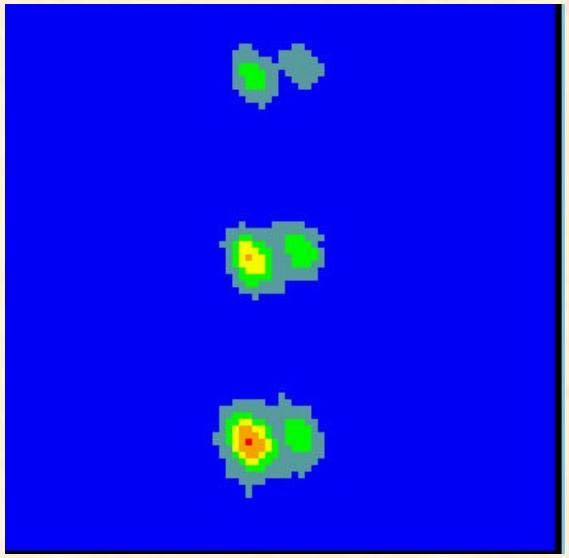
# Reducing Radiation Damage to Macromolecular Crystals at Synchrotrons by using Cryogenic Helium during Data Collection



Diffraction data collected on Displex cooled crystals, in contrast to an open flow helium cryostat, verify that a variety of protein crystals manifests ‘split spot’ diffraction at decakelvin temperatures. Additionally, these experiments were conducted at the T17 LADI neutron diffraction station at ILL, proving that the ‘spot splitting’ phenomenon is temperature induced and not the result of instrument or radiation damage, as could be construed from the synchrotron X-ray studies.

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The low temperature diffraction spot ‘splitting’ phenomenon, seen in the image above, suggests that previously published results using helium for macromolecular data collection did not achieve decakelvin temperatures. Earlier studies that suggested no improvement in crystal lifetime with helium cooling should be reconsidered in light of these findings. Further research on the ‘spot splitting’ phenomenon will solidify the use of cryogenic helium as the most reliable way of reducing the effects of radiation damage during macromolecular data collection at The Department of Energy operated synchrotrons.