IMPROVING LATERAL RESOLUTION USING ANNULAR ILLUMINATION IN RESCAN CONFOCAL MICROSCOPY

Ronald Breedijk[1], Juan Wen[1], Venkataraman Krishnaswami[1], Norbert Vischer[1], Tytus Bernas[3], Erik Manders[1,2] and Stanley Brul[1]

1 Swammerdam Institute for Life Sciences, University of Amsterdam, Science park 904, 1098 XH, Amsterdam, The Netherlands
2 Confocal.nl BV, Amsterdam, The Netherlands
3 VCU Microscopy Facility, VCU School of Medicine, Richmond, VA, USA
E-mail: breedijk@uva.nl

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ABSTRACT

Re-scan confocal microscopy (RCM) [1-3] is a useful technique for improving the lateral resolution by a factor of √2 when compared to standard confocal microscopy. In this work, we present an optical technique to further improve the lateral resolution of RCM by employing an annular aperture in the illumination path. By combining the applied annular illumination with an optimally re-scanned detection it is possible to further improve the lateral resolution by a factor of 1.2. Therefore, super-resolution (140 nm, for 488nm wavelength) can be achieved in a standard confocal microscopy by an 'optics only' approach that does not require any mathematical post processing. To study the applicability of this technique, bio-imaging was performed to gain insights into the role of specific proteins in the germination process of bacterial spore samples. We report the results of this study to demonstrate the usefulness of this imaging technique.

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