Spot Sizes for Standard Probes

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Spot sizes of the measurement probes are calculated using the Gaussian Waist method:

$$FWE = \frac{4\lambda}{\pi NA_{emitted}}$$

where,
FWE = the full width of the spot at $1/e^2$ of optical power,
λ = 1310nm,
$NA_{emitted}$= full imaging space Numerical Aperture of the probe's output beam, as defined as full width at $1/e^2$ of optical power.

The imaging space NA of optical probes is calculated using the optical modeling software Zemax, where the object space NA is set to be equal to the NA of the single mode fiber (0.14). The NA of SMF-28 optical fiber is equal to 0.14, which corresponds to **half** the cone angle at 1% power, in radians. The **full NA** at $1/e^2$ is calculated by multiplying the **full imaging NA** by 0.68.

Part#	WD†, mm	fNA, rad	fNAe, rad	FWE, µm	SS, µm
13000-10	50	0.06	0.041	41	40
13000-20	20	0.128	0.087	19	20
13000-58	20	0.3	0.204	8	10
13000-72	145	0.072	0.049	34	35
13000-75	90	0.03	0.020	82	80
13000-76	13	0.278	0.189	9	10

†WD – Working distance, fNA – image space full numerical aperture, fNAe – image space full NA at $1/e^2$, FWE – full width at $1/e^2$ of optical power, SS – spot size

Due to the approximate nature of these calculations, the numbers in the SS column are calculated by rounding the numbers in the FWE column to the nearest 5 µm.

References:
http://www.calctool.org/CALC/phys/optics/spot_size
http://www.newport.com/Gaussian-Beam-Optics/144899/1033/content.aspx
http://www.pa.msu.edu/courses/2010fall/phy431/PostNotes/PHY431-Notes-GaussianBeamOptics.pdf
http://www.rpgroup.caltech.edu/courses/aph162/2007/Protocols/Optics/e3872_Gaussian-Beam-Optics.pdf