Flicker Testing Tutorial for ENERGY STAR® Lamps V2.1

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Lamps V2.1 Overview

- 15,000-hour minimum lifetime for all LED types
- New test method (NEMA 77-2017) and reporting requirements for flicker
- Updated references to DOE test procedures
- Added references to LM-80-15, Addendum B to TM-21-11, and Addendum A to LM-80-08

§12.4 – Flicker: All Lamps Marketed as Dimmable

New Method of Measurement: NEMA 77-2017

Supplemental testing parameters mean that the low- and high-frequency waveform data captured can be uses to calculate all metrics to be reported for ENERGY STAR certification, as well as the amplitude modulation values for the California Energy Commission's JA10 cut off frequencies (collected by CEC, not EPA).

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The following flicker-related metrics shall be reported:

- Percent Flicker
- Flicker Index
- Lamp light output periodic frequency
- (New) Short Term Flicker Indicator (P_{st})
- (New) Stroboscopic Visibility Measure (SVM)
- (New) ASSIST Flicker Perception Metric (M_P)

The reported values shall be the highest value measured

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Supplemental testing parameters:

Parameter		Units	Value
Dynamic range of waveform amplitude	P_{st}, M_P		≥ 1000:1 (60 dB)
	SVM, Flicker Index, Percent Flicker		≥ 100:1 (40 dB)
Sampling Time	P_{st}, M_P	Seconds	≥ 180
	SVM, Flicker Index, Percent Flicker	Seconds	≥ 1
Sampling Rate	P_{st}, M_P	kHz	≥ 10
	SVM, Flicker Index, Percent Flicker	kHz	≥ 20
Temporal bandwidth (-3 dB cutoff frequency)	P_{st}, M_P	kHz	≥ 0.5
	SVM, Flicker Index, Percent Flicker	kHz	≥ 5

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- Waveform data shall be submitted in CSV format to:
  - Support the reported values of P_{st}, SVM, and M_P
  - Become part of a library of waveform data for further analysis
- Value reported for M_P shall be based on analysis of the entire 180-second waveform dataset, calculating M_P for each 2-second interval.

Discussion

- Questions?