Zhang *et al.* Reply: We reply here to several of the specific comments of Veenendaal and Fedro (VF) [1] on our work [2] and comment briefly on areas where we disagree with their interpretations. VF made three specific comments: (i) It is unlikely that the gap in NaV_2O_5 is proportional to U; (ii) Resonant inelastic x-ray scattering (RIXS) at the L edge in transition metal compounds is not well suited to study charge-transfer excitations; (iii) The polarization condition used in the experiment does not allow the observation of the lowest excited state of NaV_2O_5. We address each of these comments below.

(i) In our Letter [2] we made no claim for a proportionality over a wide range of U values. We said only that direct calculations within our model show that a variation in U shifts the peak position, and thus allows us to determine U from the observed energy losses.

(ii) VF claim that RIXS at the L edge in transition metal compounds is not well suited to study charge-transfer excitations, and propose to measure at K edge. This statement is, in our view, incorrect. Because of the dipole transition rules, x-ray spectroscopies at the L edge probe d (and s) orbitals, which is why most x-ray spectroscopies in transition metal (TM) oxides are done at L edges of the transition metals. Measurements at the K edge probe p orbitals, and thus are useful, for example, in the study of hybridization of O-p orbitals with TM-d orbitals in TM oxides. Our interest here was in the study of $d - d^*$ transitions which are accessible to RIXS measurements at the V-L edge.

(iii) VF commented that the polarization and scattering geometry used in our experiment does not allow the observation of the lowest excited states in NaV_2O_5. We are not necessarily interested in those lowest transitions since they do not allow us to directly probe the electron correlation effects in the d_{xy} band. We agree that selection symmetry requirements on the RIXS process in $\pi \rightarrow \pi + \sigma$ scattering require that initial and final states both have the same (even or odd) symmetry, so that energy loss processes that involve an excitation from a bonding (symmetric) to an antibonding (antisymmetric) orbital are suppressed. Band structure calculations show that the V-d_{xy} orbital at the Fermi level forms a narrow bonding band that results from a nearly pure V-d/V-d interaction, while other V-d orbitals are strongly hybridized with O-p orbitals. We doubt that this bonding to antibonding transition could be observed in the $\sigma \rightarrow \sigma + \pi$ scattering, as the calculations of VF suggest, due to the selection rule.

Our interest, however, was in the measurement of U from the splitting of the d_{xy} band when V-d electrons are on the same site. Because those split d_{xy} subbands have the same bonding nature, we do not believe that symmetry requirements prevent the observation of this excitation in the $\pi \rightarrow \pi + \sigma$ scattering, and in fact such excitations are explicitly obtained in our theoretical calculations. Thus we believe that our scattering geometry was appropriately chosen to emphasize the excitation of interest and suppress the possibly competing bonding-antibonding transition.

We believe that VF's explanation of our energy loss as a $d_{xy} \rightarrow d_{yz}, d_{xz}$ excitation is unlikely to be correct. The energy loss is observed to be narrow and strongly resonant. All d orbitals except d_{xy} form broad bands so that any such excitations would be broad and nonresonant.

It is of course true, as VF note, that the energy loss of 1.56 eV measured in our experiments cannot be compared with the optical gap, and we make no such claim. Our results are also consistent with a recent experiment by Schmitt *et al.* [3], where their energy loss is 1.6 eV. The comparison of VF's smaller excitation energy of 0.8 eV with the optical gap is equally problematic since the two measurements probe different transitions. The optical spectra measure dipole transitions obeying a $\Delta l = \pm 1$ selection rule (mostly V-$d \rightarrow$ O-p), while the two-photon RIXS process obeys a $\Delta l = 0, 2$ selection rule (mostly V-$d \rightarrow$ V-d). As shown in a previous study of TiO2 [4], there is a clear difference between optical and RIXS spectra in TM oxides.

Finally, we highlight two major differences between our calculations and those of VF: (i) Their model system, with no ladder structure, has four sites while ours has eight. Therefore, their results have larger finite-size effects. (ii) They used the Hubbard Hamiltonian while we used the extended Hubbard Hamiltonian which includes both the on-site Hubbard and nearest-neighbor terms. In conclusion, we find that the comments by VF are interesting but do not affect our major conclusions.

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