

PERC/HJT/TOP-Con PV Solar Cell Efficiency-Loss Analysis Solution QE-RX

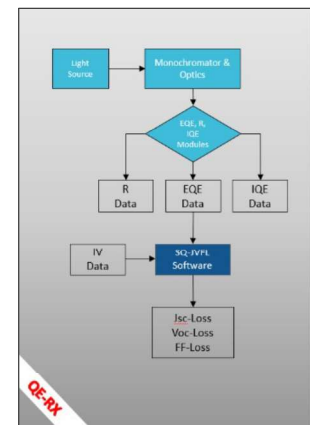
Introduction

QE-RX is a photovoltaic cell efficiency loss analyzer for high-efficiency solar cell research and development. Since 2015, the loss mechanism is the key information to improve the conversion efficiency of high-efficiency solar cells such as PERC, HJT, TOP-Con, etc. Conversion efficiency losses can be attributed to three factors, including short-circuit current density (J_{sc}), open-circuit voltage (V_{oc}), and fill factor (FF) losses. The QE-RX can not only measure PV-EQE, reflectance and PV-IQE data, but also analyze J_{sc} , V_{oc} and FF losses in conjunction with the analysis software SQ-JVFLA. Enlitech integrated three different test functions in QE-RX and developed SQJVFLA software to help users analyze three different losses using based on Shockley-Queisser thermal limit theory. QE-RX is your best partner for improving photovoltaic efficiency.



Application

- ◆ PERC / HJT/ TOP-Con – Loss Analysis (J_{sc} , V_{oc} , FF)
- ◆ IEC-60904-8 Spectral Response Measurement
- ◆ IEC-60904-7 Mis-match factor calculation
- ◆ IEC-60904-1 MMF Calibration
- ◆ Quality Control for Solar Cells Manufacturing Process
- ◆ Bandgap Analysis of Solar Cells



Specification / Product Selection Guide

- ◆ For PESC, PERC, PERL, HJT, back contact, bifacial and TOP-Con silicon solar cells.
- ◆ Provides data on QE (quantum efficiency), PV-EQE (external quantum efficiency), IPCE (incident photon-electron conversion efficiency), SR (spectral response), IQE (internal quantum efficiency) and reflectivity.
- ◆ Equipment is with a compact structure and highly repeatability over 99.5%.
- ◆ Measuring wavelength range: 300~1200 nm
- ◆ ISO/IEC 17025 accredited journal articles submit exclusive EQE uncertainty assessment reports and quality control.
- ◆ Diversified and customized sample testing devices.

Jsc loss analysis & report

- ARC reflection loss
- Metal shadow loss
- Front surface escape loss
- Blue light loss
- NIR parasitic absorption loss
- Base charge collection loss
- Non-uniform loss

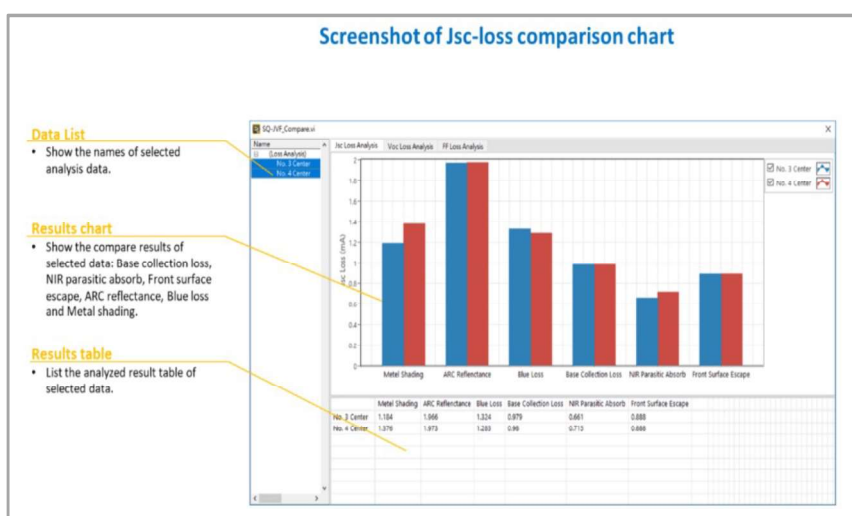
Voc loss analysis & report

- Thermodynamic loss (E1 loss)
- Radiative recombination loss (E2 loss, e.g. bandgap, doping, defects)
- Non-radiative loss (E3 loss, e.g.: metal-semiconductor junction loss, junction loss, etc.)

FF loss analysis & report

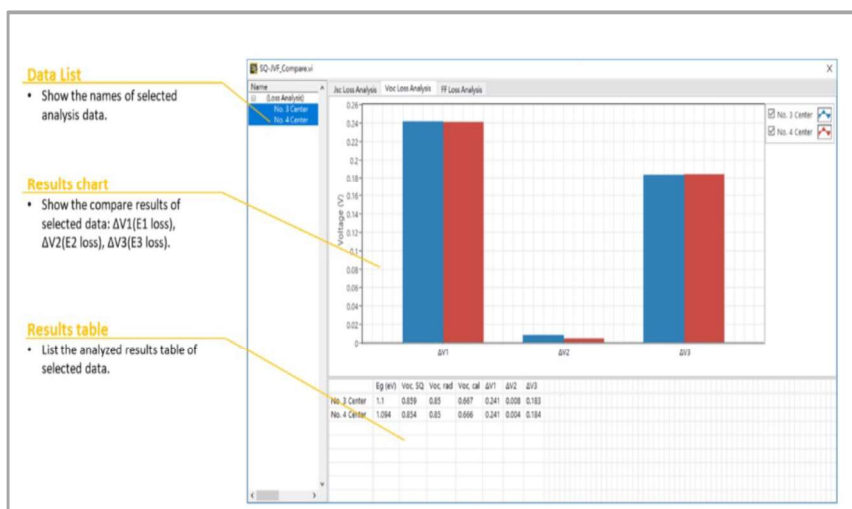
- Absolute FF loss due to R_s
- Absolute FF loss due to R_{sh}
- Absolute FF loss due to J_{02} diode recombination components

Testing Results / Publications



Jsc loss analysis of different manufacturing processes

Loading the spectral data from QE-RX into the SQ-JVFLA software, SQ-JVFLA can automatically analyze various factors which cause short circuit current density Jsc loss. These factors include ARC reflection loss, metal shielding loss, front surface escape loss, blue light loss, NIR parasitic absorption loss, etc. The test data of two different processes can be loaded at the same time, and the specific gravity analysis of different loss factors can be compared through the software, thereby providing the basis and direction for process modification.



Voc loss analysis of different manufacturing processes

Loading the spectral data from QE-RX into the SQ-JVFLA software, SQ-JVFLA can automatically analyze a variety of factors that cause the loss of open circuit voltage Voc, including thermodynamic loss (E1 loss), radiative recombination loss (E2 loss), non-radiative loss (E3 loss) loss etc. The test data of two different processes can be loaded at the same time, and the specific gravity analysis of different loss factors can be carried out through the software, thereby providing the basis and direction for process modification.

