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# Motion Blur Characterization in Matrix Displays

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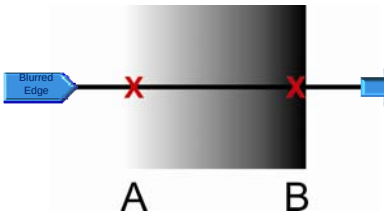
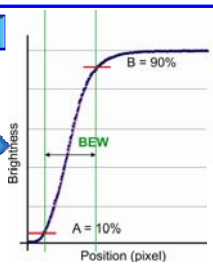
**CAUSED BY:**

- ✓ Slow LC response time.
- ✓ ***Excitation & Hold*** temporal rendering method of LCDs.
- ✓ Smooth pursuit eye movement of the human visual system.

## WHAT IS MOTION BLUR?




The basic parameter is the ***Brightness Edge Width*** **BEW**

**Some Maths:**

$$NBEW(frames) = \frac{BEW\ (pixels)}{v_p\ (pixels/frame)}$$

$$NBET\ (seconds) = NBEW\ (frames) \cdot T_f(seconds/frame)$$

✓MPRT is an objective and quantitative parameter proposed for standard characterization of Motion Blur artifact, and quantification of the visual perception of moving images.

✓Grey to Grey (G2G) Response Time Curves (RTC) must be taken into account to measure MPRT.

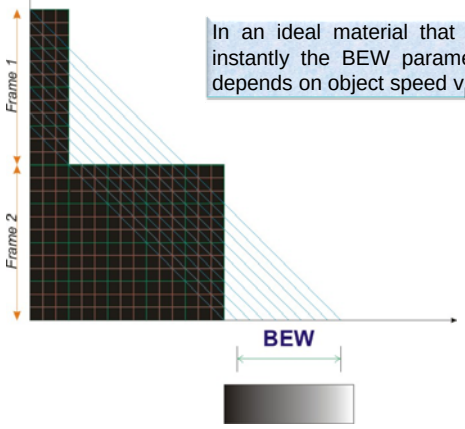
**N Gray Levels**

**M = N(N-1) Transitions**

$$MPRT\ (seconds) = \frac{1}{M} \cdot \sum_{M}^{i=1} NBET_i$$

## IDEAL & REAL MATERIALS:

Ideal Material



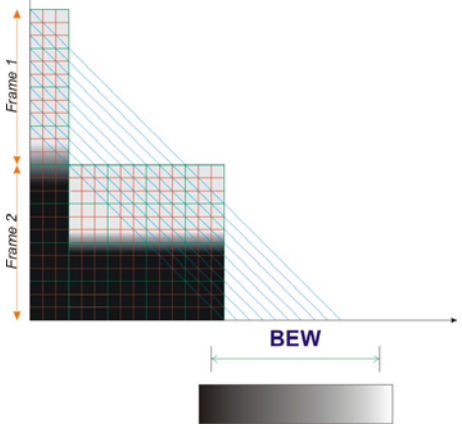

In an ideal material that switches instantly the BEW parameter only depends on object speed $v_p$.

$$BEW = \frac{160 v_p \cdot (v_p^2 - 1)}{9 + 182 v_p + 209 v_p^2}$$

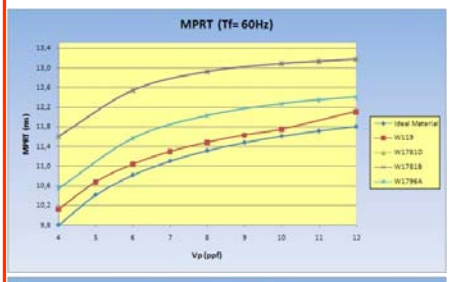
$$NBET = NBEW \cdot T_f = \frac{T_f 160 \cdot (v_p^2 - 1)}{9 + 182 v_p + 209 v_p^2}$$

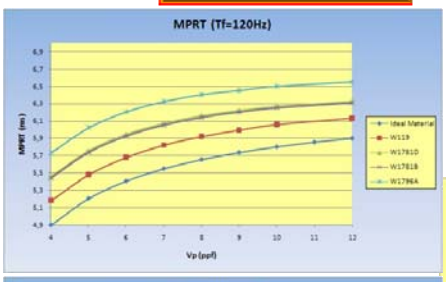
$$NBEW = \frac{BEW}{v_p} = \frac{160 \cdot (v_p^2 - 1)}{9 + 182 v_p + 209 v_p^2}$$

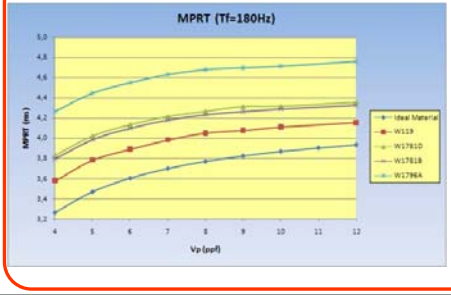
Real Material

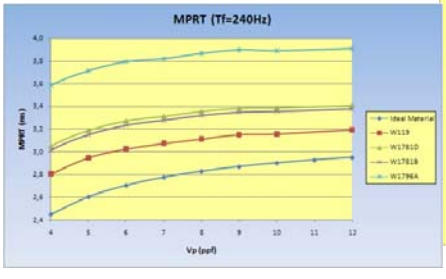



## RESULTS

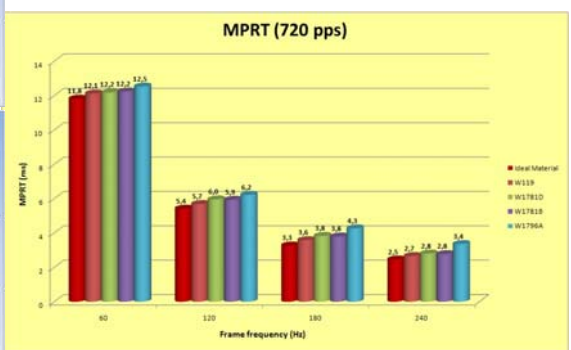



Motion Blur is customarily alleviated by increasing the frame rate. The figures at the left show the behavior of several materials, compared to an ideal case, for several frame rates. The histogram below gathers the results keeping constant the object speed (pixels/s).

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