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# *Bibliography on Atomic Line Shapes and Shifts*

(July 1978 through March 1992)

*J. R. Fuhr and A. Lesage*

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- Information Systems

<sup>1</sup>At Boulder, CO 80303.

<sup>2</sup>Some elements at Boulder, CO 80303.

# *Bibliography on Atomic Line Shapes and Shifts*

(July 1978 through March 1992)

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# BIBLIOGRAPHY ON ATOMIC LINE SHAPES AND SHIFTS

(July 1978 through March 1992)

J. R. Fuhr and A. Lesage

This is the fourth supplement to the original NBS Special Publication 366, *Bibliography on Atomic Line Shapes and Shifts (1889 through March 1972)*. It contains 1964 references and covers the literature from July 1978 to March 1992. As in our previous publications, the bibliography consists of five major parts: (1) Part 1 is a section containing papers of general interest, many without numerical data. These papers are catalogued according to the broadening mechanisms (and further, according to special topics under several of the mechanisms) and as to whether the work is a general theory, a general review, a table of profiles or parameters, a comment on existing work, a study of general experimental measurement techniques, or an experimental effort of general importance. Also included are selected papers on important applications of line broadening and on miscellaneous topics related to atomic spectral line shapes and shifts. (2) In Part 2, all papers containing numerical data are ordered according to element, ionization stage, and broadening mechanism. This section is divided into two parts: Part A--All mechanisms except for van der Waals broadening, and Part B--van der Waals broadening. In the case of foreign gas (van der Waals) broadening, the perturbing species are listed. Furthermore, it is indicated whether the data are experimentally or theoretically derived. (3) While in the two preceding parts of the bibliography the references are listed for brevity by identification numbers only, in Part 3 all references are listed completely by journal, authors, and title. In addition, the papers are arranged by year of publication and alphabetically by the first author's name within the year. (4) Part 4 contains a listing of all authors and their papers, as identified by the reference numbers from Part 3. (5) Part 5 provides corrections and/or additions to the third supplement of the original bibliography.

Key words: Atomic; instrumental broadening; line shapes; line shifts; pressure broadening; resonance broadening; Stark broadening; van der Waals broadening.

## A. INTRODUCTION

Since 1978, when our last bibliography [1] was published, the Data Center on Atomic Line Shapes and Shifts has continuously monitored the literature and collected relevant papers in the field. This process included scanning approximately 140 journals plus Chemical Abstracts on a weekly basis. This is the fourth supplement to our original bibliography [2], and it contains 1964 papers in the field of atomic spectral line broadening, including all papers that were received by the Data Center between July 1, 1978 and March 31, 1992. These references provide numerical data, reviews, or comments of general interest. Included here are a few older references that were omitted from our earlier publications. As before, we have provided an errata section (Part 5), which consists of corrections and additions to Supplement 3.

## B. ACKNOWLEDGMENTS

We would like to express our great appreciation to Mme. J. Jorand and Mr. F. Leysour of the Observatoire de Paris at Meudon, France. Mme. Jorand diligently entered all references into the database, while Mr. Leysour was the principal programmer and "trouble-shooter." Mr. Leysour helped design the database, as well as organize the sorting and printing of the bibliography. Finally, we gratefully acknowledge the help of Mrs. Helen Felrice of NIST in the preparation of the bibliography. This work was supported in part by the Office of Standard Reference Data at NIST and the CNRS in Paris.

### C. REFERENCES

- [1] Fuhr, J. R., Miller, B. M., and Martin, G. A., Bibliography on Atomic Line Shapes and Shifts (June 1975 through June 1978), Natl. Bur. Stand. (U.S.), Spec. Publ. **366**, Suppl. 3, 83 pages (Dec. 1978).
- [2] Fuhr, J. R., Wiese, W. L., and Roszman, L. J., Bibliography on Atomic Line Shapes and Shifts (1889 through March 1972), Natl. Bur. Stand. (U.S.), Spec. Publ. **366**, 165 pages (Sept. 1972).

### D. TABLE OF CODE LETTERS AND ABBREVIATIONS

A.	Description	B.	Language
1.	T--theoretical method	1.	Fr.--French
2.	E--experimental method	2.	Ger.--German
3.	C--comment	3.	Pol.--Polish
		4.	Russ.--Russian
		5.	Span.--Spanish



## E. BIBLIOGRAPHICAL MATERIAL

### 1. LITERATURE REFERENCES OF GENERAL INTEREST

#### 1.0. GENERAL ARTICLES ON LINE SHAPES AND SHIFTS

Theoretical: 3632

#### 1.1. PRESSURE BROADENING

Comment: 4527

Combined comments-theoretical: 3217, 4936

Combined experimental-theoretical: 4004

Theoretical: 3139, 3227, 3228, 3270, 3342, 3410, 3514, 3554, 3572,  
3611, 3747, 3784, 3795, 3882, 3886, 3891, 3903, 3908,  
3911, 3928, 4009, 4010, 4072, 4090, 4091, 4198, 4218,  
4228, 4229, 4246, 4283, 4285, 4296, 4335, 4368, 4390,  
4397, 4444, 4483, 4659, 4753, 4815, 4986, 5012

##### 1.1.1. Stark broadening and shifts

Comments: 3872, 4157

Combined comments-theoretical: 3726, 3745, 3833,  
3934, 3997, 4375,  
4396, 4804

Combined experimental-theoretical: 4563

Theoretical: 3091, 3133, 3274, 3280, 3299, 3334, 3488, 3505,  
3587, 3593, 3594, 3665, 3692, 3741, 3747, 3750,  
3752, 3776, 3799, 3834, 3841, 3887, 3897, 3911,  
3957, 4020, 4027, 4029, 4049, 4121, 4137, 4155,  
4185, 4187, 4204, 4214, 4220, 4237, 4289, 4290,  
4372, 4397, 4435, 4436, 4437, 4454, 4464, 4482,

4491, 4546, 4566, 4568, 4586, 4593, 4628, 4704,  
4712, 4717, 4759, 4791, 4793, 4802, 4803, 4832,  
4841, 4856, 4858, 4872, 4873, 4884, 4894, 4974,  
5014

1.1.1.1. Hydrogen and hydrogen-like (overlapping) lines

Comments: 3730, 4379

Combined comment-experimental-theoretical: 4562

Combined comments-theoretical: 3726, 3745,  
3805, 4235

Experimental: 3322

Combined experimental-theoretical: 3549

Theoretical: 3125, 3206, 3226, 3298, 3332, 3342,  
3458, 3576, 3602, 3662, 3718, 3719,  
3723, 3733, 3744, 3747, 3764, 3779,  
3888, 3965, 3985, 4013, 4142, 4143,  
4238, 4253, 4300, 4303, 4349, 4387,  
4447, 4448, 4456, 4491, 4517, 4537,  
4598, 4672, 4717, 4719, 4762, 4790,  
4836, 4865, 4929, 4935, 4987, 5017

1.1.1.2. Isolated lines of neutral spectra

Combined comments-theoretical: 3162, 3745

Experimental: 3123, 3687

Theoretical: 3160, 3171, 3196, 3747, 4041, 4533,  
4710

1.1.1.3. Isolated lines of ionic spectra

Comment: 3084

Combined comments-theoretical: 3817, 4804

Combined experimental-theoretical: 3137

Theoretical: 3181, 3398, 3460, 3477, 3478, 3638,  
3640, 3660, 3671, 3844, 4027, 4270,  
4546, 4565, 4685, 4696, 4758, 4784,  
4863, 4897, 4999, 5013

1.1.1.4. Topics of particular interest

A. Line wings

Experimental: 3152, 4269, 4661

Combined experimental-theoretical: 3222

Theoretical: 3095, 3227, 3317, 3597, 3889, 4179,  
4217, 4518, 4533, 4676, 4861

B. Effects of collective electric fields

Comments: 3426, 4118

Combined comments-experimental: 3283, 3366,  
3548, 3696,  
3729

Combined comments-theoretical: 3306, 3431,  
3484, 3485,  
3740, 4462

Experimental: 3242, 3467, 3480, 3558,  
4018, 4019, 4074, 4075, 4269

Combined experimental-comment: 3365

Combined experimental-theoretical: 4165, 4443

Theoretical: 3334, 3523, 3541, 3641, 3680, 3819,  
3897, 3914, 4495, 4592, 4621, 4767,  
4768, 4868, 4993

C. Asymmetries

Comment: 3730

Combined comments-theoretical: 3431, 3484

Experimental: 3152, 3248, 3534, 4136,  
4189, 4242, 4429, 4596,  
4613, 4843, 4910

Combined experimental-theoretical: 4468, 4479,  
4699, 4902

Theoretical: 3095, 3317, 3841, 3889, 4092, 4348,  
4598, 4714, 4903

D. Microfield distributions

Comment: 3520

Combined comments-theoretical: 3507, 3745,  
3934

Combined experimental-theoretical: 3222, 3350

Theoretical: 3390, 3504, 3527, 3562, 3668, 3669,  
3697, 3703, 3799, 3842, 3843, 3849,  
3850, 3956, 3972, 4028, 4029, 4030,  
4031, 4050, 4052, 4092, 4100, 4127,  
4153, 4177, 4178, 4179, 4185, 4186,  
4187, 4204, 4234, 4237, 4238, 4256,  
4270, 4295, 4311, 4312, 4318, 4343,  
4369, 4370, 4415, 4422, 4433, 4454,  
4460, 4461, 4466, 4475, 4533, 4535,  
4558, 4569, 4590, 4606, 4612, 4641,  
4702, 4717, 4719, 4721, 4759, 4767,  
4768, 4791, 4793, 4803, 4833, 4834,  
4851, 4858, 4876, 4898, 4904, 4911,  
4927, 4934, 4949, 5026

E. Magnetic fields

Combined comment-experimental: 3283

Experimental: 3205, 3284, 3433, 3645, 5002

Combined experimental-theoretical: 3290

Theoretical: 3252, 3441, 3527, 3541, 3719, 3724,  
4065, 4207, 4208, 4243, 4356, 4357,  
4924, 4985

F. Turbulent plasmas

Theoretical: 3523

G. Ion dynamic effects

Comments: 3520, 4265, 4379, 4385

Combined comments-experimental: 3316, 3666

Combined comments-theoretical: 3402, 3726,  
3740, 4209,  
4235, 4386

Experimental: 3169, 3288, 3292, 3468,  
3469, 3687, 3950, 3989,  
4078, 4079, 4374, 4626

Combined experimental-theoretical: 4115, 4634,  
4707, 4810

Theoretical: 3298, 3333, 3336, 3345, 3394, 3587,  
3744, 3764, 3766, 3835, 3904, 4100,  
4208, 4236, 4237, 4238, 4496, 4510,  
4511, 4516, 4517, 4552, 4580, 4641,  
4675, 4732, 4733, 4775, 4796, 4859,  
4894, 4913

H. Plasma polarization shifts

Comments: 3481, 3730, 4470

Combined comments-theoretical: 4375, 4564

Experimental: 3248, 3720, 3906, 4080,  
4136, 4166, 4499, 4910

Combined experimental-theoretical: 3549, 3782,  
4479

Theoretical: 3458, 3802, 3810, 3999, 4014, 4015,  
4185, 4491, 4536, 4696, 4724, 4867,  
4899

I. Stark effect on states above the ionization  
threshold, autoionization effects

Experimental: 3558, 5040

J. Small field limit; fine structure

K. Relativistic effects

L. Dielectronic satellites

Experimental: 3618

Theoretical: 3256, 3257, 4581

M. Rydberg atoms

Experimental: 4395

Combined experimental-theoretical: 4409

Theoretical: 4194, 4445, 4456, 4610, 4667, 4859,  
5018

1.1.2. van der Waals broadening

Comments: 3173, 3949

Combined comment-experimental: 3739

Combined comment-theoretical: 4055

Experimental: 3560, 5037

Combined experimental-theoretical: 3509, 3627, 3688,  
4004, 4082, 4241,  
4354, 4426

Theoretical: 3114, 3127, 3203, 3253, 3310, 3362, 3383, 3424,  
3518, 3557, 3597, 3610, 3611, 3721, 3785, 3800,  
3811, 3902, 3908, 3988, 3995, 4016, 4071, 4094,  
4169, 4191, 4194, 4227, 4250, 4263, 4285, 4335,  
4368, 4378, 4392, 4413, 4509, 4540, 4541, 4658,  
4703, 4752, 4827, 4874, 4953, 4965

#### 1.1.2.1. Satellite bands

Combined comment-experimental: 3465

Combined comment-theoretical: 4056

Experimental: 3199, 3473, 3529, 3584, 3655, 3682,  
3717, 3925, 4109

Combined experimental-theoretical: 3168, 3207,  
3233, 3266,  
3321, 3440,  
3583, 3688,  
3796, 3862,  
4407, 4635,  
4842

Theoretical: 3364, 3427, 3453, 3506, 3523, 3572,  
3622, 3751, 3785, 4111, 4263, 4430,  
4541, 4660, 4852, 4853, 4854, 4862,  
4947, 4950, 4951

#### 1.1.2.2. Polarization effects

Combined comments-theoretical: 3162, 4056

Experimental: 3417, 3606, 3939, 4167

Combined experimental-theoretical: 3290, 3503,  
4082, 4129,  
4543

Theoretical: 3274, 3314, 3628, 3891, 4057, 4071,  
4072, 4191, 4296

1.1.2.3. Fine structure; hyperfine structure

Combined comment-experimental-theoretical: 3921

Combined comment-theoretical: 3335

Experimental: 3311, 3413, 3417, 3486, 3710, 3769,  
3771, 3773, 3984, 4003, 4008, 4321,  
4553, 4646, 4840, 4969

Combined experimental-theoretical: 3355, 3416,  
3437, 3772,  
3963, 4211,  
4502

Theoretical: 3104, 3105, 3106, 3127, 3134, 3135,  
3215, 3252, 3382, 3383, 3412, 3434,  
3435, 3483, 3516, 3552, 3610, 3677,  
3793, 3896, 3899, 3946, 3947, 4088,  
4388, 4537, 4647, 4731. 4940

1.1.3. Resonance broadening

Theoretical: 3127, 3611, 4155, 4176

1.2. BASIC ARTICLES ON DOPPLER AND NATURAL LINE SHAPES

1.2.1. Doppler broadening and Doppler-free spectroscopy

Comment: 3268

Combined comment-experimental: 4455

Combined comment-theoretical: 3485

Experimental: 3297, 3330, 3349, 3369, 3384, 3418, 3419,  
3489, 3569, 3672, 3700, 3715, 3749, 3769,  
3806, 3885, 3898, 3901, 4000, 4135, 4139,  
4167, 4323, 4367, 4421, 4542, 4607, 4754

Combined experimental-theoretical: 3261, 3337, 3487,  
4096, 4115, 4543,  
4643, 4644, 4698,  
4744, 4773, 5039

Theoretical: 3090, 3153, 3201, 3249, 3301, 3314, 3376, 3550,  
3620, 3675, 3712, 3821, 3861, 4091, 4097, 4428,  
4511, 4827, 4963

#### 1.2.2. Natural line broadening

Theoretical: 3158, 3277, 3488, 3944, 4045, 4446, 4579, 4823,  
5015

#### 1.2.3. Radiation induced broadening

Combined comment-theoretical: 3109

Experimental: 3367, 3456, 3820, 3980, 4184, 4215

Combined experimental-theoretical: 3920, 3935

Theoretical: 3131, 3462, 3543, 3643, 3652, 3707, 3738, 3775,  
3851, 3877, 3894, 3948, 3991, 3992, 4106, 4219,  
4228, 4353, 4410, 4771, 4985, 4993

### 1.3. BASIC PAPERS ON INSTRUMENTAL BROADENING, DECONVOLUTION, SUPERPOSITION OF TWO OR MORE SIMULTANEOUSLY ACTING BROADENING MECHANISMS

#### 1.3.1. Determination of instrumental line profiles; techniques for determining line shapes

Combined comments-theoretical: 3110, 3485

Experimental: 3083, 3097, 3251, 3259, 3329, 3381, 3404,  
3474, 3513, 3517, 3684, 3714, 3859, 4210,  
4488, 4556, 4671, 4680

Combined experimental-theoretical: 3130, 3261, 3313,  
3358, 3359, 3360,

3482, 3509, 3546,  
4171, 4309, 4557, 4846

Theoretical: 3082, 3129, 3167, 3218, 3220, 3254, 3258, 3305,  
3309, 3319, 3320, 3340, 3411, 3412, 3471, 3523,  
3539, 3547, 3556, 3573, 3575, 3600, 3620, 3626,  
3706, 3731, 3905, 3912, 3913, 3915, 3951, 3990,  
4001, 4026, 4146, 4149, 4160, 4168, 4219, 4247,  
4277, 4406, 4494, 4806, 4925

### 1.3.2. Deconvolution

Combined comment-theoretical: 3110

Experimental: 3087, 4297, 4726

Combined experimental-theoretical: 3244, 3308, 3358,  
3500, 4138, 4821, 4846

Theoretical: 3138, 3167, 3220, 3320, 3340, 3344, 3361, 3411,  
3470, 3620, 3648, 3756, 3812, 3883, 4034, 4081,  
4108, 4147, 4200, 4201, 4314, 4515, 4605, 4608,  
4615, 4774, 4808

### 1.3.3. Superposition of broadening mechanisms

Comments: 3428, 3566, 4931

Combined comments-theoretical: 3577, 3857

Experimental: 3083, 3097, 3243, 3259, 3327, 3341, 3714,  
3859, 4297, 4959

Combined experimental-theoretical: 3244, 3429, 3482,  
3570, 4175, 4309, 4750

Theoretical: 3082, 3086, 3128, 3129, 3184, 3185, 3201, 3218,  
3272, 3285, 3304, 3319, 3340, 3375, 3377, 3407,  
3462, 3483, 3497, 3515, 3516, 3533, 3537, 3542,  
3547, 3552, 3601, 3605, 3607, 3650, 3675, 3691,

3708, 3711, 3712, 3732, 3774, 3780, 3787, 3837,  
3845, 3847, 3848, 3856, 4026, 4043, 4104, 4125,  
4150, 4159, 4168, 4212, 4264, 4277, 4293, 4299,  
4359, 4408, 4560, 4568, 4599, 4638, 4653, 4677,  
4678, 4683, 4727, 4761, 4765, 4806, 4807, 4820,  
5004, 5029

#### 1.3.4. Multiphoton spectroscopy and saturation methods

Comment: 3178

Experimental: 3115, 3146, 3187, 3199, 3230, 3349, 3389,  
3405, 3417, 3418, 3422, 3489, 3561, 3569,  
3579, 3614, 3659, 3749, 3827, 3885, 3898,  
3959, 4453, 4575, 4754

Combined experimental-theoretical: 3261, 3337, 3338,  
3408, 3487, 3509,  
4174, 4643, 4896

Theoretical: 3101, 3127, 3166, 3202, 3238, 3258, 3301, 3314,  
3412, 3531, 3881, 3911, 4097, 4188, 4792

### 1.4. IMPORTANT LINE BROADENING APPLICATIONS

#### 1.4.1. Laser & maser applications

Comments: 3760, 4713

Combined comment-experimental: 4455

Combined comment-experimental-theoretical: 4562

Combined comment-theoretical: 4901

Experimental: 3148, 3149, 3200, 3230, 3232, 3243, 3251,  
3269, 3312, 3343, 3367, 3389, 3393, 3405,  
3413, 3417, 3436, 3456, 3480, 3489, 3545,  
3561, 3579, 3582, 3624, 3690, 3743, 3769,  
3820, 3846, 3853, 3980, 4042, 4132, 4323,

4336, 4345, 4346, 4403, 4463, 4572, 4582,  
4728, 4843, 4941, 5037

Combined experimental-theoretical: 3165, 3222, 3261,  
3313, 3318, 3355,  
3360, 3423, 3487,  
3503, 3509, 3567,  
3592, 3619, 3651,  
3664, 4066, 4133,  
4484, 4498, 4559,  
4563, 4906, 4943

Theoretical: 3090, 3166, 3189, 3307, 3363, 3528, 3543, 3565,  
3719, 3775, 3787, 3799, 3800, 3819, 3877, 4020,  
4106, 4143, 4188, 4195, 4216, 4227, 4267, 4353,  
4476, 4491, 4585, 4600, 4609, 4647, 4658, 4759,  
4798, 4827, 4988, 5012

#### 1.4.2. Astrophysical applications

Comment: 4288

Combined comments-theoretical: 3136, 4254, 4383, 4921

Experimental: 4075, 4233, 4382, 4577, 4825

Combined experimental-theoretical: 3117, 3374, 3535,  
3536, 4165, 4409, 4747

Theoretical: 3179, 3231, 3395, 3580, 3581, 3724, 3733, 3779,  
3878, 3996, 4089, 4102, 4251, 4305, 4356, 4399,  
4400, 4401, 4587, 4591, 4593, 4637, 4715, 4811,  
4812, 4820, 4836, 4837, 4838, 4847, 4848, 4860,  
4862, 4950, 4951

#### 1.4.3. Plasma diagnostics

Comment: 3289

Combined comments-experimental: 3354, 3563, 4226  
Combined comment-experimental-theoretical: 4562  
Combined comments-theoretical: 3110, 3507  
Experimental: 3087, 3122, 3126, 3174, 3176, 3192, 3209,  
3236, 3243, 3245, 3248, 3264, 3265, 3267,  
3273, 3296, 3322, 3331, 3343, 3387, 3396,  
3397, 3400, 3404, 3415, 3430, 3457, 3463,  
3466, 3472, 3502, 3519, 3564, 3612, 3667,  
3672, 3676, 3687, 3690, 3701, 3743, 3803,  
3806, 3853, 3865, 3880, 3952, 4000, 4076,  
4078, 4117, 4119, 4132, 4135, 4203, 4252,  
4257, 4266, 4281, 4284, 4294, 4344, 4345,  
4346, 4393, 4412, 4414, 4421, 4463, 4481,  
4530, 4572, 4649, 4695, 4743, 4764, 4776,  
4824, 4826, 4829, 4866, 4955, 4957, 5002,  
5006, 5019, 5025, 5036  
Combined experimental-theoretical: 3100, 3198, 3222,  
3235, 3276, 3315,  
3318, 3355, 3359,  
3501, 3538, 3586,  
3592, 3651, 3653,  
3664, 3742, 3868,  
3923, 4037, 4066,  
4138, 4148, 4165,  
4172, 4306, 4319,  
4330, 4391, 4431,  
4559, 4563, 4633,

4773, 4831, 4922,

4943, 5043

Theoretical: 3086, 3125, 3191, 3219, 3225, 3325, 3420, 3462,  
3527, 3544, 3565, 3573, 3620, 3680, 3725, 3873,  
3931, 3987, 4050, 4060, 4121, 4123, 4153, 4193,  
4216, 4461, 4467, 4491, 4576, 4612, 4719, 4790,  
4859, 4865, 4875, 4912, 4914, 4954

#### 1.4.4. Other applications

Experimental: 3351

Theoretical: 3091, 3116, 3161, 3274, 3324

#### 1.4.5. Plasma chemistry

Experimental: 4279, 4347, 4425, 4555, 4693, 4716

Theoretical: 4879

### 1.5. OTHER TOPICS INVOLVING LINE SHAPES AND SHIFTS

#### 1.5.1. The line shape in the presence of self-absorption; effects of radiative transfer

Combined comment-experimental-theoretical: 4562

Combined comment-theoretical: 3968

Experimental: 3200, 3405, 3494, 4038, 4313, 4322, 4420,  
4735

Combined experimental-theoretical: 3495, 3619, 3852,  
4037, 4138, 4330,  
4391, 4431, 4750

Theoretical: 3226, 3231, 3399, 3406 3675, 3733, 3931, 3981,  
3995, 4022, 4023, 4035, 4089, 4248, 4526, 4576,  
4639, 4640, 4674, 4798

#### 1.5.2. Broadening of scattered radiation; redistribution of radiation

Combined comment-experimental-theoretical: 3574

Combined comments-theoretical: 3154, 4524  
Experimental: 3381, 3606, 3824, 3863, 3939, 4523, 4624,  
4663, 4839  
Combined experimental-theoretical: 3503, 3629, 4061,  
4066, 4129, 4262,  
4355, 4502, 4548,  
4611, 4750  
Theoretical: 3089, 3092, 3103, 3158, 3274, 3357, 3444, 3445,  
3446, 3451, 3452, 3530, 3532, 3628, 3704, 3713,  
3722, 3784, 3800, 3804, 3808, 3854, 3911, 3927,  
4020, 4044, 4057, 4071, 4072, 4089, 4227, 4248,  
4258, 4259, 4260, 4267, 4334, 4404, 4419, 4465,  
4469, 4519, 4525, 4528, 4529, 4544, 4545, 4549,  
4594, 4639, 4640, 4673, 4674, 4749, 4753, 4777,  
4778, 4834, 4968, 4995, 5009

#### 1.5.3. Some important papers on molecular line broadening

Experimental: 3421, 3474, 4726

Combined experimental-theoretical: 3960, 4427, 4484

Theoretical: 3143, 3263, 3340, 3539, 3607, 3738, 3809, 3854,  
3962, 4141, 4198, 4474, 4984

#### 1.5.4. Miscellaneous topics

##### A. Broadening of x-ray lines

Experimental: 3265, 4284

Combined experimental-theoretical: 3318, 3423,  
3482, 3501,  
3619

Theoretical: 3544, 3565, 3718, 4204

##### B. Light shifts; relaxation

Experimental: 3187, 3262, 3293, 3367,  
3384, 3413, 3454, 3545,  
3614, 3820, 3892, 3898,  
3922, 4058

Combined experimental-theoretical: 3118, 3142,  
3165, 3193,  
3963, 4164

Theoretical: 3153, 3301, 3302, 3307, 3362, 3383,  
3531, 3910, 3942, 4296

C. Zeeman broadening

Combined experimental-theoretical: 4664

D. New anomalous redshifts

Combined comment-theoretical: 3392

E. Laser field-induced broadening

Experimental: 3455

F. Charge-exchange effects

Combined experimental-theoretical: 4067

G. Line-narrowing mechanisms

Theoretical: 4763

1.6. REVIEW ARTICLES

1.6.1. General line broadening reviews

3108, 3255, 3623

Theoretical: 3410, 4674

1.6.2. Reviews on pressure broadening

3508, 4107, 4550, 4742, 4818, 4880, 4888, 4972

Comment: 3760

Theoretical: 3725, 3881

1.6.2.1. Reviews on Stark broadening

3147, 4196, 4197, 4310, 4603, 4782, 4880, 4917

Comment: 3520

Experimental: 4916

Combined experimental-theoretical: 3124, 3234

Theoretical: 3641, 3725, 3744, 4715, 4913, 4974

#### 1.6.2.2. Reviews on foreign gas broadening

3786, 3967, 4880

Experimental: 3582, 4373

Theoretical: 3902, 3908

#### 1.6.2.3. Reviews on resonance broadening

3728, 3967

#### 1.6.3. Reviews on Doppler broadening and Doppler-free

##### spectroscopy

4818

Combined experimental-theoretical: 3112

#### 1.6.4. Studies of regularities

3096, 3099, 3213, 3237, 3379, 3380, 3694, 3698, 3734, 3735,  
3737, 3932, 4046, 4785, 4933, 4982, 5010, 5045

Comment: 3893

Combined comment-theoretical: 5011

Experimental: 3098, 3522, 3879, 4033, 4047, 4084, 4086,  
4358, 4366, 4500, 4631, 4737, 4738, 4740,  
4788, 4816, 4878, 4960, 4979, 4996, 5034

Combined experimental-theoretical: 3326, 3736, 4604,  
4736, 4739, 4756

Theoretical: 3196, 3212, 3553, 3818, 3976, 3977, 3978, 4156,  
4158, 4289, 4291, 4292, 4372, 4566, 4886, 4887,  
4889, 4973, 4975, 4976

1.7. REFERENCES ON LINE BROADENING TABLES AND  
BIBLIOGRAPHIES

1.7.1. General line broadening tables

1.7.2. Pressure broadening tables

1.7.2.1. Special Stark broadening tables

4046, 4196, 4197, 4917, 5045

Theoretical:      4041, 4342, 4357, 4533, 4684, 4786,  
                        4837, 4855, 4882, 4883, 5031, 5032

1.7.2.2. Special foreign gas broadening tables

3786

1.7.3. Doppler and natural line broadening tables

1.7.4. Tables of Voigt functions

Theoretical: 4150

1.7.5. Line broadening bibliographies

3172, 4888, 4972, 5028

2. A. LITERATURE REFERENCES CONTAINING NUMERICAL DATA.

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

<b>Al I</b>	<b>Al XI</b>	<b>T</b>	4366, 4394,
Stark	Stark	3188, 3300,	4500, 4649,
E	E	3544, 4187,	4657, 4755,
3291, 3386,	4824	4256, 4552	4787, 4813
3646			E, T
E, T	T		3137, 4492,
3792, 4093	3544, 3884,		4814
	4873		
T		Resonance	
3406		E	
		3192, 3909,	T
		4616; 4870	3750, 4437,
	Stark		4439, 4440
	C		
<b>Al II</b>	<b>4670</b>	<b>E, T</b>	<b>Ar III</b>
Stark		4098	Stark
E	E	T	E
3699, 4602	4257	4230	3248, 4738
E, T	E, T	Stark	E, T
3736, 4371	3276	E	4604, 4915
T	T	3387, 3388,	
4437	3544, 3799,	3969, 4032,	T
	4767, 4768,	4033, 4120,	3279, 3281,
<b>Al III</b>	<b>4863</b>	<b>4192, 4316,</b>	<b>3460, 3640,</b>
Stark		<b>4501, 4596,</b>	<b>3670, 4565,</b>
T	Stark-Doppler	<b>4649, 4655,</b>	<b>4685</b>
3212, 3460,		<b>4656, 4657,</b>	
3640, 3750,	T	<b>4766, 4770,</b>	<b>Ar IV</b>
4685	4767	<b>4805, 4864,</b>	Stark
		<b>4923, 4956,</b>	E
		<b>5000</b>	4738
<b>Al IV</b>	<b>Stark</b>		
Stark	C	E, T	E, T
T	4670	3591, 3716,	4905, 4915
3752		4468, 4756,	
	C, T	4902	T
<b>Al IX</b>	<b>4235</b>		3279, 3281,
Stark		T	3460, 3640,
T	E	4230, 4280,	3670, 4565,
3544	4053, 4203,	4464, 4832	4685
	4257		
<b>Al X</b>			
Stark	E, T	Stark	<b>Ar XII</b>
T	3501	E	Stark
3544		3152, 3180,	E, T
		3248, 3461,	4134
		3906, 4202,	

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

	4256, 4300,		
<b>Ar XIV</b>	4343, 4387,	T	T
Stark	4516, 4517,	4007	4007
E, T	4519, 4536,		
4922	4552, 4558,	<b>Ba I</b>	<b>Be seq.</b>
	4598, 4612,	Resonance	Stark
<b>Ar XV</b>	4641, 4894,	E	T
Stark	4912, 4934,	3936	4154
E, T	4935		
4922		Stark	<b>Bi II</b>
	Stark-Doppler	E	Stark
<b>Ar XVI</b>	T	4192	E
Stark	4179		4047, 4084
E, T		<b>Ba II</b>	
4922	<b>B I</b>	Stark	E, T
	Stark	E	3521, 4371
T	E	4192, 4923	
5026	5033		<b>Br I</b>
		T	Stark
<b>Ar XVII</b>	<b>B II</b>	3175, 3212,	E
Stark	Stark	3638	4340
E, T	E		
3476, 3501,	5033	Zeeman	E, T
3592		E	4689, 4893
	<b>B III</b>	3273	
T	Stark		T
3336, 3660,	E		3974
3683, 3931,	5033	Stark	
4793, 4900,		E, T	<b>Br II</b>
4912, 4999,	T	3326	Stark
5026	3212, 3640,		E
	4685, 4745	T	4996
<b>Ar XVIII</b>		3640, 4290,	
Stark	<b>B IV</b>	4437, 4565,	<b>Br III</b>
C, T	Stark	4745, 5031	Stark
3335, 3507,	T		E
4235, 4386	3640, 4270,		4996
	4685	Stark	
E, T		T	<b>Br IV</b>
3592, 4906	<b>B V</b>	3640, 4685	Stark
	Stark		E
T	E		4996
3528, 3718,	3200, 5044	Stark	
3776, 3802,		E	<b>Br XXXIII</b>
3931, 3965,	E, T	3200	Stark
3966, 3985,	3355, 4907		T
4013, 4121,			3703
4153, 4179,			
4238, 4253,			

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

<b>Br XXXV</b>	E, T	Stark-Doppler	Stark
Stark	4908	E	E
T		3343, 3720	4192
3985, 4300	T		
	3279, 3385,	Stark-Zeeman	T
<b>C I</b>	3460, 3640,	T	3974
Stark	4565, 4685,	3719, 3719	
E	4686, 4745,		Zeeman
3409, 3994,	4793, 4811,	<b>Ca I</b>	E
4189, 4452,	4885, 4975,	Resonance	3647
4583, 5008	4977	E	
		4411	<b>Cd II</b>
E, T			Stark
4902	<b>C V</b>		E
	Stark	Stark	4980
	E	E	
T	4850	3433, 4190	
3385, 4838			<b>Cl I</b>
	E, T	T	Stark
<b>C II</b>	4707	4482	E
Stark	T		3085, 4358,
E	3385, 3662	<b>Ca II</b>	4688
3210, 3829,		Stark	
3830, 4687,		E	E, T
5008		3329, 3945,	4893
	<b>C VI</b>	3993, 4923	
T	Stark		<b>Cl II</b>
3385, 4811	C, E	E, T	Stark
	4170	3326	E
<b>C III</b>	E		4740
Stark	3200, 3343	T	
E		3638, 3750,	E, T
3982, 4687,	E, T	4290, 4437,	3736, 4915
4709	3222, 3355,	4565, 5032	
	3782, 3938,		<b>Cl III</b>
T	4707, 4708	<b>Ca XVIII</b>	Stark
3279, 3385,		Stark	E
3460, 3640,	T	T	4740
3670, 4636,	3188, 3300,	4872	
4685, 4745,	3528, 3662,		E, T
4811	3718, 3719,	<b>Cd I</b>	4915
	3860, 3912,	Resonance	
<b>C IV</b>	3965, 4007,	E	T
Stark	4348, 4496,	3120, 3241	3279, 3460,
E	4719, 4899,		3640, 3670,
3937, 3982,	4914		3813, 4565,
4255, 4554,			4685
4669, 4687			

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

Cl IV	Cu IV	F III
Stark	Stark	Stark
E	T	E
4740	4783	4740, 4979
T	D I	T
3640, 4685	Stark C,E	4685
Cl XVII	3316	F IX
Stark	E	Stark
T	3126, 3287,	C,E,T
4954	3463, 3642,	4562
	3952, 3989,	E,T
Co I	4626, 4830	3355
Stark	Stark-Resonance	
E	T	
4083, 4223	4252	
	E,T	F VII
	3100, 4895	Stark
Cr I	Cu I	E
Stark	Line broadening	4095
E	E	
3466	5040	
Cr II	Stark	
Stark	E	
E	4192, 4298,	F VIII
4048, 4224	4365, 4622	Stark-Doppler
		E,T
Cs I	E,T	3482
Resonance	4831	
E	E,T	Fe I
3190, 3356,		Stark
3418, 3783,	4472, 4793	E
4666, 4772		3294, 4920,
		4923
E,T	Stark-Zeeman	
3233, 3583	E	
		F II
T	5025	Stark
3498, 3526		E
Cu II	4979	Stark
Stark	E,T	E
Resonance-Doppler	4298, 4622,	4923
E	4835	
3783		Fe XV
		Stark
		T
		3496

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

<b>Fe XXV</b>	Stark	E, T	4903, 4929,
Stark	3394	3770, 4126,	4935, 4967,
T		4172, 4543,	4985, 4989,
4694, 4897	C	4634, 4698,	4993, 5017,
	3289, 4307,	4699, 4705,	5023
<b>Ga I</b>	4459	4801, 4831,	Stark-Doppler
Stark		4831, 4895,	T
E	C, E	5005	3299, 3394,
3759	3283, 3316,		3904
	3354, 3366	T	
E, T		3179, 3227,	Stark-Zeeman
4618	C, T	3229, 3298,	C, E
	3303, 3402,	3299, 3317,	3283
<b>Ga II</b>	3726, 3740,	3333, 3334,	
Stark	3934, 4317,	3394, 3555,	T
E, T	4734	3562, 3576,	3441
4618		3649, 3680,	
	E	3764, 3766,	<b>He I</b>
<b>Ga III</b>	3113, 3132,	3779, 3834,	Resonance
Stark	3177, 3248,	3836, 3841,	E
T	3287, 3396,	3889, 3904,	3156, 3517,
3212	3430, 3457,	3965, 3966,	3630, 3631,
	3463, 3467,	3998, 4060,	4817
<b>Ge I</b>	3468, 3624,	4065, 4097,	
Stark	3625, 3642,	4100, 4102,	Stark
E	3654, 3667,	4206, 4207,	C
4362, 4489,	3771, 3900,	4208, 4217,	3426
4730	3964, 3989,	4236, 4238,	
	4012, 4132,	4239, 4240,	C, E
T	4136, 4242,	4268, 4304,	3443, 3548,
3974	4266, 4269,	4305, 4350,	3666
	4278, 4301,	4388, 4389,	
<b>H I</b>	4302, 4308,	4448, 4449,	C, T
Doppler	4313, 4337,	4450, 4456,	4209
E	4429, 4432,	4505, 4510,	
4547, 4966	4457, 4504,	4511, 4518,	E
	4508, 4542,	4569, 4580,	3111, 3123,
<b>Resonance</b>	4572, 4613,	4627, 4665,	3148, 3159,
E	4648, 4661,	4676, 4679,	3163, 3164,
3710	4680, 4690,	4697, 4701,	3169, 3205,
	4797, 4843,	4719, 4724,	3242, 3288,
T	4928, 4941,	4732, 4733,	3292, 3296,
4862, 4950,	4991, 5001,	4748, 4762,	3370, 3400,
4951	5019	4775, 4791,	3421, 3466,
		4796, 4800,	3469, 3519,
		4819, 4841,	3687, 3701,
		4851, 4855,	3950, 3980,
		4861, 4876,	4074, 4077,

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

4078, 4079,				
4112, 4117,	C, E	T		I LIII
4249, 4374,	3563, 4068	3622, 4103	Stark	
4405, 4522,			T	
4799, 4849,	E	Stark		3985, 4300
4938, 5007,	3094, 3197,	E		
5024	3221, 3400,	4038	In I	
	3612, 3803,		Stark	
E, T	3840, 4080,	E, T	E, T	
3350, 3359,	4131, 4166,	3970, 4891		4618
3360, 3368,	4221, 4255,			
3538, 3653,	4414, 4418,	T	In II	
4498, 4810,	4499, 4617,	3974, 4103	Stark	
4948	4695, 4711,		E, T	
	4723, 4822	Zeeman		4618
T		E		
3133, 3278,	E, T	3647	In III	
3282, 3334,	3315, 3538,		Stark	
3345, 3432,	3549, 4794		T	
3598, 3603,		Stark		3212
3765, 3791,	T	E, T		
3801, 3816,	3332, 3593,	4891	K I	
3878, 3976,	3594, 3778,		Resonance	
3977, 3978,	3802, 3835,		E	
4156, 4158,	3965, 3999,	I I		3749
4287, 4435,	4092, 4451,	Resonance		
4436, 4621,	4521, 4665,	E		
4675, 4786,	4697, 4724,	3389	E, T	
4793, 4838,	4732, 4762,	Stark		4326
4876, 4881	4836, 4837,	E	T	
	4867, 4871,	4788		3498, 3526,
Stark-Zeeman	4929, 4942,			3858, 4610
E	5017	E, T		
3284		4893	Stark	
	Hg I		C	
Zeeman	Resonance	I II		4315
E	C	Stark		
5002	3447	E	C, T	
		4919		4338
He II	E			
Doppler	3328, 3571,	I III	E	
C, E	4503	Stark		3098, 3433,
3563, 3573		E		4182, 4183
	E, T	4919		
Stark	3440, 4502		T	
C				3196, 4438,
3493				4567, 4883

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

		4971, 4973	
K II	T		Mg XII
Stark	4565	Li III	Stark
E, T		Stark	T
3736		E	3188, 3300,
	Kr IV	4910	4349
	Stark		
K XVIII	C, T		Mn I
Stark	5011	E, T	Stark
T		4479	T
4954			4482
	Kr XXXIII	Mg I	
Kr I	T	Resonance	Mn II
Resonance	4758, 4759,	E	Stark
E	4873	3936, 4760	T
3327, 3679,			3814
4575		Stark	
	Kr XXXIV	E	N I
T	T	3329, 3433,	Stark
4792	4758, 4759,	3828, 4192	E
	4873, 5014		3155, 3250,
Stark		T	3534, 4452,
E		4436, 4482	4596
3245, 3621,	Kr XXXVI	Mg II	
4578, 4650,	Stark	Stark	Stark
4816, 4845	T	E	C
	3985, 4300	3329, 3828,	3686
E, T		3945	
4756			N II
	Li I		
	Resonance		
	E		
Kr II	3761, 3925,	E, T	
Stark	4110	3326	C, T
E			3636
3621, 4086,	T	T	
4366, 4500,	3526	3638, 3750,	
4650, 4682,		4290, 4437,	
4781, 4816,	Stark	4565	E
4845, 4960	E		3248, 4222,
	3098, 3433,		4339, 4631,
Kr III	4110, 4192,	Mg IV	4709, 5035
Stark	4572, 4992	Stark	
E		T	
4682, 4781	E, T	3640, 4685	E, T
	3792		3315
E, T			
4604	T	Mg XI	
	3196, 3637,	Line broadening	T
	3703, 3758,	E, T	3182, 3315,
	3815, 3943,	3619	3640
	3973, 4417,		

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

N III	E, T 4907	E, T 4211, 4443, 4559, 4943	E, T 4604
Stark			
C			
3686	T 4811, 4885, 4889	T 3196, 3750, 4291, 4292, 4399, 4400, 4401, 4882, 4887	T 3640, 4565, 4685
C, T			
3636			
E			
4222, 4631	Stark C, E 4170	Stark 4887	Stark E 4738
E, T			
3315	E 3200	Stark T 3640, 4685	T 3640, 4685
T			
3279, 3281, 3315, 3460, 3640, 3670, 4565, 4685	E, T 3355	Ne I Resonance T 4007, 4899	Ne VI Stark T 4889
N IV			
Stark	Stark-Doppler		Ne VII Stark
C	E	Stark	T
3686	3720	E	4745
C, T			
3636	Na I Resonance E	4377, 4629, 4680, 4741, 4757	Ne VIII Stark T
E			
3248, 4631, 4857	3373, 3422, 3551, 3761, 4024, 4025, 4110	T 3750	4745
E, T			
3315	T 3450, 3526, 4610	Ne II Stark E 3209, 4471, 4500, 4630	Ne VIII Stark E 4416
T			
3315, 3640, 4685, 4889	Stark E	E, T 3736	T 4712, 4793
N V	3098, 3433, 3806, 3865, 4110, 4192, 4345, 4346, 4395, 4572, 4866, 5033	Ne III Stark E 4738	Ne X Stark C, T 3335 E 3243, 4416

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

E, T	T	T	Pb II
3423, 3501,	3279, 3281,	3188, 3300,	Stark
4906	3460, 3479,	4899	E
T	3635, 3640,		4047, 4084,
3188, 3300,	3670, 4565,	P I	4376
3332, 3527,	4685	Stark	
3528, 3565,		E	E, T
3718, 3802,	O IV	4358	3347, 4371
3810, 4013,	Stark		
4123, 4153,	E	P II	Rb I
4179, 4214,	4737	Stark	Line broadening
4256, 4348,		E	E, T
4491, 4516,	T	4047, 4084,	3495
4536	3640, 4685,	4358	
Stark-Doppler	4889		Resonance
E	O V	E, T	3569
3243	Stark	3736, 4371	C, T
T	E	P III	4055
4179	4737	Stark	
T	T	T	E
4662, 4838,	3640, 4685		3190, 3356,
4859	4745, 4889,		3403, 3419,
O I	5013	P IV	3569, 3749,
Stark		Stark	3933, 4064,
E	O VI	T	4324
3994, 4583	Stark	3640, 4685	
T	E		E, T
4095, 4669	Pb I		3583
4662, 4838,		Resonance	
4859	T	E	T
O II	4745, 4811,	4983	3526, 3895,
	4885, 4889		4610
Stark		Stark	
E	O VIII	E	Stark
4737, 4981	Stark	4376, 4835	E, T
T	C, E		3326
3479, 3639,	4170	E, T	
3670, 3818		3347	T
O III	E		3212, 3974
Stark	3200	T	
E		3974	S I
4737	E, T		Stark
	3355		E
			3994, 4358,
			4393, 4481

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

<b>S II</b>	<b>Si I</b>	<b>Si XIII</b>	<b>Sr II</b>
Stark	Stark	Stark	Stark
E	E, T	E, T	E
4282, 4358,	3374, 3792	3318, 3501	3329, 4192,
4481, 4890			4923
	<b>Si II</b>	T	
E, T	Stark	3334, 3336,	T
3736, 4915	E	4092	3212, 3638,
	3151, 3214,		3640
	<b>S III</b>	3869, 4054,	<b>Si XIV</b>
Stark	4926	Stark	Stark-Doppler
E		E, T	E
3211, 4890	T	3501	3494
	3975, 4715,		
E, T	4811	T	<b>Ti II</b>
3371		3188, 3300,	Stark
	<b>Si III</b>	3332, 4092	T
T	Stark		3814
3460, 3478,	E	<b>Sn I</b>	<b>Ti IV</b>
3640, 3670,	3869, 5034	Stark	Stark
3813, 4565,		E	E, T
4685	T	3348	4507
	3279, 3460,		
	<b>S IV</b>	3640, 3975,	
Stark	4565, 4685,	T	<b>Ti XX</b>
E	4811, 4889	3974	Stark
3211	<b>Si IV</b>	<b>Sn II</b>	T
E, T	Stark	Stark	3703
3371	E	E	
	5034	3348, 4047,	<b>Tl I</b>
		4084, 4892	Doppler
T	T	E, T	E
3460, 3478,	3279, 3460,	4371	3341
3640, 3670,	3640, 3750,		
3813, 4565,	4565, 4685,	T	Resonance
4685	4811, 4976,	3477, 3670	E
	4978, 5013		3121, 3208,
	<b>Sb II</b>		3571
Stark	<b>Zeeman</b>	<b>Sr I</b>	<b>Tl III</b>
E	E, T	Stark	Stark
4047, 4084	4664	E	T
		4192	3212
E, T		Stark-Doppler	
4371		E	
		3494	

All mechanisms except van der Waals.

Element, mechanism, type, reference number as in part 3.

V V	T	Zeeman
Stark	4877	E
E, T		3647
4507		
Xe III		Zn II
Xe I	Stark	Stark
Resonance	E	E
E	4682, 4781	4980
3327, 3959,	E, T	
4051, 4575	4604	
E, T	T	
4896	4565	
Xe LIV		
T	Stark	
4792	T	
Stark	3985, 4300	
C, T		
5011		
Xe XLV		
E	Stark	
3331, 3753,	T	
4017, 4181,	4912, 4999	
4332, 4333,		
4650, 4916	Yb I	
E, T	Resonance	
4756	E	
E, T	4930	
T		
3752	E, T	
	5020	
Zn I		
Xe II	Resonance	
Stark	E	
E	3241	
3879, 4086,		
4225, 4366,	Stark	
4500, 4650,	E	
4722, 4780,	3291	
4816, 4916,		
4958, 4959	E, T	
	4831	
E, T		
4492	T	
	3974	

2.B. LITERATURE REFERENCES CONTAINING NUMERICAL DATA.

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

		4098 by Ar
<b>Ag I</b>		4945 by Ar, He
E		
3596 by Ar, Kr, Xe	T	
		4946 by He
<b>Al I</b>		4853 by He, Ne
		4122 by He, Ne, Ar
E		4947 by Ne
3216 by He, Ar	<b>B I</b>	
<b>Ar I</b>		
C, T	T	
4779 by He, Ne	4520 by Ne, Ar, Kr	
	<b>Ba I</b>	
E	E	
4486 by Ar	3693 by Ar	
4725 by Ar	4004 by Ar	
3192 by Ar	4271 by Ar, Kr, Xe	
3909 by Ar	4918 by He, Ar	
4316 by Ar	4244 by He, Ar, Kr	
4501 by Ar	3838 by He, Ne, Ar, Kr, Xe	
4616 by Ar	3295 by Kr	
4962 by Ar, He, Ne	3578 by Kr	
4531 by Ar, Ne, He		
4273 by He, Ne, Ar		
4532 by He, Ne, Ar	E, T	
4870 by He, Ne, Ar	4262 by Ar	
4652 by He, Ne, Ar	3425 by Ar, Kr, Xe	
E, T	4129 by Ar, Xe	
4124 by Ar	5022 by Ba	
	5021 by He, Ne, Ar, Kr, Xe	

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

T	3656 by He, Ar 3826 by He, Ar 4589 by He, Ar, Xe 5041 by He, Ne, Ar 3916 by He, Ne, Ar, Kr, Xe 4006 by He, Ne, Ar, Kr, Xe 4601 by He, Ne, Ar, Kr, Xe 4458 by He, Ne, Ar, Kr, Xe 4754 by Ne
Ba II	
E	
4373 by Ar, Ne 4654 by He, Ar	E, T
Bi I	3604 by air-C <sub>2</sub> H <sub>2</sub> 3627 by Ar 3540 by Ar-O <sub>2</sub> -H <sub>2</sub> 3919 by Ar, Kr 4514 by Ar, Kr, Xe 3535 by Ar, Ne, He, H 4747 by H 4869 by He, Ar, Xe 3825 by He, Ne, Ar, Kr, Xe
E	3917 by Kr 4175 by Kr 3540 by N <sub>2</sub> -O <sub>2</sub> -H <sub>2</sub>
Br I	
E	
3958 by Br <sub>2</sub> , O <sub>2</sub> , WF <sub>6</sub> , UF <sub>6</sub> , C <sub>3</sub> F <sub>7</sub> I , CO <sub>2</sub>	T
Ca I	3203 by Ar 3605 by Ar, He 4932 by H 3536 by H 5016 by H 4392 by He, Ar, Kr 4286 by He, Ne
E	
3352 by Ar 3807 by Ar 4004 by Ar 4561 by Ar, Kr 4411 by Ar, Kr, Xe 4272 by Ar, Ne 3746 by He 3918 by He 4453 by He 3144 by He, Ar	

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

Ca II	Cd II
E	E
3754 by Ar	3789 by Cd
3144 by He, Ar	
3656 by He, Ar	Cl I
3826 by He, Ar	
E, T	E
4004 by Ar	4840 by He, Ar, Kr, Xe, O <sub>2</sub> , CO, CO <sub>2</sub> , H <sub>2</sub> , N <sub>2</sub> , D <sub>2</sub> , Cl <sub>2</sub> , I, Cl
	Cr I
T	E
3605 by Ar, He	4021 by C <sub>2</sub> H <sub>2</sub> -air
4729 by H	3378 by He, Ar, N <sub>2</sub> , H <sub>2</sub>
4485 by He	
4614 by He	Cs I
Cd I	C, E
E	3739 by Cs
3120 by Cd	3465 by He
3102 by Cd, Ne	
3459 by He, Ar	C, T
3119 by Xe	3107 by He, Ne, Ar
3475 by Xe, Kr, Ar, He, Ne	
E, T	E
4426 by Cd, Kr	3199 by Ar
	3717 by Ar
	3827 by Ar
	3655 by Ar, He, Xe
T	4373 by Ar, Ne
4380 by Ar	4011 by Cs
4152 by Ar, Kr, Xe	3644 by H <sub>2</sub>

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

4320 by He	3751 by Ar, Kr, Xe
4232 by He, Ne, Ar, Kr	5042 by Cs
4162 by He, Ne, Ar, Kr	4964 by Cs
4062 by He, Ne, Ar, Kr, Xe	3134 by He
4161 by He, Ne, Ar, Kr, Xe	4402 by He
4085 by He, Ne, Ar, Kr, Xe	3106 by He, Ar, Kr, Xe
4480 by He, Ne, Ar, Kr, Xe	3135 by He, Ne, Ar, Kr, Xe
4909 by He, Ne, Ar, Kr, Xe	3435 by He, Ne, Ar, Kr, Xe
3613 by He, Ne, N <sub>2</sub> , CH <sub>4</sub> , C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> , C <sub>4</sub> H <sub>10</sub>	4194 by He, Ne, Ar, Kr, Xe
4321 by Ne, Ar	3238 by H, He, Ne, Ar, Kr, Xe
3391 by Ne, Ar, Kr, Xe	3453 by Kr
3560 by Ne, Ar, Xe, Kr	3557 by Ne, Ar, Kr, Xe
4574 by Xe	3227 by Xe
3473 by Xe, Ar, He	3427 by Xe
3529 by Xe, Kr	3785 by Xe
3559 by Xe, Kr, Ar, Ne	4130 by Xe
E, T	4263 by Xe
4231 by Ar, Kr	3940 by Xe
3762 by Ar, Kr, Xe	3093 by Xe, Ar
3583 by Cs	3473 by Xe, Kr, Ar, He
3437 by He, Ne, Ar, Kr, Xe, H <sub>2</sub> , N <sub>2</sub>	Cu I
3321 by Xe	E
3500 by Xe	3149 by He, Ne
3688 by Xe	3145 by N <sub>2</sub> , air
3168 by Xe, C <sub>5</sub> H <sub>12</sub>	E, T
T	3604 by air-C <sub>2</sub> H <sub>2</sub>
3203 by Ar	Cu II
3763 by Ar	
4252 by Ar, Cs	E
3688 by Ar, Kr	3346 by He
3215 by Ar, Kr, Xe	
3240 by Ar, Kr, Xe	

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

**Eu I**

E  
4513 by Ne

T  
4681 by He, Ne, Xe  
4965 by Sr

**F I**

E  
4101 by He, Ar, N<sub>2</sub>

T  
4101 by Ar

**Fe I**

C, T  
3136 by H

E  
3568 by Ar

E, T  
3536 by H, He

T  
4584 by H  
3580 by H, H-He

**Ga I**

T  
3382 by Ar, Kr, Xe

E  
3417 by He  
3769 by He

E, T  
3286 by H  
3416 by He  
4115 by He

T  
4430 by Ar  
3271 by Ar II  
3104 by He  
3946 by He  
4940 by He  
3106 by He, Ar, Kr, Xe  
3135 by He, Ne, Ar, Kr, Xe  
3435 by He, Ne, Ar, Kr, Xe  
3238 by H, He, Ne, Ar, Kr, Xe

**He I**

E  
3448 by He  
4087 by He  
4632 by He  
4937 by He

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

T	T
4122 by He	3702 by Ar, Kr, Xe
5003 by He	4286 by He, Ne
	4852 by He, Ne
Hg I	3926 by He, Ne, Ar, Kr, Xe
	3585 by He, Ne, Ar, Kr, Xe
C	3506 by Hg
3447 by Ar, Kr, Xe	4103 by Hg
	I I
E	E
3727 by Ar	3983 by Ar, O <sub>2</sub> , I <sub>2</sub> , I
4503 by Ar	4969 by Ar, O <sub>2</sub> , I <sub>2</sub>
4144 by Ar, Kr	3339 by He, O <sub>2</sub> , H
3269 by Ar, N <sub>2</sub>	4728 by I
3492 by He	4069 by O <sub>2</sub>
3890 by He, Ne	
3788 by He, Ne, Ar, Kr, Xe	
3589 by Hg	
3328 by Hg	T
3661 by Kr	3339 by He
3571 by Ne, Kr, Xe	4969 by Ne, Ar, Kr, Xe, O <sub>2</sub>
4002 by Xe	
	In I
	3223 by Hg
E, T	
3207 by Ar	
3266 by He, Ne, Ar, Kr, Xe	E
3695 by He, Ne, Ar, Kr, Xe	3223 by Hg
3157 by Hg	
3440 by Hg	
4330 by Hg	E, T
3970 by Hg	3540 by Ar-O <sub>2</sub> -H <sub>2</sub>
	4163 by He, Ne, Ar, Kr, Xe, H <sub>2</sub> , N <sub>2</sub>
	3540 by N <sub>2</sub> -O <sub>2</sub> -H <sub>2</sub>

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

T	T
3382 by Ar, Kr, Xe	4994 by Ar
	3093 by Ar
K I	4952 by H
	4540 by He, Ne, Ar, Kr, Xe
E	3195 by He, Ne, Ar, Kr, Xe
3673 by Ar	4746 by He, Ne, Ar, Kr, Xe, N <sub>2</sub> , K
3846 by Ar	3238 by H, He, Ne, Ar, Kr, Xe
3822 by Ar	4213 by K
4970 by Ar	5030 by K, Rb
3755 by Cs	4274 by Na
3195 by He, Ne, Ar, Kr, Xe, N <sub>2</sub>	4964 by Rb, K
4327 by He, Ne, Ar, Kr, Xe	
4328 by He, Ne, Ar, Kr, Xe	Kr I
4360 by N <sub>2</sub> , CO <sub>2</sub>	
3971 by Ne	E
4011 by Rb	3679 by He, Kr
	4122 by He, Ne, Kr
E, T	
3604 by air-C <sub>2</sub> H <sub>2</sub>	T
3867 by Ar	4946 by He
3797 by Cs	4853 by He, Ne
3689 by He, Ar	4122 by He, Ne, Ar, Kr
3862 by He, Ne, Ar, Kr, Xe	3327 by Kr
3117 by He, Ne, Ar, Kr, Xe	4947 by Ne
3401 by He, Ne, Ar, Xe	
3796 by K	Li I
4643 by K, Rb	
3633 by Ne	E
3634 by Ne	3353 by Ar
4842 by Ne	4114 by Ar, Kr, Xe
4140 by Rb	3790 by He, Ne
	3855 by He, Ne, Ar, Kr, Xe
	3685 by He, Ne, Ar, Kr, Xe

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

3839 by He, Ne, Ar, Kr, Xe

4534 by He, Ne, Ar, Kr, Xe

4109 by Li

T

3925 by Li

3605 by Ar, He

4286 by He, Ne

E, T

**Mg II**

4105 by Cs

E

3117 by He, Ne, Ar, Kr, Xe

3656 by He, Ar

3826 by He, Ar

T

4952 by H

T

3093 by He

3605 by Ar, He

4094 by He, Ne

4729 by H

4540 by He, Ne, Ar, Kr, Xe

4485 by He

3238 by H, He, Ne, Ar, Kr, Xe

3896 by Li, He, Ne

4213 by Li, Na, K

**Mn I**

**Mg I**

E, T

3604 by air-C<sub>2</sub>H<sub>2</sub>

E

4760 by Ar

**Na I**

4336 by H<sub>2</sub>

C

3656 by He, Ar

3178 by Ar

3826 by He, Ar

4493 by H

4795 by He, Ne, Ar, Kr, Xe

E, T

C, T

4750 by Ar

4383 by H

3425 by Ar, Kr, Xe

3709 by He, Ne

4611 by H<sub>2</sub>, He

3115 by Ar

E

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

3170 by Ar	3824 by N <sub>2</sub> , Na <sub>2</sub>
3606 by Ar	3907 by Ne
3353 by Ar	3590 by Ne, Ar, Xe
4008 by Ar	4595 by Ne, Ar, Xe
4351 by Ar, H, H <sub>2</sub>	3658 by Ne, Kr, Xe
3681 by Ar, N <sub>2</sub> , H <sub>2</sub> , H <sub>2</sub> O, H <sub>2</sub> -O <sub>2</sub> -Ar, H <sub>2</sub> -O <sub>2</sub> -N <sub>2</sub> , C <sub>2</sub> H <sub>2</sub> -O <sub>2</sub> -N <sub>2</sub> , CO-CO <sub>2</sub>	4624 by Ne, Xe
3682 by Ar, N <sub>2</sub> , H <sub>2</sub> O, H <sub>2</sub> -O <sub>2</sub> -N <sub>2</sub> , H <sub>2</sub> -O <sub>2</sub> -Ar	3659 by Ne, Xe, Kr
3579 by H <sub>2</sub> -O <sub>2</sub> -Ar	3372 by NO, CO, N <sub>2</sub> O
3183 by H <sub>2</sub> -O <sub>2</sub> -N <sub>2</sub> , H <sub>2</sub> -O <sub>2</sub> -Ar, C <sub>2</sub> H <sub>2</sub> -O <sub>2</sub> -N <sub>2</sub>	4036 by Rb, Cs
3524 by He	3767 by Xe
3781 by He	E, T
3773 by He	3604 by air-C <sub>2</sub> H <sub>2</sub>
4477 by He	3503 by Ar
4478 by He	3540 by Ar-O <sub>2</sub> -H <sub>2</sub>
3373 by He, Ar, H <sub>2</sub> , N <sub>2</sub>	3772 by He
3551 by He, Ar, H <sub>2</sub> , N <sub>2</sub> , N <sub>2</sub> O, CO, NO	4573 by He, Ar
3866 by He, Ar, Kr	3823 by He, Ne, Ar
4003 by He, Ar, Kr	3588 by He, Ne, Ar, Kr, Xe
3146 by He, Ar, N <sub>2</sub>	3142 by He, Ne, Ar, Kr, Xe
4828 by He, Ar, Xe, N <sub>2</sub>	4082 by He, Ne, Ar, Kr, Xe
3984 by He, N <sub>2</sub> , Ar, Kr	3509 by He, Ne, Kr
3349 by He, Ne	3570 by Hg
3293 by He, Ne, Ar	4407 by Hg
3490 by He, Ne, Ar, Kr, Xe	4245 by K, Rb, Cs
3449 by He, Ne, Ar, Kr, Xe	3338 by Kr
3491 by He, Ne, Ar, Kr, Xe	3540 by N <sub>2</sub> -O <sub>2</sub> -H <sub>2</sub>
3525 by He, Ne, Ar, Kr, Xe	3941 by Ne
3499 by He, Ne, Ar, Kr, Xe	4174 by Ne, Kr, Xe
3262 by He, Ne, Ar, Kr, Xe	4623 by Ne, Xe
3768 by He, Ne, Ar, Kr, Xe	4625 by Ne, Xe
3715 by He, Ne, Ar, Kr, Xe	4597 by Xe
3246 by He, Ne, H	
3986 by N <sub>2</sub>	T
4073 by N <sub>2</sub> , H <sub>2</sub> O	3203 by Ar

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

3275 by Ar	
3464 by Ar	Ne I
4809 by Ar	
4720 by Ar	C, T
3681 by Ar	4779 by He
4828 by Ar	
4173 by Ar, Kr, He, Xe	
3777 by Ar, Kr, Xe	E
3919 by Ar, Kr, Xe	3140 by He
4827 by Ar, Xe	3595 by He-Ne, Ne
4361 by H	3323 by He, Ne
4399 by H	3616 by He, Ne
4400 by H	3615 by He, Ne
4401 by H	4122 by He, Ne
4953 by H	3979 by He, Ne
3748 by He	3953 by He, Ne
4016 by He	3954 by He, Ne
3899 by He	3864 by He, Ne
4088 by He	3617 by He, Ne
3093 by He	4276 by He, Ne
4718 by He, Ar	4423 by He, Ne
3106 by He, Ar, Kr, Xe	4961 by He, Ne
4952 by He, H, Ne, Ar, Kr, Xe	4473 by He, Ne, Ar, Kr
3302 by He, Ne, Ar, Kr, Xe	3260 by He, Ne, He-Ne
3832 by He, Ne, Ar, Kr, Xe	3141 by Ne
4194 by He, Ne, Ar, Kr, Xe	4384 by Ne
4392 by He, Ne, Ar, Kr, Xe	4551 by Ne
4540 by He, Ne, Ar, Kr, Xe	4180 by Ne
4746 by He, Ne, Ar, Kr, Xe, N <sub>2</sub> , Na	4087 by Ne
4055 by He, Ne, Ar, Xe	4272 by Ne
3450 by Hg	4632 by Ne
3238 by H, He, Ne, Ar, Kr, Xe	
4274 by K	
4213 by Na, K	E, T
3364 by Ne	4744 by He, Ar, Ne
4731 by Ne, Xe	3438 by He, Ne
3372 by NO, CO	3487 by Ne

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

3567 by Ne	3674 by He 4487 by He 4997 by He
T	3486 by He, Ar 4442 by He, Ar
4854 by He	3929 by He, Ar, Xe
4946 by He	3933 by He, Ne, Ar
4341 by He-Ne, Ne	3311 by He, Ne, Ar, Kr
3088 by He, Ne	3608 by He, Ne, Ar, Kr
3599 by He, Ne	3186 by He, Ne, Ar, Kr, Xe
4122 by He, Ne	3678 by He, Ne, Ar, Kr, Xe
3439 by Ne, He	4062 by He, Ne, Ar, Kr, Xe
3204 by Ne, He-Ne	4325 by He, Ne, Ar, Kr, Xe
<b>Pb I</b>	
E	4329 by He, Ne, Ar, Kr, Xe 4642 by Ne, Kr, H <sub>2</sub> 3569 by Rb
4199 by air-C <sub>2</sub> H <sub>2</sub> , air-H <sub>2</sub>	3885 by Rb
4983 by Pb	3403 by Rb 4116 by Xe 4070 by Xe
E, T	3609 by Xe, N <sub>2</sub> , CH <sub>4</sub>
5038 by Ar, He	
<b>Rb I</b>	
C	E, T 3798 by He, Ar 3442 by He, Ne, Ar, Kr, Xe
4063 by He, Ne, Ar, Kr, Xe	3118 by N <sub>2</sub> , Ar 3193 by N <sub>2</sub> , He 4643 by Rb
C, E, T	
3921 by Ar, N <sub>2</sub>	
E	T 3215 by Ar, Kr, Xe 3240 by Ar, Kr, Xe 3134 by He
4441 by Ar, He	3106 by He, Ar, Kr, Xe
3794 by CH <sub>4</sub>	4939 by He, Ar, Kr, Xe
4011 by Cs, K	

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

3135 by He, Ne, Ar, Kr, Xe	
3435 by He, Ne, Ar, Kr, Xe	
4746 by He, Ne, Ar, Kr, Xe, N <sub>2</sub> , Rb	E
3831 by He, Xe	3150 by Ar
3832 by He, Xe	3656 by He, Ar
4173 by He, Xe	3826 by He, Ar
3238 by H, He, Ne, Ar, Kr, Xe	3961 by He, Ar, Kr, Xe
5030 by K, Rb	3939 by He, Ne, Ar, Kr, Xe
4352 by Kr	4700 by He, Ne, Ar, Kr, Xe
3093 by Kr	4005 by He, Ne, Kr
3324 by N <sub>2</sub> , He	3414 by He, Xe
4964 by Rb, K, Cs	3930 by He, Xe
3254 by Xe	4070 by Xe
3955 by Xe	
4275 by Xe	
	E, T
<b>Si I</b>	
	3540 by Ar-O <sub>2</sub> -H <sub>2</sub>
	3663 by Ar, Xe
	3540 by N <sub>2</sub> -O <sub>2</sub> -H <sub>2</sub>
E, T	T
3374 by H	
	3203 by Ar
T	
3203 by Ar	4469 by Ar
	4506 by Ar
<b>Sm I</b>	
	4286 by He, Ne
	5018 by Xe
E	
4769 by He	<b>Sr II</b>
4398 by He, Ar	
4646 by He, Ne, Ar, Kr, Xe	E
4645 by Kr	4588 by Ar
<b>Sr I</b>	
	3656 by He, Ar
	3826 by He, Ar
	4373 by He, Ne, Ar
C, T	
4056 by Ar, Kr, Xe	

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

	3570 by Hg
<b>Tl I</b>	3511 by Kr, Xe
E	4692 by Kr, Xe
3381 by Ar	4691 by Kr, Xe
4363 by Ar	4789 by Ne, Ar
3571 by Ar	4331 by Tl
4844 by Ar, He	4039 by Xe
4205 by CO	4040 by Xe
3876 by CO <sub>2</sub>	
3510 by H <sub>2</sub>	T .
3341 by H <sub>2</sub>	4703 by Ar
4620 by He, Ar	3239 by Ar, Kr, Xe
4490 by He, N <sub>2</sub>	3382 by Ar, Kr, Xe
3924 by He, Ne, Ar, Kr, Xe	4151 by Ar, Kr, Xe
4539 by He, Ne, Ar, Kr, Xe	3947 by He, Kr, Xe
4261 by He, Ne, Ar, Kr, Xe, H <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub>	4247 by He, Ne, Ar, Kr, Xe
3121 by He, Ne, Ar, Kr, Xe	4497 by He, Ne, Ar, Kr, Xe
3223 by Hg	<b>Tm I</b>
3875 by N <sub>2</sub>	
4364 by N <sub>2</sub> , He	E
4570 by Ne, Ar	4398 by Ar
4571 by Ne, Ar	4128 by He
3571 by Ne, Kr, Xe	4539 by He
4059 by SF <sub>6</sub>	4645 by Kr
3208 by Tl	4944 by Xe
	<b>U I</b>
E, T	
3512 by D <sub>2</sub>	E, T
3705 by He, Ne, Ar	4241 by He, Xe
3874 by He, Ne, Ar, Kr, Xe	
4354 by He, Ne, Ar, Kr, Xe, H <sub>2</sub> , D <sub>2</sub> , O <sub>2</sub> , N <sub>2</sub> , CO <sub>2</sub> , SF <sub>6</sub> , CO	<b>Xe I</b>
4668 by He, Ne, Ar, Kr, Xe	E
4651 by He, Ne, Ar, Kr, Xe	4990 by He, Ne, Ar

Mechanism : van der Waals.

Perturbed element; pertubing element; reference number as in part 3.

3232 by He, Ne, Ar, Xe

5027 by He, Ne, Ar, Xe

3393 by He, Xe

4122 by He, Xe

3657 by Xe

4051 by Xe

4145 by Xe

3959 by Xe

E,T

3194 by He

3757 by He, Ne, Ar, Xe

3870 by Xe

T

4946 by He

4853 by He, Ne

4122 by He, Ne, Ar, Kr, Xe

4947 by Ne

3327 by Xe

**Yb I**

E

5020 by He, Ne, Ar, Kr, Xe, Yb

E,T

5043 by He

4538 by He, Ar, Xe

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## 5. ERRATA

<u>Reference No.*</u>	<u>Corrections or Additions to NBS Special Publication 366, Supplement 3 (1978)</u>
2760	In Part 2, add the classification of Na I (Stark, T).
2913	In Part 3, change the reference to the English translation: Sov. Phys.--JETP <b>46</b> , 209 (1977).
2996	In Part 1, add the classification of 1.6.4. In Part 2, delete Na I and K I (Stark, E).
3058	In Part 1, add the classification of 1.4.3. (E).
3061	In Part 1, add the classification of 1.1.2.2. (T).
3075	In Part 1, add the classification of 1.3.4. (E).

\*The numbers refer to paper identification numbers of Part 3 of the third supplement to the original bibliography.





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