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Control of Coherence Areas in Entangled Twin Beams MATTHEW HOLTFRERICH, ALBERTO MARINO, University of Oklahoma — We demonstrate the ability to control the size of the coherence area in entangled twin beams generated with four-wave mixing (FWM) in a rubidium vapor cell by controlling the size and profile of the pump beam required for the FWM. The coherence area corresponds to the smallest spatial subareas in the twin beams that are quantum correlated. Its size is directly related to the number of spatial modes that make up the twin beams and a reduction of its size leads to an increase in the number of modes. We measure the noise properties of different spatial regions of the twin beams to determine the size of the coherence area. Furthermore, we have developed a model based on fundamental physics with which to compare our data and extract the size of the coherence area. Our results show a factor of 2 reduction in the size of the coherence area when the pump's diameter is increased from 1.5 mm to 3.2 mm. We show an additional factor of 2 reduction in the size by changing the spatial profile of the pump from a Gaussian to a flattop. The ability to control the number and size of these quantum correlated subareas has applications in quantum imaging and quantum information by adding the control of the spatial degree of freedom to the physicist's toolbox.

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