Briand *et al.* Reply: Since the first observation of hollow atoms in 1990 [1], one of the pending questions has been to know whether or not different types of hollow atoms are formed above different surfaces. We presented in a recent paper [2] first experimental evidence proving that different types of hollow atoms are formed above metal and insulator surfaces. Limburg *et al.* [3] recently claimed that they did not observe any formation of hollow atoms above insulator surfaces. Limburg *et al.* studied the interaction of N^{6+} on LiF; we studied the interaction of Ar^{17+} on Si. We explained the differences between the behavior of the ions in the two cases in [2] (page 1453, column 2, line 23) by the very different band gaps of LiF and Si and the different binding energies of the ions, exactly the same as in the present comment, surprisingly. We also explained in our Letter why hollow atoms could not be observed in Auger spectroscopy in these experiments. We did not claim a contradiction between our results and those of Limburg *et al.*

The authors of the Comment [4] draw erroneous conclusions from the energy and width of the KL^1 line we presented in our paper. The observation above metals and insulators of the same KL^1 line is easily explained by the spectroscopic properties of these ions.

The energy of the KL^1 line we observed on both targets indicates that there are, at the time of the emission of the $K\alpha$ line, few other outer shell electrons, e.g., one M electron plus one or two N electrons (also confirmed by the study of the $K\beta$ line). It is easy to demonstrate that one cannot observe above a surface more outermost spectator electrons in an ion having a KL^1 configuration.

With more M electrons the ion would decay mainly via LMM Auger transitions, filling the L shell rather than via the emission of a $K\alpha$ x ray; one thus should observe the KL^2 line instead of the KL^1 line.

The lifetime of the observed KL^1 (M^xN^y) state that decays mainly via fast Auger transitions is then of the order of 10^{-15} s, i.e., much shorter than the time the ion needs to reach the surface from the point where it starts capturing electrons (a few 10^{-13} s), and is, though weak ($\omega \sim 0.2$), observable. One thus cannot draw any conclusion on the kinematics of the ions from the exact energy of the KL^1 line and therefore throw a doubt on any other statement in our paper.

The authors further claim in their Comment that, according to the over-barrier model, the ions must be highly ionized above insulators and highly neutralized above metals. We did observe highly charged ions yet different in both cases which is exactly the contrary. This finding means (i) that the over-barrier model must be revisited and (ii) in both cases the reionizing processes of the ions in front of surfaces are faster than the capture processes.

In the last paragraph the authors claim that the different intensities of the KL^2 line above metals or insulators can come from the different electronic structures of metal and insulator surfaces. This is also the main claim of our paper [2] (we found different spectra for Au and Si surfaces).

They, however, suggest that, according to the over-barrier model, capture above metal surfaces occurs in lower n states, an assumption which also implies that the ions are more neutralized above metals than above insulators [5], and is, as previously discussed, in contradiction with our experimental results. As discussed below, we recently observed that, after electron capture, a positive charge distribution (holes) remains on insulators, inducing a backscattering of the ion ("trampoline" effect). At larger energies overcoming the backscattering effect, the ion touches the surface. The M shell filling is suddenly increased which fully explains the increase in intensity of the KL^2 satellite (the neutralization takes place after the touchdown). It may be possible, though it has not been experimentally observed, that more electrons are captured above a metal than an insulator. What we observe (highly charged ions in both cases) can be easily explained by the fact that Auger decay rates scale roughly as the square of the number of electrons and that the ion above a metal is also quicker reionized than refed.

The authors also claim that the backscattering is not definitively proven by our findings. We only said that we observed a pure "outside" spectrum above Si which implies that there is no touchdown. We have now fully demonstrated the existence of this backscattering of the ions above insulator surfaces. At ion kinetic energies below 12 eV/q the relative intensity of the KL^x line is invariant above metals, and more and more continuously peaked on KL^1, with decreasing energies, above insulators. This means that, above metals, the kinematics of the ions is governed by the image acceleration, and that this image acceleration is canceled out (overcome) above insulators [6].

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