

Critical Behaviour of a Uniform Photon Gas Near the BEC Phase Transition

L KLEEBANK¹, F VEWINGER¹, A CAMACHO-GUARDIAN², V ROMERO-ROCHÍN², R PAREDES², M WEITZ¹,
AND J SCHMITT³

¹*Institute of Applied Physics, University of Bonn, Bonn, Germany*

²*Instituto de Física, Universidad Nacional Autónoma de México, México City, Mexico*

³*Kirchhoff institute for physics, University of Heidelberg, Heidelberg, Germany*

Contact Email: espert@iap.uni-bonn.de

The divergent scaling of thermodynamic quantities near phase transitions allows for the classification of physical systems into universality classes characterized by distinct critical exponents. While quantum gases thermalizing by interparticle interactions fall into the XY model universality class, the ideal Bose gas is purely driven by quantum statistics whose signatures have not yet been revealed experimentally. Here, we report the observation of critical scaling in a two-dimensional quantum gas of the essentially noninteracting photons. We determine the critical exponent for the correlation length to be $\nu = 0.52(4)$.