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”Fusion frames as an important generalization of discrete frames are completely different in duality. One reason for the technicalities of fusion frame duals is the mismatch of the coefficient spaces of different systems. In order to achieve this, a bounded operator M , a mapping between the Hilbert spaces of the subspaces, is needed. Hence, it seems that the fusion frame operator must be modified by this map to be compatible with the duality in fusion frames (specially, Gavruta duals). For fusion frames W and V , we define the alternate cross-frame operator by $L_{W,V}^M = T_W M T_V^*$, where $M : \sum \oplus V_i \rightarrow \sum \oplus W_i$. If $W = V$ and $M = \{\pi_{W_i} S_W^{-1}\}$, we call it the alternate frame operator. We show that the alternate frame operator of a fusion Riesz basis is actually the frame operator of its 1-uniform version. We will establish a class of pioneer duals, which is called essential duals, with the alternate frame operator and obtain novel reconstruction formulas by such duals. Finally we provide some examples which compare the reconstruction formula applying the frame operator (in the Gavruta sense) and the alternate frame operator (in the essential sense).”

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