surfaces and (to a lesser extent) the (near-)field inhomogeneities lead to a significant extension of the cutoff. In comparison with the standard model shown by the thin green curve in Fig. 5(b), the cutoff is more than doubled from ca. 148 eV to 339 eV. A similar extension in the cutoff position is also reported in Ref. [32]. The phases of the harmonics beyond the homogeneous-pump cutoff are close to the phases of the harmonics at the cutoff.

We have also studied the influence of the electron collisions with the metal surfaces and the enhancement inhomogeneity for an incident femtosecond pulse as defined by Eq. (1) for the chirp parameter $C = -0.5$. The results shown in Fig. 5(c) indicate that the generation of a SAP is not influenced by the two effects shown above, even at a higher intensity of $3 \times 10^{11}$ W/cm$^2$. A single attosecond pulse with some side lobes and a FWHM duration of 120 attoseconds is predicted in this case for the range from 128 eV to 170 eV. This range was optimized to produce short and intense SAP with top-hat function as a filter function.

## 6. Conclusions

We have investigated high-harmonic generation via nanoplasmonic field enhancement by an ordered array of gold nanospheres. Gold nanospheres can be fabricated by colloidal chemistry methods in large quantities and with high accuracy. For an ordered array with spherical nanoparticles with radius $R = 80$ nm and a minimum distance between the nanoparticles of $d = 2$ nm in a hexagonal dense packing arrangement we find an enhancement factor of about 32 within a $5.7 \times 10^3$ nm$^3$ volume between nanoparticles. This volume could contain $6.33 \times 10^3$ atoms at a local gas pressure of 115 torr and exceed the conditions for the bow-tie nanoarray used in Ref. [12]. We have investigated the impact of the chirp of incident femtosecond laser pulses on the high-harmonic generation in argon. Our results indicate that a single attosecond pulse can be obtained by tailoring the chirp of the laser field, adjusting the CEP, and spectrally selecting the high energy part of the spectrum near the cutoff. We have also investigated the influence of inhomogeneity of the enhanced fields. We find that the inhomogeneity does not affect the optimal chirp conditions for the generation of a SAP, but leads to an enhancement of the cut-off by roughly a factor of two.

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