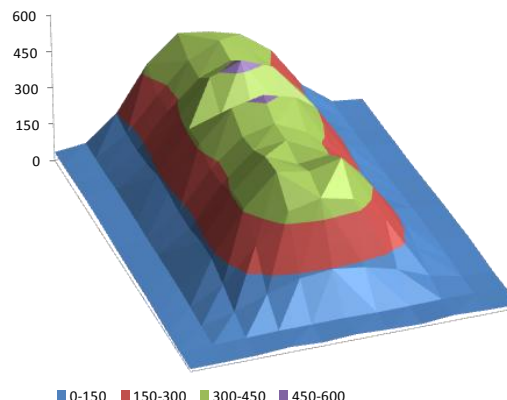


Energy Saving Lighting for PTTRM Service Station

“Measurement of Illuminance in Fields”



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Time Schedule

Work	Date
1. Site Survey (all sites)	12/12/2010
2. C-Store : T5 luminaire (New)	15/12/2010
3. Area lighting : 400W MH (Based)	19/12/2010
Canopy lighting : 250W MH (Based)-fail	
4. Canopy lighting : 250W MH (Dimmer)	21/12/2010
Canopy lighting : LED Canopy (New)	
5. Area lighting : 400W MH (Dimmer)	23/12/2010
6. Canopy lighting : 250W MH (Based)	24/12/2010
7. C-Store : T8 luminaire (Based)	5/1/2011
8. C-Store : T8 luminaire (Dimmer)	11/1/2011
9. Area lighting : LED area (New)	13/1/2011

Lighting Criteria

1. Average Illuminance (lux) on work plane area
2. Illuminance Uniformity (Min/Avg)

Lighting Zone	Avg Illuminance (lux)	Recommended Uniformity (Min/Avg)
C-Store	≥ 700	$\geq$ Based or 0.67 (2:3)
Canopy	≥ 220	$\geq$ Based or 0.50 (1:2)
Area	≥ 55	$\geq$ Based or 0.17 (1:6)

Instruments and Test Equipment



**Power Meter :
Chauvin C.A 8220**



Standard Lux-meter



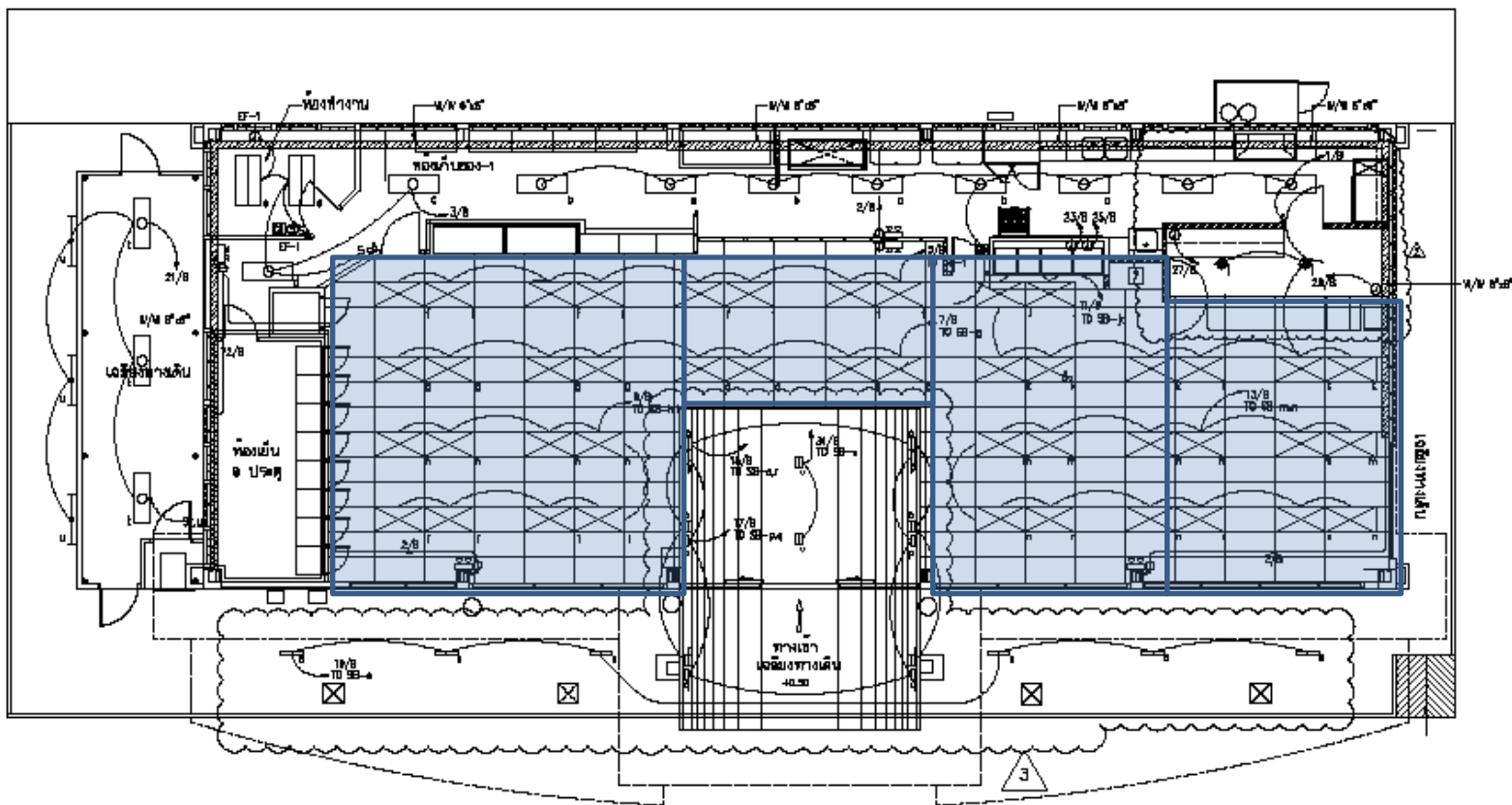
Field Illuminance Test Set

Power Consumption Tests in Laboratory



C-Store Field Test

PTT Jiffy : Nakornratchasima - Sricrew



C-Store Field Test (Cont.)



C-Store Luminaires (Louver Type)

1) T8 : 3x36W (low loss ballast)



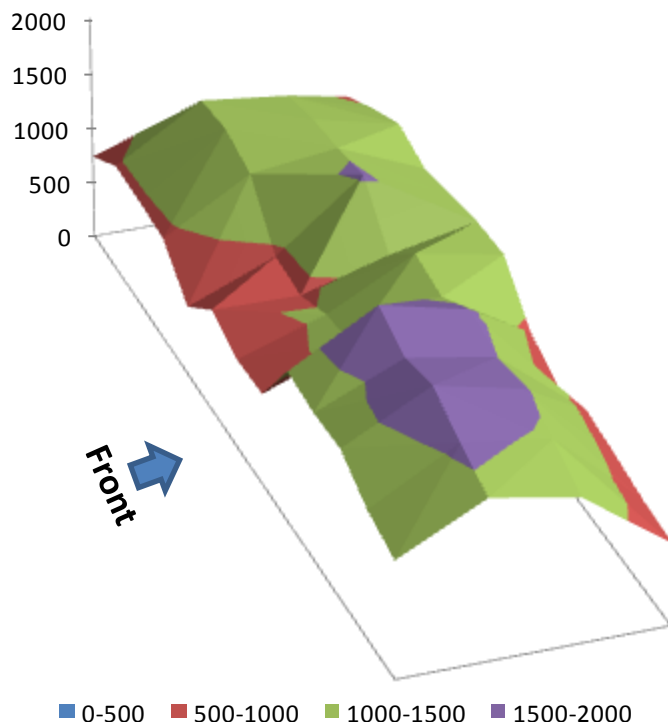
2) T5 : 3x28W (electronic ballast)



3) Power Controller for FL 36W

Field Test Results of C-Store

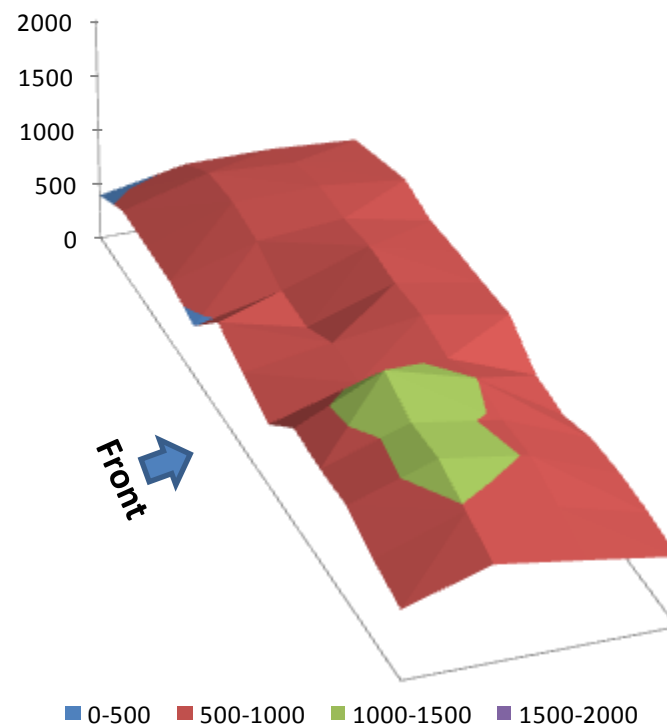
T8 : 3x36W (Based Case)



E_{avg} (lux)	Uniformity
1,285	0.58



35% Dimming (65%) T8 : 3x36W

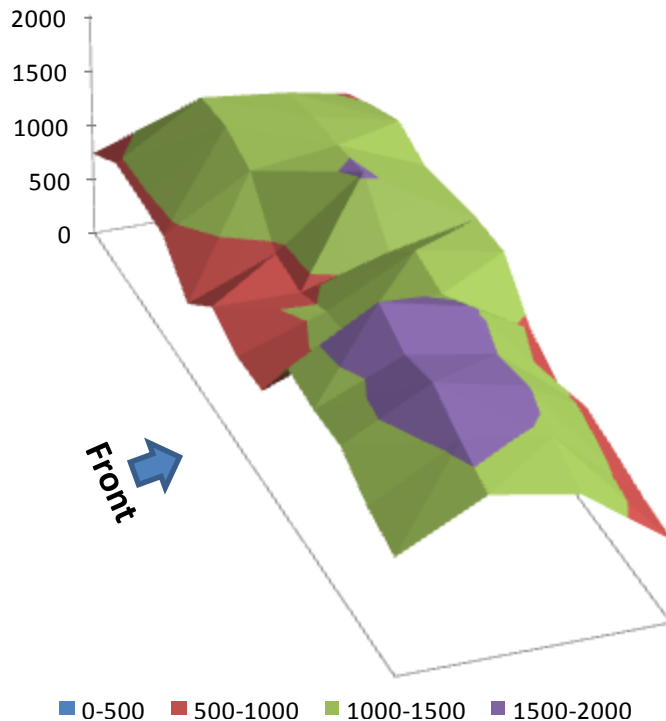


E_{avg} (lux)	Uniformity
784	0.50



Field Test Results of C-Store (Cont.)

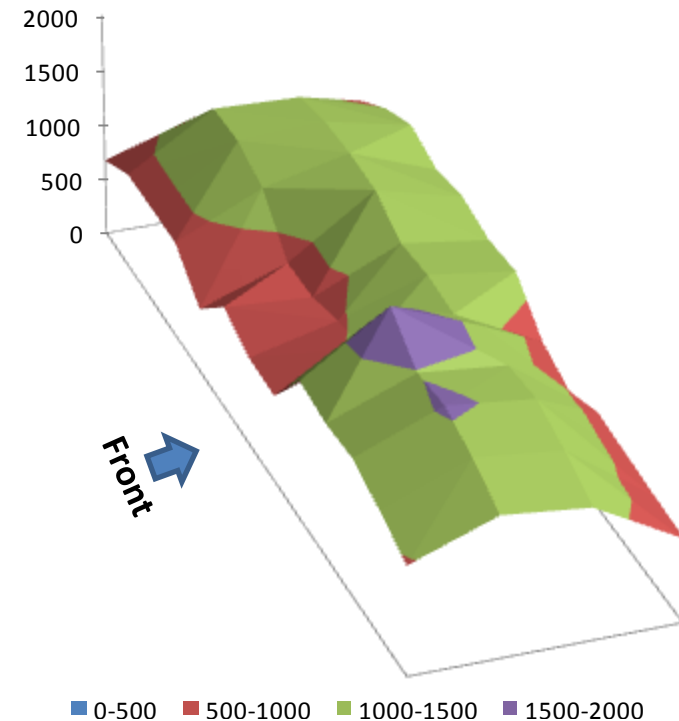
T8 : 3x36W (Based Case)



E_{avg} (lux)	Uniformity
1,285	0.58



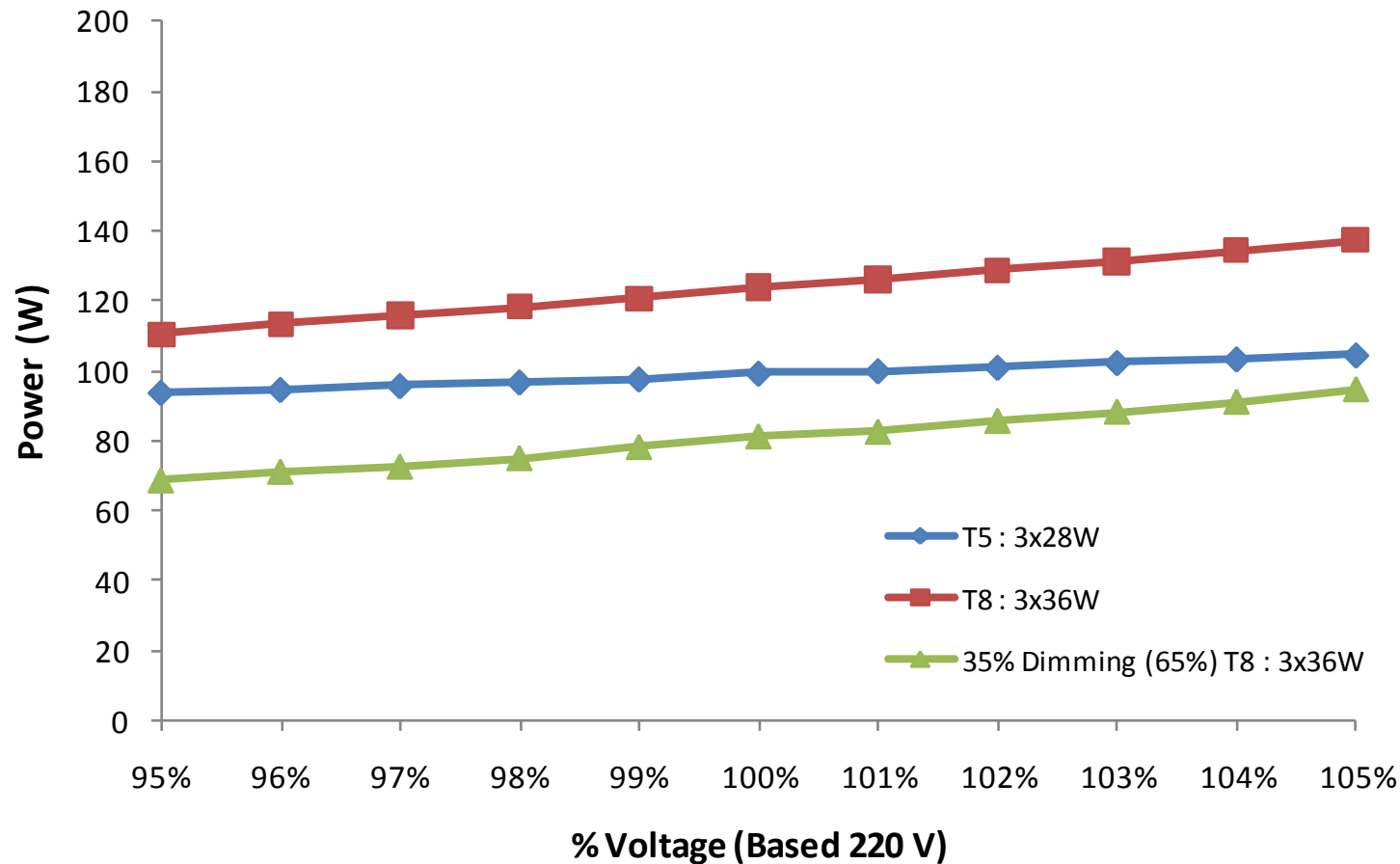
T5 : 3x28W



E_{avg} (lux)	Uniformity
1,186	0.57



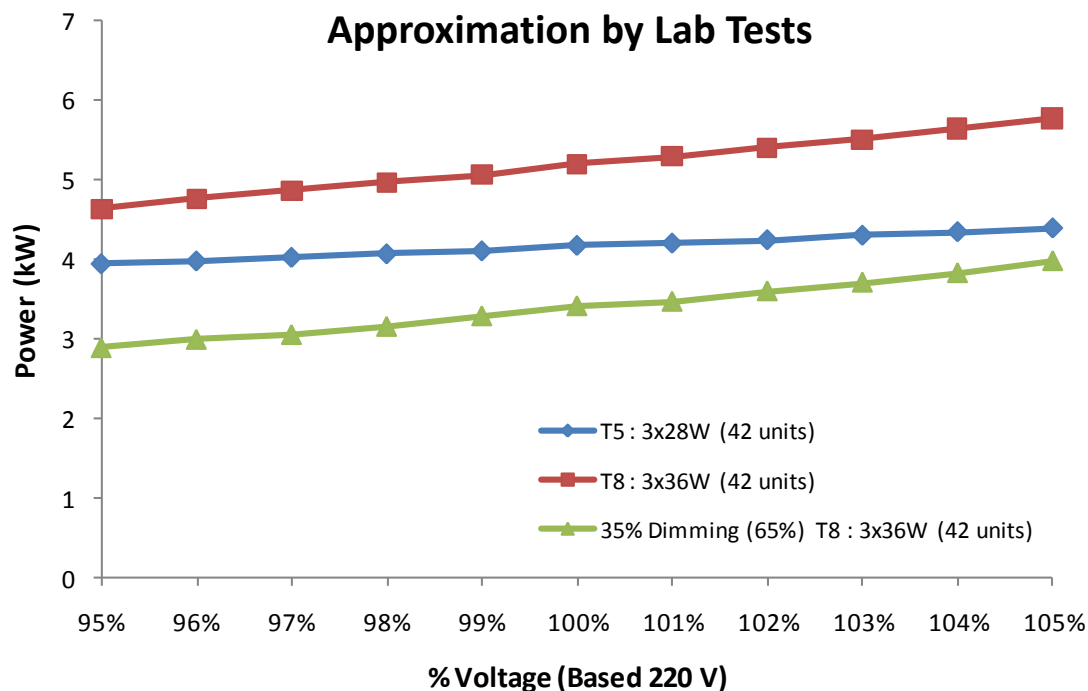
Power Consumption of C-Store Luminaires (Watt/Unit)



Power Consumption of C-Store Luminaires

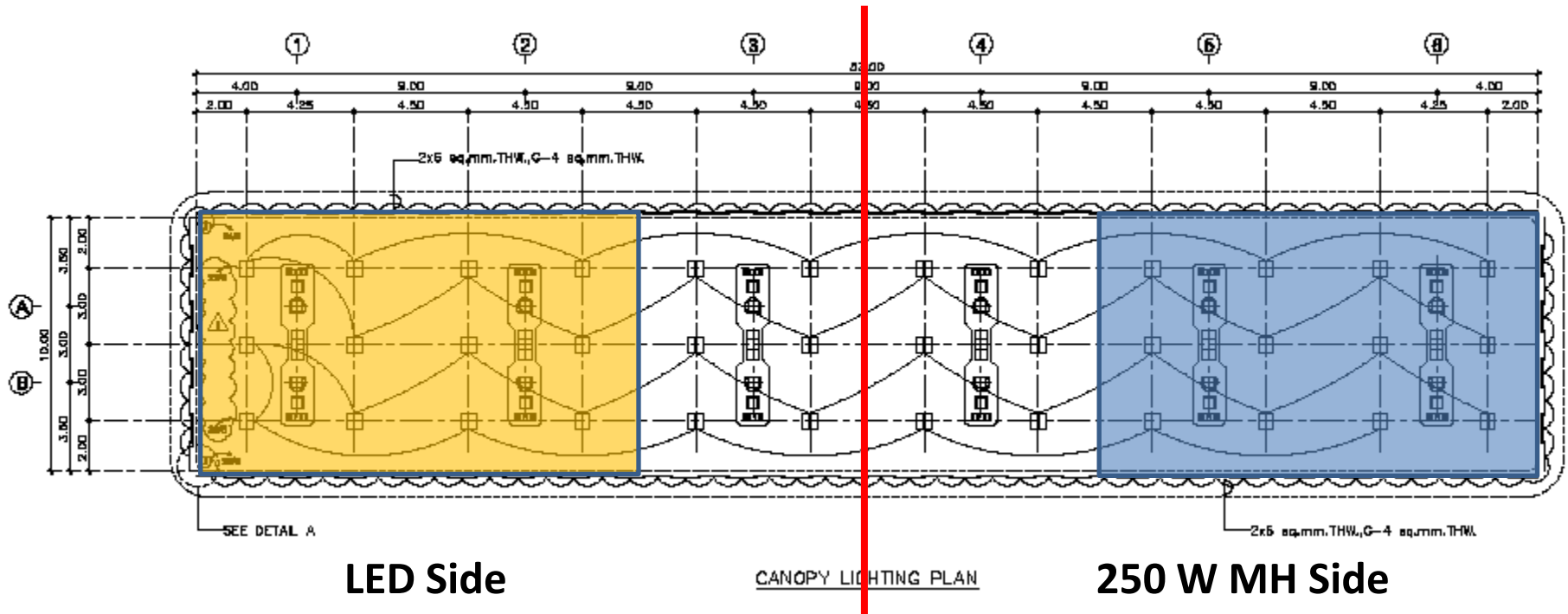
Results of Electrical Measurement in Field

Luminaire	Voltage (V)	Power (kW)
T8 : 3x36W (42 units)	228-230	5.59
T8 : 3x36W (42 units) 65%	228-231	3.34
T5 : 3x28W (42 units)	226-229	4.29



Canopy Field Test

PTT Jiffy : Pathumtani - Thammamasat

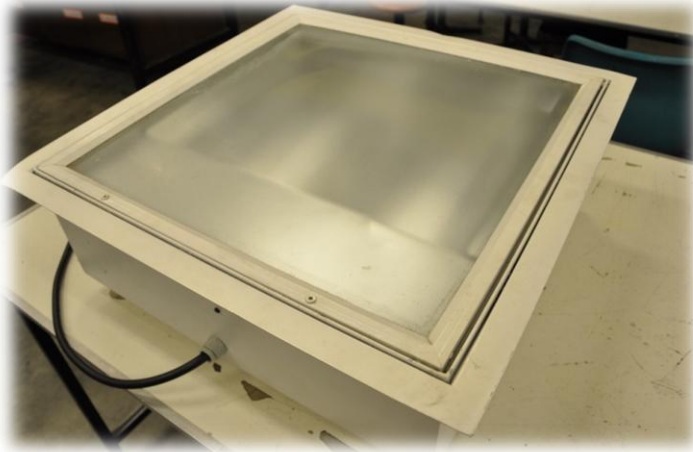


Canopy Downlight

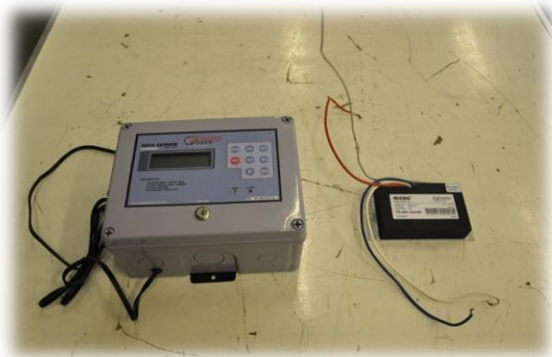
The diagram shows a 15x15 grid world environment. The grid is composed of green lines forming a 15x15 grid of cells. Red 'x' marks indicate obstacles. The grid is bounded by a dashed blue line on the right side. Three robot agents are shown, each with a blue circle and a black rectangle, moving towards the right boundary. The robots are located at (1, 1), (5, 5), and (9, 9) in 0-indexed coordinates. The grid contains obstacles at various positions, and the robots are moving towards the right boundary.

Canopy Luminaires

1) 250W MH Canopy Luminaire



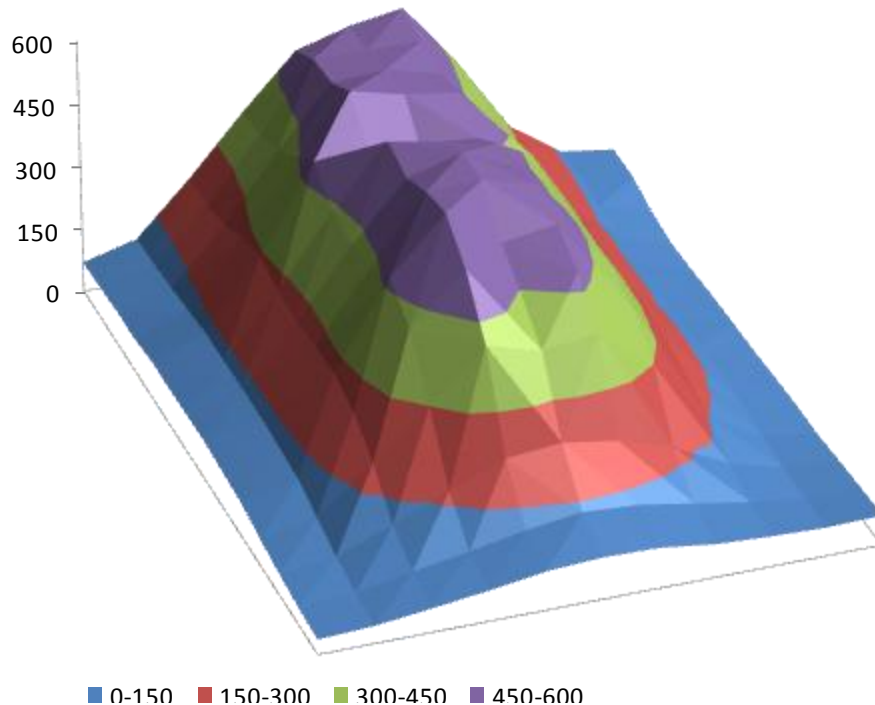
2) LED Canopy Luminaire



3) Power Controller for 250W MH

Field Test Results of Canopy

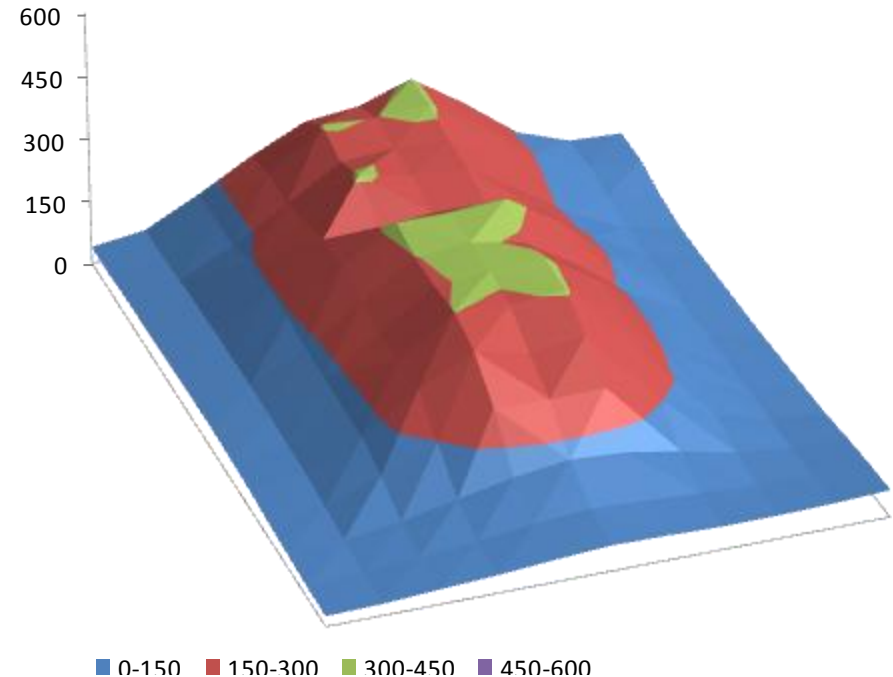
250W MH (Based Case)



E_{avg} (lux)	Uniformity
472	0.64



30% Dimming (70%) 250W MH

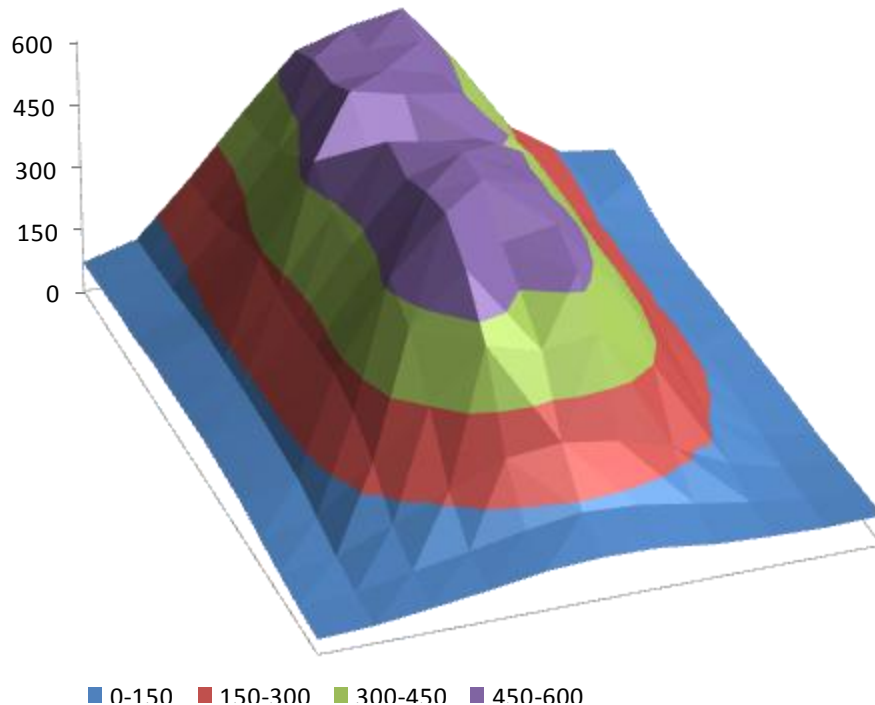


E_{avg} (lux)	Uniformity
252	0.59



Field Test Results of Canopy (Cont.)

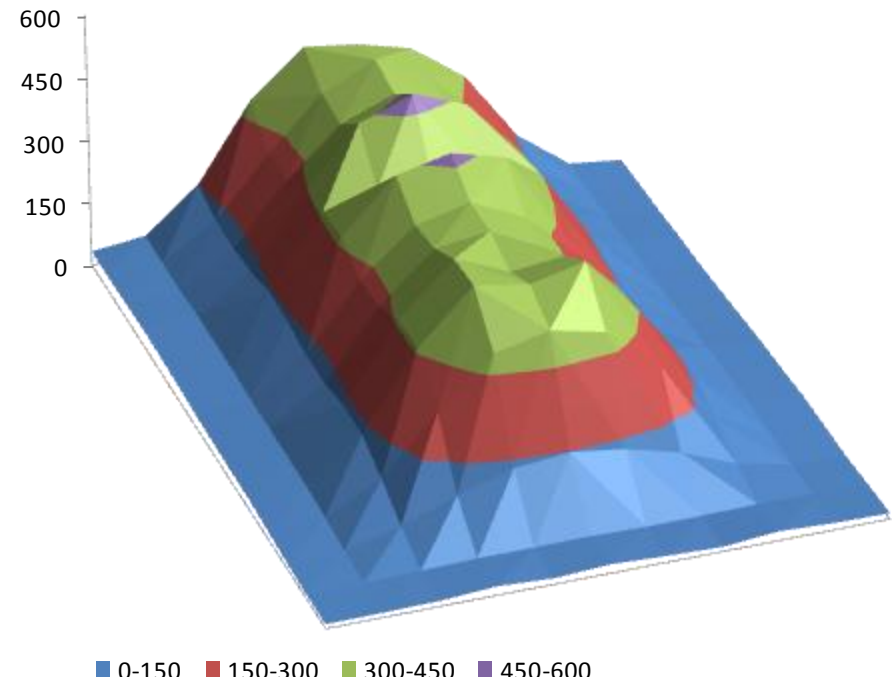
250W MH (Based Case)



E_{avg} (lux)	Uniformity
472	0.64



LED Canopy Luminaire



E_{avg} (lux)	Uniformity
350	0.64



Field Test Results of Canopy (Cont.)



Field Test Results of Canopy (Cont.)

**250W MH Canopy
Luminaire**



**LED Canopy
Luminaire**



Field Test Results of Canopy (Cont.)

250W MH Canopy Luminaire

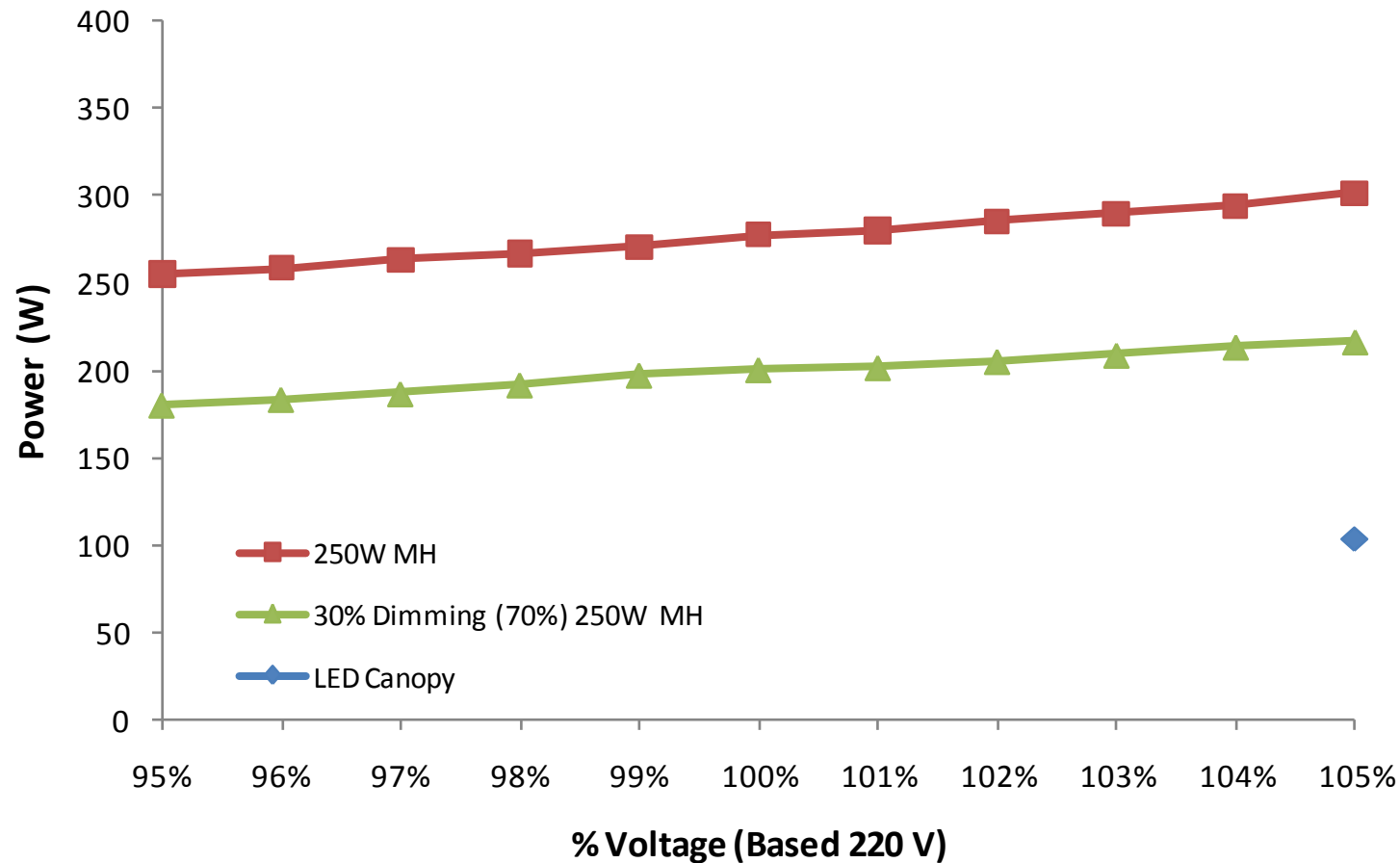


Field Test Results of Canopy (Cont.)

LED Canopy Luminaire



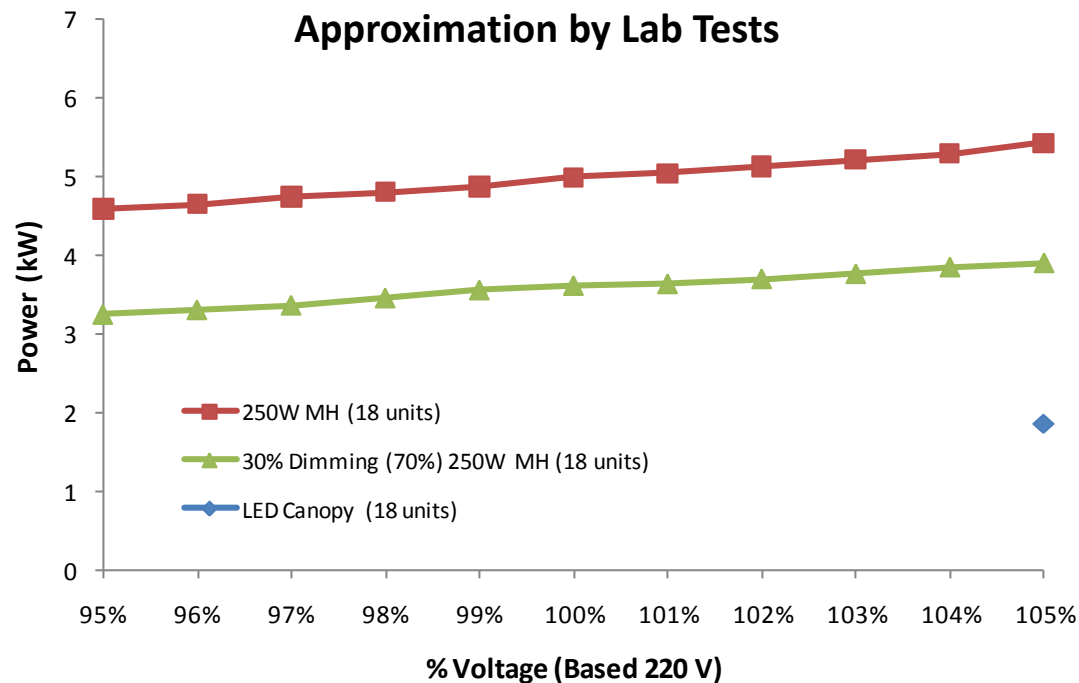
Power Consumption of Canopy Luminaires (Watt/Unit)



Power Consumption of Canopy Luminaires

Results of Electrical Measurement in Field

Luminaire	Voltage (V)	Power (kW)
250W MH (18 units)	231	5.30
250W MH (18 units) 70%	231	3.71
LED Canopy (18 units)	233	1.89

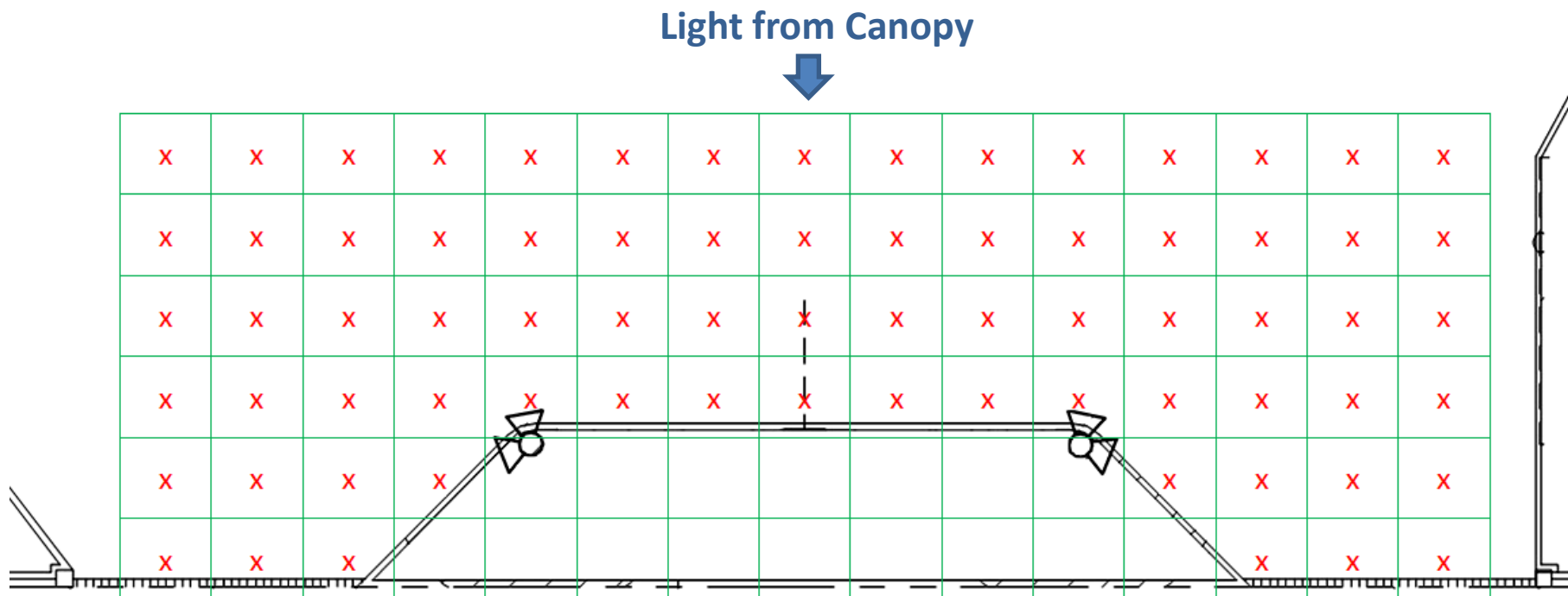


Field Test of Area Lighting

1. Entrance Area

Pole Height 7 m

Grid Area 2x2 m², Measurement Height 0.75 m (Work Plane)

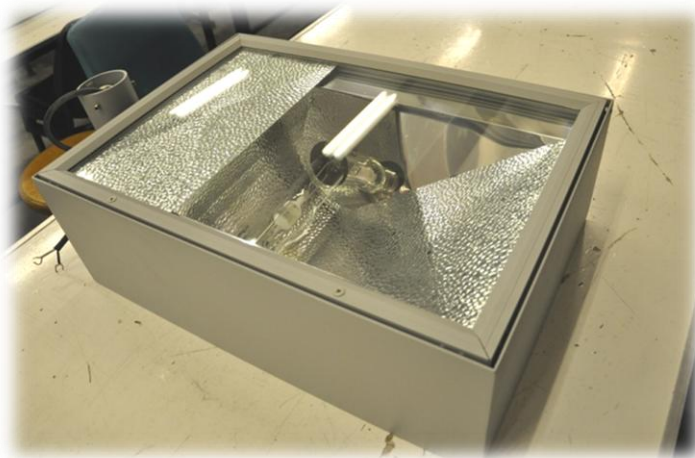


Field Test of Area Lighting (Cont.)

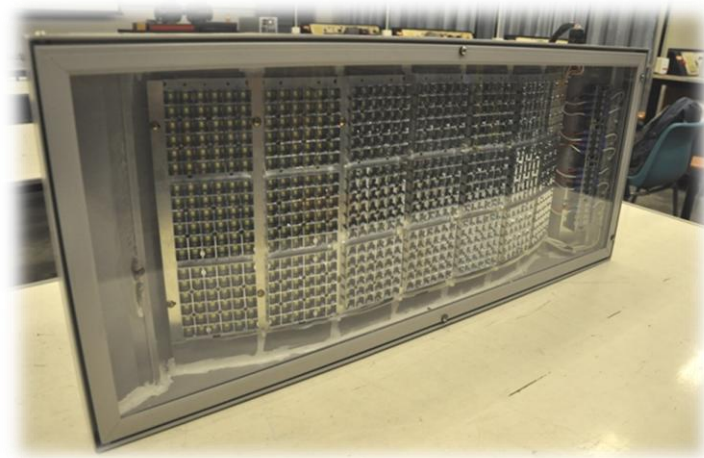


Area Lighting Luminaires

1) 400W MH Area Luminaire



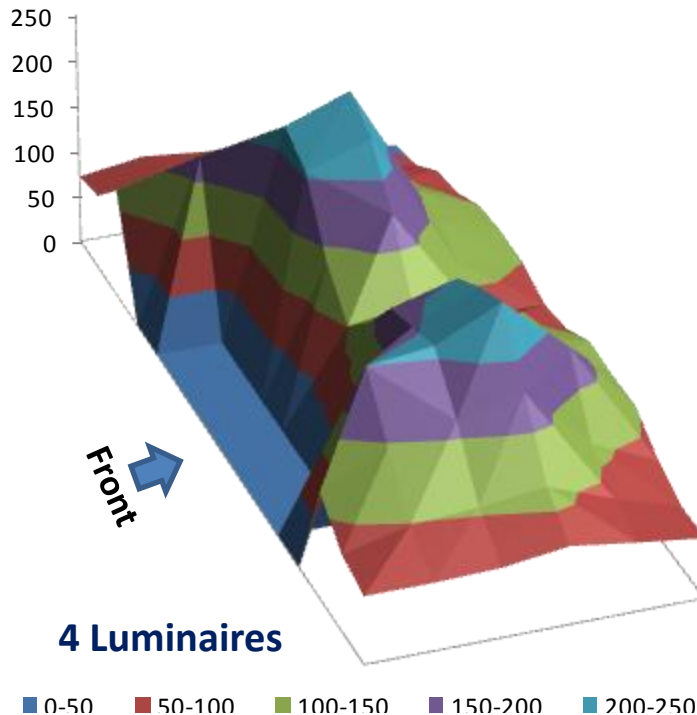
2) LED Area Luminaire



3) Power Controller for 400W MH

Field Test Results of Entrance Area

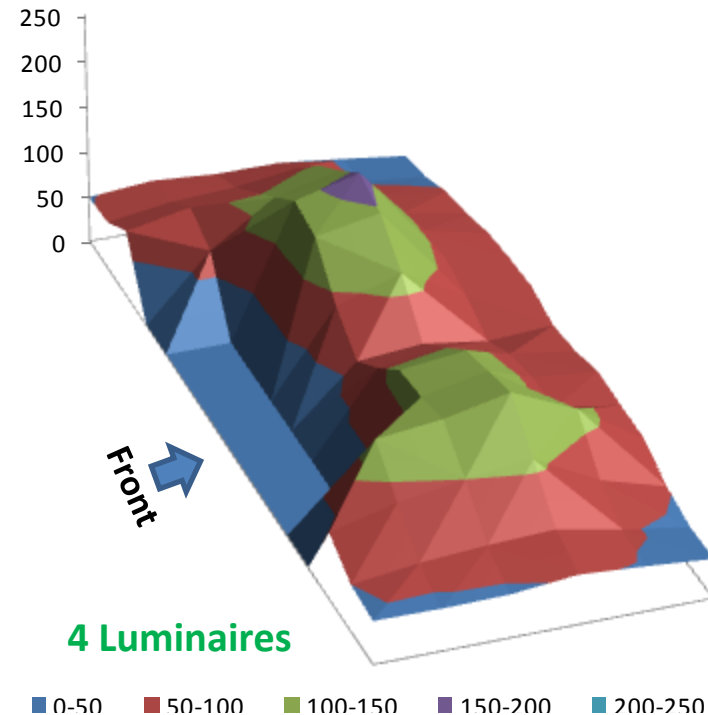
400W MH (Based Case)



E_{avg} (lux)	Uniformity
123.5	0.36



30% Dimming (70%) 400W MH

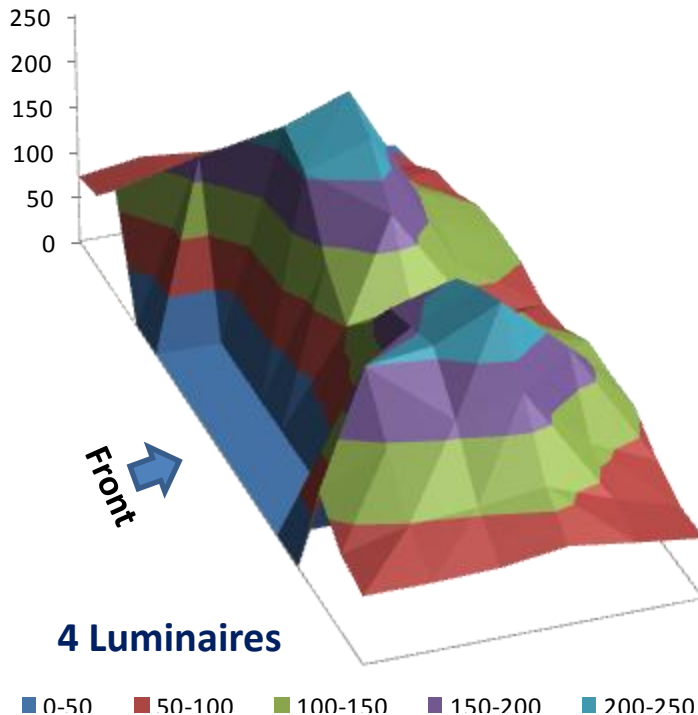


E_{avg} (lux)	Uniformity
79.8	0.41



Field Test Results of Entrance Area (Cont.)

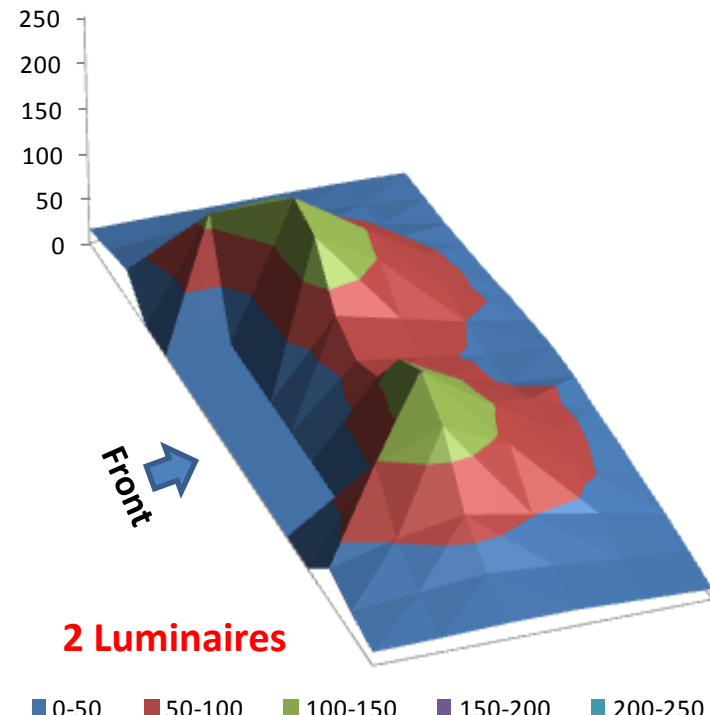
400W MH (Based Case)



E_{avg} (lux)	Uniformity
123.5	0.36



LED Area Luminaire



E_{avg} (lux)	Uniformity
51.4	0.21



400W MH Area Lighting Luminaire (4 units)



Field Test Results of Entrance Area (Cont.)

LED Area Lighting Luminaire (2 units)



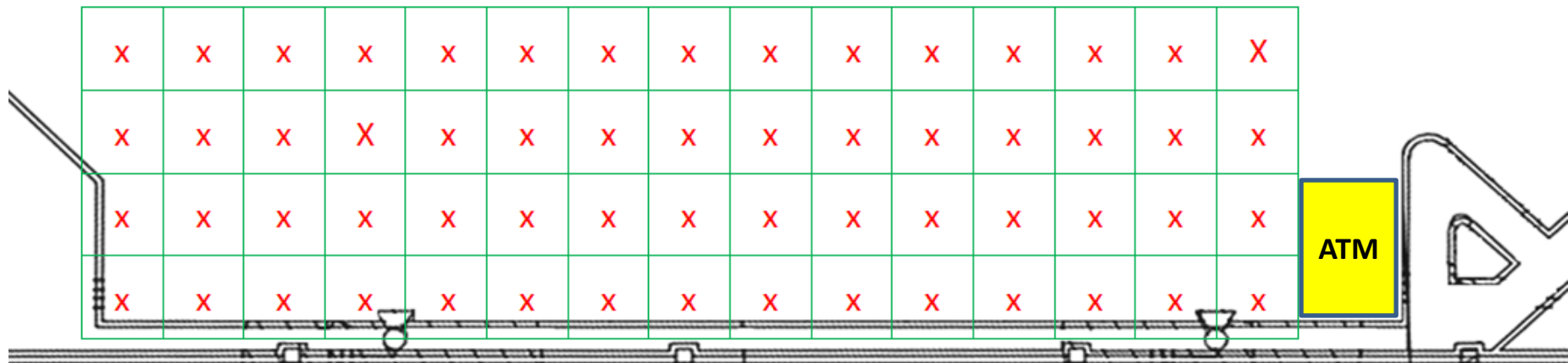
Field Test of Area Lighting (Cont.)

2. Car Park Area

Pole Height 6 m

Grid Area 2x2 m², Measurement Height 0.75 m (Work Plane)

Light from Canopy

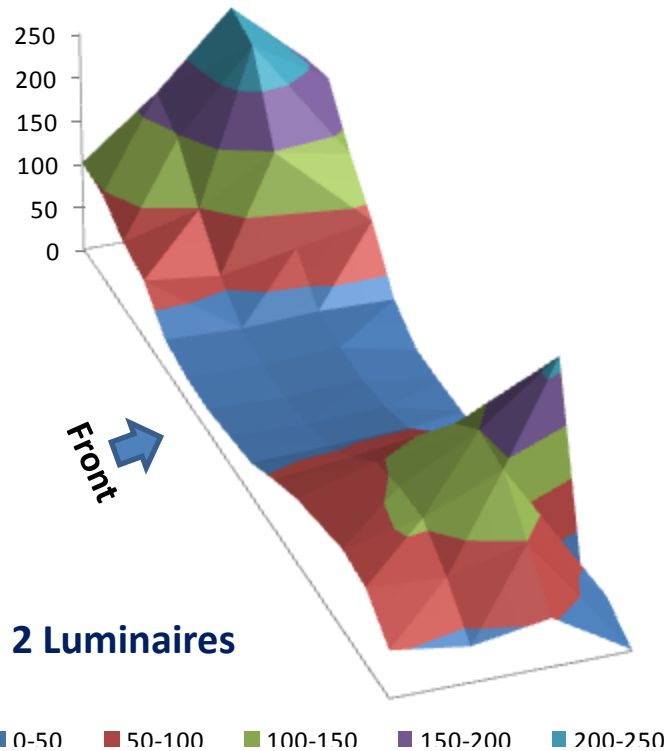


Field Test of Area Lighting (Cont.)



Field Test Results of Car Park Area

400W MH (Based Case)

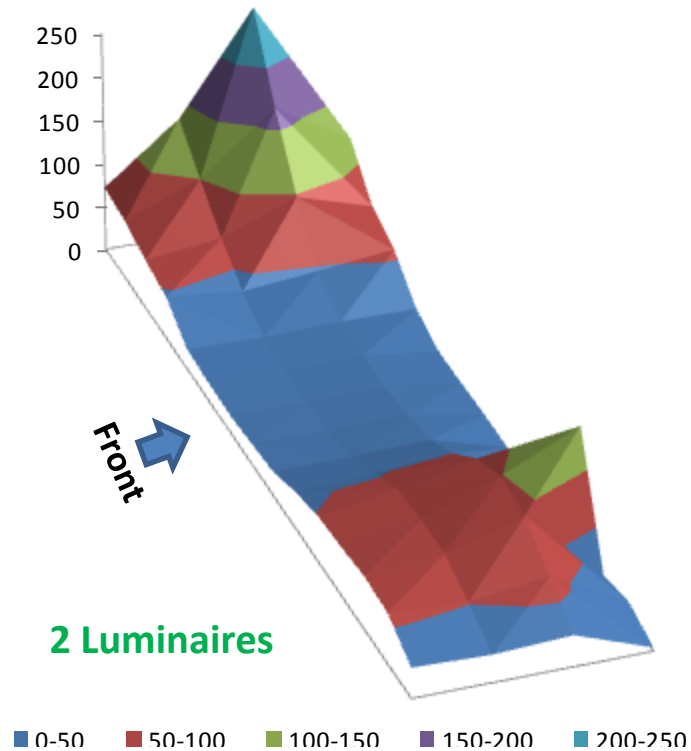


2 Luminaires

E_{avg} (lux)	Uniformity
79.5	0.29



30% Dimming (70%) 400W MH



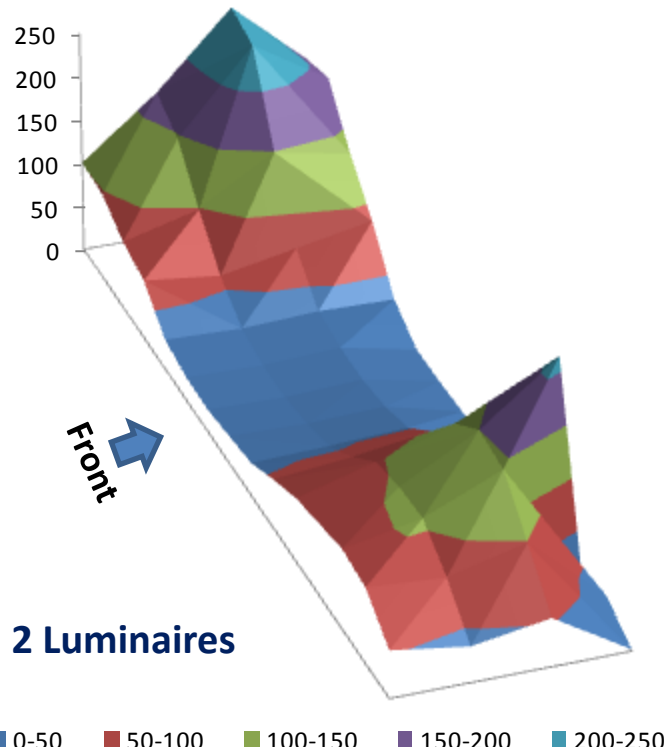
2 Luminaires

E_{avg} (lux)	Uniformity
56.8	0.30



Field Test Results of Car Park Area (Cont.)

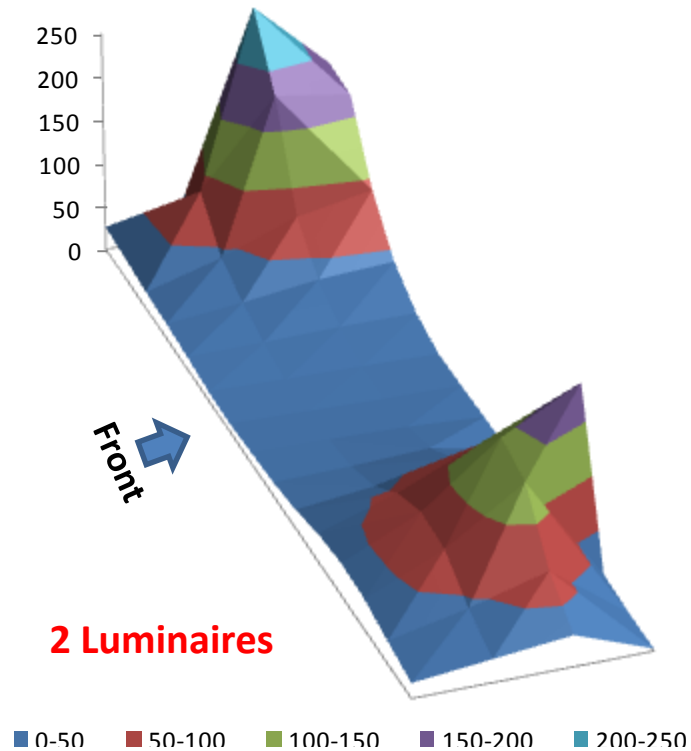
400W MH (Based Case)



E_{avg} (lux)	Uniformity
79.5	0.29



LED Area Luminaire

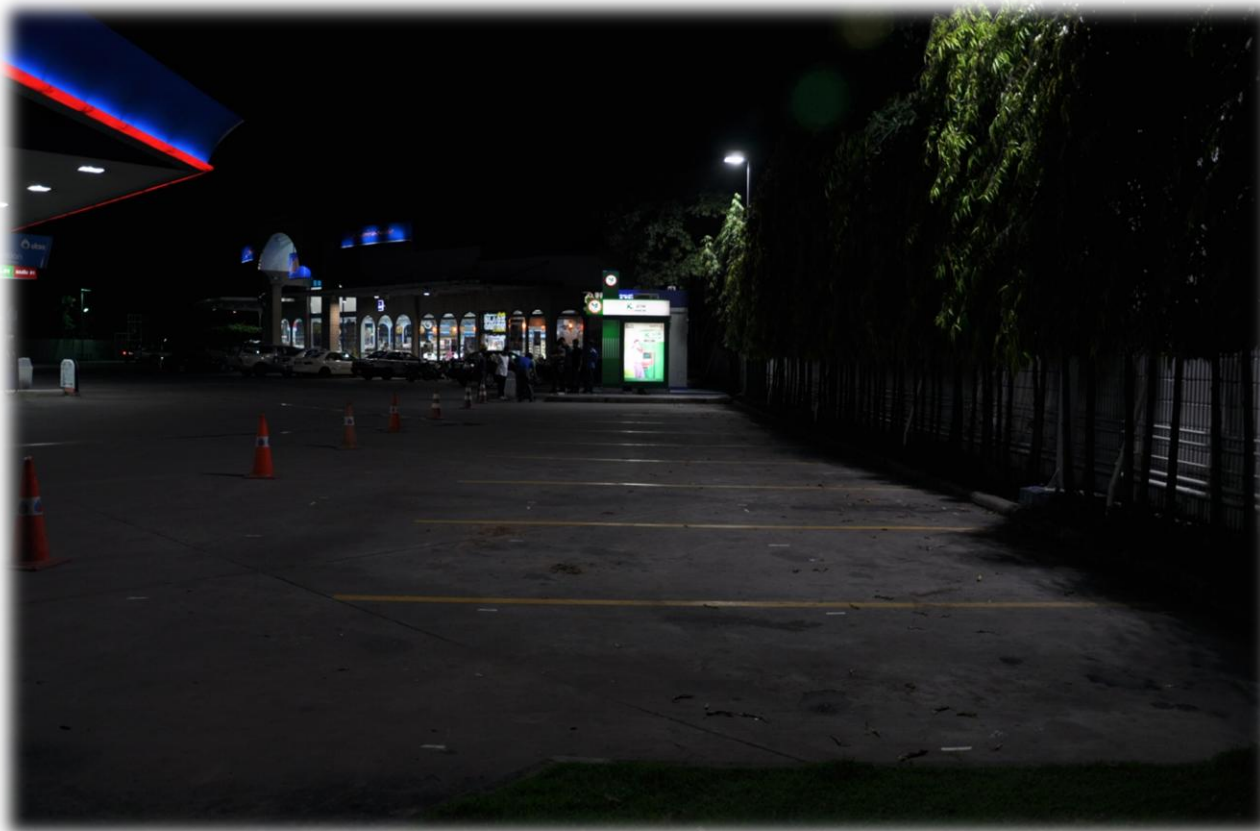


E_{avg} (lux)	Uniformity
42.8	0.12



Field Test Results of Car Park Area (Cont.)

400W MH Area Lighting Luminaire (2 units)

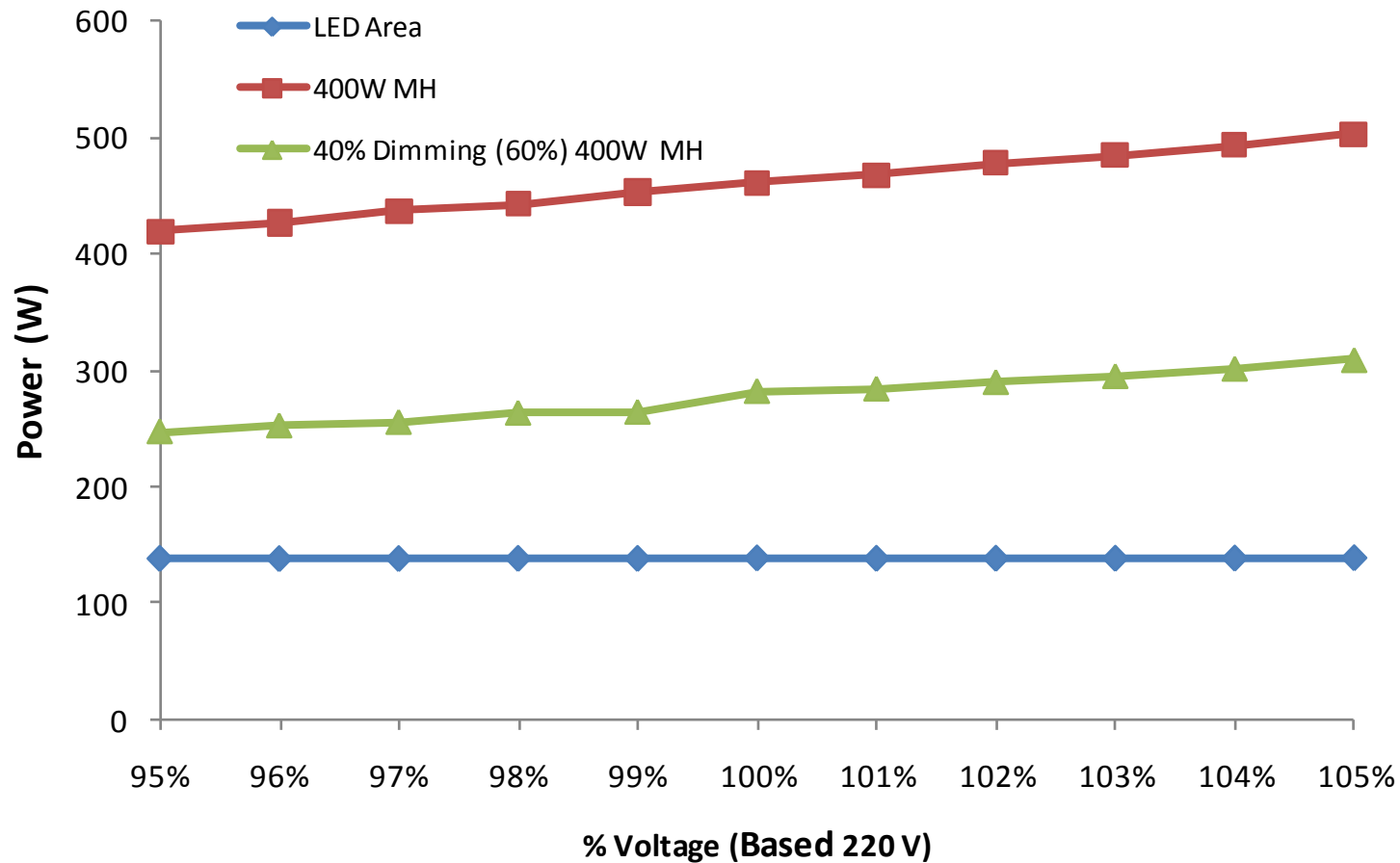


Field Test Results of Car Park Area (Cont.)

LED Area Lighting Luminaire (2 units)



Power Consumption of Area Lighting Luminaires (W/Unit)



Power Consumption of Area Lighting Luminaires

Results of Electrical Measurement in Field

Luminaire	Voltage (V)	Power (kW)
400W MH (6 units)	224	2.78
400W MH (6 units) 70%	221	2.09
LED Area (4 units)	224	0.68

