I. SPECTRAL LINE SHAPES INVESTIGATIONS IN YUGOSLAVIA 1985–1989

The recently published Bibliography and citation index on Spectral Line Shapes Investigations in Yugoslavia, covers the period 1962 - August 1985 (Dimitrijević, 1990). In the period September 1985 – December 1989, 242 articles concerning line shapes investigations have been published by Yugoslav authors (as compared to 371 in the period 1962 - Agust 1985), as well as 4 Ph. D. and 3 M. Sc. Theses. Consequently, since the first article on this topic (Vujnović et al, 1962) up to the end of 1989, 613 bibliographic items have been published by 89 Yugoslav authors. The number of published articles, authors, B. Sc., M. Sc., and Ph. D. theses are given in Table 1 for each year.

Research on Spectral Line Shapes in Yugoslavia, is developed in several institutions and cities as Institute of Physics in Zemun, Faculty of Physics and Astronomical Observatory (Belgrade), Institute of Physics of the University (Zagreb) and Faculty of Sciences (Novi Sad).

In the considered period various problems have been investigated. Stark broadening of hydrogen and hydrogen-like emitter lines, has been investigated in particularly for H-beta line dip-, and peaks-shift, central structure and profiles (426, 427, 483, 527, 587); He II Balmer beta line widths (599), and He II P-alpha line plasma shifts (532). Also, the attention is paid to the influence of the glass-to-plasma boundary layers in T-tube hydrogen plasmas on line intensities (429), profiles (483) and line to continuum intensity ratios (428), and, to the transition of hydrogen line spectrum in continuum (502).

A lot of work has been done also on the experimental determination of Stark broadening parameters of nonhydrogenic atoms and ions: Stark broadening of folowing atoms and ions has been investigated:

Ar I, II, III, IV (411, 431, 472, 545, 581, 606); Br I, II (521, 524, 526, 582); C II, III, IV (407, 522, 530); Cl I, II, III, IV (405, 493, 524, 525, 551, 582); F I, III (524, 525, 582); HeI (383, 436, 444, 445, 531, 560, 586, 588, 607, 612); I I(523, 524, 582); Kr I, II, III (411, 431, 472, 555, 606, 608); Ne I, II, III, IV (411, 431, 434, 435, 472, 487, 489, 490, 545, 550, 606); N II, III, IV, V (432, 492, 530, 547); O III, IV, V (491, 547, 548); Si II (598); Xe II, III (411, 431, 472, 606), Zn I (380). Also, the influence of ion dynamics has been investigated (471, 588, 531). In order to illustrate the contribution of Yugoslav scientists, in Table 2 is presented the number of references concerning experimentally determined Stark broadening parameters from Yugoslav authors and from others, cited in the review of Konjević and Wiese (1990) covering the period from 1982 year. One can see that an especially significant contribution exists in the case of multiply charged ions.

Theoretical investigations of non hydrogenic emitter Stark broadening were developed in several directions. An especial effort has been done in order to develop and test the modified semiempirical method (Dimitrijević and Konjević, 1980). This method, originally developed for the ion line widths, has been extended to the Stark shifts also (396, 397, 398, 460, 461, 462, 569, 592), and a simple formula useful especially in astrophysics has been derrived (459). Moreover, a simple semiclassical method for evaluation of Stark broadening parameters of neutral atom lines has been developed (393, 394, 395). An effort has been done also to develop a method for simple estimates of Stark widths along a homologous sequence (400, 573, 574, 575) and a method useful especially in astrophysics, based on the systematic dependence on the ionization potential (488, 514, 518). Approximate methods have been used and tested on numerous examples (409, 410, 414, 475, 507, 508, 509, 559, 591, 593, 594, 595, 596, 597).

Using the semiclassical perturbation approach (Sahal-Bréchot, 1969a,b), the spectra of following elements have been investigated: Ga II, III (392), Cu I (581, 614), Cu IV (512, 571), Ar II (403, 404), C IV (465, 467, 511, 515, 576), K I (466, 468), Si II (478, 534), Si IV (519, 579), Li-like ions (578). The influence of the perturber path deflection from straight line, due to the back reaction of neutral emitter on Stark broadening and collision phase shifts, has been investigated (406, 569) as well as plasma screening effects on Stark broadening at the adiabatic limit (513, 570, 572) and the influence of resonance structures in electron scattering cross sections on Stark broadening (392).

A special attention has been paid in a number of papers to the investigation of regularities and systematic trends of Stark broadening parameters (389, 400, 401, 402, 403, 404, 411, 431, 433, 463, 466, 468, 472, 488, 492, 501, 519, 520, 524, 544, 545, 546, 547, 548, 551, 559, 566, 605). Similarities of Stark broadening parameters within the same multiplets (403, 404), supermultiplet (403, 404), transition array (389) and spectral series (401, 402, 466, 468, 519) have been examinated. Also, systematic trends for the same type of transition within a homologous and isoelectronic sequence (549) as well as the dependence of Stark broadening parameters on the ionization potential and on the element ordinal number, giving as the result simple formulae of astrophysical importance (520, 544, 545, 547, 548, 551). An investigation on similarities and regularities for line broadening due to collisions with neutral perturber has also been carried out with the special intention to improve the Van der Waals formula (464, 514, 516).

Astronomical apsects of spectral line shapes research were also investigated, as the limb effect, shapes and asymmetries and bisectors of solar spectral lines (382, 415, 416, 442, 443, 477, 498, 499, 500, 611), Na abundance in Solar atmosphere (379), spectral analysis of a white light flare (494), Be stras spectra (447, 504), mechanisms of neutral oxygen line formation in stellar shels (456, 457, 458), development and weakening of shell spectrum of 88 Herculis, (528), Fe II lines in the spectrum of Am 15 Vulpeculae (300), and, Stark shifts in spectra of hot DA white dwarfs (413, 533), microturbulence and spectral line shapes (378), and Lyman alpha line transfer in chromospheric conditions (450). On Astronomical Observatory in Belgrade the Belgrade programme for monitoring of activity — sensitive spectral lines of the Sun as a star, during a 11-years Solar cycle is in the course of realization (446, 559).

In order to obtain a better connection between astronomical observations and theoretical interpretations of astrophysical spectra, the radiative transfer investigations have also been carried out (376, 384, 385, 386, 448, 449, 451, 452, 553, 561).

In a number of papers, satellite and diffuse bands of NaCd (539, 543, 562, 604), KHg (540), NaHg(562), and TlHg(541) excimers have been studied as well as the spectrum and the photochemical production of NaCd (529, 584, 585), LiMg (542) and metal vapor (486) excimers. Continua, satellite and diffuse bands have been studied also (422, 424, 482, 485, 505, 564, 565), particularly on the case of alkali vapors (381, 387, 412, 418, 430, 437, 439, 453, 473, 474, 479, 503, 538, 600, 601, 602, 603). Moreover, ionization of lithium vapor by CW quasiresonant laser radiation (438, 496), fluorescence in dimers and diatomic molecules (417, 419, 420), laser induced chemiluminescence (555), collisional population of K_2 atomic states (589), spectroscopy of collisional and radiative processes of importance for the interpretation of spectra of diatomic molecules (388, 425, 480, 484, 495, 506, 552, 609), intermediate and long range interaction potentials of heteronuclear and homonuclear alkali dimers and quasimolecules (421, 423, 481, 503, 536, 552) and interaction potentials, oscillator strengths, and quasistatic line shapes for Eu-Sr quasimolecule, have been investigated.

The contribution and influence of Yugoslav scientists in the international effort on investigation and interpretation of line shapes is well illustrated by the bibliography and citation index presented in the second part.

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TABLES — TABELE

Table 1. Number of articles, authors, B. Sc., M. Sc., and Ph. D. theses in the period 1962–1989.

Broj radova, autora, diplomskih, i magistarskih radova i doktorskih disertacija u periodu 1962–1989.

Year godina	No. of publications Br. članaka	No. of authors Br. autora	B. Sc Dipl.	M. Sc. Mag.	Ph. D Dokt.
1962	1	1			
1963	0				
1964	2	2			
1965	1	1			
1966	0				
1967	0				
1968	2	4			
1969	4	4		1	
1970	15	13			
1971	11	9	1	2	
1972	10	11			1
1973	10	13	2	1	
1974	16	16	1		1
1975	14	15	2	1	
1976	23	16	1	1	
1977	13	14	1	1	1
1978	23	16		1	1
1979	17	14		1	
1980	30	19	1		
1981	26	17	1		1
1982	46	19	1		2
1983	32	20		1	
1984	44	22		1	1
1985	43	23		1	1
1986	62	33	3	1	
1987	58	33			
1988	65	34			
1989	55	34		3	
Total Ukupno	613				

Table 2. The number of references concerning experimentally determined Stark broadening parameters from Yugoslav authors and from others, cited in (Konjević, Wiese, 1990)

Broj referenci u kojima se daju eksperimentalni podaci za parametre Štarkovog širenja, od Jugoslovenskih i drugih autora, a koje su citirane u pregledu Konjevića i Wiese-a (1990).

Element Element	Yugoslav authors Jugoslovenski autori	Others Ostali
Neutrals — Neutrali		
Al I	–	2
Ar I	1	7
Br I	1	–
C I	–	3
Cl I	1	1
Co I	1	–
Cs I	2	1
Cu I	1	2
F I	2	1
Fe I	–	1
Ga I	–	1
Ge I	–	1
He I	1	1
Hg I	–	1
In I	–	1
K I	–	1
Kr I	–	1
Ne I	2	1
O I	–	2
P I	–	1
S I	–	2
Xe I	–	1
Singly charged ions - Jednostruko naelektrisani joni		
Al II	2	–
Ar II	1	4
Bi II	1	–
Br II	1	–
C II	1	2
Ca II	–	1
Cl II	1	–
Cr II	1	–
Cu II	–	2
Ga II	–	1

(continuation)

Element Element	Yugoslav authors Jugoslovenski autori	Others Ostali
In II	–	1
Kr II	2	1
N II	2	1
Ne II	3	–
O II	1	–
P II	1	1
Pb II	1	–
S II	–	2
Sb II	1	–
Si II	1	1
Sn II	1	–
Xe II	3	2
Doubly charged ions – Dvostruko naelektrisani joni		
Ar III	2	–
C III	1	1
Cl III	1	–
F III	1	–
Kr III	1	–
N III	1	1
Ne III	2	–
O III	1	–
Si III	–	1
Xe III	1	–
Triply charged ions – Trostruko naelektrisani joni		
AR IV	1	–
C IV	1	4
Cl IV	1	–
N IV	1	–
Ne IV	1	–
O IV	1	–
Other ions – Ostali joni		
N V	1	2
O V	1	–
O VI	–	1