

**BALSLEV**



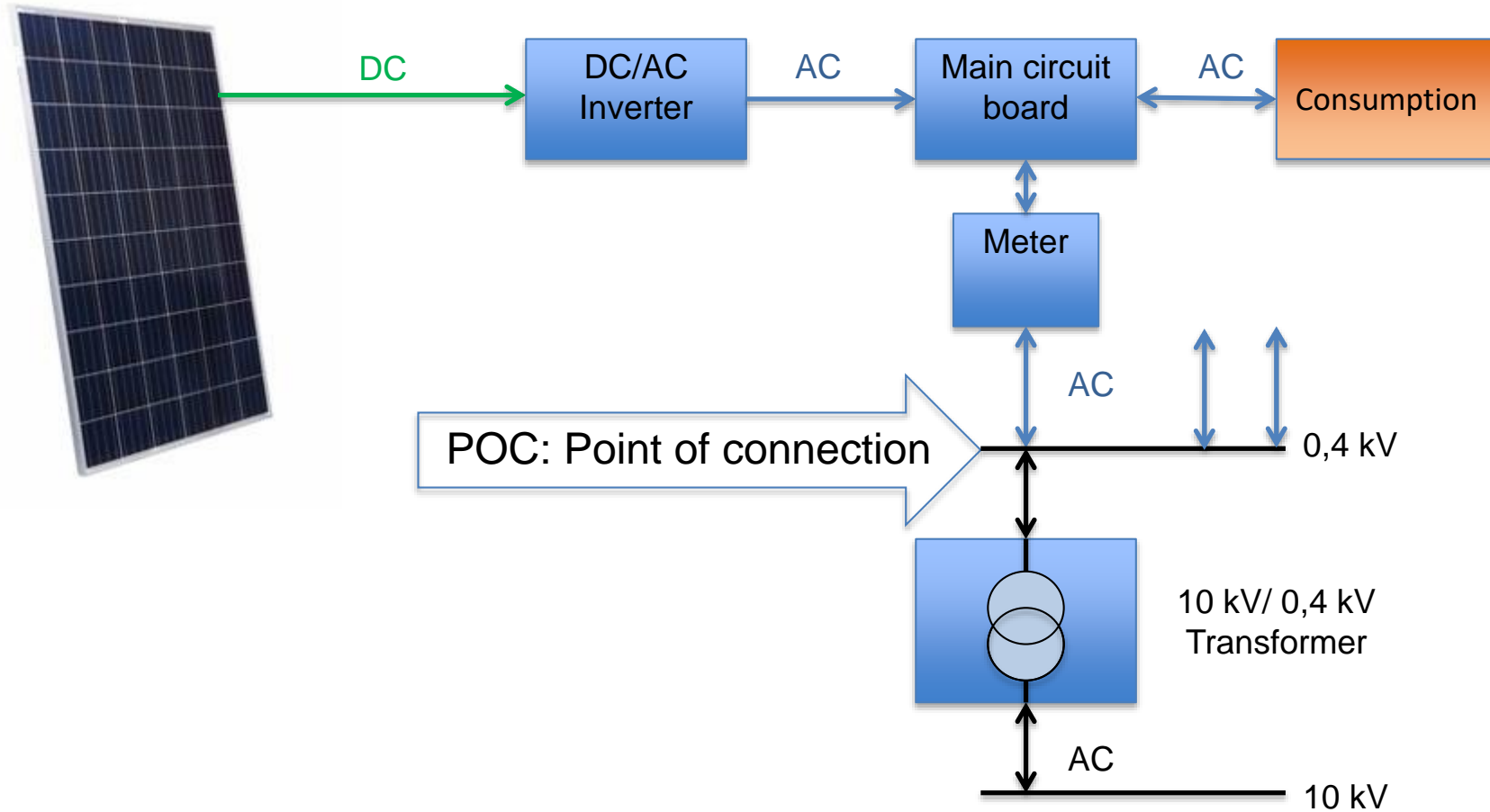
# Case study of Copenhagen International School:

## Electrical noise generated by PV system

Presented by Boris Lund Havmøller

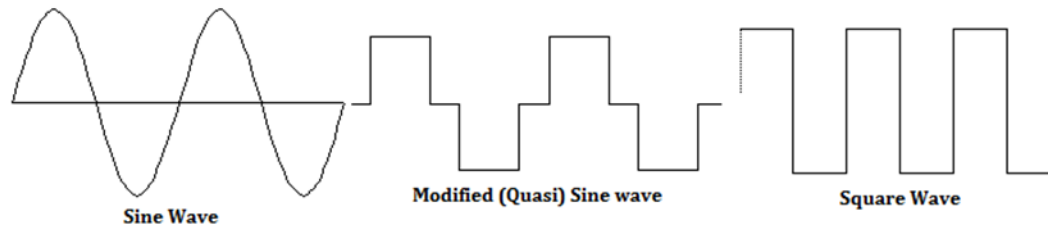


# PV systems and electrical disturbance

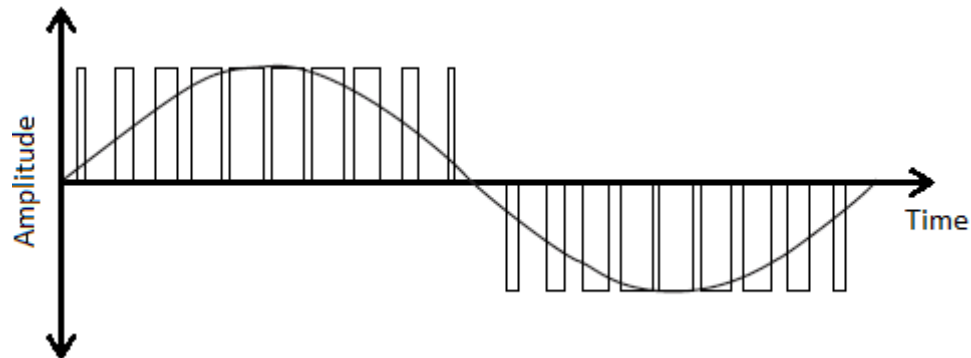


# Inverters modulation of a sine waveform

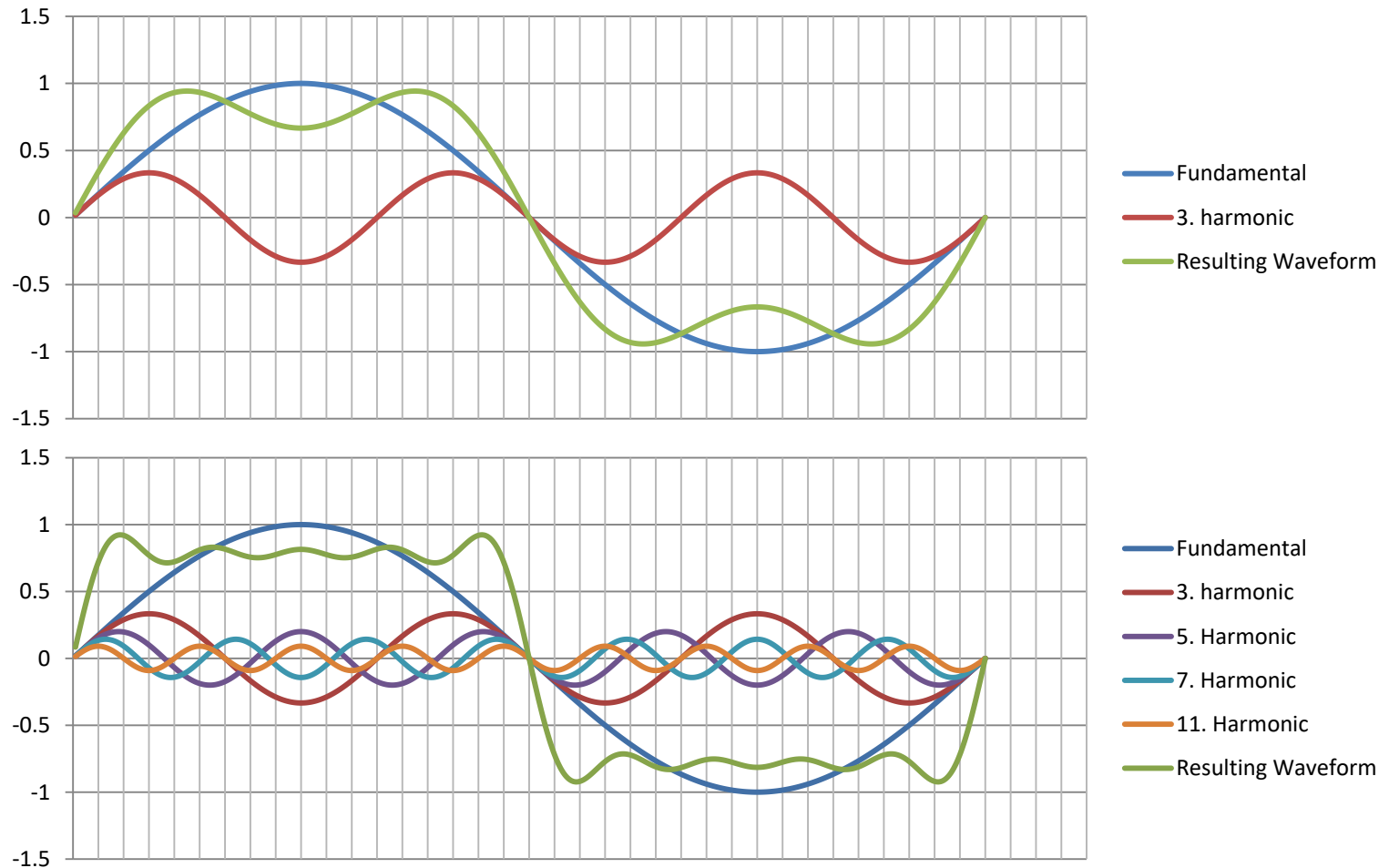
Types of AC signal in inverter systems



Pulse Width Modulation

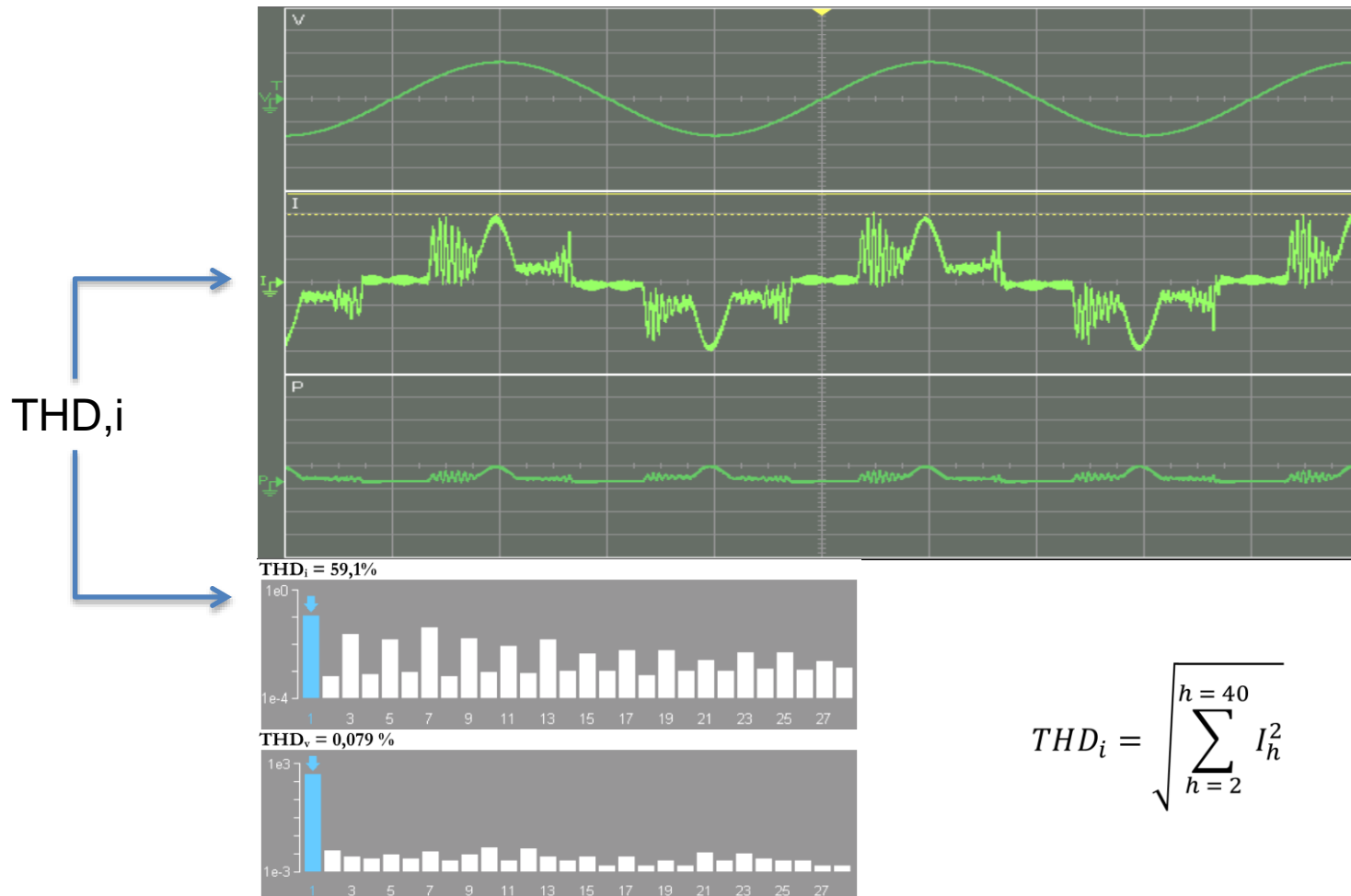


# Harmonic disturbances



# Example of disturbance

Measured U, I and P for an LED lamp



# Technical regulations for connecting PV systems to the distribution grid



Technical regulation 3.2.2 for PV power plants above 11 kW

The electricity supply undertaking

- is responsible for setting emission limits in the Point of Connection.
- must agree on a schedule for determining emission limits with grid connection applicants.

Plant owner

- must ensure that the PV power plant is designed, constructed and configured in observance of the specified emission limits without grid reinforcements being required.
- may, according to agreement, purchase supplementary services from the electricity supply undertaking to ensure compliance with the specified limit values.

# PV plants categorized based on rated power



The technical requirements of the regulation are divided into the following categories based on the total rated power in the Point of Connection:

- A2. Plants above 11 kW up to and including 50 kW
- B. Plants above 50 kW up to and including 1.5 MW
- C. Plants above 1.5 MW up to and including 25 MW
- D. Plants above 25 kW or connected to over 100 kV

The requirements concern: DC-content, asymmetry, fast voltage changes, flicker, harmonic disturbances, interharmonic disturbances, disturbances 2 - 9 kHz.



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Thank you for your attention