# Selection of welding parameters in pulsed wave micro seam welding

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The digital control of the latest pulsed fibre lasers allows very high flexibility in controlling the power density and application of the total energy to a workpiece, which brings several advantages to the joining process. By choosing different pulse shapes in different spatial profiles, it is possible to apply low energy per pulse with high precision and accuracy resulting in high productivity and lower heat input. This study aims to stablish a relationship between the fundamental laser processing parameters, such as peak power density, interaction time and the total applied energy over a spot, with the pulse energy , peak power and pulse duration, in order to understand and predict the material response under different processing conditions. The experimental work was conducted in austenitic stainless steel, SS304L. Several experiments were conducted in bead on plate configuration to investigate the effect of laser on the weld geometry, i.e. depth of penetration and width. An empirical model, previously established for continuous wave macro seam welding [1], which enables achievement of a particular depth of penetration independent of the beam diameter, was also redesigned for pulsed wave mode and presented. The model allows the laser user to select a weld profile which meets a certain quality and productivity requirements independent of the laser system. It was shown that identical depth of penetration but different weld metal profile can be obtained for a specific beam diameter for a range of power and travel speed by keeping the energy input per unit length constant.

[1] W. Suder and S. Williams (2014) Power factor model for selection of welding parameters in CW laser welding, Optics & Laser Technology, 56, 223-229.