

# Generation of an ultrashort monoenergetic proton bunch in an instability-free regime by a single-cycle laser pulse

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Prompted by the possibility<sup>1</sup> to produce high energy single cycle laser pulse in the tens of PW intensity ( $10^{24} \text{W/cm}^2$ ), we have investigated laser-matter interaction in the few optical cycle and ultra relativistic intensity regime. A particularly interesting instability-free regime for ion production was revealed leading to the efficient production of short(fs) monoenergetic ions with a peak energy greater than GeV. Of paramount importance, the interaction is absent of RTI and hole boring plaguing techniques as Target Normal Sheath Acceleration (TNSA) and Radiation Pressure Acceleration (RPA).

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