

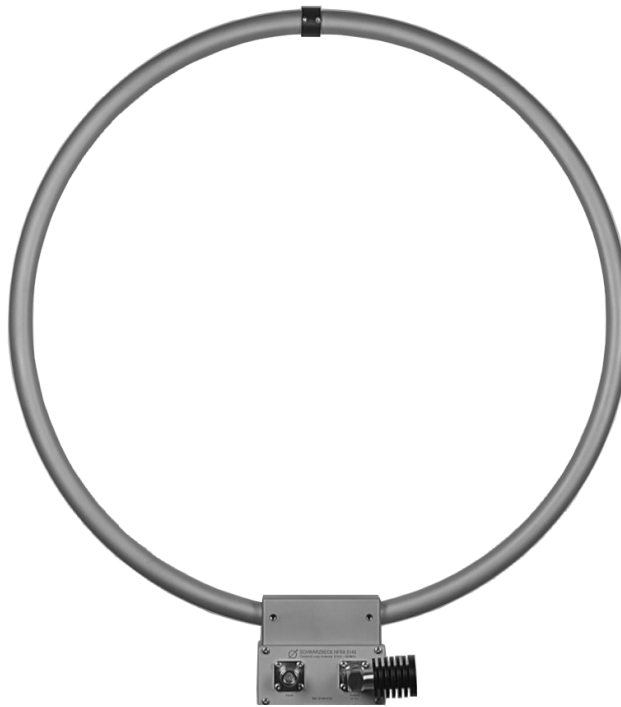
# SCHWARZBECK MESS - ELEKTRONIK

An der Klinge 29 D-69250 Schönau Tel.: 06228/1001 Fax.: (49)6228/1003

## HFRA 5149

**H-Feld Senderahmenantenne 9 kHz - 30 MHz**

*H-Field Transmit Loop VLF / HF*



### BESCHREIBUNG

Im Frequenzbereich 9 kHz - 30 MHz werden bevorzugt magnetische Feldstärken gemessen, oft aber in Einheiten der elektrischen Feldstärke als „fiktiver E-Feld-Pegel“ in dB $\mu$ V/m angegeben.

Im homogenen Fernfeld sind beide Größen durch den „Feldwellenwiderstand des freien Raums“  $120 \pi \Omega = 377 \Omega$  verknüpft. EMV/EMI-Messungen erfolgen aber nahezu immer im Nahfeld ( $D < 0.1 \lambda$ ).

Insofern besteht Bedarf an definierten H-Feld-Strahlungsquellen. Für Immunitätsprüfungen werden stärkere H-Felder benötigt, aber auch bei meßtechnischen Untersuchungen im freien Meßgelände, in Schirmräumen und in Absorberhallen ist Bedarf an leistungsfähigen kalibrierten magnetischen Sendeantennen vorhanden, da die H-Feldstärke im Nahfeld mit der dritten Potenz der Entfernung abnimmt. Schon ab 1 m Entfernung beginnt für 30 MHz der Übergang ins Fernfeld, wobei der Exponent der Feldstärkenminderung allmählich von 3 auf 1 absinkt.

Die vorliegende magnetische Sendeantenne kann kurzzeitig bis 100 Watt, im Dauerbetrieb mit 30 Watt belastet werden. Dann ist eine externe 50  $\Omega$  Last mit der erforderlichen Leistungsaufnahme anzuschließen. Ein über

### DESCRIPTION

*In the VLF-HF frequency range 9 kHz to 30 MHz the magnetic field strength is measured preferably, but often expressed in the unit of the electric field strength as the "fictive E field level" ( dB $\mu$ V/m).*

*In the undistorted far-field both units are linked by the characteristic impedance of free space  $120 \pi \Omega = 377 \Omega$ . Practical EMC/EMI measurements however are carried out in the near-field zone ( $D < 0.1 \lambda$ ).*

*For that reason defined magnetic field sources are required. For Immunity Tests powerful H fields might be needed, but also general tests and measurements at an open site, in screened rooms and in absorber-lined rooms require well-defined powerful H field sources.*

*Magnetic fields in the near-field zone decay with the inverse 3rd power of distance (ca. 18 dB at twice the distance). Even at 1 m distance at 30 MHz the transition from pure near-field to far-field begins, the exponent of degradation gradually reduces from 3 to 1 in the undistorted far-field.*

*The magnetic loop antenna described here may be operated with up to 100 W input power for short periods and with 30 W continuously. An external 50  $\Omega$  power termination with the proper dissipation is required. A 50  $\Omega$  20 Watt*

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die Leistung üblicher Labormesssender hinausgehender 20-Watt-Abschluss ist im Lieferumfang enthalten.

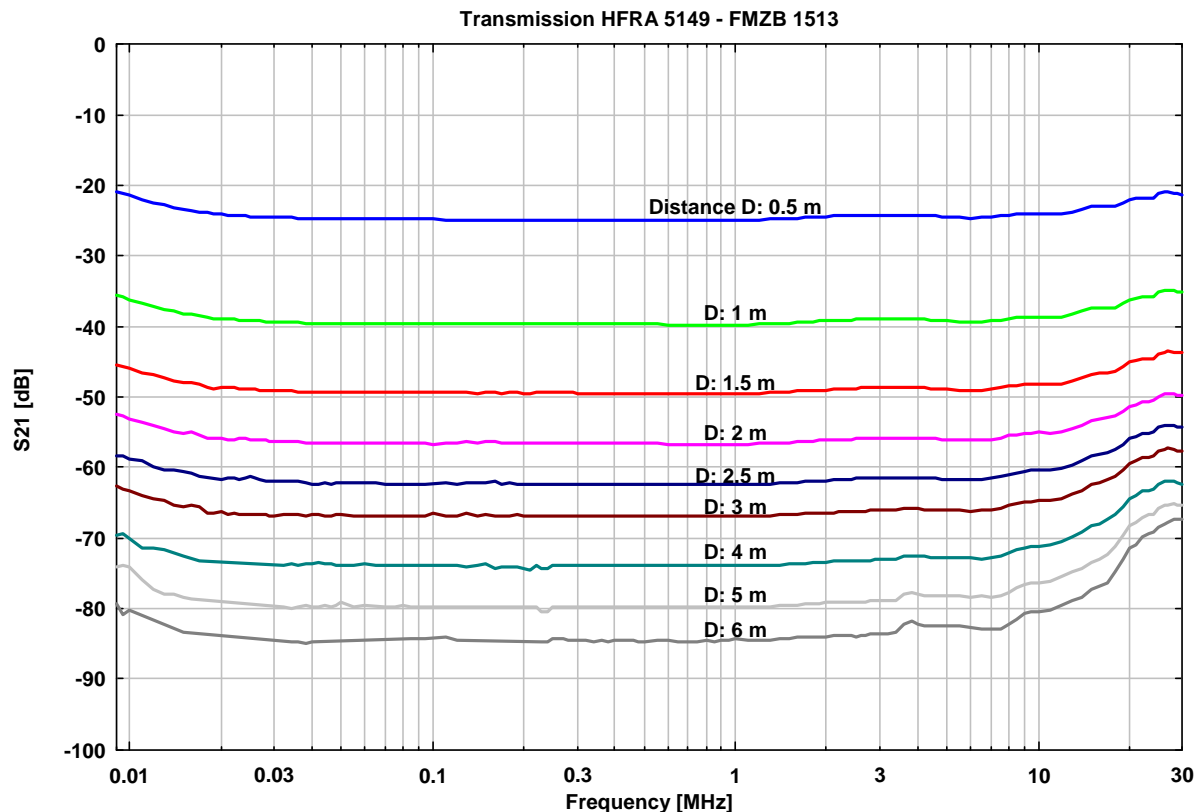
Zur Befestigung oder Stativmontage befindet sich auf der Unterseite des Gehäuses ein 3/8" Kameragewinde.

*termination is part of the scope of delivery of HFRA 5149. It is more than sufficient for the maximum output of laboratory power signal generators.*

*The HFRA 5149 has a 3/8" camera thread at the box.*

#### Technische Daten:

Frequenzbereich:	9 kHz – 30 MHz	Frequency range (nominal):
SWR (Ref. 50 Ω):	< 2 (0.02 – 20 MHz) < 4 (0.009 – 30 MHz)	SWR:
Anschlüsse: 2 x N - Buchse		Connectors: 2 x N female
Externer Abschlusswiderstand:	50 Ω	Ext. termination:
ZUBEHÖR: Abschlusswiderstand	50 Ω / 20 Watt	ACCESSORY:
Polarisation bei senkrechter Montage: vertikal (für E-Feld)		Polarisation vertically mounted: vertically (fictive E field)
Richtdiagramm: Öffnungswinkel für -3dB: 90° (2x)		Directive Pattern: 2 x 90° half power vertical axis
Abmessungen:	515 x 585 x 80 mm	Dimensions:
Rahmen-Querschnitt:	Ø 20 mm	Cross section:
Voll geschirmt		Fully shielded
Material des Gehäuses:	Aluminium	Material of the housing:
Gewicht:	1250 g	Weight:
Halterung: Stativgewinde	3/8"	Mounting support: camera thread



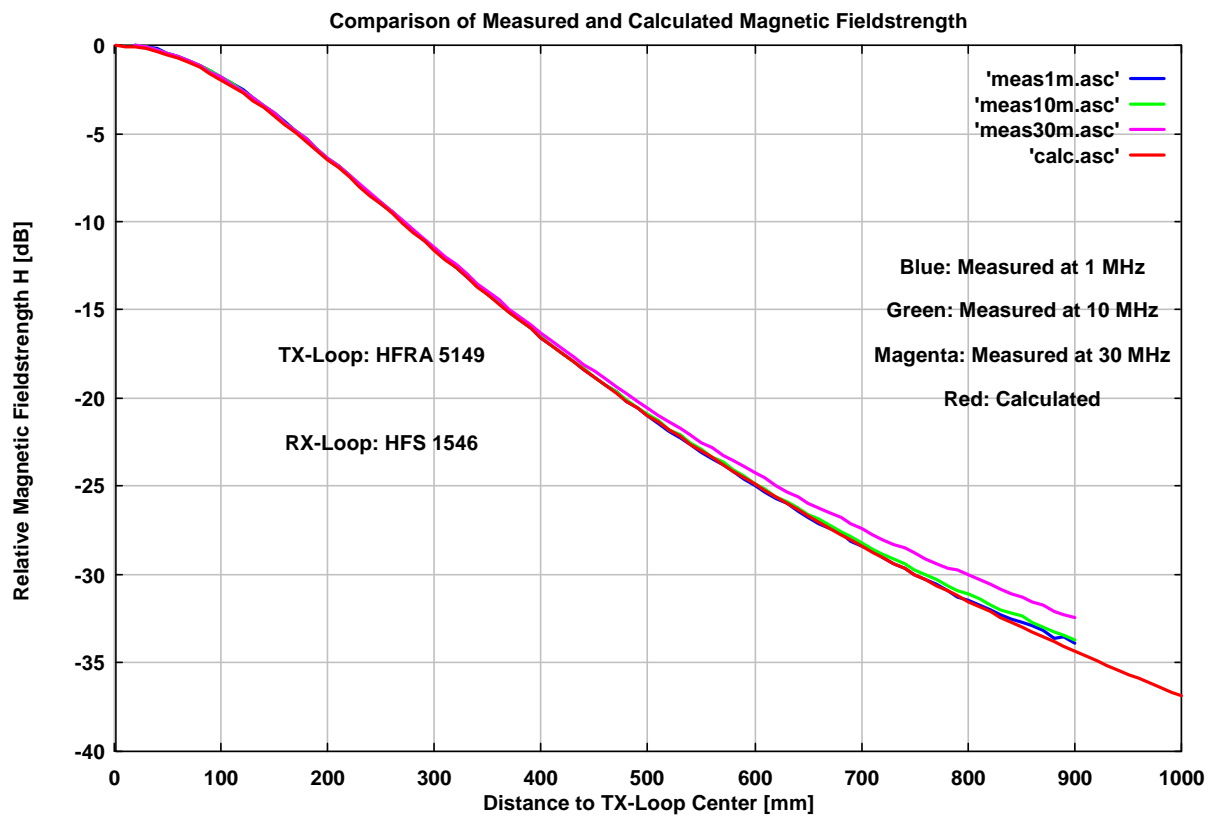
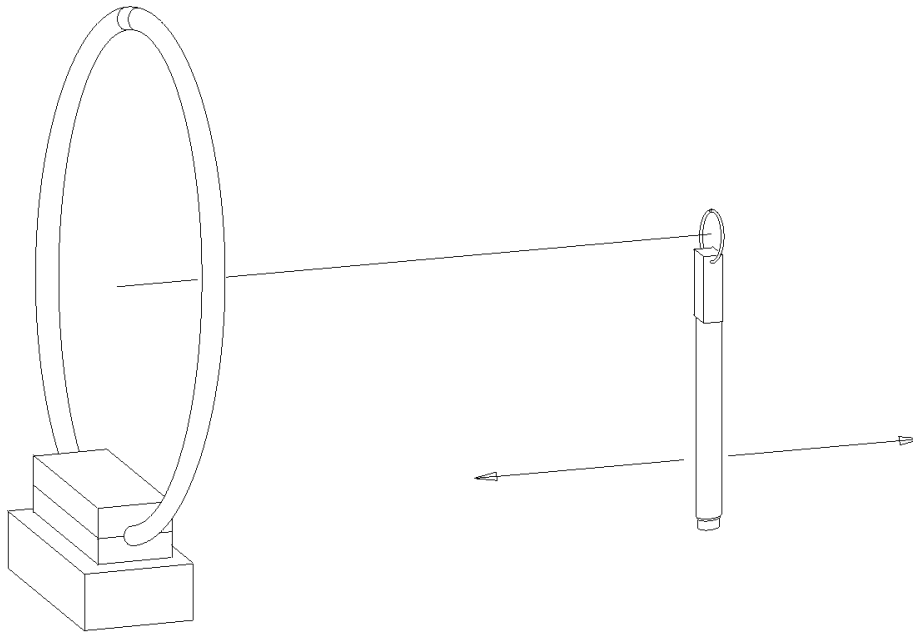
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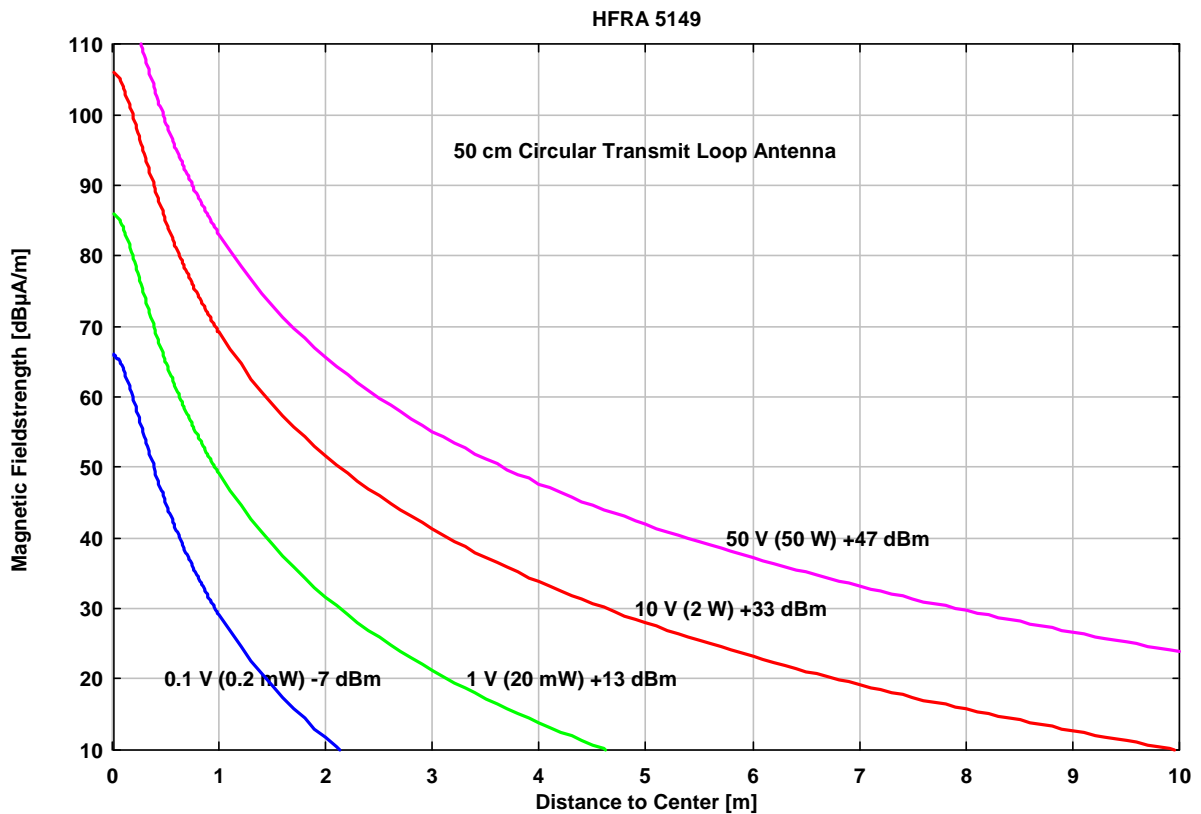
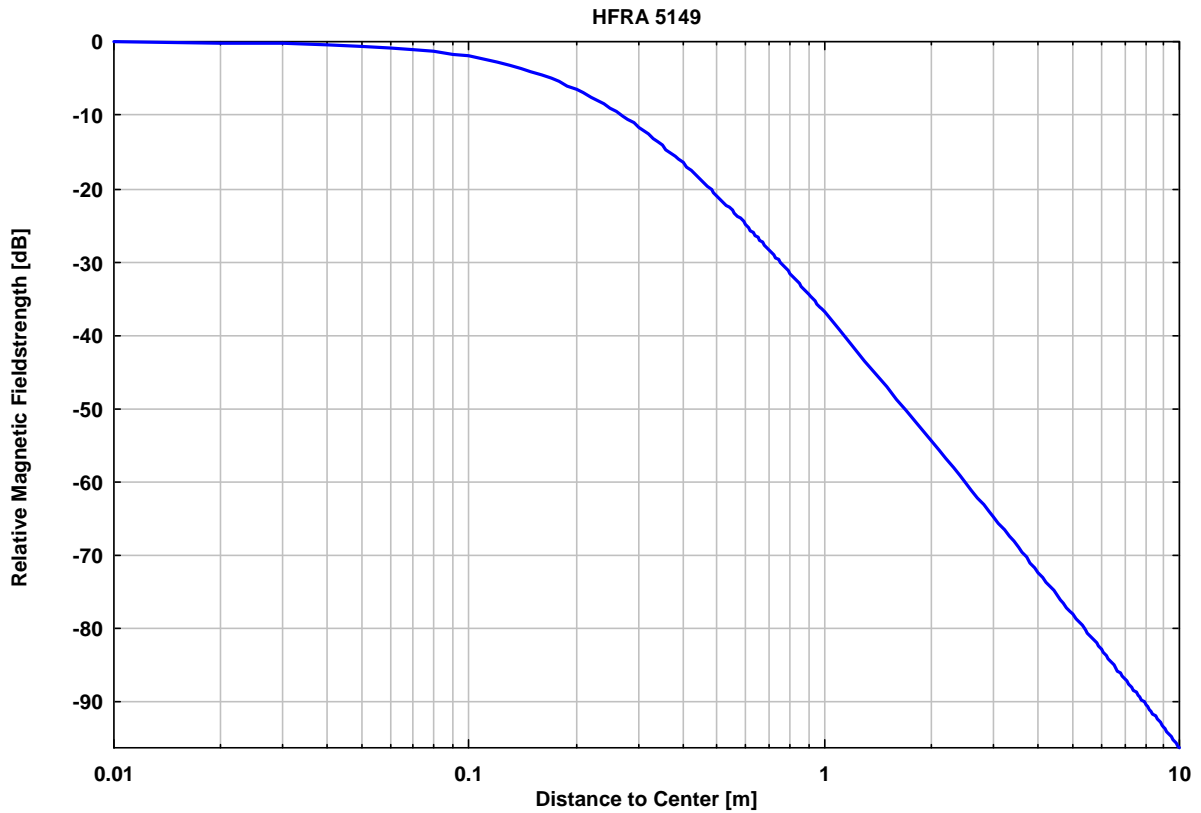
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0.0	66.02	86.02	106.02	120.00	0.00
1.0	66.00	86.00	106.00	119.98	-0.02
2.0	65.94	85.94	105.94	119.92	-0.08
3.0	65.83	85.83	105.83	119.81	-0.19
4.0	65.69	85.69	105.69	119.67	-0.33
5.0	65.51	85.51	105.51	119.49	-0.51
6.0	65.29	85.29	105.29	119.27	-0.73
7.0	65.04	85.04	105.04	119.02	-0.98
8.0	64.75	84.75	104.75	118.73	-1.27
9.0	64.43	84.43	104.43	118.41	-1.59
10.0	64.09	84.09	104.09	118.07	-1.93
11.0	63.71	83.71	103.71	117.69	-2.31
12.0	63.32	83.32	103.32	117.30	-2.70
13.0	62.90	82.90	102.90	116.88	-3.12
14.0	62.47	82.47	102.47	116.45	-3.55
15.0	62.01	82.01	102.01	115.99	-4.01
16.0	61.55	81.55	101.55	115.53	-4.47
17.0	61.07	81.07	101.07	115.05	-4.95
18.0	60.58	80.58	100.58	114.56	-5.44
19.0	60.08	80.08	100.08	114.06	-5.94
20.0	59.58	79.58	99.58	113.55	-6.45
21.0	59.06	79.06	99.06	113.04	-6.96
22.0	58.55	78.55	98.55	112.53	-7.47
23.0	58.03	78.03	98.03	112.01	-7.99
24.0	57.51	77.51	97.51	111.49	-8.51
25.0	56.99	76.99	96.99	110.97	-9.03
26.0	56.47	76.47	96.47	110.45	-9.55
27.0	55.95	75.95	95.95	109.93	-10.07
28.0	55.43	75.43	95.43	109.41	-10.59
29.0	54.91	74.91	94.91	108.89	-11.11
30.0	54.40	74.40	94.40	108.38	-11.62
31.0	53.89	73.89	93.89	107.87	-12.13
32.0	53.38	73.38	93.38	107.36	-12.64
33.0	52.88	72.88	92.88	106.86	-13.14
34.0	52.38	72.38	92.38	106.36	-13.64
35.0	51.88	71.88	91.88	105.86	-14.14
36.0	51.39	71.39	91.39	105.37	-14.63
37.0	50.91	70.91	90.91	104.88	-15.12
38.0	50.42	70.42	90.42	104.40	-15.60
39.0	49.95	69.95	89.95	103.93	-16.07
40.0	49.48	69.48	89.48	103.46	-16.54
41.0	49.01	69.01	89.01	102.99	-17.01
42.0	48.55	68.55	88.55	102.53	-17.47
43.0	48.10	68.10	88.10	102.07	-17.93
44.0	47.64	67.64	87.64	101.62	-18.38
45.0	47.20	67.20	87.20	101.18	-18.82
46.0	46.76	66.76	86.76	100.74	-19.26
47.0	46.33	66.33	86.33	100.30	-19.70
48.0	45.90	65.90	85.90	99.87	-20.13
49.0	45.47	65.47	85.47	99.45	-20.55

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Distance to Center [cm]	H [dB $\mu$ A/m] Loop Current 1 mA = 0.1 V = 0.2 mW = - 7 dBm	H [dB $\mu$ A/m] Loop Current 10 mA = 1 V = 20 mW = 13 dBm	H [dB $\mu$ A/m] Loop Current 100 mA = 10 V = = 2 W = 33 dBm	H [dB $\mu$ A/m] Loop Current 0.5 A = 50 V = 50 W = 47 dBm	H [dBrel]
50.0	45.05	65.05	85.05	99.03	-20.97
51.0	44.64	64.64	84.64	98.62	-21.38
52.0	44.23	64.23	84.23	98.21	-21.79
53.0	43.82	63.82	83.82	97.80	-22.20
54.0	43.42	63.42	83.42	97.40	-22.60
55.0	43.03	63.03	83.03	97.01	-22.99
56.0	42.64	62.64	82.64	96.62	-23.38
57.0	42.25	62.25	82.25	96.23	-23.77
58.0	41.87	61.87	81.87	95.85	-24.15
59.0	41.49	61.49	81.49	95.47	-24.53
60.0	41.12	61.12	81.12	95.10	-24.90
61.0	40.75	60.75	80.75	94.73	-25.27
62.0	40.39	60.39	80.39	94.37	-25.63
63.0	40.03	60.03	80.03	94.01	-25.99
64.0	39.68	59.68	79.68	93.66	-26.34
65.0	39.32	59.32	79.32	93.30	-26.70
66.0	38.98	58.98	78.98	92.96	-27.04
67.0	38.63	58.63	78.63	92.61	-27.39
68.0	38.29	58.29	78.29	92.27	-27.73
69.0	37.96	57.96	77.96	91.94	-28.06
70.0	37.63	57.63	77.63	91.61	-28.39
71.0	37.30	57.30	77.30	91.28	-28.72
72.0	36.97	56.97	76.97	90.95	-29.05
73.0	36.65	56.65	76.65	90.63	-29.37
74.0	36.33	56.33	76.33	90.31	-29.69
75.0	36.02	56.02	76.02	90.00	-30.00
76.0	35.71	55.71	75.71	89.69	-30.31
77.0	35.40	55.40	75.40	89.38	-30.62
78.0	35.10	55.10	75.10	89.08	-30.92
79.0	34.80	54.80	74.80	88.78	-31.22
80.0	34.50	54.50	74.50	88.48	-31.52
81.0	34.20	54.20	74.20	88.18	-31.82
82.0	33.91	53.91	73.91	87.89	-32.11
83.0	33.62	53.62	73.62	87.60	-32.40
84.0	33.33	53.33	73.33	87.31	-32.69
85.0	33.05	53.05	73.05	87.03	-32.97
86.0	32.77	52.77	72.77	86.75	-33.25
87.0	32.49	52.49	72.49	86.47	-33.53
88.0	32.22	52.22	72.22	86.20	-33.80
89.0	31.94	51.94	71.94	85.92	-34.08
90.0	31.67	51.67	71.67	85.65	-34.35
91.0	31.41	51.41	71.41	85.39	-34.61
92.0	31.14	51.14	71.14	85.12	-34.88
93.0	30.88	50.88	70.88	84.86	-35.14
94.0	30.62	50.62	70.62	84.60	-35.40
95.0	30.36	50.36	70.36	84.34	-35.66
96.0	30.11	50.11	70.11	84.09	-35.91
97.0	29.85	49.85	69.85	83.83	-36.17
98.0	29.60	49.60	69.60	83.58	-36.42
99.0	29.35	49.35	69.35	83.33	-36.67

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100.0	29.11	49.11	69.11	83.09	-36.91
110.0	26.76	46.76	66.76	80.74	-39.26
120.0	24.59	44.59	64.59	78.57	-41.43
130.0	22.59	42.59	62.59	76.57	-43.43
140.0	20.72	40.72	60.72	74.70	-45.30
150.0	18.97	38.97	58.97	72.95	-47.05
160.0	17.34	37.34	57.34	71.31	-48.69
170.0	15.79	35.79	55.79	69.77	-50.23
180.0	14.33	34.33	54.33	68.31	-51.69
190.0	12.95	32.95	52.95	66.93	-53.07
200.0	11.63	31.63	51.63	65.61	-54.39
210.0	10.38	30.38	50.38	64.36	-55.64
220.0	9.18	29.18	49.18	63.16	-56.84
230.0	8.04	28.04	48.04	62.02	-57.98
240.0	6.94	26.94	46.94	60.92	-59.08
250.0	5.89	25.89	45.89	59.87	-60.13
260.0	4.88	24.88	44.88	58.86	-61.14
270.0	3.90	23.90	43.90	57.88	-62.12
280.0	2.96	22.96	42.96	56.94	-63.06
290.0	2.06	22.06	42.06	56.04	-63.96
300.0	1.18	21.18	41.18	55.16	-64.84
310.0	0.33	20.33	40.33	54.31	-65.69
320.0	-0.49	19.51	39.51	53.49	-66.51
330.0	-1.29	18.71	38.71	52.69	-67.31
340.0	-2.06	17.94	37.94	51.92	-68.08
350.0	-2.81	17.19	37.19	51.17	-68.83
360.0	-3.54	16.46	36.46	50.44	-69.56
370.0	-4.25	15.75	35.75	49.72	-70.28
380.0	-4.95	15.05	35.05	49.03	-70.97
390.0	-5.62	14.38	34.38	48.36	-71.64
400.0	-6.28	13.72	33.72	47.70	-72.30
410.0	-6.92	13.08	33.08	47.06	-72.94
420.0	-7.54	12.46	32.46	46.44	-73.56
430.0	-8.16	11.84	31.84	45.82	-74.18
440.0	-8.75	11.25	31.25	45.23	-74.77
450.0	-9.34	10.66	30.66	44.64	-75.36
460.0	-9.91	10.09	30.09	44.07	-75.93
470.0	-10.47	9.53	29.53	43.51	-76.49
480.0	-11.01	8.99	28.99	42.97	-77.03
490.0	-11.55	8.45	28.45	42.43	-77.57
500.0	-12.07	7.93	27.93	41.91	-78.09
510.0	-12.59	7.41	27.41	41.39	-78.61
520.0	-13.09	6.91	26.91	40.89	-79.11
530.0	-13.59	6.41	26.41	40.39	-79.61
540.0	-14.07	5.93	25.93	39.90	-80.10
550.0	-14.55	5.45	25.45	39.43	-80.57
560.0	-15.02	4.98	24.98	38.96	-81.04
570.0	-15.48	4.52	24.52	38.50	-81.50
580.0	-15.93	4.07	24.07	38.05	-81.95
590.0	-16.38	3.62	23.62	37.60	-82.40

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600.0	-16.81	3.19	23.19	37.16	-82.84
610.0	-17.24	2.76	22.76	36.73	-83.27
620.0	-17.67	2.33	22.33	36.31	-83.69
630.0	-18.08	1.92	21.92	35.90	-84.10
640.0	-18.49	1.51	21.51	35.49	-84.51
650.0	-18.90	1.10	21.10	35.08	-84.92
660.0	-19.29	0.71	20.71	34.68	-85.32
670.0	-19.69	0.31	20.31	34.29	-85.71
680.0	-20.07	-0.07	19.93	33.91	-86.09
690.0	-20.45	-0.45	19.55	33.53	-86.47
700.0	-20.83	-0.83	19.17	33.15	-86.85
710.0	-21.19	-1.19	18.81	32.78	-87.22
720.0	-21.56	-1.56	18.44	32.42	-87.58
730.0	-21.92	-1.92	18.08	32.06	-87.94
740.0	-22.27	-2.27	17.73	31.71	-88.29
750.0	-22.62	-2.62	17.38	31.36	-88.64
760.0	-22.97	-2.97	17.03	31.01	-88.99
770.0	-23.31	-3.31	16.69	30.67	-89.33
780.0	-23.64	-3.64	16.36	30.34	-89.66
790.0	-23.97	-3.97	16.03	30.01	-89.99
800.0	-24.30	-4.30	15.70	29.68	-90.32
810.0	-24.62	-4.62	15.38	29.35	-90.65
820.0	-24.94	-4.94	15.06	29.04	-90.96
830.0	-25.26	-5.26	14.74	28.72	-91.28
840.0	-25.57	-5.57	14.43	28.41	-91.59
850.0	-25.88	-5.88	14.12	28.10	-91.90
860.0	-26.18	-6.18	13.82	27.80	-92.20
870.0	-26.49	-6.49	13.51	27.49	-92.51
880.0	-26.78	-6.78	13.22	27.20	-92.80
890.0	-27.08	-7.08	12.92	26.90	-93.10
900.0	-27.37	-7.37	12.63	26.61	-93.39
910.0	-27.66	-7.66	12.34	26.32	-93.68
920.0	-27.94	-7.94	12.06	26.04	-93.96
930.0	-28.22	-8.22	11.78	25.76	-94.24
940.0	-28.50	-8.50	11.50	25.48	-94.52
950.0	-28.78	-8.78	11.22	25.20	-94.80
960.0	-29.05	-9.05	10.95	24.93	-95.07
970.0	-29.32	-9.32	10.68	24.66	-95.34
980.0	-29.59	-9.59	10.41	24.39	-95.61
990.0	-29.85	-9.85	10.15	24.13	-95.87
1000.0	-30.11	-10.11	9.89	23.87	-96.13