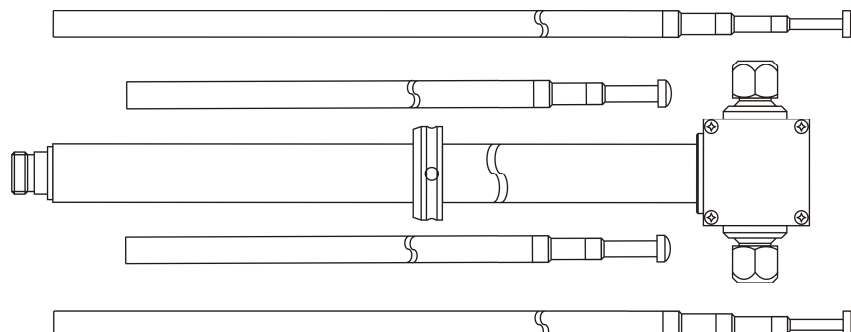


Halbwellen - Messdipol *Half - Wave Tuned Dipole Antenna*



Beschreibung:

Ein abgestimmter Halbwellen-Dipol gilt als Referenz für die Messung von Feldstärken und die Erzeugung definierter VHF-Felder. Durch die sehr weit gehende Definition aller Daten ist ein vielseitiger Einsatz in der HF-Technik gegeben.

Statt der zwei Satz ausziehbarer Teleskopstäbe können auch Bikonus-Elemente wie BBA 9106 oder BBAL 9136 bzw. Faltbikonus-Elemente FBAL 9178 oder FBAB 9177 verwendet werden. Die Verwendung der o.g. Konus-Elemente (bitte gesondert bestellen) erlaubt den breitbandigen Einsatz des 1:1-Baluns auch ohne frequenzabhängige Elementlängen-Anpassung.

Die Hauptanwendung der VHA 9103 ist die Emissionsmessung bei EMV-Messungen. Aufgrund der hohen Symmetrie, hochgenauer Kalibrierung, einer hervorragenden Verarbeitung und der geringen Verluste hat sich der VHA 9103 Balun in den letzten Jahrzehnten zu einem Marktführer entwickelt

Für die Erzeugung von Feldstärken für Immunitätsprüfungen sollten die 4:1 Halter / Baluns VHBA 9123 (50 W), VHBC 9133 (1 kW), VHBD 9134 (2.4 kW) oder VHBD 9134-4 (4 kW) verwendet werden, da diese bei tiefen Frequenzen wesentlich effektiver und belastbarer sind.

Zur Beurteilung der Eigenschaften des Messgeländes (normierte Felddämpfung) werden die Präzisionsdipole VHAP und UHAP empfohlen.

Wie die Mehrzahl der Schwarzbeck-Antennen wird die VHA 9103 an ihrem 22 mm Rohr mit Rastring befestigt, z.B. am Isolierstoff-Antennenwagen der zerlegbaren Antennen-Mastanlage Typ AM 9104. Der Rastring ermöglicht das Einrasten in vertikaler und horizontaler Dipollage.

Description:

A tuned Half-Wave Dipole Antenna is considered as a reference for the measurement of field strength and for the generation of defined VHF electromagnetic fields (up to 10 watts erp).

Instead of using 2 sets of telescopic elements, biconical elements like BBA 9106 or BBAL 9136 or collapsible biconical elements like FBAL 9178 or FBAB 9177 may be inserted. Thanks to the conical elements (order separately) the 1:1 Balun / Holder can be used as broadband antenna without a frequency dependent extension length adjustment

VHA 9103's main application is emission measurement at emc-tests. The high degree of symmetry, the accurate calibration data, an outstanding workmanship and low losses let VHA 9103 become a leading balun on the antenna market.

For the generation of high fieldstrengths we recommend to use the 4:1 baluns / holders VHBA 9123 (50 W), VHBC 9133 (1 kW) VHBD 9134 (2.4 kW) or VHBD 9134-4 (4 kW), they offering a superior effectivity and power rating, especially in the low frequency range.

The evaluation of test site performance (normalised site attenuation) should be done using the precision dipoles VHAP and UHAP.

Like most Schwarzbeck antennas VHA 9103 is mounted at its 22 mm tube with indexing ring for horizontal and vertical polarisation, e.g. when inserted in the movable antenna holding box of the detachable mast system model AM 9104 for antenna heights from 0.4 to 4 m.

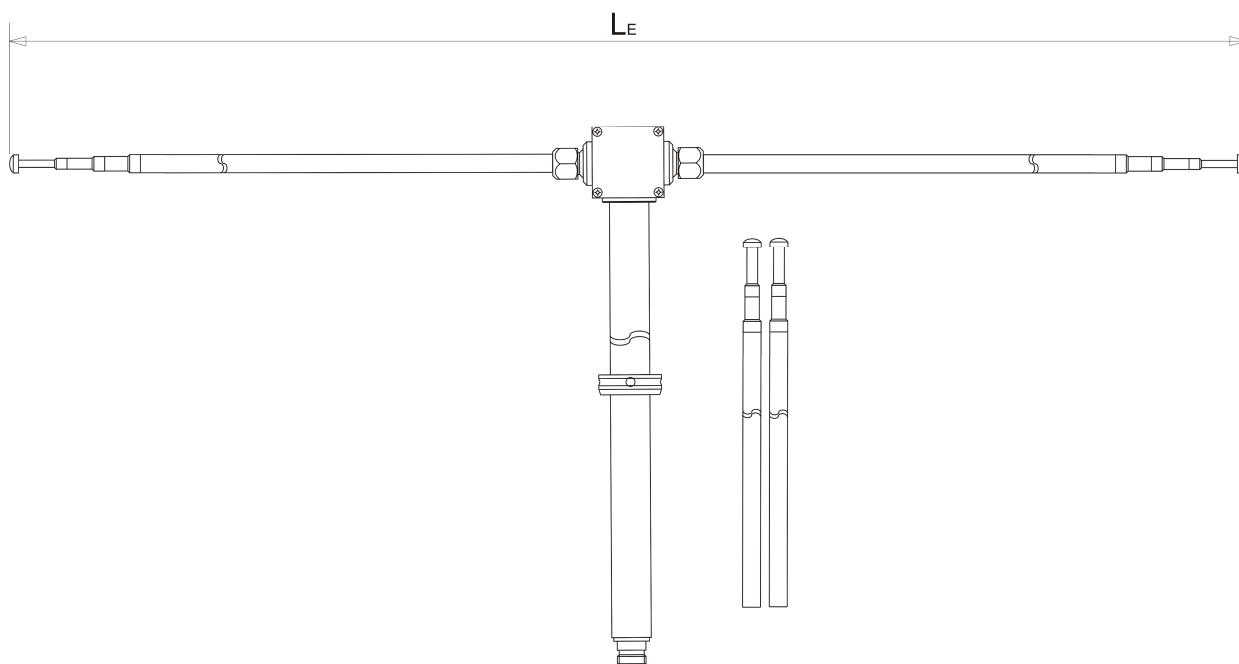
Am Ende des 22 mm Rohres ist eine Qualitäts-N-Buchse eingebaut. Dort wird im Regelfall das 10 m lange Koaxialkabel mit N-Steckern (Typ AK 9513) angeschlossen, dessen Dämpfungsverlauf über der Frequenz bekannt ist.

Der Halbwellendipol UHA 9105 stellt die Ergänzung der VHA im oberen Frequenzbereich (300-1000 MHz) dar.

At the rear end of VHA 9103 a female N-connector of high quality provides contact to the 10 m long coaxial antenna cable AK 9513. The cable loss is documented for correcting field-strength or e.r.p. calculation.

The half-wave dipole UHA 9105 can be regarded as the frequency extension of VHA in the upper frequency range (300-1000 MHz).

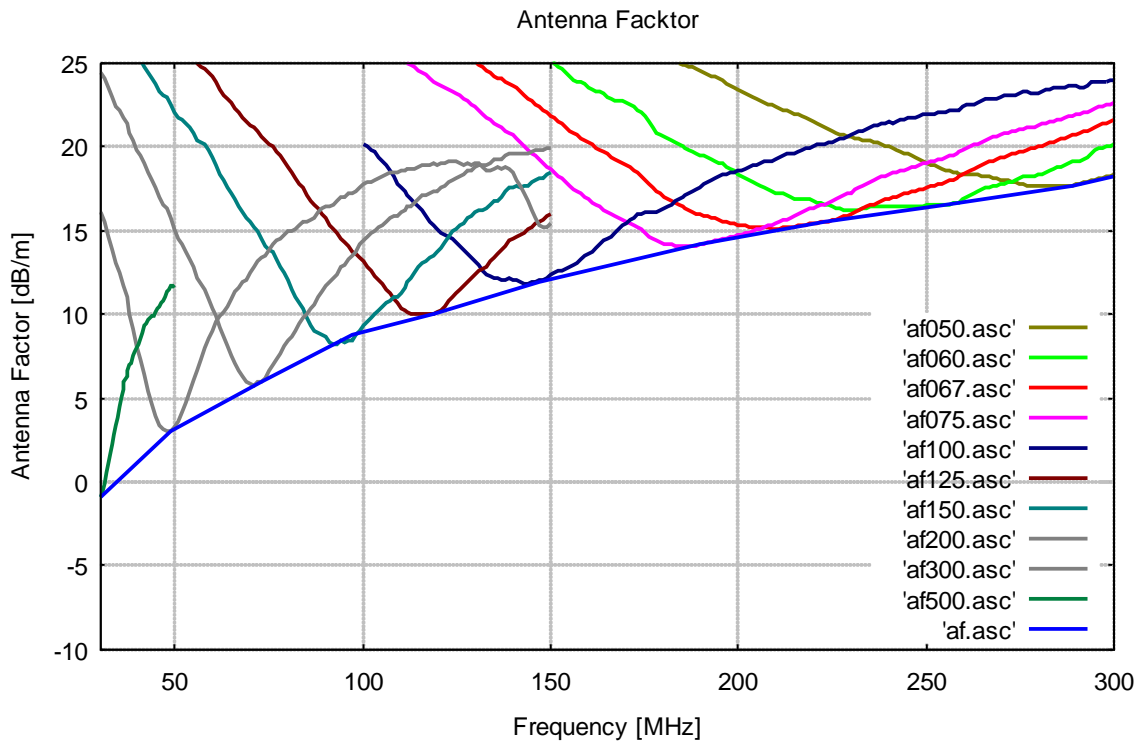
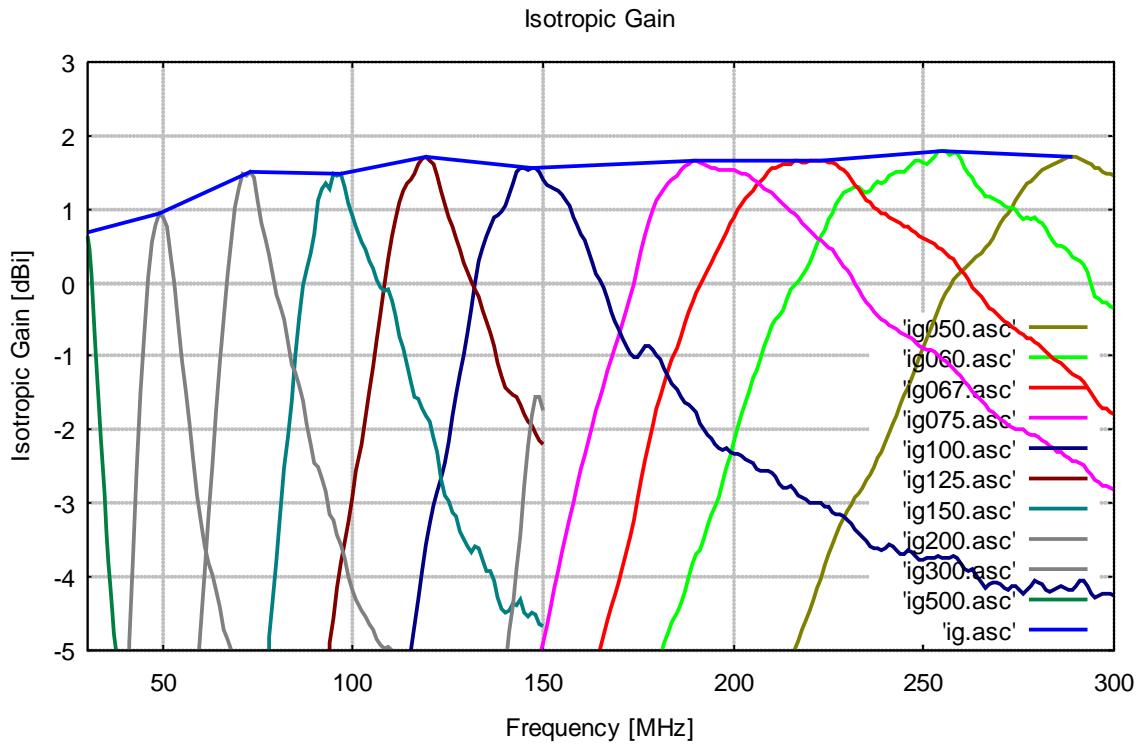
Technische Daten:		Specifications:
Frequenzbereich:	30 - 300 MHz	Frequency Range:
Bereich der Element-Auszugslängen:	0.485 / 5.00 m	Dipole Element Extension range:
Empfohlene Auszugslängen:	0.47 ... 0.5 λ	Recommended Extension length:
Dämpfung der Halterung mit Sy.-Übertrager:	0.25...0.6 dB	Holder and Balun Attenuation:
Antennenfaktoren an 50 Ω	-2.1... +18.2dB/m	Antenna Factors acr. 50 Ω :
Antennengewinn über Isotropstrahler:	typ.: +1.5 dBi	Antenna Gain over Isotropic:
Max. Belastbarkeit (Senden):	10 W	Max. Power rating:
3-dB-Öffnungswinkel in E-Ebene:	78 °	Half Power Beamwidth, E-Plane:
Länge:	530 mm	Length:
Gewicht:	930 g	Weight:
Anschluß:	N - female	Connector:



Elementlänge	Halbwellenresonanz	Frequenz des maximalen Gewinns	Isotropgewinn	Antennenfaktor	Bandbreite bei 0.5 dB Gewinnreduktion	Bandbreite bei 1 dB Gewinnreduktion
<i>Element Length</i>	<i>Half-wave resonance</i>	<i>Frequency of maximum gain</i>	<i>Isotropic Gain</i>	<i>Antenna Factor</i>	<i>Bandwidth with 0.5 dB gain decay</i>	<i>Bandwidth with 1 dB gain decay</i>
L_E	fλ/2	f g_{i,max}	g_i	AF	B[-0.5 dB]	B[-1 dB]
[m]	[MHz]	[MHz]	[dBi]	[dB/m]	[MHz]	[MHz]
5.00	30	29.50	0.67	-1.05	28.5 - 31	28 - 31.5
3.00	50	49.00	0.95	3.08	47 - 51	46 - 53
2.00	75	73.00	1.50	5.98	69 - 75	68 - 77
1.50	100	97.00	1.49	8.47	91 - 100	89 - 102
1.25	120	119.00	1.70	10.03	113 - 123	110 - 126
1.00	150	147.00	1.56	12.01	140 - 157	135 - 161
0.75	200	190.00	1.65	14.15	180 - 212	177 - 221
0.67	224	223.00	1.67	15.52	203 - 235	198 - 248
0.60	250	255.00	1.80	16.55	232 - 265	225 - 281
0.50	300	289.00	1.71	17.72	275 - 321	269 - 350

Da bei praktischen Messungen stets mit unerwünschten Reflexionen zu rechnen ist, wurden die Tabellenwerte durch mehrfache Mittelwertbildung (verschiedene Abstände, verschiedene Winkel im Richtdiagramm der H-Ebene, Höhenvariation) ermittelt. Für optimale Ergebnisse sollte insbesondere ein möglichst kleiner, reflexionsarmer Mastadapter / Mast verwendet werden

Since unwanted reflections are apparent in all practical applications, the tabular values have been determined using a multiple averaging technique (different distances, different angles of the H-plane pattern, height variation). To obtain best measurement results the mast / adapter should be as small as possible



Total Element Length: 5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
20.00	-14.45	10.70
20.50	-13.58	10.04
21.00	-12.58	9.24
21.50	-11.51	8.38
22.00	-10.51	7.58
22.50	-9.47	6.74
23.00	-8.49	5.94
23.50	-7.62	5.26
24.00	-6.83	4.66
24.50	-6.05	4.06
25.00	-5.21	3.39
25.50	-4.32	2.68
26.00	-3.40	1.92
26.50	-2.43	1.12
27.00	-1.56	0.41
27.50	-0.85	-0.14
28.00	-0.33	-0.51
28.50	0.19	-0.87
29.00	0.53	-1.07
29.50	0.67	-1.05
30.00	0.63	-0.86
30.50	0.44	-0.53
31.00	0.11	-0.06
31.50	-0.37	0.56
32.00	-0.78	1.10
32.50	-1.23	1.69
33.00	-1.66	2.25
33.50	-2.09	2.81
34.00	-2.49	3.34
34.50	-2.88	3.86
35.00	-3.41	4.51
35.50	-3.81	5.04
36.00	-4.12	5.47
36.50	-4.45	5.92
37.00	-4.77	6.35
37.50	-4.98	6.69
38.00	-5.17	6.98
38.50	-5.22	7.15
39.00	-5.46	7.50
39.50	-5.60	7.76
40.00	-5.70	7.96

Total Element Length: 3 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
40.00	-5.86	8.12
41.00	-4.90	7.37
42.00	-3.72	6.40
43.00	-2.55	5.44
44.00	-1.51	4.60
45.00	-0.70	3.99

Total Element Length: 3 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
46.00	0.06	3.42
47.00	0.55	3.12
48.00	0.79	3.05
49.00	0.95	3.08
50.00	0.90	3.30
51.00	0.75	3.62
52.00	0.36	4.18
53.00	-0.02	4.73
54.00	-0.54	5.41
55.00	-1.06	6.09
56.00	-1.48	6.66
57.00	-1.93	7.27
58.00	-2.46	7.95
59.00	-2.89	8.53
60.00	-3.26	9.05
61.00	-3.60	9.53
62.00	-3.81	9.88
63.00	-3.98	10.19
64.00	-4.17	10.52
65.00	-4.41	10.89
66.00	-4.72	11.33
67.00	-4.85	11.60
68.00	-5.05	11.92
69.00	-5.11	12.10
70.00	-5.36	12.48

Total Element Length: 2 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
55.00	-7.77	12.80
56.00	-6.99	12.17
57.00	-6.45	11.79
58.00	-5.99	11.47
59.00	-5.33	10.97
60.00	-4.63	10.41
61.00	-3.93	9.86
62.00	-3.14	9.21
63.00	-2.48	8.69
64.00	-1.77	8.12
65.00	-1.09	7.57
66.00	-0.51	7.13
67.00	0.10	6.64
68.00	0.57	6.30
69.00	1.02	5.97
70.00	1.27	5.85
71.00	1.49	5.75
72.00	1.45	5.92
73.00	1.50	5.98
74.00	1.44	6.16
75.00	1.11	6.61
76.00	0.82	7.01

Total Element Length: 2 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
77.00	0.61	7.34
78.00	0.37	7.69
79.00	0.10	8.07
80.00	-0.17	8.45
81.00	-0.32	8.71
82.00	-0.49	8.98
83.00	-0.82	9.42
84.00	-1.11	9.82
85.00	-1.21	10.02
86.00	-1.40	10.31
87.00	-1.61	10.62
88.00	-1.93	11.04
89.00	-2.21	11.41
90.00	-2.45	11.75
91.00	-2.50	11.90
92.00	-2.65	12.14
93.00	-2.84	12.43
94.00	-3.14	12.83
95.00	-3.22	12.99
96.00	-3.43	13.30
97.00	-3.55	13.50
98.00	-3.74	13.79
99.00	-4.01	14.14
100.00	-4.19	14.41
101.00	-4.31	14.62
102.00	-4.45	14.85
103.00	-4.54	15.01
104.00	-4.63	15.19
105.00	-4.71	15.35
106.00	-4.85	15.58
107.00	-4.93	15.74
108.00	-4.98	15.87
109.00	-4.96	15.93
110.00	-5.00	16.05

Total Element Length: 1.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
75.00	-6.18	13.90
76.00	-5.90	13.74
77.00	-5.39	13.34
78.00	-4.83	12.89
79.00	-4.28	12.45
80.00	-3.77	12.05
81.00	-3.12	11.51
82.00	-2.51	11.01
83.00	-2.09	10.69
84.00	-1.61	10.31
85.00	-0.99	9.80
86.00	-0.48	9.39
87.00	-0.05	9.06
88.00	0.19	8.92

Total Element Length: 1.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
89.00	0.39	8.82
90.00	0.66	8.64
91.00	1.11	8.29
92.00	1.27	8.22
93.00	1.36	8.23
94.00	1.28	8.40
95.00	1.48	8.29
96.00	1.45	8.42
97.00	1.49	8.47
98.00	1.29	8.75
99.00	1.08	9.05
100.00	0.92	9.30
101.00	0.77	9.54
102.00	0.56	9.83
103.00	0.44	10.03
104.00	0.30	10.26
105.00	0.20	10.45
106.00	0.04	10.68
107.00	-0.06	10.86
108.00	-0.12	11.01
109.00	-0.10	11.06
110.00	-0.25	11.30
111.00	-0.44	11.56
112.00	-0.74	11.94
113.00	-0.89	12.17
114.00	-1.11	12.46
115.00	-1.36	12.79
116.00	-1.55	13.06
117.00	-1.58	13.17
118.00	-1.70	13.35
119.00	-1.82	13.55
120.00	-1.90	13.70
121.00	-2.11	13.98
122.00	-2.30	14.25
123.00	-2.65	14.67
124.00	-2.89	14.98
125.00	-2.96	15.12
126.00	-3.12	15.34
127.00	-3.17	15.47
128.00	-3.39	15.76
129.00	-3.49	15.92
130.00	-3.60	16.10
131.00	-3.66	16.22
132.00	-3.58	16.22
133.00	-3.62	16.31
134.00	-3.77	16.53
135.00	-3.93	16.76
136.00	-3.91	16.80
137.00	-4.05	17.00
138.00	-4.28	17.30
139.00	-4.44	17.52
140.00	-4.48	17.62

Total Element Length: 1.25 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
90.00	-6.41	15.71
91.00	-5.96	15.37
92.00	-5.54	15.04
93.00	-5.23	14.82
94.00	-4.89	14.58
95.00	-4.56	14.33
96.00	-4.16	14.03
97.00	-3.83	13.79
98.00	-3.54	13.58
99.00	-3.25	13.39
100.00	-2.92	13.14
101.00	-2.55	12.86
102.00	-2.19	12.58
103.00	-1.84	12.32
104.00	-1.49	12.05
105.00	-1.14	11.78
106.00	-0.78	11.51
107.00	-0.43	11.24
108.00	-0.04	10.93
109.00	0.32	10.65
110.00	0.64	10.41
111.00	0.87	10.26
112.00	1.09	10.12
113.00	1.24	10.04
114.00	1.35	10.01
115.00	1.40	10.03
116.00	1.49	10.02
117.00	1.60	9.98
118.00	1.68	9.98
119.00	1.70	10.03
120.00	1.66	10.14
121.00	1.60	10.28
122.00	1.45	10.50
123.00	1.26	10.76
124.00	1.06	11.03
125.00	0.89	11.27
126.00	0.77	11.46
127.00	0.60	11.69
128.00	0.46	11.90
129.00	0.28	12.15
130.00	0.14	12.36
131.00	0.01	12.56
132.00	-0.09	12.72
133.00	-0.20	12.89
134.00	-0.37	13.13
135.00	-0.53	13.35
136.00	-0.69	13.58
137.00	-0.85	13.80
138.00	-1.08	14.09
139.00	-1.28	14.36
140.00	-1.42	14.56
141.00	-1.48	14.68
142.00	-1.53	14.79

Total Element Length: 1.25 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
143.00	-1.56	14.89
144.00	-1.67	15.06
145.00	-1.78	15.22
146.00	-1.89	15.39
147.00	-1.95	15.52
148.00	-2.04	15.66
149.00	-2.14	15.82
150.00	-2.19	15.94

Total Element Length: 1 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
110.00	-6.48	17.53
111.00	-6.18	17.31
112.00	-5.87	17.07
113.00	-5.57	16.85
114.00	-5.28	16.64
115.00	-5.02	16.45
116.00	-4.68	16.19
117.00	-4.30	15.89
118.00	-3.92	15.58
119.00	-3.57	15.30
120.00	-3.29	15.09
121.00	-3.02	14.90
122.00	-2.84	14.78
123.00	-2.66	14.68
124.00	-2.45	14.54
125.00	-2.18	14.34
126.00	-1.82	14.05
127.00	-1.53	13.82
128.00	-1.24	13.60
129.00	-0.98	13.41
130.00	-0.69	13.19
131.00	-0.35	12.91
132.00	-0.00	12.63
133.00	0.29	12.40
134.00	0.47	12.29
135.00	0.64	12.19
136.00	0.77	12.12
137.00	0.89	12.07
138.00	0.92	12.10
139.00	0.96	12.12
140.00	1.05	12.10
141.00	1.20	12.01
142.00	1.34	11.92
143.00	1.50	11.83
144.00	1.55	11.84
145.00	1.56	11.89
146.00	1.53	11.97
147.00	1.56	12.01
148.00	1.55	12.08
149.00	1.50	12.18

Total Element Length: 1 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
150.00	1.40	12.35
151.00	1.33	12.47
152.00	1.29	12.57
153.00	1.28	12.64
154.00	1.25	12.72
155.00	1.21	12.82
156.00	1.12	12.96
157.00	1.05	13.09
158.00	0.90	13.29
159.00	0.79	13.46
160.00	0.65	13.65
161.00	0.57	13.79
162.00	0.42	13.99
163.00	0.26	14.20
164.00	0.12	14.39
165.00	0.05	14.52
166.00	-0.06	14.68
167.00	-0.22	14.89
168.00	-0.39	15.12
169.00	-0.53	15.31
170.00	-0.64	15.47
171.00	-0.77	15.65
172.00	-0.87	15.80
173.00	-0.97	15.95
174.00	-1.01	16.04
175.00	-1.01	16.09
176.00	-0.93	16.06
177.00	-0.87	16.05
178.00	-0.86	16.09
179.00	-0.92	16.19
180.00	-0.98	16.30
181.00	-1.05	16.43
182.00	-1.16	16.58
183.00	-1.28	16.75
184.00	-1.38	16.90
185.00	-1.46	17.02
186.00	-1.55	17.16
187.00	-1.62	17.28
188.00	-1.65	17.35
189.00	-1.71	17.45
190.00	-1.77	17.57
191.00	-1.91	17.76
192.00	-1.99	17.88
193.00	-2.06	17.99
194.00	-2.11	18.09
195.00	-2.19	18.21
196.00	-2.26	18.32
197.00	-2.28	18.38
198.00	-2.26	18.41
199.00	-2.31	18.51
200.00	-2.32	18.56
201.00	-2.34	18.62
202.00	-2.36	18.69

Total Element Length: 1 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
203.00	-2.40	18.77
204.00	-2.44	18.86
205.00	-2.45	18.90
206.00	-2.52	19.01
207.00	-2.55	19.09
208.00	-2.56	19.15
209.00	-2.57	19.19
210.00	-2.58	19.25
211.00	-2.64	19.34
212.00	-2.73	19.48
213.00	-2.80	19.58
214.00	-2.78	19.61
215.00	-2.77	19.64
216.00	-2.82	19.73
217.00	-2.89	19.84
218.00	-2.91	19.90
219.00	-2.95	19.98
220.00	-3.00	20.07

Total Element Length: 0.75 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
145.00	-6.18	19.63
146.00	-5.92	19.43
147.00	-5.67	19.24
148.00	-5.40	19.03
149.00	-5.15	18.83
150.00	-4.90	18.64
151.00	-4.66	18.46
152.00	-4.41	18.26
153.00	-4.16	18.08
154.00	-3.91	17.88
155.00	-3.66	17.69
156.00	-3.42	17.50
157.00	-3.21	17.35
158.00	-2.99	17.18
159.00	-2.77	17.02
160.00	-2.54	16.84
161.00	-2.35	16.71
162.00	-2.15	16.56
163.00	-1.94	16.41
164.00	-1.74	16.25
165.00	-1.57	16.13
166.00	-1.39	16.01
167.00	-1.20	15.88
168.00	-1.04	15.77
169.00	-0.89	15.67
170.00	-0.73	15.56
171.00	-0.55	15.43
172.00	-0.38	15.31
173.00	-0.20	15.18
174.00	-0.01	15.04

Total Element Length: 0.75 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
175.00	0.22	14.86
176.00	0.44	14.69
177.00	0.66	14.52
178.00	0.84	14.39
179.00	1.00	14.28
180.00	1.12	14.21
181.00	1.20	14.17
182.00	1.28	14.14
183.00	1.35	14.11
184.00	1.41	14.11
185.00	1.46	14.10
186.00	1.53	14.08
187.00	1.58	14.07
188.00	1.62	14.08
189.00	1.65	14.10
190.00	1.65	14.15
191.00	1.64	14.20
192.00	1.62	14.27
193.00	1.59	14.34
194.00	1.56	14.41
195.00	1.56	14.46
196.00	1.54	14.52
197.00	1.53	14.58
198.00	1.52	14.63
199.00	1.53	14.67
200.00	1.53	14.71
201.00	1.51	14.78
202.00	1.49	14.84
203.00	1.49	14.88
204.00	1.45	14.96
205.00	1.40	15.05
206.00	1.37	15.12
207.00	1.33	15.21
208.00	1.28	15.30
209.00	1.25	15.37
210.00	1.22	15.44
211.00	1.17	15.54
212.00	1.12	15.62
213.00	1.08	15.70
214.00	1.02	15.80
215.00	0.97	15.90
216.00	0.94	15.97
217.00	0.89	16.06
218.00	0.81	16.18
219.00	0.76	16.27
220.00	0.72	16.35
221.00	0.65	16.46
222.00	0.61	16.54
223.00	0.59	16.60
224.00	0.54	16.68
225.00	0.47	16.79
226.00	0.44	16.87
227.00	0.37	16.97

Total Element Length: 0.75 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
228.00	0.30	17.08
229.00	0.23	17.19
230.00	0.17	17.28
231.00	0.08	17.41
232.00	-0.01	17.54
233.00	-0.09	17.66
234.00	-0.19	17.79
235.00	-0.26	17.90
236.00	-0.32	18.00
237.00	-0.40	18.11
238.00	-0.46	18.21
239.00	-0.49	18.28
240.00	-0.52	18.34
241.00	-0.57	18.43
242.00	-0.60	18.50
243.00	-0.62	18.55
244.00	-0.67	18.63
245.00	-0.71	18.71
246.00	-0.72	18.76
247.00	-0.76	18.83
248.00	-0.81	18.92
249.00	-0.85	18.99
250.00	-0.88	19.06
251.00	-0.90	19.12
252.00	-0.92	19.17
253.00	-0.94	19.22
254.00	-0.98	19.30
255.00	-1.03	19.38
256.00	-1.07	19.45
257.00	-1.11	19.52
258.00	-1.16	19.61
259.00	-1.21	19.70
260.00	-1.28	19.80
261.00	-1.35	19.90
262.00	-1.41	20.00
263.00	-1.48	20.10
264.00	-1.53	20.18
265.00	-1.60	20.29
266.00	-1.67	20.39
267.00	-1.73	20.48
268.00	-1.77	20.55
269.00	-1.81	20.63
270.00	-1.86	20.71
271.00	-1.90	20.78
272.00	-1.93	20.84
273.00	-1.97	20.91
274.00	-1.99	20.97
275.00	-1.99	21.00
276.00	-2.00	21.04
277.00	-2.05	21.12
278.00	-2.06	21.16
279.00	-2.06	21.19
280.00	-2.10	21.26

Total Element Length: 0.75 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
281.00	-2.14	21.34
282.00	-2.18	21.40
283.00	-2.22	21.48
284.00	-2.26	21.55
285.00	-2.29	21.60
286.00	-2.31	21.66
287.00	-2.35	21.72
288.00	-2.39	21.80
289.00	-2.42	21.86
290.00	-2.44	21.90
291.00	-2.46	21.96
292.00	-2.49	22.02
293.00	-2.55	22.11
294.00	-2.62	22.21
295.00	-2.68	22.29
296.00	-2.72	22.37
297.00	-2.77	22.44
298.00	-2.77	22.48
299.00	-2.79	22.52
300.00	-2.81	22.58

Total Element Length: 0.67 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
161.00	-5.75	20.11
162.00	-5.56	19.97
163.00	-5.36	19.82
164.00	-5.16	19.68
165.00	-4.99	19.56
166.00	-4.80	19.42
167.00	-4.60	19.27
168.00	-4.42	19.15
169.00	-4.25	19.03
170.00	-4.07	18.90
171.00	-3.87	18.75
172.00	-3.67	18.60
173.00	-3.45	18.43
174.00	-3.22	18.25
175.00	-2.95	18.03
176.00	-2.67	17.80
177.00	-2.40	17.58
178.00	-2.16	17.39
179.00	-1.93	17.20
180.00	-1.72	17.05
181.00	-1.55	16.93
182.00	-1.38	16.80
183.00	-1.20	16.67
184.00	-1.04	16.55
185.00	-0.89	16.45
186.00	-0.72	16.33
187.00	-0.55	16.21
188.00	-0.40	16.10

Total Element Length: 0.67 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
189.00	-0.27	16.01
190.00	-0.15	15.95
191.00	-0.04	15.88
192.00	0.06	15.82
193.00	0.16	15.77
194.00	0.26	15.72
195.00	0.37	15.65
196.00	0.49	15.58
197.00	0.59	15.51
198.00	0.69	15.47
199.00	0.80	15.39
200.00	0.90	15.34
201.00	0.98	15.31
202.00	1.06	15.27
203.00	1.15	15.22
204.00	1.21	15.20
205.00	1.26	15.19
206.00	1.33	15.16
207.00	1.38	15.16
208.00	1.43	15.15
209.00	1.50	15.13
210.00	1.55	15.12
211.00	1.56	15.14
212.00	1.58	15.16
213.00	1.62	15.17
214.00	1.62	15.21
215.00	1.62	15.25
216.00	1.65	15.26
217.00	1.65	15.30
218.00	1.63	15.36
219.00	1.64	15.39
220.00	1.66	15.41
221.00	1.65	15.46
222.00	1.66	15.49
223.00	1.67	15.52
224.00	1.66	15.56
225.00	1.63	15.63
226.00	1.63	15.67
227.00	1.61	15.73
228.00	1.56	15.82
229.00	1.52	15.90
230.00	1.48	15.98
231.00	1.40	16.09
232.00	1.33	16.20
233.00	1.27	16.30
234.00	1.19	16.42
235.00	1.13	16.51
236.00	1.09	16.59
237.00	1.03	16.69
238.00	0.98	16.78
239.00	0.95	16.84
240.00	0.93	16.90
241.00	0.89	16.97

Total Element Length: 0.67 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
242.00	0.86	17.04
243.00	0.84	17.09
244.00	0.80	17.17
245.00	0.77	17.24
246.00	0.75	17.29
247.00	0.72	17.35
248.00	0.68	17.43
249.00	0.64	17.50
250.00	0.60	17.58
251.00	0.57	17.64
252.00	0.55	17.70
253.00	0.53	17.75
254.00	0.49	17.83
255.00	0.44	17.91
256.00	0.40	17.98
257.00	0.36	18.06
258.00	0.31	18.14
259.00	0.25	18.24
260.00	0.18	18.34
261.00	0.11	18.44
262.00	0.03	18.55
263.00	-0.06	18.68
264.00	-0.12	18.77
265.00	-0.20	18.88
266.00	-0.28	19.00
267.00	-0.34	19.09
268.00	-0.38	19.16
269.00	-0.43	19.25
270.00	-0.48	19.33
271.00	-0.53	19.41
272.00	-0.56	19.47
273.00	-0.61	19.55
274.00	-0.64	19.62
275.00	-0.67	19.68
276.00	-0.70	19.74
277.00	-0.76	19.83
278.00	-0.77	19.88
279.00	-0.80	19.93
280.00	-0.84	20.00
281.00	-0.89	20.08
282.00	-0.93	20.15
283.00	-0.98	20.24
284.00	-1.03	20.32
285.00	-1.06	20.38
286.00	-1.10	20.45
287.00	-1.15	20.53
288.00	-1.20	20.61
289.00	-1.24	20.68
290.00	-1.27	20.74
291.00	-1.31	20.81
292.00	-1.36	20.89
293.00	-1.43	20.99
294.00	-1.51	21.10

Total Element Length: 0.67 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
295.00	-1.59	21.20
296.00	-1.65	21.30
297.00	-1.70	21.38
298.00	-1.72	21.43
299.00	-1.75	21.49
300.00	-1.79	21.56
301.00	-1.82	21.61
302.00	-1.84	21.66
303.00	-1.85	21.70
304.00	-1.87	21.75
305.00	-1.90	21.81
306.00	-1.93	21.86
307.00	-1.94	21.90
308.00	-1.96	21.96
309.00	-1.99	22.01
310.00	-1.99	22.04
311.00	-1.99	22.07
312.00	-2.01	22.11
313.00	-2.02	22.15
314.00	-2.01	22.17
315.00	-2.01	22.20
316.00	-2.02	22.23
317.00	-2.03	22.27
318.00	-2.04	22.30
319.00	-2.04	22.34
320.00	-2.04	22.36
321.00	-2.04	22.39
322.00	-2.04	22.42
323.00	-2.05	22.45
324.00	-2.06	22.49
325.00	-2.06	22.52
326.00	-2.06	22.54
327.00	-2.07	22.58
328.00	-2.06	22.60
329.00	-2.04	22.60
330.00	-2.03	22.62

Total Element Length: 0.6 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
180.00	-5.25	20.57
181.00	-5.07	20.44
182.00	-4.91	20.33
183.00	-4.76	20.23
184.00	-4.62	20.14
185.00	-4.48	20.04
186.00	-4.36	19.97
187.00	-4.21	19.86
188.00	-4.00	19.70
189.00	-3.82	19.57
190.00	-3.69	19.48
191.00	-3.63	19.47

Total Element Length: 0.6 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
192.00	-3.48	19.37
193.00	-3.31	19.24
194.00	-3.16	19.13
195.00	-3.04	19.06
196.00	-2.92	18.98
197.00	-2.72	18.83
198.00	-2.50	18.65
199.00	-2.35	18.55
200.00	-2.15	18.39
201.00	-1.97	18.25
202.00	-1.79	18.12
203.00	-1.62	17.99
204.00	-1.47	17.88
205.00	-1.30	17.75
206.00	-1.19	17.69
207.00	-1.04	17.58
208.00	-0.87	17.46
209.00	-0.72	17.34
210.00	-0.58	17.24
211.00	-0.49	17.20
212.00	-0.45	17.20
213.00	-0.37	17.16
214.00	-0.21	17.04
215.00	-0.08	16.94
216.00	-0.03	16.93
217.00	0.01	16.94
218.00	0.10	16.89
219.00	0.18	16.85
220.00	0.28	16.79
221.00	0.41	16.70
222.00	0.52	16.62
223.00	0.63	16.56
224.00	0.72	16.50
225.00	0.87	16.39
226.00	0.95	16.35
227.00	1.07	16.27
228.00	1.15	16.23
229.00	1.22	16.20
230.00	1.24	16.22
231.00	1.27	16.22
232.00	1.29	16.24
233.00	1.29	16.28
234.00	1.26	16.34
235.00	1.23	16.41
236.00	1.26	16.42
237.00	1.32	16.40
238.00	1.37	16.39
239.00	1.36	16.43
240.00	1.37	16.45
241.00	1.45	16.41
242.00	1.49	16.40
243.00	1.50	16.43
244.00	1.50	16.47

Total Element Length: 0.6 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
245.00	1.51	16.49
246.00	1.55	16.49
247.00	1.61	16.46
248.00	1.65	16.46
249.00	1.65	16.49
250.00	1.63	16.55
251.00	1.62	16.59
252.00	1.66	16.59
253.00	1.71	16.57
254.00	1.80	16.51
255.00	1.80	16.55
256.00	1.78	16.60
257.00	1.74	16.68
258.00	1.77	16.69
259.00	1.77	16.71
260.00	1.68	16.84
261.00	1.57	16.99
262.00	1.47	17.12
263.00	1.43	17.19
264.00	1.33	17.32
265.00	1.25	17.43
266.00	1.18	17.54
267.00	1.17	17.58
268.00	1.14	17.65
269.00	1.12	17.70
270.00	1.09	17.76
271.00	1.05	17.83
272.00	1.01	17.90
273.00	1.02	17.92
274.00	0.98	18.00
275.00	0.91	18.10
276.00	0.85	18.19
277.00	0.88	18.19
278.00	0.87	18.23
279.00	0.88	18.26
280.00	0.83	18.33
281.00	0.80	18.39
282.00	0.73	18.50
283.00	0.62	18.63
284.00	0.56	18.73
285.00	0.50	18.82
286.00	0.50	18.85
287.00	0.47	18.91
288.00	0.42	18.99
289.00	0.34	19.09
290.00	0.31	19.16
291.00	0.30	19.19
292.00	0.25	19.28
293.00	0.14	19.42
294.00	-0.04	19.63
295.00	-0.18	19.79
296.00	-0.23	19.88
297.00	-0.26	19.94

Total Element Length: 0.6 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
298.00	-0.28	19.99
299.00	-0.31	20.04
300.00	-0.35	20.11
301.00	-0.39	20.18
302.00	-0.47	20.29
303.00	-0.51	20.36
304.00	-0.51	20.38
305.00	-0.50	20.40
306.00	-0.53	20.47
307.00	-0.57	20.53
308.00	-0.57	20.56
309.00	-0.55	20.57
310.00	-0.58	20.62
311.00	-0.62	20.70
312.00	-0.61	20.71
313.00	-0.62	20.76
314.00	-0.68	20.84
315.00	-0.74	20.92
316.00	-0.77	20.98
317.00	-0.76	21.00
318.00	-0.79	21.06
319.00	-0.81	21.10
320.00	-0.82	21.14
321.00	-0.83	21.18
322.00	-0.83	21.21
323.00	-0.87	21.27
324.00	-0.89	21.32
325.00	-0.92	21.38
326.00	-0.94	21.43
327.00	-0.95	21.46
328.00	-1.00	21.54
329.00	-0.98	21.55
330.00	-0.92	21.51
331.00	-0.84	21.45
332.00	-0.85	21.50
333.00	-0.91	21.58
334.00	-0.99	21.69
335.00	-1.06	21.78
336.00	-1.11	21.85
337.00	-1.06	21.84
338.00	-0.99	21.79
339.00	-1.00	21.83
340.00	-1.04	21.89
341.00	-1.08	21.95
342.00	-1.06	21.96
343.00	-1.02	21.95
344.00	-1.00	21.95
345.00	-1.01	21.99
346.00	-1.07	22.07
347.00	-1.10	22.13
348.00	-1.12	22.17
349.00	-1.13	22.21
350.00	-1.16	22.26

Total Element Length: 0.6 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
351.00	-1.16	22.29
352.00	-1.18	22.33
353.00	-1.18	22.36
354.00	-1.20	22.40
355.00	-1.17	22.39
356.00	-1.19	22.44
357.00	-1.23	22.50
358.00	-1.26	22.56
359.00	-1.30	22.62
360.00	-1.34	22.68

Total Element Length: 0.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
210.00	-5.73	22.39
211.00	-5.58	22.29
212.00	-5.46	22.20
213.00	-5.35	22.13
214.00	-5.23	22.06
215.00	-5.11	21.98
216.00	-5.01	21.92
217.00	-4.88	21.83
218.00	-4.72	21.71
219.00	-4.60	21.63
220.00	-4.47	21.54
221.00	-4.32	21.42
222.00	-4.16	21.31
223.00	-4.02	21.21
224.00	-3.85	21.08
225.00	-3.69	20.95
226.00	-3.55	20.85
227.00	-3.43	20.77
228.00	-3.30	20.67
229.00	-3.19	20.61
230.00	-3.10	20.55
231.00	-3.01	20.50
232.00	-2.93	20.46
233.00	-2.86	20.43
234.00	-2.78	20.38
235.00	-2.69	20.33
236.00	-2.60	20.28
237.00	-2.50	20.22
238.00	-2.39	20.14
239.00	-2.29	20.08
240.00	-2.18	20.01
241.00	-2.04	19.90
242.00	-1.92	19.82
243.00	-1.80	19.73
244.00	-1.67	19.64
245.00	-1.54	19.55
246.00	-1.42	19.46
247.00	-1.29	19.37

Total Element Length: 0.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
248.00	-1.16	19.27
249.00	-1.02	19.17
250.00	-0.89	19.07
251.00	-0.75	18.96
252.00	-0.62	18.87
253.00	-0.49	18.78
254.00	-0.37	18.68
255.00	-0.25	18.60
256.00	-0.15	18.53
257.00	-0.06	18.48
258.00	0.03	18.43
259.00	0.10	18.38
260.00	0.15	18.37
261.00	0.19	18.36
262.00	0.24	18.34
263.00	0.30	18.32
264.00	0.35	18.30
265.00	0.41	18.28
266.00	0.48	18.24
267.00	0.54	18.21
268.00	0.61	18.17
269.00	0.70	18.11
270.00	0.81	18.04
271.00	0.88	18.00
272.00	0.94	17.97
273.00	1.02	17.92
274.00	1.12	17.85
275.00	1.19	17.81
276.00	1.28	17.76
277.00	1.35	17.72
278.00	1.39	17.71
279.00	1.44	17.70
280.00	1.49	17.67
281.00	1.54	17.65
282.00	1.57	17.66
283.00	1.58	17.67
284.00	1.61	17.67
285.00	1.63	17.68
286.00	1.66	17.69
287.00	1.69	17.69
288.00	1.71	17.70
289.00	1.71	17.72
290.00	1.71	17.76
291.00	1.69	17.80
292.00	1.66	17.86
293.00	1.64	17.91
294.00	1.61	17.98
295.00	1.57	18.04
296.00	1.55	18.10
297.00	1.51	18.17
298.00	1.49	18.22
299.00	1.47	18.26
300.00	1.46	18.30

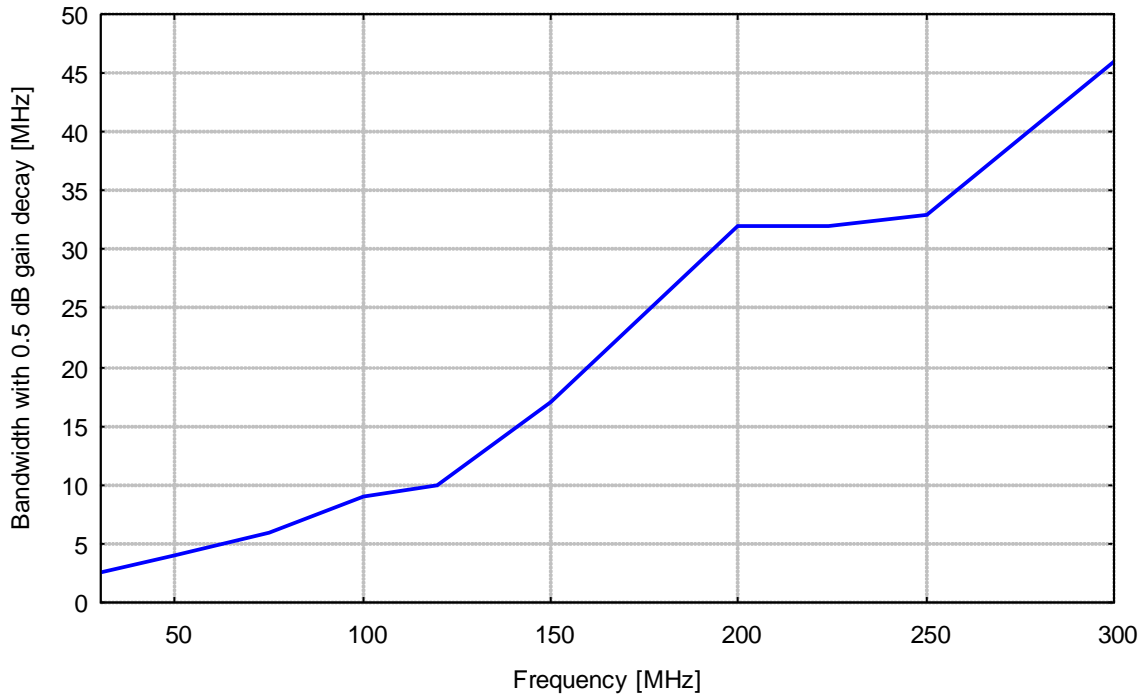
Total Element Length: 0.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
301.00	1.48	18.32
302.00	1.47	18.35
303.00	1.46	18.38
304.00	1.46	18.41
305.00	1.45	18.45
306.00	1.44	18.49
307.00	1.43	18.53
308.00	1.43	18.56
309.00	1.44	18.58
310.00	1.41	18.63
311.00	1.38	18.69
312.00	1.38	18.73
313.00	1.35	18.78
314.00	1.33	18.82
315.00	1.32	18.87
316.00	1.30	18.91
317.00	1.28	18.96
318.00	1.25	19.02
319.00	1.23	19.06
320.00	1.22	19.10
321.00	1.20	19.15
322.00	1.18	19.20
323.00	1.15	19.25
324.00	1.14	19.29
325.00	1.13	19.33
326.00	1.13	19.36
327.00	1.14	19.37
328.00	1.15	19.39
329.00	1.14	19.43
330.00	1.14	19.45
331.00	1.12	19.50
332.00	1.09	19.55
333.00	1.07	19.60
334.00	1.07	19.63
335.00	1.04	19.68
336.00	0.99	19.76
337.00	0.96	19.81
338.00	0.94	19.86
339.00	0.91	19.92
340.00	0.90	19.95
341.00	0.90	19.98
342.00	0.88	20.02
343.00	0.84	20.08
344.00	0.81	20.14
345.00	0.79	20.18
346.00	0.77	20.24
347.00	0.75	20.28
348.00	0.74	20.32
349.00	0.71	20.37
350.00	0.69	20.41
351.00	0.68	20.45
352.00	0.68	20.48
353.00	0.66	20.52

Total Element Length: 0.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
354.00	0.65	20.55
355.00	0.64	20.59
356.00	0.62	20.63
357.00	0.59	20.69
358.00	0.58	20.72
359.00	0.57	20.75
360.00	0.55	20.79
361.00	0.53	20.84
362.00	0.50	20.89
363.00	0.47	20.95
364.00	0.44	21.00
365.00	0.41	21.06
366.00	0.37	21.12
367.00	0.30	21.22
368.00	0.22	21.32
369.00	0.16	21.41

Total Element Length: 0.5 m		
Frequency	Gain(Isotr.)	Ant.-Factor
MHz	dBi	dB/m
370.00	0.11	21.48
371.00	0.06	21.55
372.00	0.01	21.63
373.00	-0.06	21.71
374.00	-0.11	21.79
375.00	-0.16	21.86
376.00	-0.18	21.90
377.00	-0.20	21.95
378.00	-0.25	22.02
379.00	-0.30	22.09
380.00	-0.33	22.15



Bandwidth with 0.5 dB gain decay



Bandwidth with 1 dB gain decay

