

Testcenter Serial: 6001_Zora

Job ID: Scanoffice_001_23022021

Address: TUAS / Joukahaisenkatu 7

Country / City: FI 20520 Turku

Number of Modules: 3

Comments:

The study was performed by the TUAS MOBILE SOLAR Lab, calibrated on 28.2.2020 by MBJ Services GmbH. The references used for characterization was the TURU004 / 192M6H601312220 PERC Reference Module, calibrated at 1.4.2020 by Fraunhofer ISE – CalLab PV Modules, accredited by Deutsche Akkreditierungsstelle GmbH.

The expanded measurement uncertainty for the measured module types is 2.5% with a probability of 95%. The study included three (3) modules of the type Energetica e.Classic M HC black, rated at 360 Wp.

With a nominal power of 360 Wp the 2.5% measurement uncertainty means a range from 351...369 Wp. The average power of the measured modules was 349.4 Wp, which is below the rated nominal power and outside the uncertainty range.

In the electroluminescence images some slight mismatching between cells was visible. Additionally, the uncut edges of some of the half-cut cells were visibly darker the middle of the cells.

Some small cracks were visible on one of the modules, but not enough to affect the power measurements in any significant way.

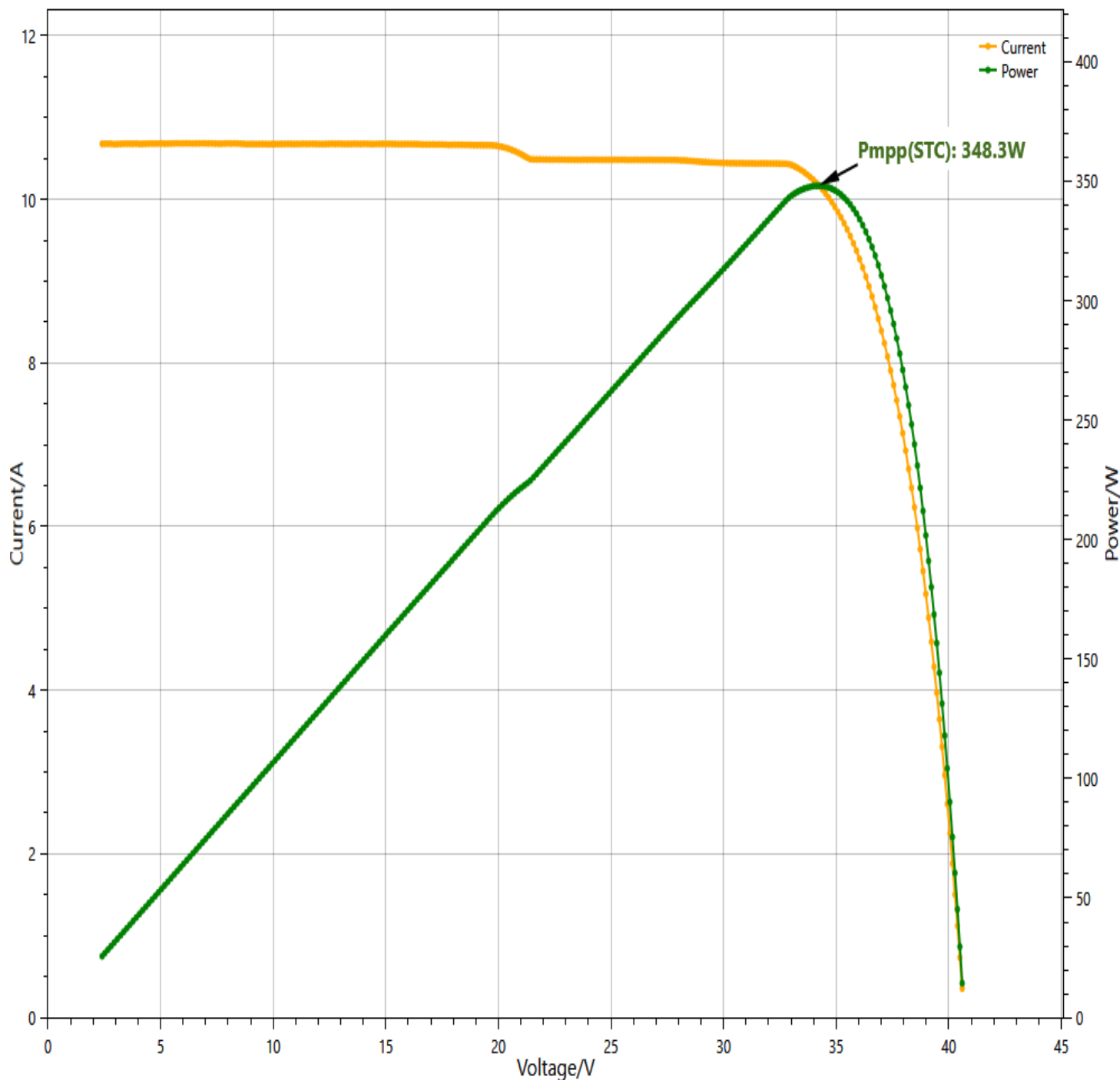
Additionally, all three Energetica panels failed the Diode Test, indicating that one or more diodes appear to be short-circuited.

MBJ Unique ID: 600120210223150320

Module ID: 002007342006531E

Type ID: Energetica / e.Classic_M_HC_black

I-V Curve



	Pmpp[W]	Impp[A]	Umpp[V]	Isc[A]	Uoc[V]	Irr[W/m2]	FF[%]
IEC60891 STC	348.3	10.17	34.24	10.67	40.70	1000.0	80.2
Measured	348.7	10.14	34.40	10.69	40.67	997.8	80.2

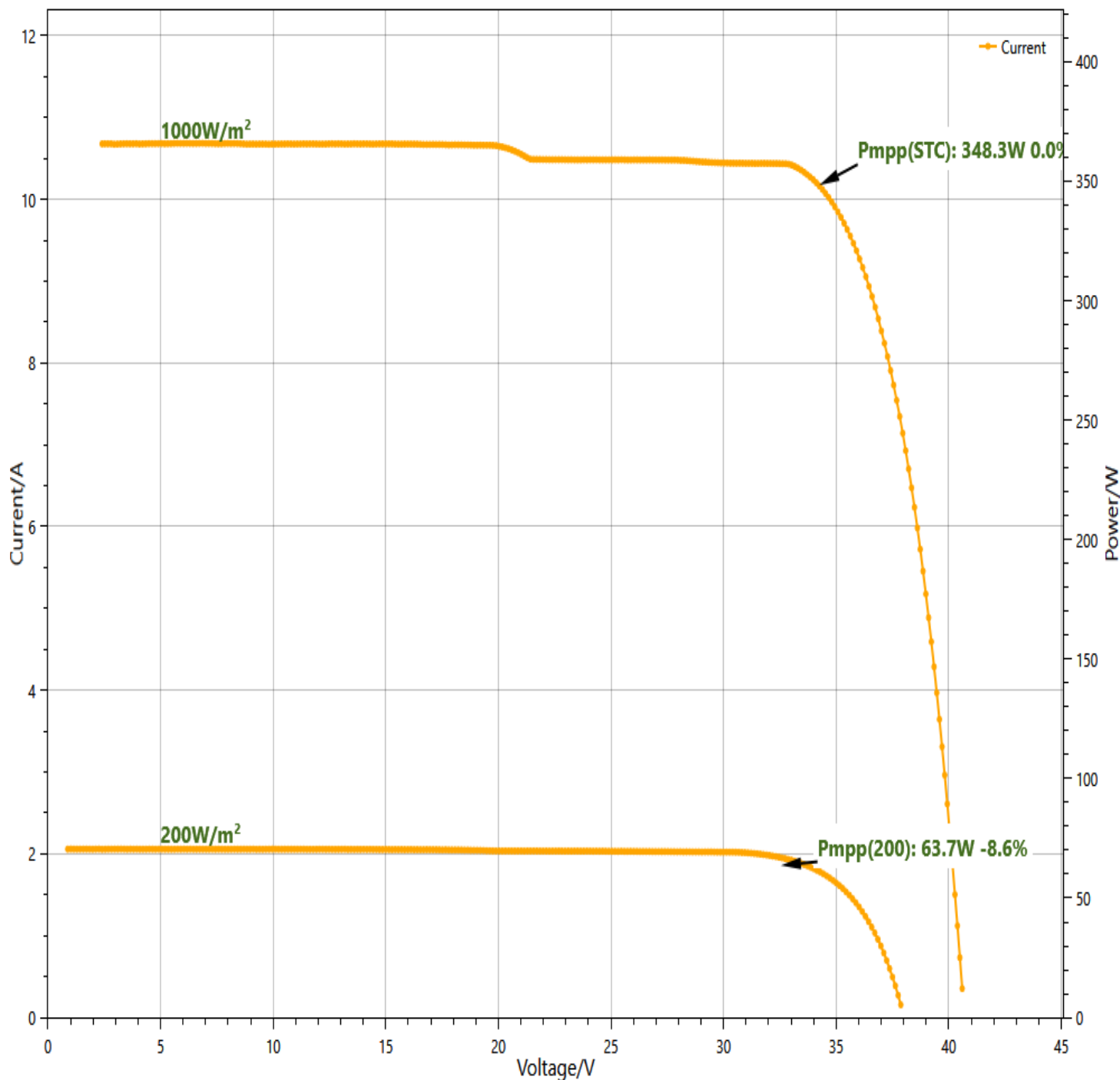
Tmod[°C]:25.1	Tref[°C]:26.2	Tfl[°C]:27.82	Tout[°C]:n/a	T[ms]:139.0
Type:Mono	alpha[%]:0.050	beta[%]:-0.260		
IEC aICF:0.060	IEC Rs[Ohm]:0.01	kappa[mOhm/K]:3.00		
Software:748p		Reference: ISE_PERC_Reference		
		FFCorr: -0.572%		

MBJ Unique ID: 600120210223150320

Module ID: 002007342006531E

Type ID: Energetica / e.Classic_M_HC_black

I-V Curve



IEC60891 Irr [W/m2]	200	1000
IEC60891 Pmpp [W]	63.7	348.3
Module Eff [%]	17.2	18.8
Eff Delta [%]	-8.6	0.0

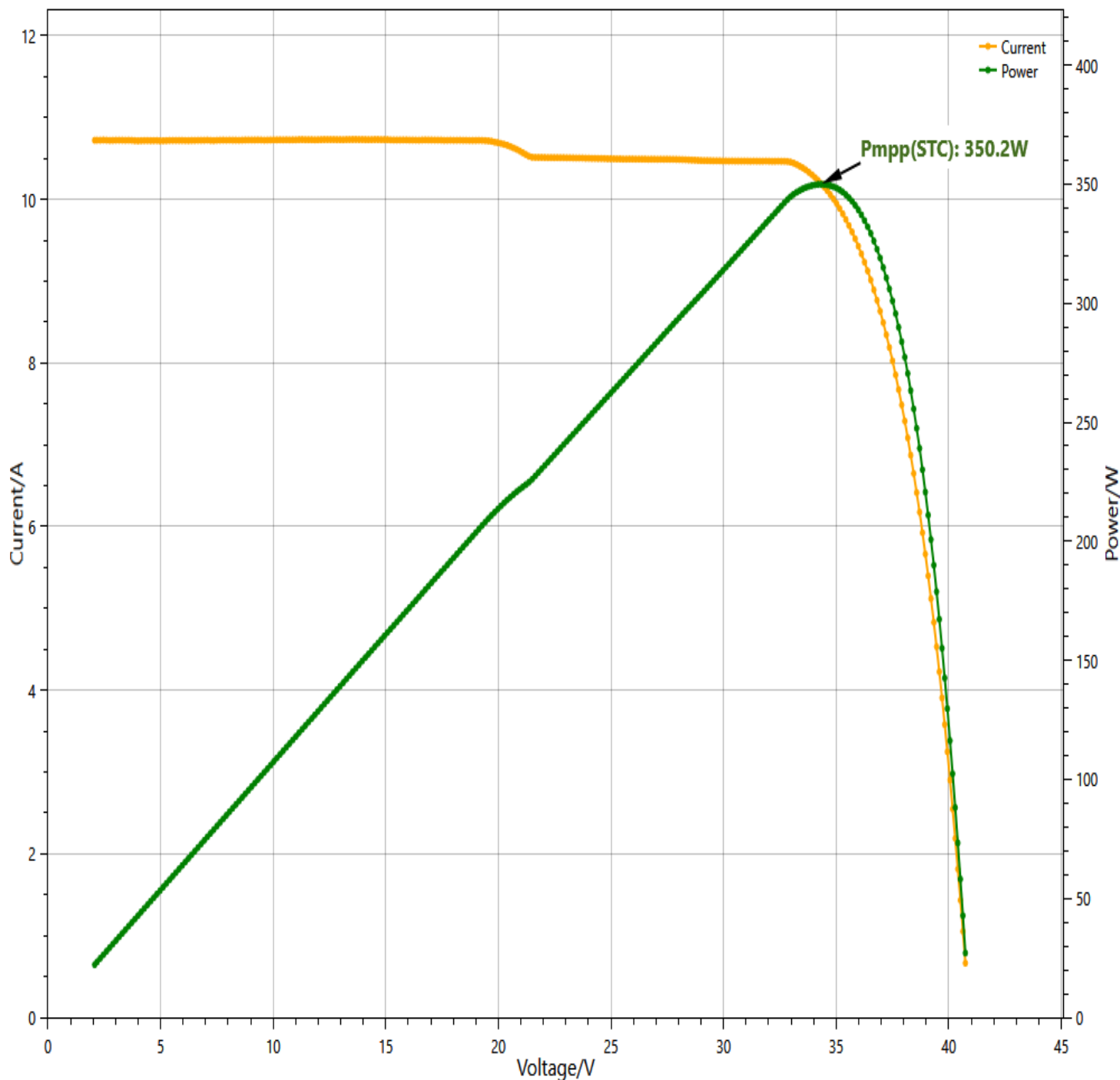
Measured [W/m2] 203.0 997.8
Module Width/Height (Portrait) [mm]:1042*1780

MBJ Unique ID: 600120210223145755

Module ID: 002007342006735E

Type ID: Energetica / e.Classic_M_HC_black

I-V Curve



	P _{mp} [W]	I _{mp} [A]	U _{mp} [V]	I _{sc} [A]	U _{oc} [V]	I _{rr} [W/m ²]	FF[%]
IEC60891 STC	350.2	10.19	34.36	10.72	40.93	1000.0	79.8
Measured	352.2	10.14	34.72	10.72	41.07	997.2	80.0

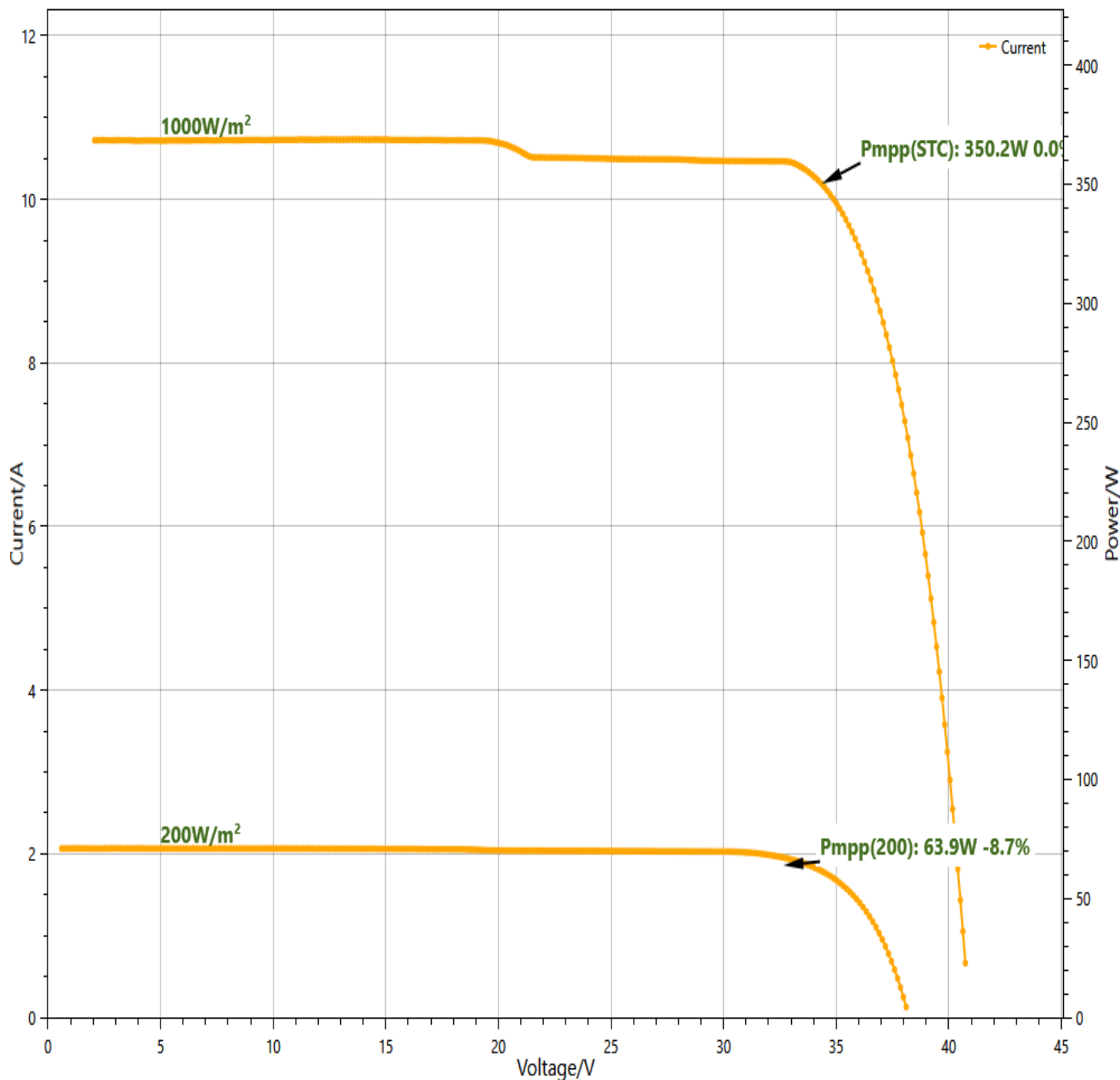
T _{mod} [°C]:23.6	T _{ref} [°C]:26.3	T _{fl} [°C]:27.11	T _{out} [°C]:n/a	T[ms]:140.5
Type:Mono	alpha[%]:0.050	beta[%]:-0.260		
IEC aICF:0.060	IEC R _s [Ohm]:0.01	kappa[mOhm/K]:3.00		
Software:748p		Reference: ISE_PERC_Reference		
		FFCorr: -0.572%		

MBJ Unique ID: 600120210223145755

Module ID: 002007342006735E

Type ID: Energetica / e.Classic_M_HC_black

I-V Curve



IEC60891 Irr [W/m2]	200	1000
IEC60891 Pmpp [W]	63.9	350.2
Module Eff [%]	17.2	18.9
Eff Delta [%]	-8.7	0.0

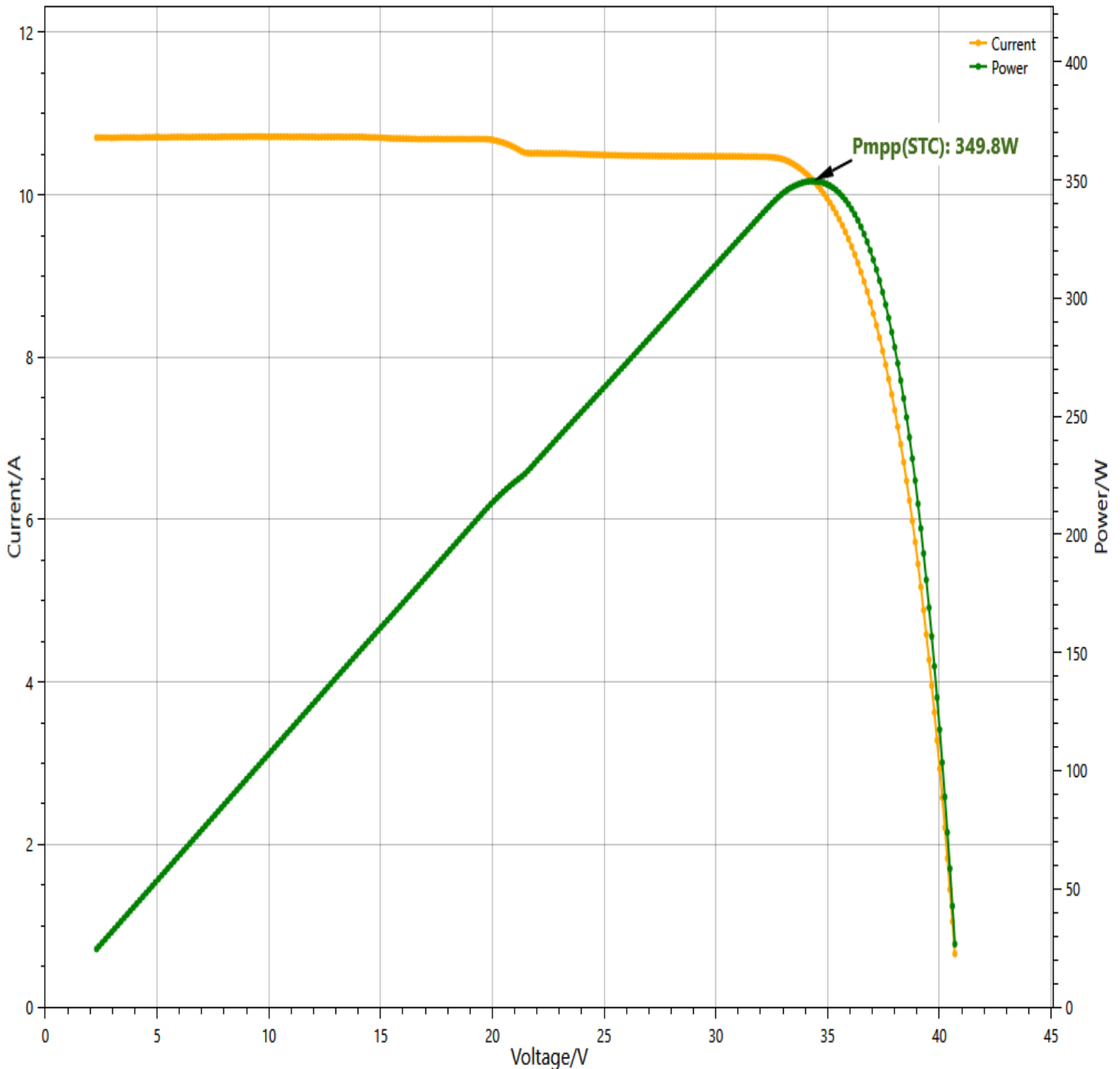
Measured [W/m2] 202.7 997.2
Module Width/Height (Portrait) [mm]:1042*1780

MBJ Unique ID: 600120210223145102

Module ID: 002007342006736E

Type ID: Energetica / e.Classic_M_HC_black

I-V Curve



	P _{mp} [W]	I _{mp} [A]	U _{mp} [V]	I _{sc} [A]	U _{oc} [V]	I _{rr} [W/m ²]	FF[%]
IEC60891 STC	349.8	10.17	34.38	10.70	40.87	1000.0	80.0
Measured	349.2	10.14	34.44	10.72	40.77	997.6	79.9

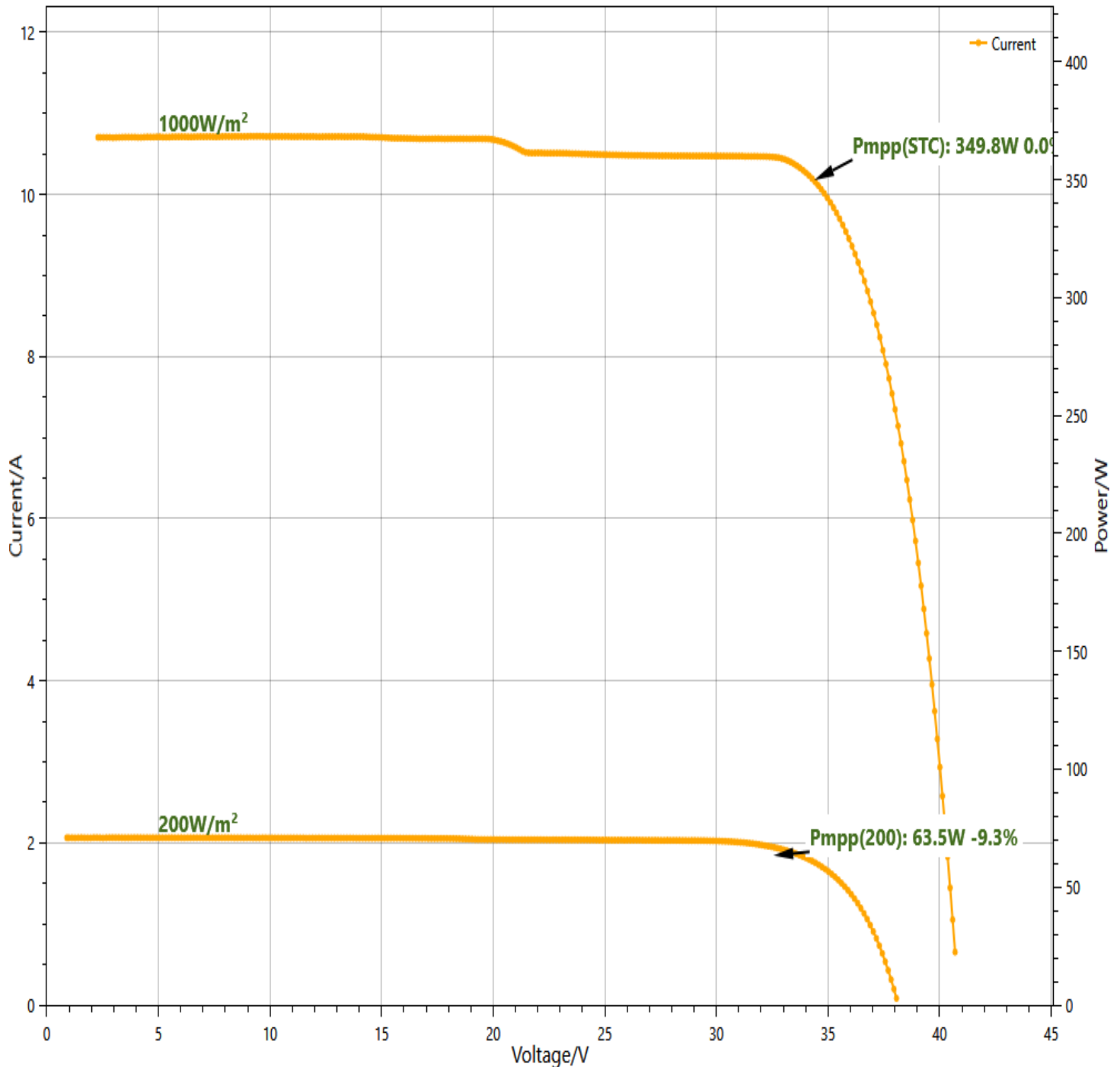
T _{mod} [°C]:25.8	T _{ref} [°C]:26.2	T _{fl} [°C]:28.07	T _{out} [°C]:n/a	T[ms]:139.5
Type:Mono	alpha[%]:0.050	beta[%]:-0.260		
IEC aICF:0.060	IEC R _s [Ohm]:0.01	kappa[mOhm/K]:3.00		
Software:748p		Reference: ISE_PERC_Reference		
		FFCorr: -0.572%		

MBJ Unique ID: 600120210223145102

Module ID: 002007342006736E

Type ID: Energetica / e.Classic_M_HC_black

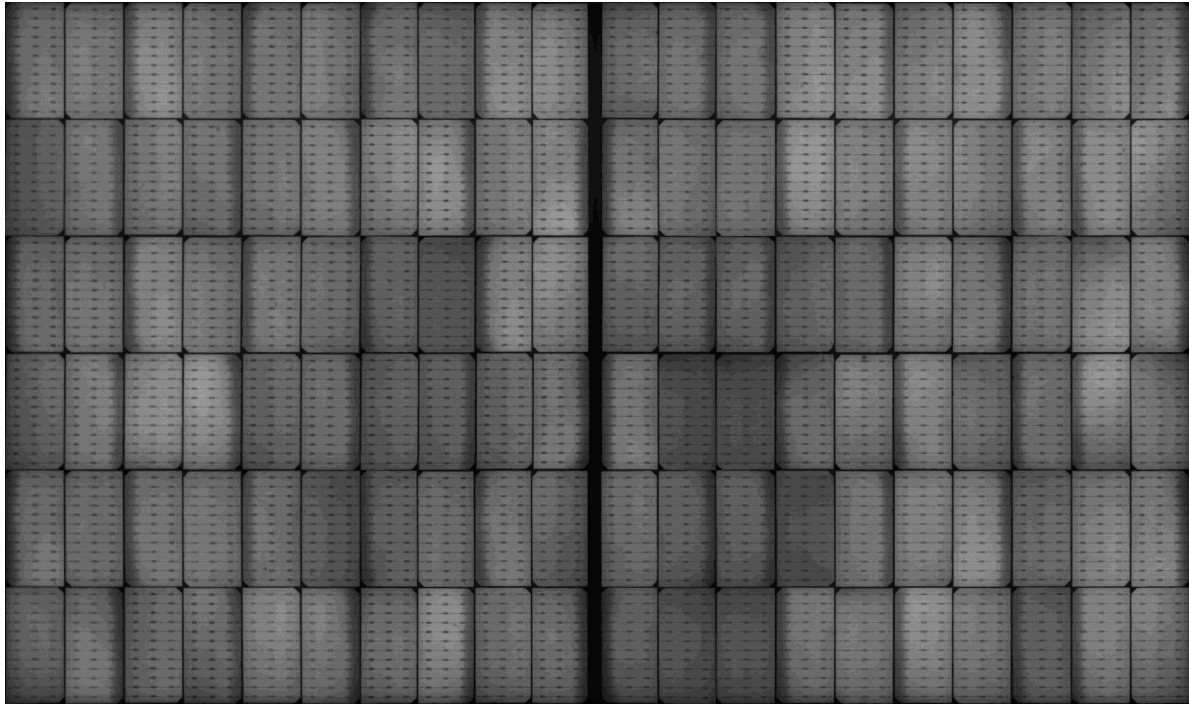
I-V Curve



IEC60891 Irr [W/m2]	200	1000
IEC60891 Pmpp [W]	63.5	349.8
Module Eff [%]	17.1	18.9
Eff Delta [%]	-9.3	0.0

Measured [W/m2] 202.8 997.6
Module Width/Height (Portrait) [mm]:1042*1780

Electroluminescence for 600120210223150320

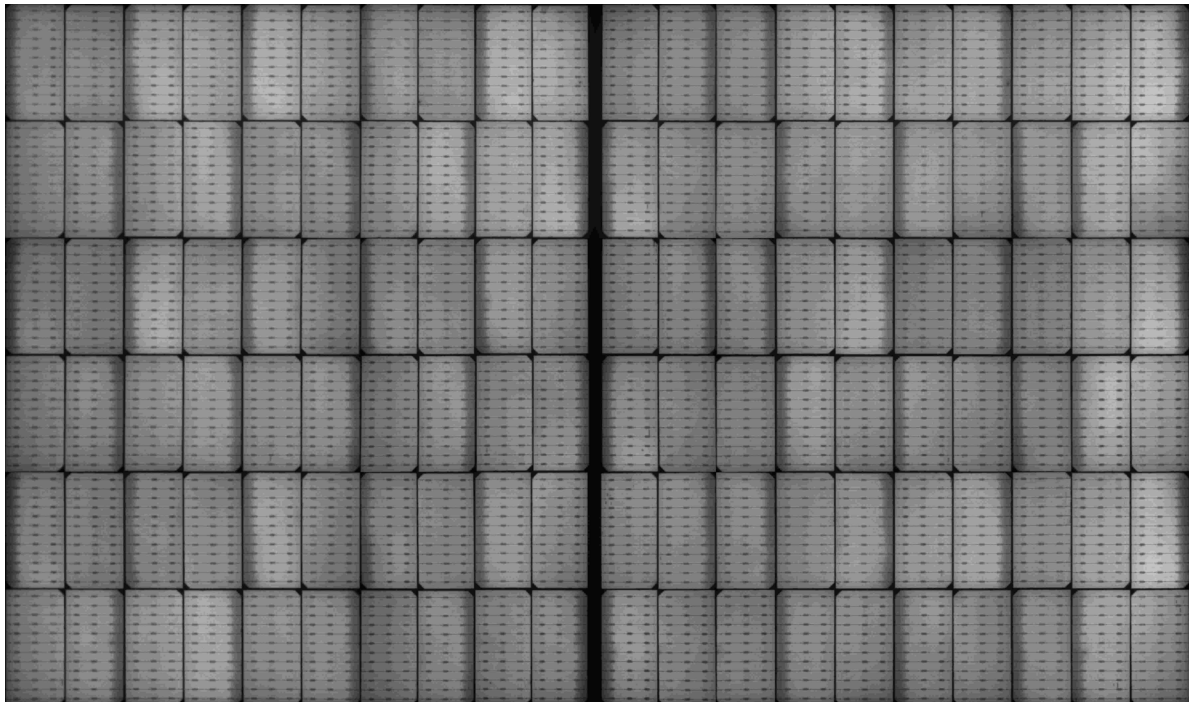


Current[A]: 12.020

Voltage[V]: 44.710

Exposure Time [ms]: 500

Electroluminescence for 600120210223145755

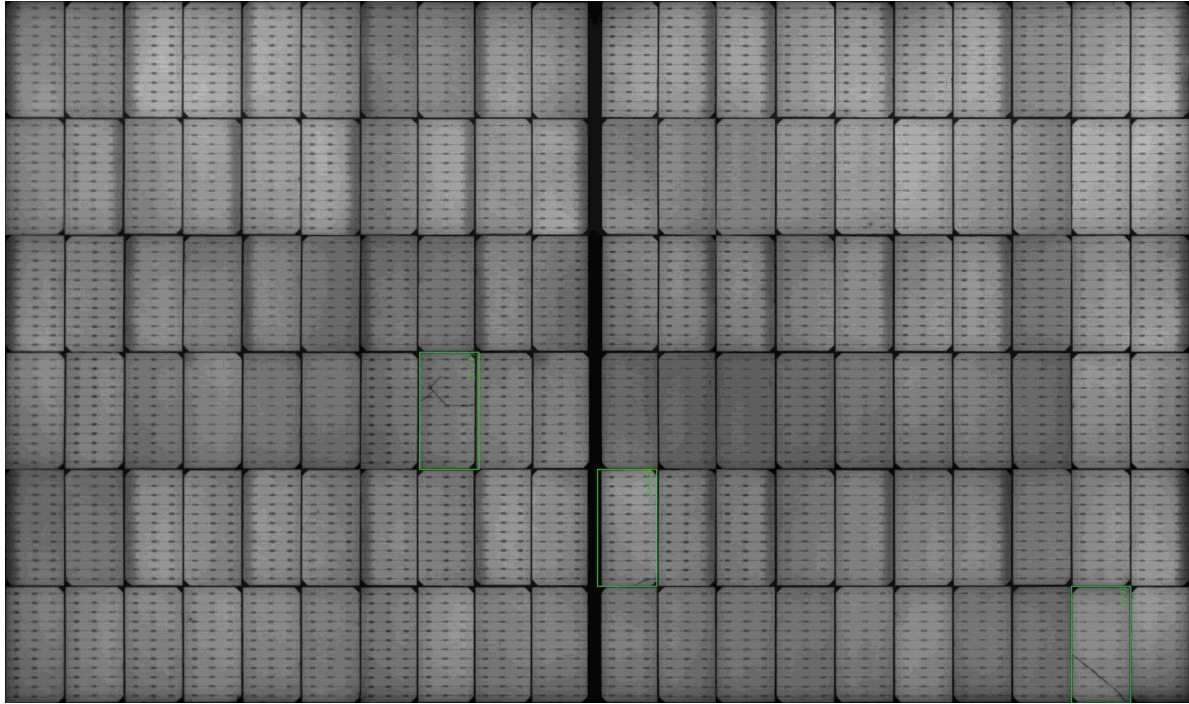


Current[A]: 12.020

Voltage[V]: 44.710

Exposure Time [ms]: 500

Electroluminescence for 600120210224151925



Current[A]: 12.020
Exposure Time [ms]: 500

Voltage[V]: 44.390

MBJ Unique ID	Module ID	Module Type/Description	Judgment
600120210223150320	002007342006531E	Energetica e.Classic_M_HC_black	ClassD
600120210223145755	002007342006735E	Energetica e.Classic_M_HC_black	ClassC
600120210223145102	002007342006736E	Energetica e.Classic_M_HC_black	ClassC

MBJ Unique ID	Connection Check	Diode Test	HiPot Test	GND Bond Tests		
				Port 1	Port 2	Port 3
600120210223150320	Successfull	One or more diodes appear to be short-circuited	n/a	n/a	n/a	n/a
600120210223145755	Successfull	One or more diodes appear to be short-circuited	n/a	n/a	n/a	n/a
600120210223145102	Successfull	One or more diodes appear to be short-circuited	n/a	n/a	n/a	n/a

MBJ Unique ID	Pmpp[W]	Impp[A]	Umpp[V]	Isc[A]	Uoc[V]	Irr[W/m2]	FF[%]
600120210223150320	348.3	10.17	34.24	10.67	40.70	1000.0	80.2
600120210223145755	350.2	10.19	34.36	10.72	40.93	1000.0	79.8
600120210223145102	349.8	10.17	34.38	10.70	40.87	1000.0	80.0

MBJ Unique ID	Red	Yellow	Green	Blue	White
600120210223150320	0	0	0	0	120
600120210223145755	0	0	0	0	120
600120210223145102	0	0	3	0	117