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Resonantly enhanced electron-positron pair production in ultra-intense laser-matter interaction FRANCOIS FILLION-GOURDEAI, Centre de recherches mathematiques, EMMANUEL LORIN, Carleton University, ANDRE BANDRAUK, Universite de Sherbrooke — A new mechanism for pair production from the interaction of a laser with two nuclei is presented. The latter takes advantage of the Stark effect in diatomic molecules and the presence of molecular resonances in the negative and positive energy continua. Both move in the complex energy plane as the interatomic distance and the electric field strength are varied. We demonstrate that there is an enhancement of pair production at the crossing of these resonances. This mechanism is studied in a very simple one-dimensional model where the nuclei are modelled by delta function potential wells and the laser by a constant electric field. The position of resonances is evaluated by using the Weyl-Titchmarch-Kodaira theory, which allows to treat singular boundary value problems and to compute the spectral density. The rate of producing pairs is also computed. It is shown that this process yields a positron production rate which is approximately an order of magnitude higher than in the single nucleus case and a few orders of magnitudes higher than Schwinger's tunnelling result in a static field.

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