Spectra of Rydberg States of Collision Pairs Xe_2 in the Energy Range of 84000-86000 cm^{-1}

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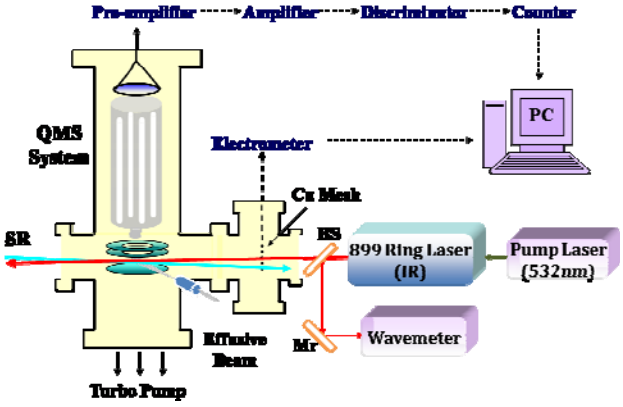
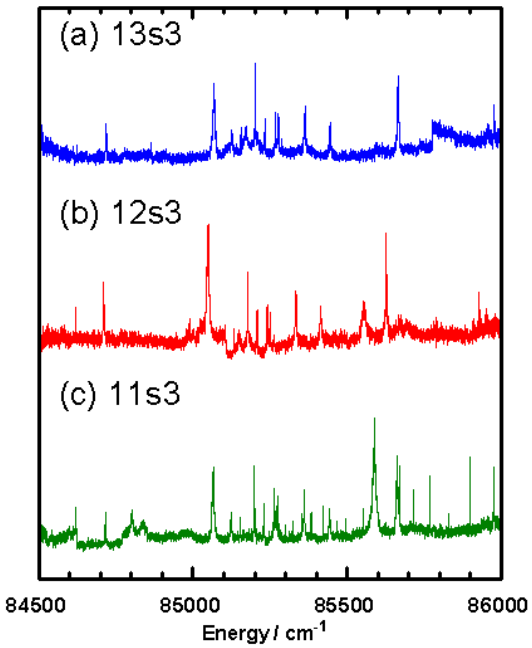
The highly excited xenon dimers were prepared by colliding excited xenon atoms with ground-state xenon atoms. The excited xenon atoms were produced by VUV light of synchrotron radiation for energy greater than 90000 cm^{-1} to form states in $5p^5 5d'[3/2]_1$, $8d[1/2]_1$, $8d[3/2]_1$, $10s[3/2]_1$, $9d[1/2]_1$, $9d[3/2]_1$, $11s[3/2]_1$, $7s'[1/2]_1$, $10d[1/2]_1$, $10d[3/2]_1$, $12s[3/2]_1$ and $13s[3/2]_1$, separately. Then the collision pairs, xenon dimers were excited to autoionizing Rydberg state (ARS) by an infrared light in the energy range of 11600-13800 cm^{-1} and then ionized dissociating to Xe ($^1S_0$) + Xe^+ ($^2P_{3/2}$). This cw IR laser has a resolution of 0.2 cm^{-1}.



Experimental setup for Xe dimer two-photon excitation

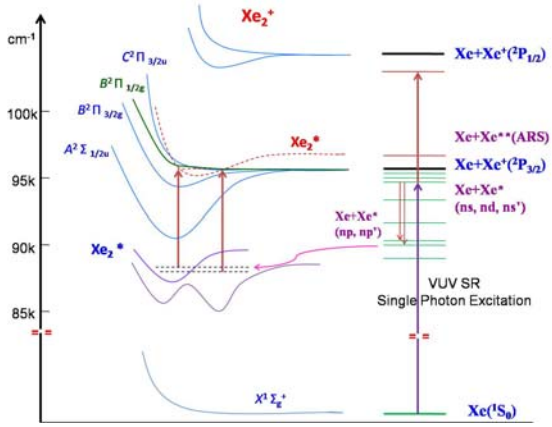
Xenon ions produced from dissociative ionization were detected using a quadruple mass spectrometer in these experiments. The observed positions of spectral lines depend on the energy of the IR laser only, independent of the Rydberg states of xenon atoms.

The line intensities significantly vary with the Rydberg states prepared of xenon atoms, indicating that the collision pairs Xe_2 were relaxed to some highly excited Rydberg states before ionization.



Spectra of Xe_2 Rygberg States

Hence from the position of ion state Xe_2^+ $B^2\Pi_{1/2g}$ crossing with the ARS of Xe_2 and energy restriction we assign the observed spectral lines corresponding to the Rydberg states of Xe_2 in the energy range of 84000-86000 cm^{-1}. Some tentative assignments are reported.



Energy Diagram of Xe_2