

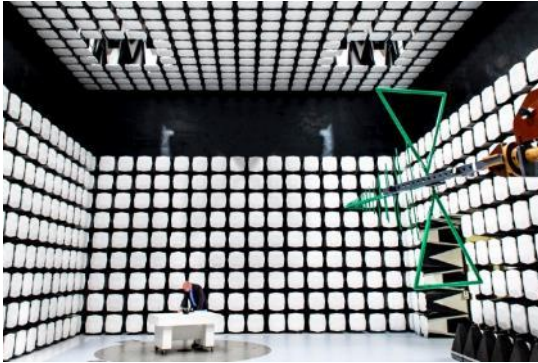
A photograph of two male scientists in white lab coats working in a laboratory. They are focused on a small, glowing device held between their hands. The background shows laboratory equipment, including a fume hood and various glassware. The lighting is bright, with a warm glow emanating from the device they are holding.

Solar Simulation

Altijd mooi weer spelen!

Marcel van Doesburg
Philips Innovation Labs – Reliability Lab
21-11-2017

Our five labs



**Electromagnetic
Compatibility & Wireless
Connectivity lab**



**Electronic Design
Services lab**



Material Analysis lab



Reliability lab



Prototyping lab

5,000   m²
lab space

Content

- Why Solar Testing?
- Effect of solar radiation on a product
- What is sunlight?
- Application knowledge
- Simulation in Lab environment
- Analysis techniques
- Defining a Solar test
- Material investigation
- Example

Why Solar testing?



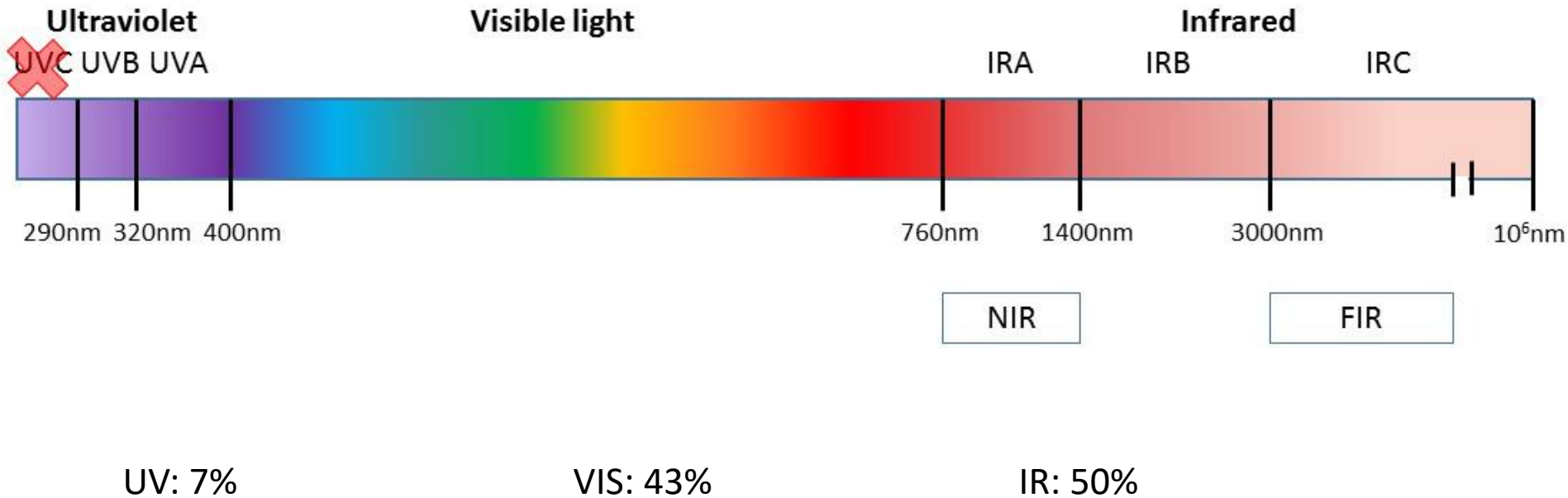
Effect of Solar radiation on a product



What is sunlight?

Sunlight is a portion of the electromagnetic radiation given off by the sun

Solar spectrum



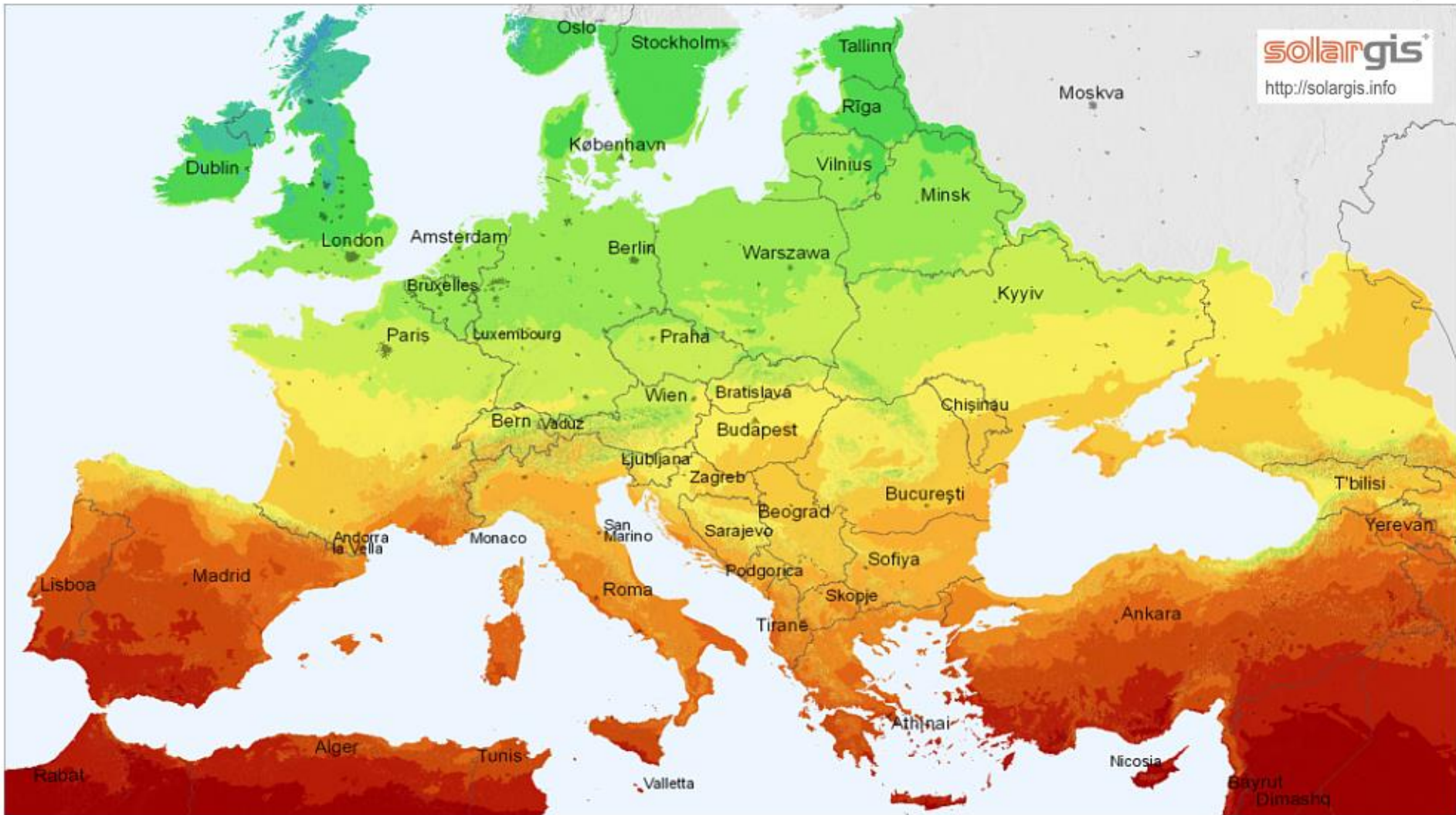
Application knowledge



Geographical location

Europe

solarGIS
<http://solargis.info>



Average annual sum (4/2004 - 3/2010)

0 250 500 km

< 700 900 1100 1300 1500 1700 1900 > kWh/m²

© 2011 GeoModel Solar s.r.o.

PHILIPS

Geographical location

Netherlands



Simulation in Lab environment



QUV Weathering tester

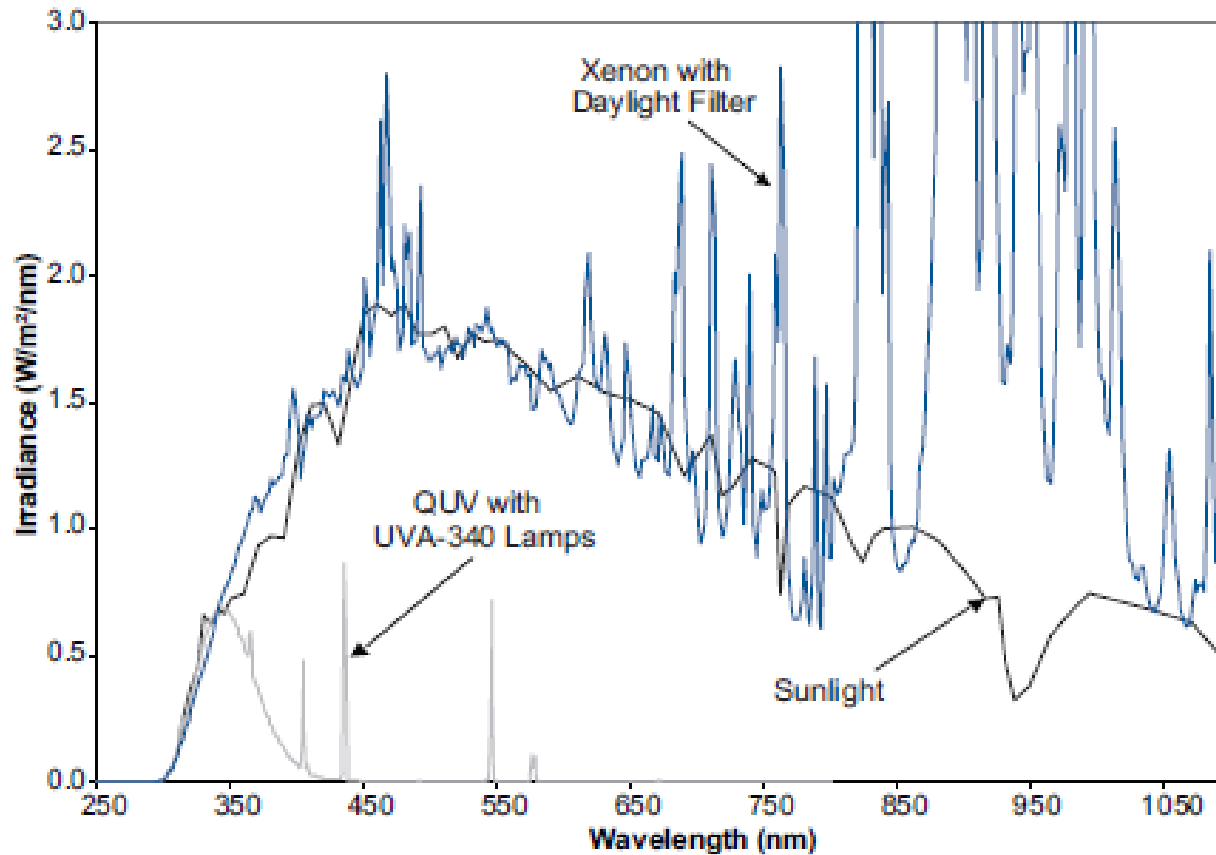


ATLAS XLS+

ATLAS ALPHA LM



Sunlight, Xenon and Fluorescent UV



Analysis techniques



Tensile tester



IK tester



colorimeter

Defining a solar test

- Example strap sportwatch



User scenario: 10 hours per week outdoor
Lifetime: 4 years

Amount of hours: 10 hours * 52 weeks * 4 weeks = 2080 hr



User scenario

Eindhoven

Average annual sun: 1025 kWh/m²

Per hour: 0.1173 kWh/m²

$2080 \text{ hr} * 0.1173 \text{ kWh/m}^2 = 244 \text{ kWh}$

Power solar tester: 1.120 kW/m²

$244 / 1.120 = 218 \text{ hr} = 9 \text{ days}$

Global Horizontal Irradiation

Netherlands



Another user scenario



Average annual sun: 1900 kWh/m²

Per hour: 0.2175 kWh/m²

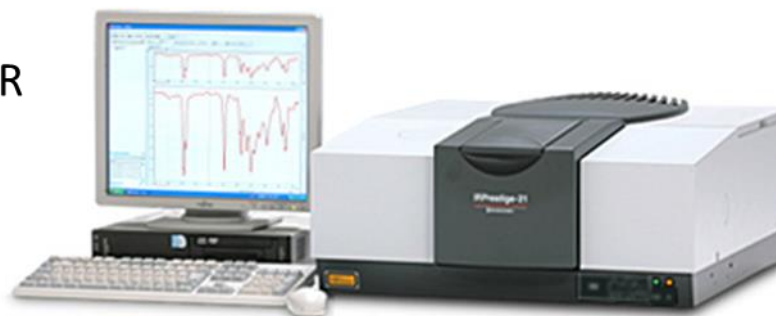
8320 hr * 0.2175 kWh/m² = 1810 kWh

Power solar tester: 1.120 kW/m²

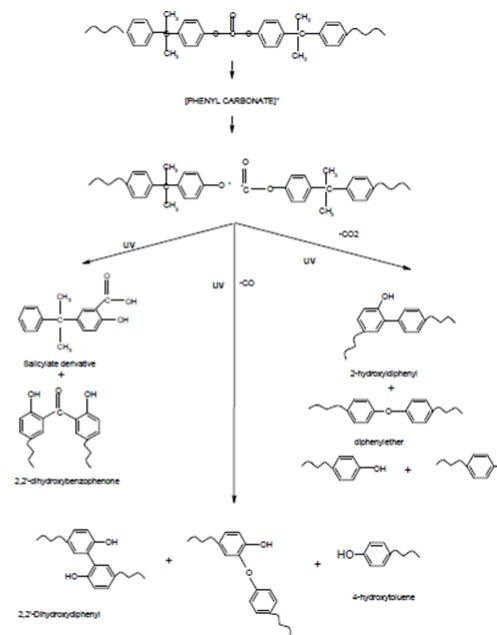
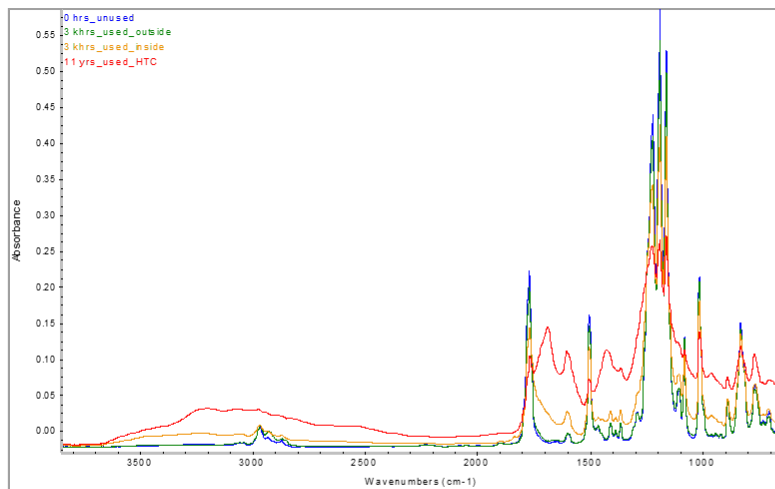
1810/ 1.120 = 1616 hr = 67 days

Material investigation (FT-IR analysis)

FT-IR



Spectral transmission measurements



Local partner, global reach



High Tech Campus
The Netherlands

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**For general questions related
to Philips Innovation labs
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A photograph of two male scientists in white lab coats working in a modern laboratory. They are focused on a small, glowing object held between their hands. The background shows laboratory equipment, including a fume hood and various containers. The text 'Thank you for your attention' is overlaid in white on the left side of the image.

Thank you
for your attention

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