

Test report: 2024000022

Test type	Measurement of the luminaire light distribution in C-Gamma
Test date	24/06/2024/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	24.9
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 grigio
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)	2604
Colour Rendering Index (CRI)	90
Total luminous flux of the light source (lm)	682.0
Output luminous flux of the luminaire (lm)	682.0
Source power (W)	8
Power included ballast (W)	10.8

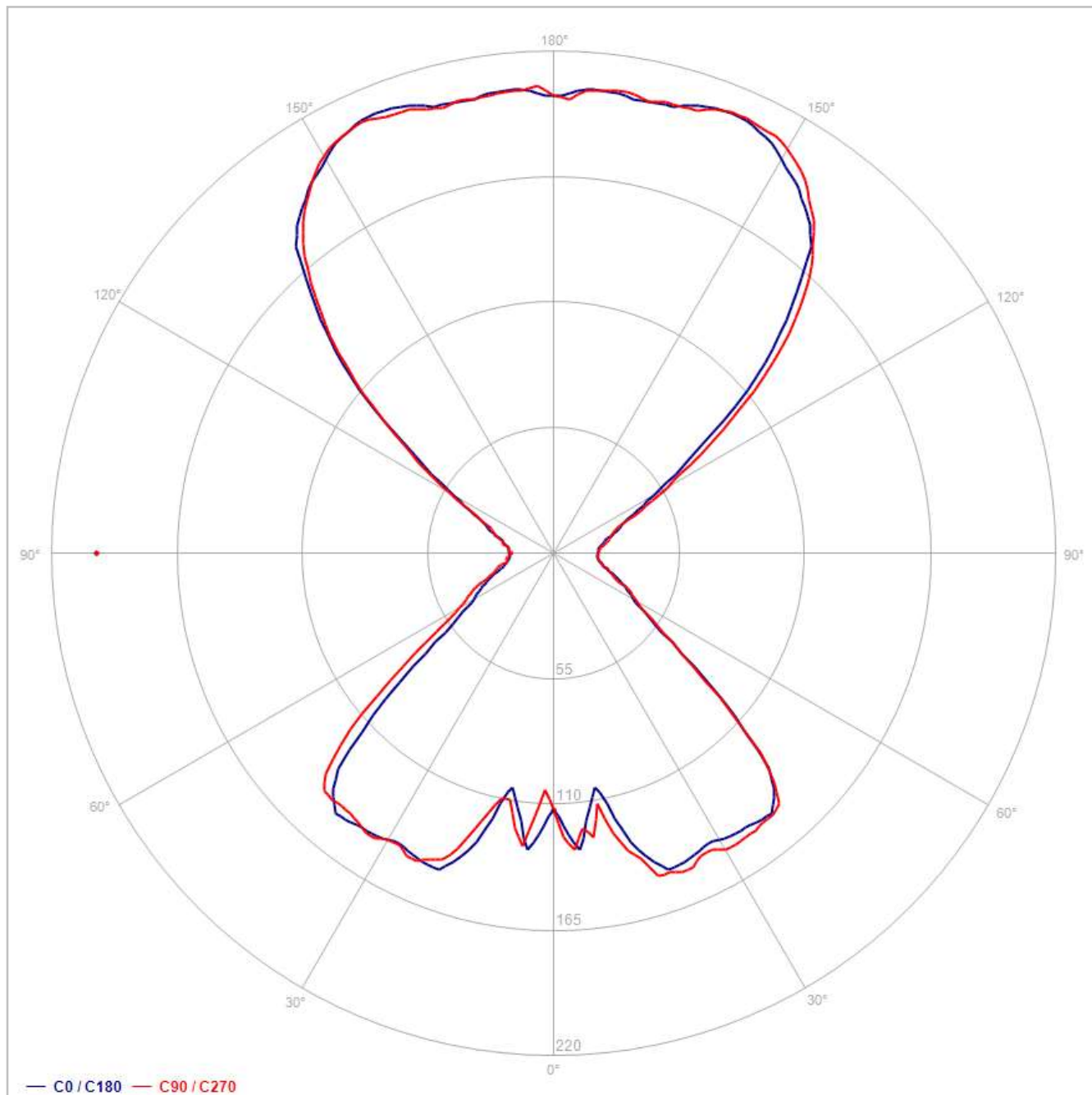
Luminaire efficiency

Light Output Ratio of luminaire (LOR)	100
Downward Flux Fraction (DFF)	44
Upward Flux Fraction (UFF)	56.00

Luminaire efficacy

LED module efficacy (lm/W)	85.25
System light efficacy (lm/W)	63.15
Luminaire light efficacy (lm/W)	63.15

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°	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57
1°	115.35	116.46	117.36	118.06	118.53	118.72	118.56	118.72	118.53	118.06	117.36	116.46
2°	119.81	120.77	121.50	122.28	123.20	124.10	124.52	124.10	123.20	122.28	121.50	120.77
3°	123.49	123.58	123.77	124.48	125.16	126.22	127.23	126.22	125.16	124.48	123.77	123.58
4°	126.69	125.61	124.31	124.31	125.37	127.66	129.94	127.66	125.37	124.31	125.14	125.61
5°	130.49	127.35	124.55	123.58	123.84	124.36	125.56	124.36	123.84	123.58	124.55	127.35
6°	125.91	123.84	122.59	121.43	120.44	120.54	121.15	120.54	120.44	121.43	122.59	123.84
7°	118.30	117.87	118.65	118.82	117.73	120.09	123.39	120.09	117.73	118.82	118.65	117.87
8°	112.19	113.25	115.80	117.28	115.85	120.21	125.63	120.21	115.85	117.28	115.80	113.25
9°	108.26	110.12	114.76	115.87	112.85	117.73	118.49	117.73	112.85	115.87	114.76	110.12
10°	104.22	107.01	113.40	114.06	113.21	115.30	111.32	115.30	113.21	114.06	113.40	107.01
11°	106.82	108.23	113.18	113.32	116.77	118.32	118.51	118.32	116.77	113.32	113.18	108.23
12°	112.17	113.70	116.29	117.33	120.92	123.84	125.70	123.84	120.92	117.33	116.29	113.70
13°	119.15	120.49	121.74	121.76	125.37	128.67	129.97	128.67	125.37	121.76	121.74	120.49
14°	125.30	126.74	126.95	123.98	129.33	132.96	134.21	132.96	129.33	124.97	126.95	126.74
15°	131.22	132.42	131.62	127.87	133.46	136.64	136.57	136.64	133.46	127.87	131.62	132.42
16°	134.87	136.92	135.81	130.91	137.70	139.89	138.90	139.89	137.70	130.91	135.81	136.92
17°	138.69	140.06	140.03	134.54	140.34	143.15	143.71	143.15	140.34	134.54	140.03	140.06
18°	142.23	142.89	143.29	139.59	143.03	146.16	148.52	146.16	143.03	139.59	143.29	142.89
19°	145.08	145.15	145.41	143.67	144.63	148.17	148.71	148.17	144.63	143.67	145.41	145.15
20°	147.51	146.75	146.49	145.79	145.34	148.73	148.90	148.73	145.34	145.79	146.49	146.75
21°	147.27	147.63	147.25	146.92	146.23	149.11	149.68	149.11	146.23	146.92	147.25	147.63
22°	147.22	147.65	148.19	147.77	147.32	149.21	150.45	149.21	147.32	147.77	148.19	147.65
23°	147.11	147.72	149.13	148.43	148.03	149.30	150.45	149.30	148.03	148.43	149.13	147.72
24°	146.59	147.34	149.06	148.90	147.98	149.04	150.45	149.04	147.98	148.90	149.06	147.34
25°	145.83	146.52	148.50	148.73	147.63	148.57	148.92	148.57	147.63	148.73	148.50	146.52
26°	145.06	145.53	147.79	147.70	146.92	147.96	147.39	147.96	146.92	147.70	147.79	145.53
27°	144.54	145.06	147.06	146.82	146.61	147.60	147.25	147.60	146.61	146.82	147.06	145.06
28°	144.30	145.10	146.59	146.71	146.89	147.98	147.11	147.98	146.89	146.71	146.59	145.10
29°	144.42	145.55	146.61	147.25	147.37	148.33	148.59	148.33	147.37	147.25	146.61	145.55
30°	144.63	146.09	146.56	147.77	147.93	148.71	150.08	148.71	147.93	147.77	146.56	146.09
31°	145.48	146.35	146.61	148.17	148.52	149.06	150.27	149.06	148.52	148.17	146.61	146.35
32°	146.09	146.54	146.47	148.36	148.57	149.06	150.45	149.06	148.57	148.36	146.47	146.54
33°	146.47	146.66	146.12	148.24	147.91	149.02	150.27	149.02	147.91	148.24	146.12	146.66
34°	146.56	146.73	145.57	147.91	147.51	148.78	150.08	148.78	147.51	147.91	145.57	146.73
35°	146.61	146.59	145.01	147.30	147.67	148.50	150.08	148.50	147.67	147.30	145.01	146.59
36°	146.99	146.31	144.91	146.52	147.72	147.91	150.08	147.91	147.72	146.52	144.91	146.31
37°	147.44	146.28	144.89	145.79	147.53	147.34	149.68	147.34	147.53	145.79	144.89	146.28
38°	147.86	146.52	144.94	145.90	147.46	147.08	149.28	147.08	147.46	145.90	144.94	146.52
39°	148.19	146.85	145.08	145.95	147.72	146.78	149.28	146.78	147.72	145.95	145.08	146.85
40°	148.64	147.25	144.73	145.13	147.86	147.08	149.28	147.08	147.86	145.13	144.73	147.25
41°	146.31	147.56	144.23	143.78	146.71	147.39	148.55	147.39	146.71	143.78	144.23	147.56
42°	144.04	146.35	142.75	142.04	145.50	145.36	147.79	145.36	145.50	142.04	142.75	146.35
43°	141.31	141.33	139.63	139.37	142.06	143.10	143.55	143.10	142.06	139.37	139.63	141.33
44°	137.80	135.98	135.41	135.04	137.49	137.11	139.28	137.11	137.49	135.04	135.41	135.98

45°	133.69	129.69	129.59	128.79	130.89	131.05	132.49	131.05	130.89	128.79	129.59	129.69
46°	124.10	122.68	123.25	120.68	123.49	122.54	125.70	122.54	123.49	120.68	123.25	122.68
47°	115.19	115.33	116.25	111.44	113.89	113.96	115.68	113.96	113.89	111.44	116.25	115.33
48°	106.28	105.29	107.90	102.22	103.99	104.51	105.66	104.51	103.99	102.22	107.90	105.29
49°	97.25	95.71	97.29	93.05	94.91	95.08	96.00	95.08	94.91	93.05	97.29	95.71
50°	88.48	86.47	87.37	84.26	86.12	85.60	86.33	85.60	86.12	84.26	87.37	86.47
51°	79.31	77.99	78.24	75.72	77.94	76.38	78.95	76.38	77.94	75.72	78.24	77.99
52°	71.46	70.35	70.25	67.75	70.14	69.52	71.57	69.52	70.14	67.75	70.25	70.35
53°	64.76	63.98	63.58	61.86	63.91	62.76	65.40	62.76	63.91	61.86	63.58	63.98
54°	58.98	58.70	57.92	56.49	57.90	58.11	59.20	58.11	57.90	56.49	57.92	58.70
55°	53.89	54.15	52.85	52.01	53.51	53.54	55.47	53.54	53.51	52.01	52.85	54.15
56°	50.54	50.12	49.18	48.45	49.39	49.91	51.75	49.91	49.39	48.45	49.18	50.12
57°	47.41	46.51	45.97	45.64	46.98	46.40	48.87	46.40	46.98	45.64	45.97	46.51
58°	44.56	43.47	43.57	43.52	44.63	44.46	45.99	44.46	44.63	43.52	43.57	43.47
59°	42.18	41.30	41.94	42.15	42.15	42.58	44.06	42.58	42.15	42.15	41.94	41.30
60°	40.34	39.42	40.43	41.04	40.03	40.83	42.13	40.83	40.03	41.04	40.43	39.42
61°	39.11	37.86	39.04	40.05	38.73	39.09	40.60	39.09	38.73	40.05	39.04	37.86
62°	38.03	36.45	37.15	39.18	37.48	37.65	39.06	37.65	37.48	39.18	37.15	36.45
63°	36.80	35.34	35.32	38.29	36.12	36.19	37.70	36.19	36.12	38.29	35.32	35.34
64°	35.46	34.18	33.57	37.34	34.56	34.73	36.31	34.73	34.56	37.34	33.57	34.18
65°	34.11	32.58	32.53	36.09	32.86	33.22	34.04	33.22	32.86	36.09	32.53	32.58
66°	33.00	31.21	31.43	34.11	31.12	31.61	31.76	31.61	31.12	34.11	31.43	31.21
67°	31.90	29.82	29.78	32.09	29.44	30.11	30.39	30.11	29.44	32.09	29.78	29.82
68°	30.69	28.60	28.55	30.34	28.15	28.81	29.00	28.81	28.15	30.34	28.55	28.60
69°	29.49	27.30	27.44	29.21	26.90	27.49	28.22	27.49	26.90	29.21	27.44	27.30
70°	28.38	26.36	25.58	28.20	25.98	26.24	27.44	26.24	25.98	28.20	25.58	26.36
71°	27.09	25.53	25.18	27.23	25.04	25.30	26.29	25.30	25.04	27.23	25.18	25.53
72°	25.91	24.90	24.21	26.57	24.16	24.97	25.13	24.97	24.16	26.57	24.21	24.90
73°	24.82	24.66	23.29	25.79	23.57	24.59	24.92	24.59	23.57	25.79	23.29	24.66
74°	23.79	24.80	22.77	24.80	23.32	24.09	24.68	24.09	23.32	24.80	22.77	24.80
75°	22.84	23.41	21.81	23.74	22.63	23.22	23.39	23.22	22.63	23.74	21.81	23.41
76°	22.30	24.26	20.86	22.68	21.83	21.95	22.07	21.95	21.83	22.68	20.86	24.26
77°	21.81	23.06	20.53	21.59	21.57	21.34	22.04	21.34	21.57	21.59	20.53	23.06
78°	21.34	22.21	20.18	21.48	21.29	21.31	22.00	21.31	21.29	21.48	20.18	22.21
79°	20.84	21.76	19.90	21.26	20.77	21.17	21.26	21.17	20.77	21.26	19.90	21.76
80°	20.39	21.36	19.76	20.93	20.42	20.96	20.51	20.96	20.42	20.44	19.76	21.36
81°	20.16	21.41	18.69	20.91	20.23	20.63	20.11	20.63	20.23	20.91	18.69	21.41
82°	19.94	21.17	17.96	20.35	19.73	20.23	19.69	20.23	19.73	20.35	17.96	21.17
83°	19.73	19.97	18.86	19.33	19.10	19.99	19.50	19.99	19.10	19.33	18.86	19.97
84°	19.47	19.21	17.42	19.47	18.84	19.83	19.31	19.83	18.84	19.47	17.42	19.21
85°	19.14	19.64	17.09	19.00	18.69	19.35	19.47	19.35	18.69	19.00	17.09	19.64
86°	19.10	19.14	17.33	18.46	18.84	18.81	19.61	18.81	18.84	18.46	17.33	19.14
87°	19.02	19.12	17.28	18.62	18.53	18.74	19.61	18.74	18.53	18.62	17.28	19.12
88°	19.10	19.05	17.30	18.46	17.73	18.74	19.61	18.74	17.73	18.46	17.28	19.05
89°	19.24	19.02	18.48	18.62	17.96	19.26	19.47	19.26	17.96	18.62	18.48	19.02
90°	19.57	19.02	16.95	19.35	18.60	19.80	19.31	19.80	18.60	19.35	16.95	19.02
91°	19.61	18.81	17.99	18.41	18.98	19.43	19.66	19.43	18.98	18.41	17.70	18.81
92°	19.71	19.47	17.92	18.74	19.21	19.14	19.99	19.14	19.21	18.74	17.70	19.47

93°	19.71	19.64	18.86	19.76	19.05	19.69	19.85	19.69	19.05	19.76	18.86	19.64
94°	19.64	19.66	18.93	19.78	18.98	20.13	19.69	20.13	18.98	19.78	18.93	19.66
95°	19.69	20.13	17.82	20.35	19.00	19.97	20.25	19.97	19.00	20.35	17.82	20.13
96°	19.92	20.86	18.65	20.79	19.66	20.02	20.82	20.02	19.66	20.79	18.65	20.86
97°	20.23	20.30	18.98	20.65	20.46	20.72	20.86	20.72	20.46	20.65	18.98	20.30
98°	20.58	20.96	19.31	20.98	20.53	21.50	20.89	21.50	20.53	20.98	19.31	20.96
99°	21.05	22.21	19.45	21.62	21.05	22.40	21.83	22.40	21.05	21.62	19.45	22.21
100°	21.55	22.94	21.41	22.63	22.51	23.20	22.75	23.20	22.51	21.90	21.41	22.94
101°	22.18	23.48	22.54	22.87	23.22	23.79	23.36	23.79	23.22	22.87	22.54	23.48
102°	22.70	24.31	22.77	23.62	23.36	24.16	23.95	24.16	23.36	23.62	22.77	24.31
103°	23.22	24.64	23.22	24.64	24.05	24.23	24.54	24.23	24.05	24.64	23.22	24.64
104°	23.74	25.39	24.12	25.23	24.75	24.80	25.13	24.80	24.75	25.23	24.12	25.39
105°	24.26	26.38	24.56	25.96	24.92	25.93	25.51	25.93	24.92	25.96	24.56	26.38
106°	25.39	26.03	24.82	26.73	25.30	26.55	25.89	26.55	25.30	26.73	24.82	26.03
107°	26.57	26.73	25.91	27.63	26.05	26.76	26.50	26.76	26.05	27.63	25.91	26.73
108°	27.79	27.16	26.47	28.36	26.88	27.37	27.09	27.37	26.88	28.36	26.47	27.16
109°	29.02	27.44	26.97	28.88	27.75	28.22	27.68	28.22	27.75	28.88	26.97	27.44
110°	30.44	27.72	28.17	29.99	28.27	28.86	28.27	28.86	28.27	29.99	28.17	27.72
111°	31.05	27.58	28.34	31.12	28.67	29.35	29.80	29.35	28.67	31.12	28.34	27.58
112°	32.04	29.40	29.73	32.23	30.69	31.02	31.33	31.02	30.69	32.23	29.73	29.40
113°	33.31	31.33	31.64	34.04	32.84	33.19	33.45	33.19	32.84	34.04	31.64	31.33
114°	34.68	33.52	33.36	36.33	34.77	35.53	35.57	35.53	34.77	36.33	33.36	33.52
115°	36.23	35.60	35.48	39.16	37.06	37.93	39.04	37.93	37.06	39.16	35.48	35.60
116°	38.78	37.79	38.07	41.94	40.03	40.81	42.51	40.81	40.03	41.94	38.07	37.79
117°	41.52	40.43	41.61	44.91	43.26	43.85	45.62	43.85	43.26	44.91	41.61	40.43
118°	44.27	43.66	44.86	47.55	46.98	47.46	48.71	47.46	46.98	47.55	44.86	43.66
119°	47.08	47.48	48.14	50.40	50.76	51.20	52.95	51.20	50.76	50.40	48.14	47.48
120°	50.24	51.68	52.36	54.41	54.67	55.24	57.19	55.24	54.67	54.41	52.36	51.68
121°	54.39	55.64	56.84	58.42	58.72	59.29	61.34	59.29	58.72	58.42	56.84	55.64
122°	58.80	59.81	61.18	62.24	62.80	64.50	65.47	64.50	62.80	62.24	61.18	59.81
123°	63.51	64.62	65.82	67.05	68.77	69.85	71.43	69.85	68.77	67.05	65.82	64.62
124°	68.67	70.37	71.27	73.13	75.04	75.98	77.40	75.98	75.04	73.13	71.27	70.37
125°	74.14	76.64	77.63	78.83	80.98	82.13	84.52	82.13	80.98	78.83	77.63	76.64
126°	80.46	82.98	84.14	84.68	86.97	89.02	91.64	89.02	86.97	84.68	84.14	82.98
127°	87.51	89.49	90.93	91.23	94.09	95.97	98.43	95.97	94.09	91.23	90.93	89.49
128°	95.03	96.21	98.45	98.12	101.23	102.76	105.21	102.76	101.23	98.12	98.45	96.21
129°	102.69	103.40	106.16	105.03	108.73	109.51	112.95	109.51	108.73	105.03	106.16	103.40
130°	110.85	110.87	113.73	112.07	116.18	116.91	120.66	116.91	116.18	112.07	113.73	110.87
131°	117.73	118.23	121.17	119.43	123.32	124.36	127.59	124.36	123.32	119.43	121.17	118.23
132°	124.52	125.21	128.95	126.55	130.51	131.31	134.52	131.31	130.51	126.55	128.95	125.21
133°	130.98	131.85	135.41	132.75	137.11	138.31	140.93	138.31	137.11	132.75	135.41	131.85
134°	137.42	138.38	141.38	138.90	143.62	144.37	147.34	144.37	143.62	138.90	141.38	138.38
135°	144.21	145.13	147.06	145.53	150.31	150.36	153.17	150.36	150.31	145.53	147.06	145.13
136°	150.03	151.80	152.58	152.06	156.75	156.16	158.99	156.16	156.75	152.06	152.58	151.80
137°	156.21	158.45	157.88	157.67	161.79	161.94	164.03	161.94	161.79	157.67	157.88	158.45
138°	162.50	165.33	163.23	162.74	166.32	167.00	169.06	167.00	166.32	162.74	163.23	165.33
139°	168.91	169.95	167.76	167.69	170.82	171.88	172.76	171.88	170.82	167.69	167.76	169.95
140°	175.51	173.56	171.67	172.52	175.23	174.97	176.43	174.97	175.23	172.52	171.67	173.56

141°	178.86	176.95	175.42	176.95	178.84	178.13	180.84	178.13	178.84	176.95	175.42	176.95
142°	182.14	180.32	179.05	180.96	182.45	182.26	185.23	182.26	182.45	180.96	179.05	180.32
143°	184.73	183.44	182.78	185.09	186.01	186.36	187.99	186.36	186.01	185.09	182.78	183.44
144°	187.16	186.36	186.38	188.32	189.54	189.28	190.74	189.28	189.54	188.32	186.38	186.36
145°	189.49	189.09	189.05	191.19	191.95	192.14	193.81	192.14	191.95	191.19	189.05	189.09
146°	191.88	191.57	191.64	193.76	193.95	194.78	196.85	194.78	193.95	193.76	191.64	191.57
147°	193.90	193.90	194.35	196.31	196.12	197.42	199.00	197.42	196.12	196.31	194.35	193.90
148°	195.72	196.07	196.87	198.90	198.38	199.44	201.12	199.44	198.38	198.90	196.87	196.07
149°	197.44	198.19	199.00	201.31	200.55	201.38	202.84	201.38	200.55	201.31	199.00	198.19
150°	199.33	200.39	201.05	203.55	202.53	203.14	204.54	203.14	202.53	203.55	201.05	200.39
151°	201.40	202.44	203.00	205.34	204.32	204.84	205.74	204.84	204.32	205.34	203.00	202.44
152°	203.10	204.04	204.49	206.42	205.83	205.83	206.92	205.83	205.83	206.42	204.49	204.04
153°	204.30	205.53	205.88	207.36	207.03	206.59	207.11	206.59	207.03	207.36	205.88	205.53
154°	205.41	207.08	207.08	207.98	207.22	207.03	207.29	207.03	207.22	207.98	207.08	207.08
155°	206.73	207.72	207.98	208.40	207.20	207.29	207.86	207.29	207.20	208.40	207.98	207.72
156°	207.29	208.24	208.54	208.66	207.51	207.15	208.43	207.15	207.51	208.66	208.54	208.24
157°	207.60	208.59	208.83	208.83	207.77	206.92	208.24	206.92	207.77	208.83	208.83	208.59
158°	207.60	208.78	208.45	208.76	207.32	206.87	208.05	206.87	207.32	208.76	208.45	208.78
159°	207.62	208.57	207.65	207.95	206.63	206.82	207.46	206.82	206.63	207.95	207.65	208.57
160°	207.46	207.65	206.59	207.06	206.09	206.37	206.85	206.37	206.09	207.06	206.59	207.65
161°	206.61	206.49	205.64	206.09	205.76	205.76	205.36	205.76	205.76	206.09	205.64	206.49
162°	205.74	205.38	204.82	204.87	205.24	205.01	203.88	205.01	205.24	204.87	204.82	205.38
163°	204.75	204.32	204.09	203.38	204.46	204.25	203.64	204.25	204.46	203.38	204.09	204.32
164°	203.55	203.47	203.33	202.70	203.64	203.62	203.40	203.62	203.64	202.70	203.33	203.47
165°	202.51	203.10	202.65	202.70	202.86	203.10	203.40	203.10	202.86	202.70	202.65	203.10
166°	202.23	202.89	202.32	203.07	202.44	202.77	203.40	202.77	202.44	203.07	202.32	202.89
167°	202.15	202.70	202.23	202.74	202.65	202.53	202.70	202.53	202.65	202.74	202.23	202.70
168°	202.11	202.63	202.13	202.48	202.79	202.46	201.99	202.46	202.79	202.48	202.13	202.63
169°	201.97	202.46	202.37	202.37	202.70	202.86	202.89	202.86	202.70	202.37	202.37	202.46
170°	201.80	202.27	202.74	202.51	202.51	203.19	203.78	203.19	202.51	202.51	202.74	202.27
171°	202.53	202.46	203.22	202.72	202.51	203.38	204.21	203.38	202.51	202.72	203.22	202.46
172°	203.29	202.98	203.99	203.03	202.67	203.57	204.61	203.57	202.67	203.03	203.99	202.98
173°	203.59	203.52	204.09	203.45	202.86	203.43	204.06	203.43	202.86	203.45	204.09	203.52
174°	203.57	203.73	203.97	203.76	203.31	203.22	203.50	203.22	203.31	203.76	203.97	203.73
175°	203.80	203.71	203.43	203.55	203.59	203.26	203.31	203.26	203.59	203.55	203.43	203.71
176°	203.59	203.17	202.20	202.74	202.96	203.00	203.10	203.00	202.96	202.74	202.20	203.17
177°	202.96	202.56	201.97	201.47	201.45	201.31	201.02	201.31	201.45	201.47	201.97	202.56
178°	201.73	201.52	201.14	200.65	200.08	199.51	198.92	199.51	200.08	200.65	201.14	201.52
179°	200.48	200.39	200.29	200.13	199.91	199.70	199.49	199.70	199.91	200.13	200.29	200.39
180°	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06
Gamma	C180°	C195°	C210°	C225°	C240°	C255°	C270°	C285°	C300°	C315°	C330°	C345°
0°	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57	112.57
1°	115.35	114.34	113.16	111.84	110.50	109.22	108.14	109.22	110.50	111.84	113.16	114.34
2°	119.81	117.99	115.56	112.57	109.22	106.37	103.71	106.37	109.22	112.57	115.56	117.99
3°	123.49	121.88	118.98	115.45	114.27	112.22	109.67	112.22	114.27	115.45	118.98	121.88
4°	126.69	126.60	127.92	123.20	121.36	118.39	115.63	118.39	121.36	123.20	120.59	126.60
5°	130.49	131.95	130.70	129.64	125.87	122.90	122.42	122.90	125.87	129.64	130.70	131.95
6°	125.91	128.04	131.90	130.56	123.44	125.09	129.21	125.09	123.44	130.56	131.90	128.04

7°	118.30	120.07	123.25	123.16	117.24	121.32	125.54	121.32	117.24	123.16	123.25	120.07
8°	112.19	113.84	116.46	113.44	112.95	116.37	121.83	116.37	112.95	113.44	116.46	113.84
9°	108.26	109.72	111.51	109.39	109.51	112.78	115.68	112.78	109.51	109.39	111.51	109.72
10°	104.22	105.71	107.41	107.97	108.54	110.19	109.53	110.19	108.54	107.97	107.41	105.71
11°	106.82	106.11	104.20	107.71	109.79	109.93	109.72	109.93	109.79	107.71	104.20	106.11
12°	112.17	110.80	105.03	109.98	111.46	110.80	109.91	110.80	111.46	109.98	105.03	110.80
13°	119.15	116.84	110.97	112.52	112.90	113.16	113.37	113.16	112.90	112.52	110.97	116.84
14°	125.30	122.59	117.10	114.62	114.62	116.44	116.84	116.44	114.62	114.34	117.10	122.59
15°	131.22	128.18	123.30	117.33	118.77	120.61	121.27	120.61	118.77	117.33	123.30	128.18
16°	134.87	133.01	129.59	120.96	123.44	125.65	125.70	125.65	123.44	120.96	129.59	133.01
17°	138.69	136.52	134.87	125.42	127.66	130.65	130.93	130.65	127.66	125.42	134.87	136.52
18°	142.23	139.66	138.01	130.79	131.62	135.53	136.14	135.53	131.62	130.79	138.01	139.66
19°	145.08	142.44	139.99	135.15	134.73	139.28	139.61	139.28	134.73	135.15	139.99	142.44
20°	147.51	144.89	142.01	138.50	137.30	141.33	143.08	141.33	137.30	138.50	142.01	144.89
21°	147.27	146.49	144.11	141.40	139.85	143.29	143.90	143.29	139.85	141.40	144.11	146.49
22°	147.22	146.59	146.02	143.69	142.25	145.17	144.73	145.17	142.25	143.69	146.02	146.59
23°	147.11	146.64	147.53	145.32	144.28	146.64	146.02	146.64	144.28	145.32	147.53	146.64
24°	146.59	146.35	147.48	146.23	145.15	147.13	147.32	147.13	145.15	146.23	147.48	146.35
25°	145.83	145.62	146.66	146.09	145.60	147.20	147.37	147.20	145.60	146.09	146.66	145.62
26°	145.06	144.58	145.55	144.87	144.96	146.00	147.39	146.00	144.96	144.87	145.55	144.58
27°	144.54	144.14	144.66	143.71	144.28	144.80	146.02	144.80	144.28	143.71	144.66	144.14
28°	144.30	144.40	144.28	143.85	143.74	144.02	144.66	144.02	143.74	143.85	144.28	144.40
29°	144.42	145.10	144.09	144.58	143.38	143.64	144.66	143.64	143.38	144.58	144.09	145.10
30°	144.63	145.69	144.35	145.53	144.07	144.63	144.66	144.63	144.07	145.53	144.35	145.69
31°	145.48	145.98	144.73	146.12	145.48	145.57	146.02	145.57	145.48	146.12	144.73	145.98
32°	146.09	146.07	144.77	146.54	146.14	146.12	147.39	146.12	146.14	146.54	144.77	146.07
33°	146.47	146.00	144.42	146.52	145.76	146.52	147.39	146.52	145.76	146.52	144.42	146.00
34°	146.56	145.86	144.40	146.19	145.65	146.38	147.39	146.38	145.65	146.19	144.40	145.86
35°	146.61	145.53	144.33	145.88	146.07	146.19	146.66	146.19	146.07	145.88	144.33	145.53
36°	146.99	145.03	144.47	145.69	146.23	145.90	145.90	145.90	146.23	145.69	144.47	145.03
37°	147.44	145.01	144.11	145.41	145.74	145.65	145.32	145.65	145.74	145.41	144.11	145.01
38°	147.86	145.50	143.85	145.13	145.32	145.13	144.73	145.13	145.32	145.13	143.85	145.50
39°	148.19	146.12	143.69	144.77	145.60	144.61	144.73	144.61	145.60	144.77	143.69	146.12
40°	148.64	146.82	143.81	144.44	145.98	144.07	144.73	144.07	145.98	144.44	143.81	146.82
41°	146.31	147.44	143.88	144.47	145.65	143.55	144.89	143.55	145.65	144.47	143.88	147.44
42°	144.04	146.68	143.55	144.02	145.29	143.92	145.03	143.92	145.29	144.02	143.55	146.68
43°	141.31	142.68	142.18	142.44	144.68	144.30	144.84	144.30	144.68	142.44	142.18	142.68
44°	137.80	138.13	139.63	139.61	143.31	142.20	144.66	142.20	143.31	139.61	139.63	138.13
45°	133.69	132.68	135.27	135.27	138.95	139.96	141.76	139.96	138.95	135.27	135.27	132.68
46°	124.10	126.43	129.87	129.12	133.88	134.73	138.83	134.73	133.88	129.12	129.87	126.43
47°	115.19	119.52	123.56	121.88	126.62	129.38	132.30	129.38	126.62	121.88	123.56	119.52
48°	106.28	109.62	115.96	113.91	118.79	121.91	125.77	121.91	118.79	113.91	115.96	109.62
49°	97.25	99.96	105.10	104.34	109.86	114.27	117.66	114.27	109.86	104.34	105.10	99.96
50°	88.48	90.41	94.65	94.98	100.69	104.27	109.53	104.27	100.69	94.98	94.65	90.41
51°	79.31	81.43	85.13	85.74	91.40	94.42	100.05	94.42	91.40	85.74	85.13	81.43
52°	71.46	73.62	76.43	77.04	82.42	85.98	90.57	85.98	82.42	77.04	76.43	73.62
53°	64.76	67.26	68.74	70.04	75.04	77.56	82.65	77.56	75.04	70.04	68.74	67.26
54°	58.98	62.00	62.57	63.77	68.04	70.98	74.71	70.98	68.04	63.77	62.57	62.00

55°	53.89	57.38	57.71	58.94	62.66	64.62	68.34	64.62	62.66	58.94	57.71	57.38
56°	50.54	53.09	53.63	54.74	57.55	60.26	61.95	60.26	57.55	54.74	53.63	53.09
57°	47.41	49.34	50.17	51.53	53.75	55.94	57.52	55.94	53.75	51.53	50.17	49.34
58°	44.56	46.02	47.24	48.99	50.21	52.05	53.09	52.05	50.21	48.99	47.24	46.02
59°	42.18	43.57	44.70	47.03	47.76	48.38	50.52	48.38	47.76	47.03	44.70	43.57
60°	40.34	41.68	43.00	45.48	45.78	46.44	47.95	46.44	45.78	45.48	43.00	41.68
61°	39.11	39.94	41.77	44.16	44.72	44.51	45.69	44.51	44.72	44.16	41.77	39.94
62°	38.03	38.17	39.79	43.35	43.35	42.76	43.40	42.76	43.35	43.35	39.79	38.17
63°	36.80	37.18	38.24	42.39	41.54	41.09	42.03	41.09	41.54	42.39	38.24	37.18
64°	35.46	36.16	37.25	40.81	39.37	39.75	40.64	39.75	39.37	40.81	37.25	36.16
65°	34.11	34.25	35.10	39.06	36.94	38.24	39.09	38.24	36.94	39.06	35.10	34.25
66°	33.00	32.65	32.72	37.04	35.08	36.16	37.51	36.16	35.08	37.04	32.72	32.65
67°	31.90	31.07	30.67	35.48	33.41	34.07	35.39	34.07	33.41	35.48	30.67	31.07
68°	30.69	29.47	29.54	33.83	31.76	32.11	33.26	32.11	31.76	33.83	29.54	29.47
69°	29.49	27.42	28.69	31.90	30.25	30.55	31.73	30.55	30.25	31.90	28.69	27.42
70°	28.38	26.43	27.61	30.27	29.47	29.85	30.20	29.85	29.47	30.27	27.61	26.43
71°	27.09	26.33	26.52	28.78	28.50	29.11	28.86	29.11	28.50	28.78	26.52	26.33
72°	25.91	26.17	25.44	28.29	26.97	28.36	27.51	28.36	26.97	28.29	25.44	26.17
73°	24.82	25.63	24.71	27.35	25.74	27.35	26.88	27.35	25.74	27.35	24.71	25.63
74°	23.79	25.15	24.40	26.03	24.92	26.00	26.24	26.00	24.92	26.03	24.40	25.15
75°	22.84	24.54	23.01	24.92	24.07	24.87	25.65	24.87	24.07	24.92	23.01	24.54
76°	22.30	24.59	22.11	23.88	23.20	23.98	25.06	23.98	23.20	23.88	22.11	24.59
77°	21.81	23.29	21.85	22.94	22.94	23.24	24.14	23.24	22.94	22.94	21.85	23.29
78°	21.34	23.50	21.15	23.01	22.68	22.66	23.20	22.66	22.68	23.01	21.15	23.50
79°	20.84	22.68	20.35	22.51	22.02	22.00	21.90	22.00	22.02	22.51	20.35	22.68
80°	20.39	22.00	20.39	20.51	21.29	21.26	20.58	21.26	21.29	21.38	20.39	22.00
81°	20.16	21.29	20.16	21.19	20.46	21.10	20.89	21.10	20.46	21.19	20.16	21.29
82°	19.94	20.25	19.12	21.01	20.04	21.24	21.19	21.24	20.04	21.01	19.12	20.25
83°	19.73	21.17	18.72	20.72	19.83	20.75	21.01	20.75	19.83	20.72	18.72	21.17
84°	19.47	20.98	18.72	20.86	19.94	20.04	20.82	20.04	19.94	20.86	18.72	20.98
85°	19.14	19.76	18.86	20.09	19.97	19.73	20.06	19.73	19.97	20.09	18.86	19.76
86°	19.10	19.59	18.88	19.19	19.28	19.52	19.31	19.52	19.28	19.19	18.88	19.59
87°	19.02	19.10	17.00	19.35	18.84	19.64	19.47	19.64	18.84	19.35	17.00	19.10
88°	19.10	19.24	16.95	18.77	18.65	19.78	19.61	19.78	18.65	18.77	17.33	19.24
89°	19.24	19.02	17.70	18.74	18.77	19.28	18.91	19.28	18.77	18.74	17.92	19.02
90°	19.57	19.52	18.88	19.71	18.95	18.74	18.20	18.74	18.95	19.71	18.88	19.52
91°	19.61	19.52	18.88	20.44	18.95	19.47	18.77	19.47	18.95	20.44	18.86	19.52
92°	19.71	20.58	17.37	20.20	18.95	20.18	19.31	20.18	18.95	20.20	17.70	20.58
93°	19.71	20.77	18.58	19.59	18.98	20.75	19.50	20.75	18.98	19.59	18.58	20.77
94°	19.64	20.86	18.60	20.35	19.10	21.10	19.69	21.10	19.10	20.35	18.60	20.86
95°	19.69	20.46	18.58	20.56	19.33	20.42	19.69	20.42	19.33	20.56	18.58	20.46
96°	19.92	19.80	19.33	20.44	19.87	19.92	19.69	19.92	19.87	20.44	19.33	19.80
97°	20.23	20.68	19.14	20.16	20.51	20.11	19.69	20.11	20.51	20.16	19.14	20.68
98°	20.58	21.57	20.23	20.84	21.36	20.42	19.69	20.42	21.36	20.84	20.23	21.57
99°	21.05	22.35	20.93	21.69	21.97	21.12	21.19	21.12	21.97	21.69	20.93	22.35
100°	21.55	22.49	20.98	21.90	22.09	21.97	22.68	21.97	22.09	22.58	20.98	22.49
101°	22.18	23.88	21.50	22.96	22.56	23.10	22.56	23.10	22.56	22.96	21.50	23.88
102°	22.70	24.52	23.03	23.67	23.27	23.93	22.44	23.93	23.27	23.67	23.03	24.52

103°	23.22	25.23	24.19	24.54	23.46	24.33	23.20	24.33	23.46	24.54	24.19	25.23
104°	23.74	26.22	24.38	25.70	23.62	24.80	23.95	24.80	23.62	25.70	24.38	26.22
105°	24.26	25.48	24.61	26.55	24.94	25.41	24.73	25.41	24.94	26.55	24.61	25.48
106°	25.39	26.85	24.94	27.25	26.24	26.03	25.51	26.03	26.24	27.25	24.94	26.85
107°	26.57	27.39	26.12	28.10	27.54	26.62	26.12	26.62	27.54	28.10	26.12	27.39
108°	27.79	26.83	26.57	29.00	28.22	27.35	26.71	27.35	28.22	29.00	26.57	26.83
109°	29.02	27.46	26.97	29.94	28.29	28.20	27.65	28.20	28.29	29.94	26.97	27.46
110°	30.44	28.08	28.10	30.79	28.81	28.86	28.57	28.86	28.81	30.79	28.10	28.08
111°	31.05	28.10	28.43	31.87	29.49	29.37	29.02	29.37	29.49	31.87	28.43	28.10
112°	32.04	29.68	30.46	33.19	30.91	30.53	29.47	30.53	30.91	33.19	30.46	29.68
113°	33.31	31.64	32.70	35.29	32.53	31.97	31.76	31.97	32.53	35.29	32.70	31.64
114°	34.68	33.88	34.02	37.74	34.47	34.23	34.02	34.23	34.47	37.74	34.02	33.88
115°	36.23	35.20	36.56	40.17	36.73	36.75	36.19	36.75	36.73	40.17	36.56	35.20
116°	38.78	36.42	39.35	42.51	39.84	39.37	38.33	39.37	39.84	42.51	39.35	36.42
117°	41.52	39.39	41.89	44.96	42.91	42.01	41.80	42.01	42.91	44.96	41.89	39.39
118°	44.27	42.84	44.75	47.90	45.99	45.38	45.26	45.38	45.99	47.90	44.75	42.84
119°	47.08	46.56	48.28	51.11	49.46	48.92	49.11	48.92	49.46	51.11	48.28	46.56
120°	50.24	50.76	51.86	54.36	53.18	52.45	52.95	52.45	53.18	54.36	51.86	50.76
121°	54.39	55.19	55.68	57.71	57.26	55.97	57.05	55.97	57.26	57.71	55.68	55.19
122°	58.80	59.72	60.42	61.13	61.58	60.78	61.15	60.78	61.58	61.13	60.42	59.72
123°	63.51	64.85	65.47	65.18	66.13	65.80	66.34	65.80	66.13	65.18	65.47	64.85
124°	68.67	70.35	70.65	70.14	70.75	70.91	71.50	70.91	70.75	70.14	70.65	70.35
125°	74.14	76.15	76.05	75.39	76.52	75.96	76.59	75.96	76.52	75.39	76.05	76.15
126°	80.46	82.16	81.83	80.72	82.39	81.85	81.66	81.85	82.39	80.72	81.83	82.16
127°	87.51	88.71	88.45	86.94	88.74	87.86	88.38	87.86	88.74	86.94	88.45	88.71
128°	95.03	95.62	95.90	93.47	95.12	93.88	95.08	93.88	95.12	93.47	95.90	95.62
129°	102.69	102.57	103.59	100.71	101.68	99.86	102.06	99.86	101.68	100.71	103.59	102.57
130°	110.85	109.67	111.11	107.93	108.52	107.19	109.01	107.19	108.52	107.93	111.11	109.67
131°	117.73	116.79	118.75	114.08	115.19	114.64	115.61	114.64	115.19	114.08	118.75	116.79
132°	124.52	123.65	126.27	120.40	121.83	121.29	122.21	121.29	121.83	120.40	126.27	123.65
133°	130.98	130.56	132.16	127.23	129.03	127.89	128.98	127.89	129.03	127.23	132.16	130.56
134°	137.42	137.18	138.15	134.19	136.05	134.42	135.72	134.42	136.05	134.19	138.15	137.18
135°	144.21	143.97	143.97	140.77	142.37	140.93	141.38	140.93	142.37	140.77	143.97	143.97
136°	150.03	150.74	149.61	147.01	148.57	146.78	147.04	146.78	148.57	147.01	149.61	150.74
137°	156.21	157.60	154.89	153.12	154.27	152.55	153.02	152.55	154.27	153.12	154.89	157.60
138°	162.50	165.00	160.17	159.13	159.74	158.71	158.99	158.71	159.74	159.13	160.17	165.00
139°	168.91	170.26	165.33	164.74	165.57	164.86	164.22	164.86	165.57	164.74	165.33	170.26
140°	175.51	174.31	170.21	169.86	171.06	169.34	169.43	169.34	171.06	169.86	170.21	174.31
141°	178.86	177.66	174.62	174.69	175.04	173.77	173.86	173.77	175.04	174.69	174.62	177.66
142°	182.14	180.37	178.32	179.24	178.96	178.01	178.30	178.01	178.96	179.24	178.32	180.37
143°	184.73	182.92	181.88	183.58	182.19	182.28	181.95	182.28	182.19	183.58	181.88	182.92
144°	187.16	185.49	185.39	186.48	185.32	185.27	185.60	185.27	185.32	186.48	185.39	185.49
145°	189.49	188.13	188.08	189.07	188.46	188.17	188.36	188.17	188.46	189.07	188.08	188.13
146°	191.88	190.74	190.81	191.97	191.52	191.10	191.12	191.10	191.52	191.97	190.81	190.74
147°	193.90	193.10	193.74	194.99	194.45	194.00	194.00	194.00	194.45	194.99	193.74	193.10
148°	195.72	195.36	196.57	197.79	197.11	196.24	196.85	196.24	197.11	197.79	196.57	195.36
149°	197.44	197.77	199.02	200.17	199.28	198.36	199.00	198.36	199.28	200.17	199.02	197.77
150°	199.33	200.29	201.28	202.46	201.12	200.57	201.12	200.57	201.12	202.46	201.28	200.29



151°	201.40	202.53	203.52	204.54	202.81	202.72	202.51	202.72	202.81	204.54	203.52	202.53
152°	203.10	204.28	205.29	206.11	204.37	204.02	203.88	204.02	204.37	206.11	205.29	204.28
153°	204.30	205.69	206.59	207.39	205.67	205.17	204.65	205.17	205.67	207.39	206.59	205.69
154°	205.41	207.27	207.53	208.00	206.02	205.86	205.43	205.86	206.02	208.00	207.53	207.27
155°	206.73	207.84	208.21	208.47	206.14	206.35	206.14	206.35	206.14	208.47	208.21	207.84
156°	207.29	208.28	208.68	208.73	206.82	206.66	206.85	206.66	206.82	208.73	208.68	208.28
157°	207.60	208.50	208.76	208.83	207.44	206.89	206.14	206.89	207.44	208.83	208.76	208.50
158°	207.60	208.66	208.24	208.76	207.20	207.01	205.43	207.01	207.20	208.76	208.24	208.66
159°	207.62	208.80	207.84	208.38	206.75	207.03	204.84	207.03	206.75	208.38	207.84	208.80
160°	207.46	208.17	207.39	207.60	206.35	206.26	204.25	206.26	206.35	207.60	207.39	208.17
161°	206.61	207.22	206.82	206.40	205.97	204.98	204.21	204.98	205.97	206.40	206.82	207.22
162°	205.74	206.07	205.88	205.12	205.31	204.28	204.16	204.28	205.31	205.12	205.88	206.07
163°	204.75	204.79	204.75	204.04	204.02	203.99	203.24	203.99	204.02	204.04	204.75	204.79
164°	203.55	203.64	203.80	203.19	202.74	203.10	202.30	203.10	202.74	203.19	203.80	203.64
165°	202.51	202.96	203.14	202.41	202.81	201.73	201.56	201.73	202.81	202.41	203.14	202.96
166°	202.23	202.60	202.63	201.68	202.98	201.38	200.81	201.38	202.98	201.90	202.63	202.60
167°	202.15	202.37	202.15	201.87	202.79	202.06	201.52	202.06	202.79	201.87	202.15	202.37
168°	202.11	202.20	201.80	202.18	202.60	202.46	202.23	202.46	202.60	202.18	201.80	202.20
169°	201.97	202.04	201.68	202.37	202.51	202.44	202.08	202.44	202.51	202.37	201.68	202.04
170°	201.80	202.06	201.90	202.32	202.44	202.34	201.92	202.34	202.44	202.32	201.90	202.06
171°	202.53	202.65	202.39	202.30	202.44	202.30	201.97	202.30	202.44	202.30	202.39	202.65
172°	203.29	203.62	203.14	202.56	202.60	202.32	201.99	202.32	202.60	202.56	203.14	203.62
173°	203.59	204.13	203.71	202.96	202.72	202.63	202.60	202.63	202.72	202.96	203.71	204.13
174°	203.57	204.11	203.85	203.22	202.93	202.93	203.19	202.93	202.93	203.22	203.85	204.11
175°	203.80	204.09	204.30	203.64	203.07	202.98	203.19	202.98	203.07	203.64	204.30	204.09
176°	203.59	204.23	204.84	204.39	203.62	203.07	203.19	203.07	203.62	204.39	205.34	204.23
177°	202.96	203.80	204.54	204.96	204.16	203.73	203.90	203.73	204.16	204.96	204.54	203.80
178°	201.73	202.51	203.10	203.50	203.71	204.25	204.61	204.25	203.71	203.50	203.10	202.51
179°	200.48	200.95	201.38	201.75	202.06	202.27	202.34	202.27	202.06	201.75	201.38	200.95
180°	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06	200.06