

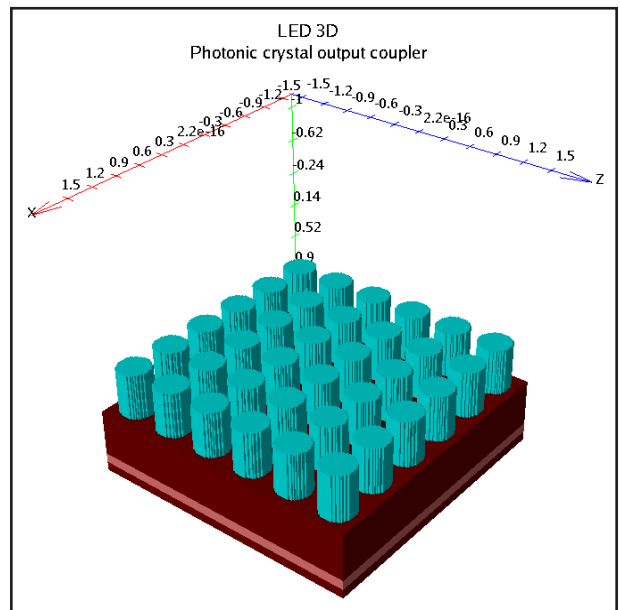
LED3D

3D LIGHT EMITTING DIODE SIMULATOR

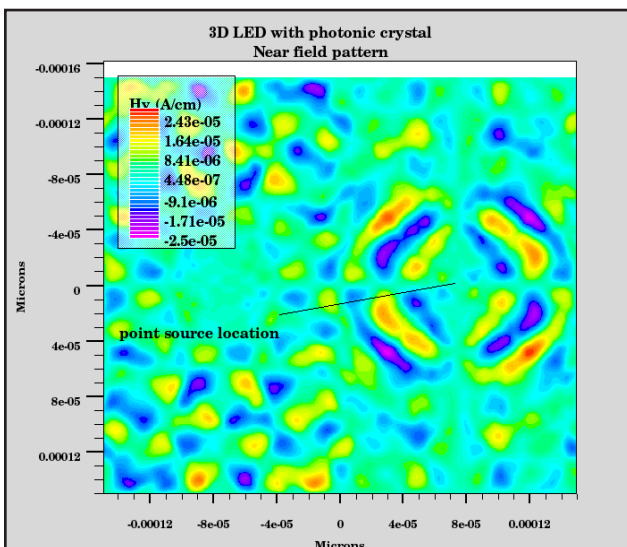
LED3D is a module used for simulation and analysis of light emitting diodes. LED3D is integrated in the ATLAS framework and allows simulation of electrical, optical and thermal behavior of light emitting diodes in 3D.

Features

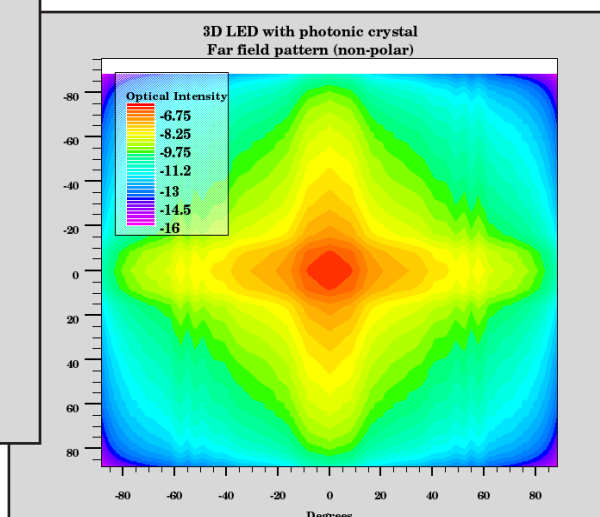
- Uses advanced radiative recombination models in zincblende, wurtzite and organic/polymer materials to give light output intensity response electrical stimulus and spectral emission characteristics
- Radiative emission models account for material composition, strain, polarization and dipole emission effects
- Finite difference time domain analysis give far field emission characteristics and output coupling efficiency
- Analysis of output coupling enhancement with photonic crystals using finite difference time domain
- Can be used with the Giga simulator to give realistic device behavior in conditions of self-heating
- Can be used with the MixedMode simulator to allow LED characterization in a SPICE circuit environment
- LED is fully integrated into the ATLAS framework and Device3D simulator to give emission characteristics as a function of device composition and electrical stimuli



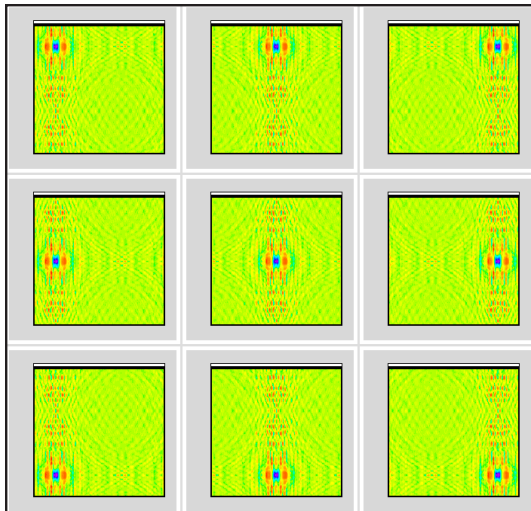
Here we show a 3D LED device with integrated photonic crystal-line output coupling layer (upper glass has been stripped away).



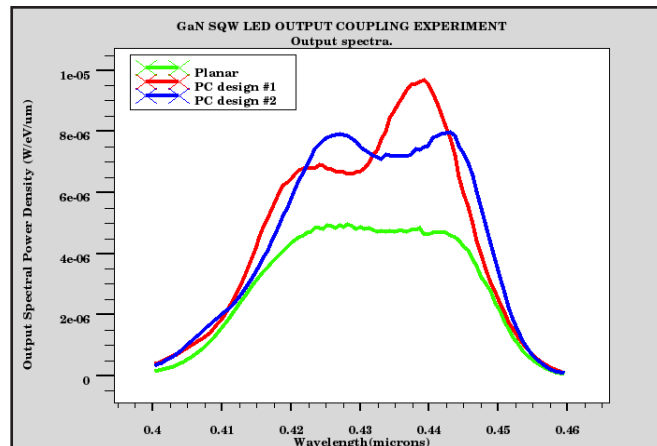
This figure shows the near field H_y component at a single source location.



Far field intensity pattern corresponding to near field pattern at left.



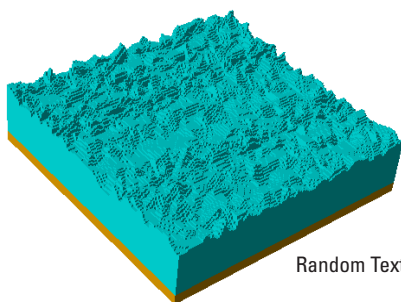
These figures show the Hz component of field taken at various locations during scanning of dipole location in 3D. Here slices are taken in the plane of the device. The effects of dipole location can be taken in all 3 dimensions.



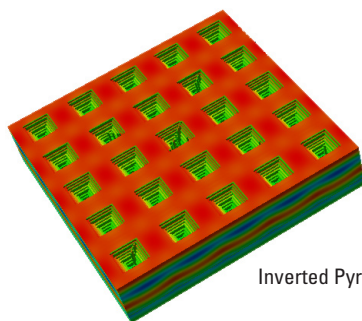
The results from the dipole scans are integrated, weighted with the local spontaneous emission spectrum to obtain characterizations of output coupling as a function of wavelength and geometry as shown in the accompanying figure.

Photonic Crystals and Textures

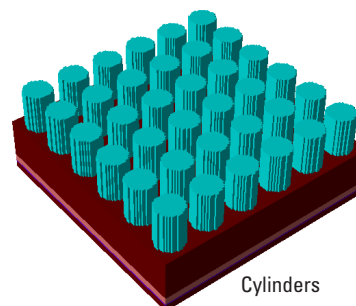
You can represent various photonic crystals with various primitives such as cylinders, spheres, pyramids, ellipsoids and user defined primitives in regular rectangular, hexagonal periodicity or randomly textured.



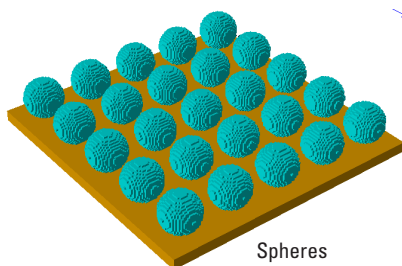
Random Texture



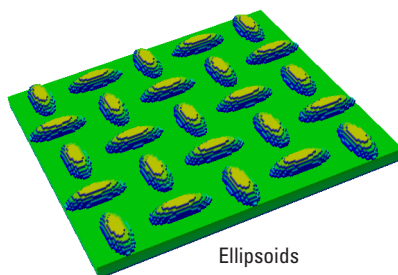
Inverted Pyramids



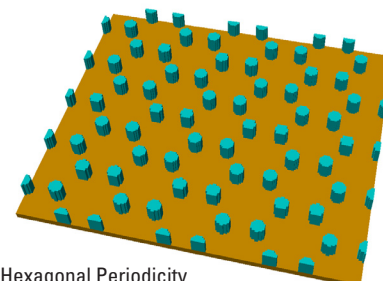
Cylinders



Spheres



Ellipsoids



Hexagonal Periodicity

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