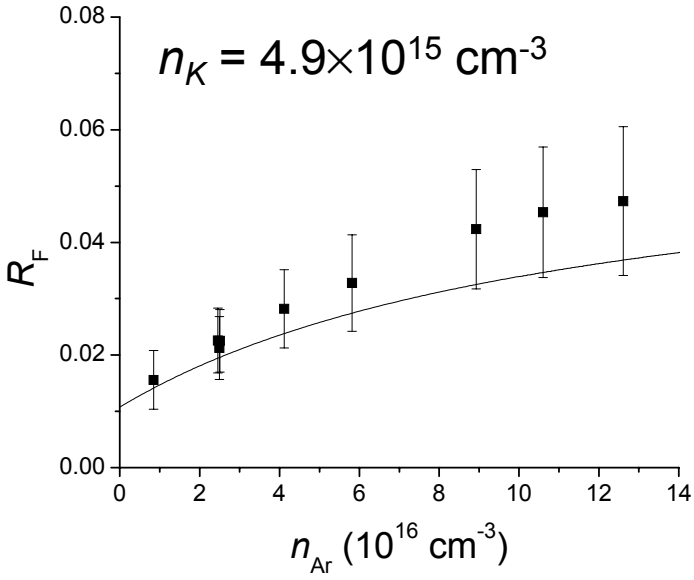
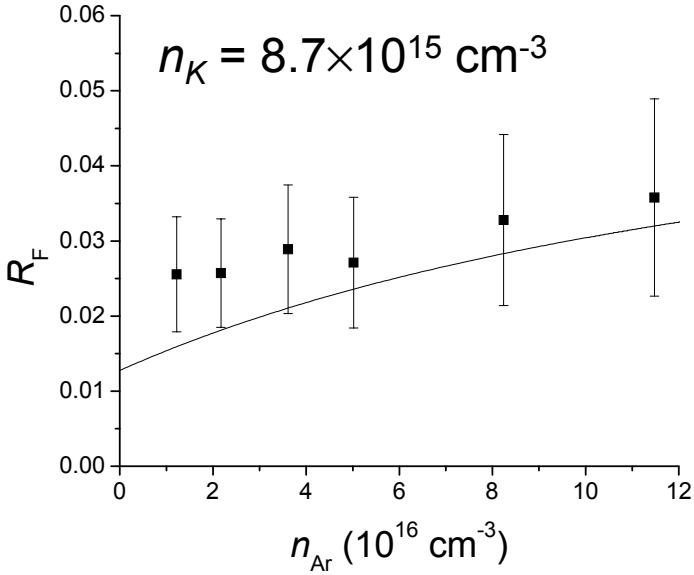


Fig. 7: Fluorescence data, $\Delta J = -3$







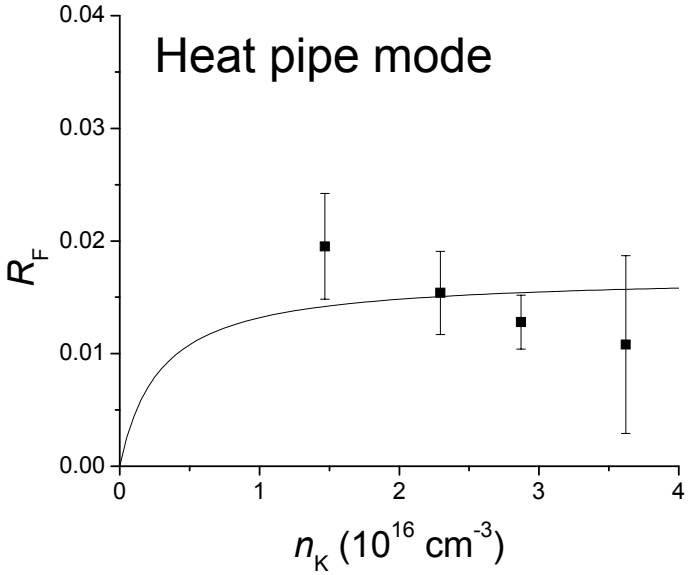


Fig. 8: Fluorescence data, $\Delta J = -4$

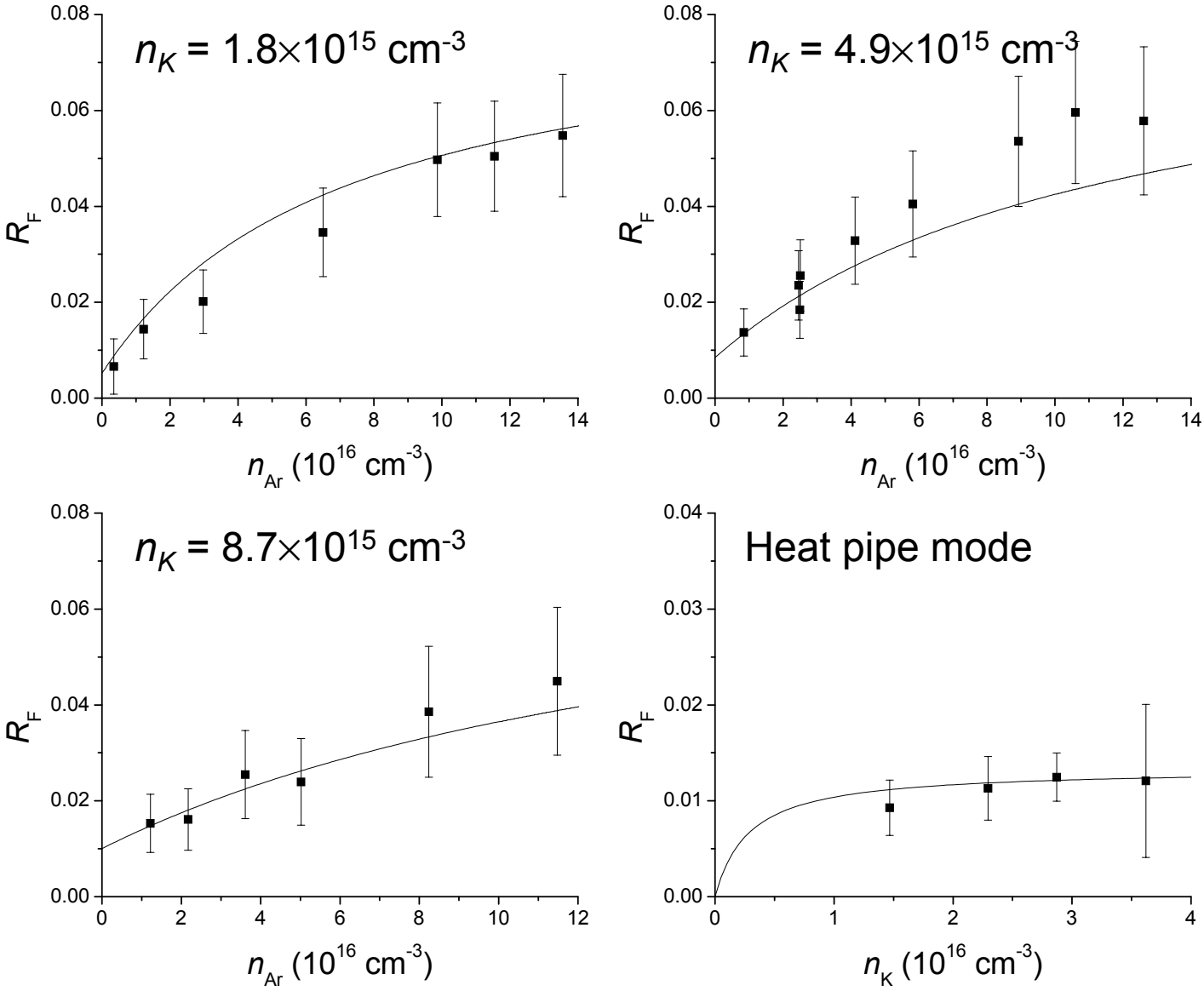


Fig. 9: Polarization data, $\Delta J = +1$

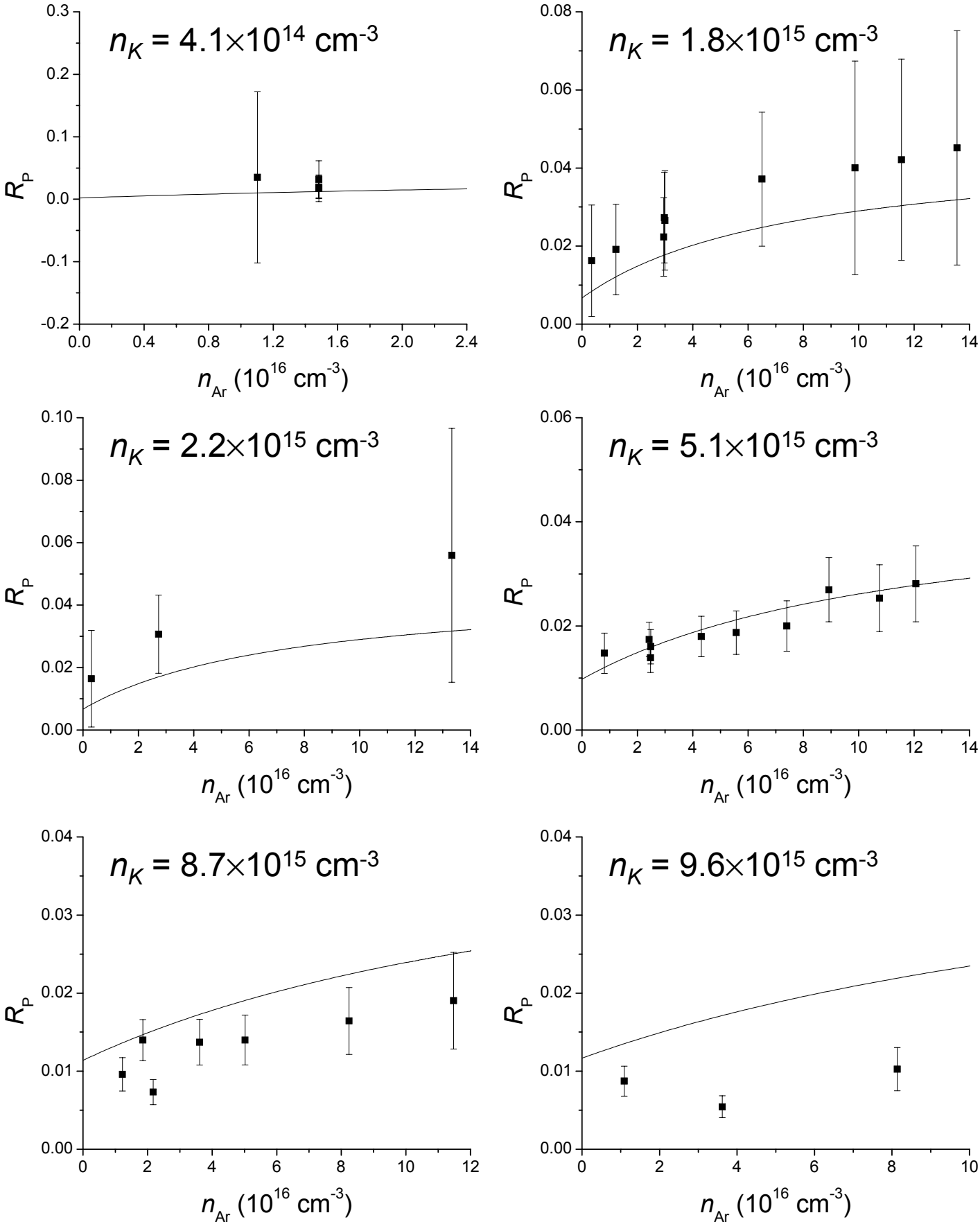


Fig. 9: Polarization data, $\Delta J = +1$

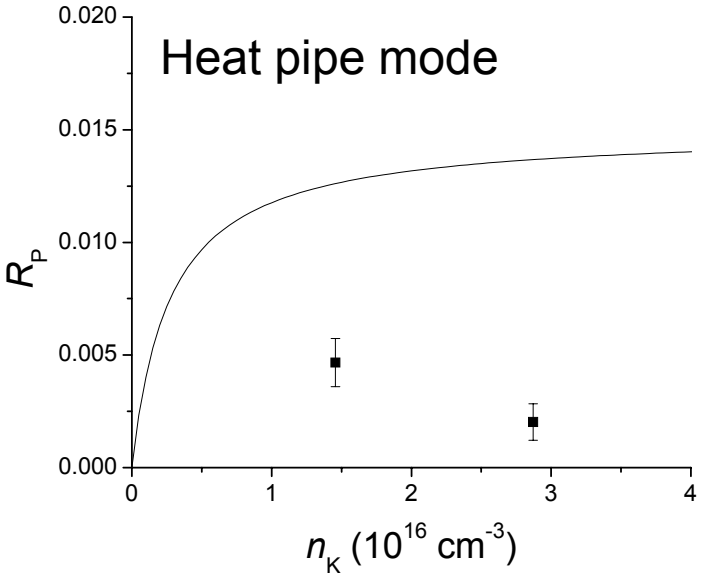
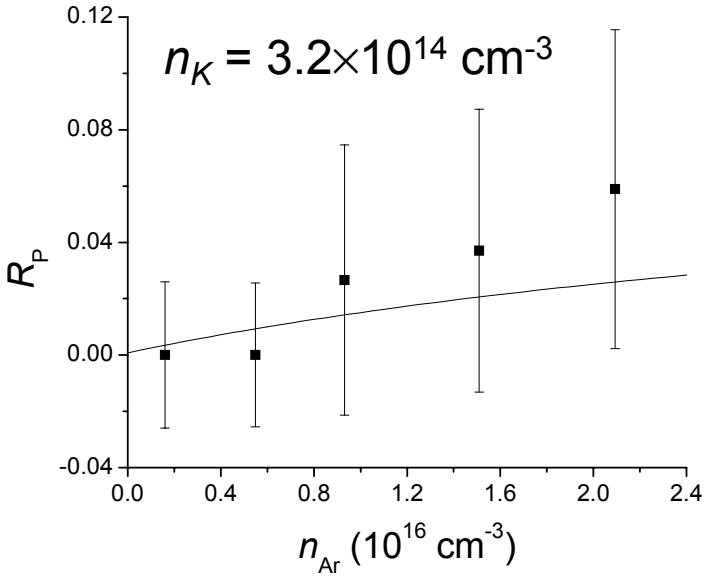
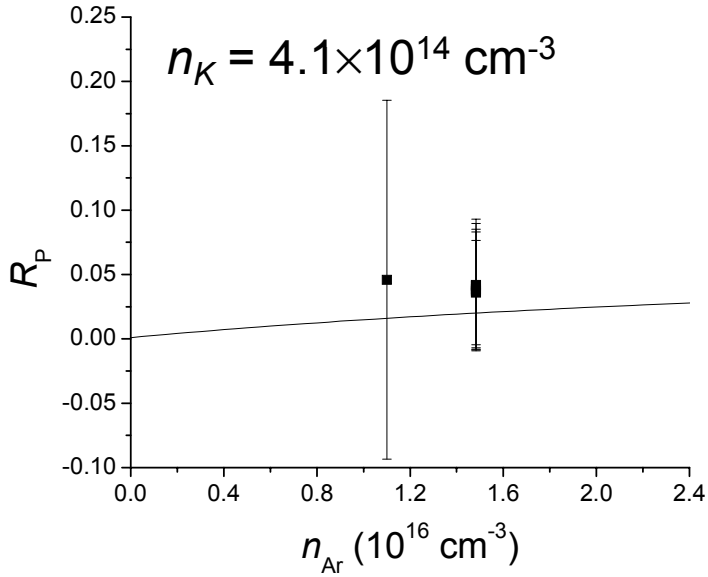
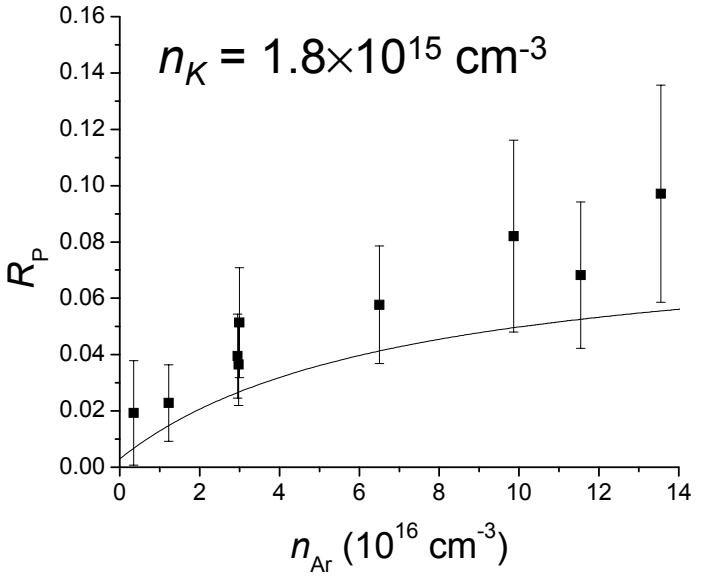
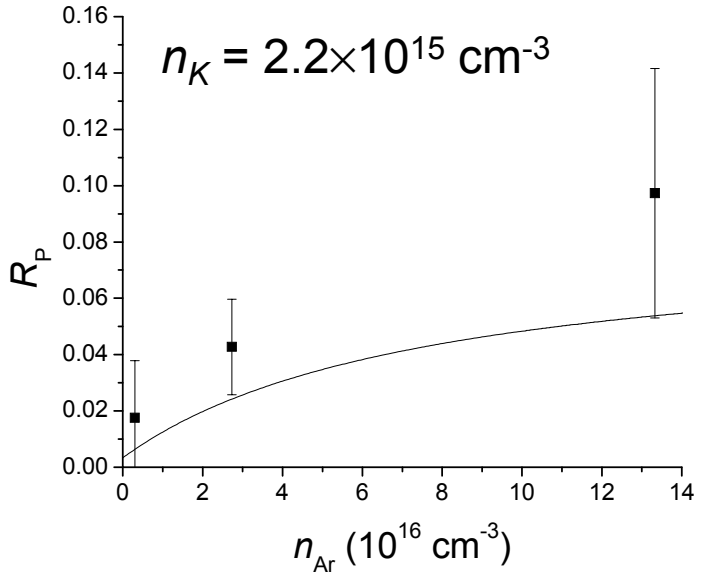


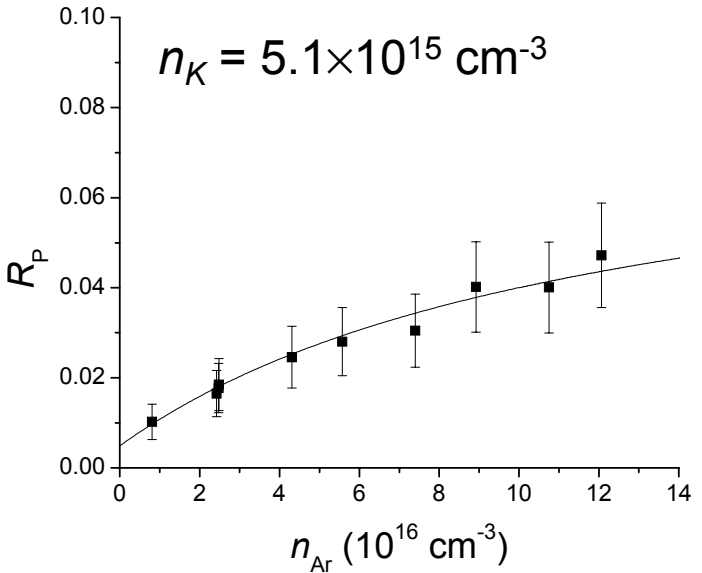
Fig. 10: Polarization data, $\Delta J = +2$











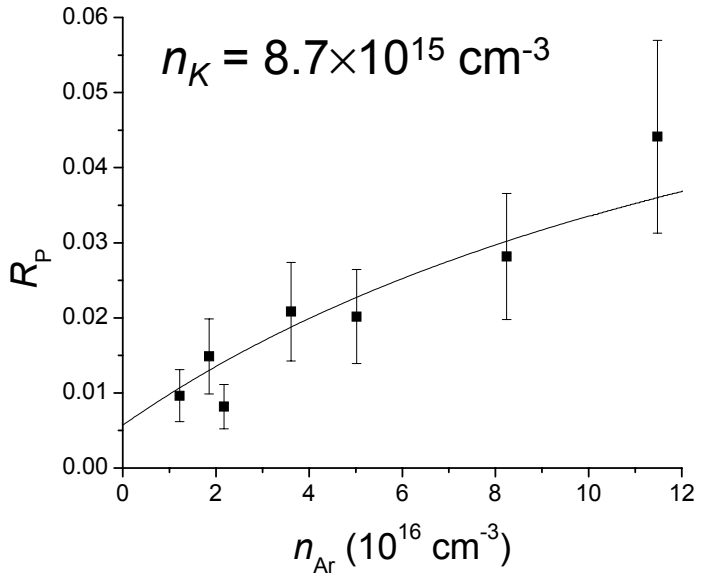
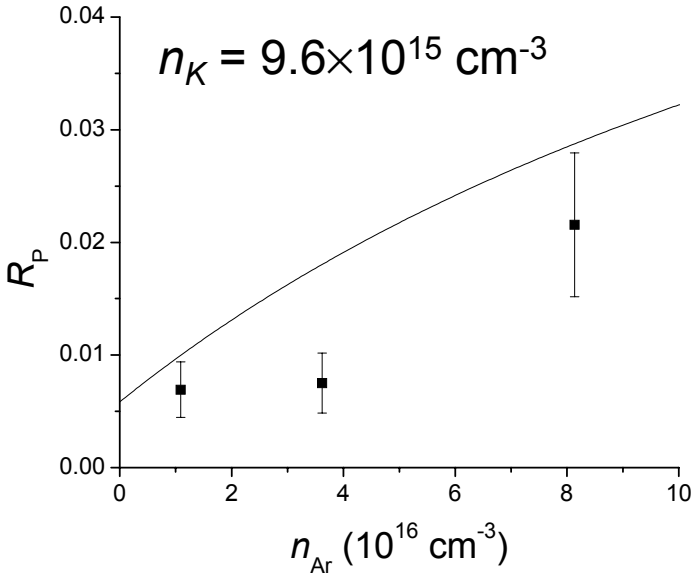


Fig. 10: Polarization data, $\Delta J = +2$



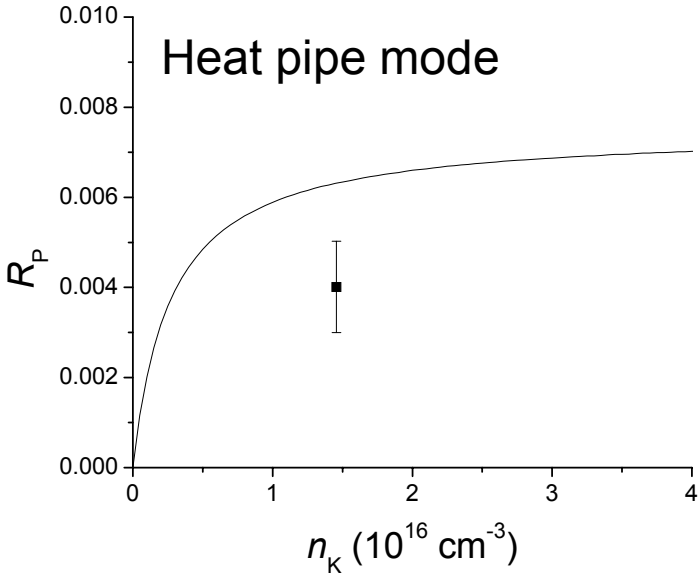
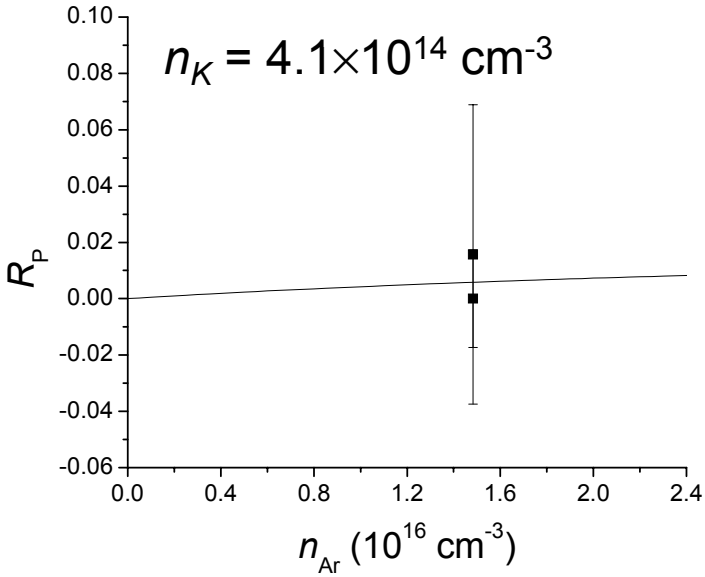
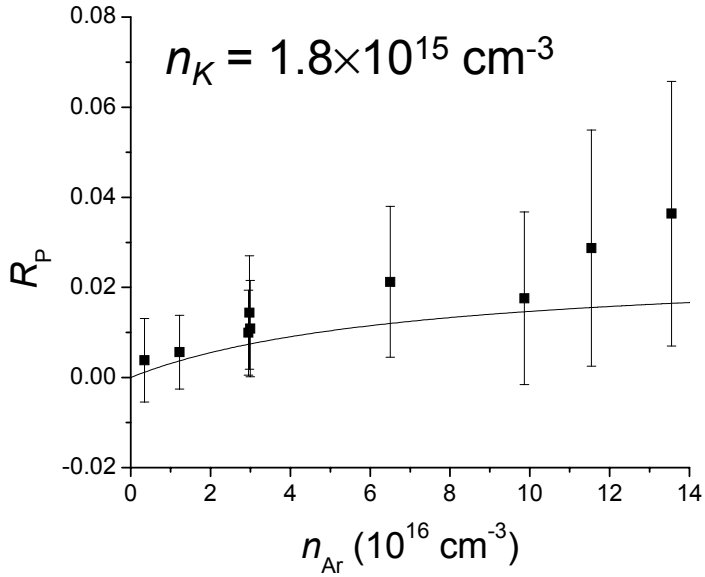
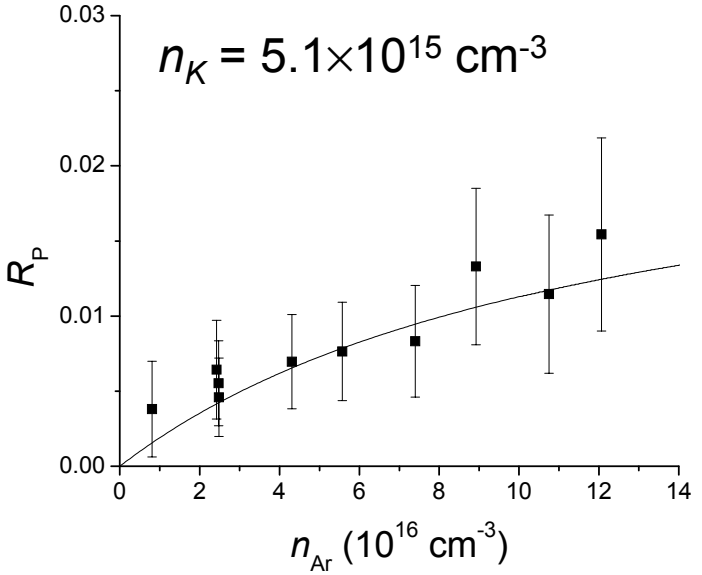
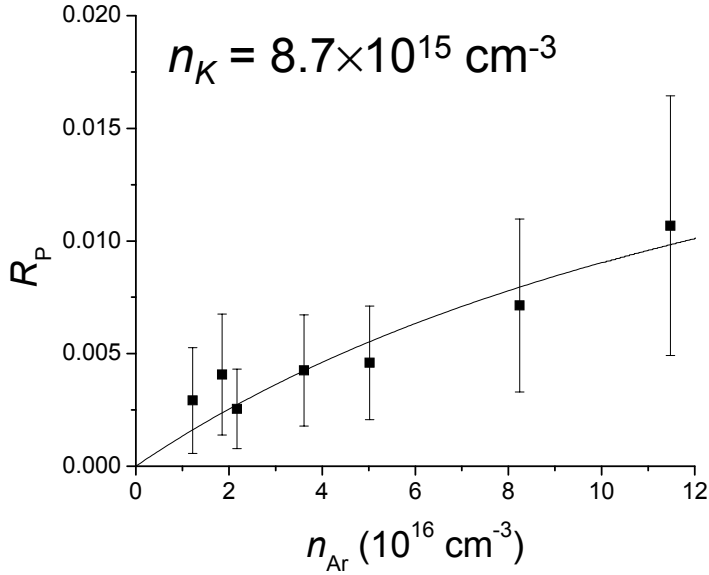


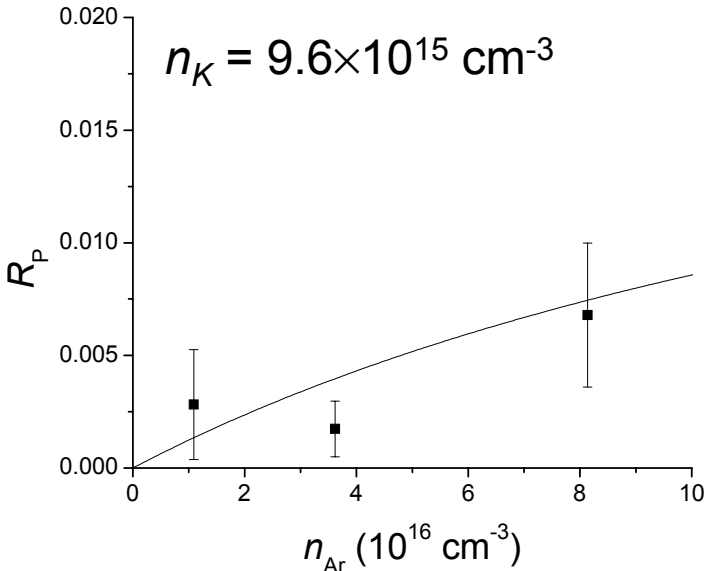
Fig. 11: Polarization data, $\Delta J = +3$











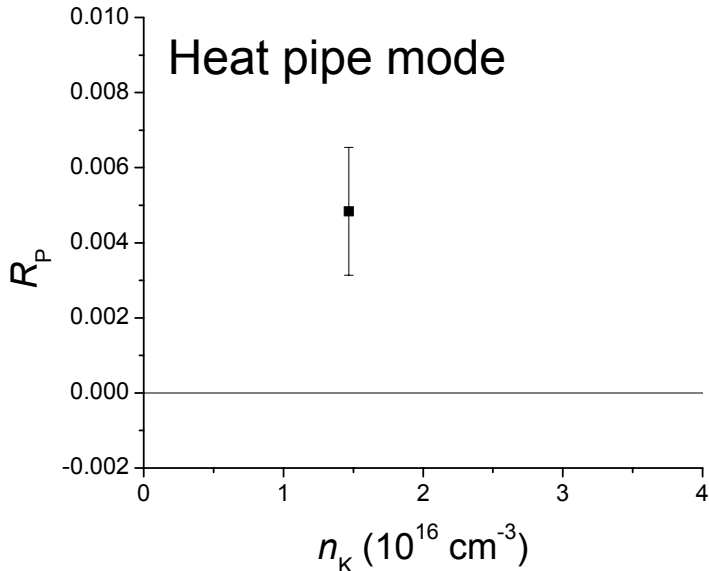
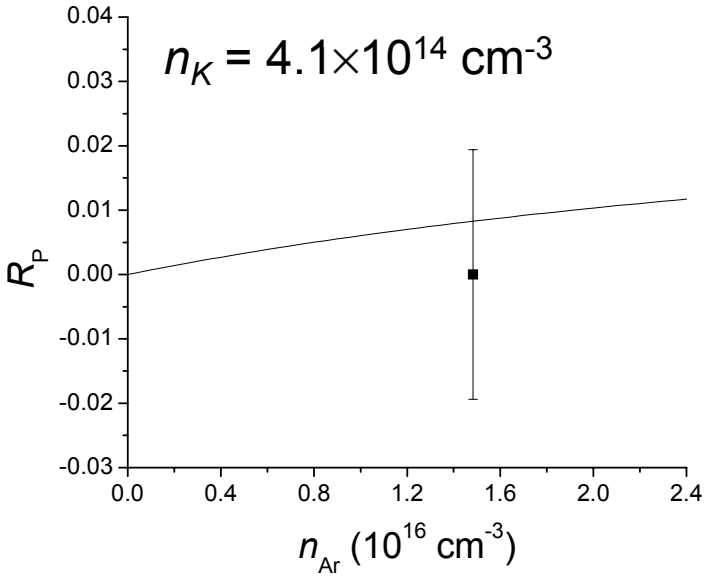
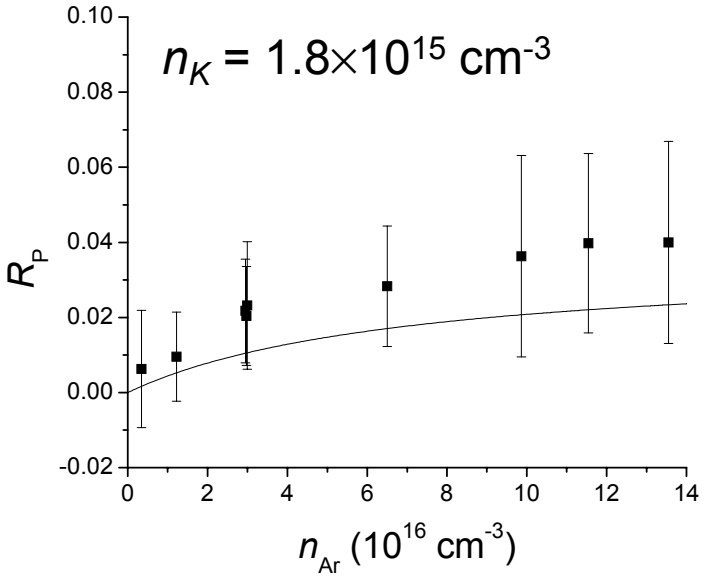
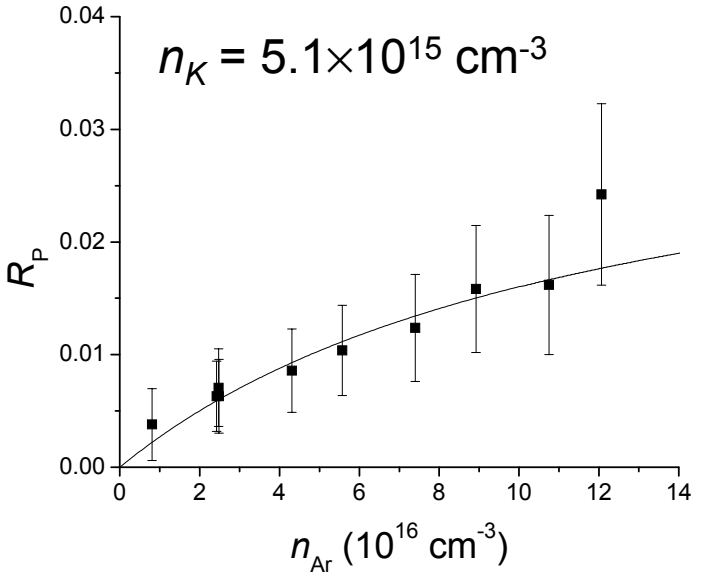
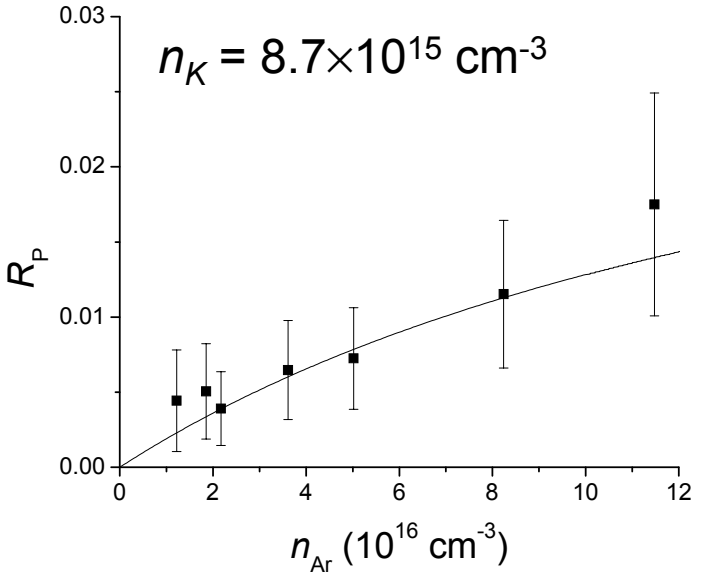


Fig. 12: Polarization data, $\Delta J = +4$









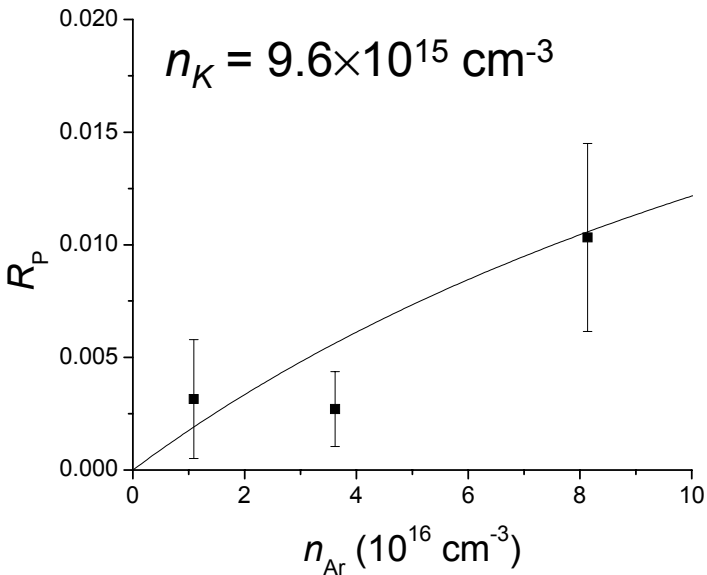
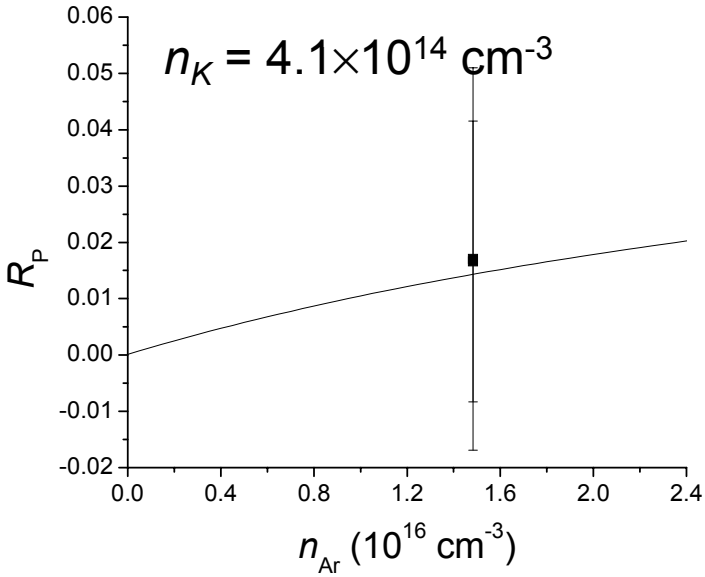
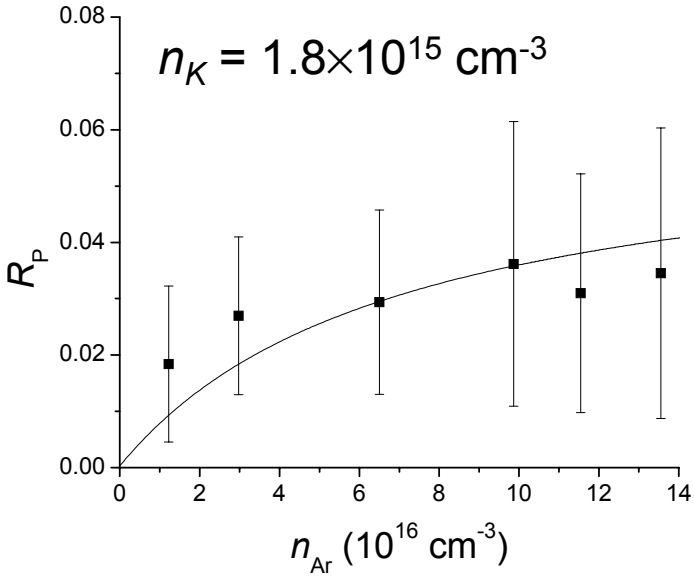
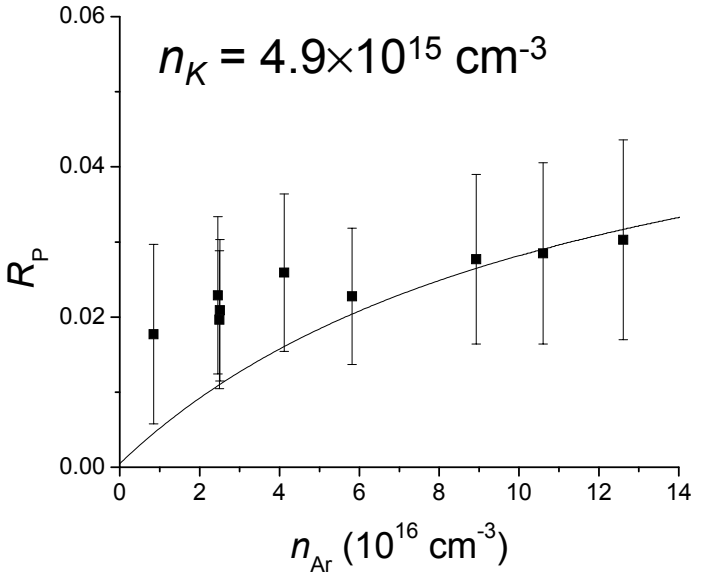
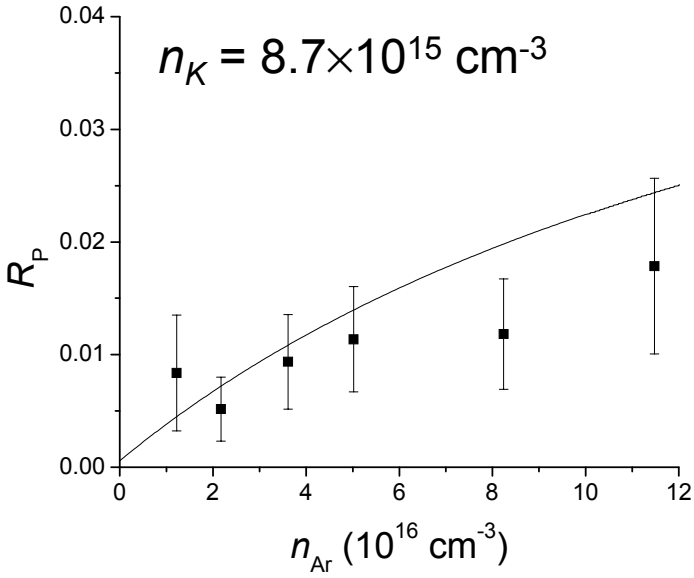


Fig. 13: Polarization data, $\Delta J = -1$









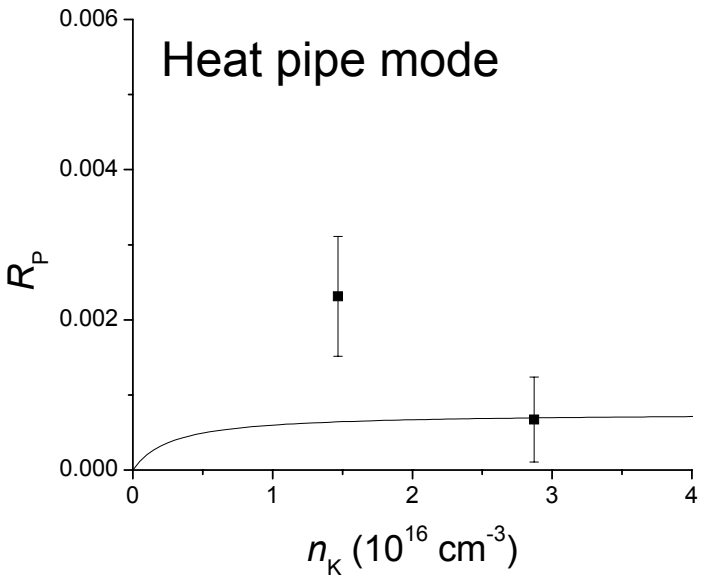
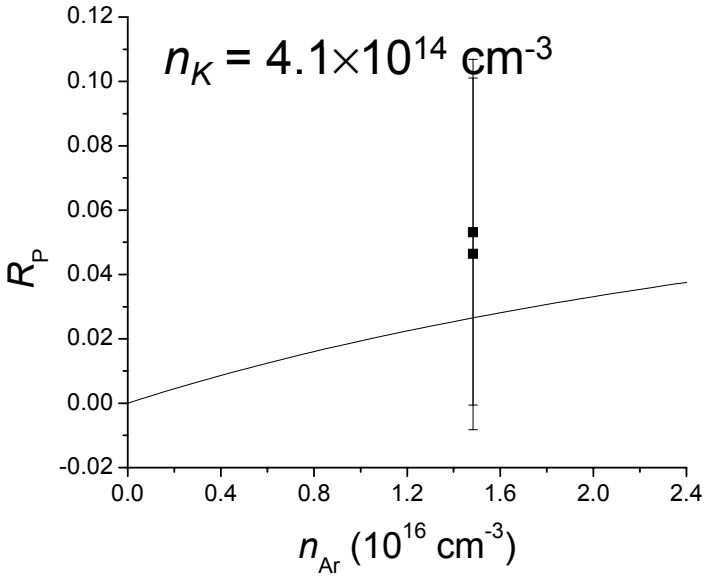
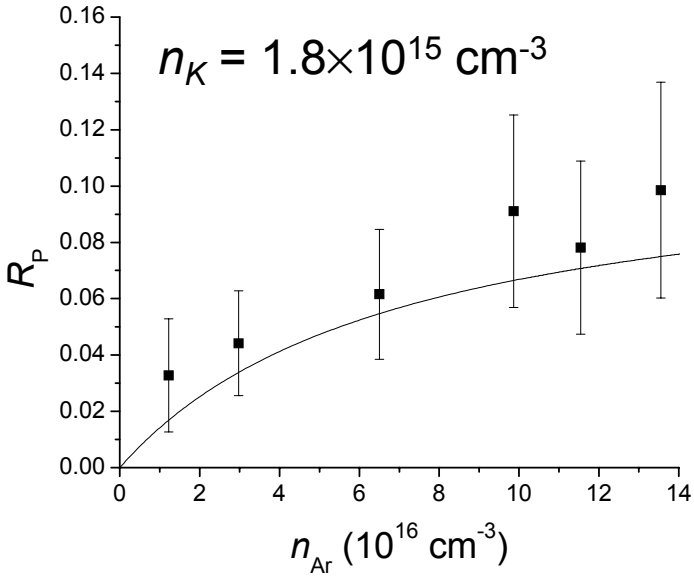
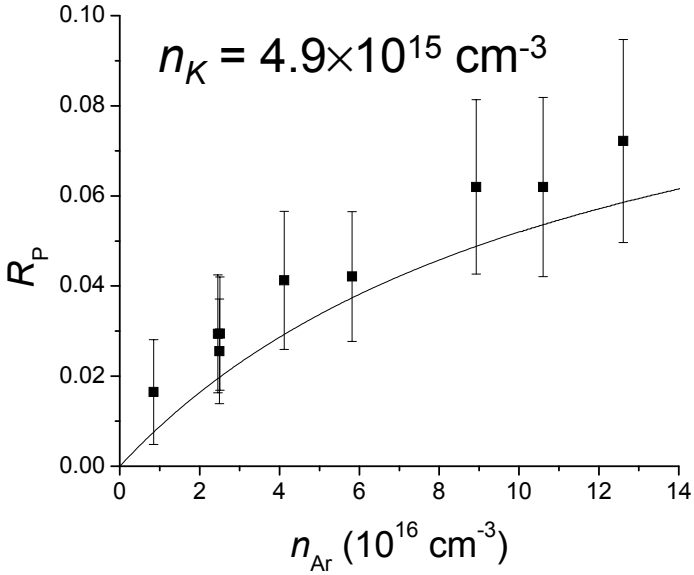
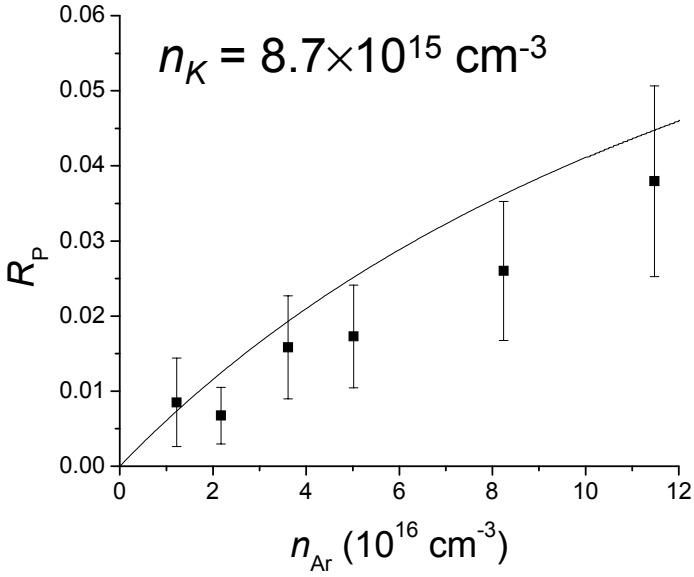


Fig. 14: Polarization data, $\Delta J = -2$









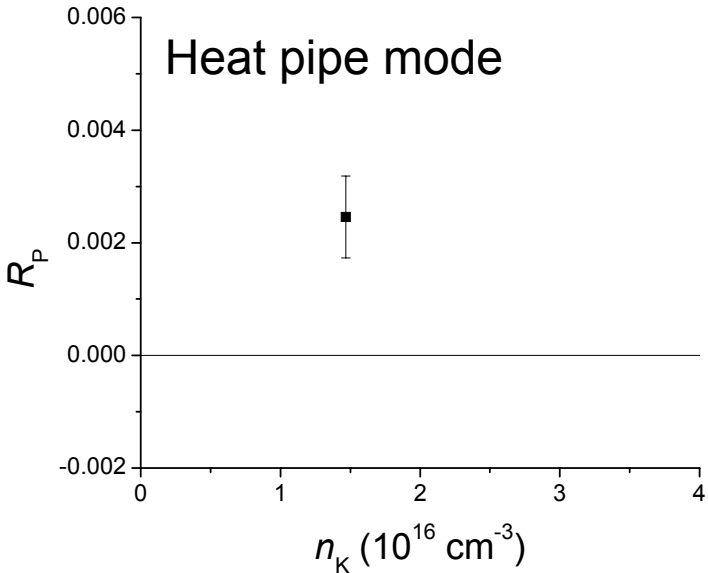
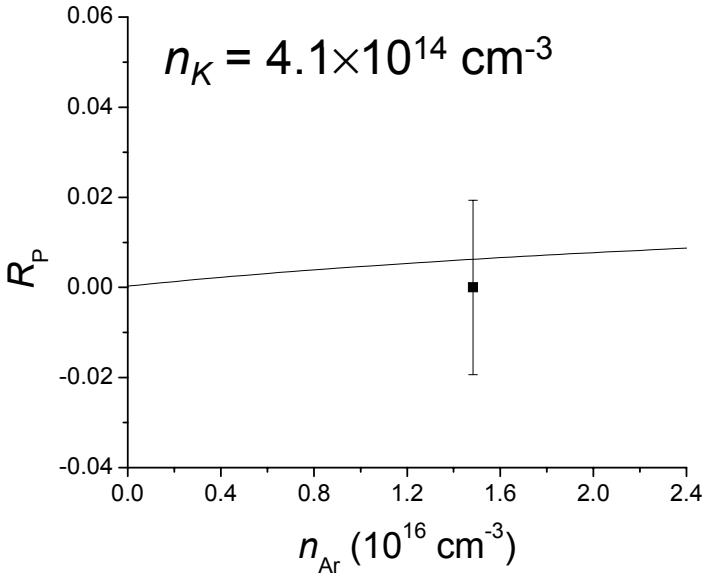
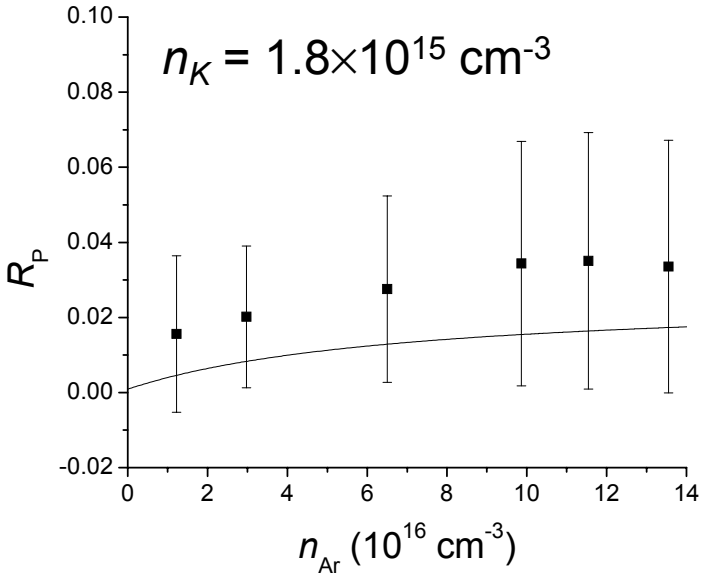
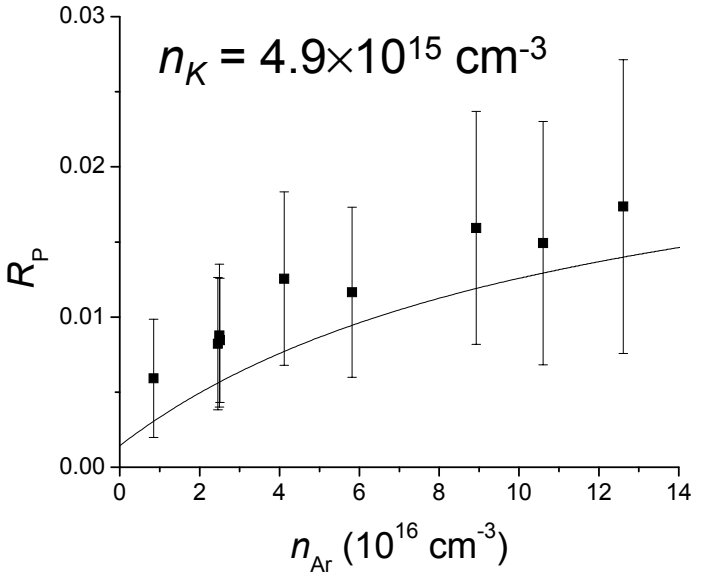
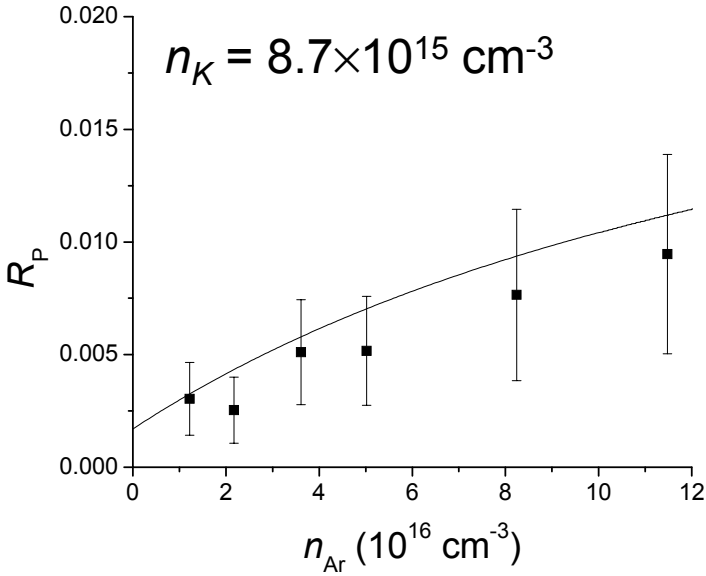


Fig. 15: Polarization data, $\Delta J = -3$









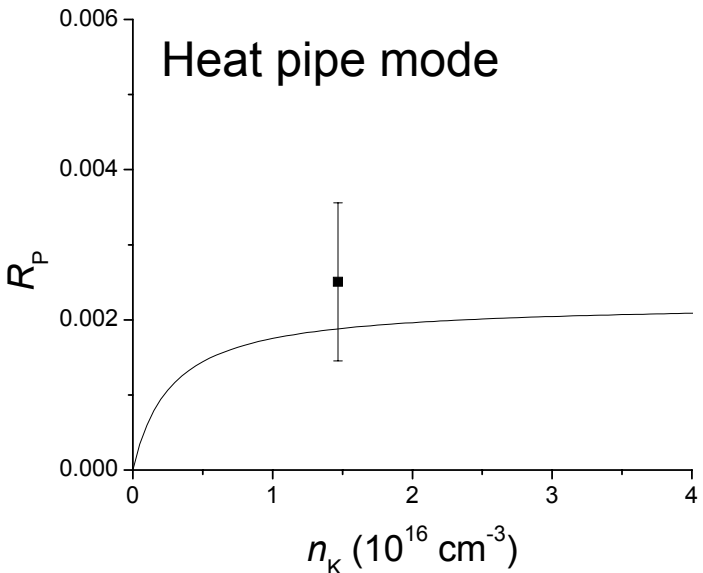
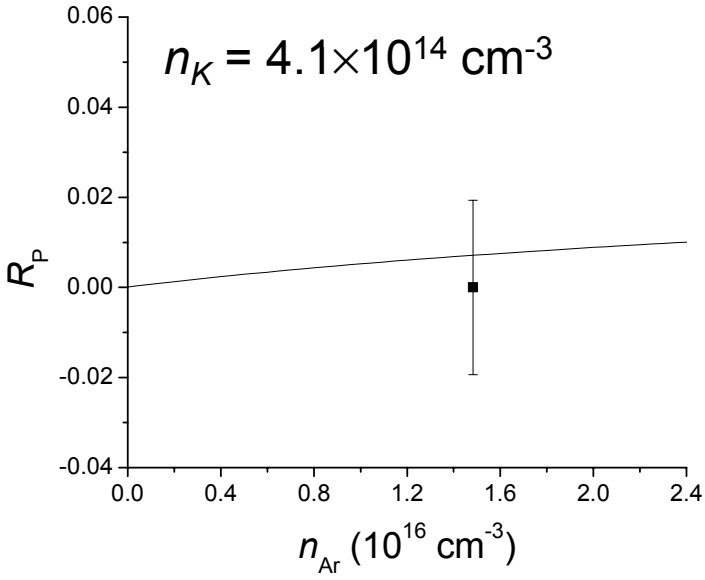
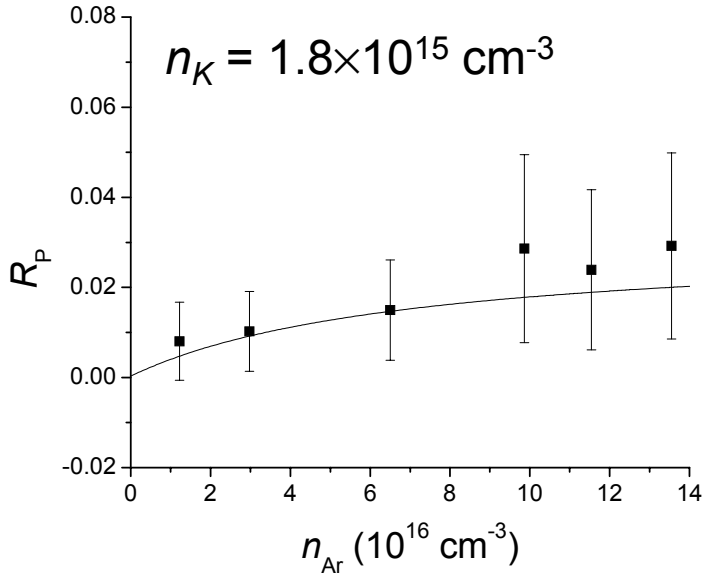
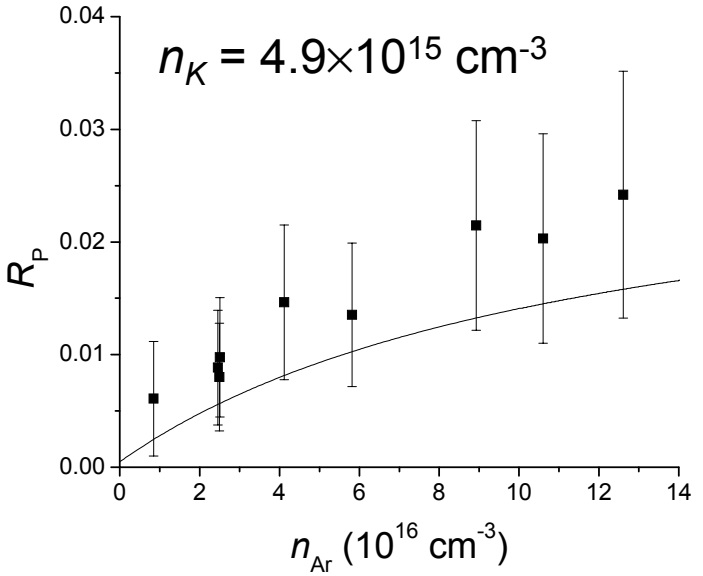
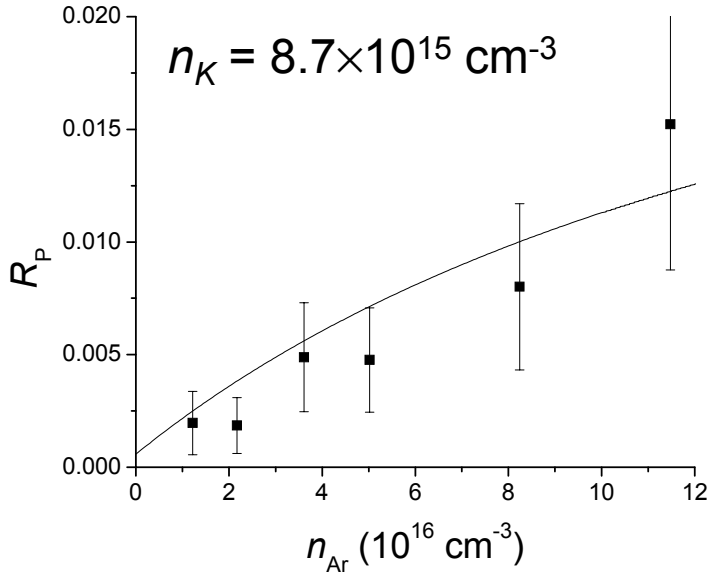


Fig. 16: Polarization data, $\Delta J = -4$









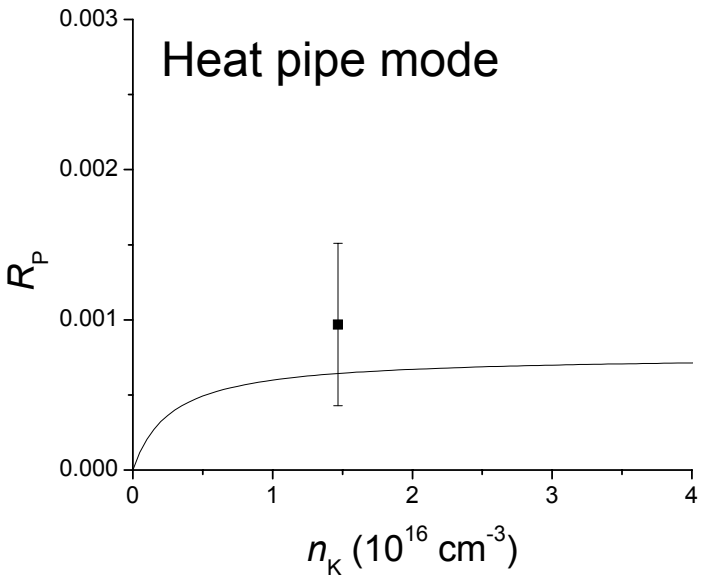
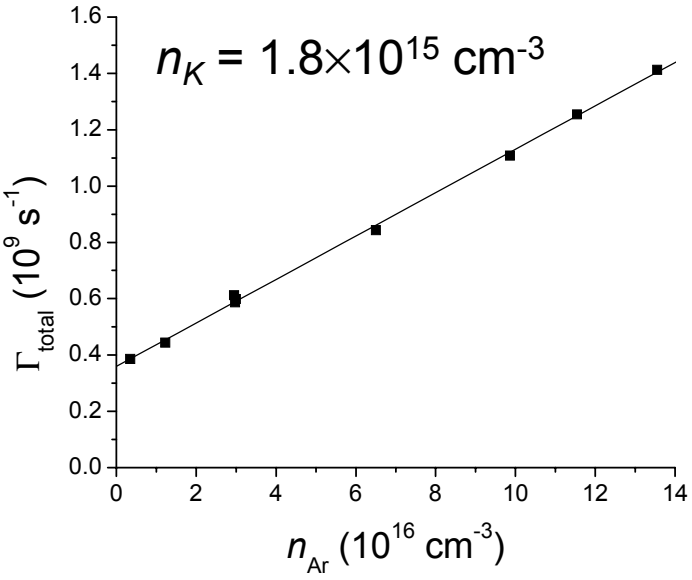
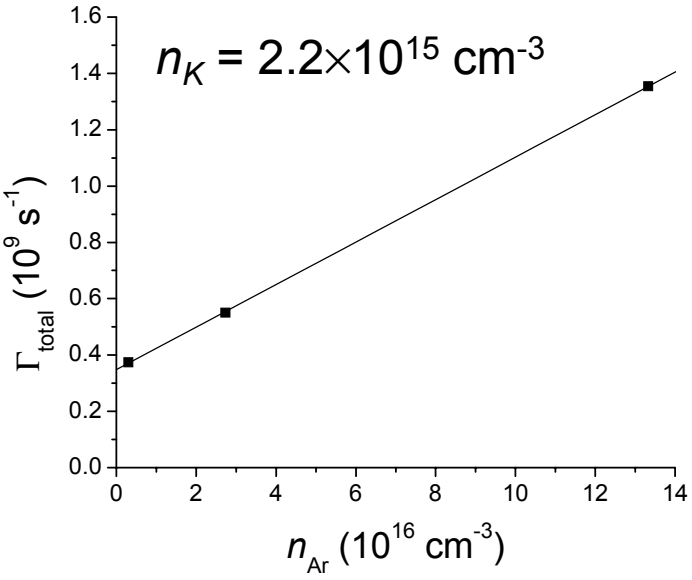
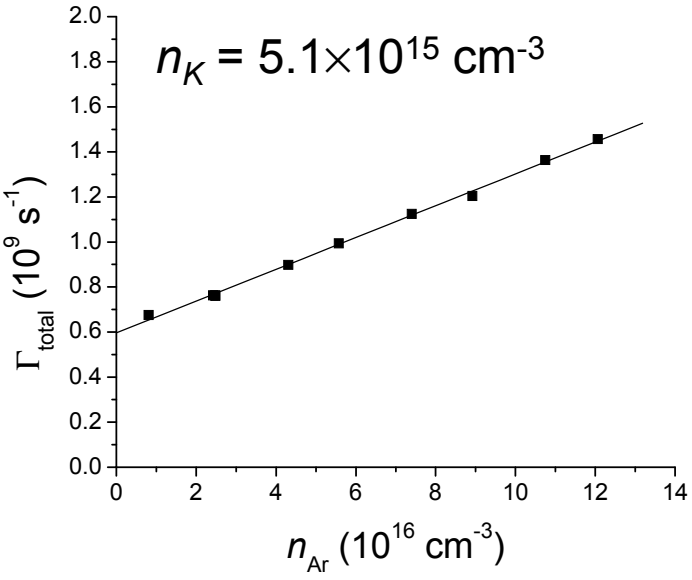
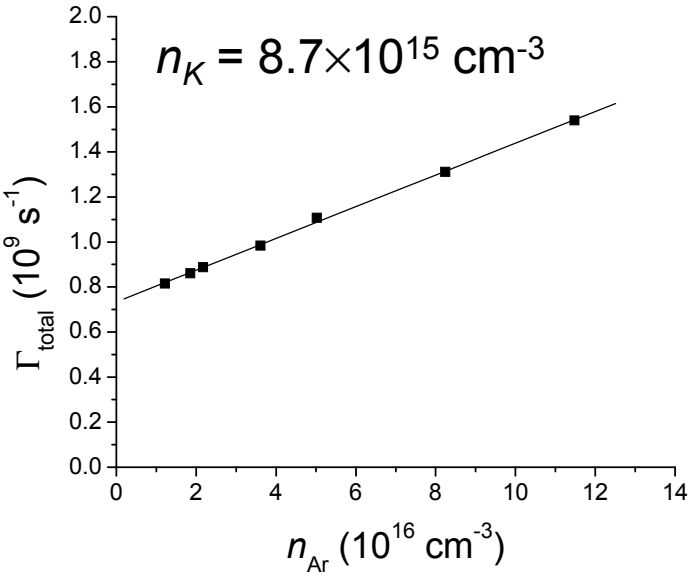


Fig. 17: Argon broadening data









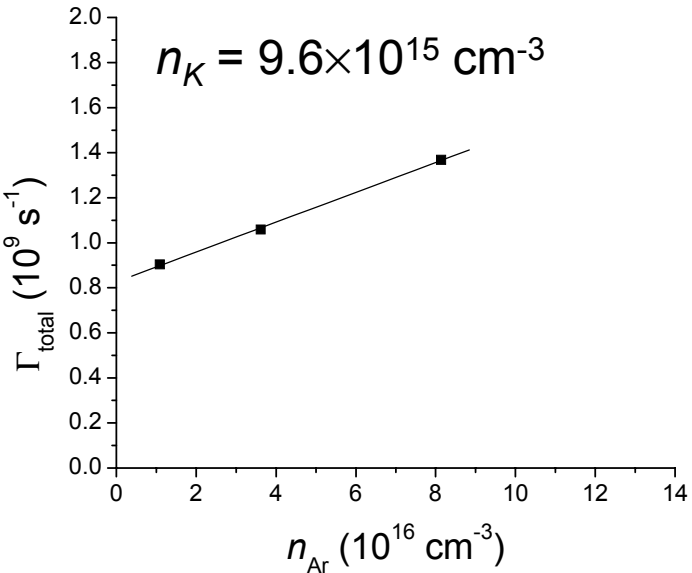


Fig. 18: Potassium broadening data