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Applications:

- Optical communication and sensor links through foliage (leaves and tree-top canopies)
- UAV communicating with troops in forested area
- Beacons – search and rescue

MONTE-CARLO SIMULATION

Model Assumptions:

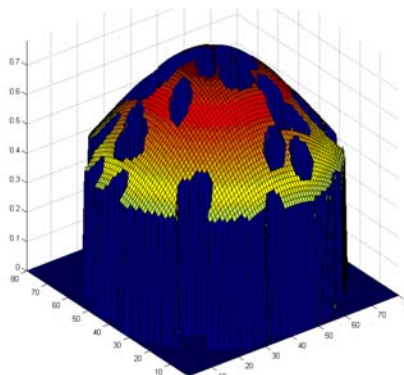
Beam/FOV Characteristics

- Beam spot-size/FOV determined by the user
- Intensity/Power characteristics determined by the user
- Number of pixels in the FOV determined by user

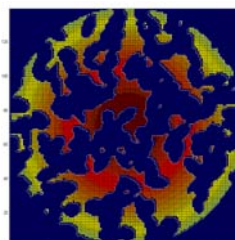
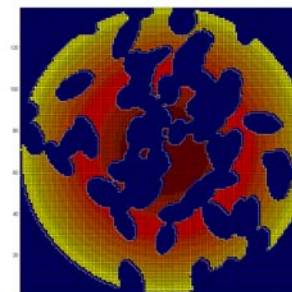
Leaf Characteristics

- Leaf placement in successive planes chosen from appropriate statistical distributions
- Photons hitting leaves are absorbed
- Leaves are uniformly distributed across RX field of view (FOV)
- Leaves can be modeled as ellipses with major and minor axes chosen from Gaussian distributions
- Leaves can be randomly oriented in the FOV.

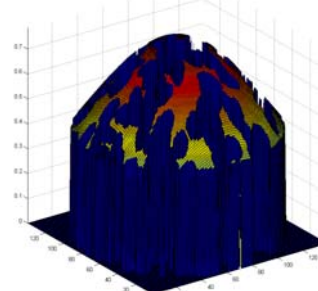
Side View of Beam with Leaf Obscuration



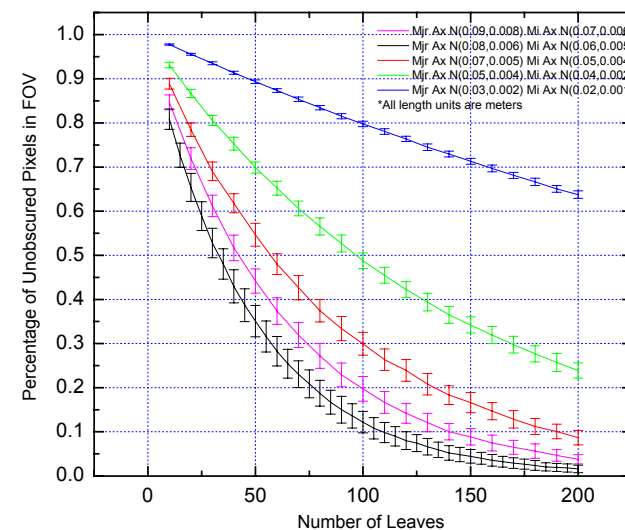
Gaussian beam with moderate superimposed leaf obscuration



Gaussian beam with severe superimposed leaf obscuration



Pixel Obscuration In Increasingly Dense Foliage



INTERIM CONCLUSIONS

- Large diameter laser beams penetrate foliage well
- Wind assists in allowing data packet flow

What's Next?

- Experimentally show that for a given number of leaves in the FOV, the total area obscured agrees with the model.
- Incorporate time-varying scintillation effects into model and verify experimentally.
- Develop stochastic pixel diversity probability distributions for leaf obscurations.