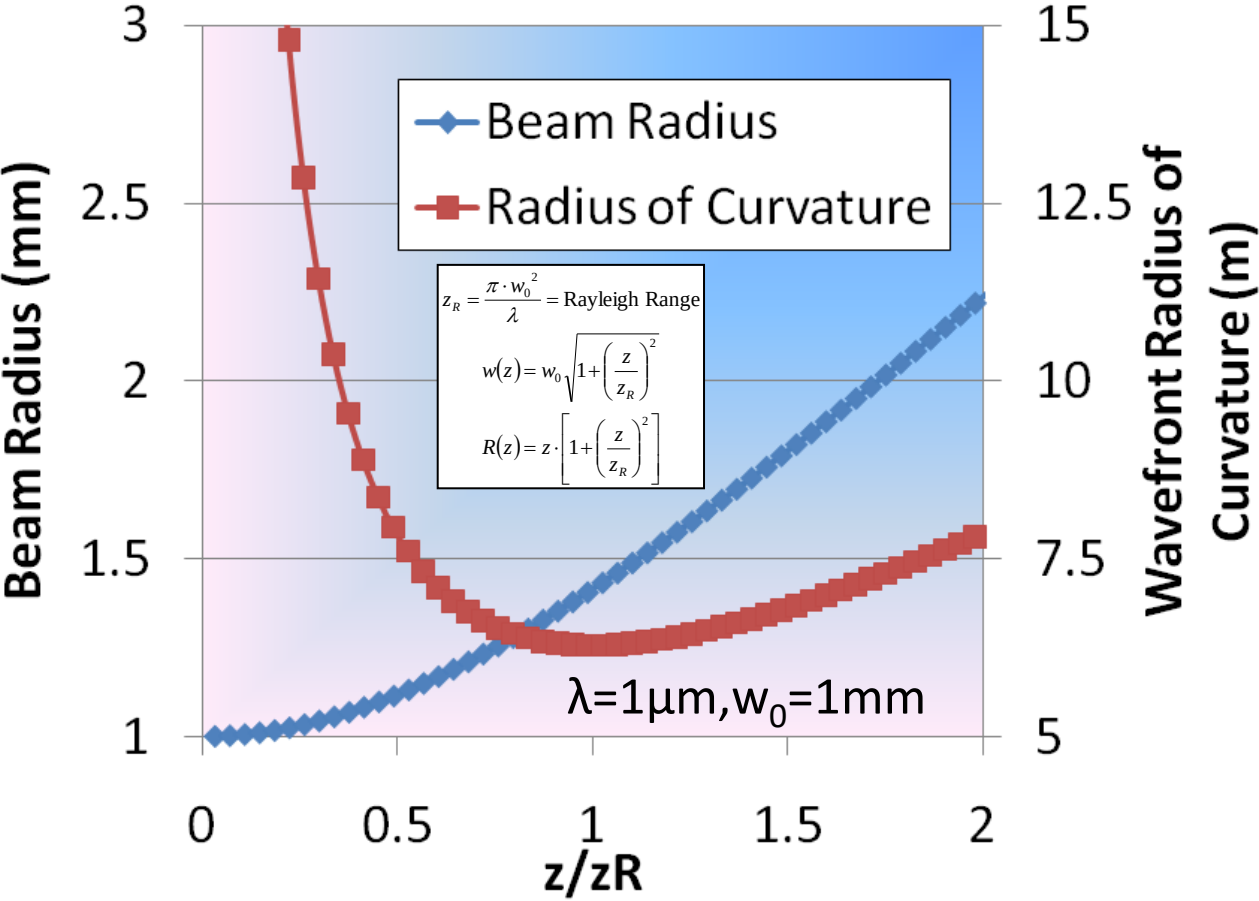


Lasers

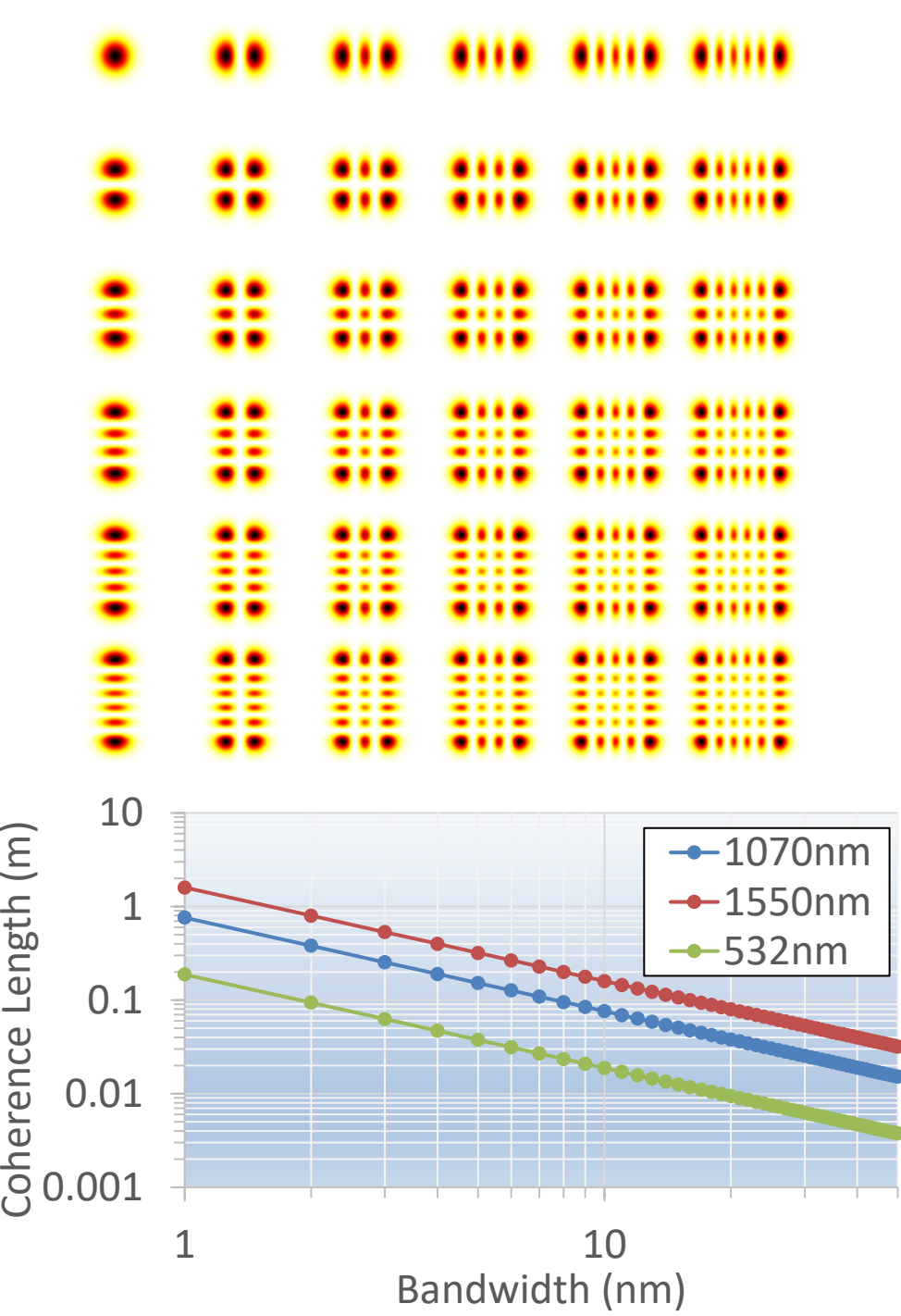
Gaussian Beam Parameters



Common Laser Wavelengths

Wavelength (nm)	Gain Medium
1319, 1064	Nd:YAG
1047	Nd:YLF
1030	Yb:Glass
633	HeNe
532	Doubled Nd:YAG
10,600	CO ₂
1550	Er:Glass

Hermite-Gaussian Laser Modes



Common ABCD Ray Matrices

Thin Lens Matrix:

$$\begin{bmatrix} 1 & 0 \\ -1/f & 1 \end{bmatrix}$$

Free Space Propagation Matrix:

$$\begin{bmatrix} 1 & nL \\ 0 & 1 \end{bmatrix}$$

Ray Transfer Equations:

$$\frac{1}{q} = \frac{1}{R} - j \frac{\lambda}{\pi w^2}$$
$$q' = \frac{Aq + B}{Cq + D}$$

Stable Resonator TEM₀₀ Mode Size

Resonator Schematic and Mode Size Equations:

$$w_0 = \sqrt{\sqrt{L(R_1 - L)} \frac{\lambda}{\pi}}$$
$$w_0 = \sqrt{\sqrt{\frac{L}{2} \left(R_1 - \frac{L}{2}\right)} \frac{\lambda}{\pi}}$$