Title Page

Title:

Reflectivity enhancement in titanium by ultrafast XUV irradiation

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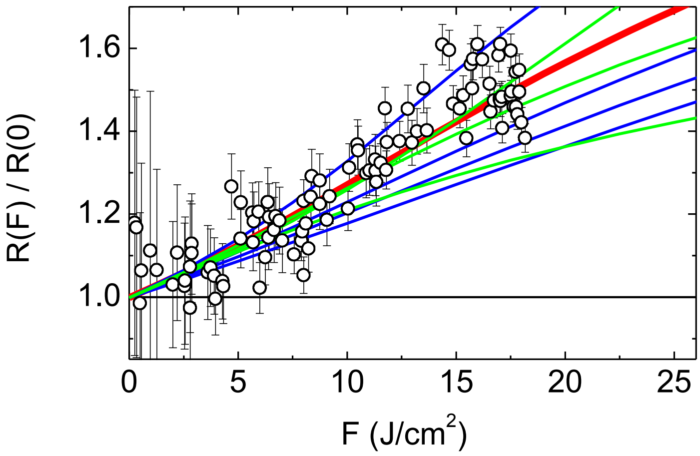
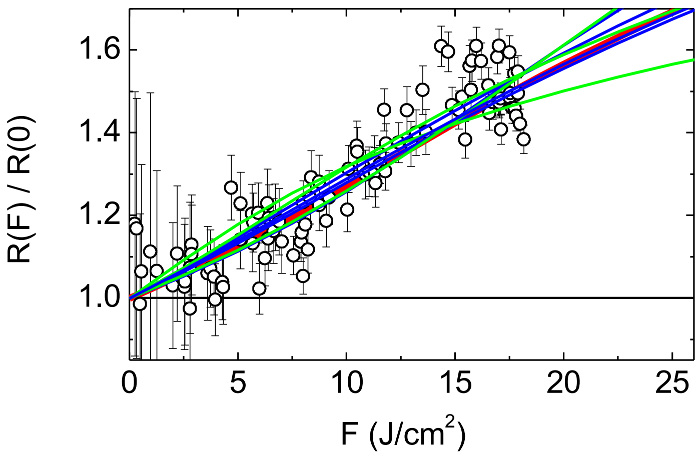
Supplementary Information:

Figure S1 reports the experimental data shown in Figure 2 (upper panel) along with a set of curves calculated for different values of γ and $\omega_p(0)$ keeping fixed the coefficient A at $7.5*10^{12}$ m^3/J. The thick red line is that shown in the manuscript and corresponds to $\omega_p(0)$=17.7 eV and γ=1.5 eV. The set of blue lines are obtained by keeping fix $\omega_p(0)$ at 17.7 eV and using γ-values (from top to bottom) of 0.5, 2.5, 3.5 and 5 eV. Green lines are calculated by keeping fix γ at 1.5 eV and assuming $\omega_p(0)$=17, 18 and 18.5 eV (from top to bottom).



S1: Circles and the red thick line are, respectively, the experimental R(F)/R(0) data and the calculation reported in Figure 2 (upper panel), green and blue lines are the calculations carried out for different choices of $\omega_p(0)$ and γ (see text).

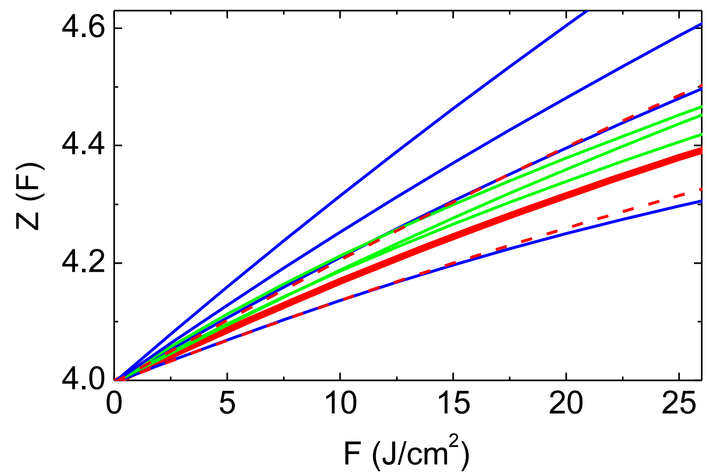
The curves shown in Figure S1 demonstrate how the scattering of the experimental data are essentially consistent with a fairly broad range of γ-values (0.5-2.5 eV), without the necessity to adjust the value of "A" to match the data. This range is basically compatible with the range of γ-values (0.1-3 eV) typically found for metals. A narrower $\omega_p(0)$-range of 17-18 eV, which includes the actual plasma frequency of Ti, is as well compatible with the uncertaint of the experimental data. Figure S1 also points out how in the probed photon frequency range the dependence of R(F) on $\omega_p(0)$ is more relevant than the one on γ.



S2: As in Figure S1 if the parameter "A" is used to match the experimental data.

Figure S2 reports curves calculated with the same choices of ($\omega_p(0)$,γ)-values used to obtain the curves shown in Figure S1 but with the parameter A adjusted in order to match the data, i.e.: A=6.2/9/10.5/12.5*10^{12} m^3/J for γ=0.5/2.5/3.5/5 eV and $\omega_p(0)$=17.7 eV (blue lines) and A=7.5/9/12.5*10^{12} m^3/J for $\omega_p(0)$=17/18/18.5 eV and γ=1.5 eV (green lines).

The F-dependence of Z(F) corresponding to data shown in Figure S2 are displayed in Figure S3. Curves obtained with γ and $\omega_p(0)$ in the 0.5-2.5 eV and 17-18.5 eV range, respectively, are essentially compatible with the estimated confidence range (dashed lines in Figure S3); curves obtained assuming γ=3.5 and 5 eV (values much larger than the ones typically found for metals and not compatible with electron energy loss data of Ti [29,30]) are instead outside this range. We recall that in the present context the empiric coefficient A is just the fractional increase in N_e per unit E, without a more clear physical meaning, and it is only used to derive Z(F) from R(F)/R(0). It is thus evident from Figure S3 how curves obtained using different values of $\omega_p(0)$ and γ fall inside the quoted confidence range provided that the parameter A is adjusted to fit the experimental R(F)/R(0) data. This makes us confident on the soundness of the results, since the reported Z(F) trend is consistent with the observed variation in R(F)/R(0) as far as the actual values of $\omega_p(0)$ and γ are within the 17-18.5 eV and 0.5-2.5 eV ranges, respectively, that much reasonably include the actual values of $\omega_p(0)$ and γ for the investigated Ti sample.



S3: Full lines are the F-dependence of Z(F) derived from the curves reported in Figure S2; colors have the same meaning that in Figures S1 and S2. Dashed red lines are the confidence range shown in Figure 3 of the manuscript (the thick red line is the Z(F) trend reported in Figure 3 of the manuscript). Blue lines outside this range correspond to (from top to bottom) γ=5 and 3.5 eV.