5. Plasma diagnostics

DISCHARGE PLASMA DIAGNOSTICS BY MEANS OF SPECTRAL LINE PROFILE STUDIES

N. Zorina(*), G. Revalde, A. Skudra

Institute of Atomic Physics and Spectroscopy, University of Latvia,
Skunu 4, Riga, LV-1050, Latvia
(*) **natalja.zorina@gmail.com**

Recovering or decomposition of the real spectral line shape has always been an important problem in the discharge plasma diagnostics. An experimentally registered spectral line profile is a convolution of the real spectral line shape and instrument function. The instrument function can destroy the real spectral line shape significantly, for example, it changes the width of the real spectral line. To obtain the real value of the FWHM (the full width at half of maximum) it is necessary to solve an inverse ill-posed task where small experimental uncertainties can cause large deviations in the solution.

In this work we use for low-temperature discharge plasma diagnostics mercury 253,7 nm spectral line, emitted from mercury isotope electrodeless discharge light source manufactured at the Institute of Atomic Physics and Spectroscopy.

The measurements were performed by means of the scanning Fabry Perrot interferometer.

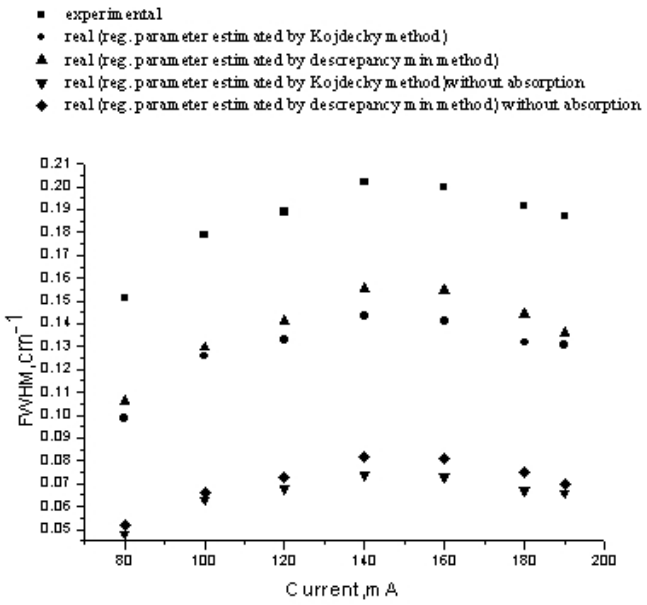

Fig.1. The FWHM of experimentally registered Hg 253.7nm line profile (squares) and the FWHM of the results after deconvolution by means of Tikhonov regularization method using two ways to determinate regularization parameter in dependence on the generator current. The Ar pressure is 10 Torr .

The real value of the FWHM of the spectral line was obtained [Fig.1] solving the ill -posed task by means of a regularization method, proposed by Tikhonov [1]. The mathematical model is described in detail in the papers [2, 3].For methods of regularization the correct determination of the parameter of regularization is very significant task. Therefore in this work we used two independed methods to obtain it.

The influence of the instrumental function and absorption to the real width of the Hg 253.7 nm resonance line in dependence of discharge current, temperature of the radiating atoms, are obtained.

Acknowledgments:
The work was supported by project 2009/0210/1DP/1.1.1.2.0/09/APIA/VIAA/100

References

[1]A. Tikhonov, V.Arsenin, 1979 ,The solution's methods of the ill- posed problem (Moscow: Nauka)
[2] N. Zorina, G. Revalde, R. Disch, 2008, AOMD-6 special issue of SPIE Proceedings, Edited by Spigulis J; Krumins A et al.: **7142**, 71420J-1
[3] G.Revalde, A.Sholupov, A.Skudra, N.Zorina, 2007, JQSRT: **107**, 164–172