Pyrheliometer

Dr. A. Balamurugan

Assistant Professor of Physics

Government Arts and Science College

Avinashi-641654

Introduction

A **pyrheliometer** is an instrument for measurement of direct beam solar irradiance is an instrument for measurement of direct beam solar irradiance. Sunlight enters the instrument through a window and is directed onto a thermopile which converts heat to an electrical signal that can be recorded. The signal voltage is converted via a formula to measure watts per square metre.

Standards

- Pyrheliometer measurement specifications are subject to International Organization for StandardizationPyrheliometer measurement specifications are subject to International Organization for Standardization (ISO) and World Meteorological Organization (WMO) standards. Comparisons between pyrheliometers for intercalibration are carried out regularly to measure the amount of solar energy received.

Applications:

Typical pyrheliometer measurement applications include scientific meteorological and climate observations, material testing research, and assessment of the efficiency of solar collectors Typical pyrheliometer measurement applications include scientific meteorological and climate observations, material testing research, and assessment of the efficiency

Diagram

PYRHELIOMETER

A pyrheliometer is an instrument for measurement of direct solar irradiance.

It is used with a solar tracking system to keep the instrument aimed at the sun.

A pyrheliometer is often used in the same setup with a pyranometer.

Pyranometer

PYRANOMETER

A type of **actinometer** used to measure **broadband solar irradiance** on a **planar surface.**

It is a sensor that is designed to measure the **solar radiation flux density** (in **watts per metre square**) from a **field of view of 180 degrees**.

The name pyranometer has a **Greek origin**, "pyr" : "fire" and "ano" : "above, sky".

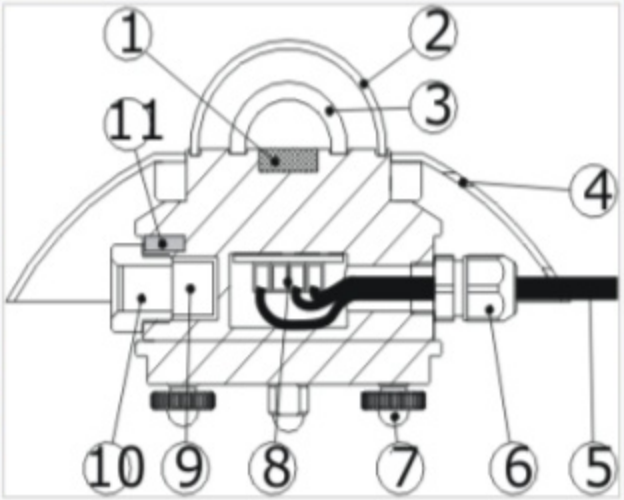
Instruments used to measure heating power of radiation, used in meteorology to measure solar radiation as pyrheliometers / pyranometers.

Conti….

PYRANOMETER (contd.)

MAIN COMPONENTS :

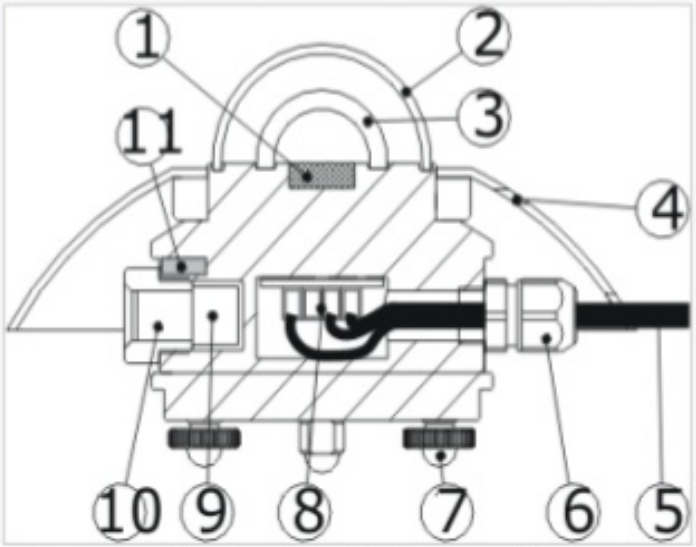
1. Thermopile Sensor with a Black Coating :
   1. absorbs all solar radiation,
   2. has a flat spectrum covering the 300 to 50,000 nanometer range,
   3. has a near-perfect cosine response.
2. Glass dome.
   1. limits the spectral response from 300 to 2,800 nanometers (cutting off the part above 2,800 nm), while preserving the 180 degrees field of view.
   2. shields the thermopile sensor from convection.



(1) sensor, (2, 3) glass domes, (5) cable, standard length 5 m, (9) desiccant.

PYRANOMETER (contd.)

3. Black coating on the thermopile sensor :
   1. absorbs solar radiation, which is converted to heat.
   2. The heat flows through the sensor to the pyranometer housing.
   3. The thermopile sensor generates a voltage output signal that is proportional to the solar radiation.



(1) sensor, (2, 3) glass domes, (5) cable, standard length 5 m, (9) desiccant.

PYRANOMETER (contd.)

APPLICATIONS :

Pyranometers are frequently used in

1. **Meteorology :** They can be seen in many meteorological stations - typically installed horizontally and next to solar panels - typically mounted with the sensor surface in the plane of the panel.
2. **Climatology**
3. **Solar Energy Studies**
4. **Building Physics**

STANDARDIZATION :

- Pyranometers are standardized according to the **ISO 9060** standard, that is also adopted by the **World Meteorological Organization (WMO)**.
- This standard discriminates **three classes**. The best is (confusingly) called **"secondary standard"** the second best **"first class"** and the last one **"second class"**
- Calibration is typically done relative to **World Radiometric Reference (WRR)**. This reference is maintained by in **Davos, Switzerland.**

Direct solar irradiance

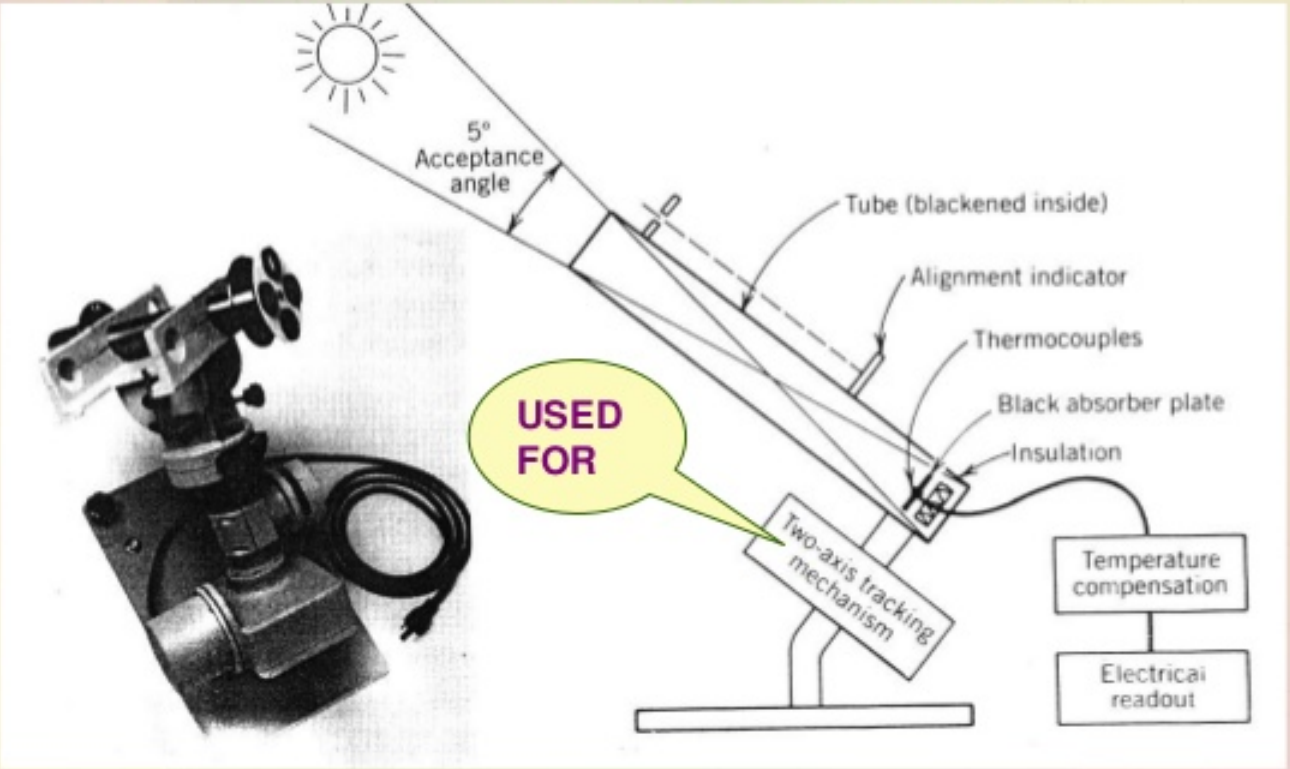
PYRHELIOMETER

A pyrheliometer is an instrument for measurement of direct solar irradiance.

It is used with a solar tracking system to keep the instrument aimed at the sun.

A pyrheliometer is often used in the same setup with a pyranometer.

PYRHELIOMETER (contd.)



Thank You