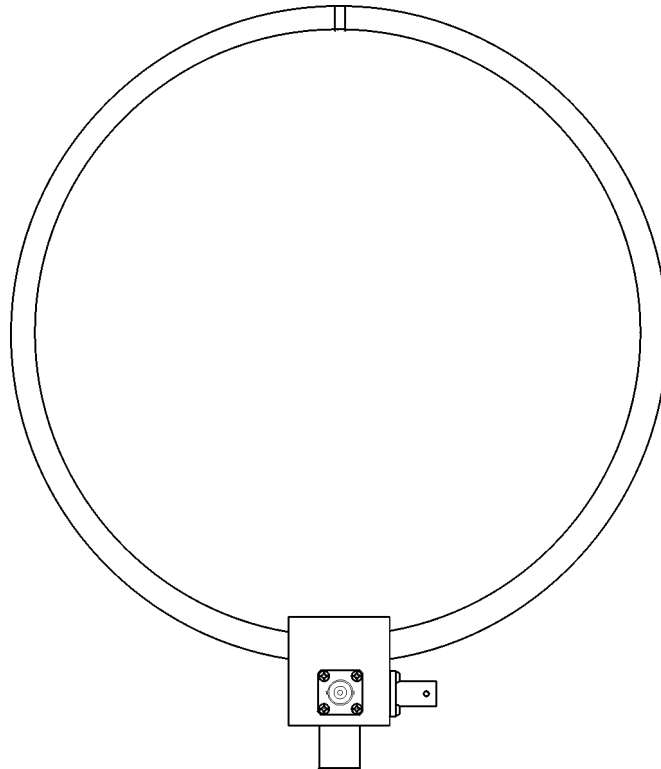


**Senderahmen HFRA 5159**  
**Transmit Loop Antenna HFRA 5159**



<b>Technische Daten:</b>	<b>HFRA 5159</b>	<b>Specifications:</b>
Frequenzbereich:	DC-400 kHz	<i>Frequency Range:</i>
Rahmendurchmesser:	250 mm	<i>Loop diameter:</i>
Resonanzfrequenz:	600 kHz	<i>Self Resonance:</i>
Windungszahl:	28	<i>Number of turns:</i>
Widerstand zur Stromkontrolle:	10 $\Omega$	<i>Resistor for current monitoring:</i>
Induktivität:	450 $\mu$ H	<i>Inductance:</i>
Serienwiderstand des Windungspakets:	2 $\Omega$	<i>Series resistance of the turns:</i>
Parasitäre Parallelkapazität:	160 pF	<i>Parasitic Parallel Capacitance:</i>
Maximaler Strom Buchse A:	70 mA	<i>Maximum Current Input A:</i>
Eingangsimpedanz Buchse A:	1.26 k $\Omega$	<i>Input Impedance A:</i>
Maximaler Strom Buchse B:	110 mA	<i>Maximum Current Input B:</i>
Eingangsimpedanz Buchse B:	see Diagram	<i>Input Impedance B:</i>
Maximale Leistung:	5 W	<i>Maximum Power:</i>
Abmessungen:	260 x 305 x 80 mm	<i>Mechanical Dimensions:</i>
Anschlüsse:	3 x BNC	<i>Terminals:</i>
Befestigung:	3/8"	<i>Mount:</i>
Gewicht:	450 g	<i>Weight:</i>

# SCHWARZBECK MESS - ELEKTRONIK

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

## Senderahmen HFRA 5159 Transmit Loop Antenna HFRA 5159

### Beschreibung:

Der Senderahmen HFRA 5159 dient zur Erzeugung von definierten Magnetfeldern im Frequenzbereich von DC bis 400 kHz. Für orientierende Messungen kann der Frequenzbereich bis über 2 MHz ausgedehnt werden. Der Rahmen, bestehend aus 28 kreisrunden Windungen, ist gegen E-Felder geschirmt. Im vernickelten Messinggehäuse sind Widerstände zur Stromkontrolle und zur Linearisierung des Frequenzgangs untergebracht. Die Befestigung der Rahmenantenne erfolgt mittels großem Kameragewinde.

Die erzeugte Magnetfeldstärke ist proportional zum Rahmenstrom. Für den Rahmenstrom von 100 mA ist in der Tabelle die absolute Magnetfeldstärke in A/m und in dB $\mu$ A/m angegeben. Zusätzlich ist noch der relative Abfall der Magnetfeldstärke, bezogen auf den Spulennittelpunkt angegeben. Geringere Feldstärken können durch entsprechende Skalierung des Stromes erzeugt werden. Bei einem Speisestrom von 10 mA anstelle von 100 mA reduzieren sich die Tabellenwerte für die Feldstärke um Faktor 10 d.h. um 20 dB im logarithmischen Maß. Alle Magnetfeldangaben beziehen sich auf die Feldstärkekomponente, die senkrecht zur Rahmenebene steht.

### Anwendung:

Die HFRA 5159 ist mit drei BNC-Buchsen ausgestattet. Die Buchse (A) wird zur Speisung des Rahmens mit einer 50  $\Omega$  Quelle mit konstanter Spannung verwendet, man erreicht dadurch eine konstante Feldstärke, während die andere Buchse (C) zur Messung des Rahmenstroms als Spannungsabfall an einem 10  $\Omega$  Widerstand benutzt werden kann. In dieser Betriebsart ist die Eingangsimpedanz durch einen Serienwiderstand linearisiert, was zu einem glatten Frequenzgang führt, aber auch die erzielbare Feldstärke verringert. Alternativ kann in Buchse (B) eingespeist werden, hierbei ist lediglich die Induktivität der Rahmenwindung in Serie mit 10  $\Omega$  sichtbar, wobei eine Stromkontrolle durch Messung des Spannungsabfalls an Buchse (C) unbedingt notwendig ist. Diese Betriebsart erlaubt höhere Feldstärken, allerdings muß bei jeder Frequenz der Rahmenstrom kontrolliert werden und ggfs. die Eingangsspannung angepaßt werden. Es wird empfohlen, ein hochohmiges Spannungsmeßgerät an der Buchse C zu verwenden.

### Description:

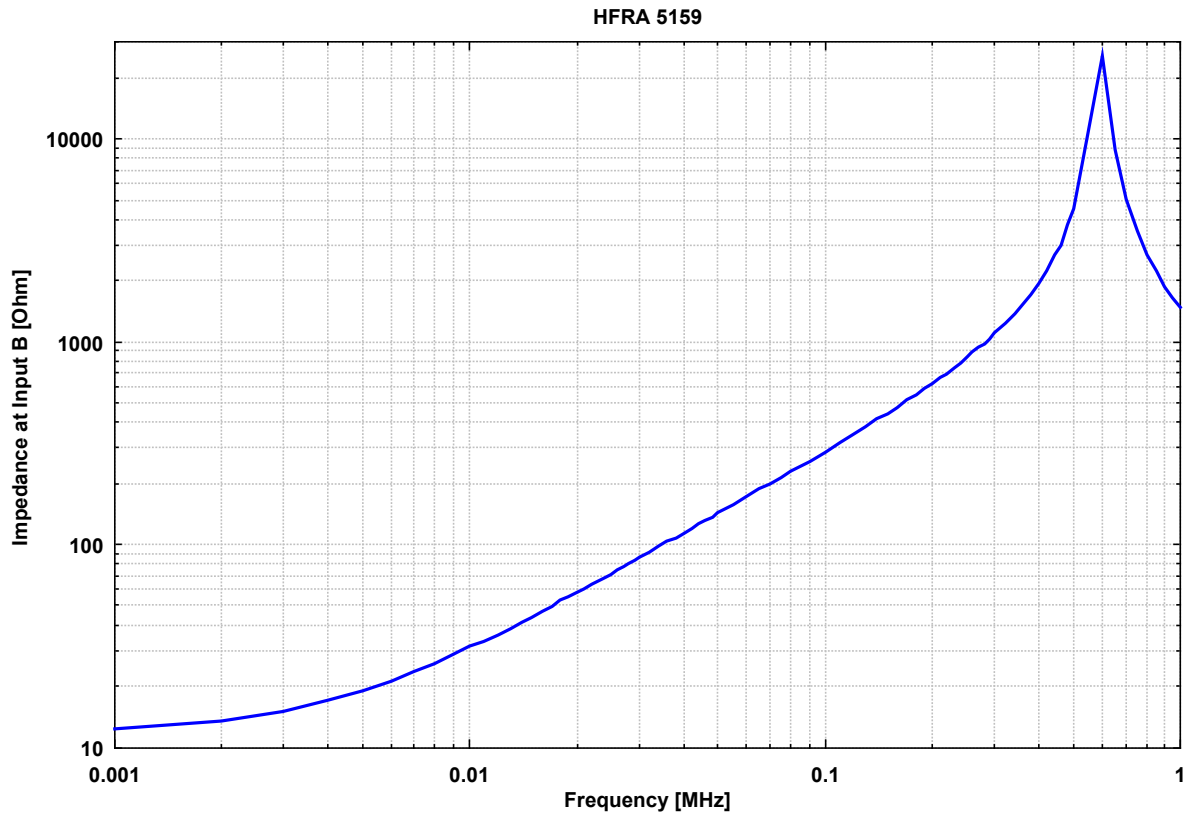
*The transmit loop antenna HFRA 5159 was designed to generate well defined magnetic fields in the frequency range from DC to 400 kHz. With slightly reduced performance the loop can be used in the frequency range up to 2 MHz. The loop, consisting of 28 turns, is shielded against E-fields. The nickel-plated brass housing contains resistors to verify the loop current by voltage measurement. The loop antenna has a flat frequency response over the entire frequency range. The loop can be mounted at its female large camera thread.*

*The generated magnetic field is proportional to the loop current. A tabular indicates the fieldstrength values in A/m and dB $\mu$ A/m to be expected with the loop current of 100 mA. Additionally the relative decrease of magnetic fieldstrength referred to the center of the loop antenna can be found. Lower magnetic fieldstrengths can be achieved by scaling the current to the respective value. With a feed current of 10 mA instead of 100 mA the tabular values decrease by a factor of 10, which corresponds to a reduction by 20 dB in logarithmic measure. All specified magnetic fieldstrengths refer to the component which is perpendicular to the loop-plane.*

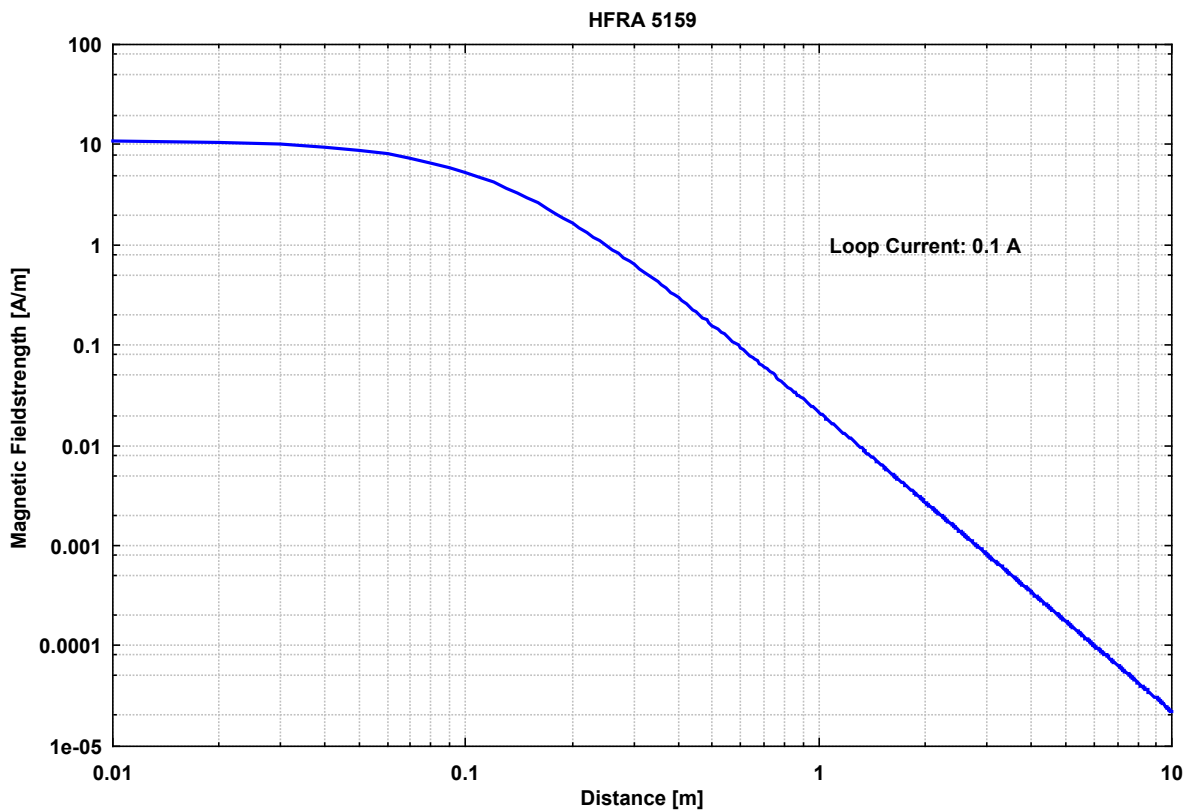
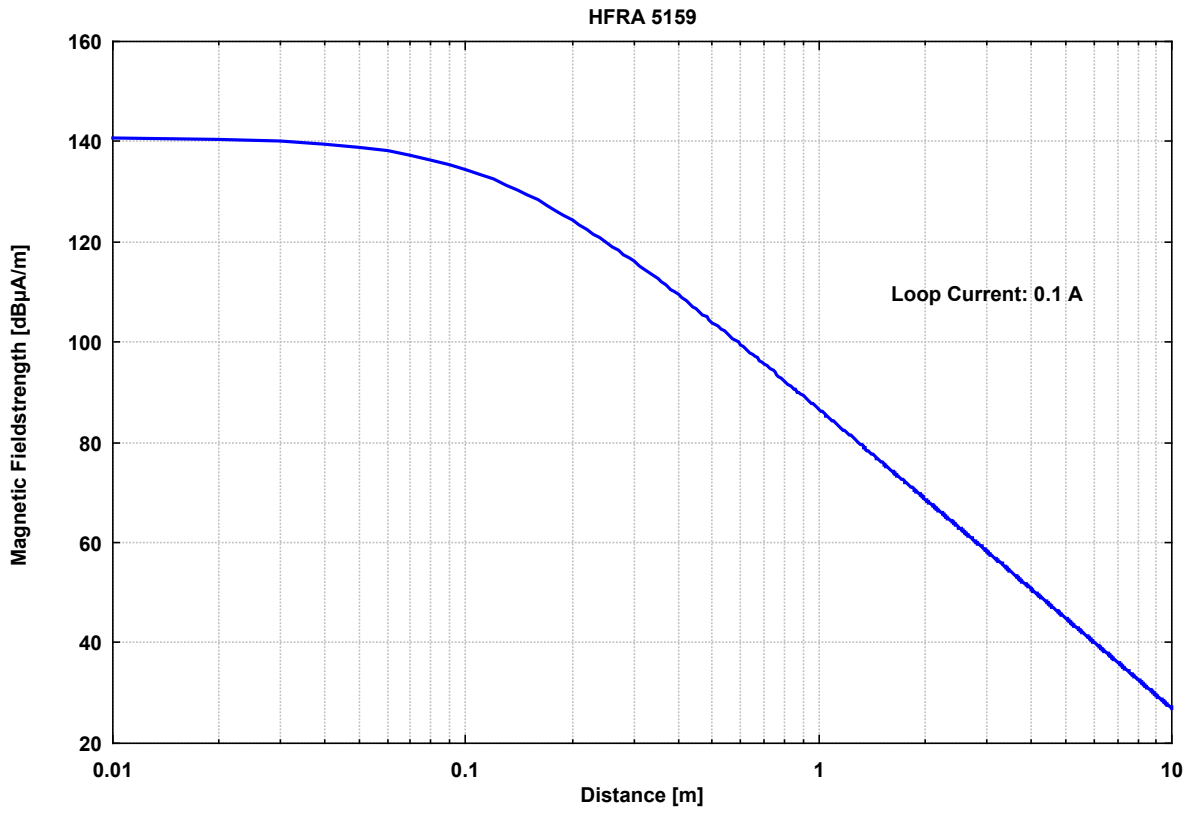
### Application:

*The HFRA 5159 comes with 3 BNC connectors. Connector A is used to feed the loop with a 50  $\Omega$  source with constant voltage, which generates a constant magnetic fieldstrength versa frequency. Connector C is used to monitor the loop current by measuring the voltage drop across a 10  $\Omega$  resistor. This operation mode uses a linearisation of the loop current by a series resistor, which causes a flat frequency response, but the achievable fieldstrength is limited. Alternatively the loop antenna can be driven through Connector B, which presents the loop inductance in series with the 10  $\Omega$  resistor. In this case the loop current has to be checked by measuring the voltage drop across the 10  $\Omega$  resistor. This operation mode allows to generate higher fieldstrength levels, but requires current monitoring and input voltage adjustment for each frequency. We recommend to use voltage measuring equipment with high impedance to measure at connector C.*

**Senderahmen HFRA 5159**  
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# SCHWARZBECK MESS - ELEKTRONIK

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## Senderahmen HFRA 5159 Transmit Loop Antenna HFRA 5159

Loop Current: 100 mA Voltage at Connector C: 1 V			
Distance from Center	Magnetic Field-strength	Magnetic Field-strength	Magnetic Field-strength relative
Dist.[cm]	H [A/m]	H [dBµA/m]	H [dBrel]
0.0	11.2000	140.98	0.00
1.0	11.0933	140.90	-0.08
2.0	10.7833	140.66	-0.33
3.0	10.2976	140.25	-0.73
4.0	9.6763	139.71	-1.27
5.0	8.9646	139.05	-1.93
6.0	8.2063	138.28	-2.70
7.0	7.4392	137.43	-3.55
8.0	6.6923	136.51	-4.47
9.0	5.9860	135.54	-5.44
10.0	5.3328	134.54	-6.45
11.0	4.7385	133.51	-7.47
12.0	4.2046	132.47	-8.51
13.0	3.7293	131.43	-9.55
14.0	3.3088	130.39	-10.59
15.0	2.9386	129.36	-11.62
16.0	2.6134	128.34	-12.64
17.0	2.3283	127.34	-13.64
18.0	2.0785	126.35	-14.63
19.0	1.8595	125.39	-15.60
20.0	1.6674	124.44	-16.54
21.0	1.4987	123.51	-17.47
22.0	1.3503	122.61	-18.38
23.0	1.2195	121.72	-19.26
24.0	1.1040	120.86	-20.13
25.0	1.0018	120.02	-20.97
26.0	0.9111	119.19	-21.79
27.0	0.8305	118.39	-22.60
28.0	0.7587	117.60	-23.38
29.0	0.6946	116.83	-24.15
30.0	0.6372	116.09	-24.90
31.0	0.5858	115.35	-25.63
32.0	0.5395	114.64	-26.34
33.0	0.4978	113.94	-27.04
34.0	0.4602	113.26	-27.73
35.0	0.4261	112.59	-28.39
36.0	0.3953	111.94	-29.05
37.0	0.3672	111.30	-29.69
38.0	0.3417	110.67	-30.31
39.0	0.3185	110.06	-30.92
40.0	0.2972	109.46	-31.52
41.0	0.2778	108.87	-32.11
42.0	0.2600	108.30	-32.69
43.0	0.2436	107.73	-33.25
44.0	0.2286	107.18	-33.80
45.0	0.2147	106.64	-34.35
46.0	0.2020	106.11	-34.88
47.0	0.1902	105.58	-35.40

Loop Current: 100 mA Voltage at Connector C: 1 V			
Distance from Center	Magnetic Field-strength	Magnetic Field-strength	Magnetic Field-strength relative
Dist.[cm]	H [A/m]	H [dBµA/m]	H [dBrel]
48.0	0.1793	105.07	-35.91
49.0	0.1692	104.57	-36.42
50.0	0.1598	104.07	-36.91
51.0	0.1511	103.58	-37.40
52.0	0.1430	103.11	-37.88
53.0	0.1355	102.64	-38.35
54.0	0.1285	102.18	-38.81
55.0	0.1219	101.72	-39.26
56.0	0.1158	101.27	-39.71
57.0	0.1101	100.83	-40.15
58.0	0.1047	100.40	-40.58
59.0	0.0997	99.98	-41.01
60.0	0.0950	99.56	-41.43
61.0	0.0906	99.14	-41.84
62.0	0.0865	98.74	-42.25
63.0	0.0826	98.34	-42.65
64.0	0.0789	97.94	-43.04
65.0	0.0754	97.55	-43.43
66.0	0.0722	97.17	-43.82
67.0	0.0691	96.79	-44.20
68.0	0.0662	96.42	-44.57
69.0	0.0634	96.05	-44.94
70.0	0.0608	95.68	-45.30
71.0	0.0584	95.33	-45.66
72.0	0.0561	94.97	-46.01
73.0	0.0538	94.62	-46.36
74.0	0.0518	94.28	-46.71
75.0	0.0498	93.94	-47.05
76.0	0.0479	93.60	-47.38
77.0	0.0461	93.27	-47.71
78.0	0.0444	92.94	-48.04
79.0	0.0428	92.62	-48.37
80.0	0.0412	92.30	-48.69
81.0	0.0397	91.98	-49.00
82.0	0.0383	91.67	-49.31
83.0	0.0370	91.36	-49.62
84.0	0.0357	91.06	-49.93
85.0	0.0345	90.76	-50.23
86.0	0.0333	90.46	-50.53
87.0	0.0322	90.16	-50.82
88.0	0.0312	89.87	-51.11
89.0	0.0301	89.58	-51.40
90.0	0.0292	89.30	-51.69
91.0	0.0282	89.01	-51.97
92.0	0.0273	88.73	-52.25
93.0	0.0265	88.46	-52.53
94.0	0.0257	88.18	-52.80
95.0	0.0249	87.91	-53.07

# SCHWARZBECK MESS - ELEKTRONIK

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## Senderahmen HFRA 5159 Transmit Loop Antenna HFRA 5159

Loop Current: 100 mA Voltage at Connector C: 1 V			
Distance from Center	Magnetic Field-strength	Magnetic Field-strength	Magnetic Field-strength relative
Dist.[cm]	H [A/m]	H [dBµA/m]	H [dBrel]
96.0	0.0241	87.64	-53.34
97.0	0.0234	87.38	-53.61
98.0	0.0227	87.12	-53.87
99.0	0.0220	86.85	-54.13
100.0	0.0214	86.60	-54.39
110.0	0.0161	84.15	-56.84
120.0	0.0125	81.91	-59.08
130.0	0.0098	79.84	-61.14
140.0	0.0079	77.93	-63.06
150.0	0.0064	76.14	-64.84
160.0	0.0053	74.47	-66.51
170.0	0.0044	72.90	-68.08
180.0	0.0037	71.42	-69.56
190.0	0.0032	70.02	-70.97
200.0	0.0027	68.69	-72.30
210.0	0.0023	67.42	-73.56
220.0	0.0020	66.21	-74.77
230.0	0.0018	65.06	-75.93
240.0	0.0016	63.95	-77.03
250.0	0.0014	62.89	-78.09
260.0	0.0012	61.87	-79.11
270.0	0.0011	60.89	-80.10
280.0	0.0010	59.94	-81.04
290.0	0.0009	59.03	-81.95
300.0	0.0008	58.15	-82.84
310.0	0.0007	57.30	-83.69
320.0	0.0007	56.47	-84.51
330.0	0.0006	55.67	-85.31
340.0	0.0006	54.89	-86.09
350.0	0.0005	54.14	-86.85
360.0	0.0005	53.41	-87.58
370.0	0.0004	52.69	-88.29
380.0	0.0004	52.00	-88.99
390.0	0.0004	51.32	-89.66
400.0	0.0003	50.66	-90.32
410.0	0.0003	50.02	-90.96
420.0	0.0003	49.39	-91.59
430.0	0.0003	48.78	-92.20
440.0	0.0003	48.18	-92.80
450.0	0.0002	47.60	-93.39
460.0	0.0002	47.02	-93.96
470.0	0.0002	46.46	-94.52
480.0	0.0002	45.92	-95.07
490.0	0.0002	45.38	-95.61
500.0	0.0002	44.85	-96.13
510.0	0.0002	44.34	-96.65
520.0	0.0002	43.83	-97.15
530.0	0.0001	43.34	-97.65
540.0	0.0001	42.85	-98.14

Loop Current: 100 mA Voltage at Connector C: 1 V			
Distance from Center	Magnetic Field-strength	Magnetic Field-strength	Magnetic Field-strength relative
Dist.[cm]	H [A/m]	H [dBµA/m]	H [dBrel]
550.0	0.0001	42.37	-98.61
560.0	0.0001	41.90	-99.08
570.0	0.0001	41.44	-99.54
580.0	0.0001	40.99	-100.00
590.0	0.0001	40.54	-100.44
600.0	0.0001	40.10	-100.88
610.0	0.0001	39.67	-101.31
620.0	0.0001	39.25	-101.73
630.0	0.0001	38.83	-102.15
640.0	0.0001	38.42	-102.56
650.0	0.0001	38.02	-102.97
660.0	0.0001	37.62	-103.36
670.0	0.0001	37.23	-103.75
680.0	0.0001	36.84	-104.14
690.0	0.0001	36.46	-104.52
700.0	0.0001	36.09	-104.90
710.0	0.0001	35.72	-105.27
720.0	0.0001	35.35	-105.63
730.0	0.0001	35.00	-105.99
740.0	0.0001	34.64	-106.34
750.0	0.0001	34.29	-106.69
760.0	0.0000	33.95	-107.04
770.0	0.0000	33.61	-107.38
780.0	0.0000	33.27	-107.71
790.0	0.0000	32.94	-108.05
800.0	0.0000	32.61	-108.37
810.0	0.0000	32.29	-108.70
820.0	0.0000	31.97	-109.02
830.0	0.0000	31.65	-109.33
840.0	0.0000	31.34	-109.65
850.0	0.0000	31.03	-109.95
860.0	0.0000	30.73	-110.26
870.0	0.0000	30.42	-110.56
880.0	0.0000	30.13	-110.86
890.0	0.0000	29.83	-111.15
900.0	0.0000	29.54	-111.44
910.0	0.0000	29.25	-111.73
920.0	0.0000	28.97	-112.02
930.0	0.0000	28.69	-112.30
940.0	0.0000	28.41	-112.58
950.0	0.0000	28.13	-112.85
960.0	0.0000	27.86	-113.12
970.0	0.0000	27.59	-113.39
980.0	0.0000	27.32	-113.66
990.0	0.0000	27.06	-113.93
1000.0	0.0000	26.80	-114.19