



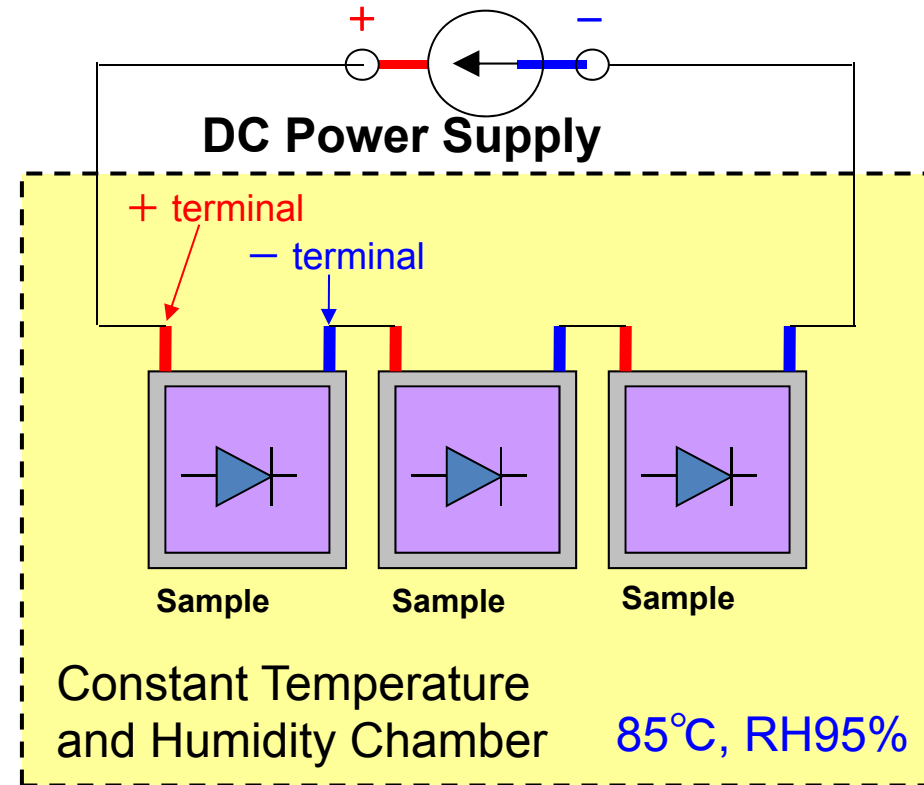
Japanese Task Group 8 Activities in International PV Module Quality Assurance

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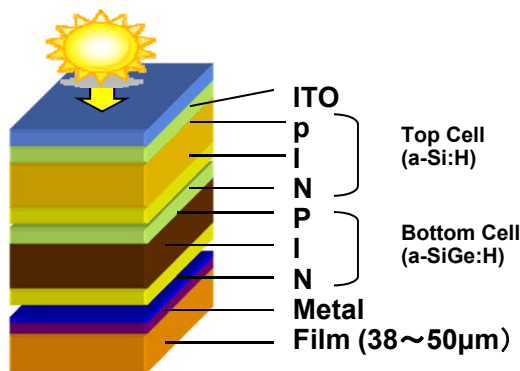
PVMRW 2014, Feb 25-26, 2014, Golden, CO, USA

Current Injection during DH test

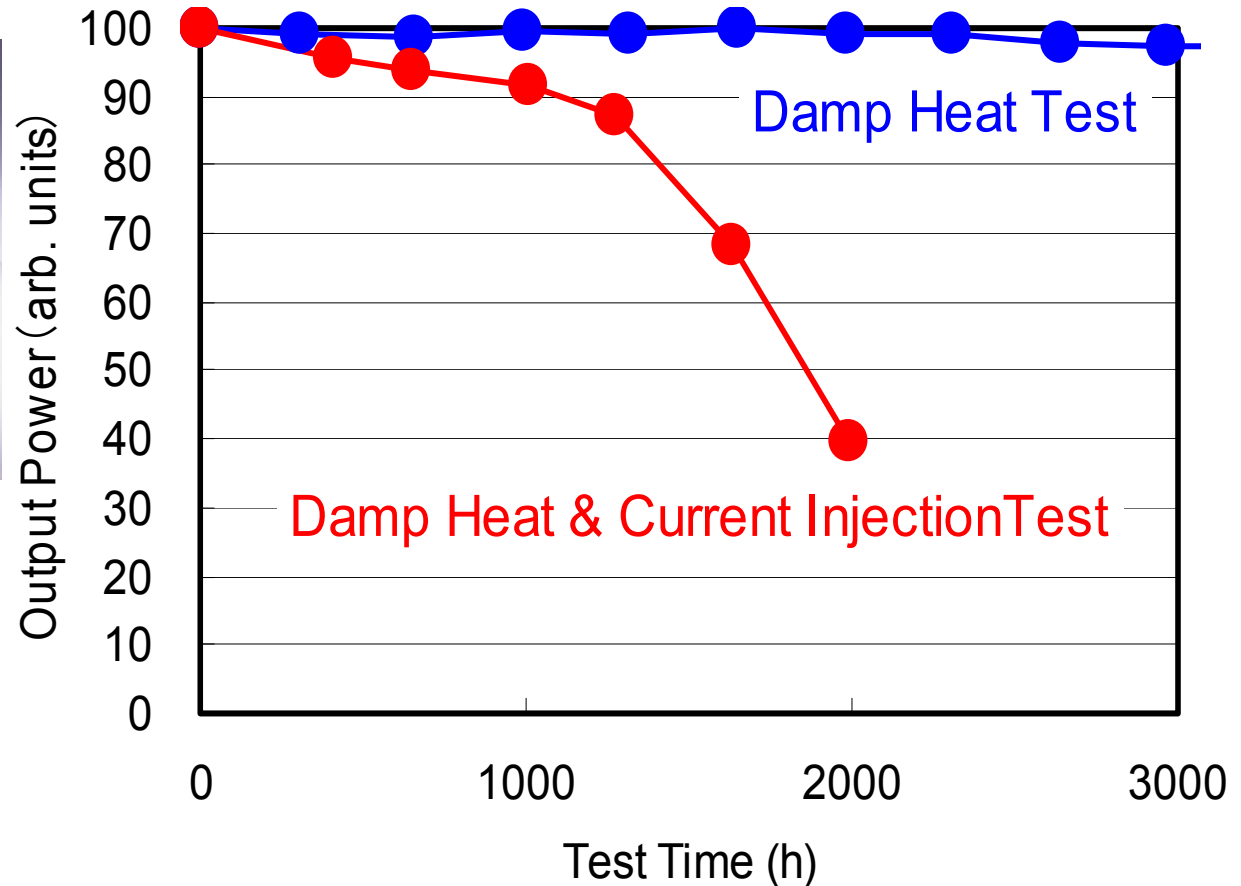


Current Injection during DH test: observation

Test results of prototype thin-Si flexible modules (note: not commercial models)



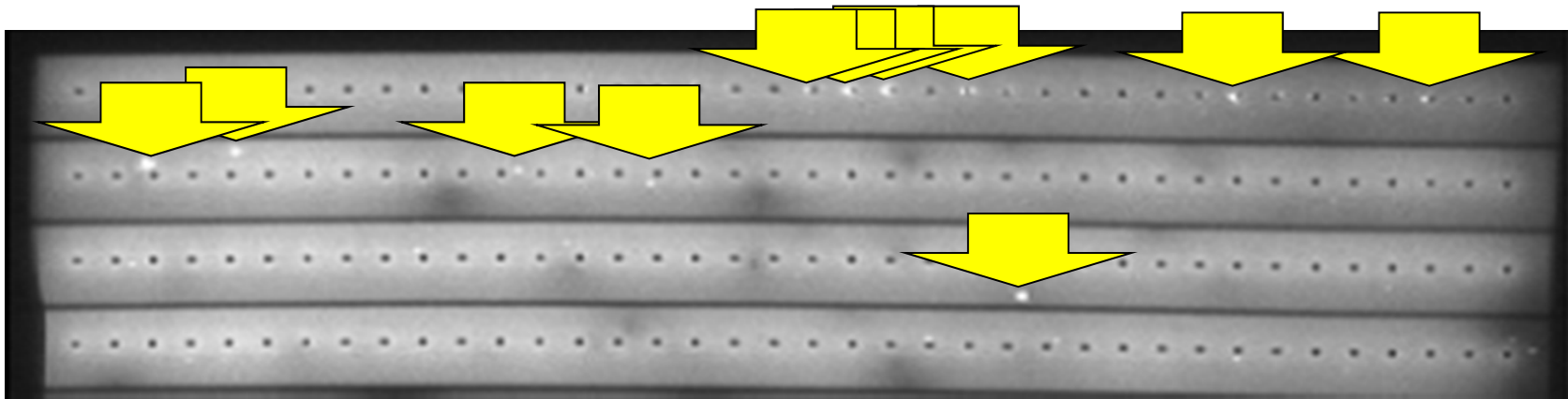
a-Si/a-SiGe Tandem Cell



A. Takano et al, *Acceleration Test of Combined Stressess for Flexible Thin Film Si Solar Modules*, 28th EUPVSEC, Paris, 30 Sep 2013 – 4 Oct 2013, 3BO.5.4.

Leak points in EL image

Electro Luminescence Image of a module after the “Damp Heat + Current Injection Test”.

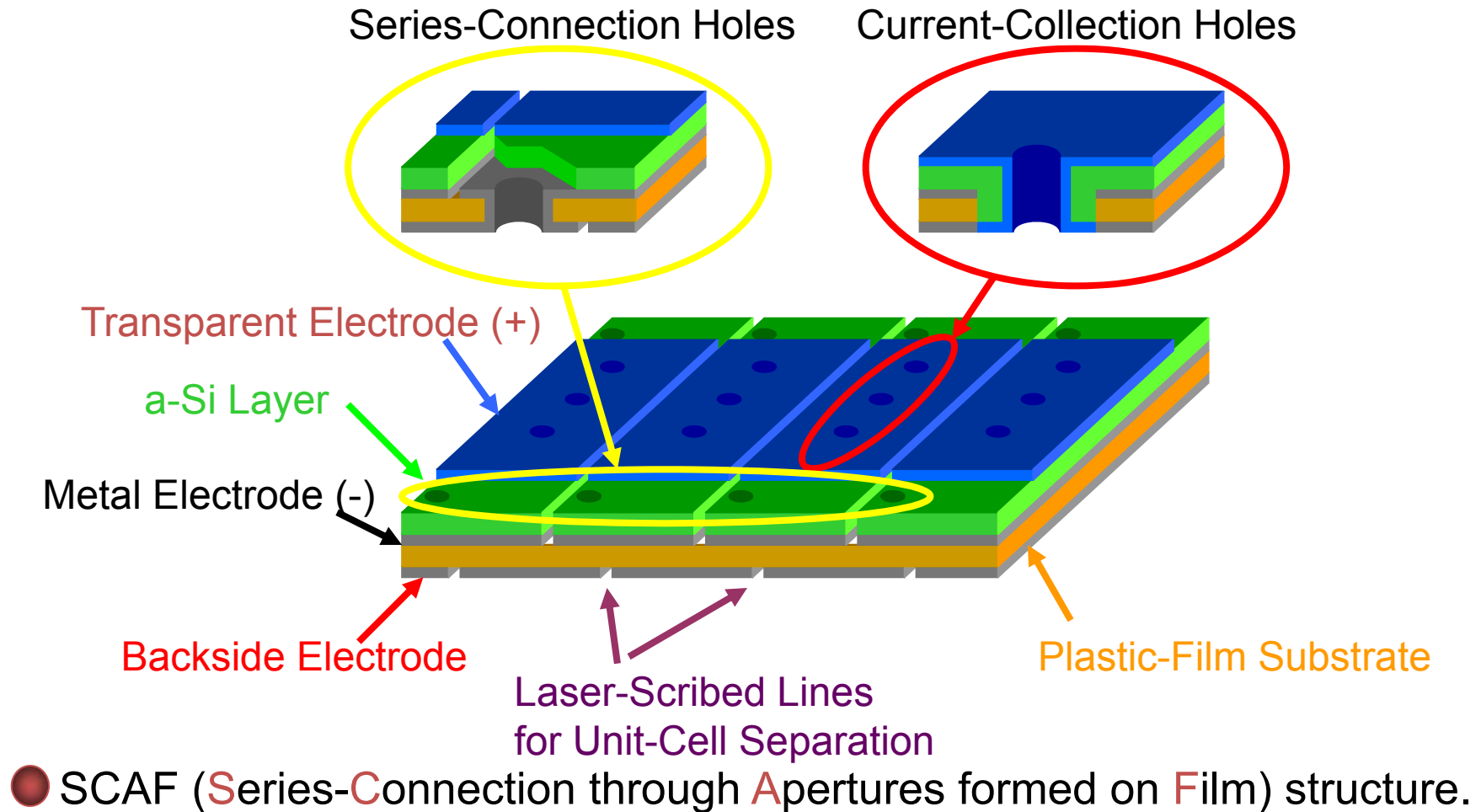


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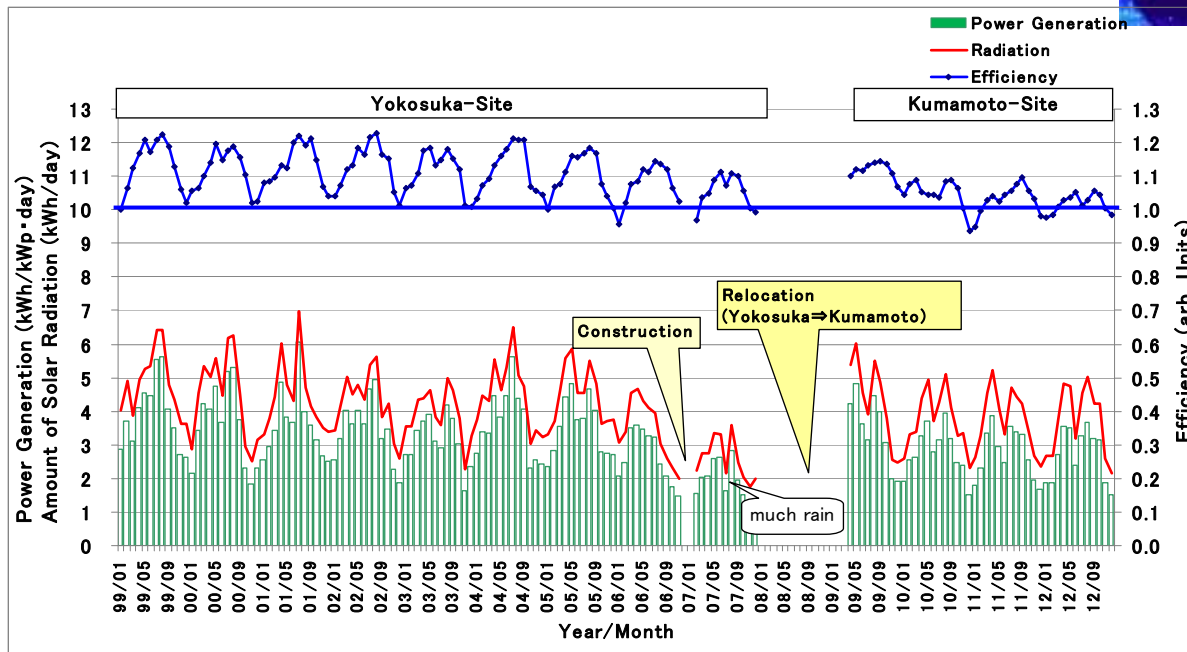
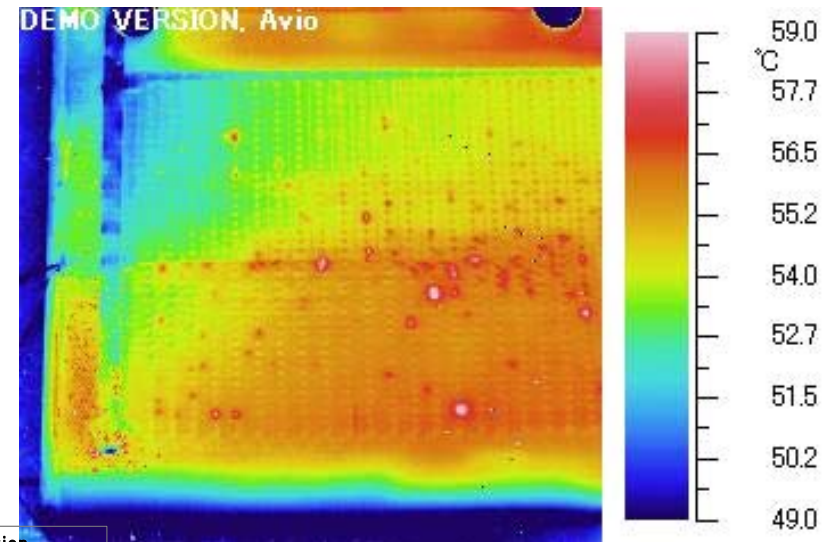
Bright spots = leak points around the interconnection holes (similar to what have been observed in the field)

EVA encapsulant may induce an hydrolysis reaction and form acetic acid in the module. Acetic acid may have caused the formation of defects (leak points).

Location of the leak points

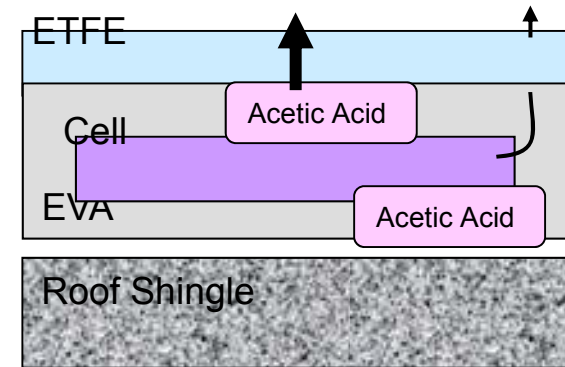
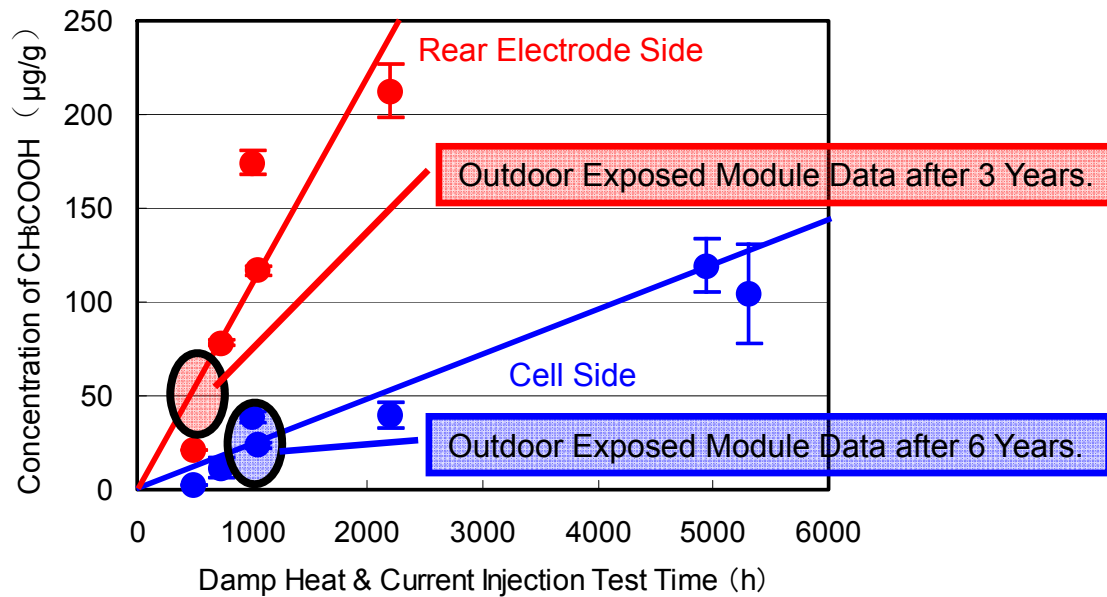


Similar results at outdoors

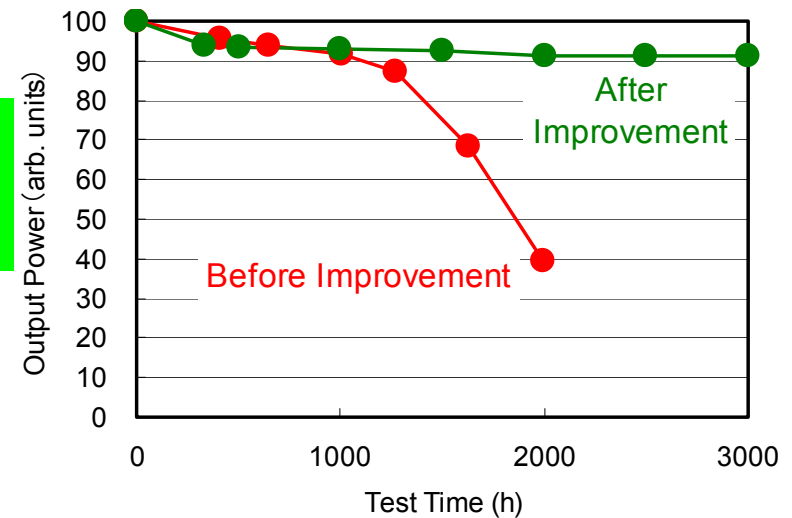


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Acetic acid from EVA?



Encapsulant
EVA ⇒ Polyolefin



What we can say now..

At least in one flexible thin film Si case:

- Conventional Damp Heat test could not reproduce one certain type of degradation observed in the field.
- Current injection during the Damp Heat test have reproduced a certain type of degradation.
- The degradation was eliminated by changing the encapsulant from EVA to Acetic-acid-free materials, such as Polyolefin or Ionomer.

Possibly,

- Adding current injection (or light irradiation) +DH tests may be recommended for QA of certain type of thin film Si flexible modules, especially of those using EVA.
- The same may apply on other types of flexible modules ... we need to check if it does or not.

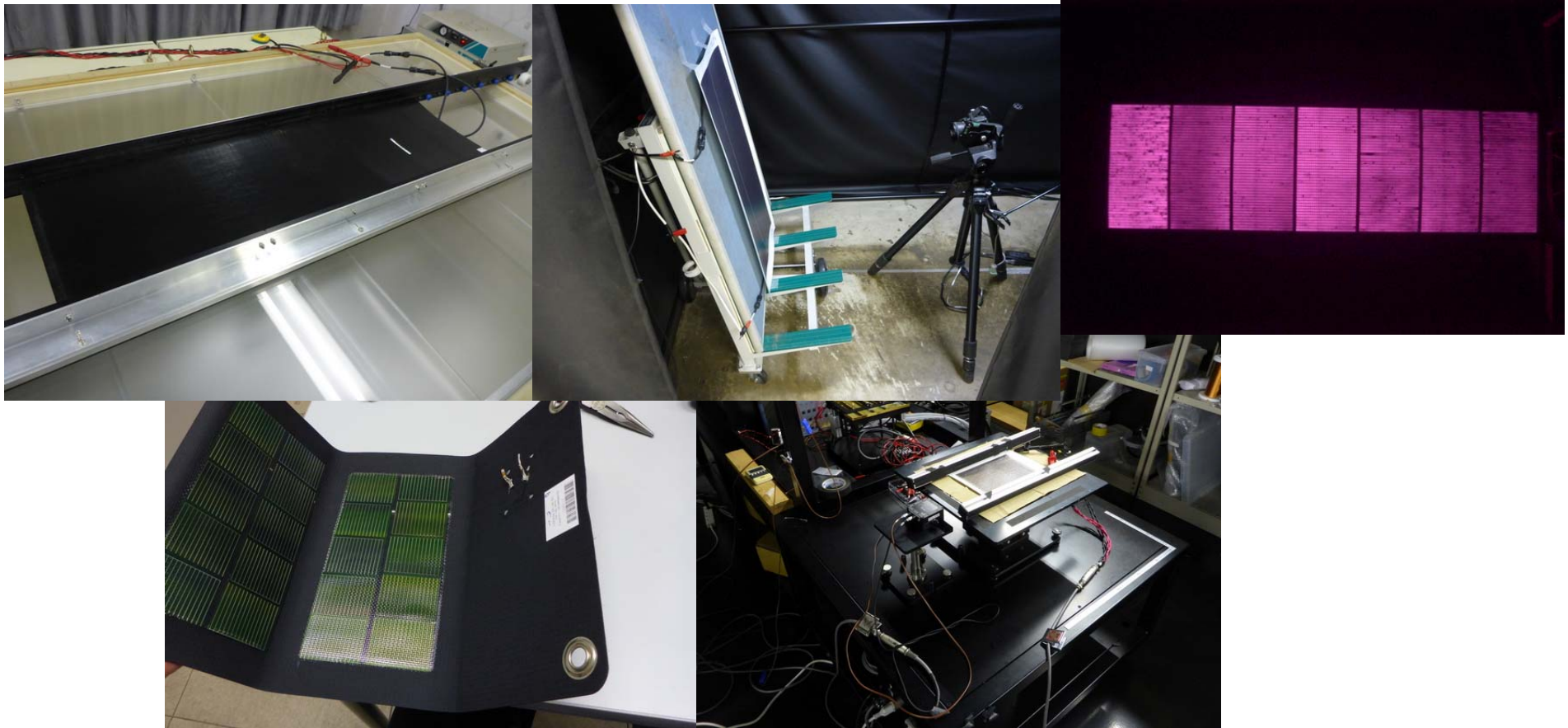
Activities of QA forum TG8 JP team

Compare “DH + Current” vs “DH + Light” vs DH on flexible modules

- ◆ Samples:
 - CIGS (Global Solar, Ascent Solar)
 - Thin Film Si (Fuji Electric)
- ◆ Test Condition
 - ✓ AIST & SolarFrontier : DH Chamber with Light
Light = max 1sun
 - ✓ Fuji Electric : DH Chamber with Current
Current = 1.5 / 1.0 / 0.5 times of I_{pm} .
 - ✓ Send same samples to FSEC&JABIL
- ◆ Evaluation
 - ✓ IV, EL, IR

TG8 JP: current status

- Samples have arrived to AIST
- initial measurement in progress



- will be distributed to other institutes soon
- first set of results expected to be available around May