

Test report: 2024000020

Test type	Measurement of the luminaire light distribution in C-Gamma
Test date	23/06/2024/MILAB
Laboratory	MILAB S.r.l.s. - Viale della Resistenza, 48 - 20094 Corsico (MI)
Operator	Manuel O

The measurement have been performed in the following laboratory ambient conditions

Temperature	24.5
Relative humidity	70
Air turbulence	0.02

Used instruments

Photogoniometer	Model: Photoglobe P4FASC S.N: 2407-71
Photogoniometer classification	Type 4 according to EN 13032-1 Type C according to IES LM 75-19

Applied standards

Photometric measurement	EN 13032-1; EN 13032-4; IES LM 79-08; IES LM 79-19
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Tested luminaire data

Luminaire name	Chapeaux Tavolo vetro bianco caldo
Manufacturer	Foscarini S.p.A.
Luminaire dimensions (mm)	Diameter: 280 x H 480
Luminous area dimensions (mm)	280 x 0
Type of light source	8W LED 2700K CRI92
Correlated Colour Temperature (CCT)	2308
Colour Rendering Index (CRI)	90
Total luminous flux of the light source (lm)	686.4
Output luminous flux of the luminaire (lm)	686.4
Source power (W)	8
Power included ballast (W)	10.8

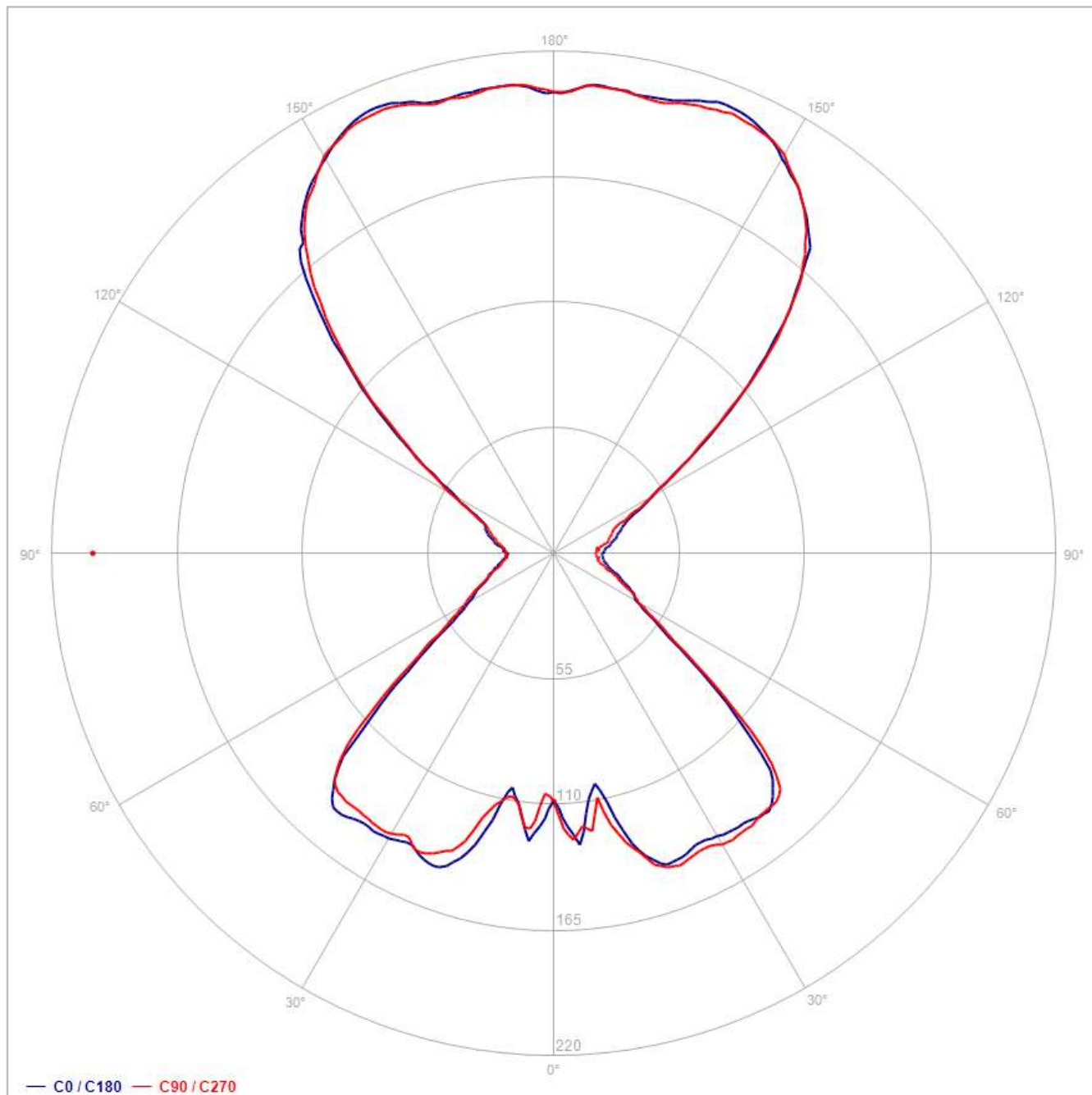
Luminaire efficiency

Light Output Ratio of luminaire (LOR)	100
Downward Flux Fraction (DFF)	45
Upward Flux Fraction (UFF)	55.00

Luminaire efficacy

LED module efficacy (lm/W)	85.80
System light efficacy (lm/W)	63.56
Luminaire light efficacy (lm/W)	63.56

Photometric Polar Diagram



Photometric Cartesian Diagram



Light Emission Photo



Light intensities distribution values (cd/klm)

Gamma	C0°	C15°	C30°	C45°	C60°	C75°	C90°	C105°	C120°	C135°	C150°	C165°
0°	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41
1°	111.25	112.42	113.36	114.11	114.60	114.78	114.60	114.78	114.60	114.11	113.36	113.05
2°	115.58	116.75	117.64	118.53	119.49	120.41	120.78	120.41	119.49	118.53	117.64	117.36
3°	119.40	119.82	120.24	121.02	121.51	122.40	123.26	122.40	121.51	121.02	120.24	120.06
4°	123.80	122.80	121.09	121.04	121.72	123.73	125.75	123.73	121.72	121.04	122.68	122.07
5°	128.42	125.16	122.26	120.83	120.59	121.34	122.87	121.34	120.59	120.83	122.26	123.17
6°	123.03	121.58	120.52	119.17	117.81	118.46	119.96	118.46	117.81	119.17	120.52	120.90
7°	114.78	115.65	116.68	116.47	115.42	118.06	121.48	118.06	115.42	116.47	116.68	116.66
8°	109.30	111.67	114.22	114.81	113.64	118.11	123.01	118.11	113.64	114.81	114.22	113.66
9°	105.93	109.16	113.40	113.57	110.85	115.86	115.91	115.86	110.85	113.57	113.40	112.58
10°	102.35	106.80	112.51	112.02	111.74	113.78	108.79	113.78	111.74	112.02	112.51	111.32
11°	105.63	108.60	112.82	111.62	115.93	116.42	115.16	116.42	115.93	111.62	112.82	111.15
12°	111.58	114.15	115.86	116.07	120.06	121.23	121.53	121.23	120.06	116.07	115.86	115.56
13°	118.65	120.69	120.74	121.02	123.71	126.05	125.91	126.05	123.71	121.02	120.74	121.18
14°	125.19	126.78	125.63	123.73	127.04	130.76	130.27	130.76	127.04	124.90	125.63	126.50
15°	131.84	132.38	130.20	126.85	131.32	134.49	133.17	134.49	131.32	126.85	130.20	131.25
16°	135.17	136.69	134.42	129.12	135.54	137.34	136.06	137.34	135.54	129.12	134.42	135.68
17°	138.49	139.87	138.40	132.42	137.55	140.01	139.73	140.01	137.55	132.42	138.40	139.24
18°	141.40	142.71	141.54	137.30	139.73	142.57	143.39	142.57	139.73	137.30	141.54	141.68
19°	143.65	144.79	143.90	141.23	141.30	144.54	144.86	144.54	141.30	141.23	143.90	143.90
20°	145.38	146.10	145.14	143.32	142.08	145.38	146.34	145.38	142.08	143.32	145.14	145.68
21°	144.98	146.67	145.78	144.47	143.11	146.18	146.95	146.18	143.11	144.47	145.78	146.83
22°	144.89	146.22	146.32	145.36	144.58	146.92	147.53	146.92	144.58	145.36	146.32	147.84
23°	144.51	145.78	146.69	145.47	145.43	147.30	147.02	147.30	145.43	145.47	146.69	147.79
24°	143.72	144.86	146.55	145.38	144.96	147.07	146.50	147.07	144.96	145.38	146.55	146.85
25°	142.75	143.43	145.99	144.96	144.58	146.34	145.87	146.34	144.58	144.96	145.99	145.68
26°	142.03	142.22	145.28	144.54	144.00	144.65	145.24	144.65	144.00	144.54	145.28	144.51
27°	141.98	142.01	144.51	144.51	143.60	143.67	145.24	143.67	143.60	144.51	144.51	143.62
28°	142.19	142.50	144.49	145.07	143.88	144.75	145.24	144.75	143.88	145.07	144.49	143.53
29°	142.90	143.22	145.21	145.99	144.47	145.78	146.22	145.78	144.47	145.99	145.21	144.02
30°	143.22	143.90	145.57	146.57	144.91	146.48	147.18	146.48	144.91	146.57	145.57	144.14
31°	143.93	144.25	145.26	146.78	144.98	146.99	147.74	146.99	144.98	146.78	145.26	143.93
32°	144.16	144.49	144.82	146.81	145.38	147.07	148.28	147.07	145.38	146.81	144.82	143.72
33°	144.42	144.63	144.28	146.32	145.94	147.18	147.74	147.18	145.94	146.32	144.28	143.43
34°	144.77	144.75	143.90	146.03	146.08	146.67	147.18	146.67	146.08	146.03	143.90	143.34
35°	144.82	144.84	143.36	145.85	145.71	146.15	147.32	146.15	145.71	145.85	143.36	143.60
36°	145.12	144.84	143.34	145.45	145.54	145.80	147.46	145.80	145.54	145.45	143.34	143.83
37°	145.87	145.14	143.43	144.91	146.10	145.43	146.92	145.43	146.10	144.91	143.43	144.04
38°	146.62	145.68	143.55	144.96	146.71	145.87	146.36	145.87	146.71	144.96	143.55	144.30
39°	146.85	146.25	143.57	145.03	146.53	146.34	146.18	146.34	146.53	145.03	143.57	144.28
40°	147.14	146.99	143.48	144.86	146.25	146.27	145.99	146.27	146.25	144.86	143.48	144.00
41°	145.36	147.74	143.39	144.35	146.06	146.20	146.15	146.20	146.06	144.35	143.39	143.83
42°	143.43	147.16	142.80	142.94	145.73	145.80	146.29	145.80	145.73	142.94	142.80	143.41
43°	141.21	143.18	141.42	140.44	144.23	145.21	144.77	145.21	144.23	140.44	141.42	142.22
44°	138.14	138.75	138.98	137.02	141.77	141.28	143.25	141.28	141.77	137.02	138.98	140.13

45°	134.58	132.99	134.09	132.42	136.36	137.25	138.07	137.25	136.36	132.42	134.09	136.62
46°	125.70	126.36	127.69	125.82	130.29	130.13	132.87	130.13	130.29	125.82	127.69	128.02
47°	117.17	119.54	120.52	117.15	122.09	122.94	124.30	122.94	122.09	117.15	120.52	118.42
48°	108.53	109.75	113.12	108.44	113.47	114.13	115.70	114.13	113.47	108.44	113.12	109.09
49°	100.17	100.45	103.31	100.05	104.17	105.30	106.26	105.30	104.17	100.05	103.31	99.82
50°	92.37	91.31	93.66	91.85	94.83	95.37	96.79	95.37	94.83	91.85	93.66	90.63
51°	84.10	82.69	84.66	83.61	86.09	85.62	87.80	85.62	86.09	83.61	84.66	82.01
52°	76.32	74.84	76.34	75.80	77.70	78.17	78.78	78.17	77.70	75.80	76.34	74.75
53°	69.13	68.40	68.87	68.99	70.46	70.77	72.22	70.77	70.46	68.99	68.87	68.59
54°	62.71	62.78	62.59	62.78	63.55	64.68	65.66	64.68	63.55	62.78	62.59	63.16
55°	57.11	57.65	57.67	57.84	59.01	58.77	60.67	58.77	59.01	57.84	57.67	58.07
56°	52.99	53.15	53.83	53.67	54.63	54.72	55.66	54.72	54.63	53.67	53.83	53.46
57°	49.47	49.08	50.44	50.60	51.25	50.74	51.84	50.74	51.25	50.60	50.44	49.80
58°	46.45	45.75	47.44	48.33	48.26	47.88	48.02	47.88	48.26	48.33	47.44	46.73
59°	43.85	43.64	44.79	46.71	46.34	45.16	45.59	45.16	46.34	46.71	44.79	44.77
60°	41.74	41.63	43.06	45.02	44.27	43.48	43.13	43.48	44.27	45.02	43.06	43.08
61°	40.83	40.39	41.63	43.50	41.81	41.77	41.77	41.77	41.81	43.50	41.63	41.23
62°	40.08	39.35	39.92	42.00	40.03	39.94	40.39	39.94	40.03	42.00	39.92	39.35
63°	39.03	38.07	38.49	40.57	38.91	38.35	39.24	38.35	38.91	40.57	38.49	37.69
64°	37.76	36.87	37.55	39.71	37.27	37.62	38.07	37.62	37.27	39.71	37.55	36.73
65°	36.43	35.75	35.61	38.56	35.26	36.61	35.82	36.61	35.26	38.56	35.61	35.89
66°	35.19	34.65	33.80	36.82	33.69	34.76	33.55	34.76	33.69	36.82	33.80	34.11
67°	33.97	32.80	32.94	34.97	32.35	32.94	32.00	32.94	32.35	34.97	32.94	32.37
68°	32.87	31.74	31.39	33.43	31.09	31.16	30.43	31.16	31.09	33.43	31.39	30.59
69°	31.81	31.20	29.61	32.63	29.84	29.56	29.66	29.56	29.84	32.63	29.61	29.31
70°	30.99	29.47	28.60	31.53	28.42	28.37	28.88	28.37	28.42	31.53	28.60	28.44
71°	29.82	28.20	27.38	30.20	27.10	27.50	27.92	27.50	27.10	30.20	27.38	27.45
72°	28.63	27.48	26.85	29.31	26.21	27.20	26.94	27.20	26.21	29.31	26.85	26.66
73°	27.41	27.60	26.10	28.34	25.53	26.42	25.32	26.42	25.53	28.34	26.10	26.12
74°	26.38	26.71	24.83	27.41	25.21	24.97	23.68	24.97	25.21	27.41	24.83	26.24
75°	25.51	26.42	24.71	26.63	24.39	23.82	23.24	23.82	24.39	26.63	24.71	24.76
76°	24.92	26.17	24.22	25.67	23.28	22.98	22.79	22.98	23.28	25.67	24.22	23.66
77°	24.36	25.96	23.21	24.55	23.05	22.54	21.72	22.54	23.05	24.55	23.21	23.19
78°	23.73	24.67	22.82	24.29	22.79	22.42	20.64	22.42	22.79	24.29	22.82	22.98
79°	23.19	24.71	23.03	23.94	22.00	22.37	20.61	22.37	22.00	23.94	23.03	22.47
80°	22.58	24.62	22.61	23.52	21.15	22.32	20.57	22.32	21.15	23.10	22.61	22.47
81°	22.37	23.80	21.06	22.49	20.26	21.86	19.84	21.86	20.26	22.49	21.06	22.11
82°	22.16	23.24	20.29	22.02	19.94	21.13	19.09	21.13	19.94	22.02	20.29	21.32
83°	21.97	22.18	20.45	21.95	19.89	20.80	19.61	20.80	19.89	21.95	20.45	21.06
84°	21.72	23.14	19.61	21.60	19.49	20.61	20.12	20.61	19.49	21.60	19.61	20.83
85°	21.46	21.97	20.73	21.60	19.21	20.01	19.40	20.01	19.21	21.60	20.73	20.80
86°	21.29	21.11	19.65	21.43	19.37	19.30	18.65	19.30	19.37	21.43	19.65	21.15
87°	21.11	21.18	18.88	20.22	19.44	19.21	18.65	19.21	19.44	20.22	18.88	20.97
88°	21.08	20.94	18.97	20.73	19.44	19.21	18.65	19.21	19.44	20.73	18.86	21.04
89°	21.20	20.92	19.77	20.99	19.44	19.72	18.51	19.72	19.44	20.99	19.63	21.20
90°	21.46	22.96	20.78	20.31	19.44	20.26	18.34	20.26	19.44	20.31	20.78	20.90
91°	22.11	22.96	20.75	21.04	19.28	19.56	18.34	19.56	19.28	21.04	20.78	20.90
92°	22.25	22.96	19.56	21.36	19.26	19.00	18.34	19.00	19.26	21.36	19.28	20.99

93°	22.42	21.46	19.33	21.27	19.63	19.86	19.23	19.86	19.63	21.27	19.33	21.86
94°	22.65	22.23	20.50	20.59	20.15	20.50	20.12	20.50	20.15	20.59	20.50	21.57
95°	23.03	22.86	20.50	21.20	20.78	19.82	19.42	19.82	20.78	21.20	20.50	21.20
96°	23.57	23.47	20.99	22.18	20.94	19.47	18.72	19.47	20.94	22.18	20.99	22.11
97°	24.32	23.82	21.46	23.17	21.08	20.36	19.65	20.36	21.08	23.17	21.46	22.65
98°	24.85	24.43	22.32	23.47	21.90	21.34	20.57	21.34	21.90	23.47	22.32	23.71
99°	25.23	26.05	23.03	24.01	22.72	22.47	21.36	22.47	22.72	24.01	23.03	23.99
100°	25.53	26.31	23.52	24.90	23.64	23.31	22.14	23.31	23.64	24.25	23.52	24.88
101°	26.26	27.41	24.48	25.79	24.10	23.66	23.43	23.66	24.10	25.79	24.48	25.04
102°	26.89	27.60	25.25	26.52	24.27	24.08	24.71	24.08	24.27	26.52	25.25	25.18
103°	27.45	28.81	25.56	27.13	24.90	24.69	24.76	24.69	24.90	27.13	25.56	26.05
104°	28.04	28.86	26.14	27.99	25.65	25.49	24.78	25.49	25.65	27.99	26.14	26.26
105°	28.65	28.84	27.48	28.39	26.85	26.49	25.16	26.49	26.85	28.39	27.48	26.61
106°	29.21	29.38	27.38	28.63	27.71	27.01	25.53	27.01	27.71	28.63	27.38	27.88
107°	29.84	29.14	27.85	29.59	27.83	27.06	26.14	27.06	27.83	29.59	27.85	27.83
108°	30.50	30.01	28.39	30.41	28.02	27.57	26.73	27.57	28.02	30.41	28.39	28.27
109°	31.11	30.13	29.09	31.11	28.30	28.39	27.10	28.39	28.30	31.11	29.09	29.09
110°	31.72	30.27	30.15	31.86	29.00	28.84	27.48	28.84	29.00	31.86	30.15	29.56
111°	32.35	31.11	30.22	32.89	29.89	29.07	28.23	29.07	29.89	32.89	30.22	29.94
112°	33.26	31.37	30.92	34.34	30.71	29.75	28.95	29.75	30.71	34.34	30.92	30.78
113°	34.48	32.16	32.12	35.63	31.67	30.57	30.34	30.57	31.67	35.63	32.12	31.91
114°	35.91	33.57	33.76	37.11	33.29	32.30	31.69	32.30	33.29	37.11	33.76	33.19
115°	37.48	35.56	36.00	38.96	35.09	34.34	34.15	34.34	35.09	38.96	36.00	34.86
116°	39.75	38.32	38.56	40.76	37.39	37.04	36.59	37.04	37.39	40.76	38.56	37.81
117°	42.21	41.23	40.97	42.80	40.01	39.94	39.50	39.94	40.01	42.80	40.97	40.71
118°	44.70	44.23	43.92	45.23	43.06	42.94	42.38	42.94	43.06	45.23	43.92	43.38
119°	47.18	46.87	47.25	48.00	46.29	45.98	46.01	45.98	46.29	48.00	47.25	46.78
120°	49.90	50.13	50.51	51.02	49.64	49.50	49.64	49.50	49.64	51.02	50.51	50.36
121°	53.67	53.88	54.00	54.39	53.32	53.01	53.15	53.01	53.32	54.39	54.00	54.37
122°	57.93	58.07	58.38	58.42	57.18	57.21	56.67	57.21	57.18	58.42	58.38	58.66
123°	62.76	62.64	62.94	62.48	61.89	61.56	62.38	61.56	61.89	62.48	62.94	63.01
124°	67.98	67.63	67.79	66.60	66.83	66.67	68.07	66.67	66.83	66.60	67.79	67.82
125°	73.51	73.30	73.23	71.52	73.09	71.75	73.30	71.75	73.09	71.52	73.23	73.25
126°	79.48	79.13	79.13	77.19	79.39	77.98	78.52	77.98	79.39	77.19	79.13	79.15
127°	86.00	85.43	85.62	83.58	85.50	84.31	84.89	84.31	85.50	83.58	85.62	85.25
128°	92.72	91.90	92.79	90.35	91.83	91.13	91.27	91.13	91.83	90.35	92.79	91.62
129°	99.56	98.60	100.14	97.52	99.39	97.92	98.57	97.92	99.39	97.52	100.14	98.29
130°	106.94	105.49	107.48	104.83	106.98	105.44	105.88	105.44	106.98	104.83	107.48	105.37
131°	113.45	112.47	115.00	111.79	113.99	113.03	113.89	113.03	113.99	111.79	115.00	112.79
132°	120.41	119.38	123.05	118.70	121.04	120.10	121.88	120.10	121.04	118.70	123.05	120.41
133°	127.53	126.99	129.59	125.44	128.21	127.22	129.03	127.22	128.21	125.44	129.59	128.23
134°	134.63	134.39	136.01	132.42	135.33	134.58	136.17	134.58	135.33	132.42	136.01	136.38
135°	142.45	141.91	142.26	139.50	142.05	141.96	142.90	141.96	142.05	139.50	142.26	144.07
136°	149.01	149.06	148.17	146.32	148.68	148.45	149.60	148.45	148.68	146.32	148.17	149.78
137°	155.62	156.25	153.67	153.04	155.43	154.80	155.92	154.80	155.43	153.04	153.67	155.64
138°	161.85	163.81	159.32	159.50	161.66	160.51	162.24	160.51	161.66	159.50	159.32	161.05
139°	168.22	169.01	164.61	164.96	166.91	166.23	166.70	166.23	166.91	164.96	164.61	166.09
140°	174.87	173.18	169.30	169.58	171.97	170.51	171.15	170.51	171.97	169.58	169.30	170.63

141°	178.13	176.82	173.65	173.96	175.97	174.80	175.39	174.80	175.97	173.96	173.65	174.92
142°	181.24	179.72	177.52	178.41	179.88	178.60	179.60	178.60	179.88	178.41	177.52	178.69
143°	184.15	182.41	181.29	182.65	183.12	182.25	183.09	182.25	183.12	182.65	181.29	181.90
144°	186.84	185.39	185.04	185.90	186.47	185.69	186.56	185.69	186.47	185.90	185.04	185.04
145°	189.44	188.48	188.15	188.88	189.51	189.09	189.44	189.09	189.51	188.88	188.15	188.11
146°	191.90	191.32	191.06	191.78	192.46	191.88	192.32	191.88	192.46	191.78	191.06	191.11
147°	193.99	193.59	193.94	194.74	195.16	194.67	194.29	194.67	195.16	194.74	193.94	193.73
148°	195.88	195.70	196.70	197.59	197.57	196.84	196.26	196.84	197.57	197.59	196.70	196.28
149°	197.95	197.83	199.42	199.91	199.59	198.93	198.93	198.93	199.59	199.91	199.42	198.60
150°	200.03	199.98	202.00	202.00	201.27	200.87	201.58	200.87	201.27	202.00	202.00	200.62
151°	202.26	201.95	203.85	203.99	202.94	202.79	203.10	202.79	202.94	203.99	203.85	202.70
152°	204.01	203.68	205.23	205.49	204.29	204.13	204.62	204.13	204.29	205.49	205.23	204.67
153°	205.72	205.30	206.68	206.73	205.51	205.35	205.25	205.35	205.51	206.73	206.68	206.07
154°	206.73	206.94	207.97	207.78	206.12	206.33	205.89	206.33	206.12	207.78	207.97	207.46
155°	208.25	207.69	208.98	208.84	206.61	207.18	206.28	207.18	206.61	208.84	208.98	208.49
156°	208.77	208.35	209.96	209.38	207.25	207.55	206.68	207.55	207.25	209.38	209.96	209.21
157°	209.59	208.81	210.67	209.71	207.69	207.71	207.25	207.71	207.69	209.71	210.67	209.80
158°	210.08	209.31	210.22	209.78	208.14	207.43	207.78	207.43	208.14	209.78	210.22	210.27
159°	210.31	209.92	209.33	209.00	208.63	207.03	207.20	207.03	208.63	209.00	209.33	209.49
160°	210.06	209.35	208.25	207.90	208.35	206.82	206.61	206.82	208.35	207.90	208.25	208.77
161°	208.96	208.21	207.46	206.80	207.32	206.73	206.24	206.73	207.32	206.80	207.46	208.23
162°	208.04	207.18	206.75	206.07	206.21	206.07	205.86	206.07	206.21	206.07	206.75	207.39
163°	206.96	206.28	206.07	205.47	205.16	204.97	205.28	204.97	205.16	205.47	206.07	206.12
164°	205.98	205.30	205.68	204.76	204.34	204.34	204.67	204.34	204.34	204.76	205.68	205.21
165°	205.07	204.67	205.16	204.32	204.06	204.32	203.78	204.32	204.06	204.32	205.16	204.60
166°	204.79	204.50	204.50	204.18	203.64	204.01	202.89	204.01	203.64	204.15	204.50	204.13
167°	204.53	204.57	204.13	204.01	203.64	203.50	202.89	203.50	203.64	204.01	204.13	204.18
168°	204.25	204.81	204.11	204.08	203.59	203.40	202.89	203.40	203.59	204.08	204.11	204.46
169°	204.01	205.04	204.60	204.41	203.85	203.71	203.31	203.71	203.85	204.41	204.60	204.81
170°	204.15	205.28	205.11	204.79	204.27	204.06	203.71	204.06	204.27	204.79	205.11	205.35
171°	204.86	205.68	205.42	205.07	204.86	204.62	204.46	204.62	204.86	205.07	205.42	205.65
172°	204.97	205.93	205.39	205.39	205.32	205.16	205.18	205.16	205.32	205.39	205.39	205.63
173°	205.23	205.89	205.42	205.51	205.63	205.37	205.18	205.37	205.63	205.51	205.42	205.61
174°	205.63	205.79	205.68	205.44	205.47	205.47	205.18	205.47	205.47	205.44	205.68	205.77
175°	205.72	205.82	205.54	205.25	205.32	205.32	205.16	205.32	205.32	205.25	205.54	205.70
176°	205.18	205.14	204.50	204.74	204.86	205.04	205.11	205.04	204.86	204.74	205.37	205.00
177°	204.06	204.11	204.01	203.85	203.87	203.83	203.59	203.83	203.87	203.85	204.01	204.06
178°	202.72	202.89	202.94	202.86	202.72	202.49	202.07	202.49	202.72	202.86	202.94	202.94
179°	201.53	201.72	201.90	202.02	202.09	202.09	202.07	202.09	202.09	202.02	201.90	201.83
180°	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07
Gamma	C180°	C195°	C210°	C225°	C240°	C255°	C270°	C285°	C300°	C315°	C330°	C345°
0°	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41	108.41
1°	112.00	111.67	110.78	109.94	108.91	107.73	106.59	105.51	105.86	106.96	108.13	108.53
2°	116.40	115.98	114.78	113.07	110.78	108.01	105.27	102.72	103.59	106.16	109.02	109.91
3°	119.68	119.59	119.07	117.50	114.11	112.72	111.04	109.14	109.84	111.74	113.00	113.31
4°	123.19	123.52	124.62	123.76	121.41	119.89	117.83	115.44	116.17	118.67	120.45	120.97
5°	126.29	127.39	129.75	129.68	126.40	125.12	121.30	122.07	121.63	121.86	125.84	125.82
6°	121.86	122.35	123.87	126.57	126.19	120.29	120.78	128.18	125.89	119.52	122.14	124.44

7°	115.14	114.81	115.53	117.99	118.46	112.61	116.05	120.76	119.38	114.22	114.39	116.80
8°	110.73	109.91	110.36	112.47	111.34	108.27	111.25	113.19	112.44	110.50	107.38	109.54
9°	107.76	106.73	106.77	109.49	108.09	106.73	108.86	110.66	110.03	108.37	107.08	107.45
10°	104.43	103.28	103.24	106.21	107.24	106.87	108.30	108.48	108.46	108.09	106.91	107.41
11°	106.73	106.33	105.58	103.82	107.94	109.19	108.79	108.27	108.69	108.60	108.67	108.34
12°	112.58	112.23	111.39	108.27	109.77	112.23	110.83	108.23	109.42	110.87	111.83	110.92
13°	119.59	119.24	117.85	113.97	112.35	113.87	113.26	112.28	112.65	113.19	114.69	113.59
14°	125.96	125.63	124.06	119.73	116.59	114.88	116.40	116.47	116.31	116.19	115.68	115.32
15°	132.26	132.19	130.29	125.61	121.34	117.46	119.89	121.02	121.11	119.80	116.89	118.81
16°	136.24	135.73	134.51	131.49	125.44	121.95	126.01	125.61	126.36	124.81	120.08	121.79
17°	139.62	139.12	137.93	136.08	129.03	126.26	131.93	130.88	131.25	130.18	125.16	125.63
18°	142.54	141.96	140.79	138.84	132.26	130.25	135.02	136.10	135.80	134.04	130.11	130.48
19°	144.68	144.14	143.04	140.79	135.70	134.16	137.72	137.79	138.05	136.17	134.02	134.27
20°	146.18	145.61	144.84	142.61	138.30	136.71	138.98	139.26	139.45	137.88	137.18	137.06
21°	146.50	145.36	145.26	144.02	139.85	138.77	140.25	140.48	140.81	139.38	139.57	139.59
22°	146.39	144.98	145.05	145.19	141.37	140.83	141.61	141.65	142.17	141.07	141.65	141.56
23°	145.73	144.54	144.63	144.96	142.43	142.80	143.01	142.83	143.36	142.36	143.67	142.85
24°	144.56	143.55	143.69	144.23	142.80	144.09	143.34	144.00	144.39	143.67	144.04	143.22
25°	143.20	142.61	142.43	143.18	142.61	142.61	143.08	142.85	143.55	142.99	143.25	142.90
26°	142.36	142.12	141.79	142.05	142.19	140.81	141.72	141.49	141.77	142.01	142.08	142.05
27°	142.36	142.08	142.05	141.37	141.82	139.83	139.83	140.62	140.97	140.76	141.65	141.42
28°	142.78	142.33	142.71	141.61	141.91	139.66	139.71	139.83	140.88	139.87	141.98	141.84
29°	143.41	143.04	143.48	142.15	141.82	140.23	141.00	140.79	141.54	140.74	142.26	143.01
30°	144.04	143.62	144.25	142.47	142.22	141.28	141.91	141.94	142.52	142.08	142.64	144.00
31°	144.49	144.09	144.61	142.47	143.11	142.22	142.36	142.24	142.87	142.52	143.15	143.97
32°	144.75	144.32	144.39	142.52	143.62	143.22	142.54	142.45	142.90	142.61	143.29	143.79
33°	144.79	144.56	144.11	142.75	143.53	144.09	142.57	142.68	142.85	142.61	143.43	143.34
34°	144.86	144.75	143.81	143.08	143.29	144.21	142.50	142.94	142.78	142.45	143.93	143.06
35°	144.86	144.82	143.67	142.90	142.78	144.28	142.08	142.64	142.50	142.26	144.21	142.94
36°	145.07	145.36	144.11	142.85	142.54	144.37	141.77	142.31	142.08	142.08	143.83	143.20
37°	145.78	146.20	144.91	143.08	142.59	144.18	141.61	141.84	141.94	141.79	143.69	143.32
38°	146.48	146.88	145.47	143.32	142.40	143.90	141.47	141.40	142.01	141.56	143.39	142.54
39°	147.46	147.44	146.32	143.53	141.89	143.79	141.51	141.40	141.91	141.54	143.57	141.89
40°	147.67	148.14	146.71	143.83	141.26	143.67	141.56	141.44	141.72	141.70	143.25	141.98
41°	147.56	146.39	146.97	143.90	140.88	143.57	141.35	141.44	141.47	141.79	142.57	142.08
42°	144.79	143.88	144.79	143.43	140.18	142.83	140.97	141.40	141.21	141.84	141.75	141.14
43°	141.91	141.21	142.05	142.10	138.12	140.76	139.73	140.58	140.32	141.14	140.37	139.03
44°	138.14	137.74	138.28	139.55	135.40	137.81	137.86	139.69	138.82	138.07	137.20	135.82
45°	133.62	133.60	133.64	136.15	130.83	133.62	134.25	136.50	135.70	134.39	132.49	131.11
46°	127.83	125.58	127.81	128.23	124.95	128.40	129.80	133.01	131.28	129.12	126.45	125.05
47°	118.18	116.73	118.04	119.10	118.04	121.74	122.80	126.87	125.35	123.08	119.00	117.85
48°	108.91	108.04	108.79	110.17	110.54	113.66	115.25	120.36	118.35	114.90	110.90	109.89
49°	99.91	99.61	99.75	101.32	101.69	103.56	106.26	112.09	110.17	106.59	101.97	101.15
50°	91.22	91.73	91.13	92.11	92.30	94.03	97.40	103.59	101.25	97.45	92.81	92.55
51°	82.93	83.70	82.93	83.42	84.10	85.15	89.16	94.64	92.23	88.71	83.65	83.32
52°	75.66	75.90	75.31	75.48	76.91	76.98	81.15	85.62	83.23	80.94	75.59	74.70
53°	69.25	68.85	68.59	68.38	70.16	70.02	74.00	78.26	75.50	73.63	68.64	68.47
54°	63.32	62.57	62.69	62.31	64.33	63.74	67.30	71.05	68.89	67.47	62.64	62.83

55°	58.10	57.18	57.67	57.63	59.85	58.40	61.61	64.89	63.13	61.73	57.58	58.19
56°	53.53	53.04	53.46	53.78	56.64	54.14	56.69	58.84	58.14	57.16	53.27	54.39
57°	49.97	49.83	50.08	50.62	54.11	50.81	53.15	54.60	53.78	53.20	49.50	51.35
58°	47.20	47.13	47.25	47.91	51.49	47.83	49.99	50.62	49.92	50.15	46.97	48.82
59°	45.05	44.70	44.86	45.47	48.80	45.12	47.62	48.12	47.11	47.86	45.12	46.62
60°	43.01	42.75	42.75	43.20	46.22	43.43	45.52	45.75	45.02	46.52	43.71	45.19
61°	41.16	41.30	40.99	41.93	44.18	42.17	43.64	44.39	43.22	44.72	42.45	44.13
62°	39.64	40.13	39.73	40.78	42.26	40.46	41.91	43.13	41.60	42.40	40.43	43.24
63°	38.58	38.82	38.75	39.14	40.10	38.77	40.34	41.04	39.85	40.50	38.61	42.12
64°	37.43	37.32	37.57	37.43	38.37	37.04	38.79	38.86	38.02	38.91	37.72	40.01
65°	36.08	35.77	36.24	35.56	36.92	35.44	37.34	37.01	36.33	37.46	36.68	38.89
66°	34.69	34.51	34.62	33.87	34.65	34.01	35.96	35.21	34.76	36.08	35.37	38.35
67°	33.12	33.36	33.12	32.21	32.68	32.37	34.65	33.71	33.12	34.46	33.73	36.05
68°	31.98	32.35	31.98	30.57	31.06	30.59	33.15	32.23	31.48	32.73	32.16	33.94
69°	31.06	31.79	30.99	29.73	30.34	29.56	31.53	30.76	29.94	31.20	30.83	32.77
70°	30.05	31.39	30.29	29.21	29.70	28.81	30.38	29.28	28.44	29.80	30.05	31.60
71°	29.73	30.83	29.87	28.04	28.79	27.69	29.35	28.20	27.45	29.09	29.82	30.38
72°	29.59	29.66	29.61	26.66	27.62	26.71	28.53	27.15	26.66	28.37	29.02	29.47
73°	28.18	28.34	28.91	26.00	26.61	25.89	27.76	25.89	25.63	27.41	28.11	28.18
74°	27.48	27.06	27.69	24.60	25.93	25.00	26.42	24.62	24.48	26.19	27.38	26.52
75°	26.87	25.93	26.54	24.69	24.62	24.15	25.14	23.54	23.14	24.62	26.66	25.53
76°	25.67	25.04	25.23	24.08	23.92	23.21	24.71	22.49	21.74	23.89	25.89	24.74
77°	24.85	24.43	24.92	23.05	23.64	22.44	24.29	21.93	20.99	23.78	25.49	24.13
78°	25.09	24.13	25.07	22.49	22.77	22.30	23.61	21.36	20.45	23.64	25.04	23.33
79°	23.66	23.54	23.64	22.47	22.18	22.07	23.07	20.97	20.01	23.52	24.39	22.91
80°	23.14	22.39	23.36	22.21	21.72	21.76	22.82	20.59	19.58	22.86	24.39	23.12
81°	23.21	21.76	22.98	21.43	21.15	21.62	22.39	20.57	18.93	22.11	24.50	21.74
82°	22.63	22.56	22.35	21.46	20.57	21.32	21.69	20.52	18.25	21.32	24.32	20.92
83°	22.30	22.30	21.72	20.87	20.54	20.38	21.34	19.86	18.53	20.68	24.06	20.59
84°	21.50	21.41	21.34	20.29	20.36	19.61	21.34	19.16	18.95	20.50	23.75	20.26
85°	20.52	21.15	20.83	20.80	19.91	18.93	20.87	18.95	18.34	20.29	23.10	20.24
86°	21.32	20.87	21.27	19.86	20.10	18.62	20.15	18.76	17.64	20.05	22.82	20.22
87°	21.01	20.52	21.01	20.80	20.12	18.65	20.50	18.58	17.12	19.63	22.86	19.70
88°	21.01	21.43	21.04	19.98	19.70	19.35	21.20	18.41	16.61	19.04	23.89	20.01
89°	19.89	21.46	21.01	19.51	19.35	19.30	20.68	18.08	17.08	19.40	23.89	20.17
90°	20.75	21.46	20.75	21.20	19.89	18.86	19.98	17.73	17.59	19.98	22.98	19.96
91°	20.99	21.46	20.78	21.01	20.08	19.56	20.52	18.25	17.29	20.19	23.71	19.96
92°	21.43	21.53	21.01	20.45	20.92	20.01	21.04	18.76	17.01	20.36	24.18	20.52
93°	22.44	21.53	21.43	20.90	21.18	20.01	21.22	18.25	17.50	20.36	24.32	21.20
94°	21.43	22.18	22.44	20.83	20.40	19.86	21.36	17.76	17.97	20.31	23.68	20.57
95°	21.53	22.16	21.60	22.21	20.45	19.70	21.36	18.44	17.83	20.15	23.45	20.97
96°	22.65	22.18	22.35	22.25	21.34	19.96	21.69	19.14	17.80	20.73	23.89	21.53
97°	23.14	23.45	23.66	22.42	22.42	20.61	22.58	19.86	18.72	21.88	24.92	21.76
98°	24.34	23.89	24.39	23.10	23.36	21.83	23.26	20.57	19.68	22.63	25.77	22.86
99°	25.35	24.36	25.51	24.15	23.71	22.65	23.71	21.29	21.08	23.24	26.10	23.99
100°	25.81	24.90	25.86	24.85	24.57	23.43	24.41	22.02	22.28	24.06	26.38	25.02
101°	26.68	26.63	26.66	25.00	25.09	24.29	25.30	22.75	22.37	24.90	26.75	25.23
102°	27.03	27.45	26.96	25.11	25.37	24.92	25.58	23.45	22.61	25.60	27.34	25.98

103°	27.71	28.16	27.64	26.07	25.65	25.25	25.65	23.82	23.47	26.26	27.92	27.06
104°	28.46	28.86	28.58	26.31	25.93	25.37	26.45	24.20	24.20	26.75	28.49	27.71
105°	29.47	29.52	29.42	26.47	26.56	25.51	27.43	24.74	24.29	27.34	29.24	28.09
106°	30.10	29.94	30.08	27.90	27.64	26.52	28.04	25.30	24.57	27.95	29.47	28.23
107°	30.52	30.13	30.69	27.83	28.39	27.13	28.65	26.17	25.51	28.53	29.07	29.38
108°	30.92	30.29	31.06	28.27	29.07	27.15	29.33	27.03	26.42	29.09	29.66	30.59
109°	31.65	30.78	30.92	28.46	29.66	27.99	29.94	27.92	27.31	29.68	30.50	31.84
110°	31.88	31.55	30.99	29.40	30.48	29.21	30.29	28.81	28.13	30.22	31.41	32.37
111°	31.62	32.12	31.11	30.90	31.04	30.05	30.80	29.38	28.72	30.78	32.09	33.22
112°	32.16	32.70	31.84	31.74	31.46	30.95	32.00	30.03	29.59	31.41	32.54	34.48
113°	33.43	33.48	33.10	33.31	33.36	32.37	33.45	31.67	31.16	33.26	33.76	36.22
114°	34.88	34.44	35.16	34.90	35.70	34.01	35.40	33.38	32.96	35.19	35.37	38.32
115°	36.31	36.08	37.36	36.33	38.32	35.75	37.27	35.51	35.16	37.22	37.97	40.53
116°	38.30	38.58	39.57	39.78	41.18	38.49	39.12	37.72	37.41	39.50	40.34	42.96
117°	40.88	41.44	41.81	43.15	44.23	41.65	41.60	40.32	39.82	42.56	42.33	45.98
118°	43.85	44.41	44.39	45.73	47.48	44.39	44.84	43.01	42.80	45.80	45.28	48.80
119°	46.64	47.32	47.13	48.75	51.14	47.25	48.35	46.59	46.66	49.26	48.68	51.54
120°	49.87	50.58	50.41	52.12	55.26	51.11	52.03	50.20	50.48	52.80	51.75	54.16
121°	53.71	54.28	54.09	56.13	58.80	55.00	55.73	54.25	54.23	56.39	55.00	57.32
122°	58.10	58.35	58.38	60.44	62.76	58.80	59.41	58.31	58.28	60.65	59.03	61.07
123°	62.71	62.78	62.92	64.63	67.32	62.97	63.90	62.76	62.71	65.47	63.30	64.98
124°	67.65	67.65	67.79	69.20	71.82	67.68	68.87	67.30	67.42	70.16	68.26	69.50
125°	73.02	73.02	73.42	74.84	77.07	73.16	73.70	72.69	72.50	74.77	73.49	74.47
126°	78.99	79.08	79.67	80.98	82.32	79.34	78.50	78.05	77.80	80.00	78.31	79.95
127°	85.34	85.78	86.16	86.98	87.59	85.06	83.93	83.56	83.21	85.29	83.89	85.60
128°	91.99	92.81	92.93	93.12	93.33	90.66	89.65	89.13	89.11	91.64	90.54	91.43
129°	98.72	99.98	100.12	99.58	99.70	97.57	96.47	95.55	95.51	98.36	97.45	97.68
130°	105.09	107.03	106.28	106.23	106.16	105.20	103.66	102.02	102.04	104.69	104.62	104.01
131°	111.74	113.19	112.96	113.59	112.86	112.02	110.54	108.95	108.83	111.04	111.41	111.39
132°	118.77	119.87	120.10	121.41	119.63	118.42	117.31	115.91	115.89	117.95	118.28	118.93
133°	126.08	126.80	127.34	129.29	126.10	125.37	123.92	122.61	123.01	125.05	125.58	125.68
134°	133.92	133.90	134.98	137.39	132.47	132.52	130.55	129.26	129.75	131.37	132.89	132.56
135°	141.19	141.02	141.82	145.19	139.03	139.50	137.04	135.61	136.10	137.70	139.64	139.05
136°	148.40	147.86	148.82	150.77	145.45	146.43	143.55	142.03	142.73	144.35	145.82	145.21
137°	155.48	154.96	155.71	156.11	151.77	152.83	149.97	148.75	149.64	150.88	151.89	151.38
138°	162.22	161.64	162.53	160.98	158.24	158.82	156.41	155.33	155.94	156.97	158.29	157.44
139°	169.09	168.05	169.41	165.76	164.12	164.47	162.13	160.89	161.40	162.85	164.45	163.42
140°	173.49	174.19	174.00	170.47	169.55	169.81	167.61	166.41	166.67	168.01	169.65	169.25
141°	174.57	177.59	175.15	174.99	174.15	174.80	172.53	171.38	171.66	172.90	174.52	174.43
142°	180.19	180.66	181.06	179.02	178.41	179.63	177.21	176.21	176.28	177.49	179.09	178.76
143°	183.26	183.47	183.96	182.41	182.51	184.10	181.34	180.10	180.54	181.88	185.01	182.79
144°	186.30	186.21	186.79	185.48	186.30	187.29	185.20	183.87	184.12	185.27	186.63	186.47
145°	189.23	189.00	189.30	188.41	189.72	190.07	188.01	186.51	186.82	188.08	189.68	190.05
146°	191.78	191.81	191.55	191.18	192.65	192.30	190.26	189.21	189.58	190.82	192.56	193.17
147°	194.03	194.31	193.59	193.71	195.23	194.48	192.82	192.30	192.51	193.61	195.32	195.95
148°	196.07	196.38	195.56	196.45	197.57	196.87	195.56	195.27	195.18	196.19	197.78	198.53
149°	198.04	198.34	197.59	199.30	199.96	199.19	198.13	197.34	197.41	198.48	199.91	200.26
150°	200.01	200.48	199.84	202.02	202.21	201.34	200.69	199.37	199.54	200.50	201.93	202.07



151°	201.95	202.65	202.07	204.11	204.15	203.50	202.42	201.32	201.53	201.86	203.68	203.99
152°	203.73	204.62	203.97	206.31	205.98	205.07	203.43	203.22	203.40	203.19	205.16	205.68
153°	205.30	206.19	205.75	207.74	207.88	206.19	204.76	204.65	205.09	205.02	206.33	207.06
154°	206.75	207.78	207.46	208.81	208.98	207.10	206.07	205.93	206.31	206.61	207.18	208.09
155°	208.09	209.42	208.53	209.49	209.31	207.60	206.99	206.17	206.80	207.36	207.90	208.93
156°	209.00	209.85	209.00	209.89	209.59	207.97	207.43	206.36	206.99	208.09	208.42	209.21
157°	209.66	210.10	209.61	210.13	209.92	208.37	207.76	206.33	206.66	207.99	208.81	209.19
158°	209.96	210.15	210.10	210.34	210.15	208.63	207.97	206.33	206.59	208.02	208.63	208.98
159°	210.03	209.73	210.15	209.85	210.20	208.42	208.16	206.59	207.08	208.07	208.18	208.98
160°	209.59	209.28	209.63	209.28	209.19	207.88	207.74	206.78	207.25	207.92	207.78	208.81
161°	208.51	208.28	208.46	208.60	207.99	207.25	207.32	206.36	206.61	207.25	207.34	207.92
162°	207.43	207.46	207.55	207.71	206.80	206.54	206.40	205.89	205.91	206.43	206.78	206.68
163°	206.28	206.26	206.47	206.57	205.79	205.79	205.32	204.88	205.02	205.56	205.70	205.51
164°	205.21	205.30	205.39	205.68	205.21	205.07	204.34	203.90	204.11	204.53	204.62	204.83
165°	204.27	204.36	204.57	205.16	204.76	204.50	203.36	203.15	203.24	203.87	204.15	204.39
166°	204.22	204.36	204.43	204.72	204.25	204.08	203.66	202.44	202.68	204.01	203.85	203.47
167°	204.29	204.32	204.22	204.50	203.83	203.61	204.15	202.82	203.10	204.32	203.36	203.68
168°	204.65	204.41	204.08	204.43	203.92	203.24	203.83	203.17	203.43	203.83	203.66	203.94
169°	205.00	204.50	203.92	204.67	204.22	203.78	203.38	203.59	203.54	203.22	204.04	204.34
170°	205.09	204.60	204.04	205.35	204.55	204.27	203.80	204.06	203.87	203.87	204.50	204.57
171°	205.47	205.14	204.79	206.05	205.14	204.72	204.65	204.67	204.62	204.67	204.97	205.07
172°	205.65	205.30	205.25	206.31	206.00	205.42	205.28	205.28	205.23	205.28	205.54	205.75
173°	205.70	205.47	205.65	206.47	206.68	206.03	205.58	205.32	205.28	205.68	206.14	206.43
174°	205.72	205.68	205.98	206.68	206.92	206.17	205.70	205.39	205.28	205.84	206.38	206.64
175°	205.82	205.77	206.14	206.66	206.50	206.19	205.68	205.37	205.37	205.84	206.31	206.40
176°	205.18	205.21	205.61	206.05	206.03	205.70	205.47	205.28	205.35	205.54	205.79	205.93
177°	204.11	204.11	204.48	204.93	205.16	204.93	204.65	204.67	204.67	204.76	205.02	205.11
178°	202.84	202.79	203.08	203.45	203.68	203.73	203.92	204.06	204.04	203.80	203.73	203.71
179°	201.65	201.58	201.74	202.09	202.42	202.70	202.91	203.05	203.01	202.84	202.61	202.51
180°	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07	202.07