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ELECTRONIC SUPPLEMENTARY INFORMATION

Vibrational mode-specific dynamics of the $F^- + CH_3CH_2Cl$ multi-channel reaction

Viktor Tajti and Gábor Czakó*

MTA-SZTE Lendület Computational Reaction Dynamics Research Group, Interdisciplinary Excellence Centre and Department of Physical Chemistry and Materials Science, Institute of Chemistry, University of Szeged, Rerrich Béla tér 1, Szeged H-6720, Hungary

* Email: gczako@chem.u-szeged.hu

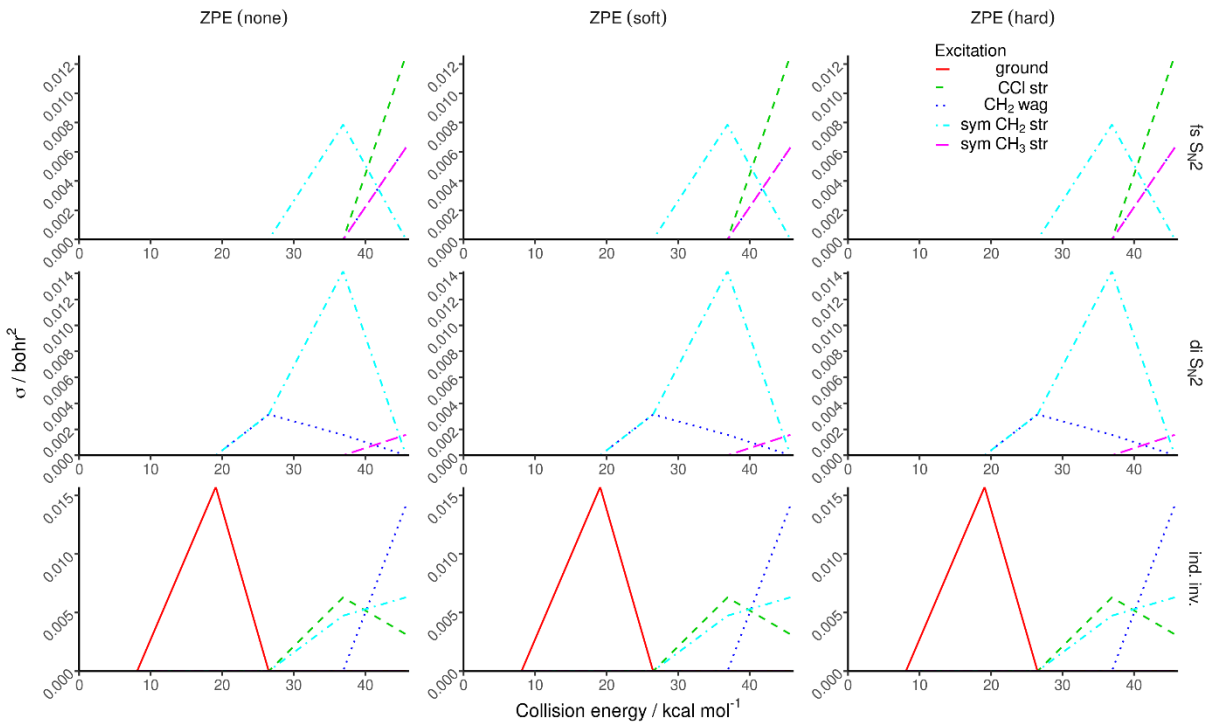

Figure S1. Cross sections for the front-side attack (fs S_N2), double-inversion (di S_N2), and induced-inversion (ind. inv.) pathways of the $F^- + CH_3CH_2Cl(v_k = 0, 1)$ [k = 10, 7, 1, 3] reactions as a function of collision energy obtained without and with soft and hard ZPE constraints (for these channels the soft and hard cases are equivalent).

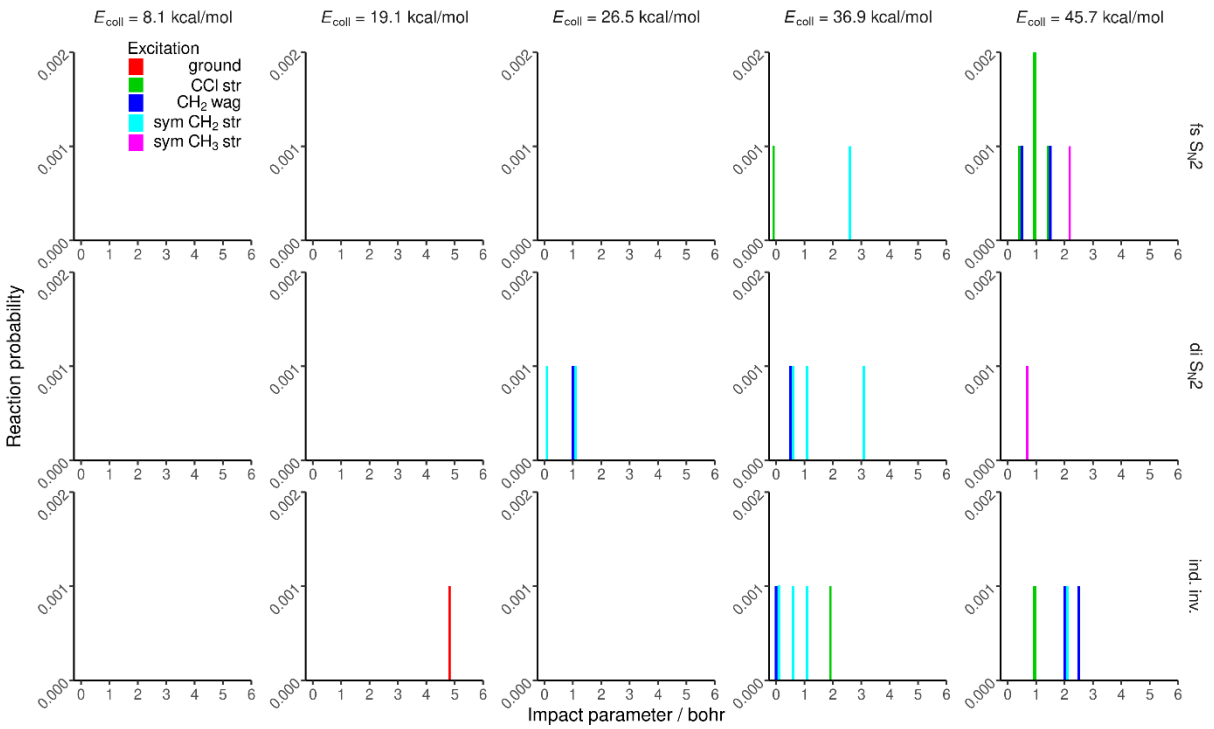

Figure S2. Reaction probabilities for the front-side attack (fs S_N2), double-inversion (di S_N2), and induced-inversion (ind. inv.) pathways of the $F^- + CH_3CH_2Cl(v_k = 0, 1)$ [k = 10, 7, 1, 3] reactions as a function of impact parameter at different collision energies.

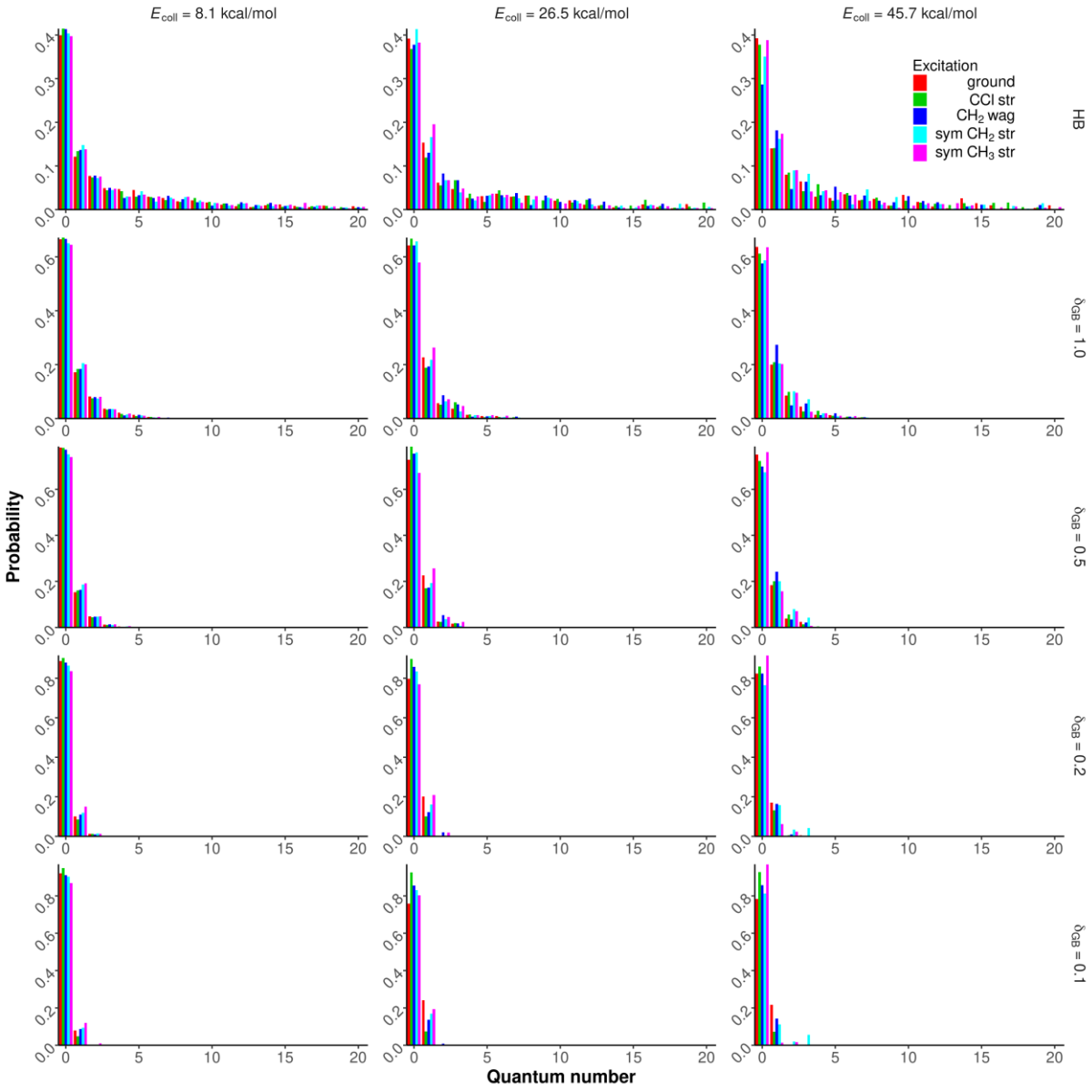

Figure S3. Normalized symmetric CH_3 stretching mode specific vibrational distributions for the CH_3CH_2F product of the $F^- + CH_3CH_2Cl(v_k = 0, 1)$ [k = 10, 7, 1, 3] S_N2 reactions at different collision energies obtained with histogram binning (HB) and Gaussian binning (GB) using different full-width at half-maximum (δ) values.

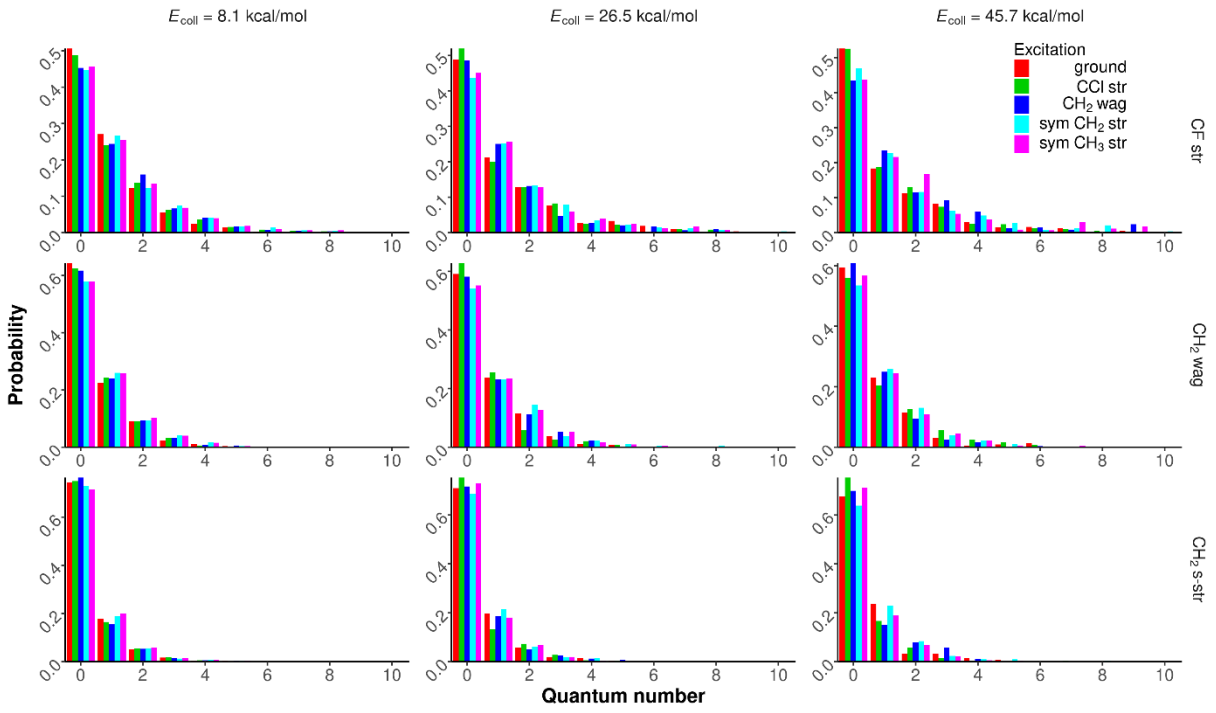

Figure S4. Normalized CF stretching, CH_2 wagging, and symmetric CH_2 stretching mode specific vibrational distributions for the CH_3CH_2F product of the $F^- + CH_3CH_2Cl(v_k = 0, 1)$ [k = 10, 7, 1, 3] S_N2 reactions at different collision energies obtained with histogram binning.

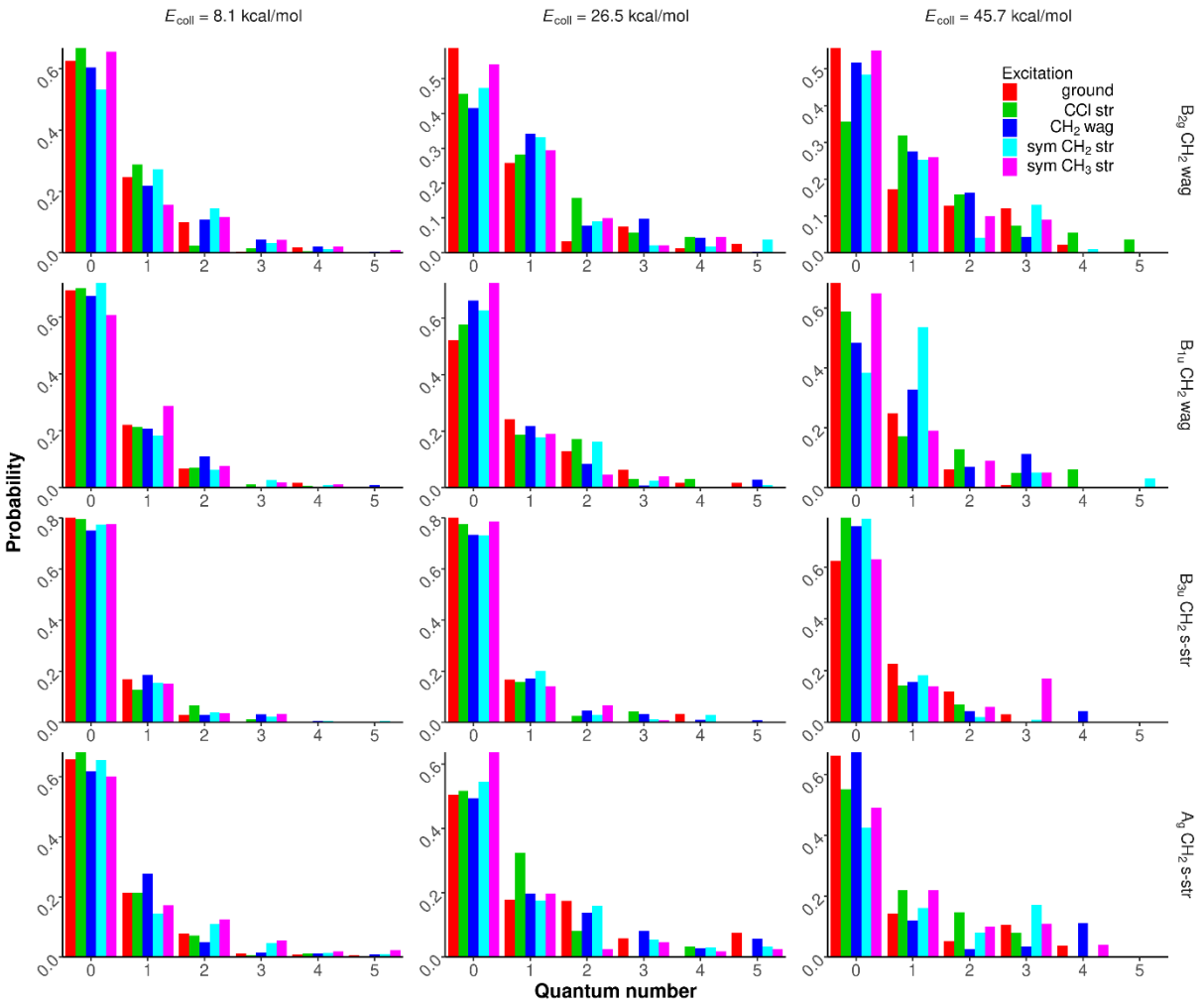

Figure S5. Normalized mode-specific vibrational distributions for the C_2H_4 product of the $F^- + CH_3CH_2Cl(v_k = 0, 1) \rightarrow FH\cdots Cl^- + C_2H_4$ [k = 10, 7, 1, 3] reactions at different collision energies obtained with histogram binning.

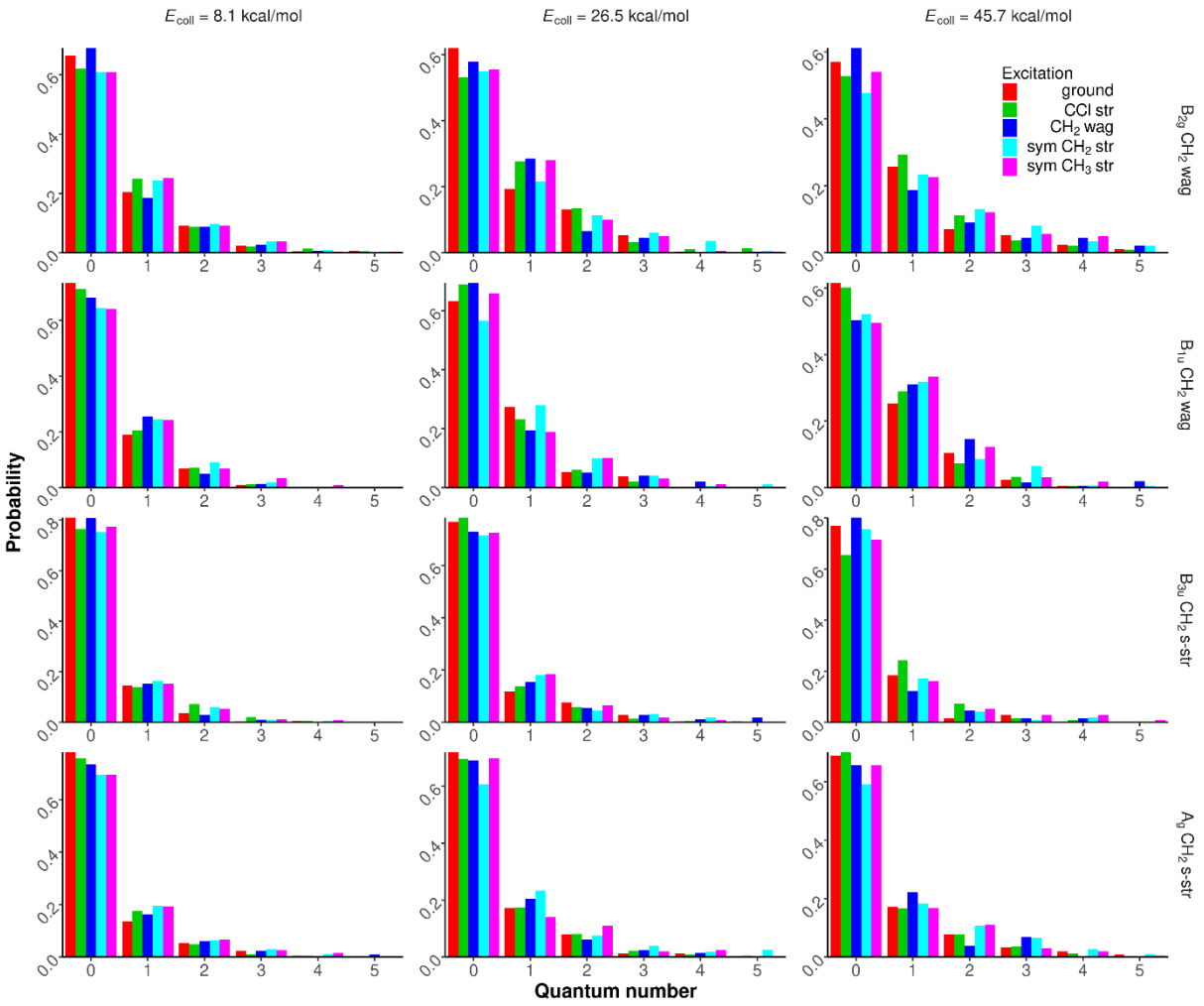

Figure S6. Normalized mode-specific vibrational distributions for the C_2H_4 product of the $F^- + CH_3CH_2Cl(v_k = 0, 1)$ [k = 10, 7, 1, 3] syn-E2 reactions at different collision energies obtained with histogram binning.

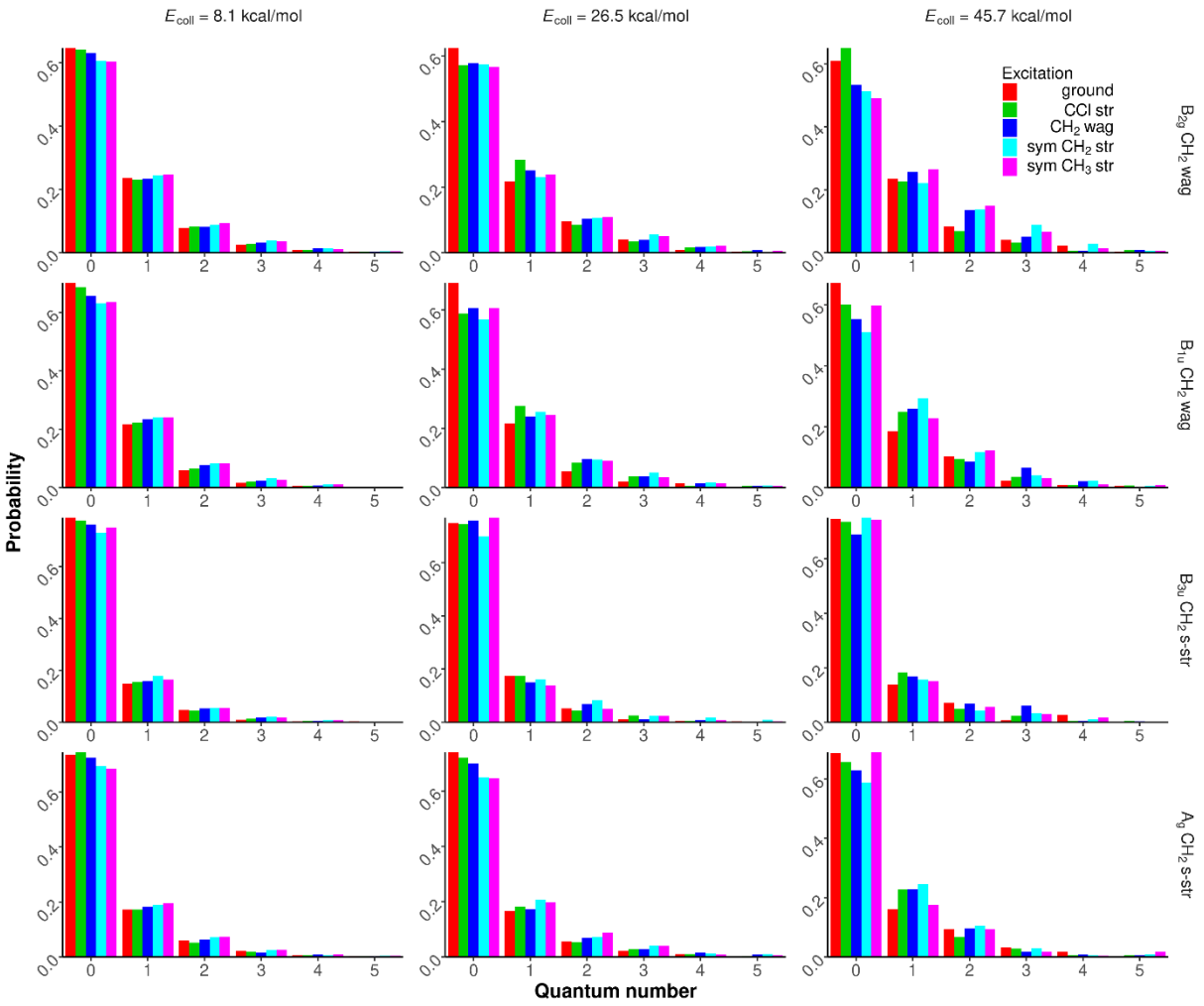

Figure S7. Normalized mode-specific vibrational distributions for the C_2H_4 product of the $F^- + CH_3CH_2Cl(v_k = 0, 1)$ [k = 10, 7, 1, 3] anti-E2 reactions at different collision energies obtained with histogram binning.