Kortus *et al.* Reply: Samuely *et al.* [1] find that several experiments on carbon doped MgB_2 do not show significant interband scattering. To clarify the case, we reproduce Fig. 1 from [1] together with our prediction of the T_c dependence of the gaps without interband scattering (Fig. 2 from [2]). Our results, shown in Fig. 1, without interband scattering reproduce nicely the new data points from [1]. The straightforward conclusion is that these samples have, indeed, very small interband scattering.

In our Letter we never claimed that the merging of the σ and π gaps observed in [3] is a universal behavior for C-doped MgB_2 samples, and we emphasized this view by expressions like “indicate for the first time” [2] and referencing several other works not showing this behavior. Obviously, the behavior will depend on the defects that may cause interband scattering in MgB_2 , which can be very different for samples produced by different techniques in different places. This becomes immediately clear from Fig. 1 from our Letter [2]: if all samples with the same doping concentration would have the same interband scattering rate, their critical temperature T_c should be the same. This is clearly not the case for higher doping concentrations.

Our model allows one to describe all available experimental data by simply varying the interband scattering rate. The model does not depend on or require any assumption on any particular experiment. In particular, there is no assumption that the two gaps have to merge in C-doped samples at 10% doping. The doping concentration at which the two gaps will merge depends on the magnitude of interband scattering. Our abstract and conclusion of [2] clearly state that the compensating effect of band filling and interband scattering shifts the merging of the gaps to higher doping concentrations. The reason we emphasized the data from [3] is that if one observes the merging of the two gaps (or even just a constant π gap as function of doping [4]) interband scattering has to be taken into account in addition to the band filling effect. The experimental results of [3] are reproduced by a very simple assumption for the magnitude of the interband scattering, which may be correct only for this particular set of samples.

Erwin and Mazin [5] show that a single C impurity replacing B does not relax out of the boron plane due to symmetry and induces relatively large in plane relaxation of the neighboring boron atoms. The authors relate the out of plane displacement to the interband scattering, which would be zero for such a C impurity. This is only at a first superficial sight in contrast to our results. We already pointed out that T_c varies for samples with the same doping concentration, which clearly indicates that the C doping is not directly generating the interband scattering. However, C impurities in the boron plane may induce other defects that cause interband scattering. Other possibilities that may be relevant at higher doping concentrations include, e.g.,

FIG. 1 (color online). The figure reproduces Fig. 1 from [1] together with our line (solid) without interband scattering from Fig. 2 from our Letter [2].

the formation of pairs or clusters of carbon [6] that may allow for buckling out of the boron plane. Therefore, if the concentration of defects that cause interband scattering is proportional to the C doping, the simple linear assumption used to reproduce the results of [3] would still hold.

In summary, we are confident that our model [2] captures the essential features to understand the doping behavior in MgB_2 , including the data presented in [1]. Even if the data reported in [3] were questionable, for which we see at the moment no good reason, our theoretical description of the doping behavior of the two gaps and T_c would still be correct. In that case, our work is a challenge to produce samples with controlled interband scattering rates, e.g., following the suggestion by Erwin and Mazin [5] of co-doping Al and Na, in order to obtain the predicted merging of the two superconducting gaps.

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