



ENERGY STAR Products Partner Meeting

Dimming LED Lights Insights & Solutions

Monday October 23, 2017
Chicago IL

Session Schedule

- Introduction from Taylor Jantz-Sell
- Overview of technical requirements Robert Nachtrieb – LUTRON
- Update on NEMA program progress from Jennifer Dolin – LEDVANCE (formerly Sylvania)





ENERGY STAR Lamps Dimming Requirements

- Why do we have them?
- Lamps V1.0 vs V2.0 & V2.1
- Section 12 for Lamps employing controls and ALL Lamps Marketed as Dimmable
- **Maximum Light Output:** Lamp light output on the maximum setting of a dimmer shall not fall below the lamp's baseline light output when operated without a dimmer by more than 20%
- **Minimum Light Output:** Lamp light output on a dimmer/control shall be no more than 20% of the maximum light output of the lamp on each tested dimmer/control.
- **Flicker:** The following flicker related metrics shall be reported: 1. Percent Flicker; 2. Flicker Index; 3. Lamp light output periodic frequency. **V2.1:** 4. Short Term Flicker Indicator (Pst); 5. Stroboscopic Visibility Measure (SVM); and 6. ASSIST Flicker Perception Metric (MP)
- **Audible Noise:** Lamp shall not emit noise above 24 dBA.



ENERGY STAR Lamps V2.1 Dimming Requirements

- **3 Basic testing pathways**
 - Lamps designed for phase cut dimming (and SSL7A) test one lamp with reference circuit using ENERGY STAR Recommended practice for light output on a dimmer, noise and NEMA 77.
 - Lamps designed for phase cut dimming (but NOT SSL7A) test one lamp on 5 different dimmers chosen by the partner. Same as above NEMA 77 can still be used to test.*
 - EPA's intent is for the dimmers selected to be varied in electrical construction and to represent a wide range of potential consumer situations. For example, a selection of five dimmers might include at least one dimmer specified for use with energy efficient lighting (such as CFL or LED lamps), one that has pre-set levels, one forward-phase dimmer rated 600W, and one reverse-phase dimmer.
 - Lamps that are not designed to work with phase cut dimmer e.g. connected lamp test with provided compatible control e.g. app, remote or custom wall control

Section 12.1 Dimming: New streamlined testing pathway

- Streamlined testing for products now available since NEMA launched lamp + dimmer compatibility marking program
 - Test with SSL7A complaint dimmer or circuit only
 - Sign NEMA MOU for use of trademark
 - Pay NEMA participation fee
 - Comply with NEMA 77 recommended limits for Pst and Svm



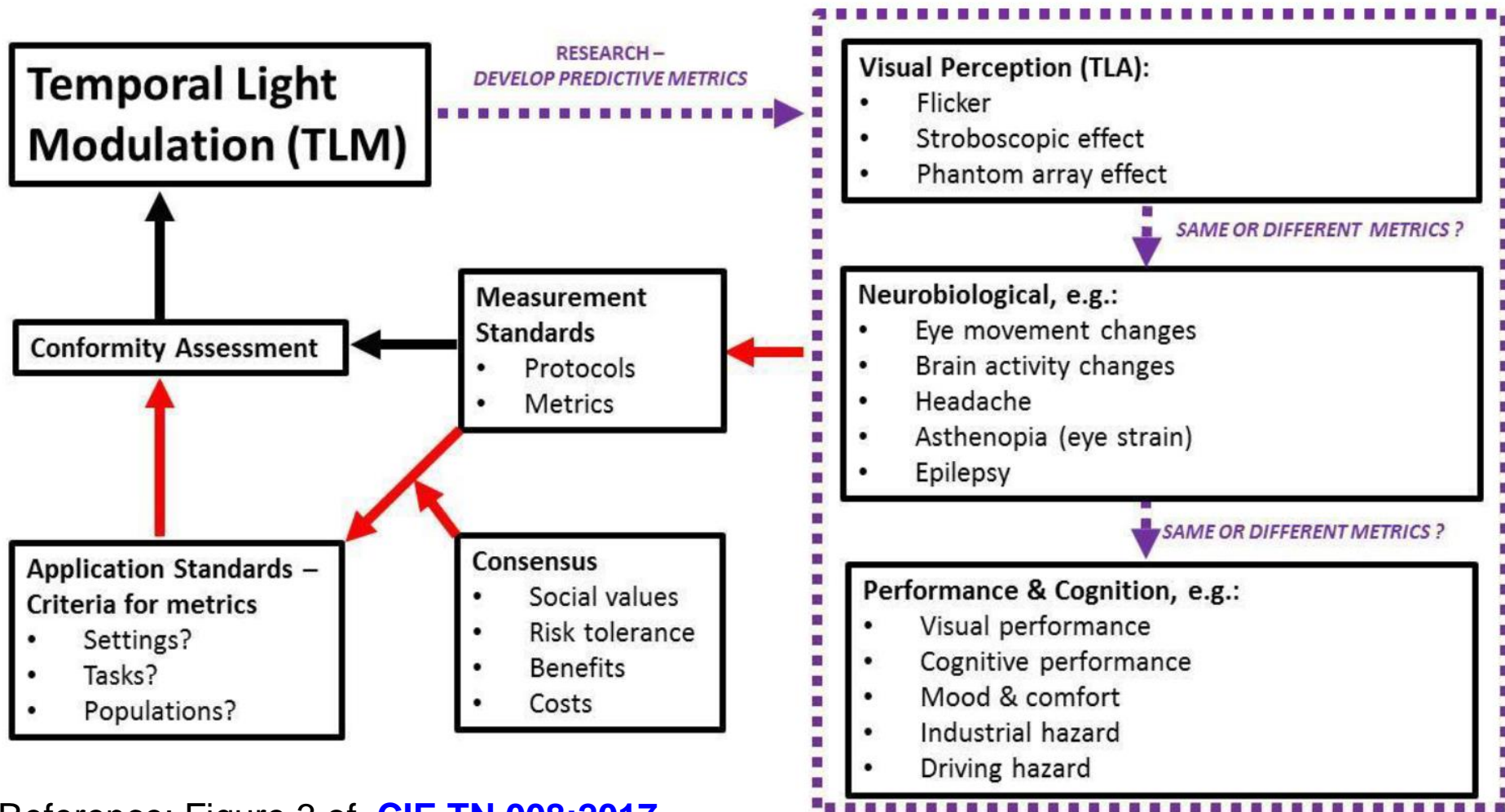
PAIR
BULB + DIMMER



Overview of technical requirements for lamp+dimmer program from Lutron

- NEMA SSL 7A for dimmers and lamps for compatibility
- NEMA 77 for dimmers and lamps for flicker
- ENERGY STAR dimming requirements for lamps
- A quick word about testing

Flicker and the Big Picture



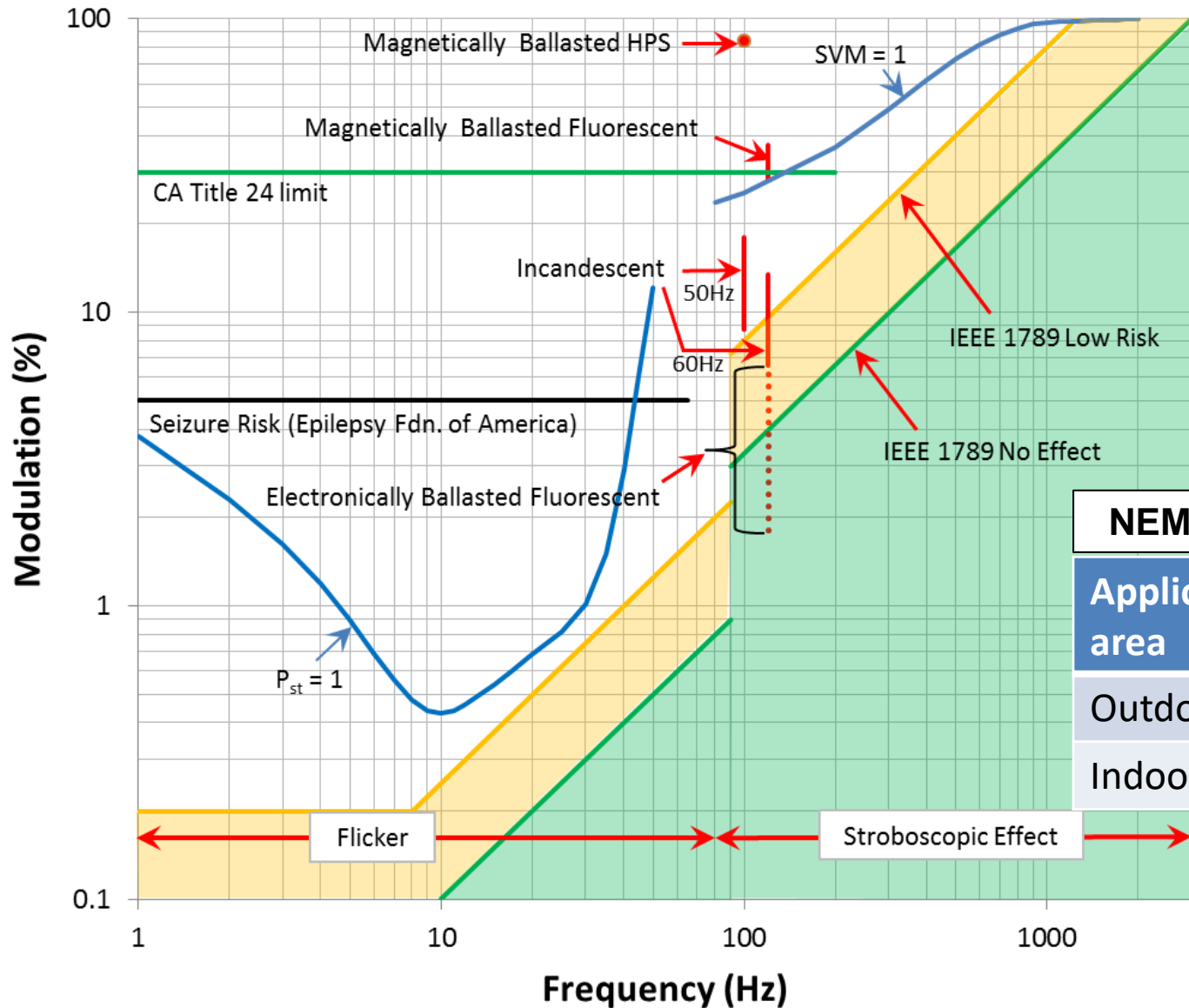
Reference: Figure 3 of [CIE TN 008:2017](#)



ENERGY STAR Lamps Dimming (and Controls) Requirements

	<i>Lamps 1.2, 2010-03-22</i>	<i>Lamps 1.4, 2011-05-13</i>	<i>ES RP Light output on a dimmer, 2015-12</i>	<i>ES RP Light source flicker, 2015-12</i>	<i>Lamps 2.0, 2016-02</i>	<i>Lamps 2.1, 2017-06</i>
Dimming Testing	n/a	n/a			NEMA SSL7A-2013 compliant dimmer	NEMA SSL7A-2015 compliant dimmer or reference circuit
Packaging/ website w dimming/ compatibility	yes	yes			yes	yes
Flicker	120Hz	120Hz		flicker index	ES RP Flicker	NEMA 77-2017, LRC ASSIST, ES RP Flicker
Max light output			report	report	80%	80%
Min Light output			report	20%	20%	20%
Audible Noise					24 dBA	24 dBA
Connected Functionality					optional	optional
Open Access					optional	optional
Energy Consumption Reporting					optional	optional
Operational Status Reporting					optional	optional
Remote Management					optional	optional
Information to Consumers					optional	optional

Comparison of Different Temporal Light Artifact (TLA) specifications

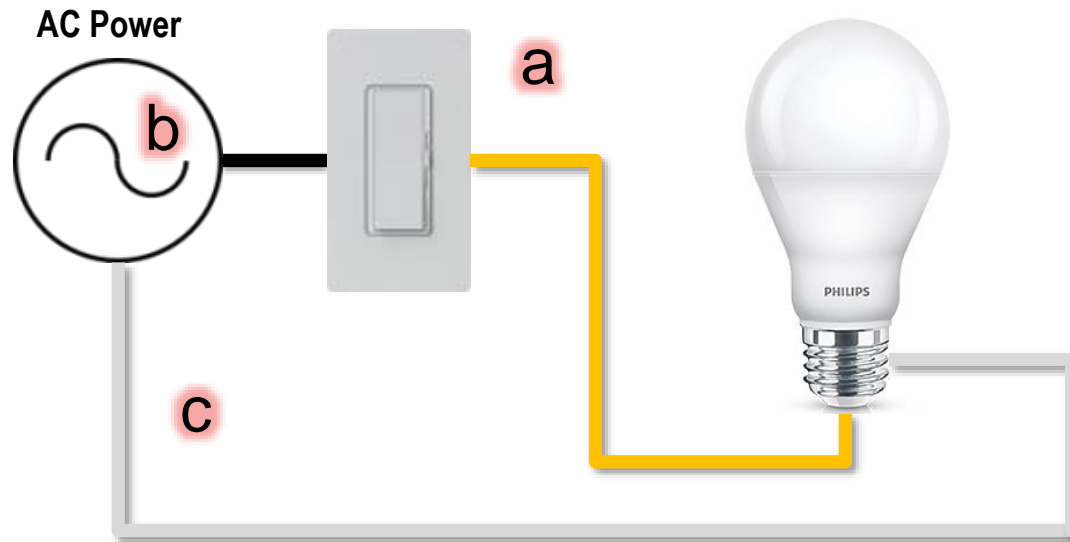


NEMA 77:2017 recommends

Application area	P_{st} limit	SVM limit
Outdoor	≤ 1.0	None
Indoor	≤ 1.0	≤ 1.6

One source of TLA: Jitter from two-wire dimmer

- a. **Dimmer-driver interaction**
- b. Source voltage changes (noise)
- c. Externally coupled noise sources





Questions & Discussion