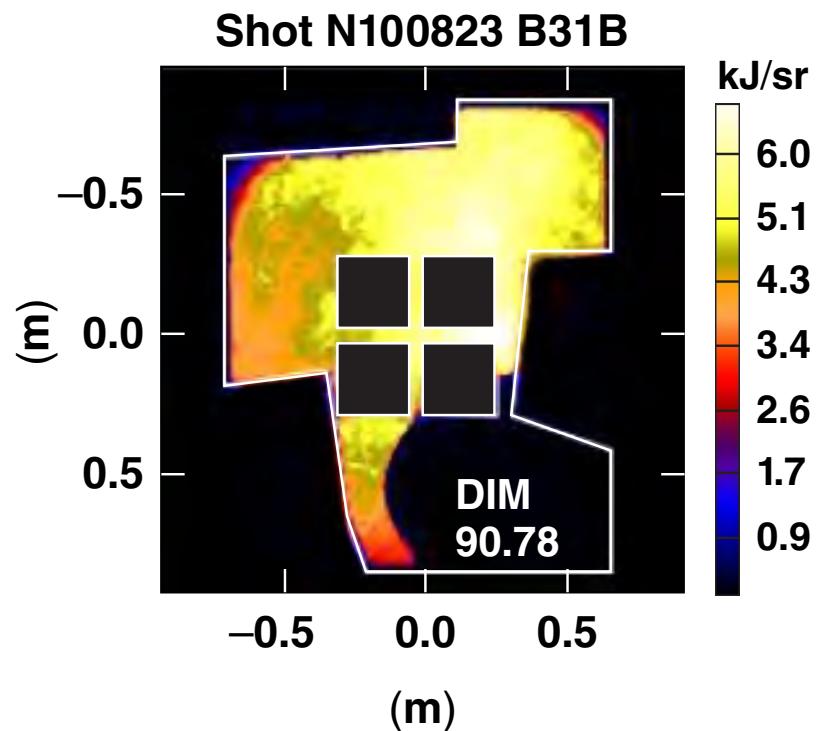
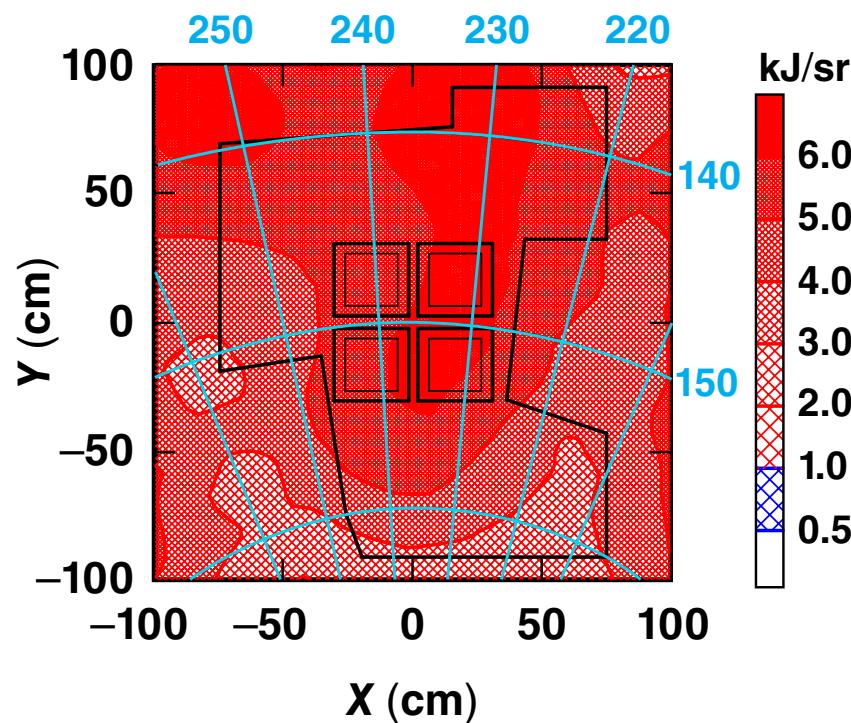


# Three-Dimensional Distributions of Deposited Energy and Scattered Light in NIF “Exploding-Pusher” Polar-Drive Experiments



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## Summary

# SAGE modeling of NIF “exploding-pusher” experiments is consistent with experimental scattered light observations



- The simulations combine 2-D hydrodynamics with 3-D ray tracing including all 192 NIF beam directions
- The deposited energy is ~20% higher at the equator and very uniform azimuthally
- The scattered light predicted on the NBI plates shows strong spatial variations consistent with observations

# Collaborators

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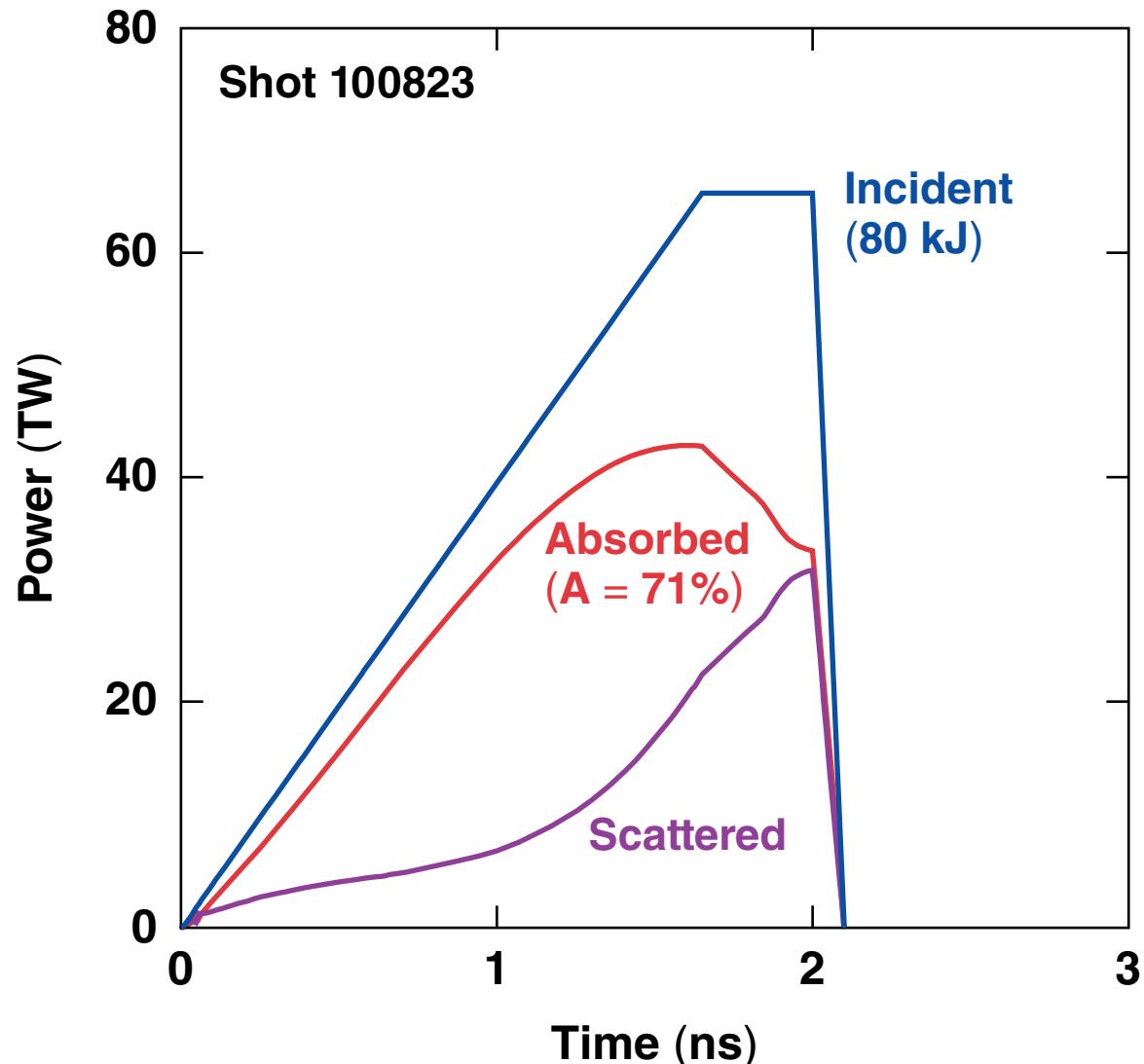
# **Understanding the scattered light distribution in NIF polar-drive experiments is important for two primary reasons**

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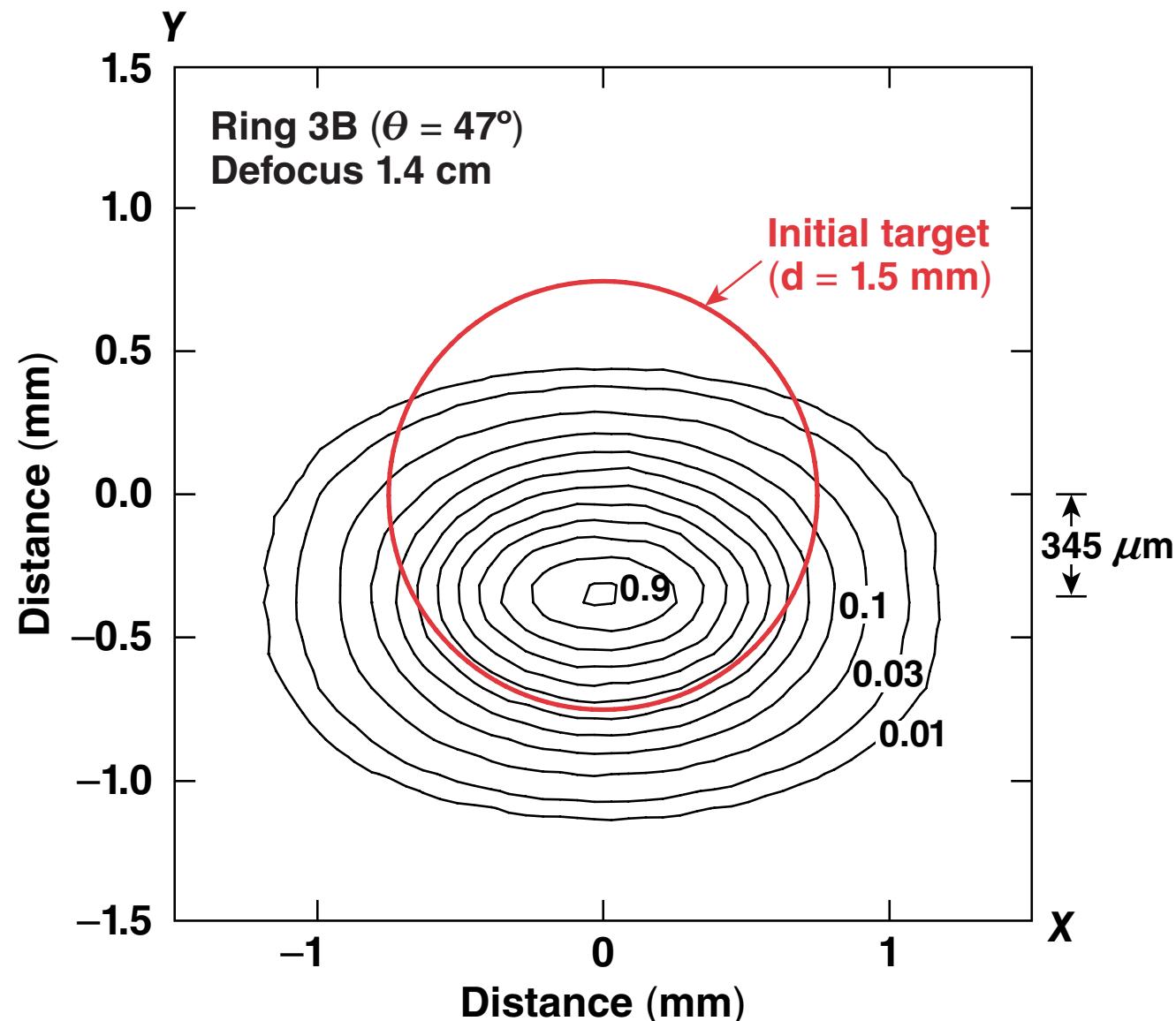


- By matching NBI/FABS observations to simulations one may estimate the target absorption
- For assessment of potential damage to NIF optics one needs realistic estimates of the scattered light flux

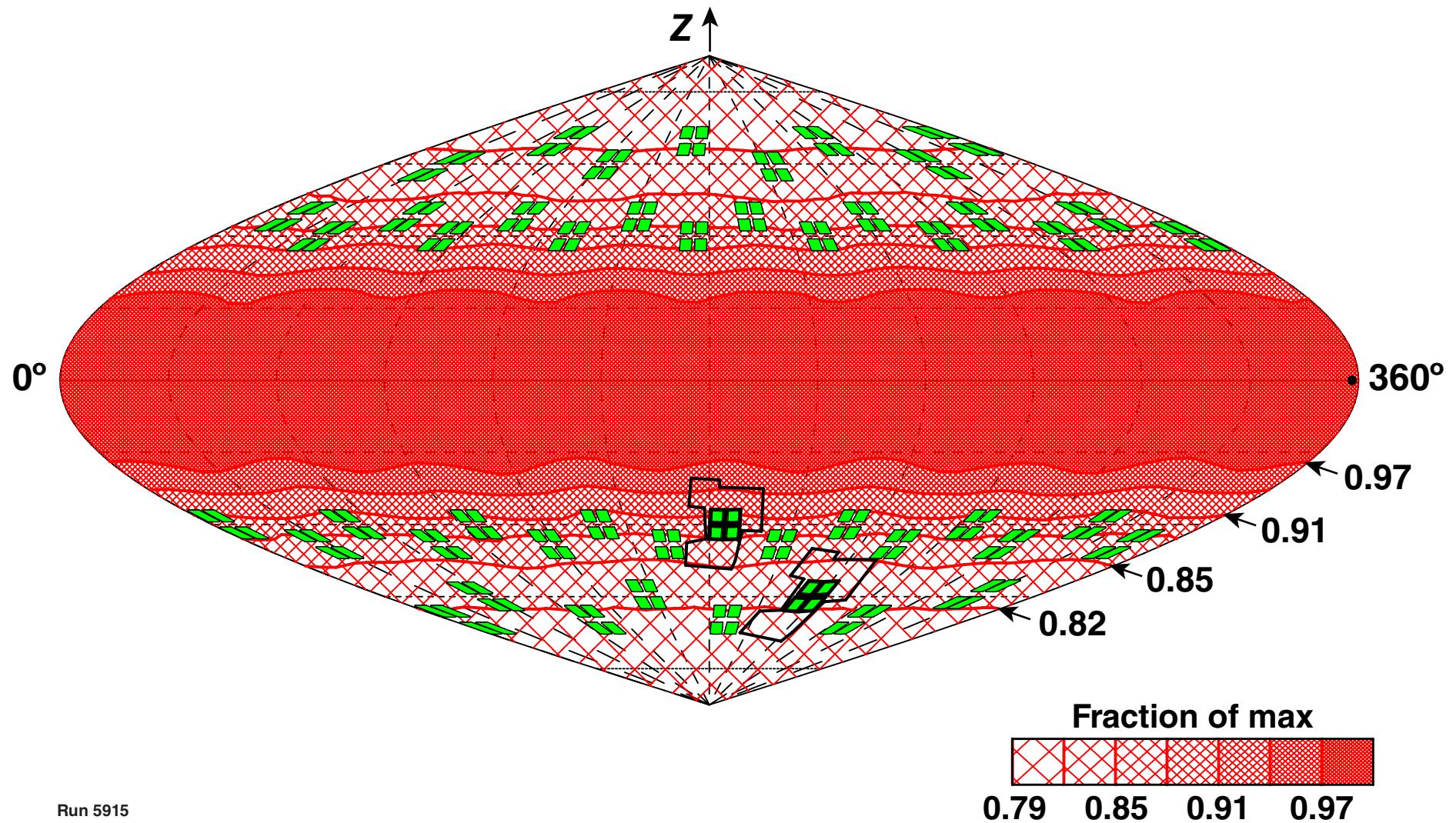
# “Exploding-pusher” shot 100823 used a ramp laser pulse



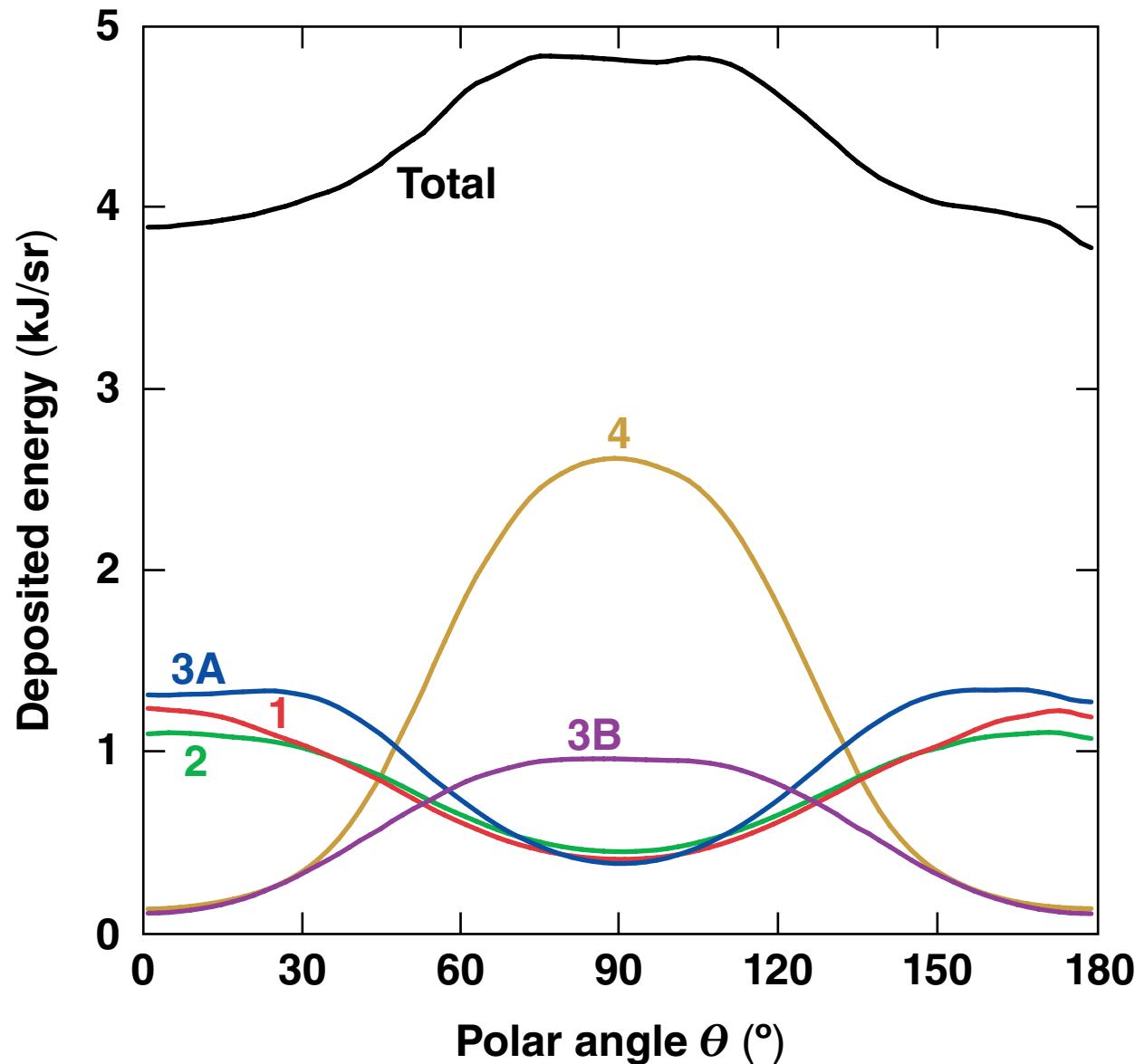
# The polar-drive design involves defocusing and repointing the NIF beams, using the indirect-drive phase plates



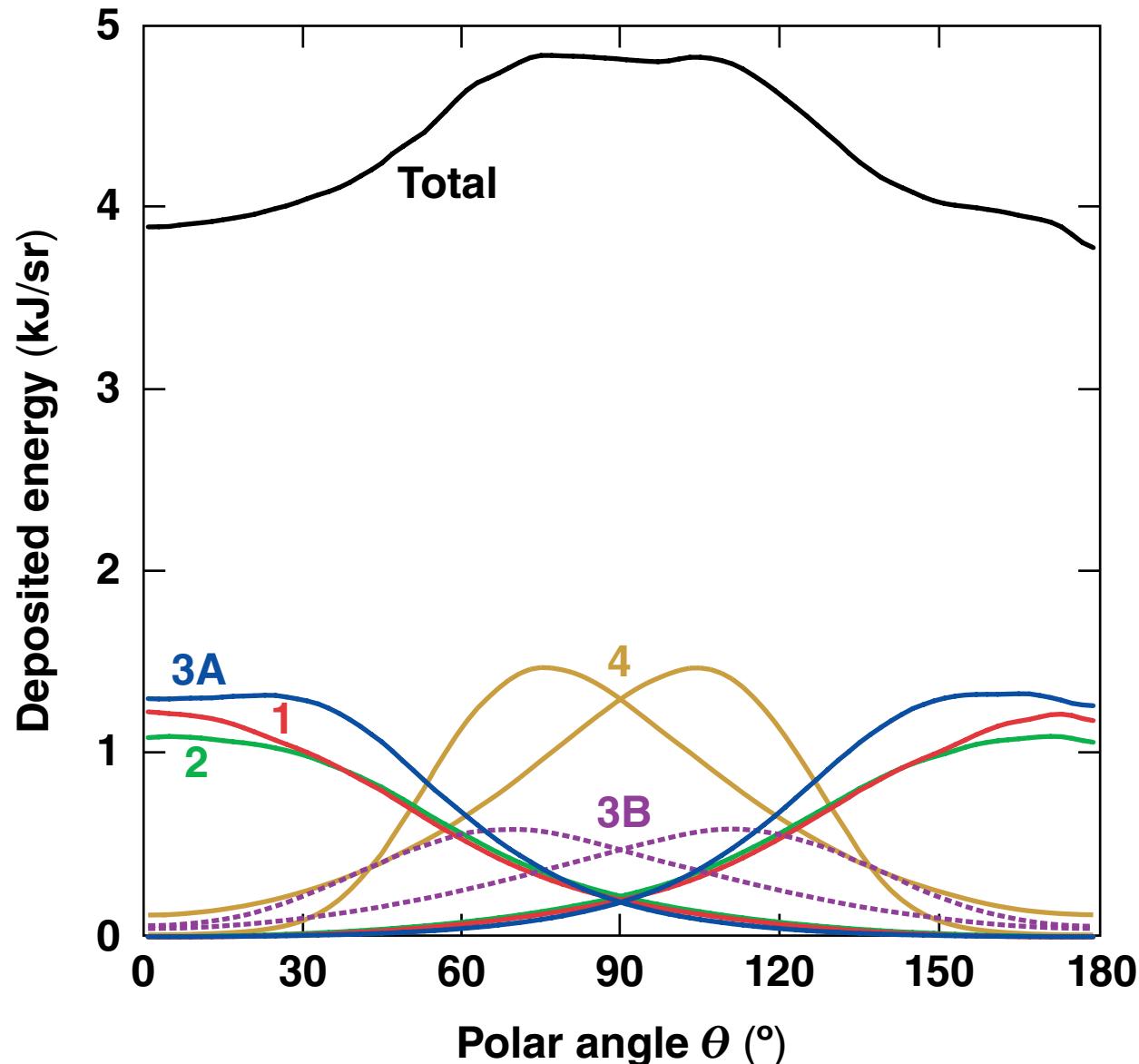
The cumulative deposited energy is ~20% higher at the equator and very uniform azimuthally



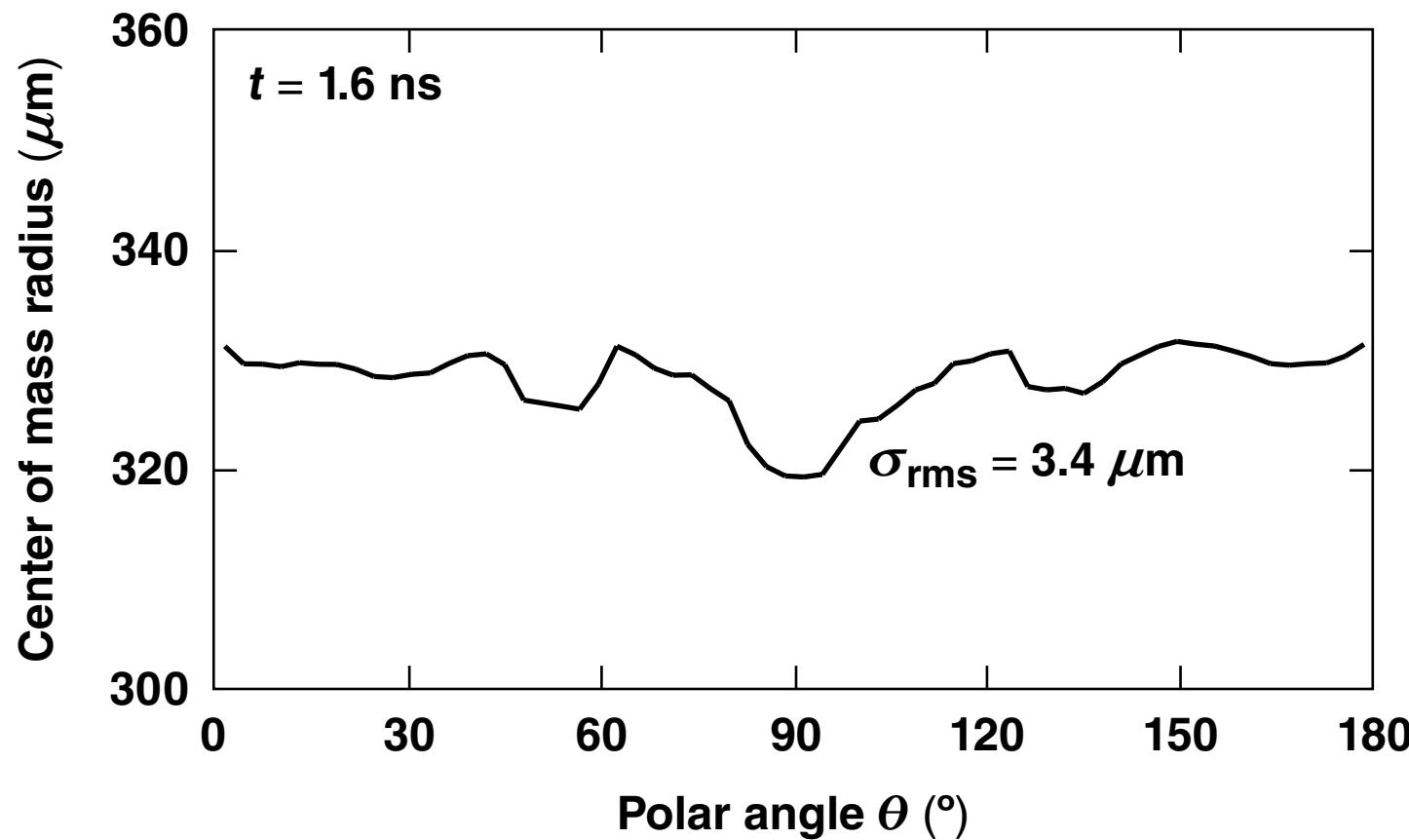
The deposited energy patterns of the individual rings combine to give a total deposition that is ~20% higher at the equator



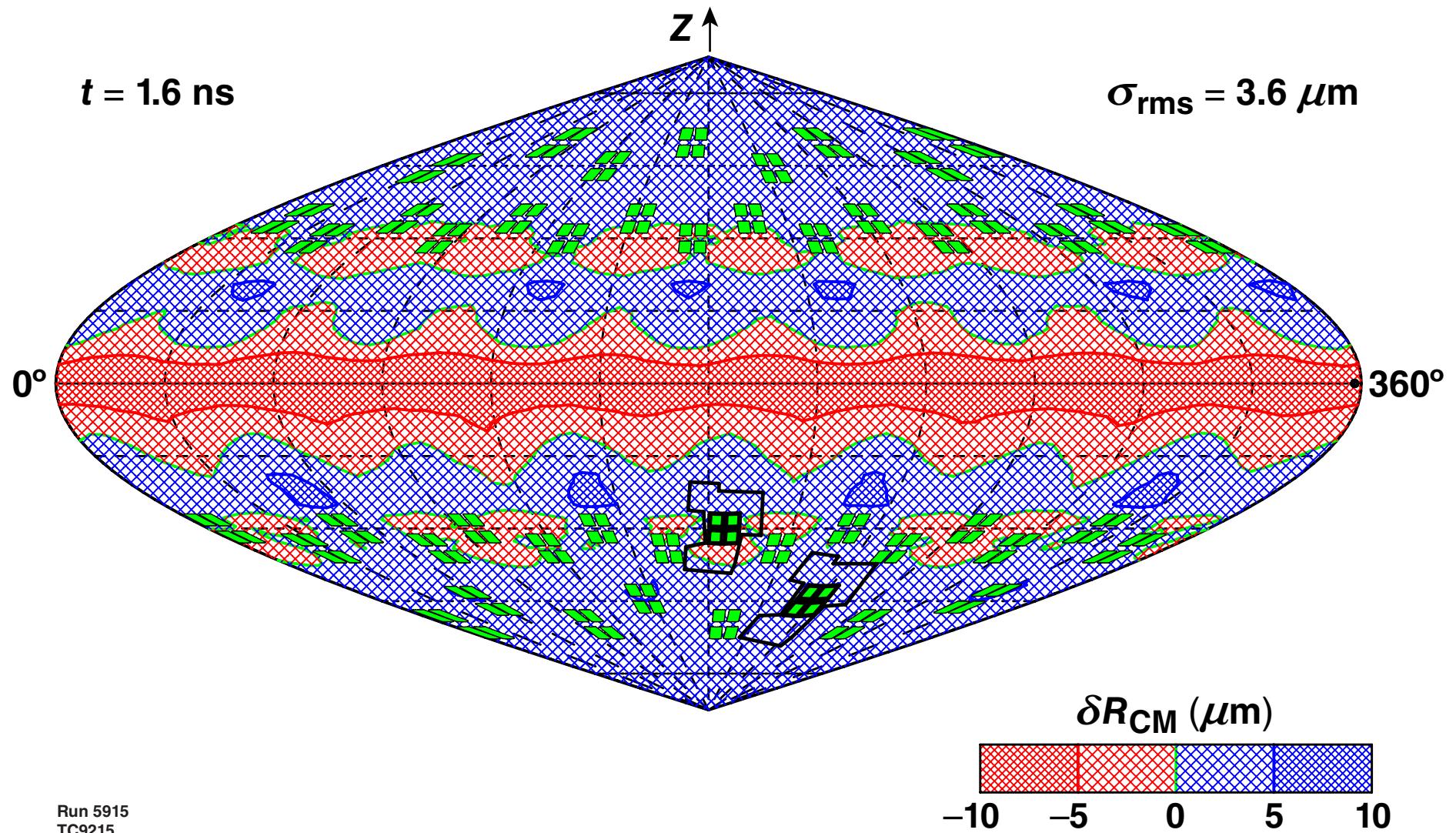
# Rings 3B and 4 from the upper and lower hemispheres combine well at the equator



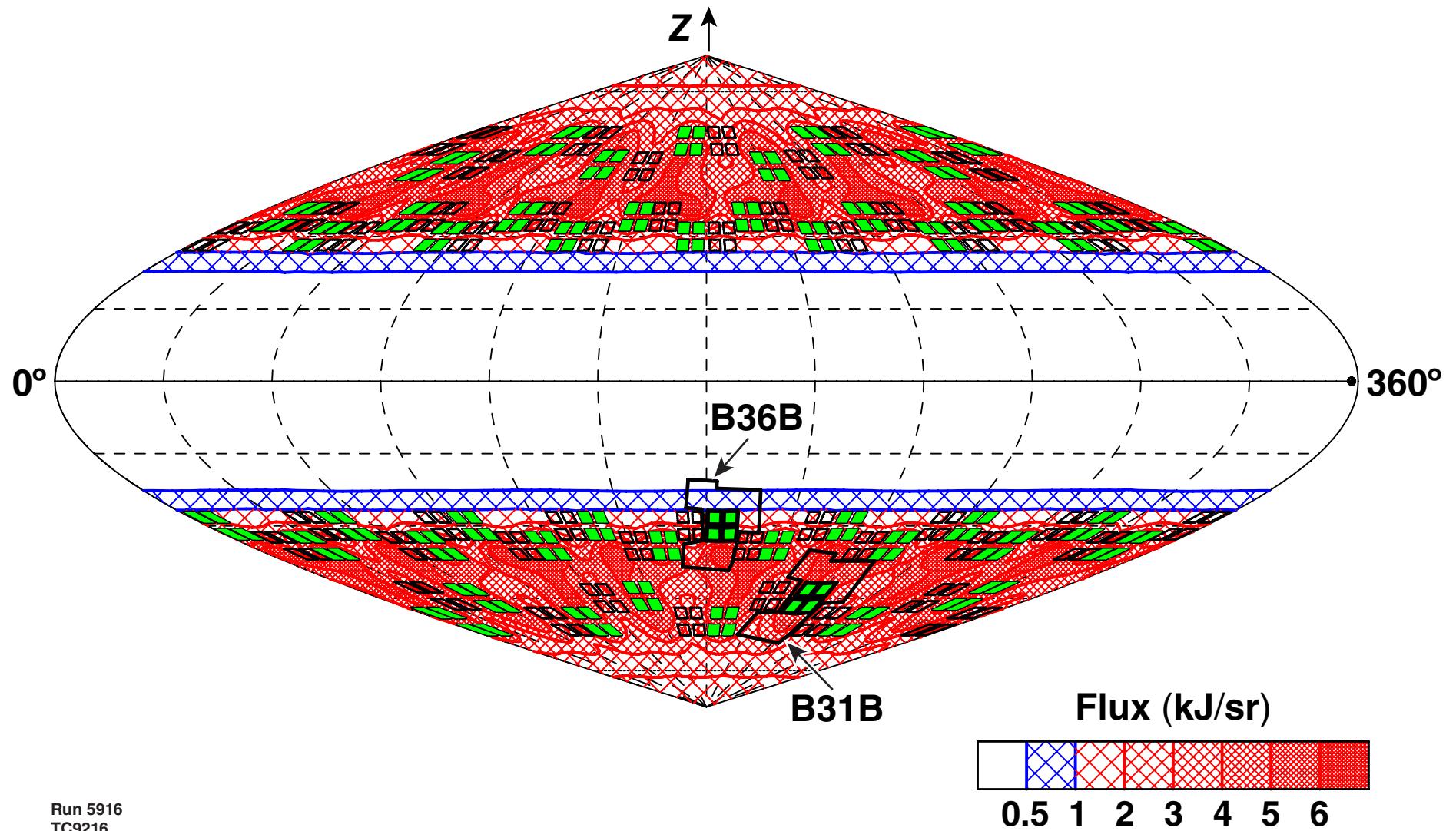
The azimuthally averaged center-of-mass radius  
at 1.6 ns is uniform to 3.4  $\mu\text{m}$  (rms)



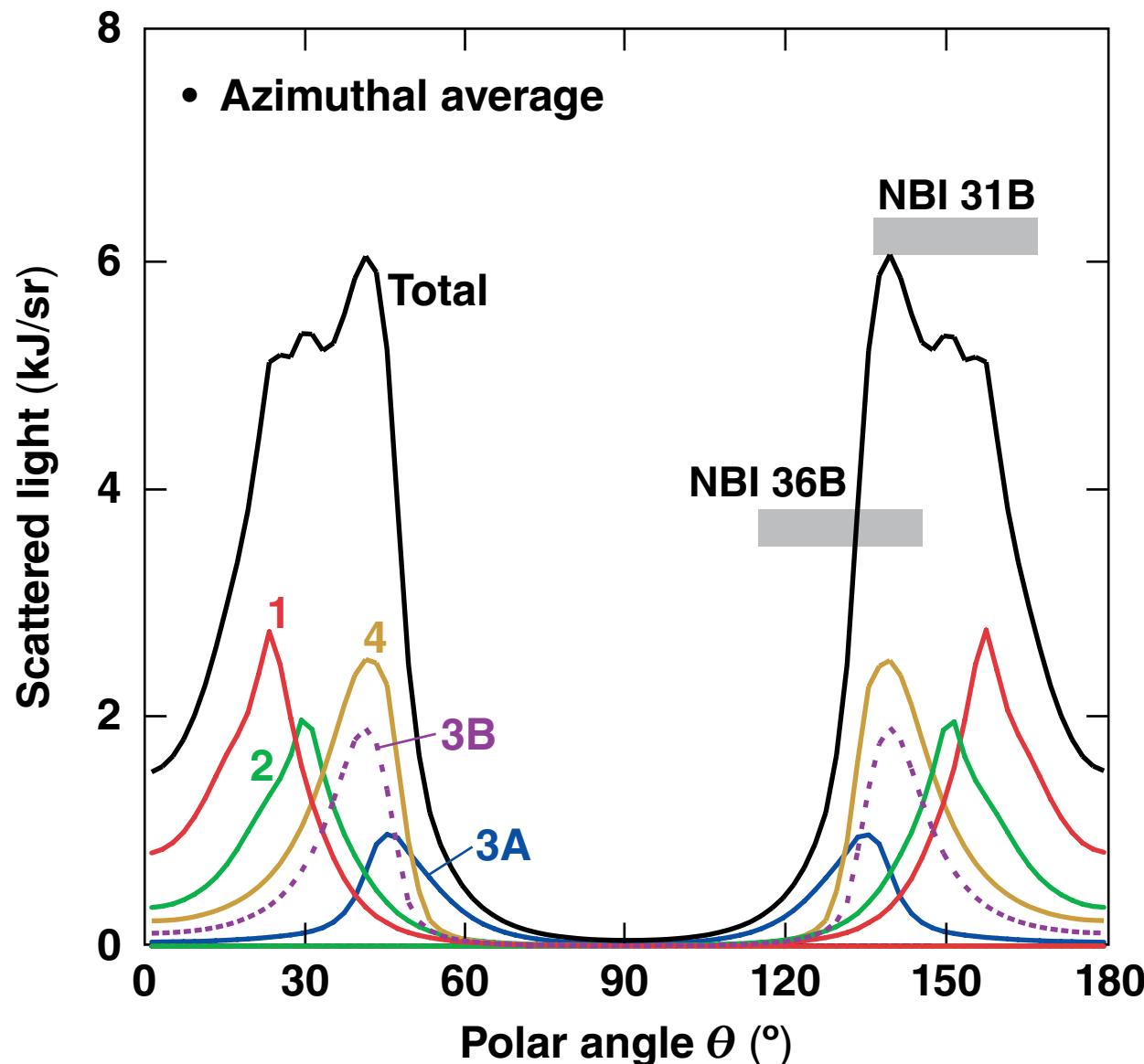
Averaged over the sphere, the center-of-mass radius  
is uniform to  $3.6 \mu\text{m}$



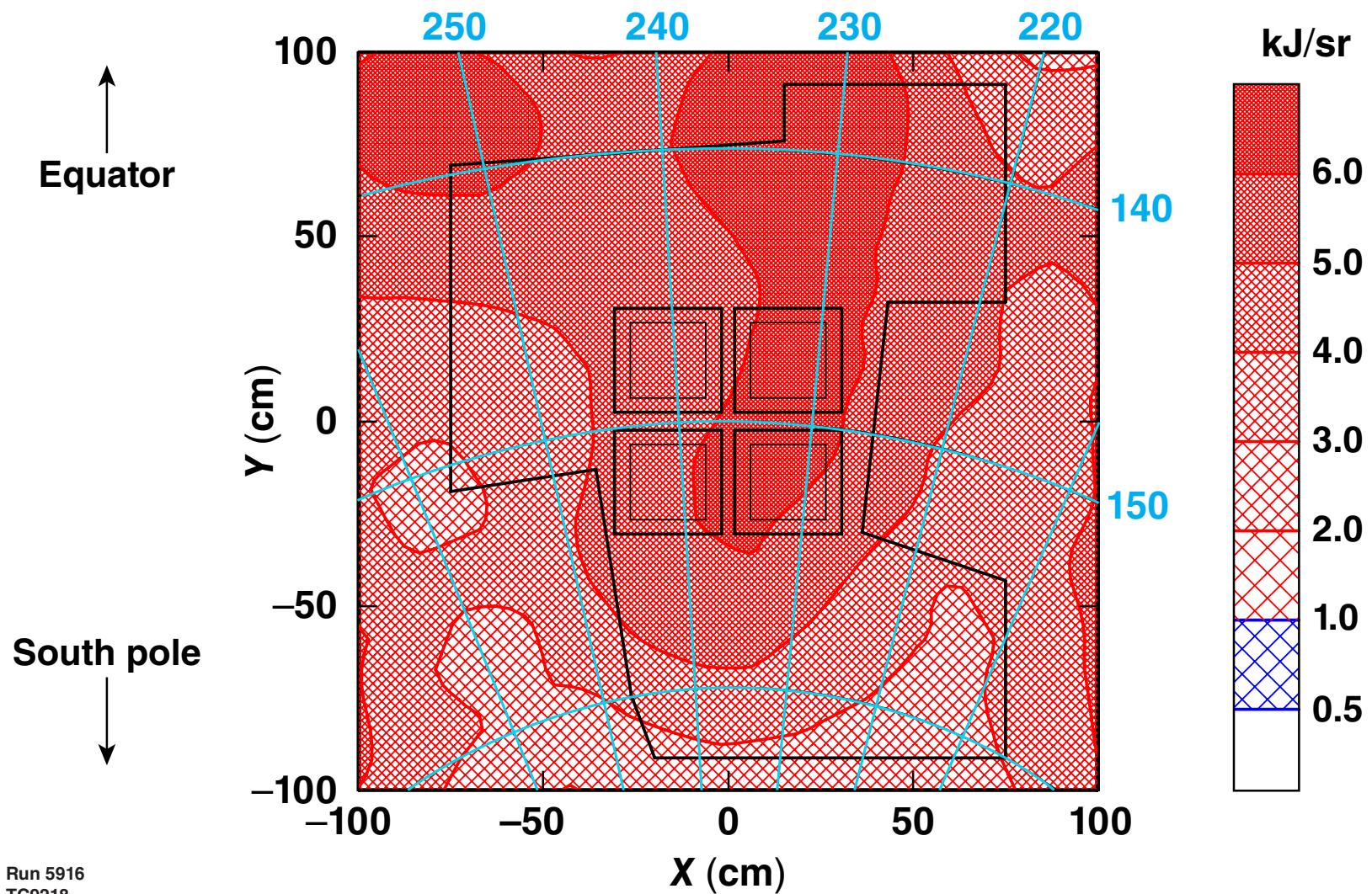
The cumulative scattered light is concentrated in a narrow range of angles  $\theta$  sampled by the two NBI plates



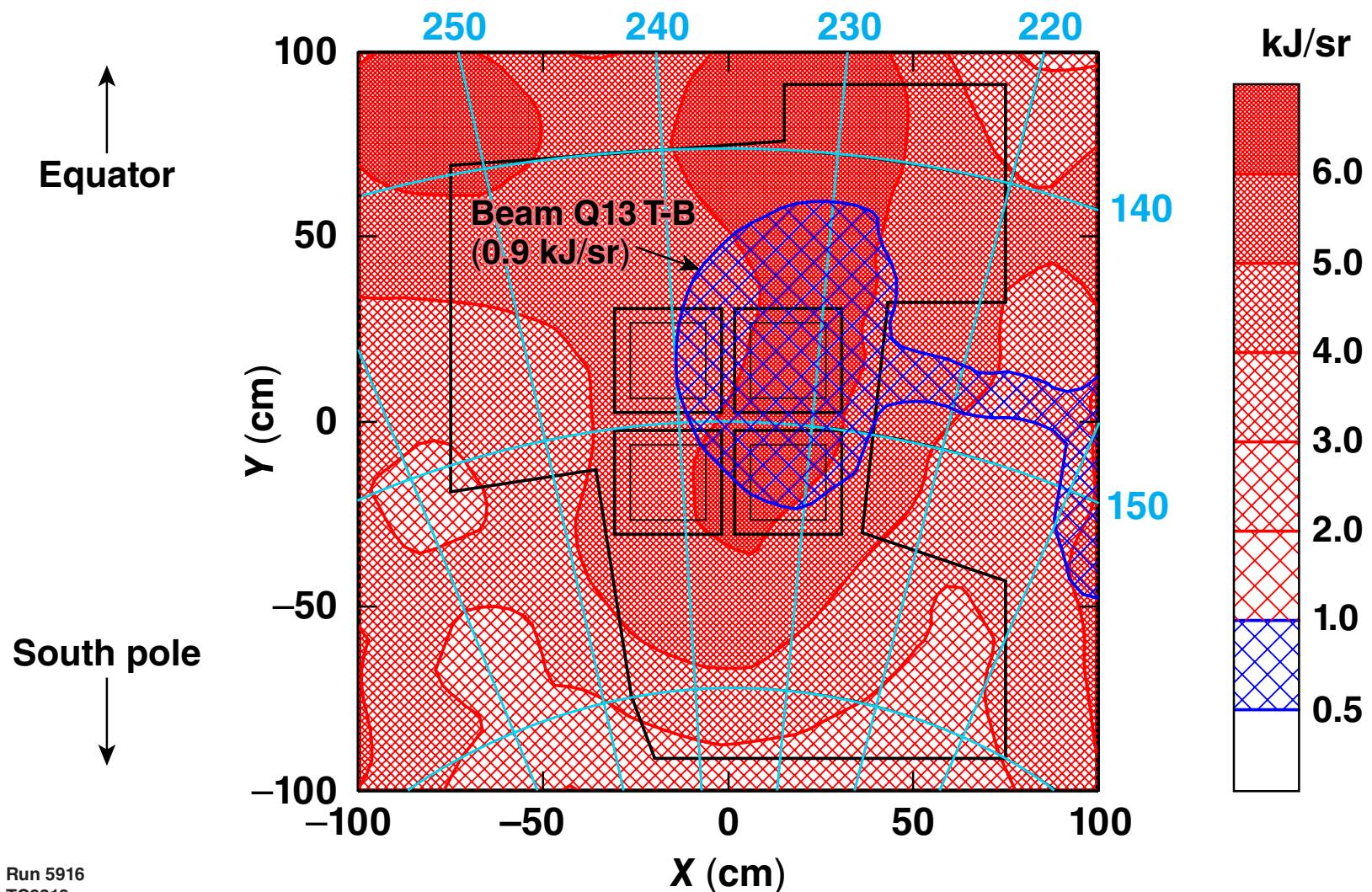
# The contributions of the individual rings to the cumulative scattered light can be identified



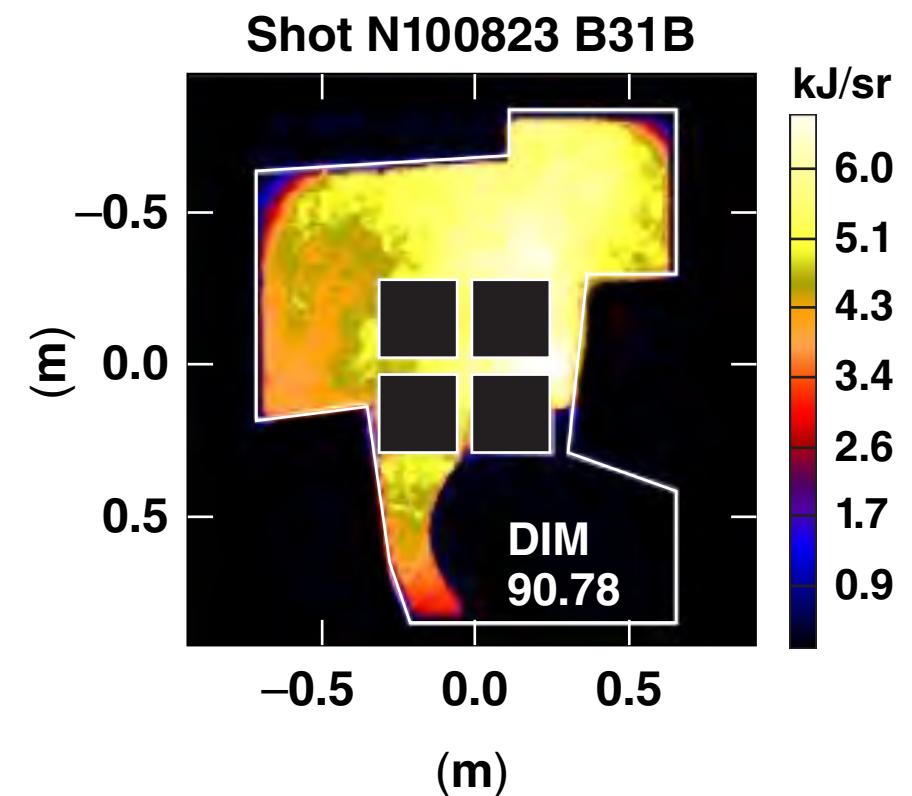
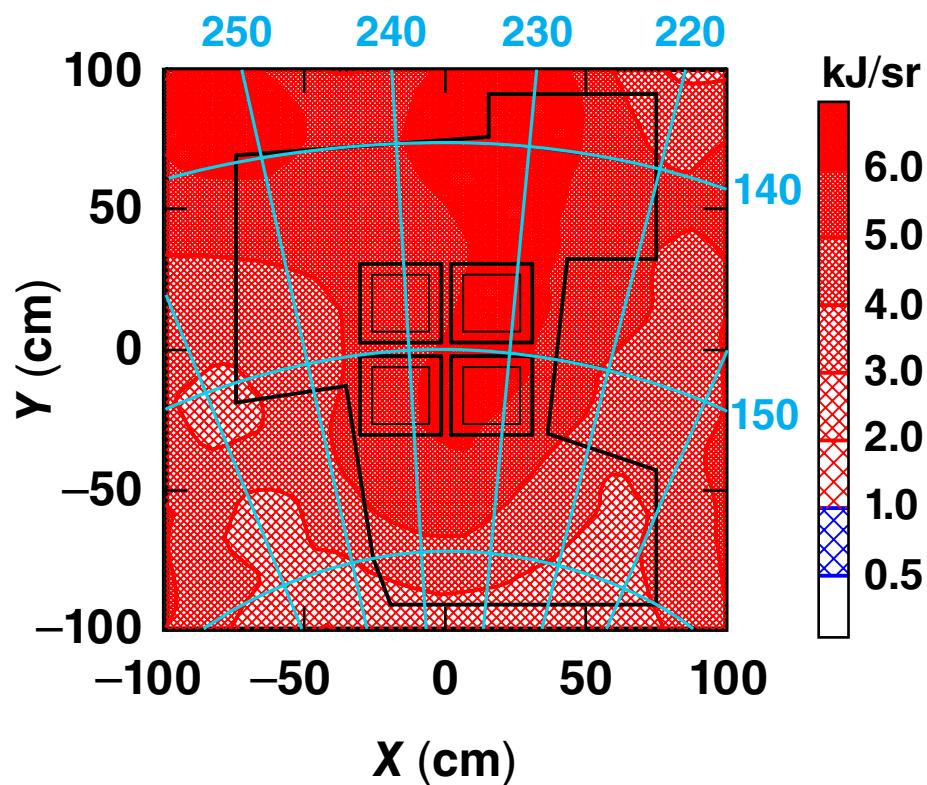
# The calculated scattered light on NBI plate B31B shows significant structure



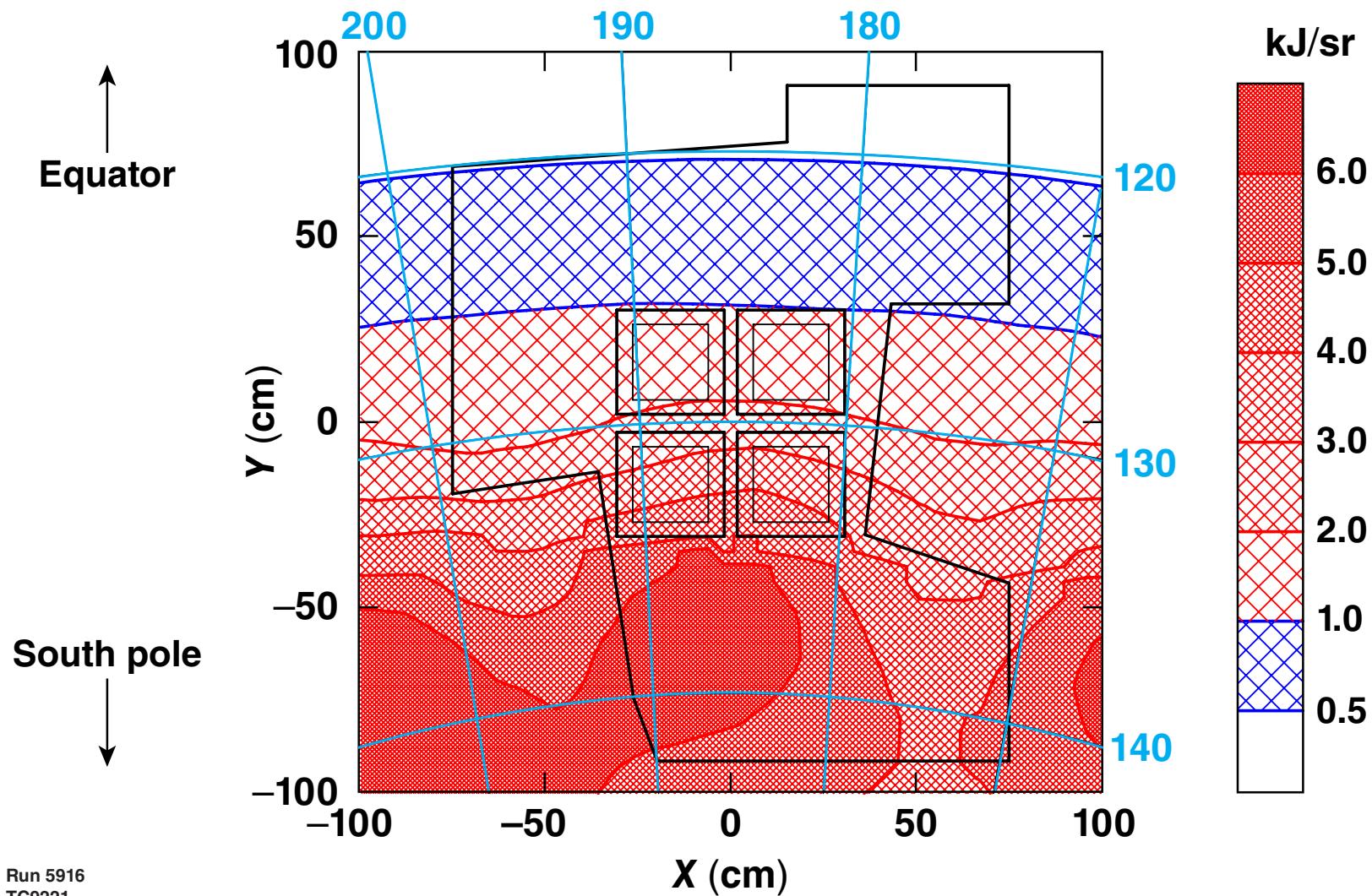
# The calculated scattered light on NBI plate B31B shows significant structure



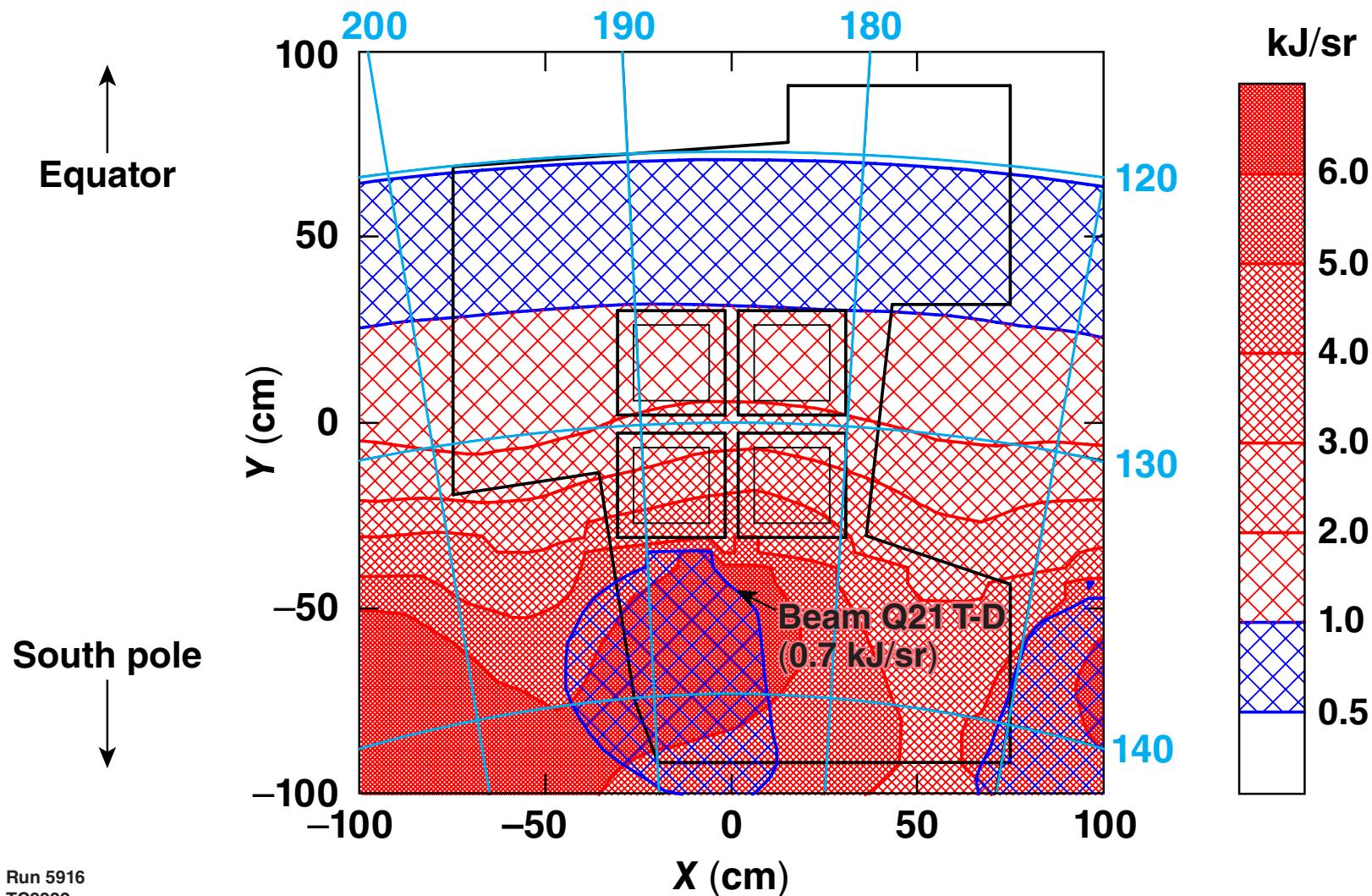
# The SAGE simulation of the B31B NBI image is consistent with the experiment



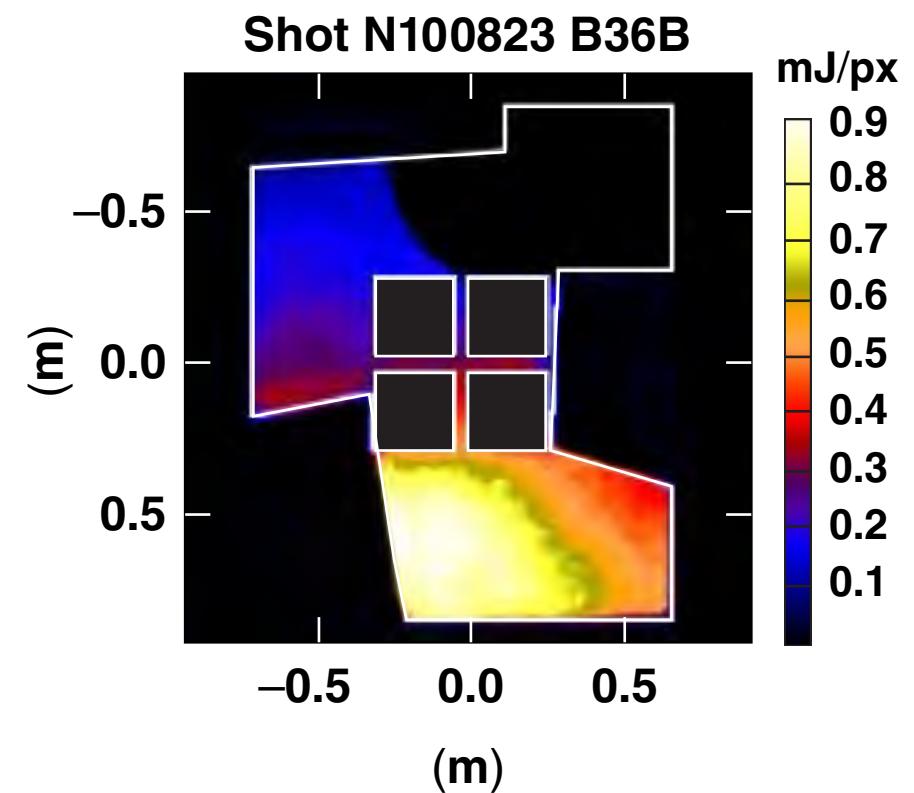
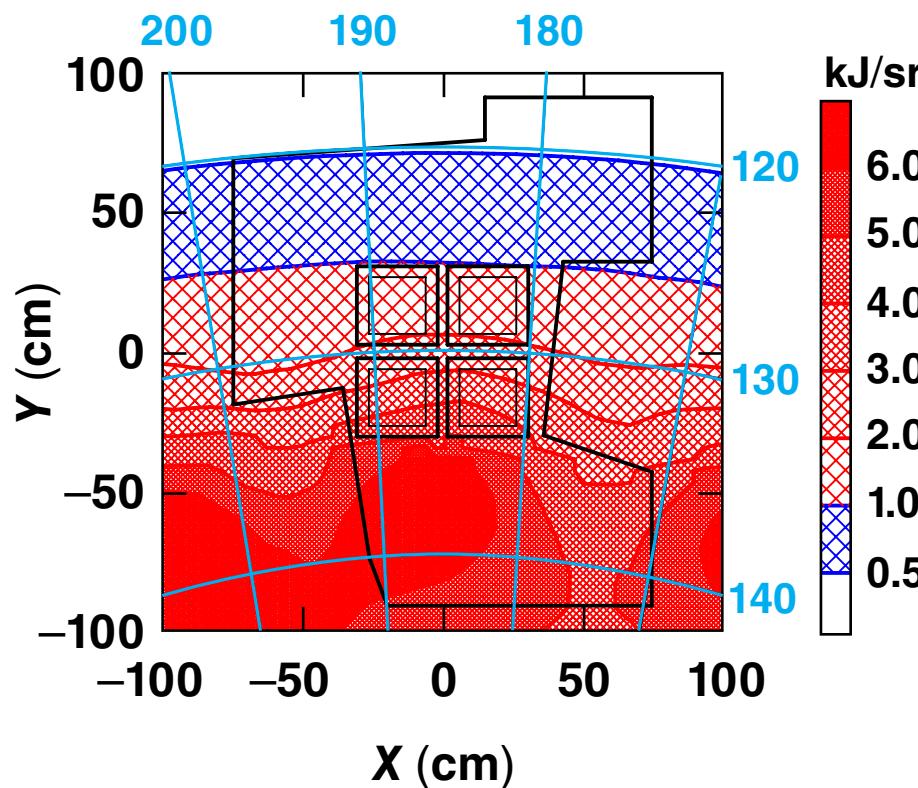
# The calculated scattered light on NBI plate B36B shows a strong top-to-bottom variation



# The calculated scattered light on NBI plate B36B shows a strong top-to-bottom variation



# The SAGE simulation of the B36B NBI image is broadly consistent with the experiment



# SAGE modeling of NIF “exploding-pusher” experiments is consistent with experimental scattered light observations



- The simulations combine 2-D hydrodynamics with 3-D ray tracing including all 192 NIF beam directions
- The deposited energy is ~20% higher at the equator and very uniform azimuthally
- The scattered light predicted on the NBI plates shows strong spatial variations consistent with observations

Comparisons with NBI/FABS measurements may enable the target absorption to be estimated.