

PULSE MODIFIER WITH ADJUSTABLE ETENDUE

ABSTRACT

A beam modifying unit is provided in the illumination system of the lithographic apparatus to increase both the temporal pulse length and the Etendue of an illumination beam where the increase in temporal pulse length reduces the degradation of lens elements, while, when combined with an increase of Etendue of the beam results in a reduction of speckle. The pulse modifying unit is configured to receive an input pulse of radiation and further configured to emit one or more corresponding output pulses of radiation, including a beam splitter configured to divide the incoming pulse into a first and a second pulse portion, wherein the beam splitter is further configured to direct the first pulse portion along a second optical path where the second portion is directed on a first optical path as a portion of an output beam. The second optical path is configured to include a divergence optical element whereby the divergence optical element angle can increase the divergence of the beam without decreasing the beam size, thus increasing the Etendue. A first and a second mirror, each with a radius of curvature, are disposed facing each other with a predetermined separation, configured to receive the second pulse portion and to redirect the second portion such that the optical path of the second portion through the pulse modifier is longer than that of the first portion, and the separation is less than radius of curvature.

Figure 2A