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Low temperature confocal microscopy with a 4 K closed-cycle cryostat ANGELIKA KUENG, CHRISTOPH BOEDEFELD, CHRISTIAN SCHULHAUSER, Attocube System AG, MATTHIAS BUEHLER, JENS HOEHNE, VeriCold Technologies GmbH — Low temperature confocal microscopy is a technique of major interest with regard to research fields ranging from material and surface science to single molecule spectroscopy. Common setups involve the use of expensive liquid helium and suffer from the lack of coarse positioning units at cryogenic temperatures. We present for the first time a highly flexible confocal microscope combined with a 4 K closed-cycle cryostat. This complete system solution enables plug-and-play high resolution confocal microscopy at low temperatures without the need of liquid helium. The low-vibration pulse tube based cryostat has been specially adapted for very low vibrations as required for applications in combination with scanning probe microscopy. The developed confocal microscope is thermally compensated guaranteeing ultra-high stability at low temperature providing at the same time very high optical resolution as will be shown in various examples. Furthermore, nanopositioning units based on the slip-stick principle allow coarse positioning over centimeters. The system allows operation at extreme conditions as high magnetic fields and high vacuum.

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