

# Hydrogen Wave Function

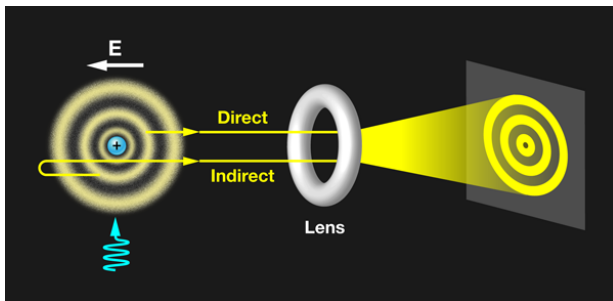
Khoruzhii K., Primak E.

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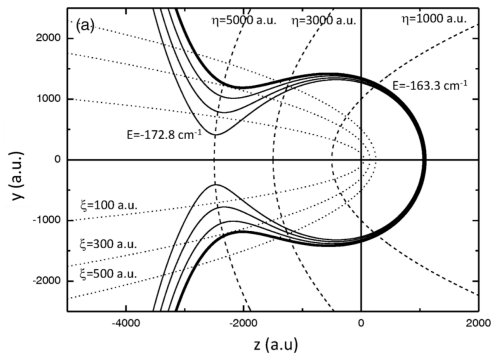
Possible applications:

- optical reflectometry;
- chaos radar;
- random numbers generation;
- signal encryption.

# Idea of «quantum microscope»



# Geometry of the problem



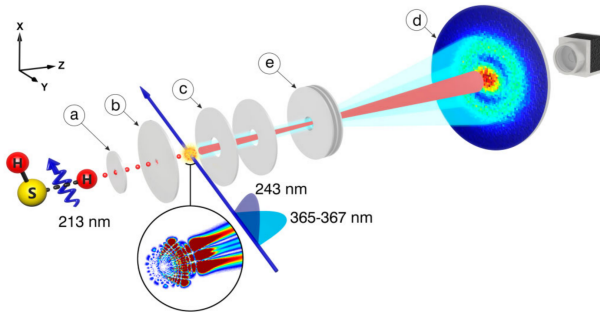
For  $z$  — displacement along the electric field.  
And  $r$  — electron-proton distance.

$$\eta = r - z$$

$$\xi = r + z$$

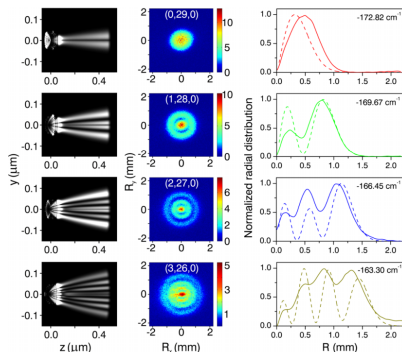
$$\Psi(\xi, \eta, \varphi) = \frac{1}{\sqrt{2\pi\eta\xi}} \chi_1(\xi) \chi_2(\eta) e^{im\varphi}$$

# Preparation of state



# Experimental observation

Experimental observation of the transverse nodal structure of four atomic hydrogen Stark states



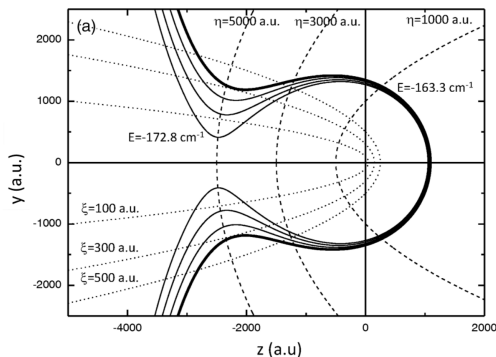
States  $(n_1, n_2, m)$   
 $m$  — the magnetic quantum number.

$n_1, n_2$  — related to the principal quantum number as

$$n = n_1 + n_2 + |m| + 1$$

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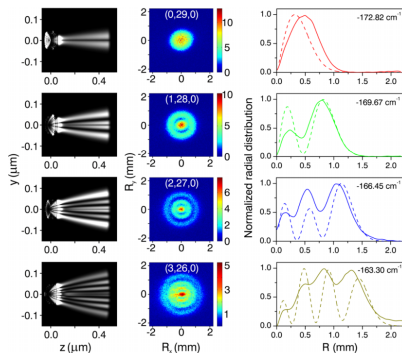
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