

ECR-00991

ARM Radiometer Ventilation Improvements

**Results from Initial Broadband
Radiometer Ventilator Fan
Evaluation**

AC and DC Fans under Test

Fan Manufacturer	Part Number	Type	Test Designation
Delta Electronics	QFR0812SH-F00	12VDC	A
Sunon	PMD1208PKB1-A.(2).GN	12VDC	B
Delta Electronics	FFB0812VH	12VDC	C
Delta Electronics	FFB0812VHE-F00	12VDC	D
Delta Electronics	FFB0812VH-T500	12VDC	E
Pelonis	K8038L12BPLB2-7	12VDC	F
Sanyo Denki	109-043UL	115VAC Present Eppley	G
Comair Rotron	SUZA1 "Sprite"	115VAC Original Eppley	H </tr



Bench Measured Fan Flow Characteristics

Test Designation	Measured Volumetric Flow Rate (cfm)	Measured Static Pressure (in H ₂ O)	Measured Electrical Power (W)	Overall Rank Based on Flow Characteristics
A	5.6	0.25	2.5	2
B	5.9	0.29	3.8	1
C	5.0	0.23	3.1	5
D	5.5	0.27	3.4	3
E	4.9	0.21	3.0	6
F	5.1	0.24	2.6	4
G (present Eppley)	4.1	0.13	8.6	7

Outdoor Test Setup

Test Layout (PSP tp signal, ventilator temperature and intake temp measured)

Installation Configuration (PSP/Fan pairs)

Ventilator	Set 1 1/9/2014 to 1/25/2014 Fan Designation	Set 2 1/25/2014 to 2/22/2014 Fan Designation
1	H	H
2	E	C
3	B	A
4	D	F
5	G	G



Operational Observations

(frost clearing AC vs. DC)

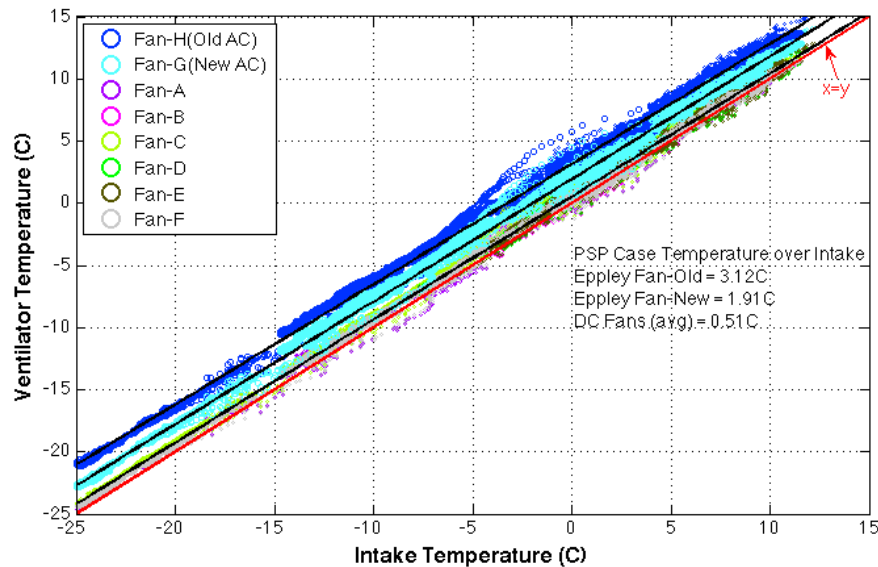


Nighttime Data Evaluation

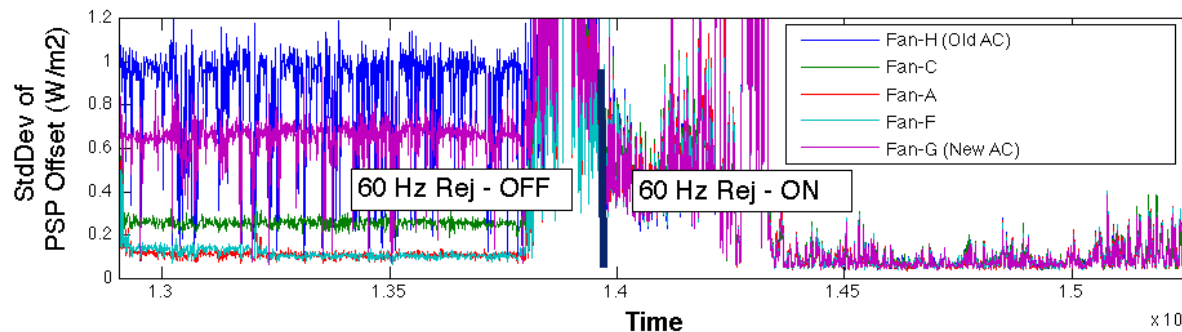
Nighttime Temperature Rise Characteristics

AC: 1.5 – 3°C rise over intake

DC: 0.5 °C rise over intake



Less Induced Noise in PSP Signal (even without 60Hz rejection)

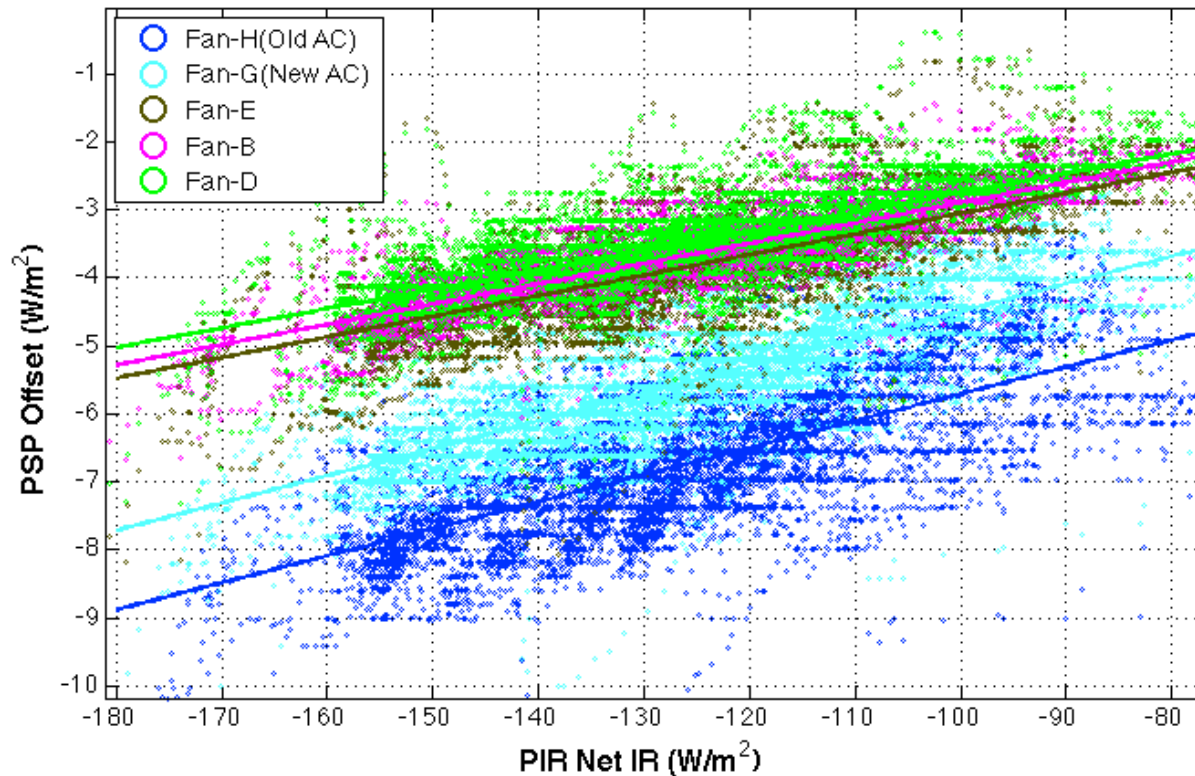


Nighttime Data Evaluation

PSP Nighttime Offset vs. Net IR from Co-Located PIR

Offset Improvement $\sim 2.5\text{-}3\text{ W/m}^2$

Slight Decrease in net IR responsivity



Fan Evaluation Summary

- Six 12VDC fans having 50-60cfm manufacturers specification were operated in ventilators at NREL in two sets of three DC fans with two AC reference fans during January and February 2014.
- Results of nighttime data show that each of the tested 12VDC provide generally equivalent IR loss reduction and could reduce PSP IR loss 30-40% (Probably less improvement at most ARM sites).
- DC powered ventilators may not provide the same level of frost/dew clearing as AC units.
- 60 Hz rejection eliminates most AC fan induced noise. DC fans will nearly eliminate the issue completely.
- Changes will impact VAPs that incorporate IR Loss
- All PSPs, 8-48s, and PIRs with AC ventilator fans will be affected.
- Anticipated durability and vendor availability will be incorporated as factors in fan selection.
- Site Ops has been provided additional information on ventilator checks and maintenance per guidance from Chuck Long.
- Selected DC fan will be installed prior to 2014 BORCAL season. Installation at all sites planned after as calibrated radiometers are rolled out in late summer/fall 2014.
- Radiometers sent to SGP for BORCAL are to be calibrated in the same manner of ventilation as used in operation at field sites.
- Tracker plates will be replaced with new plates with 5" holes beneath each ventilator position to facilitate easier ventilator filter cleaning/replacement.