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Testing Positivity at Muon Colliders JIAYIN GU, Johannes Gutenberg University, Mainz, LIANTAO WANG, University of Chicago, CEN ZHANG, Institute for High Energy Physics, and School of Physical Sciences, University of Chinese Academy of Sciences — Certain dimension-eight operator coefficients of the Standard Model Effective Field Theory (SMEFT) are subject to positivity bounds, derived from fundamental principles of Quantum Field Theory, such as unitarity, locality, analyticity, and Lorentz invariance. We discuss the unique advantage of a multi-TeV muon collider in probing these positivity bounds. We point out a special channel, mu+mu- (e+ e-) -¿ gamma gamma, for which the leading new physics contribution comes only from dimension-8 operators. The positivity bounds are thus applicable to the most direct observable — the diphoton cross-sections. This unique feature provides a clear, robust, and unambiguous test of the principles of Quantum Field Theory. We estimate the capability of various future lepton colliders and point out the importance of having a high center-of-mass energy in probing this channel. We also perform a combined analysis of the gamma gamma, Z gamma, and ZZ processes in the high energy limit and point out the important interplay among them.

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