

# 4d<sup>9</sup>np resonant Auger effect in Xe: interchannel interaction as a dominant effect in the population of high angular momentum final ionic states

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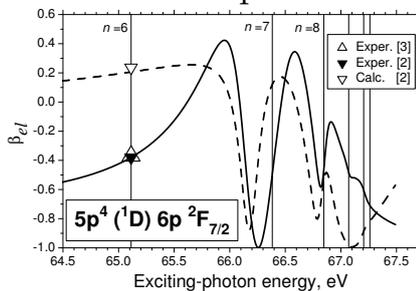
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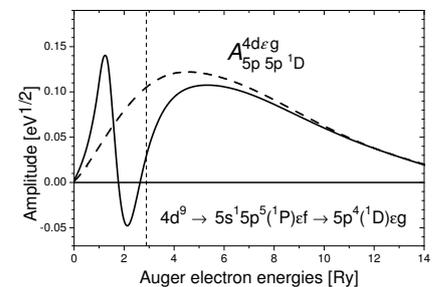
Radiationless decay of the photon-excited inner-shell atomic resonance is known as the resonance Auger effect (RAE). The intensities of the spectral lines and the photoelectron angular distribution (PAD) have been studied intensively for the rare-gas atoms (see, e.g., recent review [1]). Large differences between measured and calculated PAD parameters for the high total angular momentum ( $J=5/2, 7/2$ ) ionic states (in some cases even the sign is opposite, see experimental dots for  $\beta_{el}$  in Fig. 1) have been observed [2,3]. However, the reason of the discrepancy was not clearly understood before the present investigation.

The interaction between different decay channels of the 4d<sup>9</sup>6p resonances in Xe was investigated theoretically within the configuration interaction Pauli-Fock approximation with core polarization (CIPFCP) [4]. The strong impact of the 4d<sup>9</sup>5s<sup>2</sup>5p<sup>6</sup>6p-4d<sup>10</sup>5s<sup>1</sup>5p<sup>5</sup>6p $\epsilon$ f decay channel on other decay channels was revealed. This influence is associated with the resonance-like dependence of the 5s5p-4d $\epsilon$ f decay amplitude on the energy of the  $\epsilon$ f-electron and has the same origin as the well-known giant resonance in the 4d photoabsorption of Xe, i.e. the potential barrier effect.

The interaction between the 4d<sup>10</sup>5s<sup>1</sup>5p<sup>5</sup>6p $\epsilon$ f and 4d<sup>10</sup>5s<sup>2</sup>5p<sup>4</sup>6p $\epsilon$ g decay channels decreases the 5p5p-4d $\epsilon$ g amplitude by a factor of about 3 (Fig. 2) and results in strong changes of the photoionization cross section and (even in sign) polarization parameters  $\beta_{el}$ , alignment  $A_{20}$  and orientation  $O_{10}$  of the Xe 5p<sup>4</sup>mp levels with large values of the total angular momentum for which the 4d<sup>10</sup>5s<sup>2</sup>5p<sup>4</sup>6p $\epsilon$ g channel is dominating. This conclusion is confirmed by the good agreement between the measured  $\beta_{el}$ ,  $A_{20}$  and  $O_{10}$  parameters [2,3] and those computed taking into account the interchannel interaction (Fig. 1)



**Figure 1:** Computed and measured PAD parameters for the  $(^1D)6p\ ^2F_{7/2}$  level. Dashed (without) and solid (with interchannel interaction) curves – present calculations. Vertical lines – positions of the  $4d^9_{5/2}np_{3/2}$  resonances.



**Figure 2:** Auger amplitudes for the 5p5p-4d $\epsilon$ g decay channel computed without (dashed line) and with (solid line) influence of the 5s5p-4d $\epsilon$ f decay channel. Vertical line – position of the 4d<sup>9</sup>np resonance in the respective continuum.

## References

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