



Product Test Reference: CALiPER 09-73 24"x24" Troffer Benchmark Fluorescent

DOE TEST REPORT 09-73 – SUMMARY PAGE

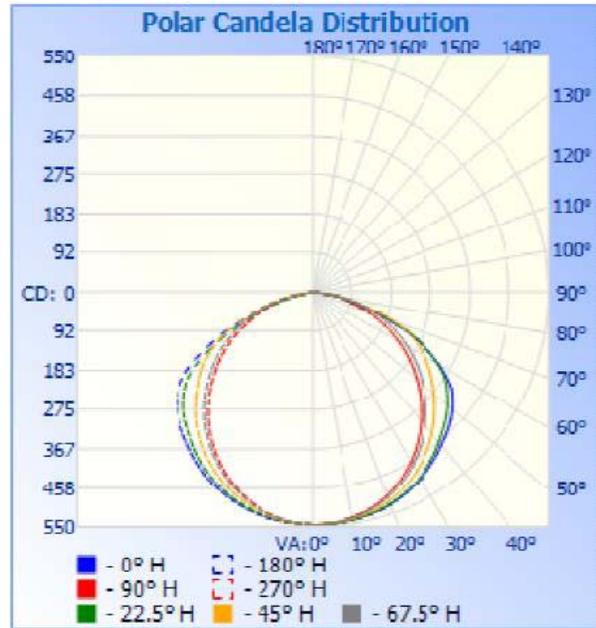
Product Category	Troffer (24"x24" Panel) Fluorescent Benchmark
Product Description	Columbia Lighting e•poc™ Full Distribution Luminaire EPC22-217G-CV-E104U-F0835 with 2 Sylvania Octron XP FO17/835/XP/ECO3 lamps
Date of Test(s) 09-73	August 5, 2009
Laboratory Performing Testing	OnSpeX
List of Tests Performed	Spectroradiometry & Goniophotometry following IESNA LM-79-08, Temperature
Total Luminaire Light Output 09-73-01	1706 lm
Luminaire Efficacy 09-73-01	48.9 lm/W

Product Photo



Photo credit: Columbia Lighting

Luminaire Candela Distribution Plot: 09-73-02



Product Test References

CALiPER Test Number	09-73
Manufacturer's name	Columbia Lighting
Product Category	Troffer (24"x24" Panel) Fluorescent Benchmark
Product Description	Columbia Lighting e•poc™ Full Distribution Luminaire with 2 Sylvania Octron XP FO17/835/XP/ECO3 lamps
Catalog Number	EPC22-217G-CV-E104U-F0835
Acquisition Notes	Purchased from distributor 7/2009

Lamp/Package References (www.sylvania.com spec sheet)

Lamp Type	24 inch Fluorescent tubes
Lamp/Package CCT	3500K
Lamp/Package CRI	85
Lamp Power Rating	17 W
Lamp Initial Lumens	1375 lm
Manufacturer Published Lamp Life	36,000 hours (3 hour start) 42,000 hours (12 hour start)

Luminaire References (www.columbialighting.com spec sheet 2009)

Luminaire number of Lamps	2
Luminaire Voltage Rating	120V
Luminaire Power Rating	34 W
Luminaire Output & Efficiency	2043 lm, Total Luminaire Efficiency=74.3% Luminaire Efficacy Rating=59 lm/W
Luminaire Manufacturer Description	<ul style="list-style-type: none"> • Full distribution provides controlled high angle light for visual comfort • Advanced optical design produces high efficiencies • Step dimming options available for both T5 and T8 expand energy savings opportunities • Low W/ft² ratio meets the most restrictive lighting power density codes • Typically qualifies for EPC Act tax deductions • Exclusive T8 EnergyMax® tuned 1.04 ballast factor ballast • Unique frameless optics system allows easy access to lamps and electrical from below the ceiling • Low profile housing fits in tight plenum spaces

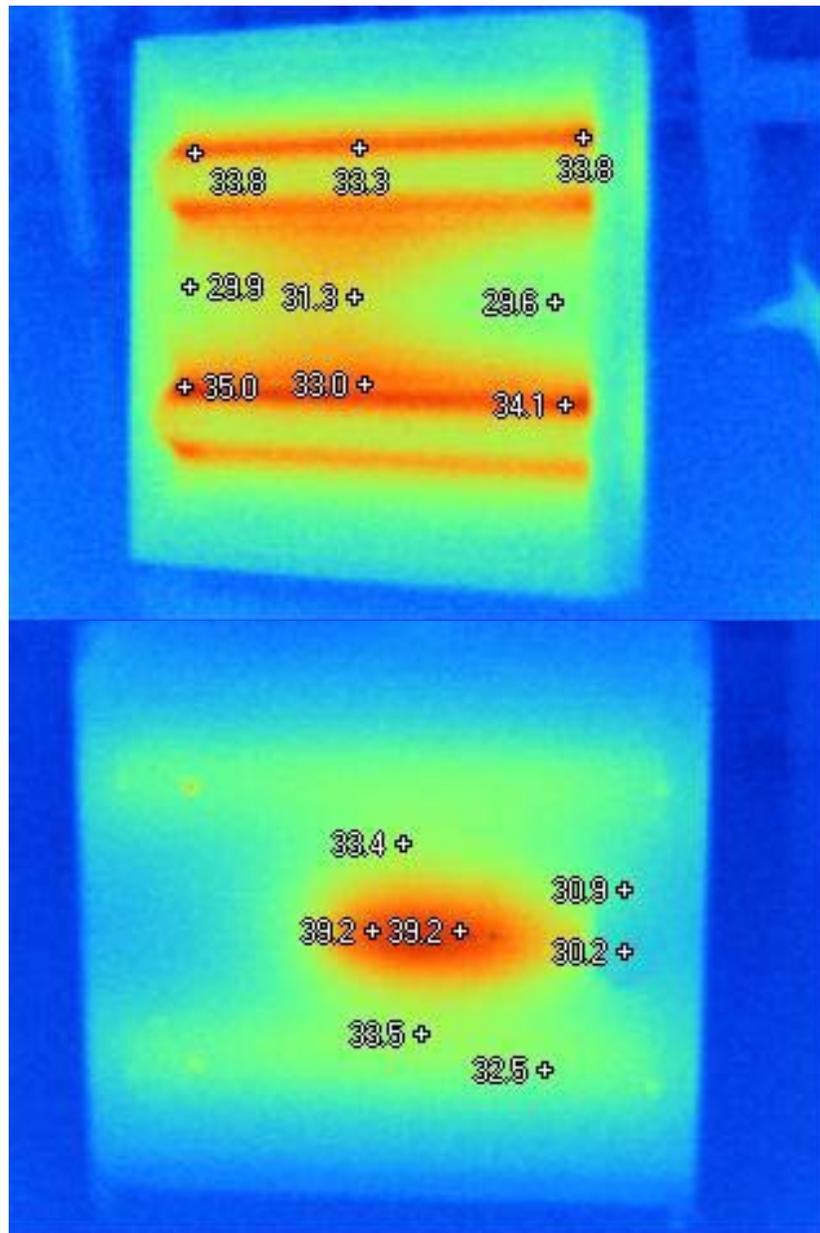
Description of Lamp Tested



Test Configuration Description

CALiPER
09-73-01

Temperature
Measurement
Locations
Face & Back



Temperature Measurements

CALiPER 09-73

Max on Back of Luminaire

Temperature
39.2°C

Measured Photometric Quantities -- Test Results: Light Output & Efficacy**Light Output & Efficacy Values**

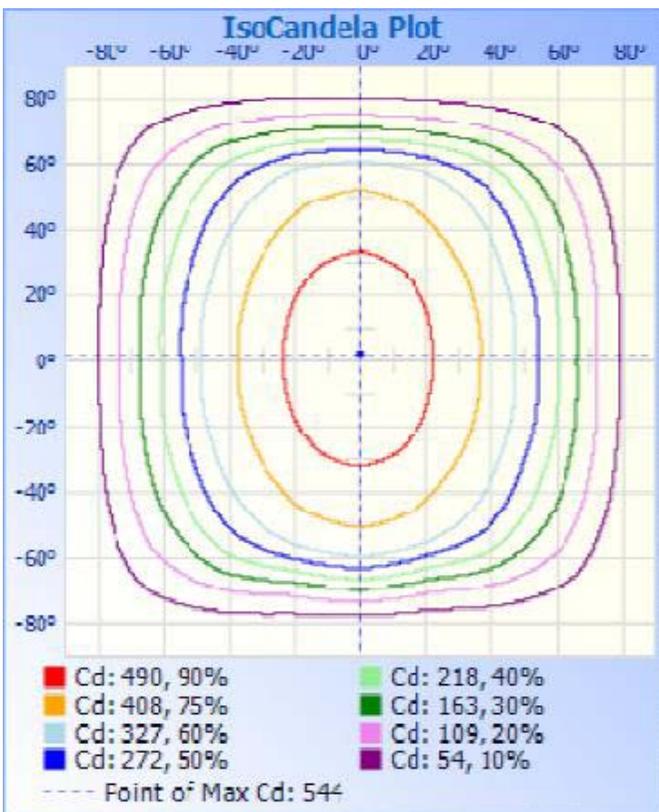
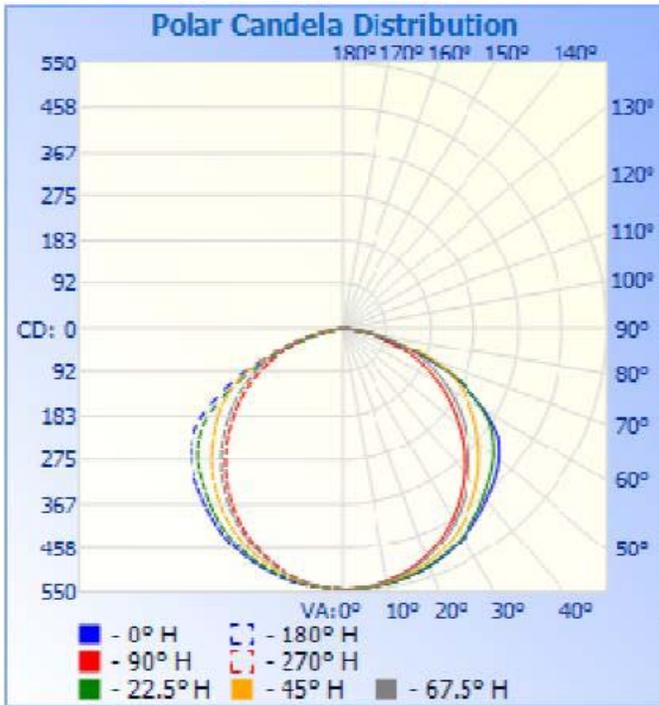
Test identifier	Measured Radiant Flux (milliwatts)	Measured Power (Watts)	Total Measured Light Output (lumens)	Calculated Luminaire Efficacy (lumens/Watt)
CALiPER 09-73-01	5590 mW	34.9 W	1706 lm	48.9 lm/W
CALiPER 09-73-02	--	35.0 W	1663 lm	47.5 lm/W

Measured Power Factor

CALiPER 09-73-01	0.99
CALiPER 09-73-02	0.99

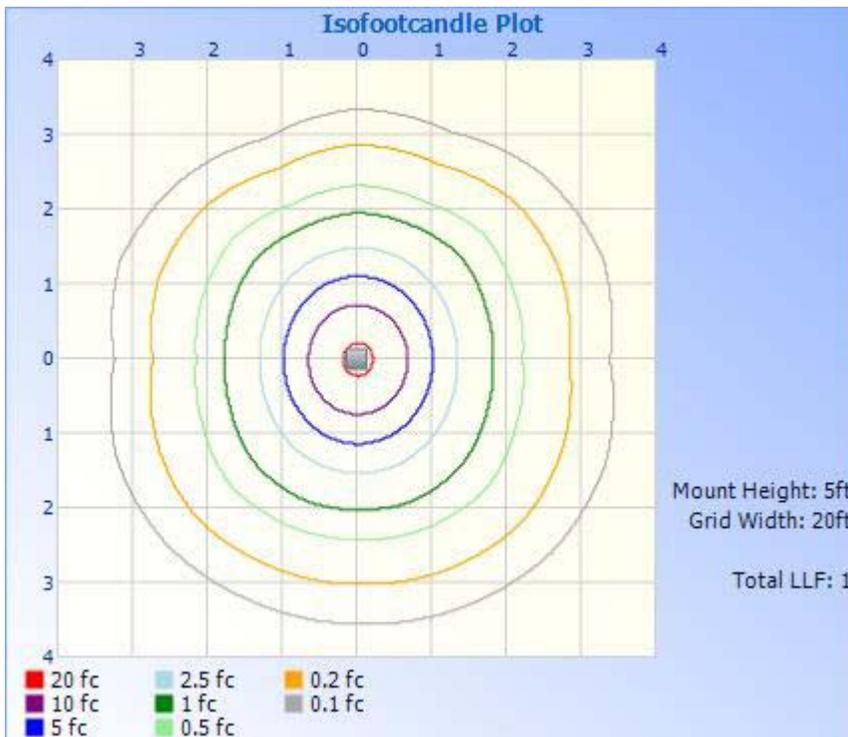
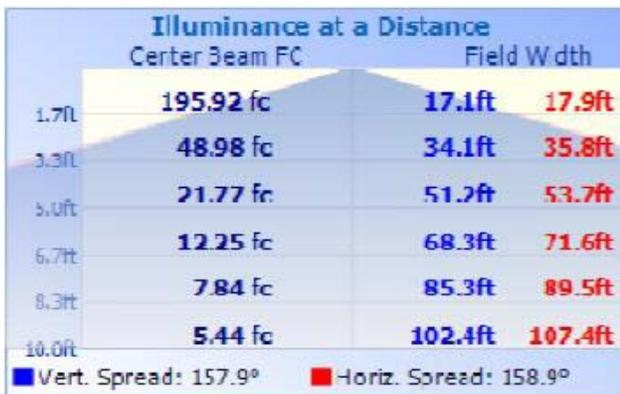
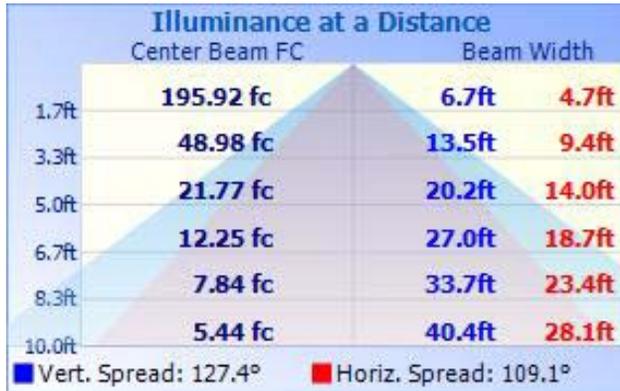
Intensity Distribution Plots

CALiPER 09-73-02



Illuminance Plots

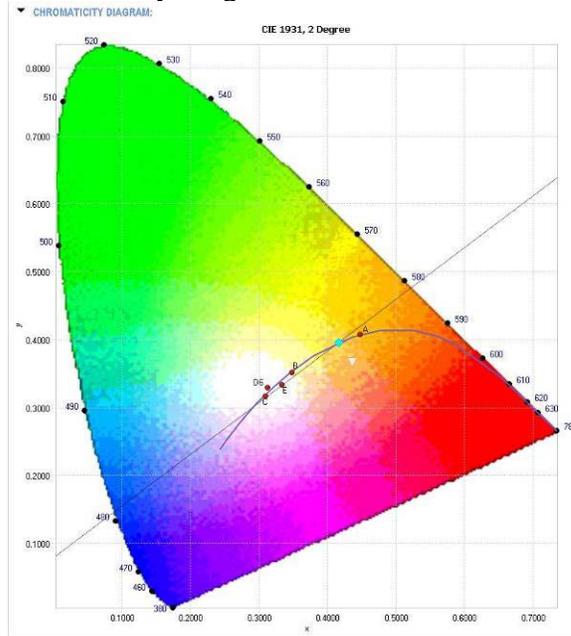
CALiPER 09-73-02



Measured Photometric Quantities -- Test Results: Color Metrics

Test identifier: CALiPER 09-73-01

Chromaticity Diagram



Correlated Color Temperature-CCT (K)¹

3318

Duv

0.000

Chromaticity Coordinates

x	y
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0.4160	0.3961
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Chromaticity Coordinates

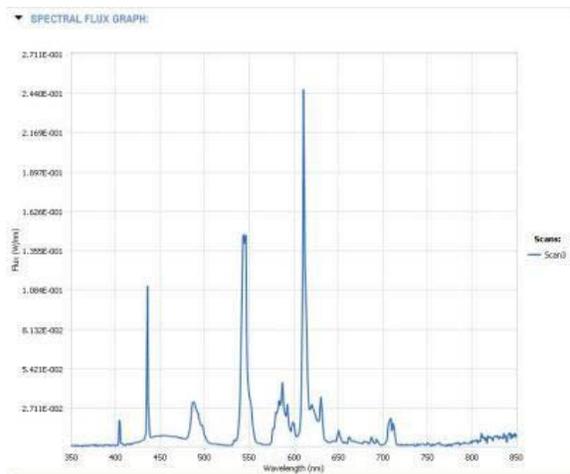
u'	v'
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0.2404	0.5151
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CRI²

86.4

**Spectral Power Distribution Curve
CALiPER 09-73-01**



¹ Specifications for the chromaticity of solid state lighting products are defined in ANSI_NEMA_ANSLG C78.377-2008.

² Readers are urged to be aware of the complexities of assessing color quality and the limitations of CRI with regard to SSL technologies. Alternative metrics are under development. In the meantime, qualitative visual assessment by human observers may provide additional insight regarding the suitability of color quality of a luminaire for a given application. See: Protzman, J. Brent and Kevin W. Houser. October 2006. LEDs for General Illumination: The State of the Science. Leukos. Vol. 3, No. 2, pp. 121-142. Narendran N, Deng L. 2002. Color rendering properties of LED light sources. Proc. of SPIE: Solid State Lighting II.

Appendix A: Description of Test Conditions, Test Configuration, Test Procedures

Summary of Luminaire Tests Conducted

References CALiPER 09-73
 Date Testing Completed August 5, 2009
 List of Tests Performed Spectroradiometry & Goniophotometry following IESNA LM-79-08

Photometric equipment used

CALiPER 09-73-01
 Spectroradiometer

Equipment List:	
Description	Manufacturer and Model Number
Integrating Sphere 65” Spectroradiometer	Labsphere LMS650
Spectroradiometer	Labsphere CDS500
Auxiliary Lamp PSU	Labsphere LPS200
Power Analyzer	Voltech PM1000+
Regulated Power Supply	California Instruments 1001P
Data Acquisition Recorder	Yokogawa DX2048
Thermal Imaging Camera	Fluke Ti25
Thermometer (Thermocouple)	Fluke 52

CALiPER 09-73-02
 Goniophotometer

The goniophotometer was manufactured by Mayer Engineering.

Lamp Stabilization and Test Setup.

The sample was placed inside the integrating sphere and powered by a regulated and conditioned 120.0 Volt 60 Hertz Alternating Current supply. The correlated color temperature, color rendering index, chromaticity coordinates and electrical power measurements contained in this report are the numeric averages of the three readings upon which stabilization is verified. The stabilization times shown on the results pages of this report denote the time of the 1st measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization.

Verification that test conditions comply with LM-79-08

	<u>09-73-01</u>	<u>09-73-02</u>
Measured ambient temperature	25.2°C	25.2°C
Measured voltage during testing	120VAC	120VAC
Measured current during testing	0.293 A	0.295 A
Measured power during testing	34.87 W	35.03 W
Measured power factor	0.993	0.989
Total Harmonic Distortion (THD-V)	0.153%	-

APPENDIX B: IES Summary Data

CALiPER 09-73-02

LAMP SPACING CRITERIA: 1.38 (0° – 180°) / 1.26 (90° – 270°)

ZONAL LUMEN SUMMARY

Zone	Lumens	%Total
0 - 10	51.6	3.1
10 - 20	149.0	9.0
20 - 30	229.2	13.8
30 - 40	282.8	17.0
40 - 50	304.5	18.3
50 - 60	290.5	17.5
60 - 70	220.7	13.3
70 - 80	111.9	6.7
80 - 90	22.6	1.4
Total	1662.9	100%

CANDELA TABULATION

	0	22.5	45	67.5	90	112.5	135	157.5	180	202.5
0.0	544.23	544.23	544.23	544.23	544.23	544.23	544.23	544.23	544.23	544.23
2.5	544.49	544.29	544.28	544.28	544.07	543.99	543.93	544.19	543.73	543.22
5.0	543.92	543.89	543.27	543.09	542.58	542.54	542.89	542.90	542.75	542.73
7.5	542.75	542.99	541.74	540.39	540.07	540.17	540.86	542.04	541.39	540.33
10.0	541.86	541.04	539.28	536.90	535.42	536.24	538.36	539.39	539.69	537.89
12.5	539.30	539.22	535.73	532.00	530.15	531.31	534.16	537.09	537.04	534.64
15.0	536.32	535.61	531.69	526.04	523.21	525.15	529.34	533.12	533.84	530.53
17.5	533.20	531.62	526.02	519.16	515.14	517.50	523.47	528.14	529.30	525.82
20.0	528.44	526.48	519.07	510.28	505.89	508.83	516.53	522.75	524.17	519.76
22.5	523.10	520.89	511.65	500.84	495.47	499.26	508.48	516.26	518.47	513.40
25.0	517.27	514.34	502.99	490.16	483.58	488.43	499.29	509.50	511.99	505.22
27.5	510.42	506.80	493.63	478.77	470.68	476.78	489.59	501.30	504.76	497.41
30.0	503.20	498.96	483.17	466.18	457.11	464.02	478.57	492.74	496.75	487.80
32.5	495.19	490.01	471.73	452.39	442.28	449.90	466.75	482.80	487.32	477.85
35.0	486.20	479.74	459.58	438.10	426.36	435.29	454.06	472.32	477.73	467.19
37.5	477.19	469.51	446.51	423.01	409.86	419.70	440.47	461.16	467.51	455.40
40.0	467.19	458.10	432.56	406.61	392.49	403.37	425.81	448.73	457.15	442.81
42.5	458.04	446.65	418.05	389.88	374.27	386.31	410.37	436.63	447.79	430.94
45.0	448.75	435.69	402.08	372.14	355.50	368.25	394.09	425.24	437.21	419.61
47.5	437.85	424.08	386.05	353.88	336.11	349.96	377.22	412.53	425.19	406.48
50.0	425.46	411.49	369.32	334.89	315.75	330.37	359.46	398.33	411.77	391.49
52.5	411.38	396.78	352.98	315.23	295.16	310.82	343.18	382.83	397.35	374.48
55.0	396.85	381.53	336.76	295.47	274.33	290.61	325.82	363.98	378.64	354.98
57.5	371.72	364.35	319.23	274.67	252.53	269.50	307.13	336.47	351.59	324.50
60.0	342.16	337.73	300.51	253.15	230.48	247.89	287.18	302.19	315.21	286.92
62.5	307.60	308.39	281.03	232.15	208.28	226.22	266.50	262.23	274.09	245.10
65.0	268.01	273.97	259.31	210.46	185.67	204.39	240.12	220.87	235.85	206.89
67.5	226.08	235.57	231.24	189.44	163.04	183.38	210.22	180.02	191.86	165.21
70.0	184.95	195.78	201.26	168.72	140.64	162.65	176.63	142.69	153.56	129.21

72.5	147.60	158.07	168.22	147.74	118.37	141.31	141.85	109.19	119.11	96.89
75.0	114.98	123.88	134.04	126.33	96.59	120.12	109.07	79.98	85.54	68.80
77.5	86.22	94.13	101.78	102.64	76.24	96.22	80.13	55.40	50.96	46.12
80.0	60.47	67.70	73.58	77.57	57.25	70.50	54.85	35.16	29.54	27.25
82.5	36.52	43.47	48.57	52.14	39.50	45.64	33.08	19.14	14.08	12.64
85.0	16.20	21.45	26.45	30.01	23.45	24.55	15.24	8.35	2.35	5.19
87.5	7.72	10.64	10.29	12.20	11.09	8.59	6.05	3.76	0.25	1.05
90.0	1.45	4.49	4.17	2.61	1.89	1.04	1.11	1.13	0.31	0.34

CANDELA TABULATION (Continued)

	225	247.5	270	292.5	315	337.5	360
0.0	544.23	544.23	544.23	544.23	544.23	544.23	544.23
2.5	543.33	542.84	542.78	542.96	543.79	544.01	544.21
5.0	541.30	540.51	540.67	540.80	541.76	543.29	543.83
7.5	538.80	537.16	536.40	537.35	539.34	541.52	542.77
10.0	534.97	532.06	531.72	532.76	536.21	539.64	541.17
12.5	530.47	526.17	524.55	527.38	531.82	536.63	539.33
15.0	524.81	519.31	516.72	519.89	526.95	533.28	536.60
17.5	517.84	510.82	507.69	511.69	520.36	528.60	532.46
20.0	510.43	501.13	497.52	502.58	513.10	523.40	528.28
22.5	501.85	490.68	486.22	492.06	504.78	517.24	523.10
25.0	492.32	479.33	473.62	480.93	495.47	510.22	517.20
27.5	481.80	466.83	460.02	468.43	485.42	502.68	510.47
30.0	470.49	453.19	445.48	455.11	474.17	493.89	503.21
32.5	458.80	439.39	430.40	440.93	462.39	484.36	495.23
35.0	445.07	423.73	414.08	426.22	449.59	474.10	486.27
37.5	431.17	408.02	397.00	410.08	435.95	463.03	477.10
40.0	416.16	391.13	378.85	393.46	421.34	451.60	467.15
42.5	400.48	373.64	359.89	376.16	406.16	439.88	458.06
45.0	383.71	355.40	340.89	357.86	390.06	428.54	448.61
47.5	366.25	336.34	321.20	339.40	373.80	416.82	437.99
50.0	348.96	317.01	300.46	320.00	357.05	403.17	425.24
52.5	332.61	296.96	280.42	300.32	340.71	389.10	411.61
55.0	315.71	277.47	260.01	280.58	323.83	373.40	396.56
57.5	297.01	256.78	238.05	259.66	306.34	355.05	371.85
60.0	275.37	234.24	215.51	238.40	287.75	327.80	341.98
62.5	250.26	211.02	191.00	216.71	267.94	296.98	307.52
65.0	224.98	192.38	170.41	195.45	243.54	261.69	268.25
67.5	190.38	169.56	146.51	174.68	215.68	222.95	226.37
70.0	155.84	148.64	124.03	153.81	184.45	183.52	185.11
72.5	121.72	127.30	102.26	132.61	150.81	146.22	147.77
75.0	90.38	103.97	81.03	110.64	117.52	113.37	114.93
77.5	63.55	78.42	61.19	86.33	87.04	84.66	86.36
80.0	40.16	52.38	43.26	61.15	60.38	59.04	60.67
82.5	20.22	29.65	26.62	36.87	36.88	35.25	36.56
85.0	6.99	11.27	13.42	17.44	16.25	16.39	16.27
87.5	1.22	1.88	3.32	4.98	6.80	8.63	7.79
90.0	0.37	0.52	0.57	1.18	2.04	2.93	3.86