

BEA Laser Scanner Spot Size

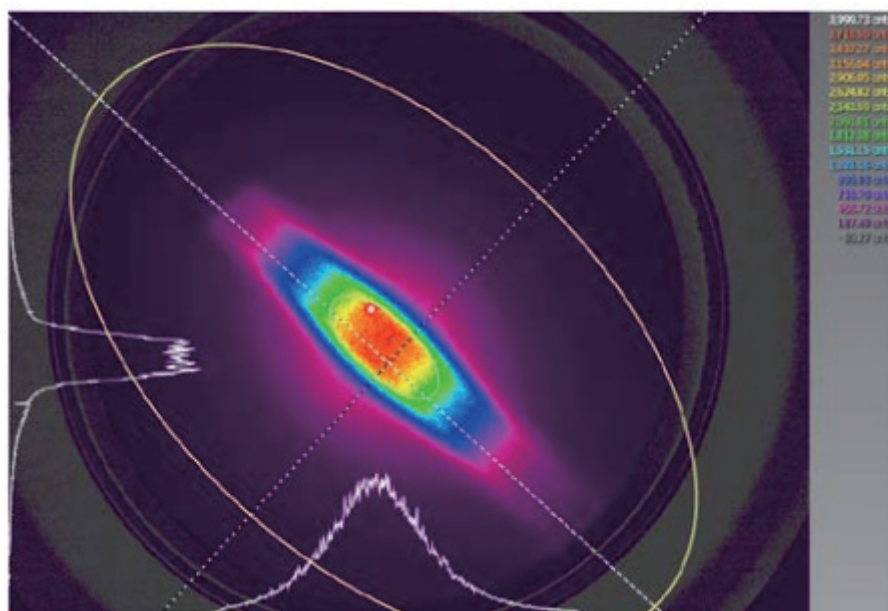
FLATSCAN

How has been the spot size been calculated?

Laser scanner as an optical device has great convergence and energy density, which is often taken as an advantage compare with normal infrared device.

In theory the spot size is elliptical and proportional with the distance. For instance: at 3 meters distance, the spot size will be 37.5mm*4.5mm according to the component data specification. As light is always a little diverged, the theoretical number is given based on the spot area where 90% energy is located.

Refer to below picture for better understanding, the closer to the center, the more density the energy is:



Typical far field scan of triple junction lasers

This implies, outside of the area where 90% energy locates, there are still stray light surrounding which could possibly trigger detection depending on the reflectivity of objects.

Why sometimes the spot size seems to be bigger than given number?

As explained, there is still 10% energy outside the given area, that means with high enough reflective object approaching the beam area, possibility of detection occurs.

When using a white paper approaching the laser beam, due to high reflectivity, the stray light

outside of the given area is already enough to trigger the detection, which makes the spot size test result “bigger” than the theoretical number.

Yet using a black paper (or other black objectives) approaching the laser beam, due to low reflectivity, the spot size may measured to be “smaller” than the given number.

Why not use 100% energy as reference to calculate the spot size?

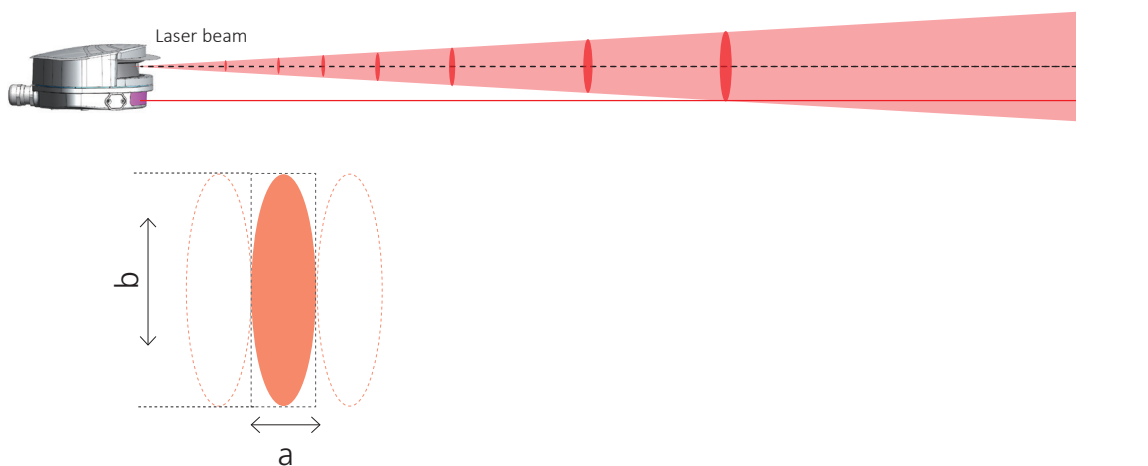
As the light is always diverged and the lens/mirror/window can't be perfect, it will always have diffusion. For different application, the reflectivity of objective possibly higher than 100%. That is why we take the component data spec as a standard reference, knowing that for each application it is always needed to validate with environment and application specifically.

How shall we take the spot size as reference more efficient?

BEA recognizes that using an object with high reflectivity to position the laser spot may be more realistic. Here is a reference to help making the first evaluation (**table 1**).

Please Note that this spot size number is only for roughly reference at given test objective, it could be slightly different from one to another ; And the usable spot size will highly link to distance, objective reflectivity, objective surface, and some other parameters which could impact the sensitivity of detection such as fog filter due to the reason explained above. And the number here only valid for Flatscan based product, it is different for other laser platform.

In any case, the customer shall make their own validation with actual environment vs spot size to ensure the charateristic of the scanner suit for their specific application.



<i>Reference object</i>	<i>Typical Spot Size (b in mm)@3 meter</i>
White A4 paper	60mm +/-10mm

table 1