



A New Light Source for Photostability Testing

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Q-Lab Corporation

Q-Lab Corporation Introduction

Q-Lab Corporation is a Cleveland, Ohio based manufacturer of weathering and lightfastness test chambers, with facilities and distributors worldwide.



Q-SUN



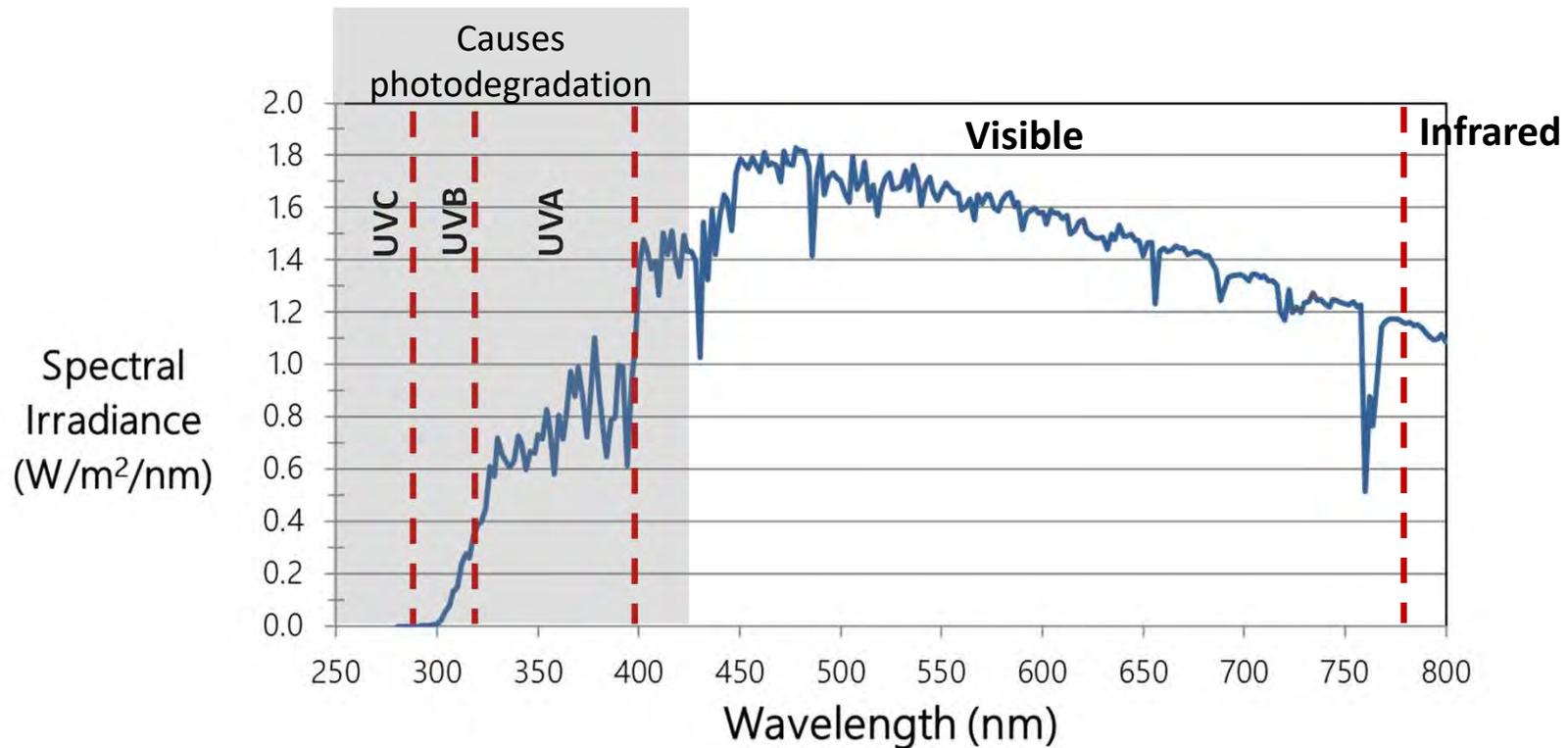
QUV

Topics

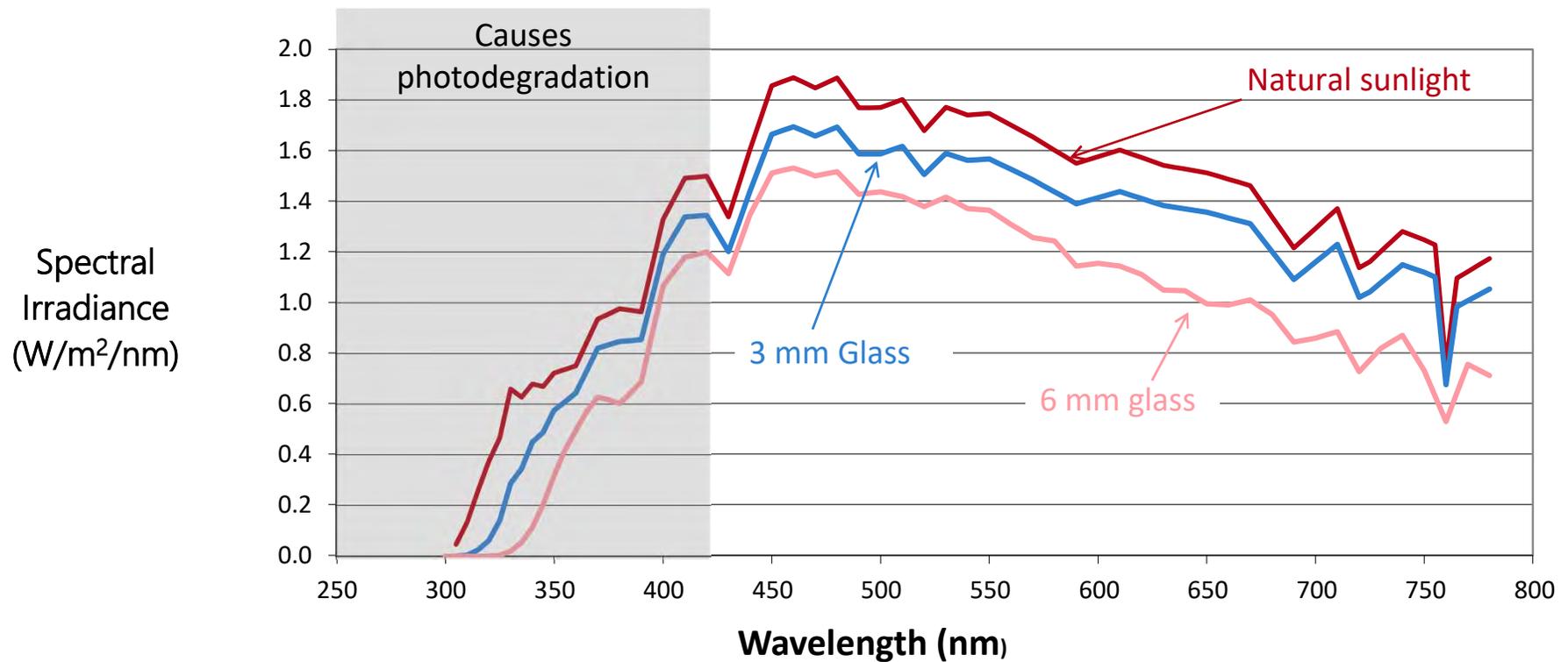
- Lightstability testing in the graphic arts community—Technologies/Methods
- A new fluorescent UV light source of interest for the graphic arts community (TUV-421)
- New optical filters for interior simulations
- Comparison testing between TUV-421 and xenon arc, including ISO 18937-2



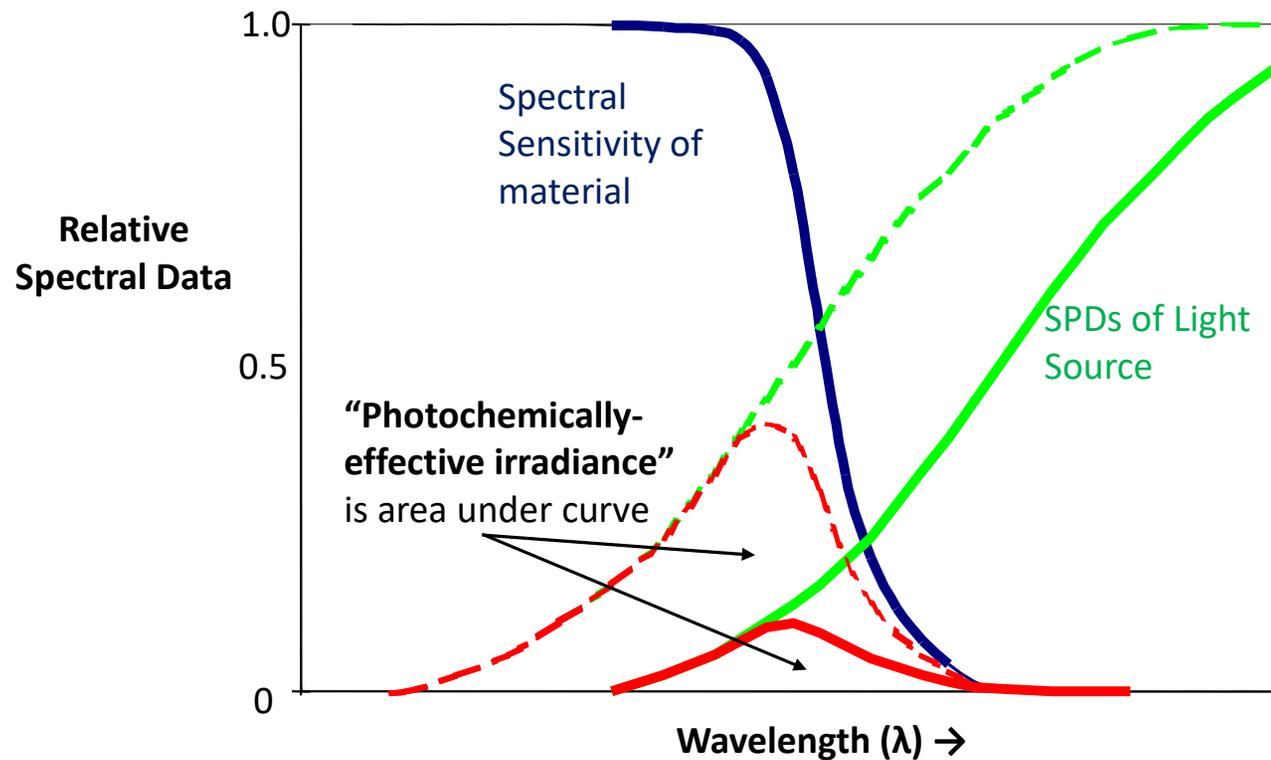
Peak Direct Sunlight Spectrum



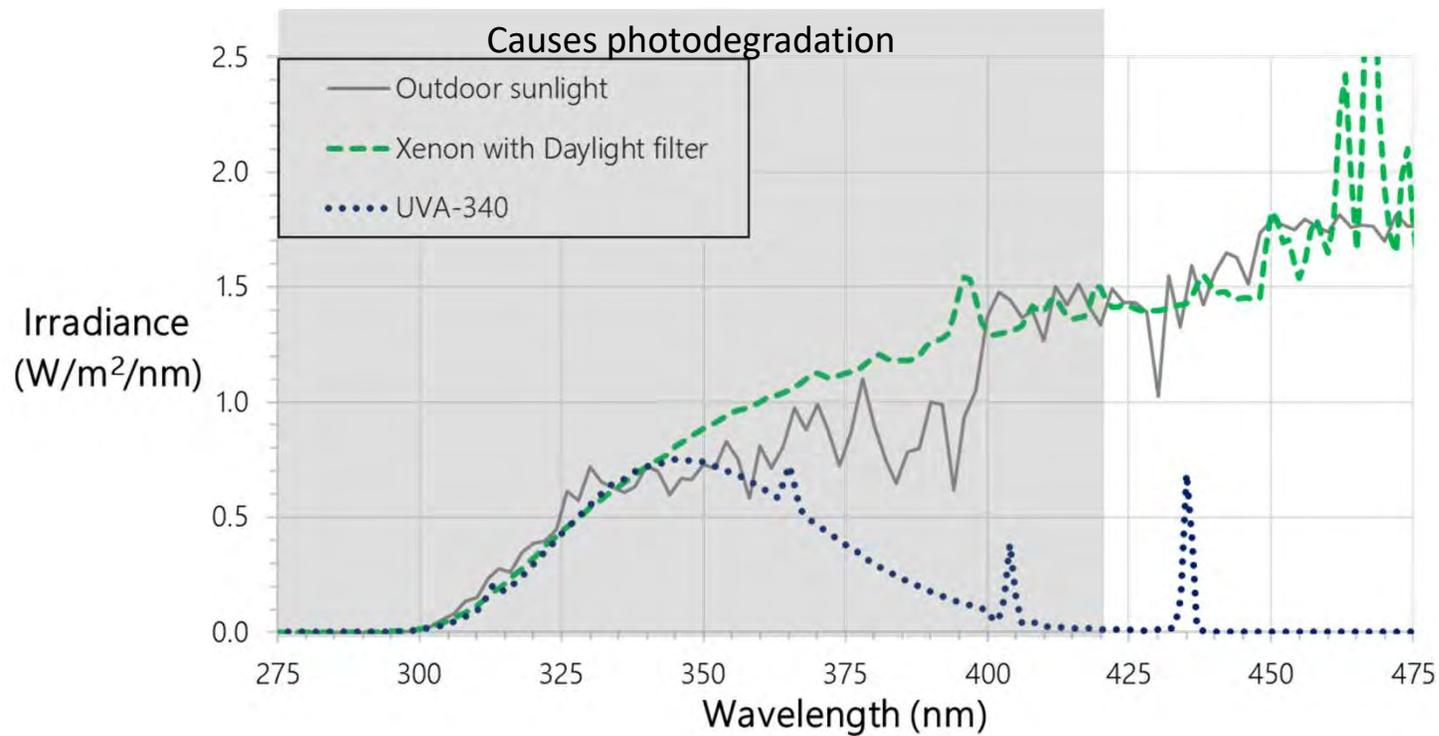
Sunlight through Window Glass



Spectral Sensitivity



Simulating Direct Sunlight



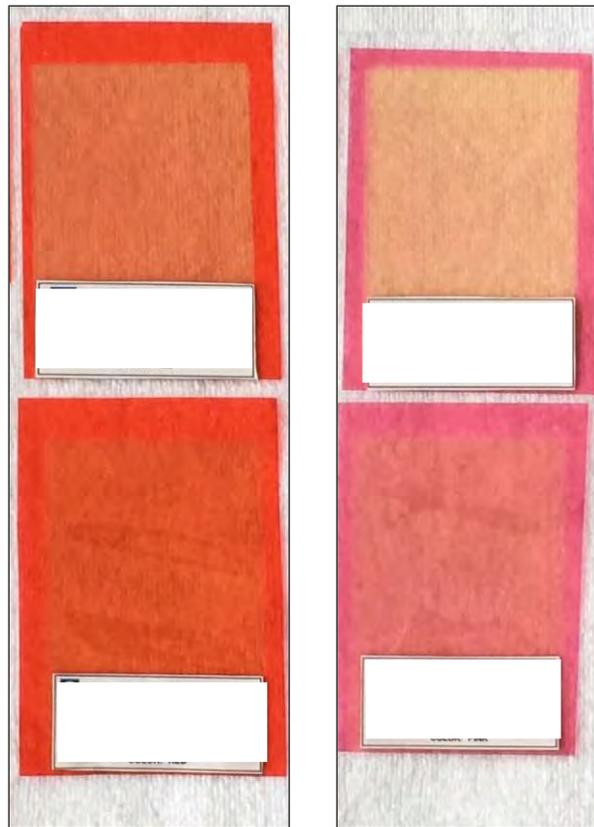
Color Fade and Light Spectrum

Xenon arc

Light source **with**
long-wavelength UV
and visible

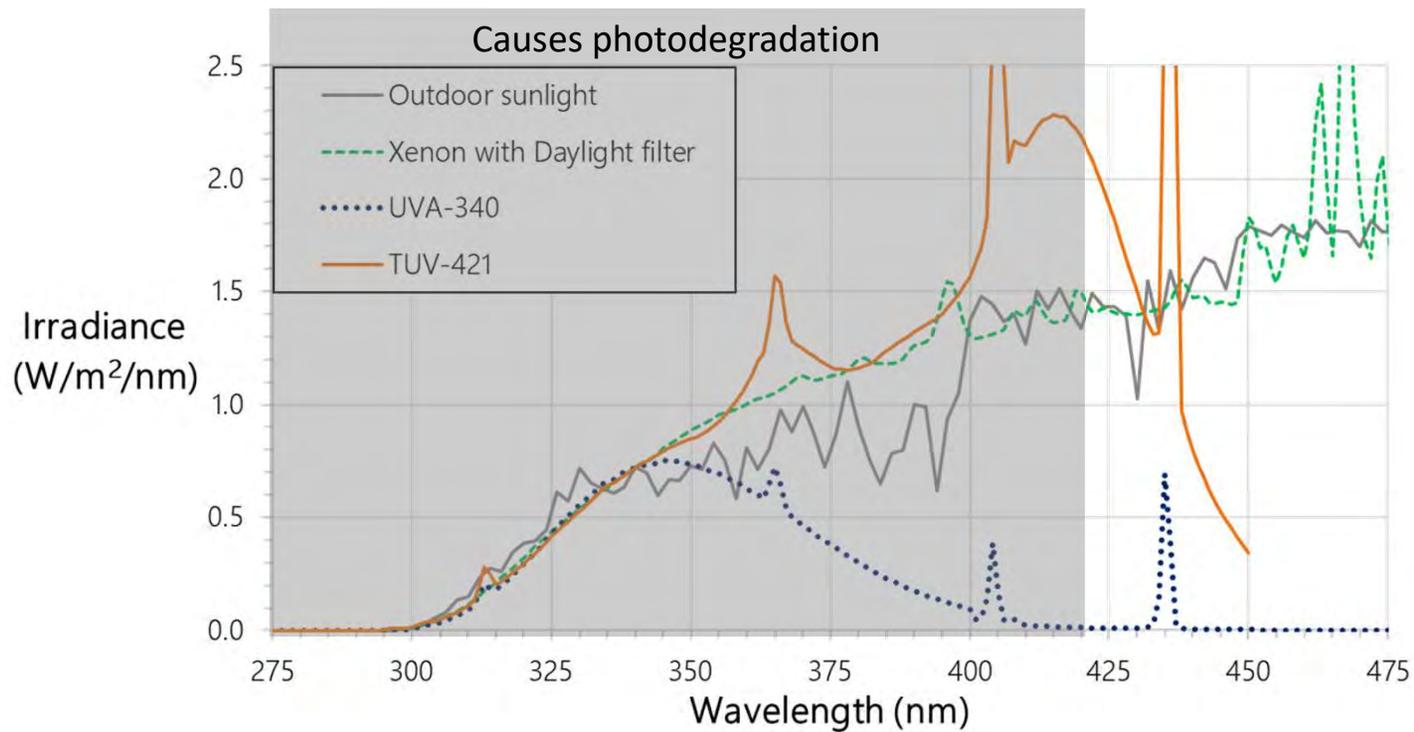
UVA-340

Light source **without**
long-wavelength UV
and visible



- Greater color fade seen here for full-spectrum light
- Some materials are sensitive to longer-wavelength light
- UV-only light sources may not properly replicate some materials degradation, like color fade

New Fluorescent UV Light Source



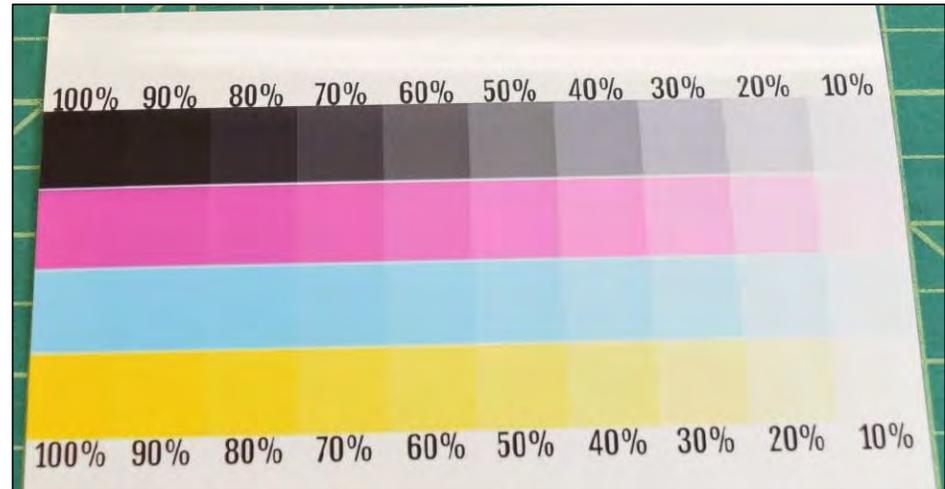
TUV-421 is a new fluorescent UV lamp

Photo Paper Exposure to Simulated Direct Sunlight



Photo Paper

- “Premium Digital Paper” – commercially-available photo development paper
- Four colors: black, magenta, cyan, and yellow
- Saturation from 10-100%



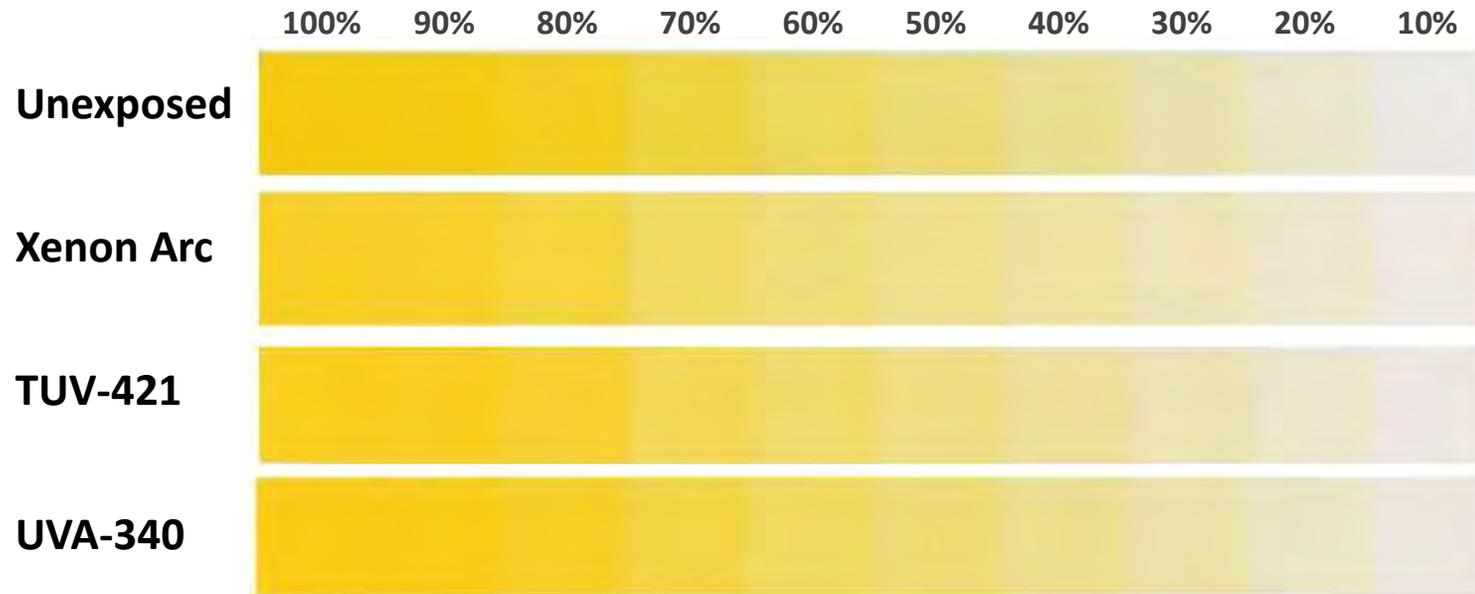
Exposure Details

96 hour test

Light Source	Apparatus	Irradiance (W/m ²)	Black Panel Temp (°C)	Chamber Conditions
Xenon arc (Type I Daylight)	Xenon	60 @300-400 nm	45	Chamber Air 30 °C Relative Humidity ---
TUV-421	UV Fluorescent	60 @300-400 nm	45	n/a
UVA-340	UV Fluorescent	0.55 @340 nm	45	n/a

No liquid water

Yellow



- Little change from any exposure
- Small fade from xenon arc and TUV-421

Yellow

Unexposed

Xenon Arc

TUV-421

UVA-340

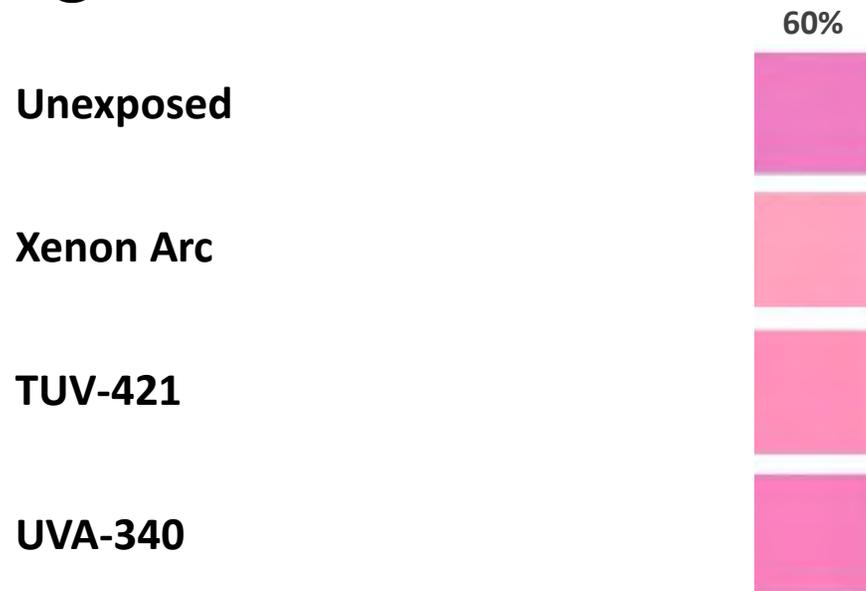
60%



Because showing all of the saturation levels makes it confusing to see what's going on, we'll look at the 60% saturation level, which makes it relatively easy to see the differences.

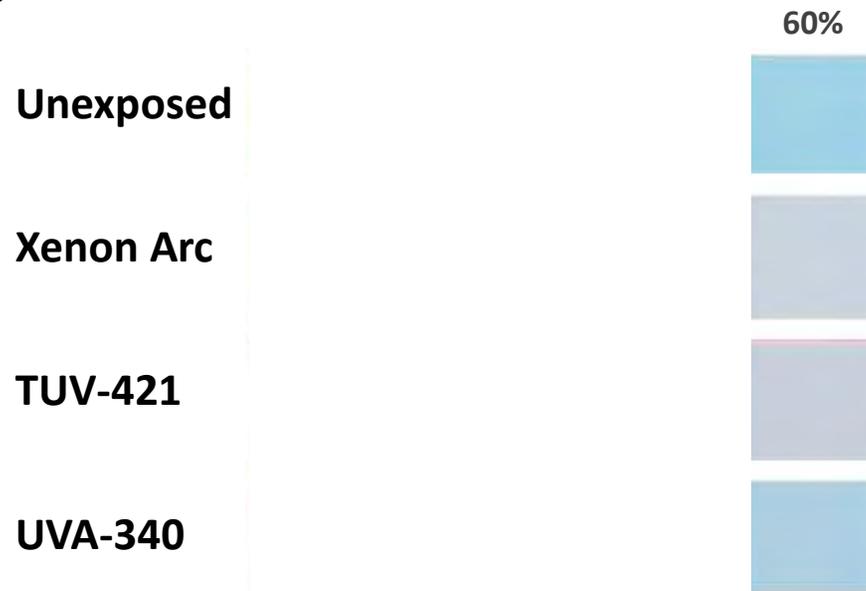
- Little change from any exposure
- Small fade from xenon arc and TUV-421

Magenta



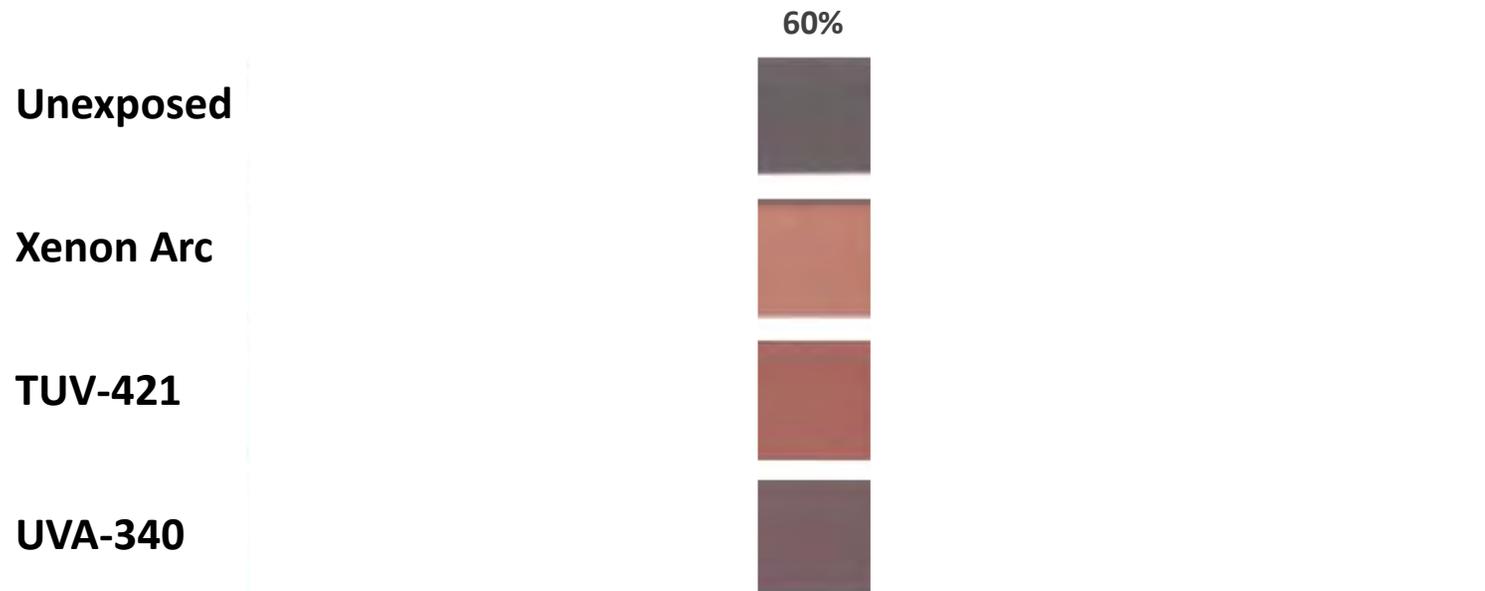
- Most change from Xenon Arc, followed by TUV-421
- Least change from UVA-340

Cyan



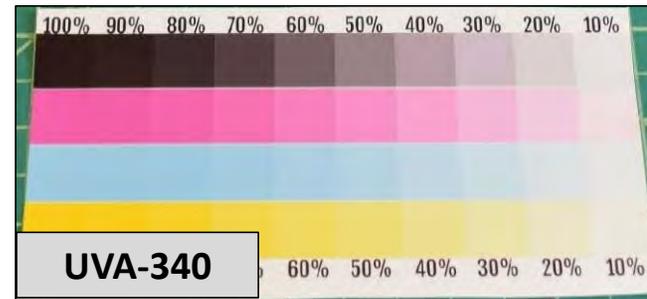
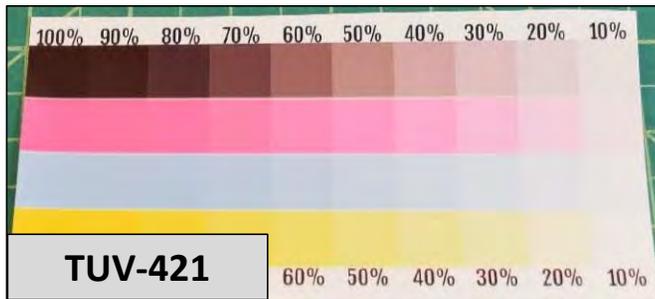
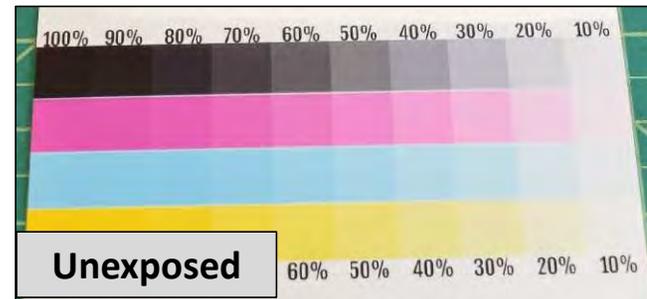
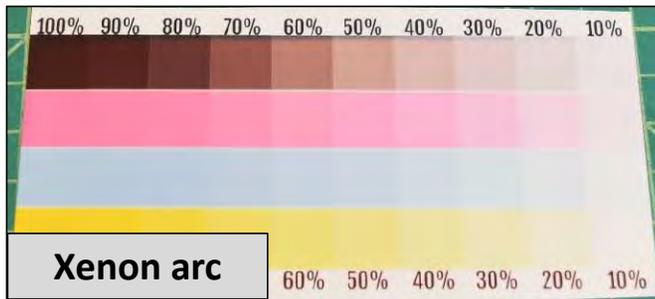
- Xenon Arc and TUV-421 produce significant, similar fade
- Very little change from UVA-340

Black



- Xenon Arc and TUV-421 produce significant, similar fade
- Very little change from UVA-340

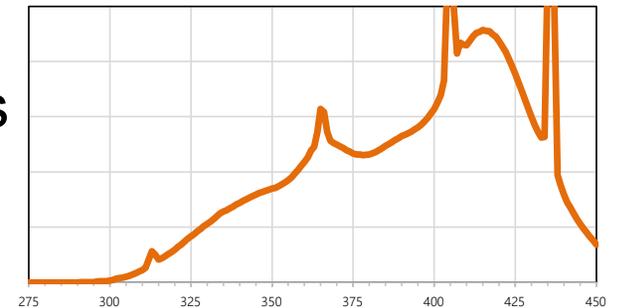
Photo Paper Summary



- Photo paper color fade correlated very well between Xenon arc and TUV-421
- UVA-340 exposures did not produce much color fade of these inks

Summary

- New UV fluorescent lamp (TUV-421) delivers extended spectrum
 - Long-wavelength UV light
 - Short-wavelength visible light



- 96 hour exposure of printed inks on photo paper shows excellent color fade agreement between TUV-421 and xenon arc, with UVA-340 producing little to no color fading

Simulating Sunlight in Interior Spaces

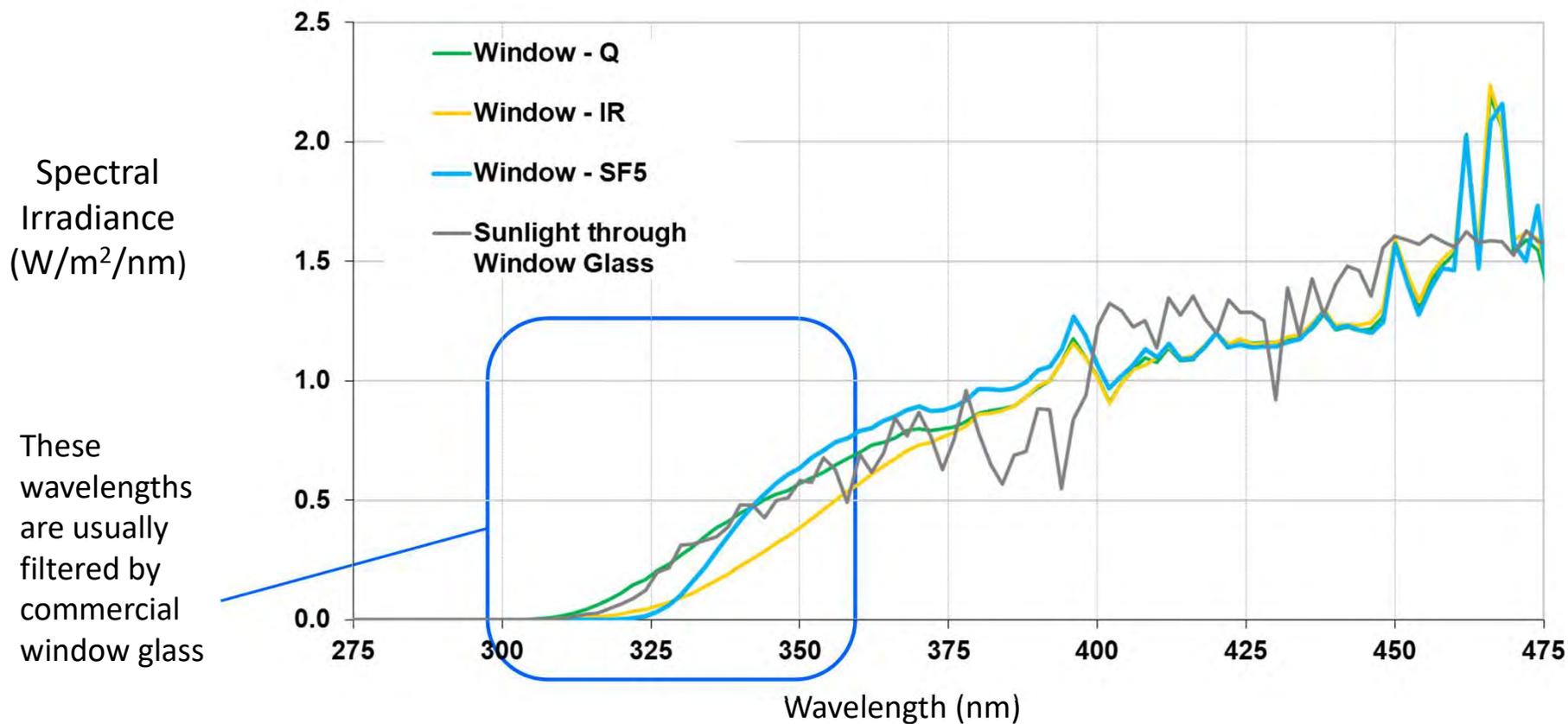


Sunlight in Interior Spaces

- Museums and other commercial spaces use window glass that filters more UV than typical “window glass” filters used in traditional xenon arc testing
- New options are being developed for use in ISO photographic image permanence testing – xenon arc
- One new option can be used with TUV-421 lamps

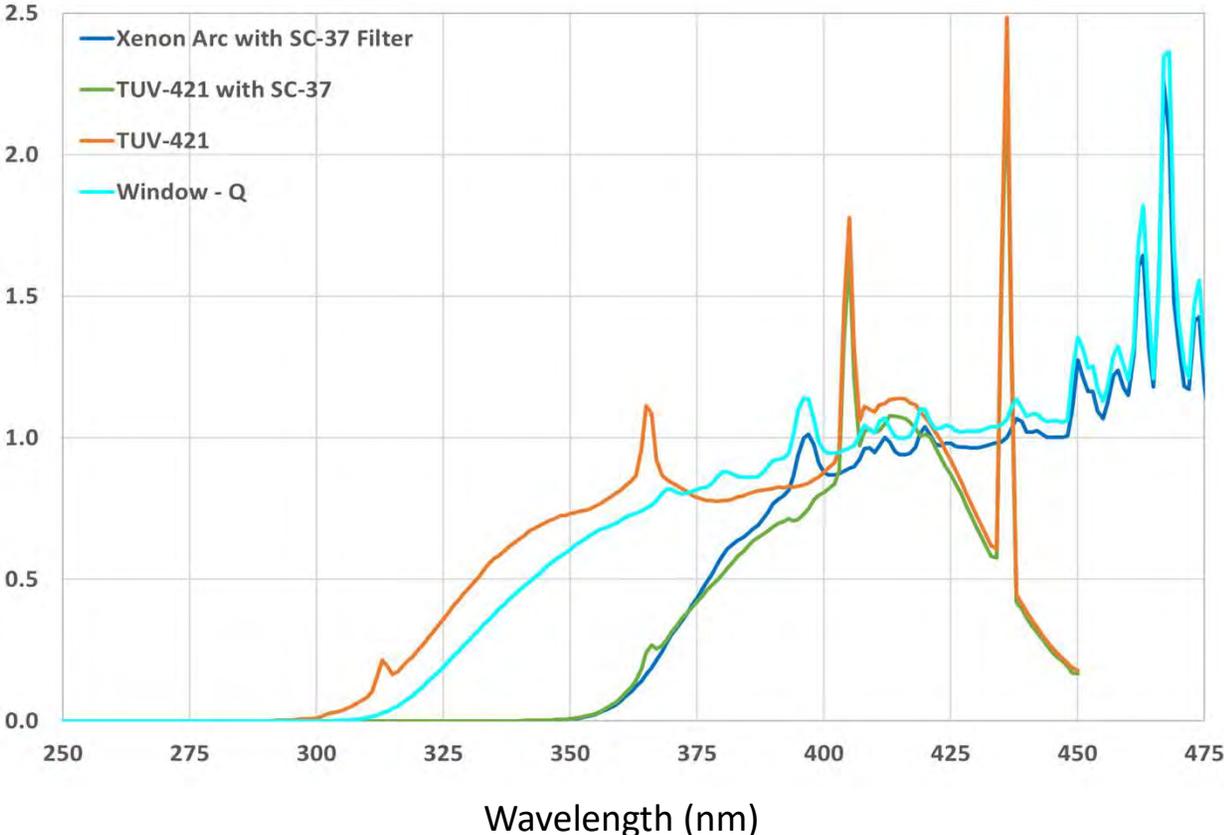


Xenon Arc with Window Glass Filters

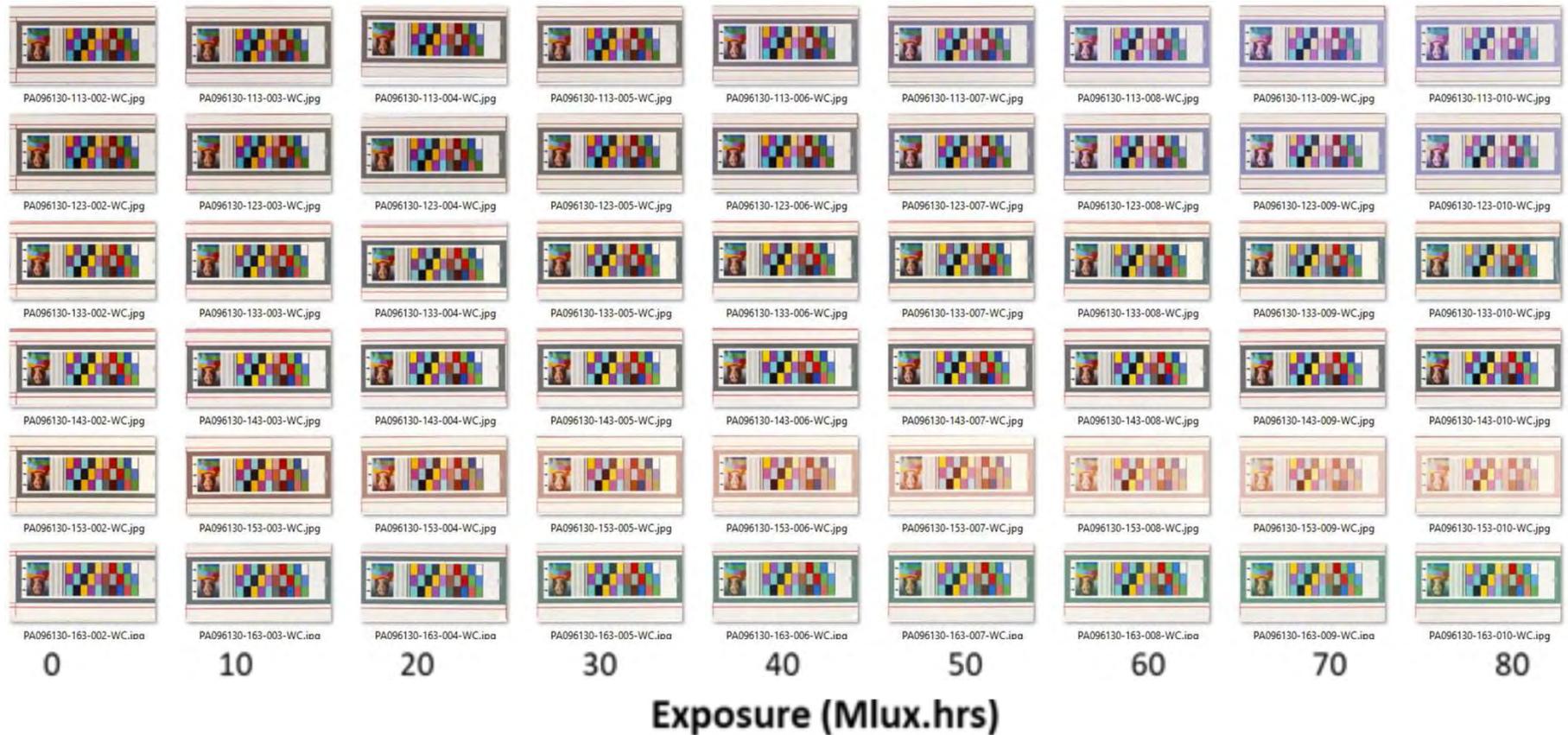


Xenon Arc and TUV-421 with SC-37 Filter

Spectral
Irradiance
(W/m²/nm)



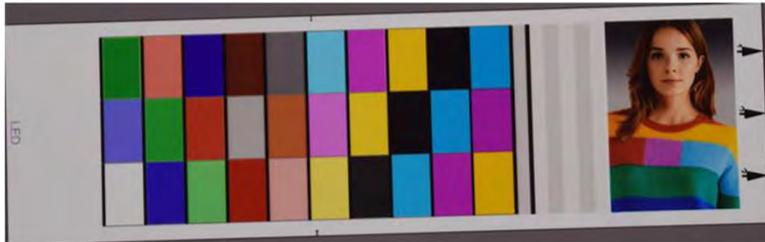
ISO TC42 Interlaboratory Study on ISO 18937-2



Tests Run to 80 Mlx·hours

- Xenon Arc with SC37 or L37 Filter (similar spectra)
- TUV-421
- TUV-421 with SC37 Filter

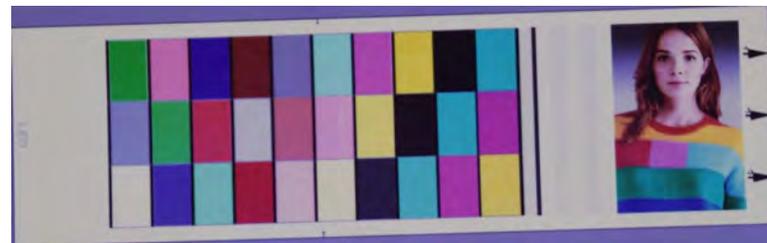
Sample A



Unexposed



TUV-421



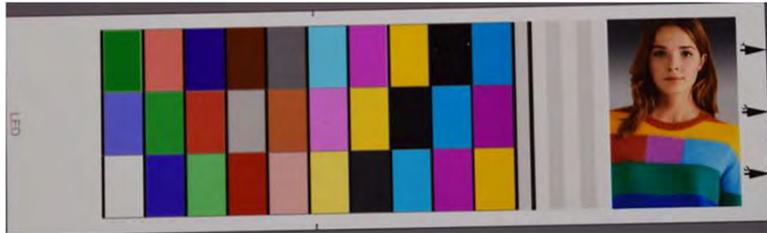
TUV-421 +
SC37 Filter

Complete loss of color in TUV-421 test
Slight fading and loss of skin tone in TUV-421+SC37 and Xenon Arc + SC37, which is slightly more severe for cyan and yellow

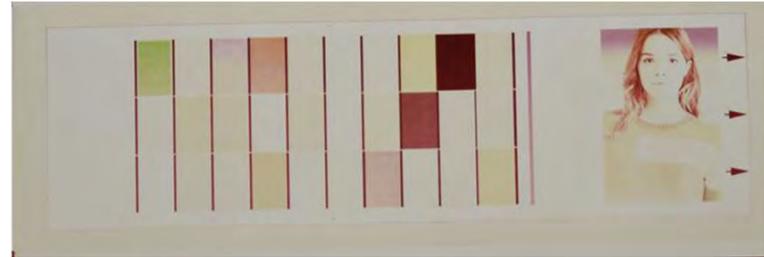


Xenon Arc +
SC37 Filter

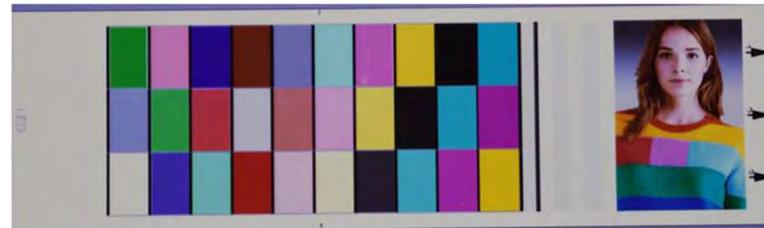
Sample B



Unexposed



TUV-421



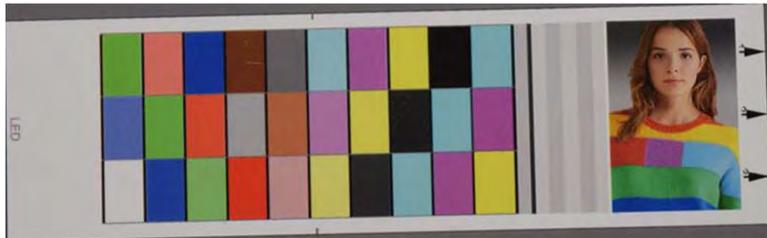
TUV-421 +
SC37 Filter

Complete loss of color in TUV-421 test
Slight fading and loss of skin tone in TUV-421+SC37 and Xenon Arc + SC37, which is slightly more severe for cyan and yellow



Xenon Arc +
SC37 Filter

Sample C



Unexposed

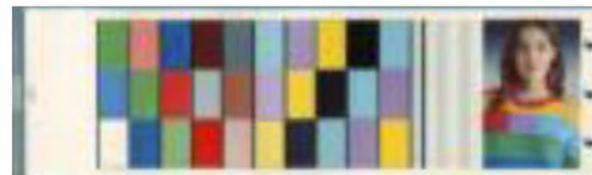


TUV-421



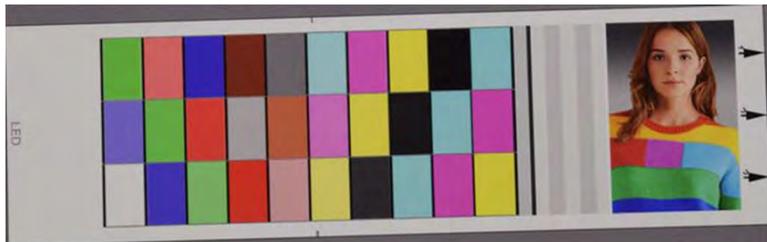
TUV-421 +
SC37 Filter

Severe fading in TUV-421 test
Very slight fading and loss of skin tone in
TUV-421+SC37 and Xenon Arc + SC37,
which are very similar

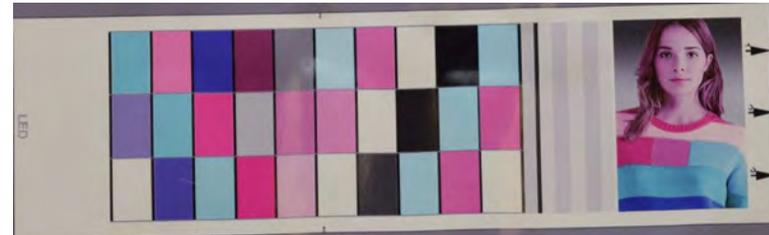


Xenon Arc +
SC37 Filter

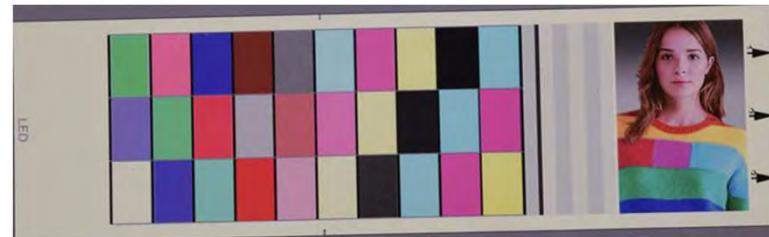
Sample D



Unexposed



TUV-421



TUV-421 +
SC37 Filter

Moderate fading in TUV-421 test
Slight loss of skin tone and very slight
fading in TUV-421+SC37, and slightly less
change yellow and green in Xenon Arc +
SC37



Xenon Arc +
SC37 Filter

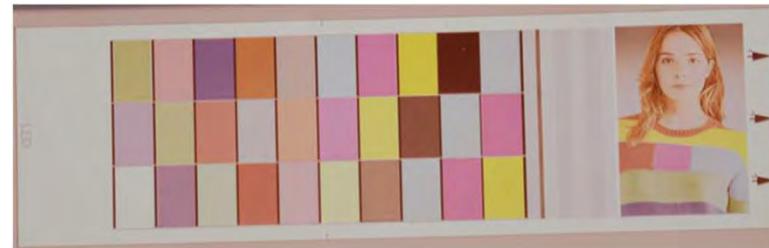
Sample E



Unexposed

Did not test

TUV-421



TUV-421 +
SC37 Filter

Very severe fading in both TUV-421+SC37,
and Xenon Arc + SC37, which are very
similar



Xenon Arc +
SC37 Filter

Interior Sunlight Simulation Conclusions

- TUV-421 without additional filtering produces more severe results, as expected
- TUV-421+SC37 and Xenon Arc+SC37 produce similar absolute results with some small differences



Summary

- TUV-421 fluorescent UV exposures closely match xenon arc with daylight filters
- Adding SC37 or L37 optical filters to both TUV-421 and xenon arc exposures reduce the severity and likely are better for determining lightstability of printed material in typical indoor environments with windows

Acknowledgments

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Thank you!

www.q-lab.com

