Variability in NOCT Standard Test Results as a Function of Day, Time of Day, and TC location

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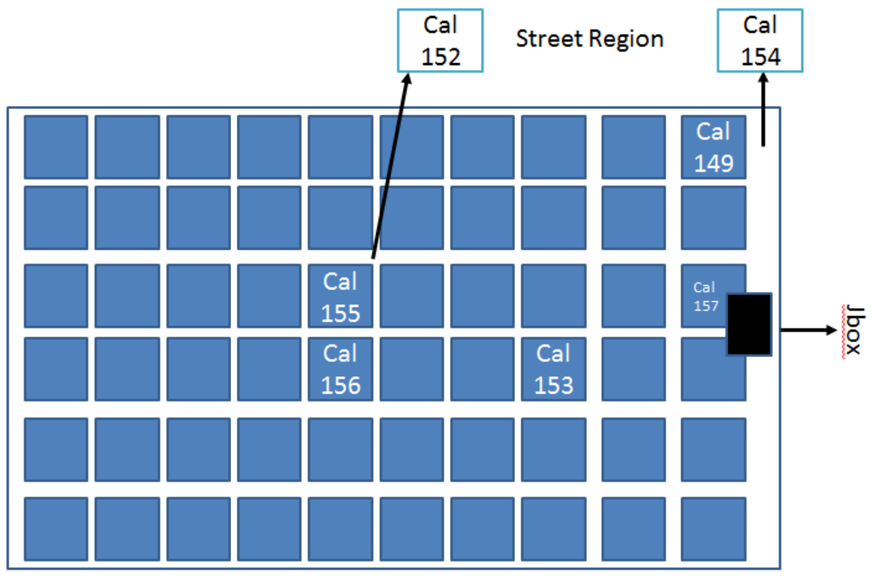
Purpose

The purpose of this investigation is to quantify the major components of variation in the Determination of NOCT test as performed according to section 10.5 of the IEC 61215 standard.

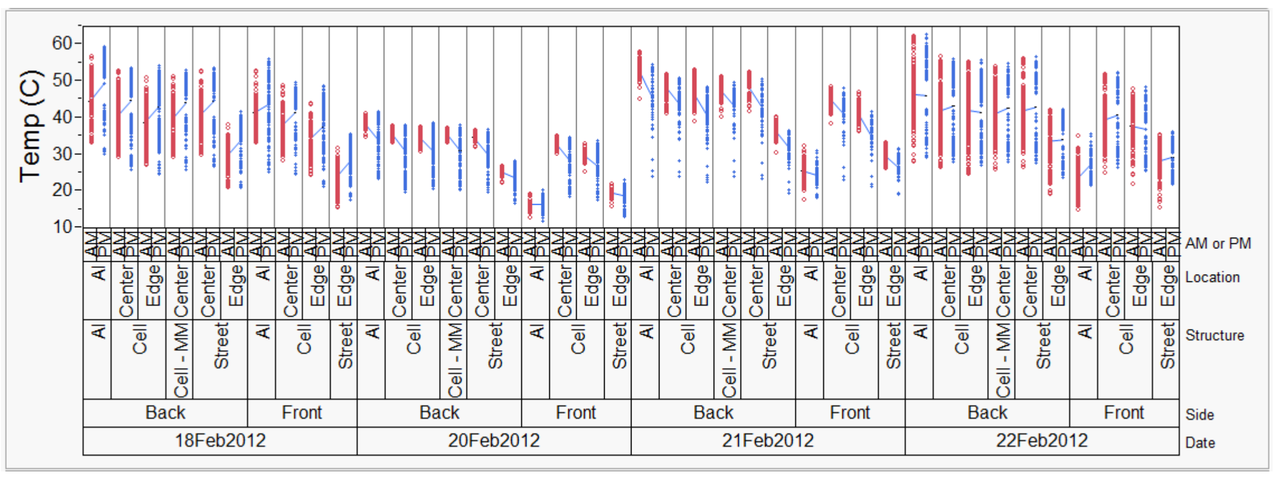
Test Setup

- Tests conducted at CFV Solar Test Laboratory in Albuquerque, NM
- Test stand setup according to IEC 61215 requirements

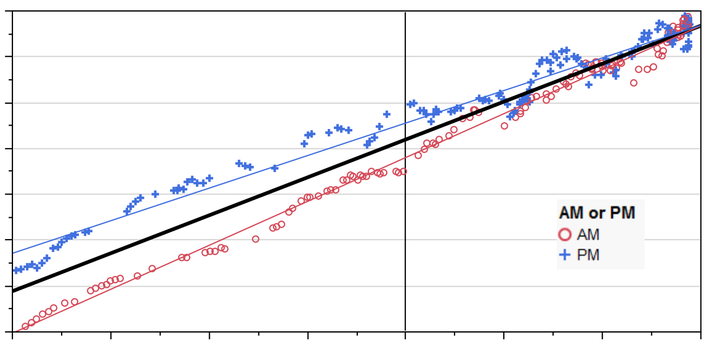


Config. #	TC IDs
1	Cal 156, 155,152
2	Cal 157, 156, 155
3	Cal 153, 154, 152
4	Cal 157, 156, 153, 154, 155, 149, 152
5	Cal 156, 154, 155, 152, 237, 244, 236

Results



- Module component temperatures are similar for Al plates, center cells, edge cells, and street regions in the center of the module
- Temperatures on the front side of the module are lower than the back side
- Temperature of mis-matched cell under short circuit is approximately the same as other center cell temperatures during NOCT test



Difference in temperature delta from morning and afternoon on a previously tested crystalline module

Conclusion

NOCT TEST DATA- OPEN CIRCUIT, DIFFERENT TC KONFIGURATION FEBRUARY 2012						
Date	18-Feb	20-Feb	21-Feb	22-Feb	Average	Range
Time (start/end)	9:15-16:35	11:04-16:37	09:57-15:53	8:31-16:34		
# data points	432	321	340	470		
Ambient Temp C, average	9.7	7.3	11.4	13.7		
Wind Speed m/s, average	1.03	1.6	1.6	1.30		
Irradiance range W/m^2	404.7-1133	400.4-1165	520.5-1142	415.1-1184		
Irradiance W/m^2, average	932.78	942.36	1003.68	851.87		
NOCT correction factor, C	-1	0	0	0		
NOCT reported, TC config 1	44.5	45.8	45.5	43	44.7	1.3
NOCT reported, TC config 2	46.9	42.8	45.6	47	45.6	4.1
NOCT reported, TC config 3	44.2	40.3	43.1	44.4	43.0	3.9
NOCT reported, TC config 4	45.6	41.8	44.5	45.9	44.5	3.8
NOCT reported, TC config 5	42.9	39.1	42.1	43.3	41.9	3.8
NOCT average C, TC config 1-5	44.8	42.0	44.2	44.7		
NOCT range C, TC config 1-5	4.0	6.7	3.5	4.0		

- Accurate estimate of module temperature is critical to NOCT measurements
- Based on these data, the estimate of module temperature using estimates from the back side, center proved most repeatable from day to day
- Estimates of module temperature result in a 4 degree difference depending on TC configuration, even on a clear day with low wind

Literature Review:

- IEC 61215. Crystalline silicon terrestrial photovoltaic (PV) modules – Design qualification and type approval 2006
- M. Pellegrino, C. Cornaro, S. Bartocci, G D'Angiolini, G.Flaminio, V. Giglio, A. Matano, G. Nardelli, A. Ortense, and A. Spena, Proceedings of the 24th European Photovoltaic Solar Energy Conference, 21-25 September 2009, Hamburg, Germany
- Ruhi Bharti, Joseph Kuitche, Mani G. TamizhMani, ''Nominal Operating Cell Temperature (NOCT): Effects of module size, Loading and solar spectrum" in: Proceedings of the IEEE Photovoltaic Specialist Conference, September, 2009.
- Matthew Muller, "Measuring and Modeling Nominal Operating Cell Temperature (NOCT)" in: PV Performance Modeling Workshop Albuquerque, NM, September 22-23, 2010.