

A Piece of Golden Advice of Doctor Guy Wise

Last week, my long time friend from Taiwan who has been in the business for close to twenty years asked me some fundamental questions on Light Output when comparing two competitive products. Soon I found out that he was not the only one who was facing this problem and that some clarification could be more than helpful for many of us.

What are Lumens?

Lumens relate to the amount of energy (light) that is coming out of a projector. It tells you everything about the potential of a projector but actually says nothing about the brightness you will get on your screen. This brightness depends on many parameters with the screen being the most important one: both its size and characteristics influence the result dramatically.

An additional given is the fact that Lumens are very hard to measure. The most practicable thing you can do is measure the illumination on the screen surface (in Lux or Foot Candles). The light output of the projector can then be calculated with the following formula:

Light Output (Lumen) = Illumination (Lux) x Screen Surface (square meters)

What are "Peak White" and "Full White" Lumens?

Many large screen projectors (typically CRT based) have the capability to produce a very bright image during a short period or within a small area. To express this capability, marketing people created the term Peak White Lumens, mostly accompanied by a percentage.

10% Peak White Measurement

This measuring method requires a test signal with a small white rectangle in the center of a black background. The percentage indicates the white surface versus the total surface (i.e. 10% peak white).

20% Peak White Measurement

The smaller the bright surface, the higher this value will be. A 10% Peak White Measurement will show a higher value than a 20% Peak White Measurement.

100% Full White Measurement

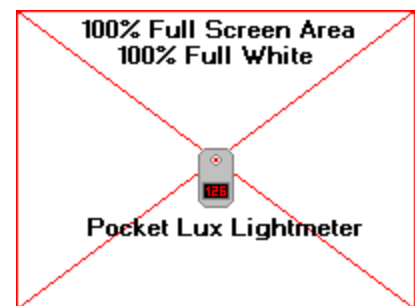
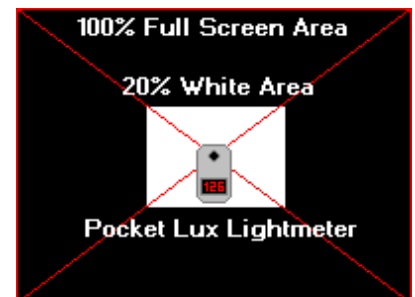
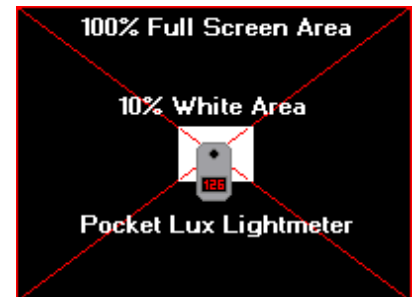
In the case of a 100% White test pattern, we obviously do not speak any more of Peak White, but the term Full White or Center (Full) White is generally used.

This measuring method might not look scientific on a first glance but is perfectly defensible: most video pictures have a rather low picture content comparable with 10 to 30% Peak White, DOS-Applications have a picture content comparable to 40% Peak White while Windows applications typically have a picture content of 50 to 70% Peak White.

The Lumen Curve

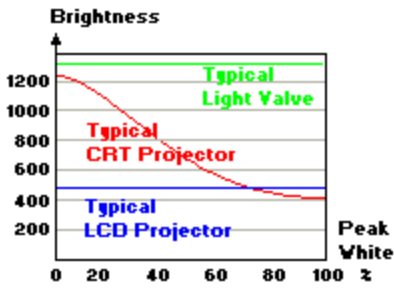
While CRT projectors have the capability to produce "Peak Whites", LCD projectors or Light Valve types do not have this capability and always produce the same brightness, whatever the white percentage of the picture. If you draw the curve that expresses the relation between Light Output and Picture Content for both typical CRT and typical portable LCD projectors, you can easily see the difference.

Therefore, an LCD projector might look brighter compared to a CRT projector projecting a typical WINDOWS picture with a high picture content. With a video laser disc however, that same LCD projector might give a much dimmer and duller picture than the same CRT projector.



GOLDEN ADVICE: Be very careful when you compare light specifications from different projector technologies on paper. Always ask yourself: "What is my main application?" and try to get hold on as much different clearly defined specs as you can.

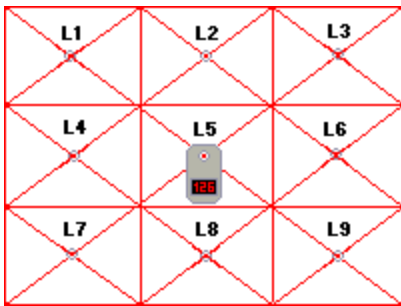
What are ANSI Lumens?



From time to time you can also see the specification ANSI Lumen, referring to the American National Standards Institute. This is a meticulously described measuring method that should make specifications more comparable. Unfortunately, it does not take into account the peak power CRT projectors can deliver and is therefore not very well suited for this type of projectors.

Basically, the measurement is done on a full white picture, and the illumination on the screen is measured in Lux on 9 different places on the screen. The ANSI Lumen value is then calculated as an average of these 9 measurements:

$$\text{ANSI Lumen} = (L1+L2+L3+L4+L5+L6+L7+L8+L9)/9 * \text{Screen Surface (square meters)}$$



What this measurement does take into account very well, is the drop in Brightness in the corners that many poorly designed projectors show so very well. This drop in Brightness can be quite dramatic on some projectors and is observed as a "Hot Spot". It is also expressed by the specification "Edge to Center" ratio:

$$\text{Edge to Center Ratio} = L1/L5$$

In some cases this ratio can be as low as 20% but for a good projector without any observable Hot Spot, you should count on a ratio of approximately 70% or up.

Conclusion

If you digested all this information and on got hold on all these specifications from the manufacturer, you might think you have finished. Unfortunately this is not the case; all the above measurements are very dependent on the circumstances in which they are performed and can vary widely for identical products. On top of that, many manufacturers do not take all specifications very seriously and over specify their products.

GOLDEN ADVICE: Always try to compare the different projectors you are considering on a side by side basis with your own video or computer sources. This is by far the best and most discriminating method to make your final judgment.