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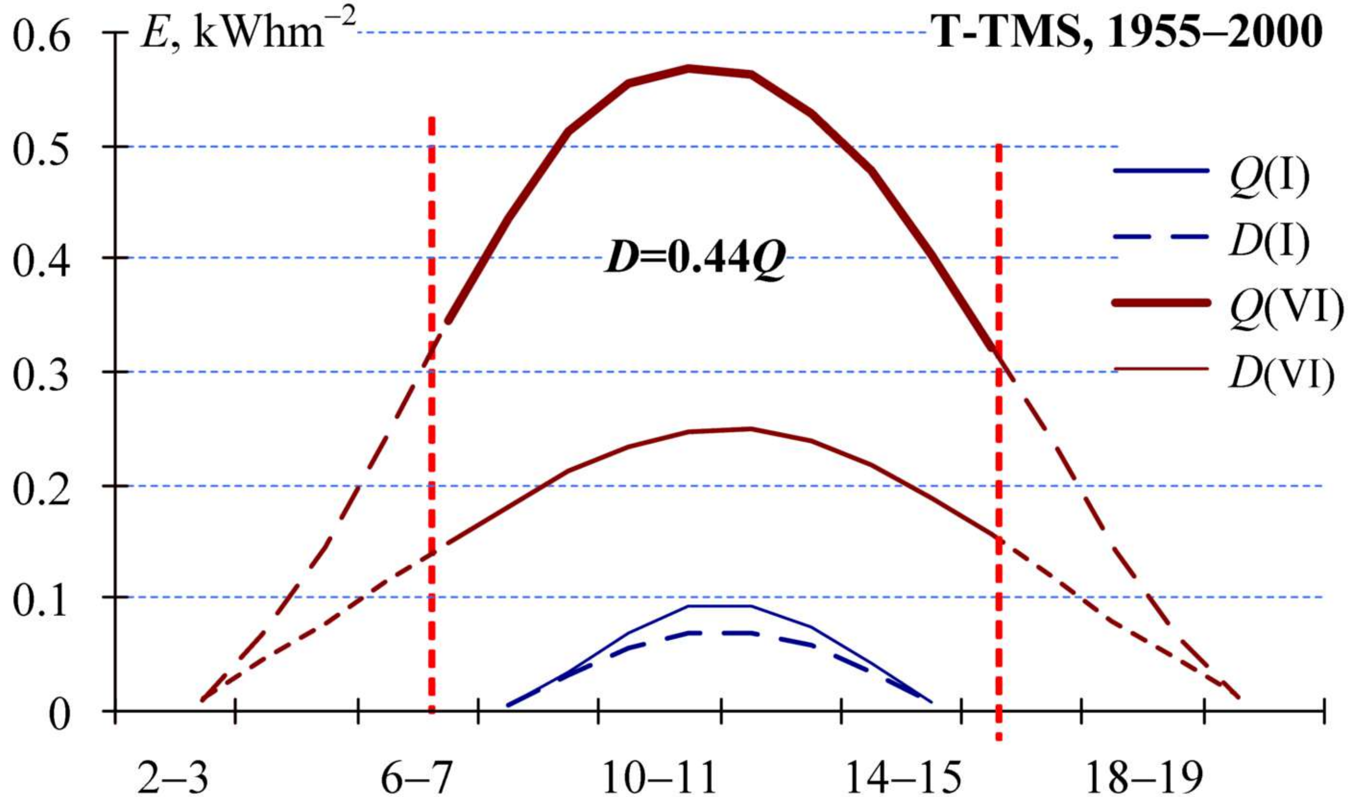


0.6
0.5
0.4
0.3
0.2
0.1
0
E, kWhm⁻²
T-TMS, 1955–2000
D=0.44Q
Q(I)
D(I)
Q(VI)
D(VI)
2–3
6–7
10–11
14–15
18–19

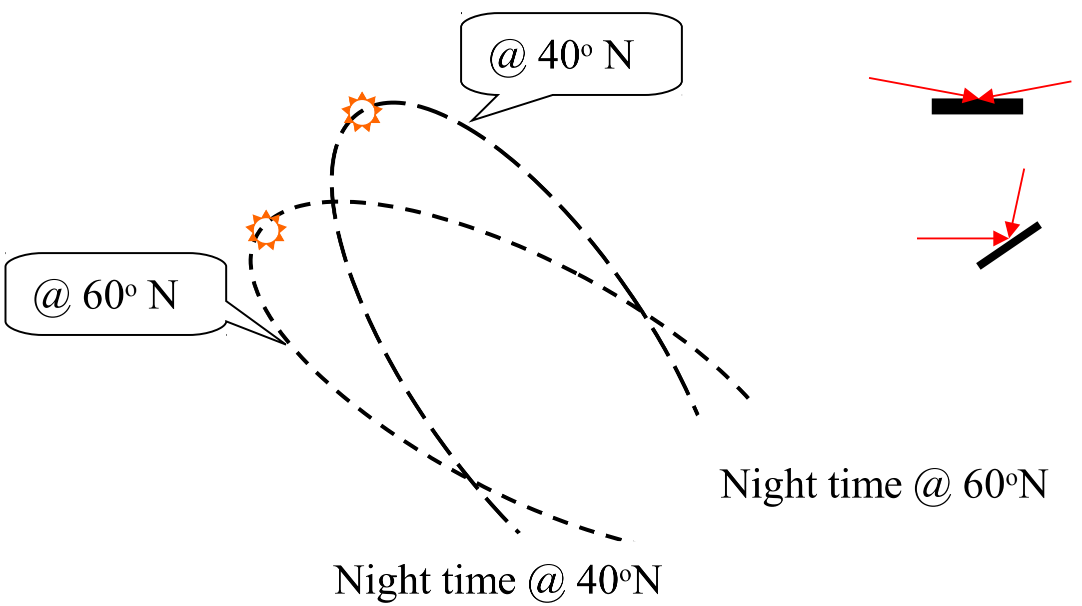
1

STRUCTURE OF SOLAR RADIATION AT HIGH LATITUDES

Teolan Tomson, Enn Mellikov[1]

Department of Materials Science, Tallinn University of Technology

Sun's path in June month at different latitudes



Rome: 1524 kWhy^{-1}; a 25º tilted collector loses 6 sunny hours per day
Stockholm: 975 kWhy^{-1}; a 45º tilted collector loses 10 sunny hours per day

1. Tracking – why?

Converted solar energy Q_C [@isotropic model of G_d]

$$Q_C = \int_T G_b(t,\theta,k_\theta)dt + \int_T G_d(t,\psi)dt$$

G_b – beam commponent of the irradiance

G_b – diffuse commponent of the irradiance

T – exposition interval

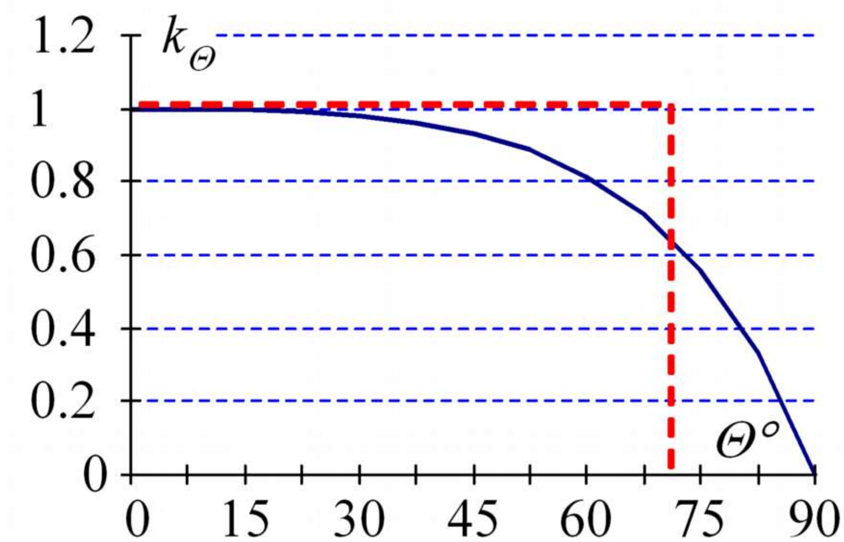
t – current time

k_Q – incident angle modifier $=\tau\alpha(\Theta)$

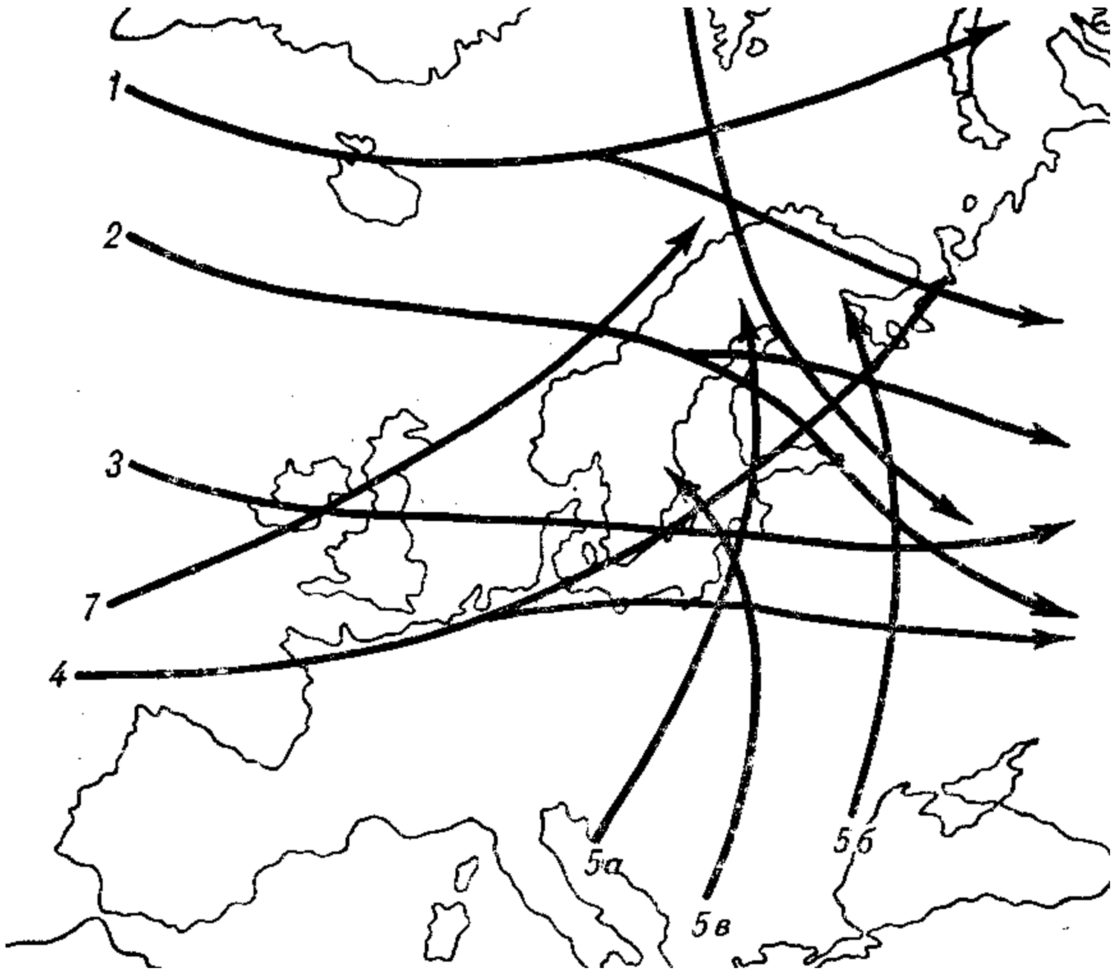
Θ – incident angle

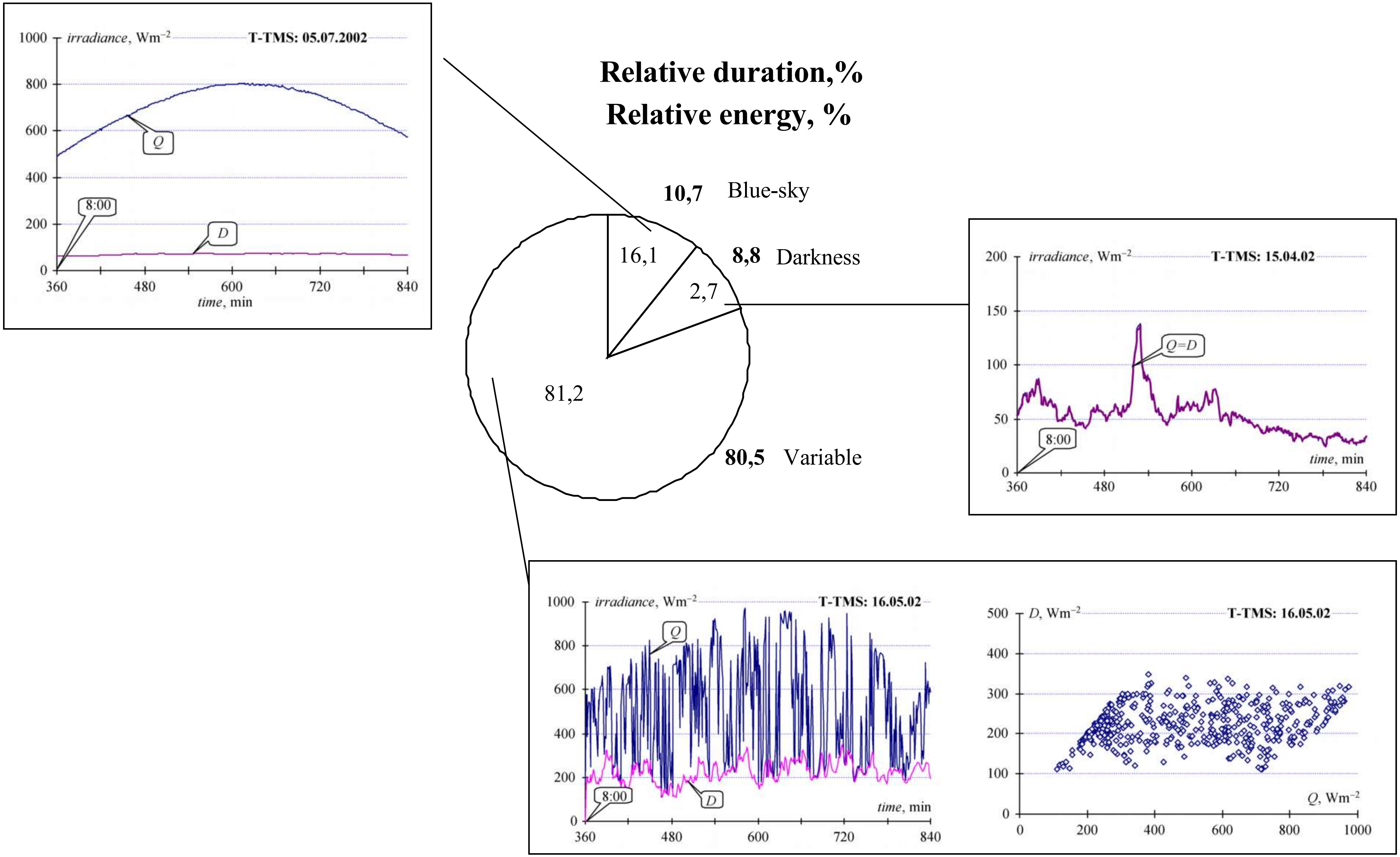
Ψ – apperture angle

$\tau\alpha$ – transmitance absorbtance product



Tsüklonite teekond





Typical radiation conditions at high latitudes,
correlation between direct and diffuse fractions of the irradiance

Materjaliteaduslike uuringute suunad

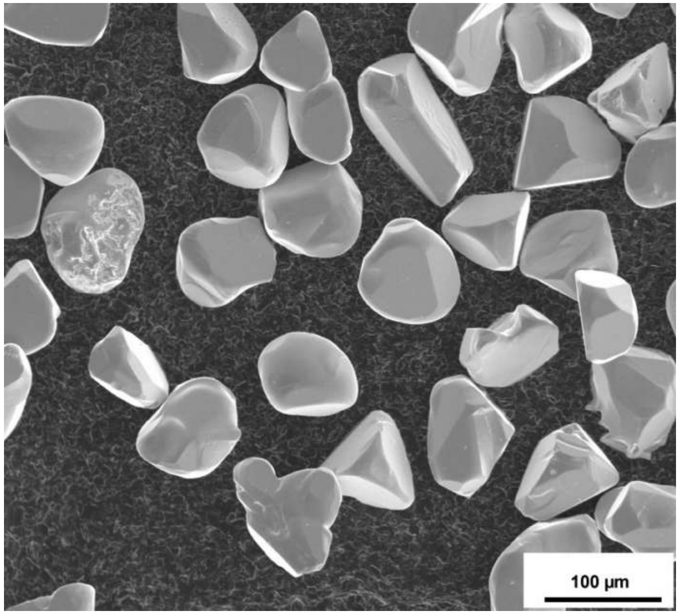
- Ühendpooljuhtmaterjalide õhukesed kiled keemilistel ja elektrokeemilistel meetoditel, keemia ja tehnoloogia

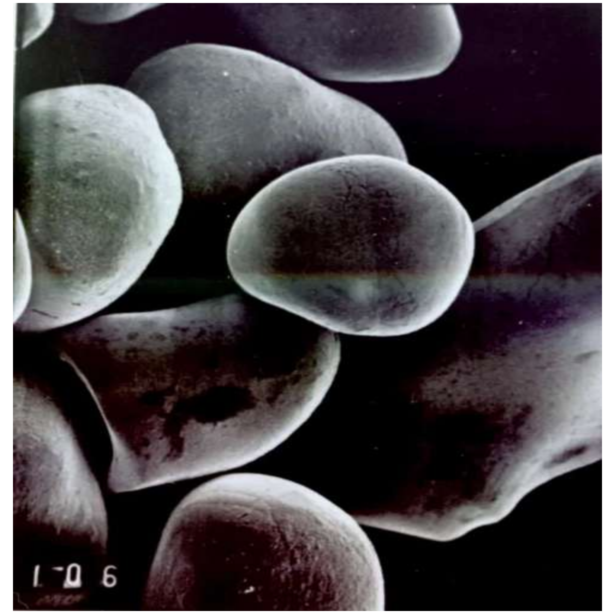
- Ühendpooljuhtmaterjalide pulbrite moodustumine rekristallisatsiooniprotsessis, mehhanism ja kineetika

- Õhukesekileliste ja pulbriliste pooljuhtpäikese-elementide keemia, füüsika ja tehnoloogia

EESMÄRK: uued ja odavad teaduslikult põhjendatud tehnoloogiad päikesepatareide valmistamiseks

Monoterapulbrid





Monoterapulbrite eelised:

1. Iga pulbriosake on väike monokristall;

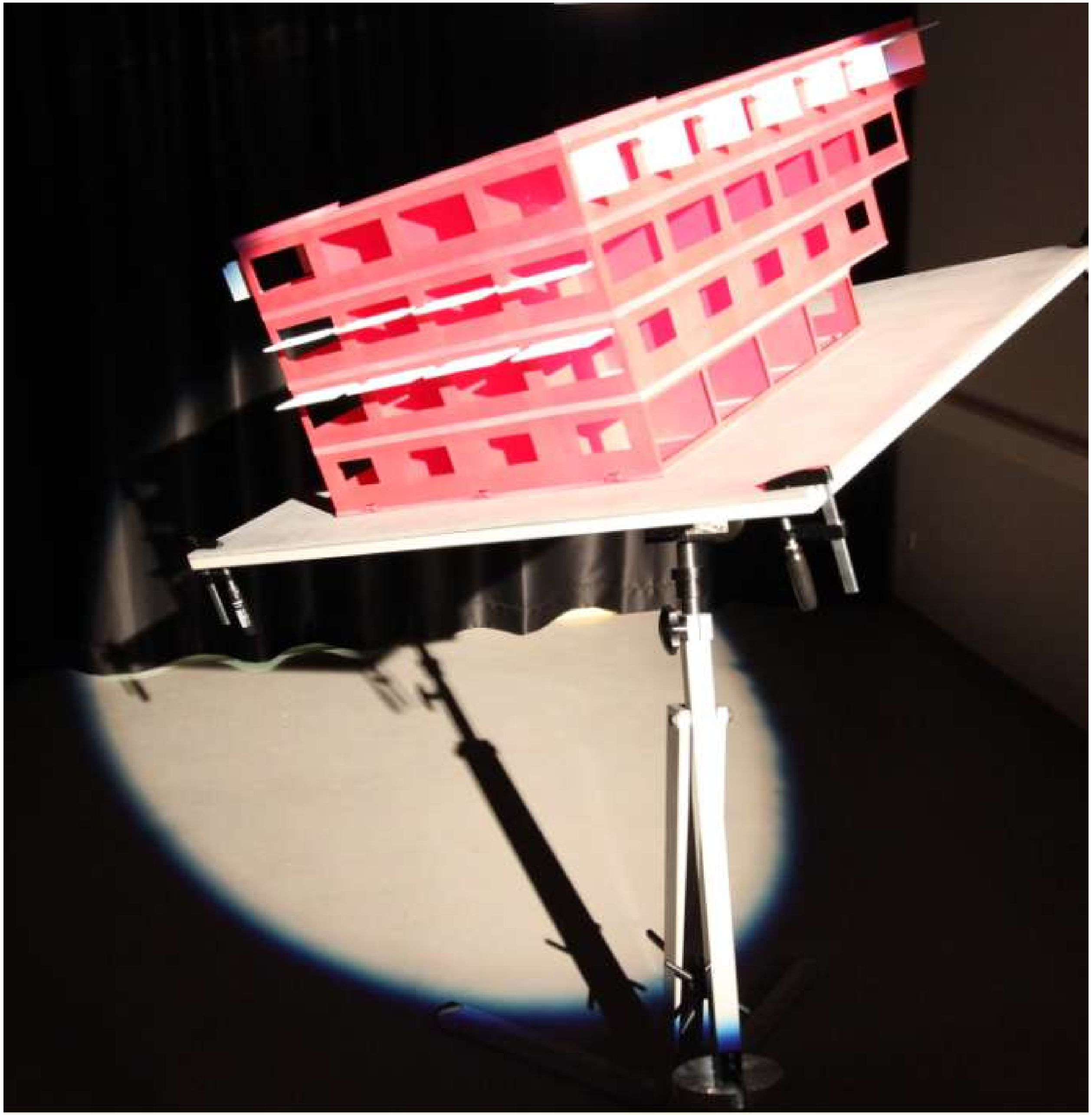
2. kitsas granulomeetriline koostis;

3. Homogeenne keemiline koostis ja lisandite jaotus

Monoterakihtide eelised

- Materjalide ja seadiste odavad tehnoloogiad
- Võimalus valmistada seadiseid praktiliselt piiramatus pindalas
- Võimalus kasutada materjali praktiliselt 100%-liselt

re 1. Four metal frames for mounting of up to 32 m^2 of modules on the roof of Material Science department



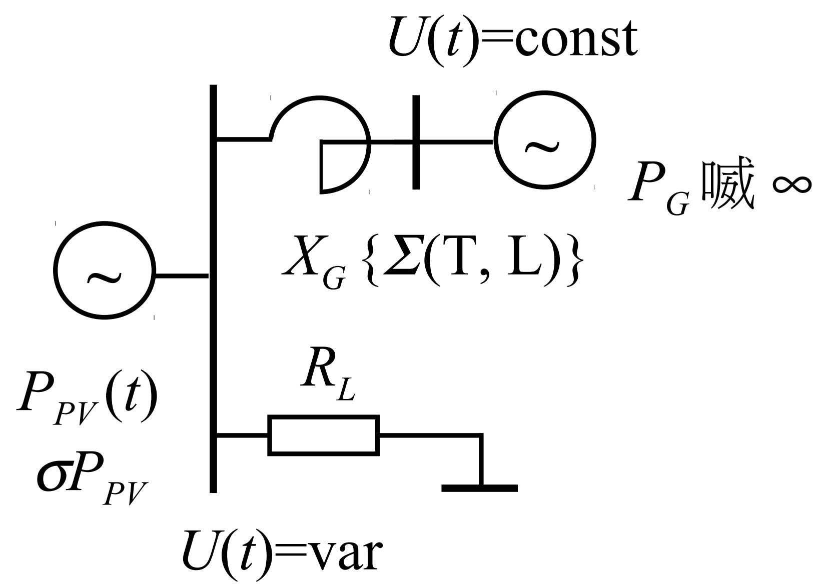
TUT heliodon

TUT mirror box

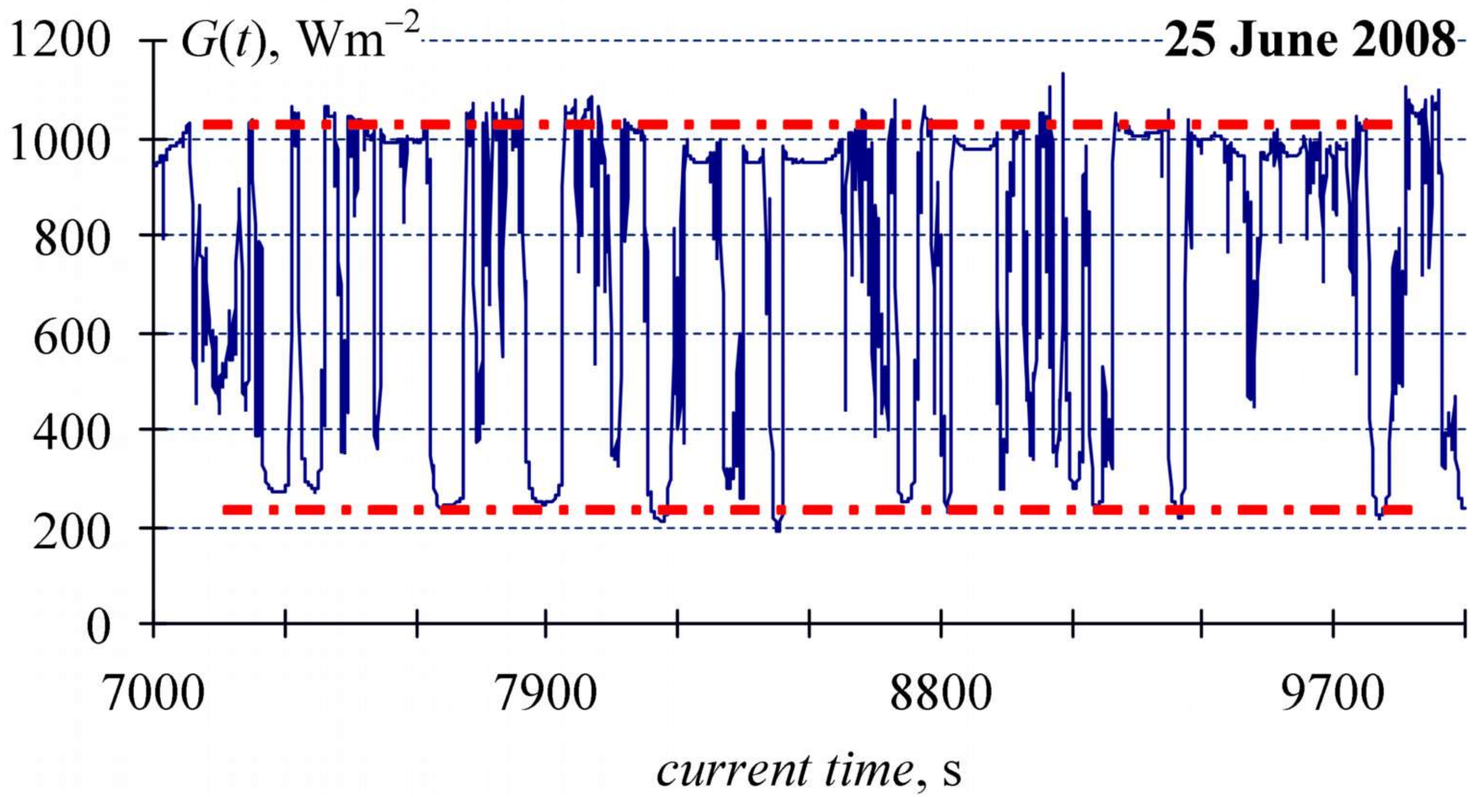
Reasons to investigate dynamical behavior of the solar radiation

1. **Fatigue of materials under alternating radiation**
2. **Assessment of capacity of the (local) energy storage unit**
3. **Problems of the stability of frequency in (a weak) grid**
4. **Problems of voltage flicker for the local load**

Due to τ_{PV}嗻0 dynamic of a PV farm is assessed by the dynamical behavior of cloud's shadows

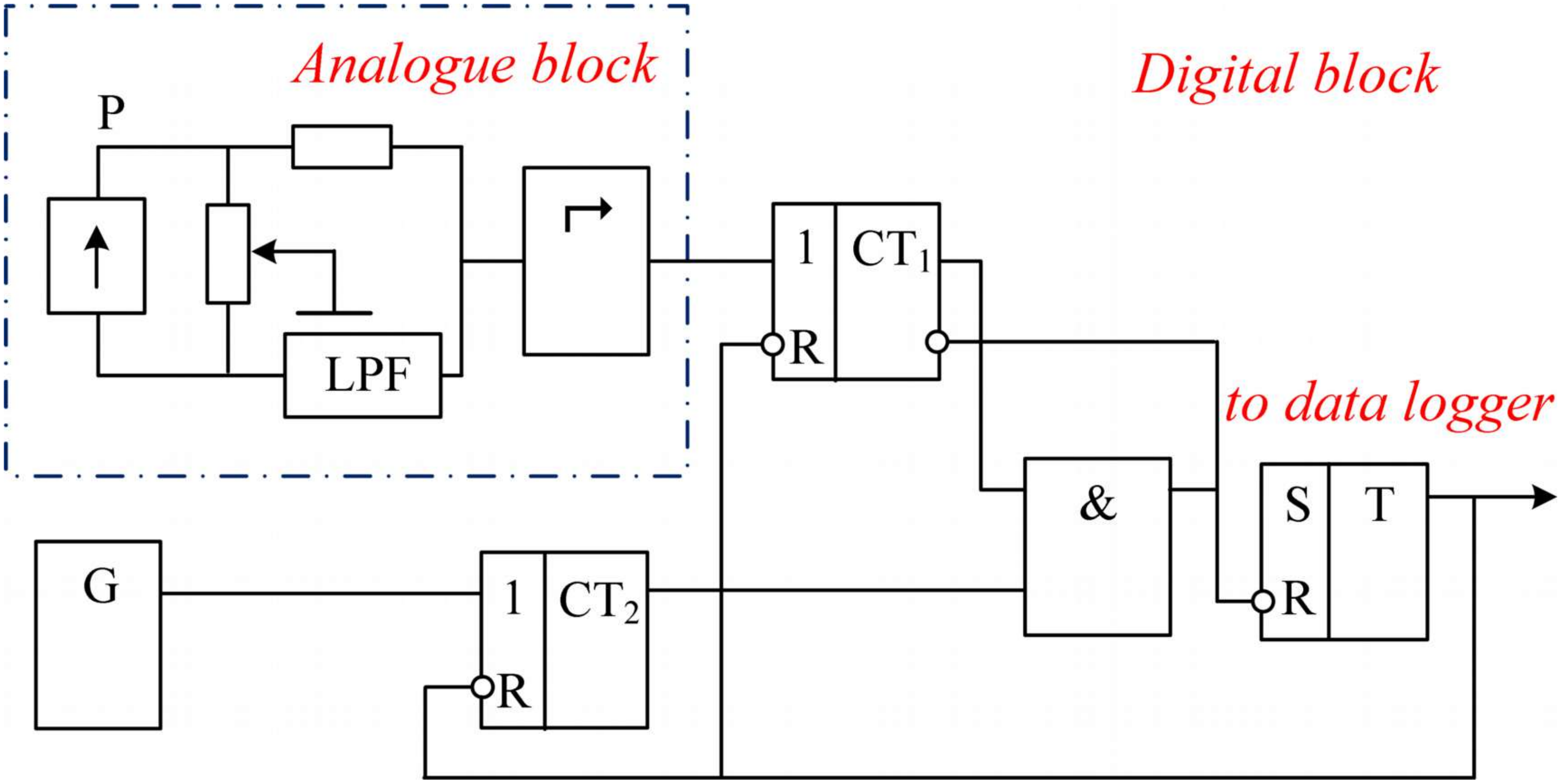


Cumulus Humilis *(field measurements)*



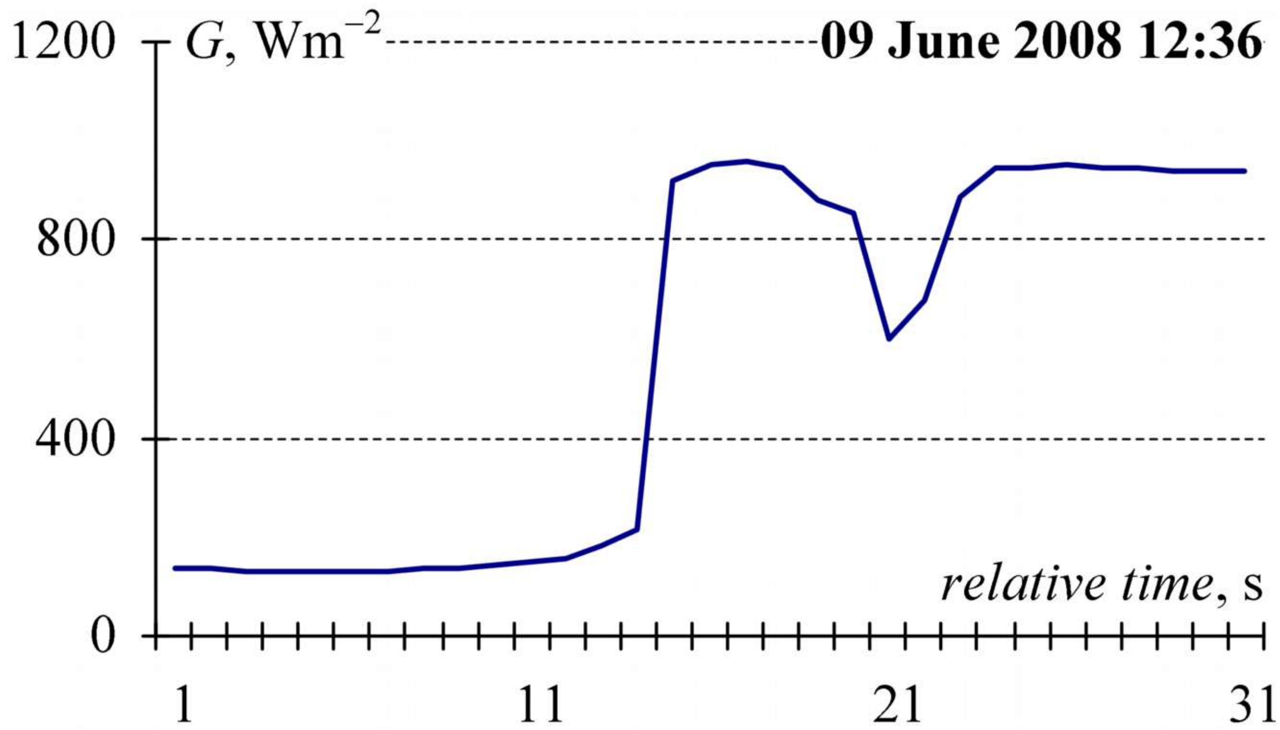
Fragment of the recording in conditions of (single-layer) *Cumulus Humilis*

Automat to detect the fast alternating radiation



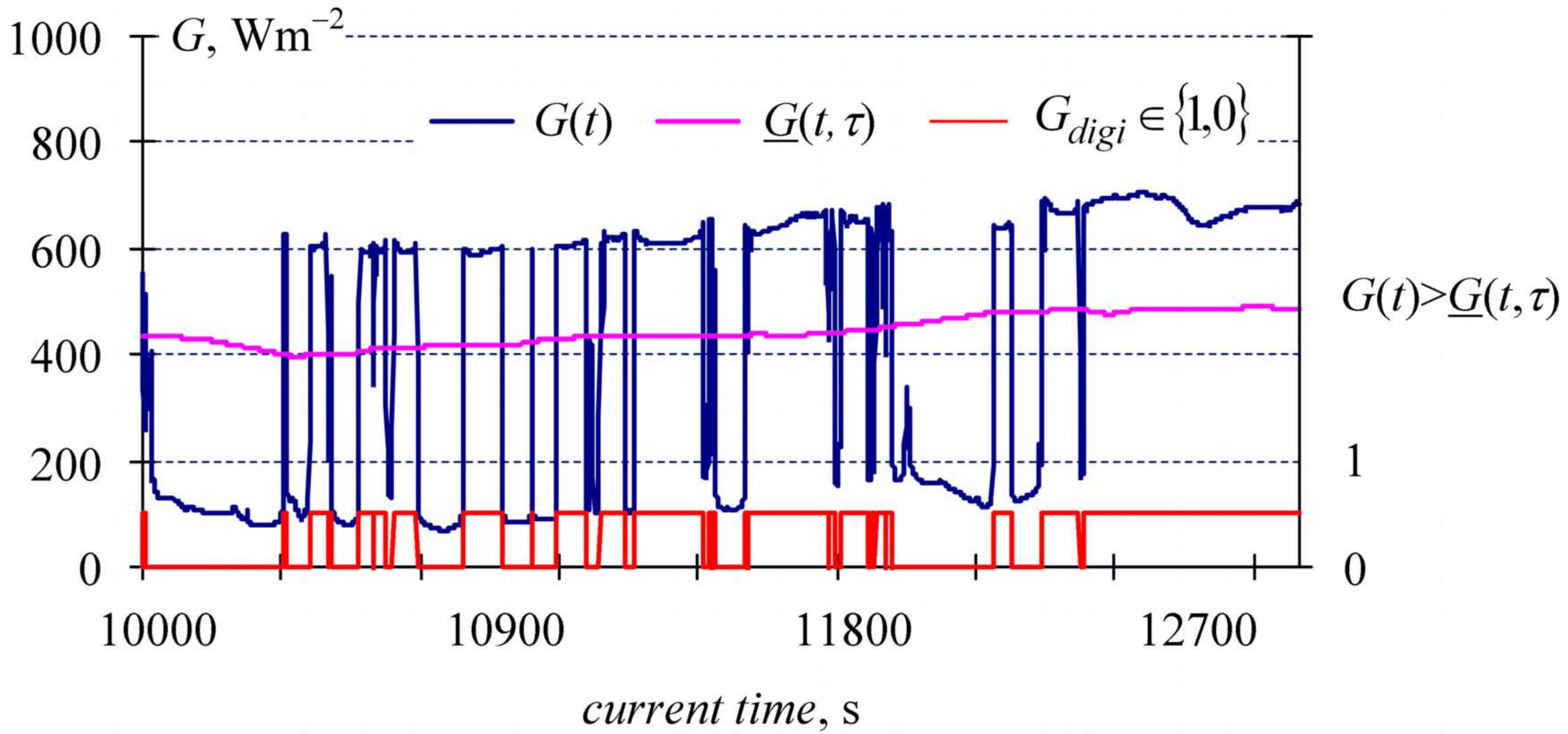
Automatically recorded data of the fast alternating radiation

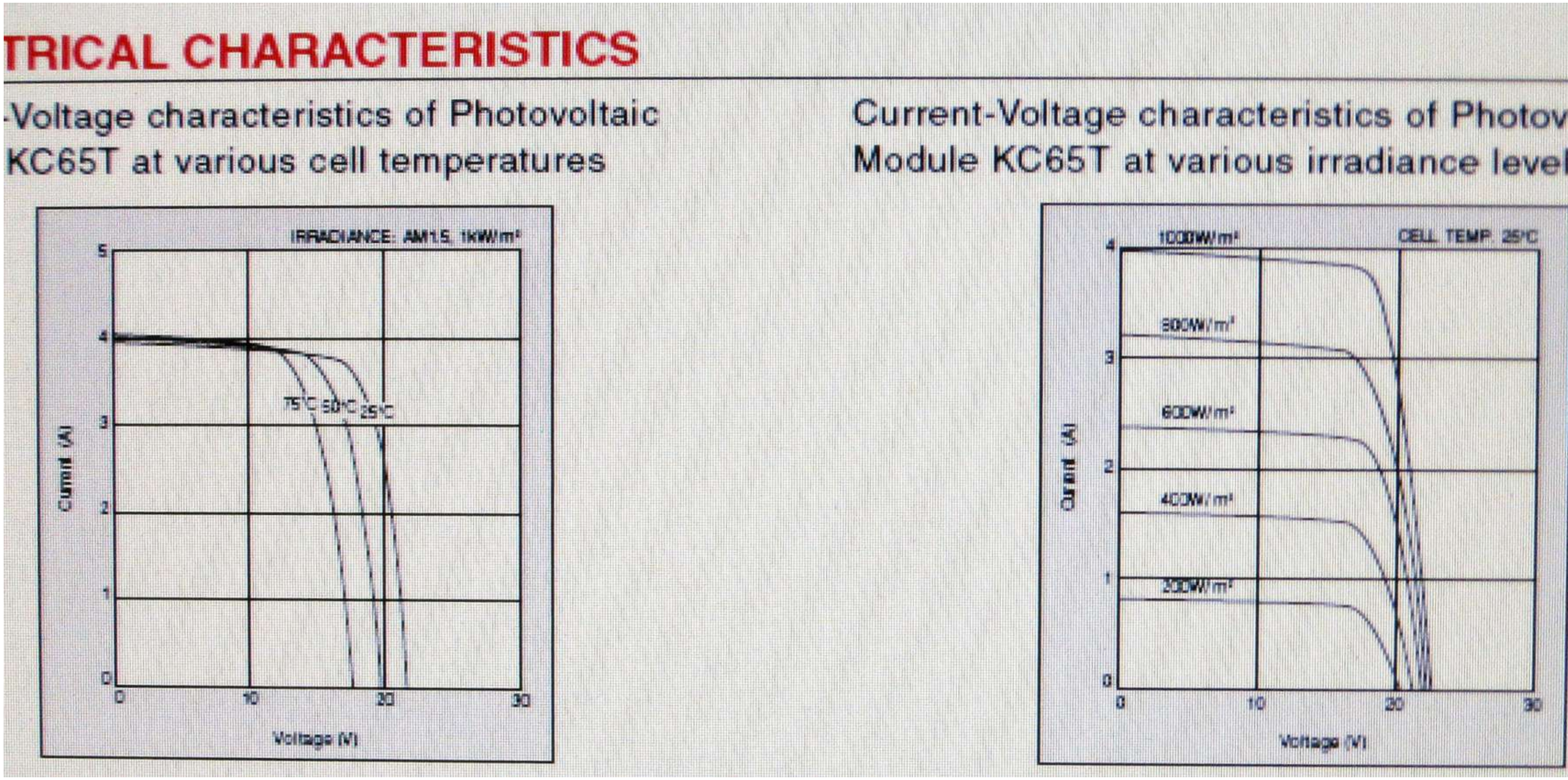
The largest increment (705 $Wm^{-2}s^{-1}$), recorded during summer season 2008

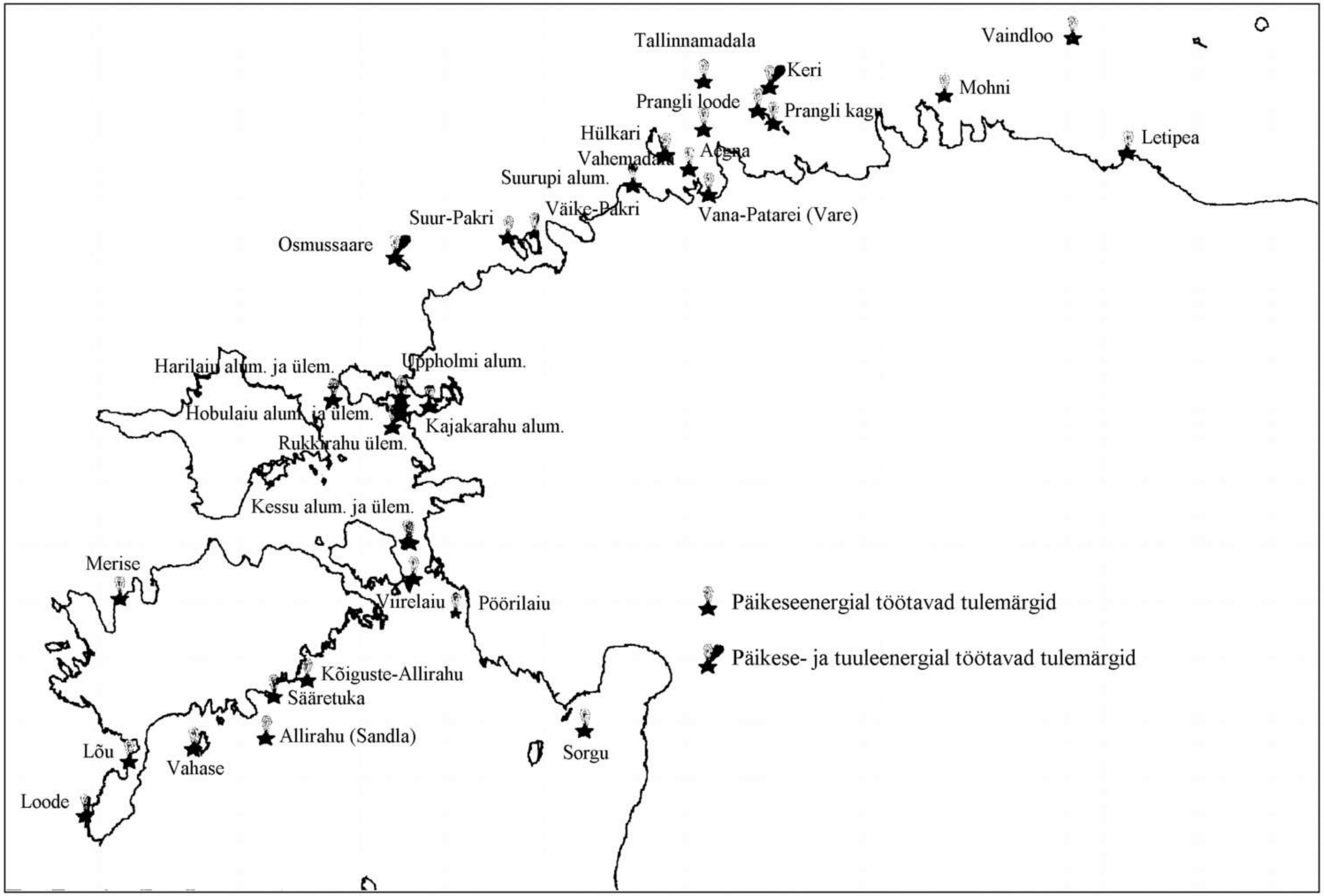


Automatically recorded data of the fast alternating radiation

Digitization of the recorded data (assessment of fronts)




TRICAL CHARACTERISTICS
-Voltage characteristics of Photovoltaic
KC65T at various cell temperatures
Current-Voltage characteristics of Photovo
Module KC65T at various irradiance levels
IRRADIANCE: AM1.5, 1kW/m²
75°C
50°C
25°C
Current (A)
Voltage (V)
CELL TEMP. 25°C
1000W/m²
800W/m²
600W/m²
400W/m²
200W/m²
Current (A)
Voltage (V)



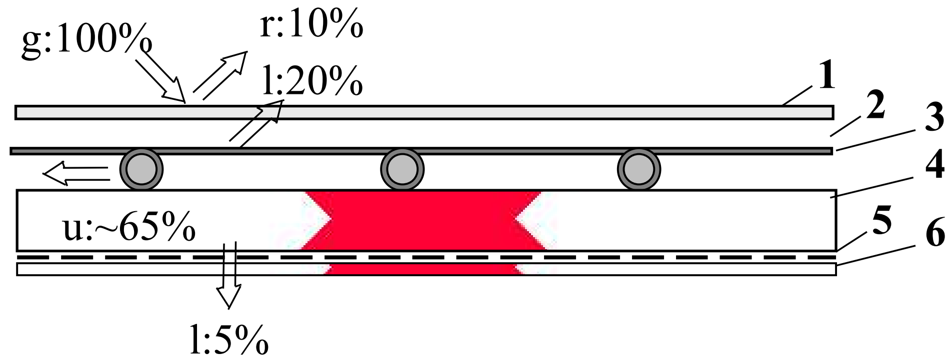
Eesti päikesetoitel mere-hoiatusmärgid


Vaindloo


Reheelamu väikesaarel


Tõnu Kaljuste suvekodu Naissaarel


Naissaare
külastuskeskus



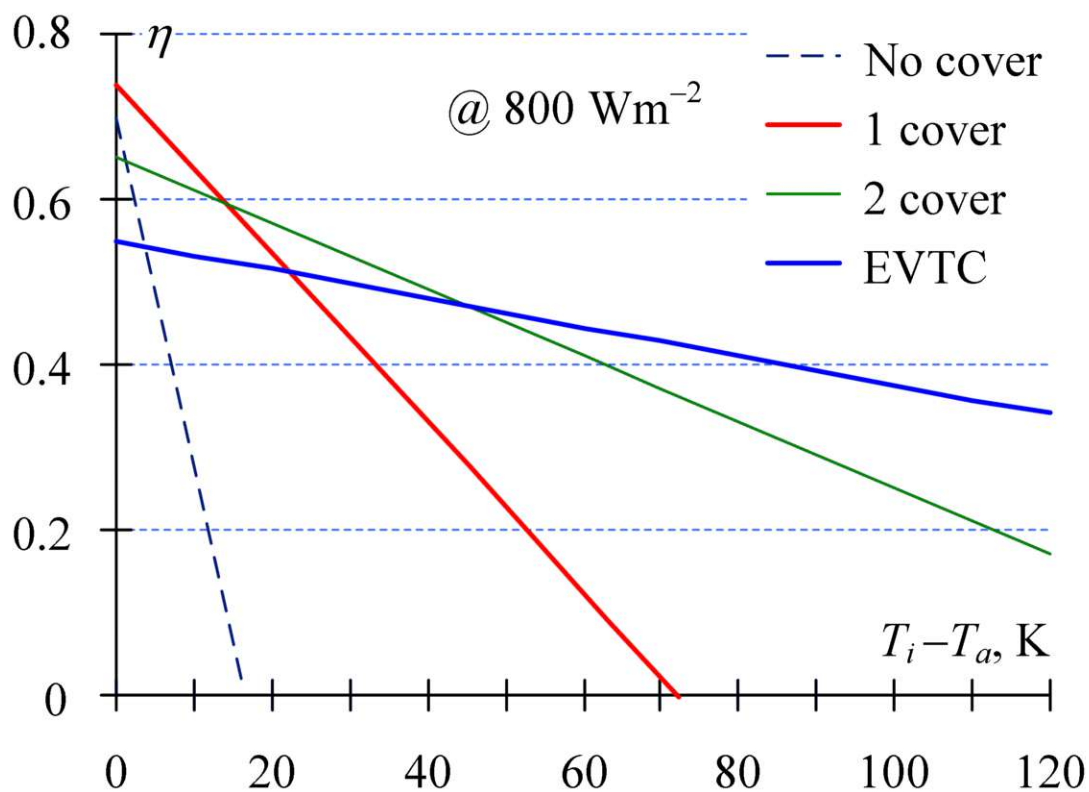
1. **Optical cover (glass, polycarbonat)**
2. **Air gap (insulation gap)**
3. **Absorber**
4. **Back insulation (mineral wool)**

5 Mirror film

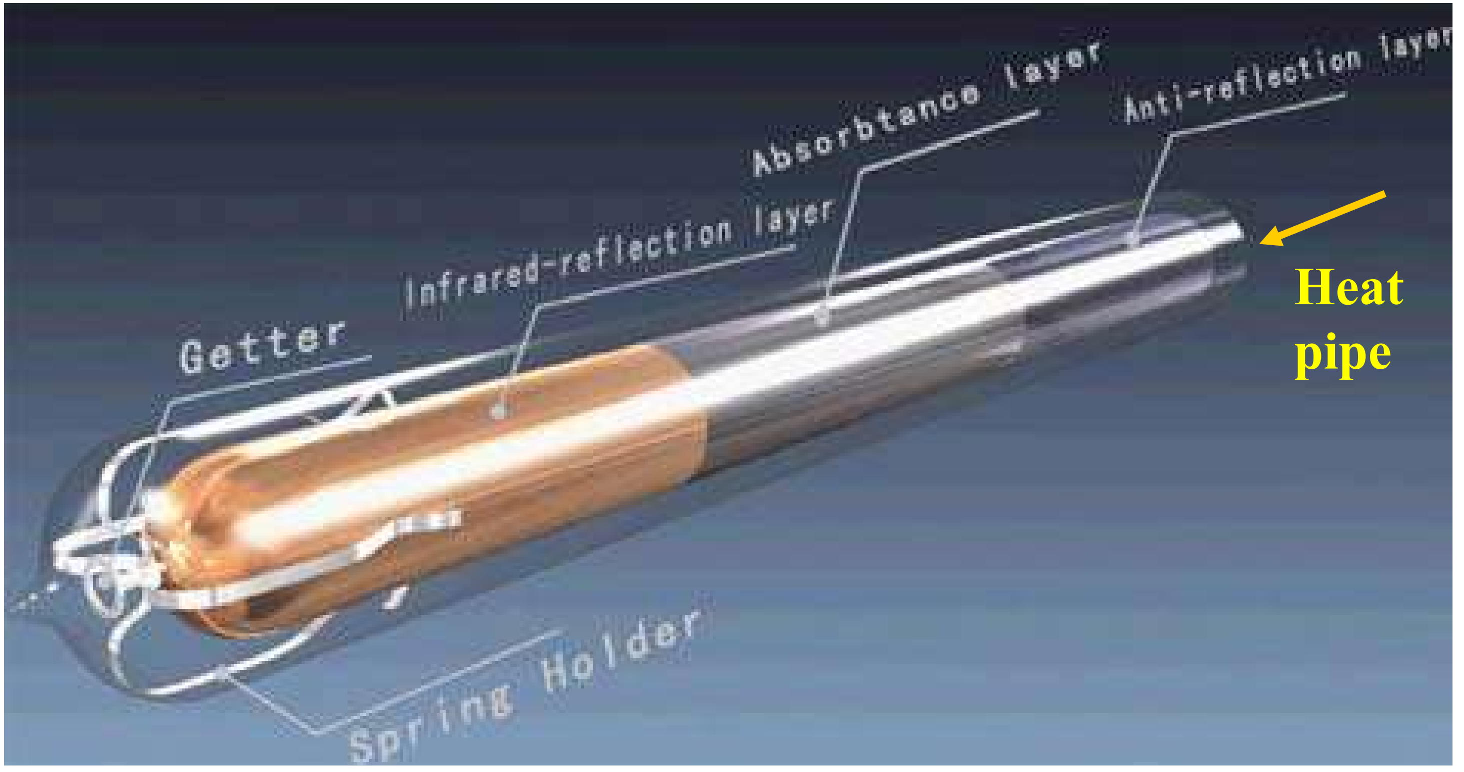
6 Back cover (Al, plywood)

g: irradiated 100%**; r**: reflected 10%; **l**: emitted losses 20%;
u: useful liquid flow 65%; **l** Conducted losses 1.5%

FPC- flat plate collector

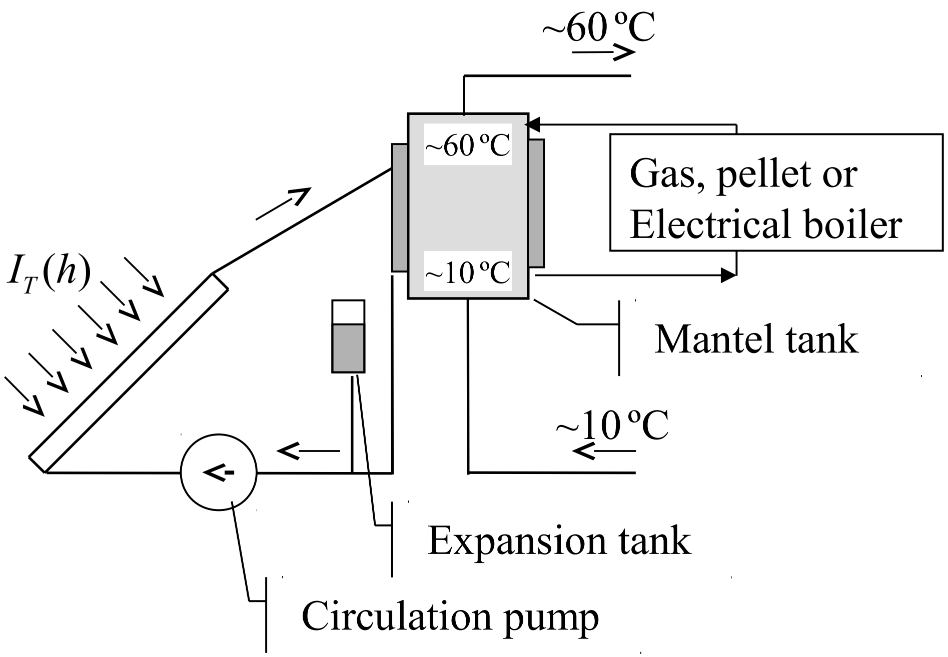


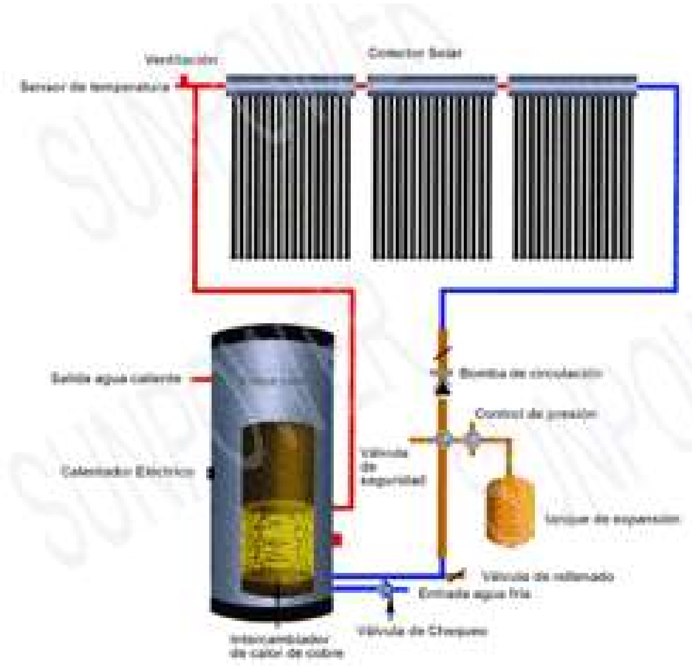
Efficiency curves I



EVTC

Evacuated tube collector





Most common double loop DHW system

Vändra haigla

Keila SOS lasteküla

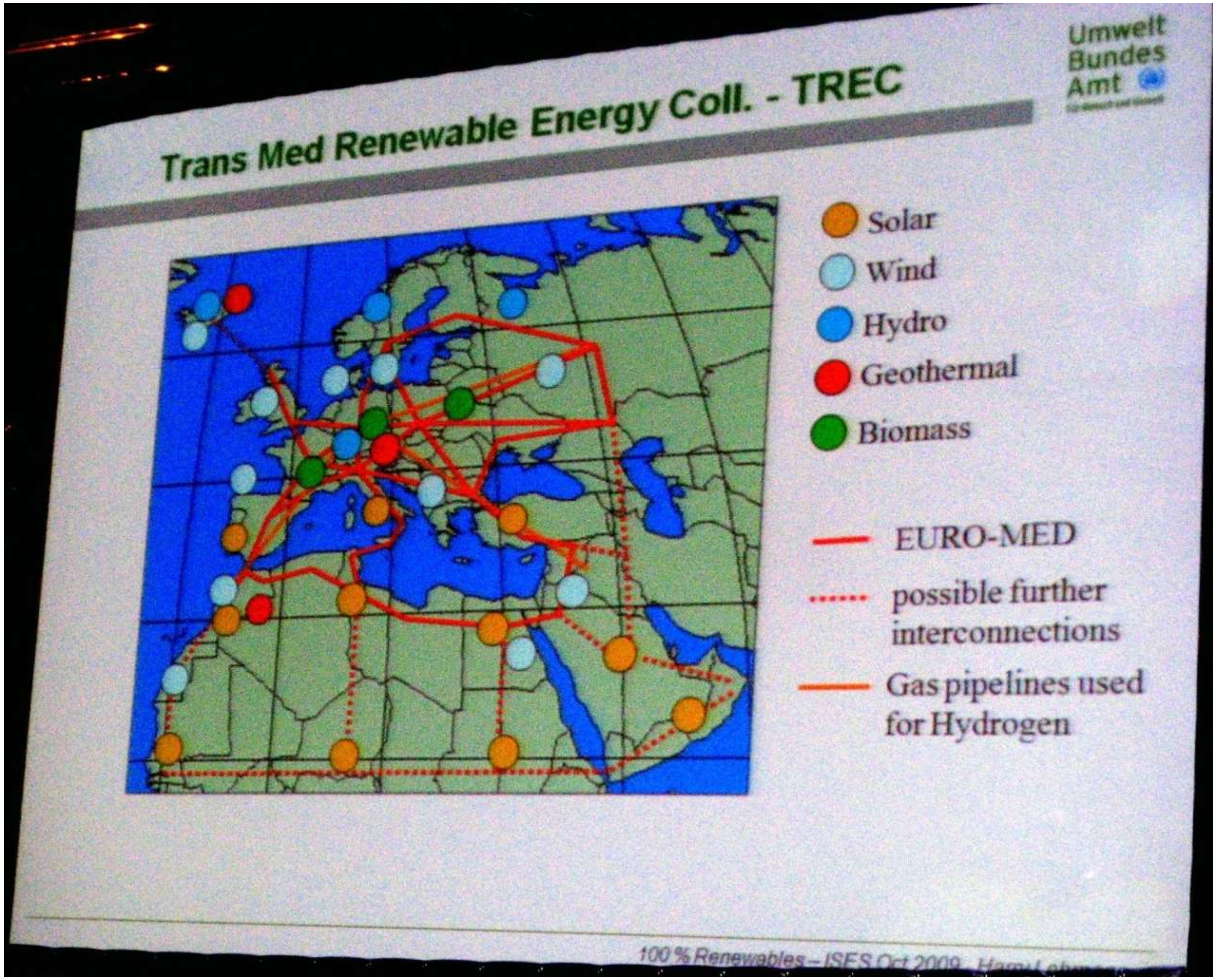
Tallinn, firma Anrebell


Kurtna kool


Kohila ostukeskus

Valga lasteaed


Tallinn, Mustamäe tee 181



Euroopa energiavarustus