

# Get the Light Right

## The Case for UVA-340 Fluorescent Lamps in Accelerated Weathering Testing

3M Weathering Resource Center, 3M Company, St. Paul, MN, USA

3M chooses UVA-340 lamps when UV fluorescent lamps are used in accelerated weathering tests for wind energy applications. We recommend that our customers “see the light” and do the same.

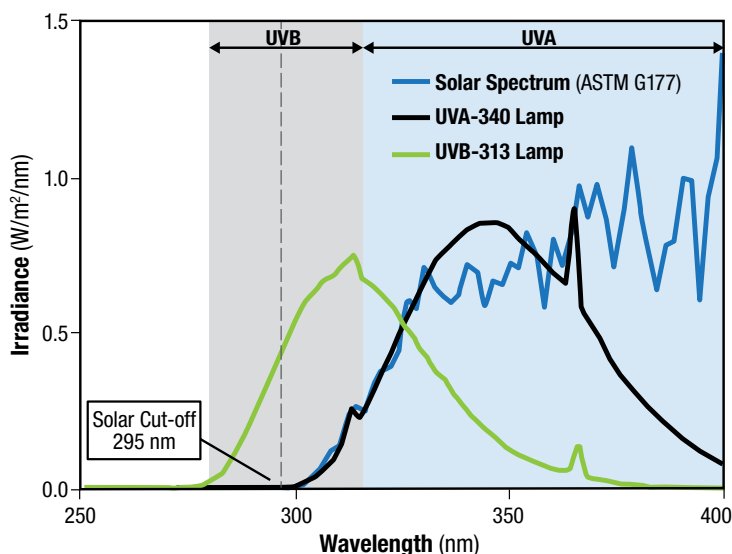
### What is sunlight?

The majority of solar radiation comes from visible light. Sunlight also includes UV radiation, which is higher in energy and can damage polymers over time. The UV component of sun is primarily UVA with some UVB. Sunlight contains essentially no UV radiation below the solar cut-off of 295 nm. (See chart below).

### How may solar UV radiation be simulated?

UVA-340 and UVB-313 lamps are commonly used for UV exposure in accelerated laboratory weathering using fluorescent UV lamps. The UVA-340 lamp is a much better match to the solar UV spectrum, especially in the short wavelength region.

(See comparison to the right).



UVA-340 lamps match the solar UV spectrum well, especially from 295 to 370 nm. UVB-313 lamps include significant unnatural radiation below the solar cut-off of 295 nm.

### Why does 3M use and recommend UVA-340 lamps when fluorescent UV lamps are used in accelerated weathering tests?

3M develops wind energy solutions that will perform well both on-shore and off-shore. 3M's use of UVA-340 lamps in accelerated testing enables:

- More accurate simulation of real-world performance for both on-shore and off-shore applications
- Streamlined designs that maximize real-world performance without adding unnecessary features to meet unnatural test conditions

Contact 3M Renewable Energy Technical Service for more in-depth information.

**Note:** The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

#### UVA-340/UVB-313 Comparison

##### UVA-340 Lamps

- + Current technology
- + Good match to the UV component of natural sunlight
- + Has been shown to correlate well with real-world degradation
- + Recommended practice in ASTM<sup>1</sup> and ISO<sup>2</sup> standards

##### UVB-313 Lamps

- Historical precedent
- Includes UV radiation below the solar cut-off of 295 nm
- Can cause failure that will not occur in natural sunlight
- Not recommended in ASTM<sup>3</sup> and ISO<sup>4</sup> standards

<sup>1</sup> "For simulations of direct solar UV radiation the UVA-340 lamp is recommended." – ASTM G154-06, *Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials*, ASTM International, West Conshohocken, PA, United States, 2006.

<sup>2</sup> "Unless otherwise specified, type 1A (UVA-340) fluorescent UV lamps... shall be used to simulate the UV part of daylight..." – ISO 4892-3:2006(E), *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*, ISO, Geneva, Switzerland, 2006.

<sup>3</sup> "Fluorescent UVB lamps have the spectral distribution of radiation peaking near the 313-nm mercury line. They emit significant amounts of radiation below 300 nm, the nominal cut on wavelength of global solar radiation, that may result in aging processes not occurring outdoors. Use of this lamp is not recommended for sunlight simulation." – ASTM G154-06, *Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials*, ASTM International, West Conshohocken, PA, United States, 2006.

<sup>4</sup> "Type 2 (UVB-313) fluorescent lamps have a spectral distribution of radiation which peaks near the 313 nm mercury line and may emit radiation down to  $\lambda = 254$  nm, which can initiate ageing processes that never occur in end-use environments." – ISO 4892-3:2006(E), *Plastics – Methods of exposure to laboratory light sources – Part 3: Fluorescent UV lamps*, ISO, Geneva, Switzerland, 2006.

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