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Simulation of BSDF's generated with Window6 and TracePro – prelimenary results

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Simulation of BSDFs generated with Window6 and TracePro – prelimenary results

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Goal: Simulate with full directional properties

- Three phase method opens possibility to easily simulate complex fenestration systems. The method accepts BSDF descriptions in Klems coordinates

- Baseline: Window6 – Radiosity

- Simulate with full directional properties (specular systems) – Raytracing

Status:

- Comparison between diffuse venetian blind:
    - Ideal properties, perfectly diffuse, 70% reflectance (Window6, slat material A)

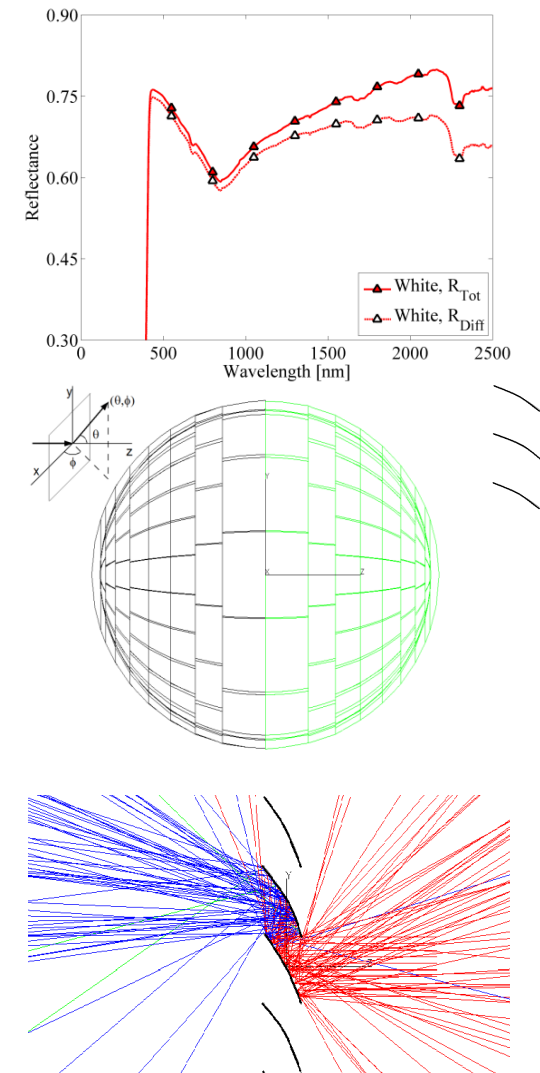- Compared by applying annual simulations
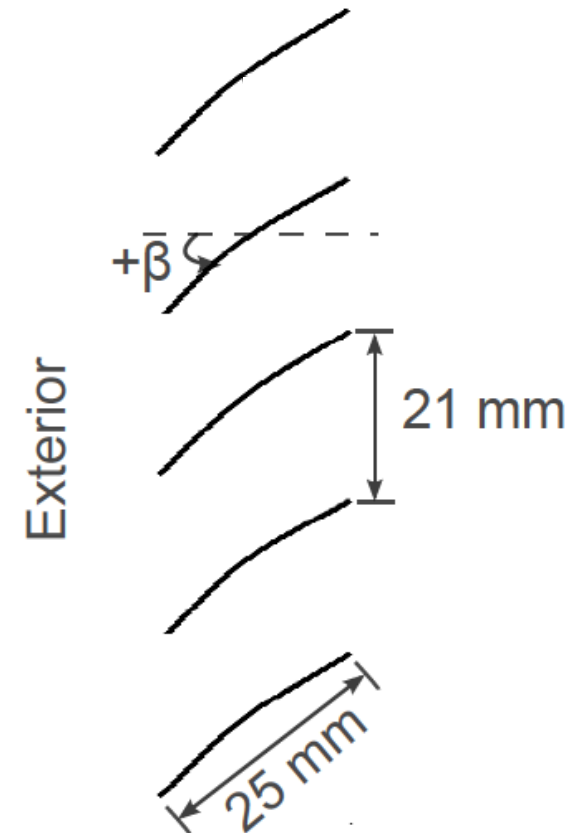
Window6 - Radiosity

- Accurate method for predicting the hemispherical transmission and reflection of slat shading systems.

- *Limitation:*

  One exception is the use of slat materials with a strong specular component of reflectance. In these cases even the hemispherical transmittance and reflectance can be significantly in error and the directional behavior will be poorly represented. For specular blinds we must rely on raytracing to generate full bidirectional properties, (Rubin et al., 2007).
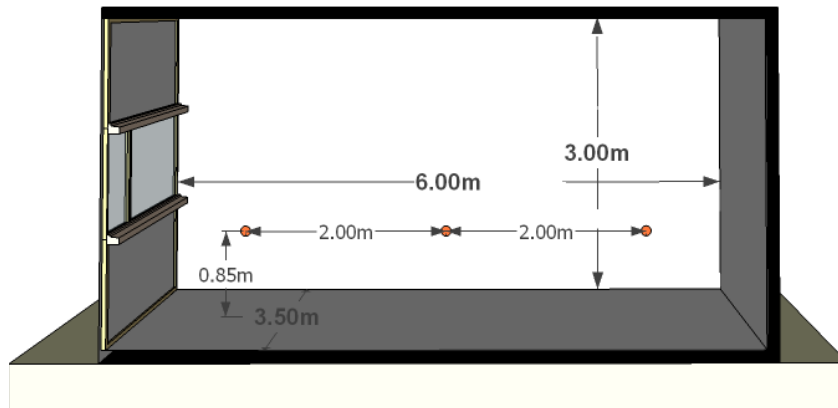
TracePro - Raytracing

- The optical properties are assigned to the slats

- The Venetian blind system is "placed" in a virtual sphere, which is used as light source and detector

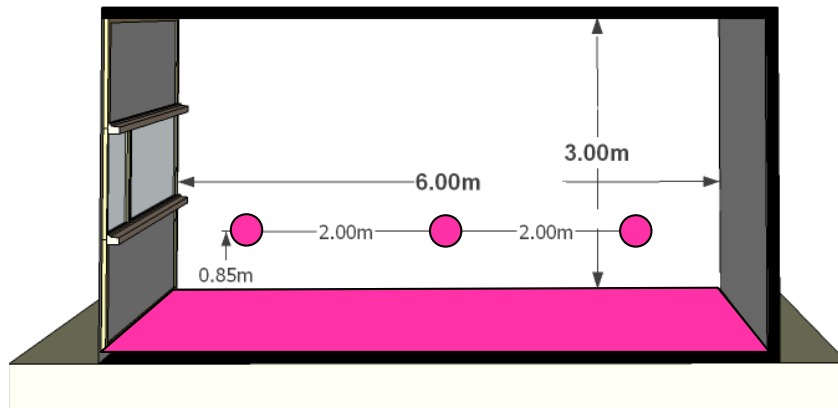- Transmittance and reflectance for the Venetian blind system is simulated for a few different slat angles

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Three Phase Method

$$i = VTDs$$

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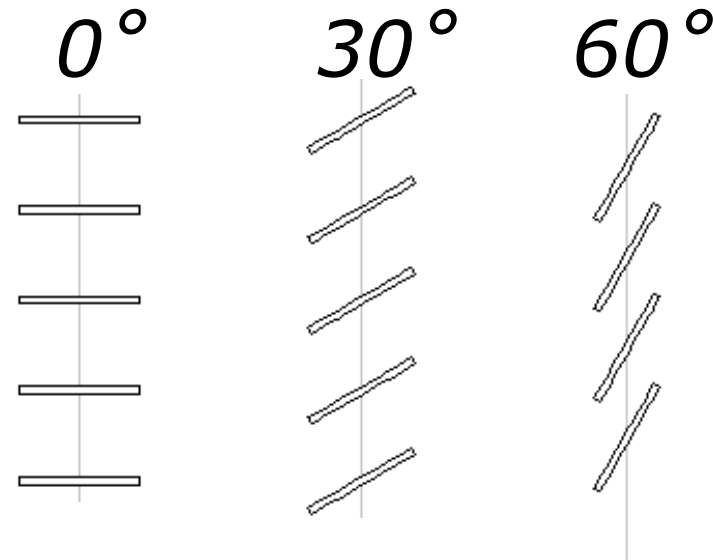
Three Phase Method

$$i=VTDs$$

Three Phase Method

$$i = V \boldsymbol{T} D s$$

$0°$ $\quad$ $30°$ $\quad$ $60°$

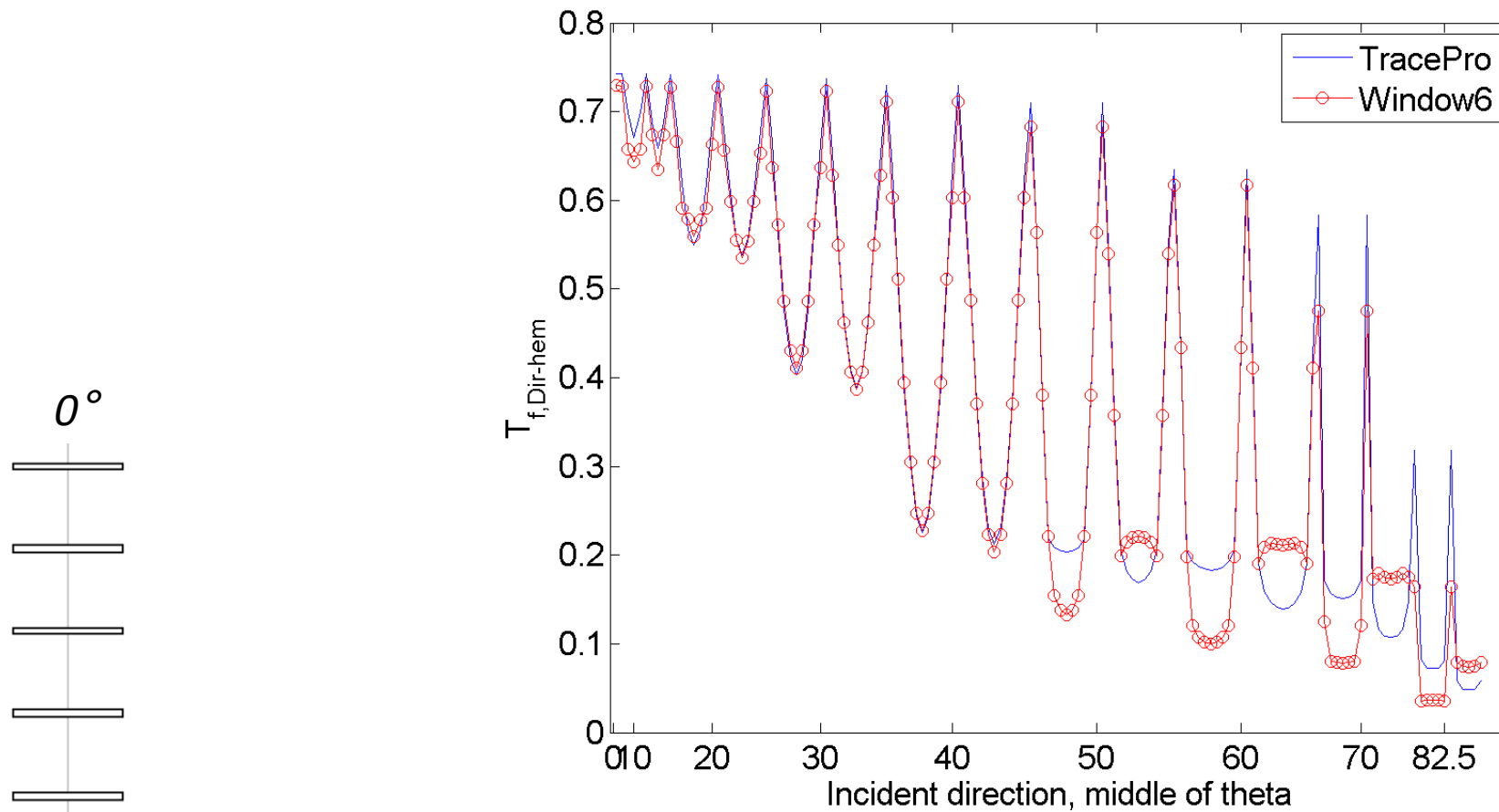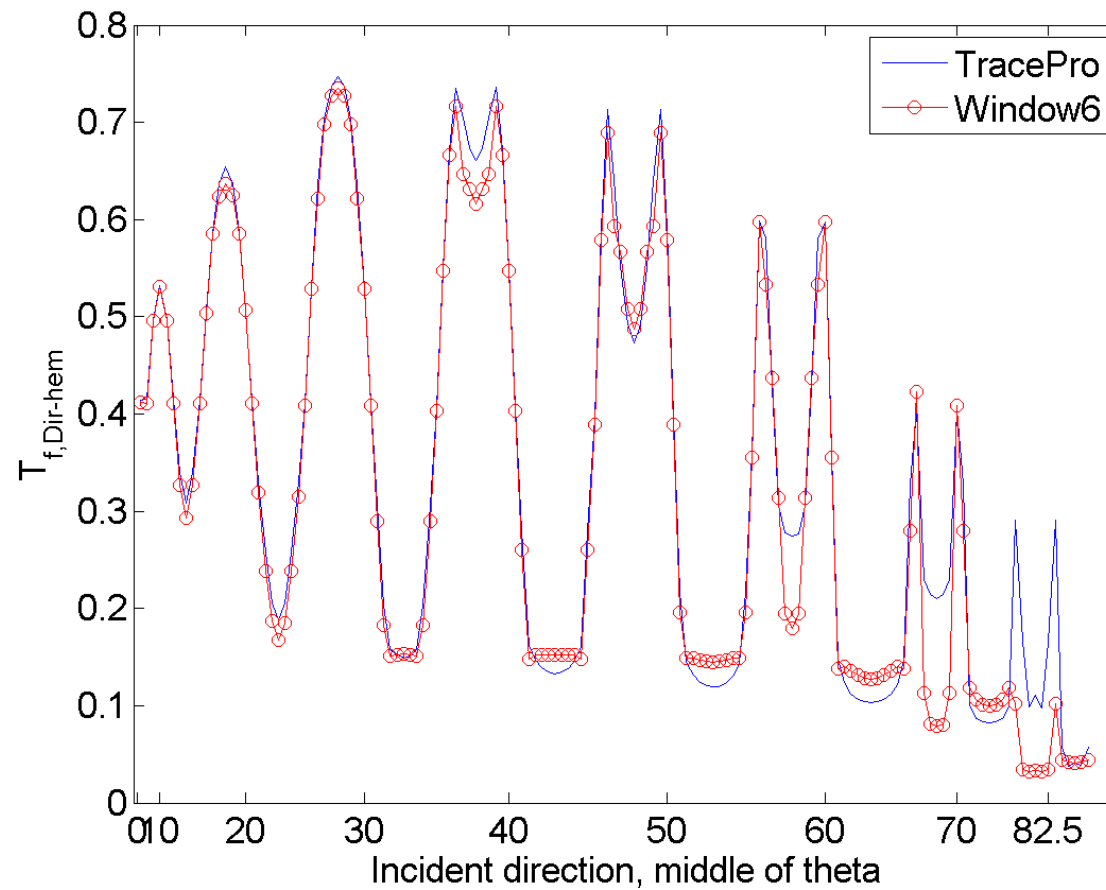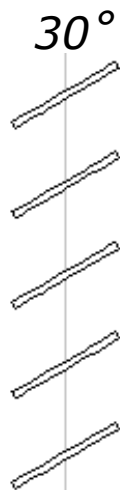**DTU Civil Engineering, Technical University of Denmark** $\qquad$ Radiance Workshop 2011 $\quad$ 2011/08/25
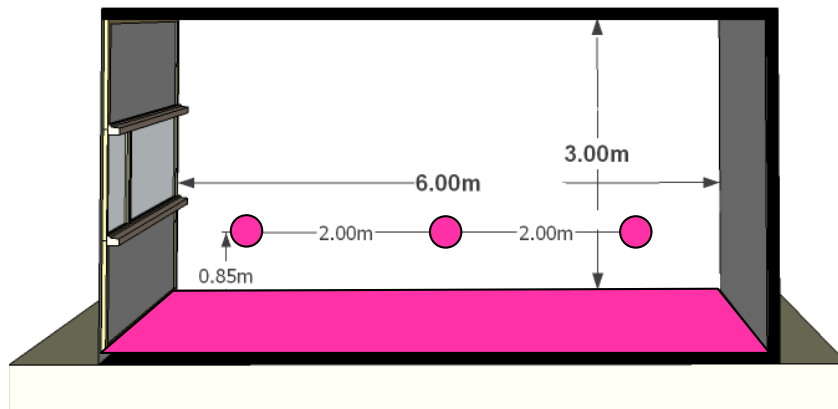
Results

- Hemispherical transmittance

- Light distribution in the room - Accumulated annual luminance distribution

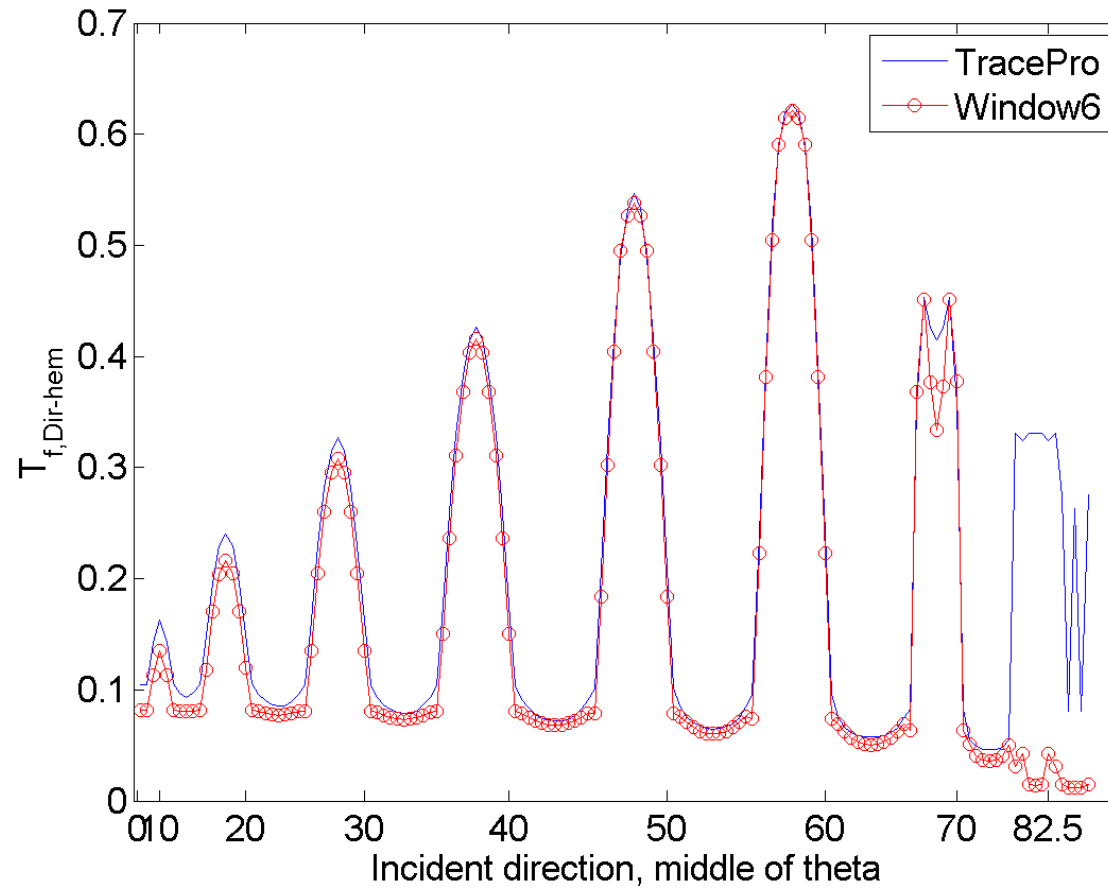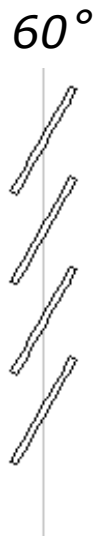- Annual time series of illuminance level with time resolution of 1 hour
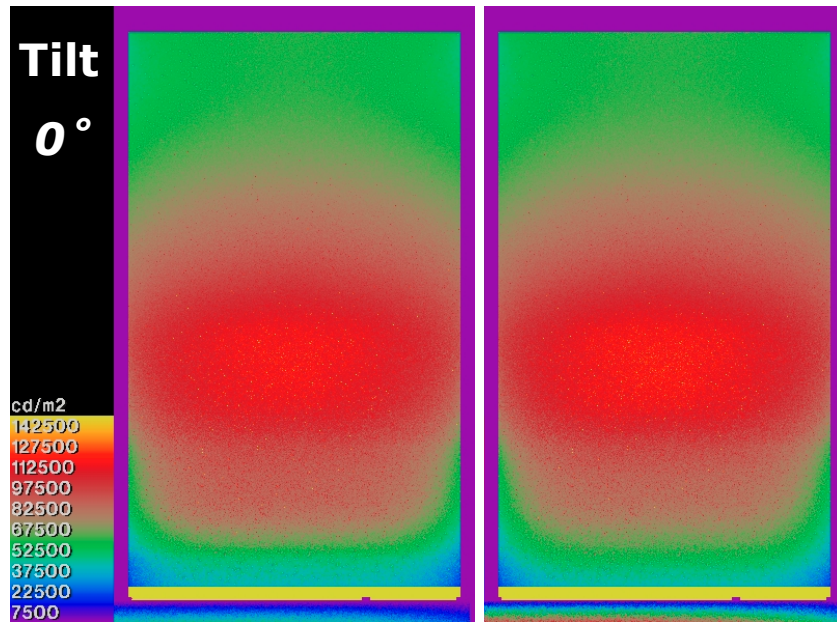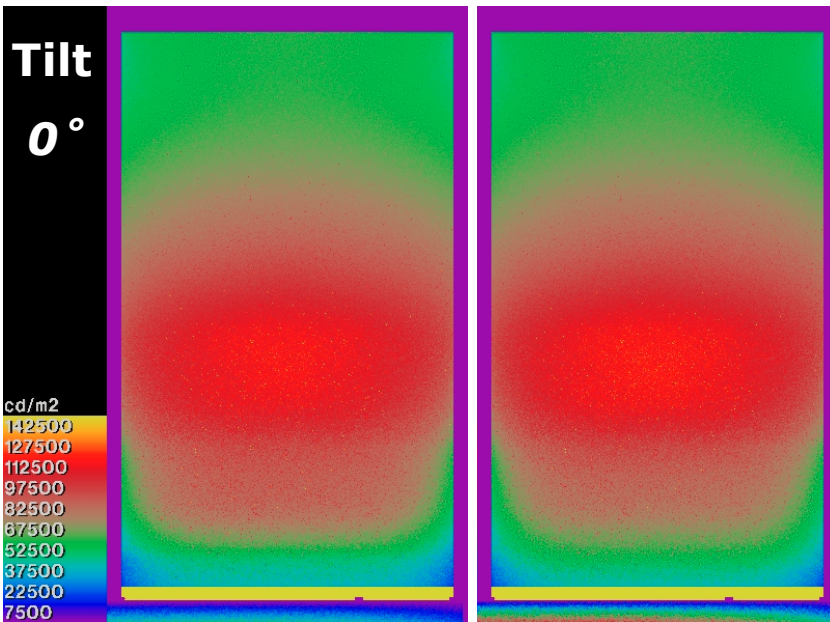
Hemispherical transmittance

0°

Hemispherical transmittance

30°

Hemispherical transmittance

60°

Light distribution in the room

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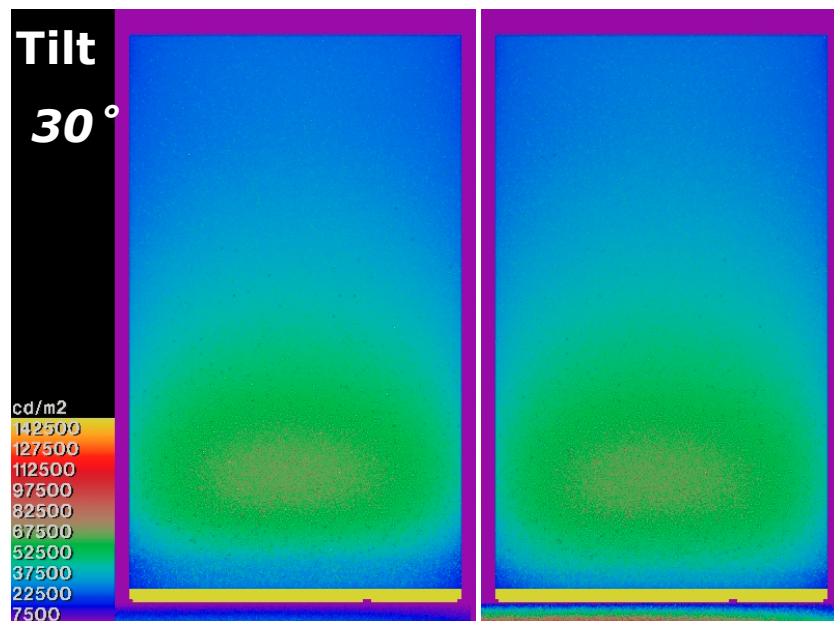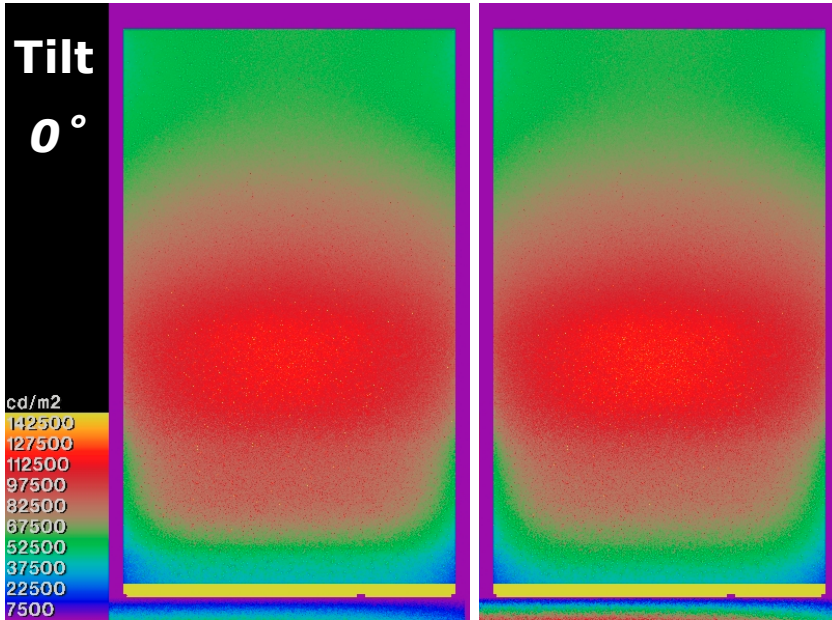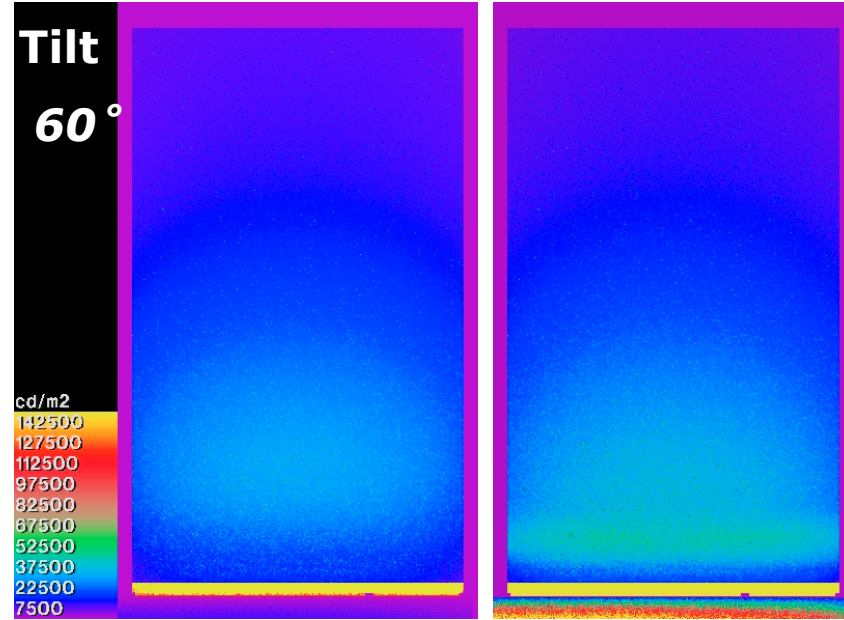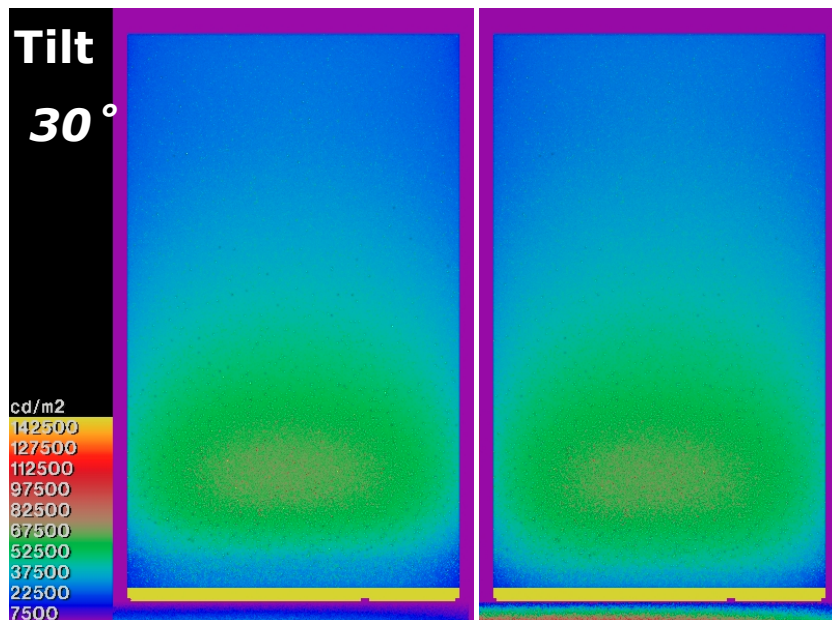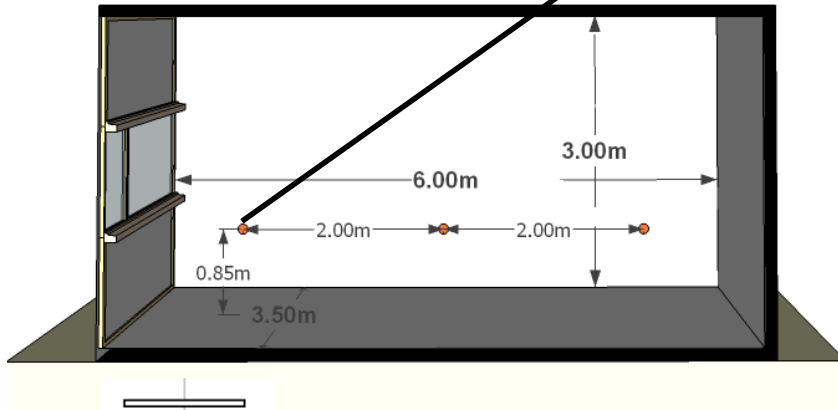
- dctimestep images/vmx/window_%03d.hdr **$transmtx**\
results/"$windowsub1".dmx tmp/skydistX3.skv >images/accum_"$BTDF".hdr

Tilt

0°

cd/m2
142500
127500
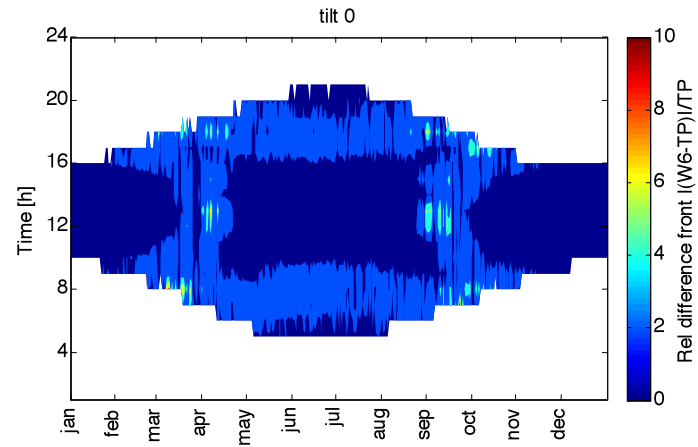112500
97500
82500
67500
52500
37500
22500
7500

W6

TP

- dctimestep images/vmx/window_%03d.hdr $transmtx\
  results/"$windowsub1".dmx tmp/skydistX3.skv >images/accum_"$BTDF".hdr

Tilt

30°

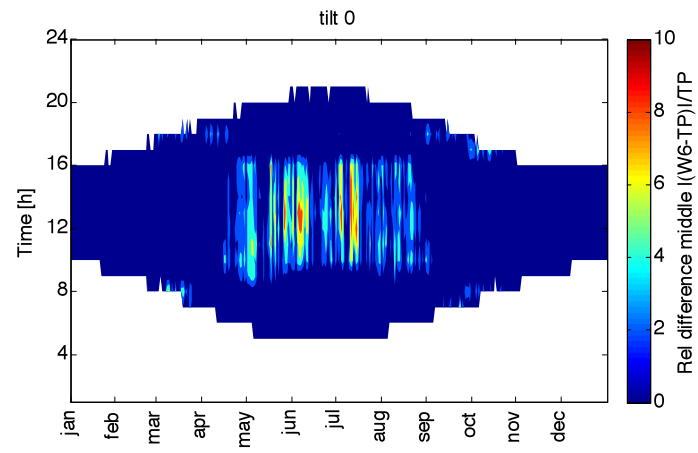cd/m2
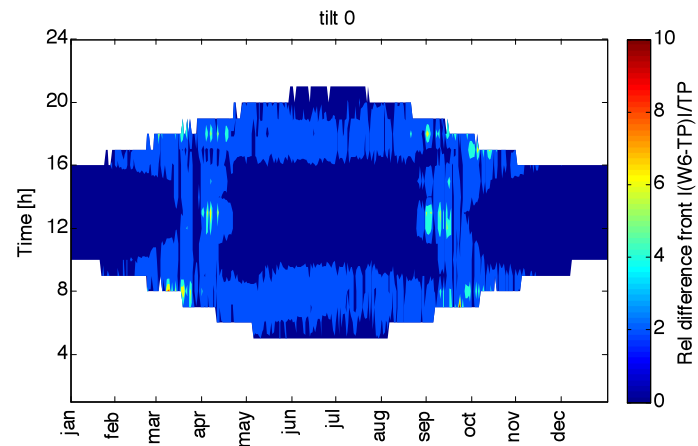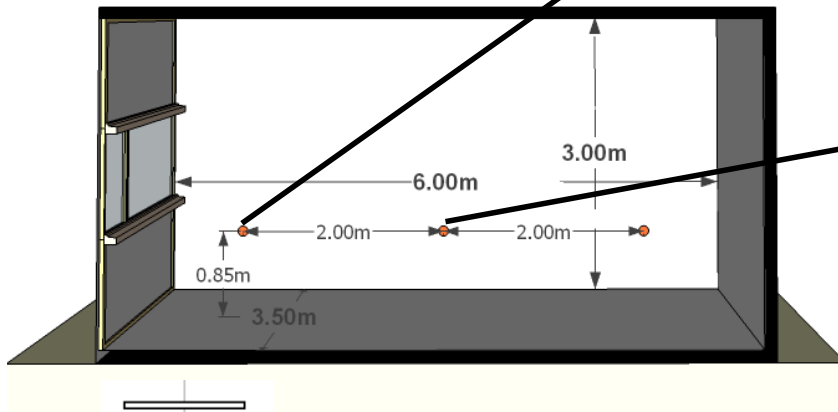142500
127500
112500
97500
82500
67500
52500
37500
22500
7500

Tilt 0°

cd/m2
142500
127500
112500
97500
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W6 TP

- dctimestep images/vmx/window_%03d.hdr $transmtx\
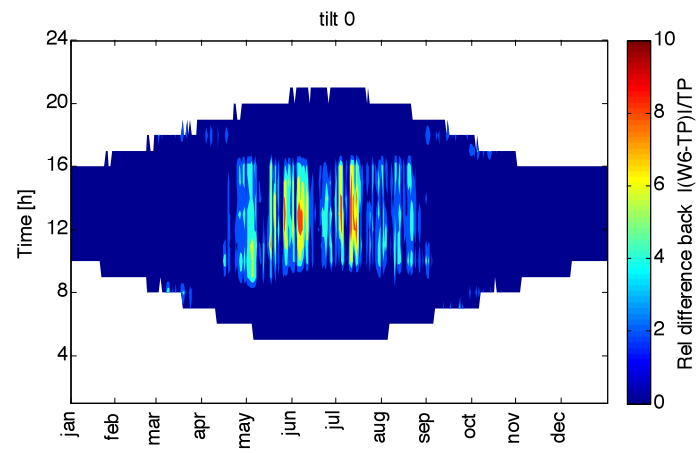results/"$windowsub1".dmx tmp/skydistX3.skv >images/accum_"$BTDF".hdr

Tilt 30°

cd/m2
142500
127500
112500
97500
82500
67500
52500
37500
22500
7500

Tilt 60°

cd/m2
142500
127500
112500
97500
82500
67500
52500
37500
22500
7500

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Time series

Tilt 0°

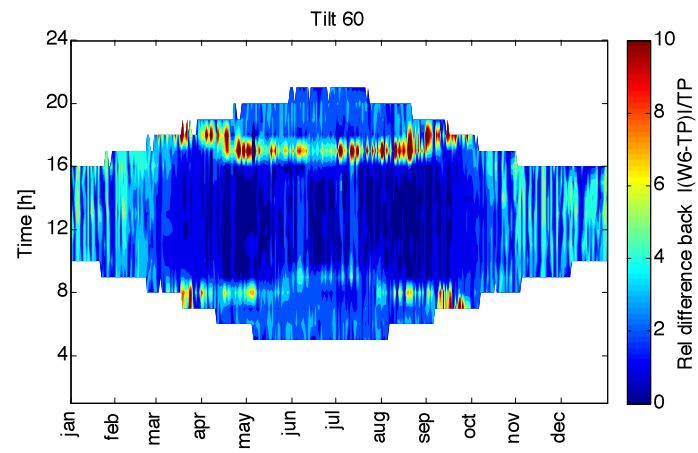**DTU Civil Engineering, Technical University of Denmark**   Radiance Workshop 2011   2011/08/25
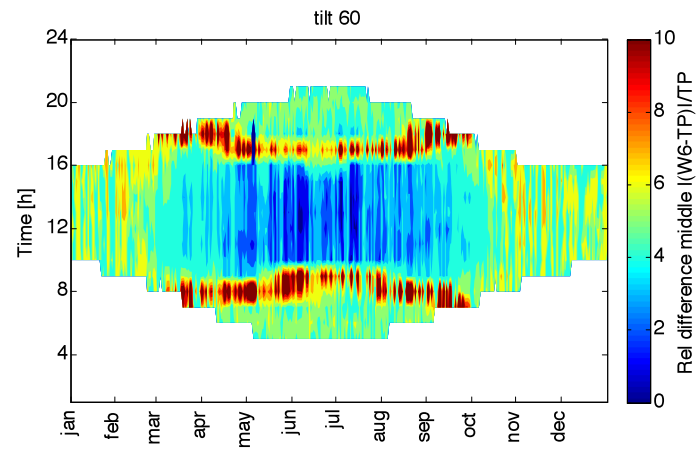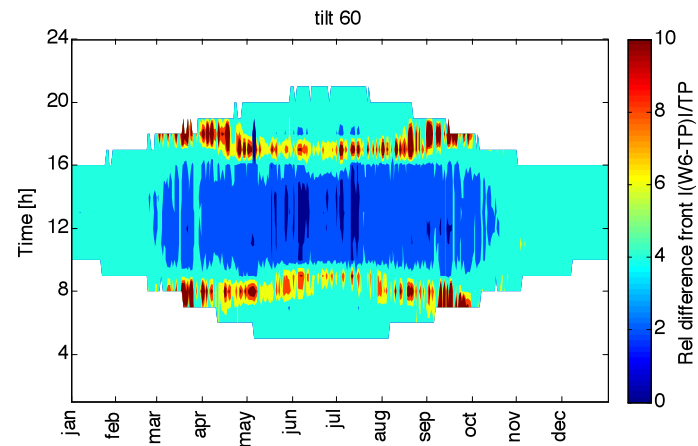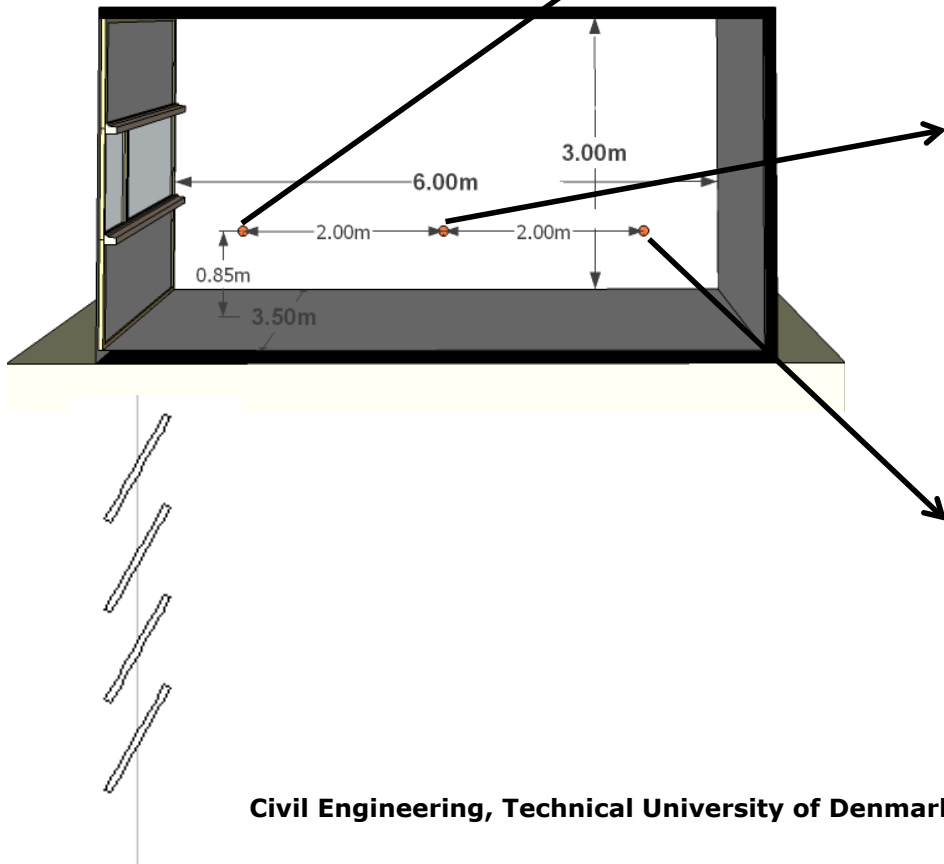
Tilt 0°

Tilt 0°
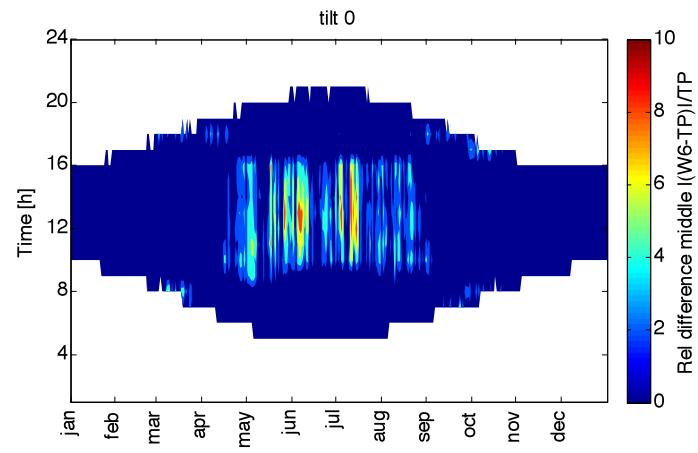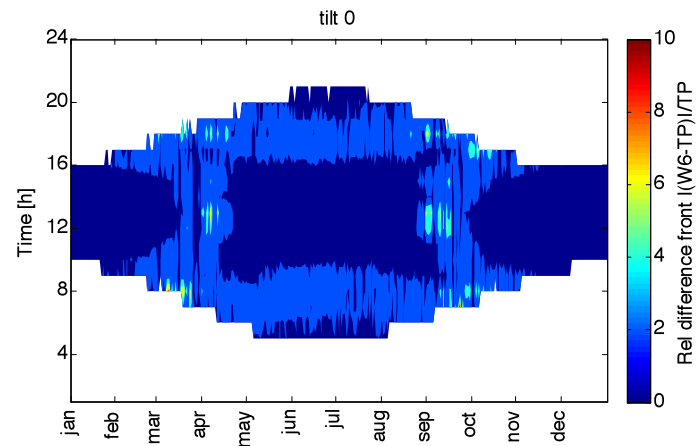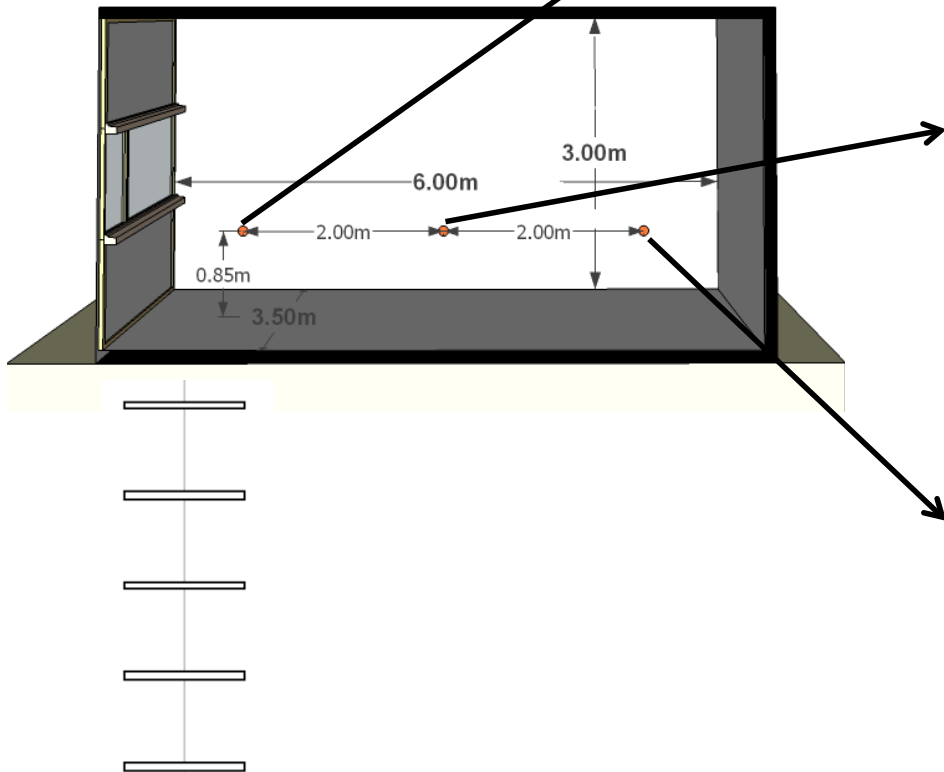
Tilt 30°
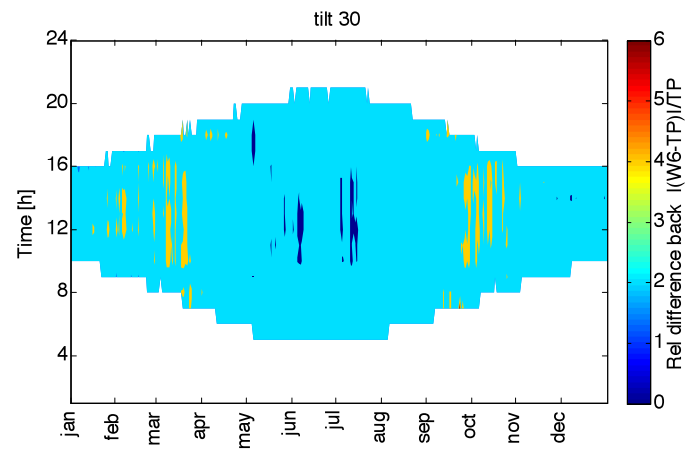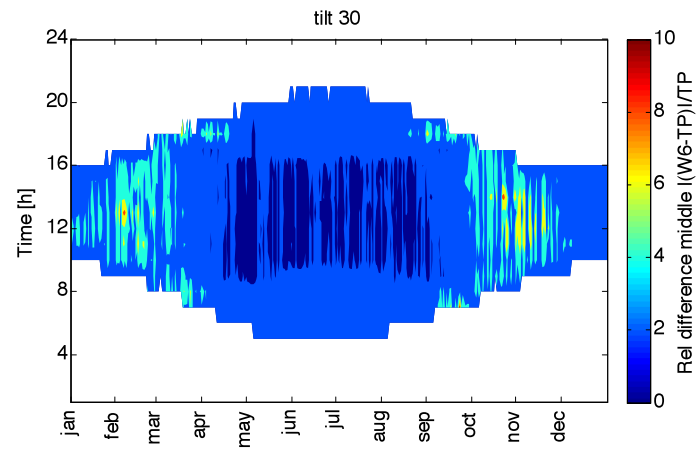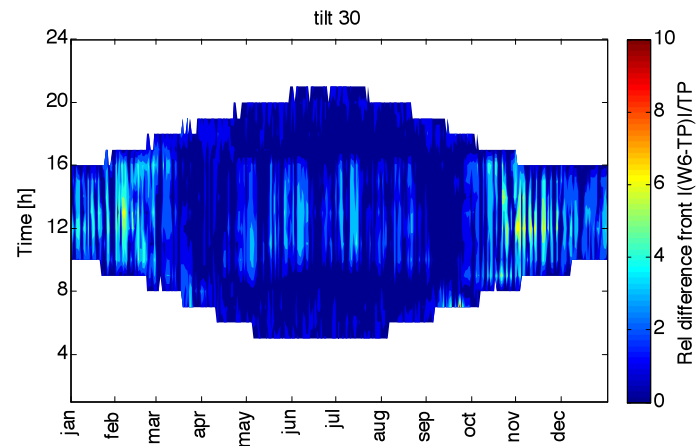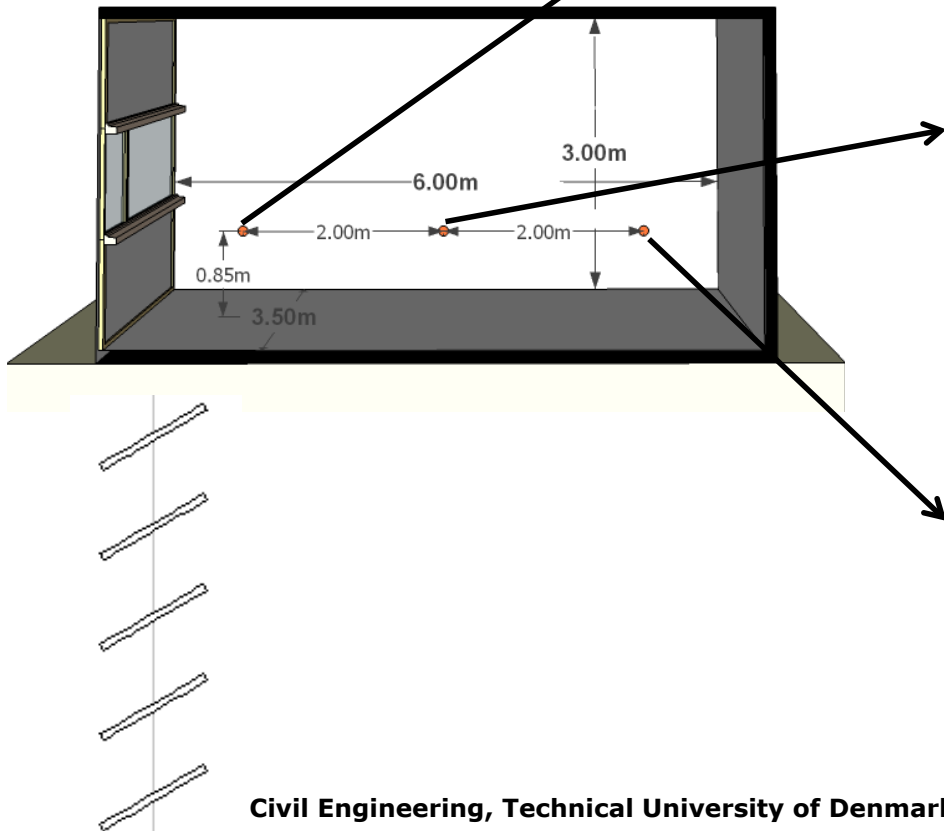
Tilt 60°

Conclusion

- OK agreement between simulations with Window6 BSDF and TracePro BSDF

- Highest discrepancy for tilt 60° caused by
  -> light being re-reflected in the blinds

Future work

- Simulation of a more complex material

- Comparison to full scale measurements