System-Oriented Modelling for Estimation of Solar Power Generation and Optical Optimisation of Solar Cells and Modules

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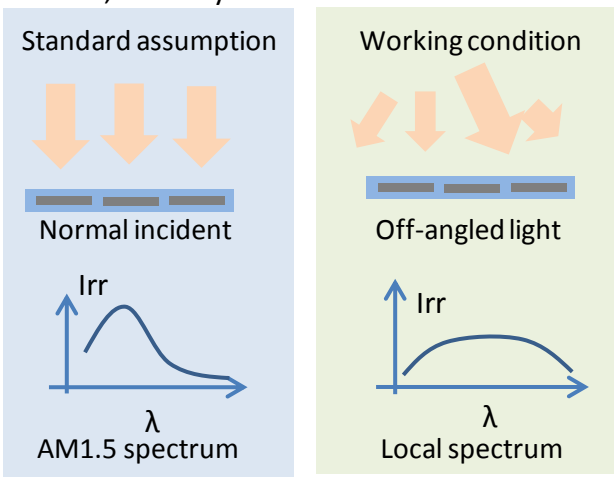
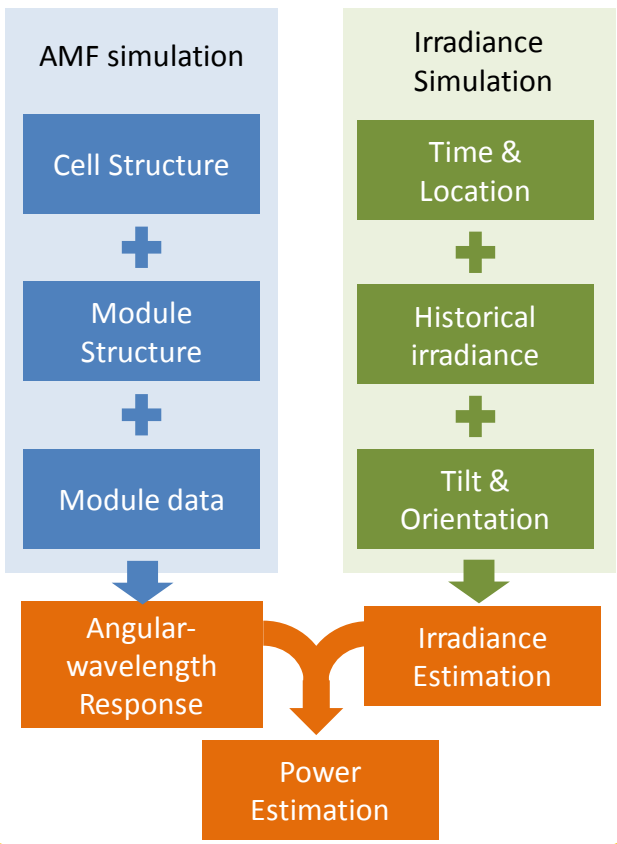
1. Problems

Traditionally, the optical designs of solar cells have been optimised under the assumption of normal incident light and AM1.5 spectrum. However, depending on where a module is installed, this may not be accurate.



2. System-Oriented Modelling



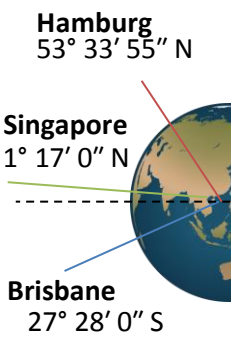
3. System Generation Estimation

The AMF-based method can be used to accurately model and estimate system performance. It can potentially support system design, monitoring, fault analysis and generation-load balance strategies.

The AMF-based method was demonstrated to be more accurate and more consistent compared with the traditional method .

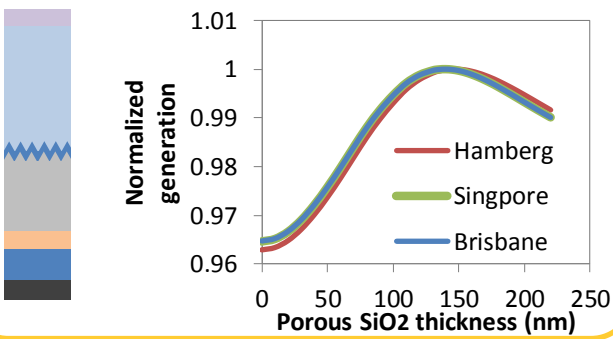
Methods	Traditional method	AMF-based
Simulation/ measurement	1.03	1.006
Error	3%	0.6%
STD of ratio	0.27	0.16

4. Cells and Modules Optimisation



The porous SiO_2 glass-ARC of a module with PERC cell (left) was optimised for 3 cities having different latitudes and air masses.

It shows an improvement of up to 3.75%. As the latitude increases, both the optimised ARC thickness and enhancement of power generation increase.



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