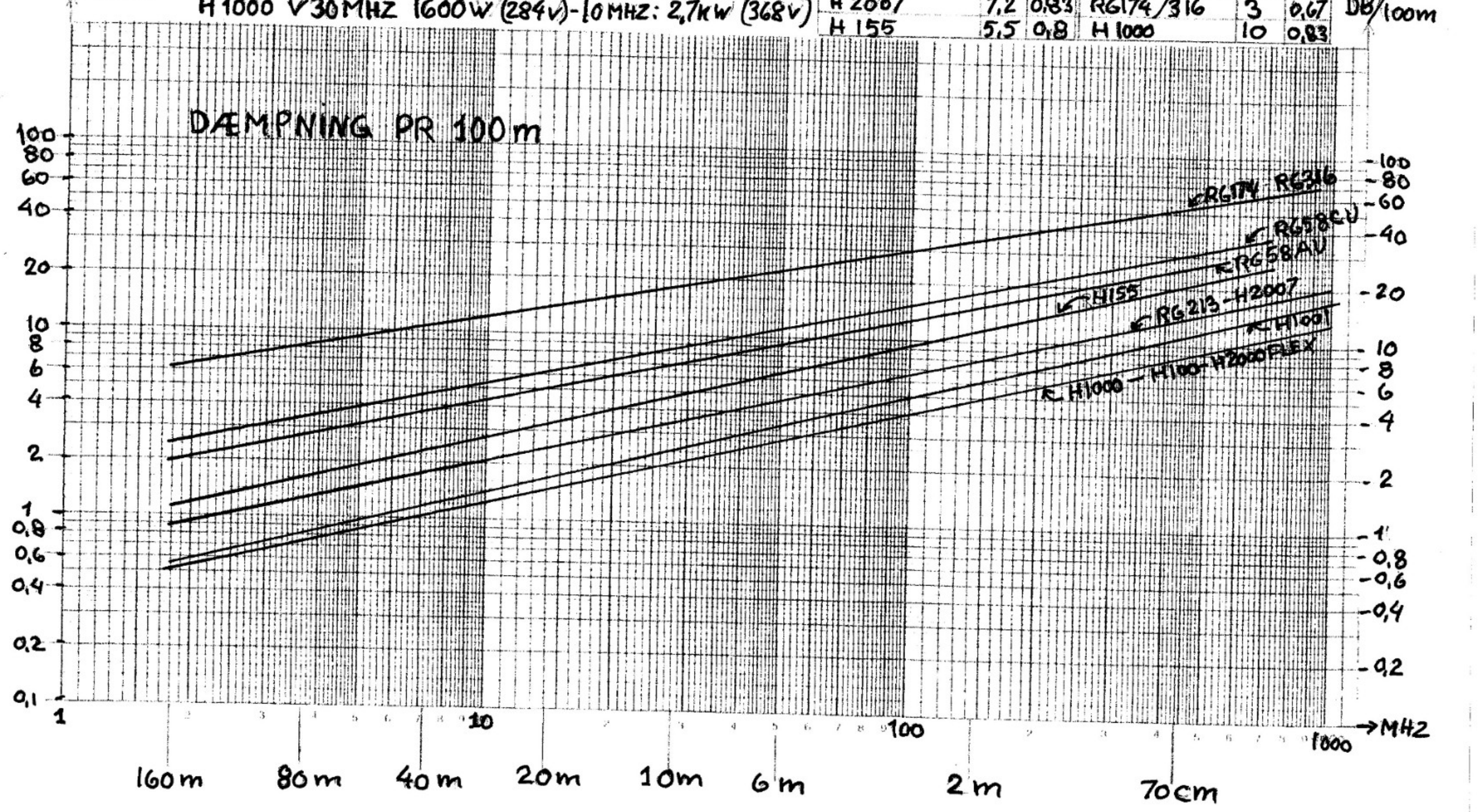
Transmissionslinier og SWR

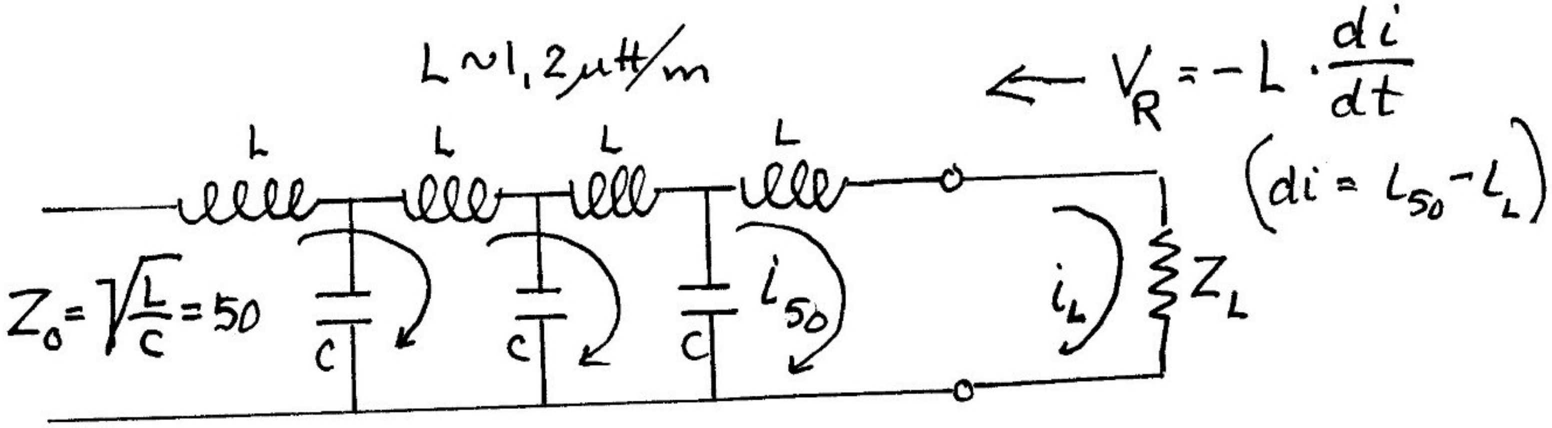
EKS. MAX POWER: (Veff.)

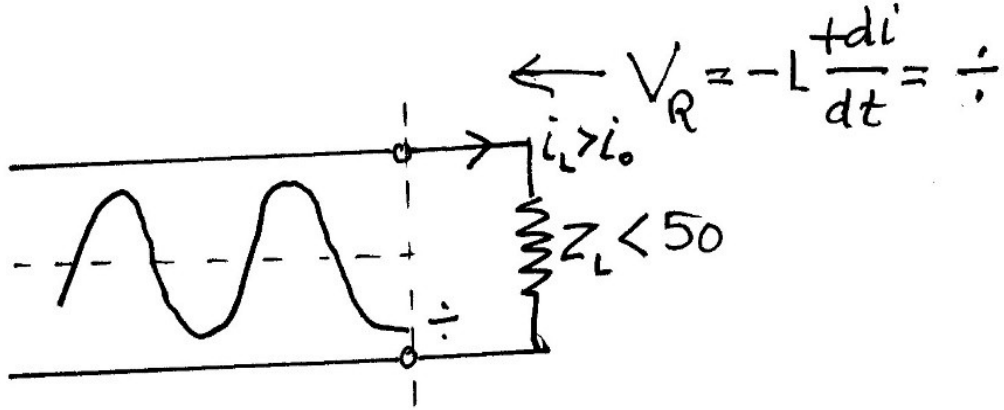
H155 V30MHZ: 470W (154v) - 10MHz: 850W (206v)

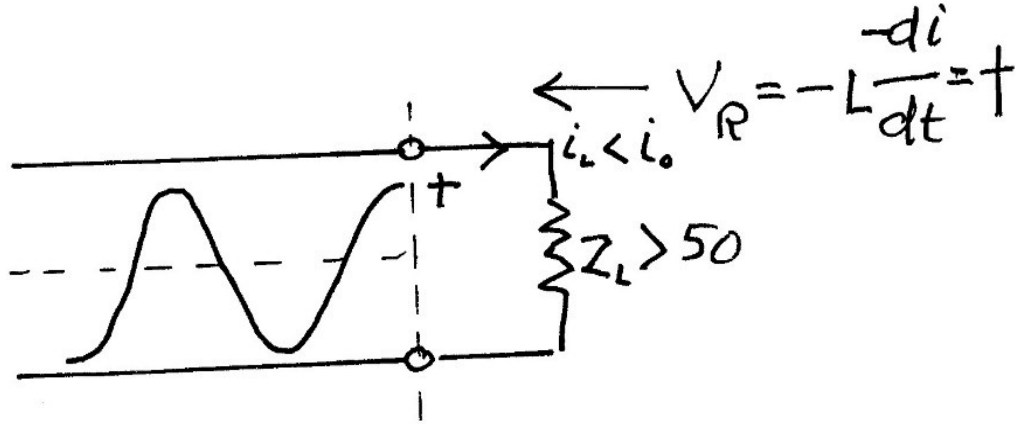
H1000 V30MHZ 1600W (284v) - 10MHz: 2,7kW (368v)

KABEL	mm	Kv	KABEL	mm	Kv
H 100 (STIV)	10	0,84	RG 213	10	0,67
H 1001	10	0,81	RG 58 CU	5	0,67
H 2000 FLEX	10	0,8	RG 58 AU	5	0,8
H 2007	7,2	0,83	RG174/316	3	0,67
H 155	5,5	0,8	H 1000	10	0,83

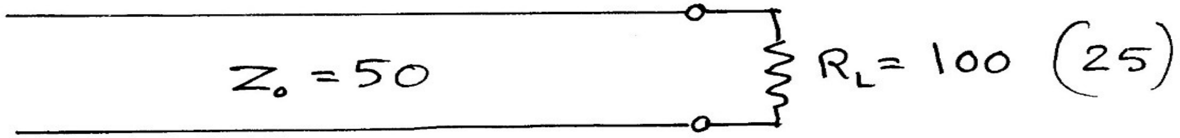


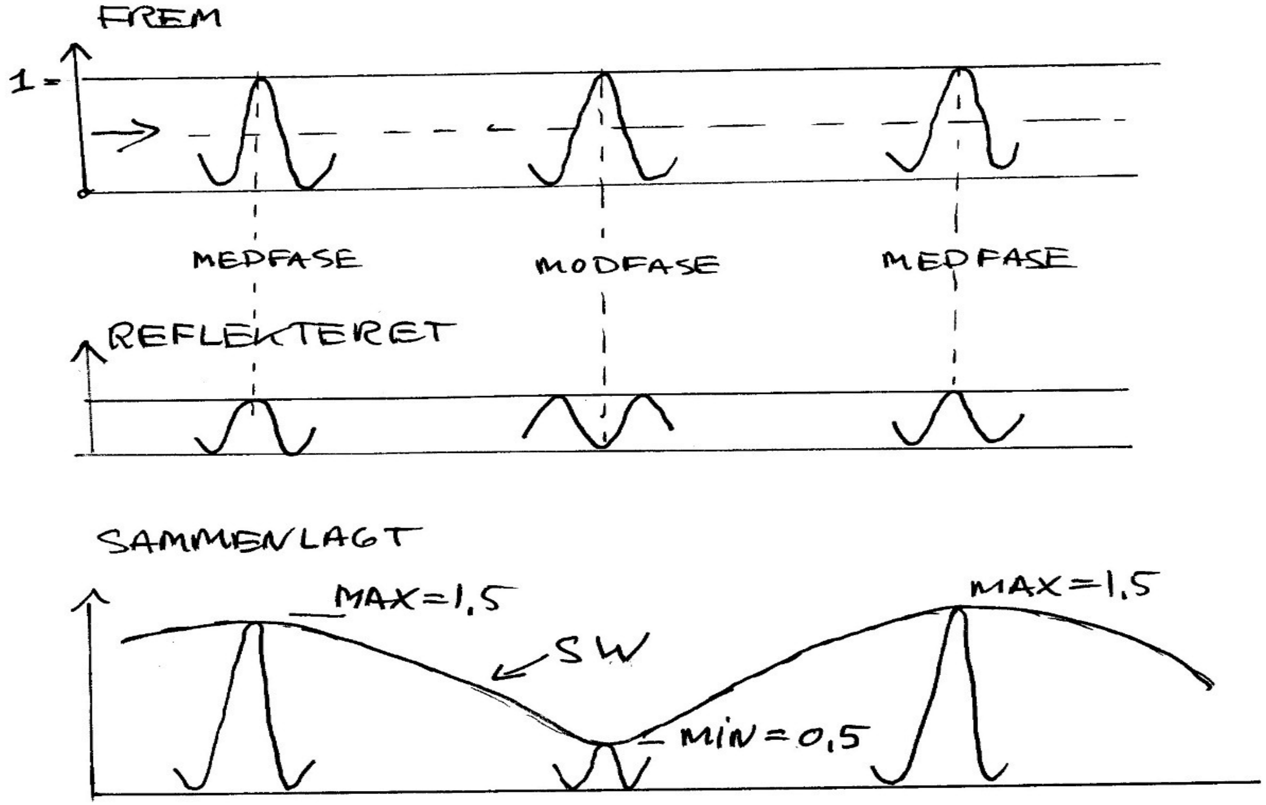

L~1,2μH/m
L
L
L
L
$V_R = -L \cdot \frac{di}{dt}$
$(di = i_{50} - i_L)$
$Z_0 = \sqrt{\frac{L}{C}} = 50$
C
C
C
i_{50}
i_L
Z_L


$V_R = -L \frac{+di}{dt} = \div$
$i_L > i_0$
$Z_L < 50$
÷

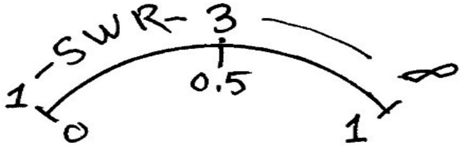

$V_R = -L \frac{-di}{dt} = +$
$i_L < i_0$
+
$Z_L > 50$

EKSEMPEL:

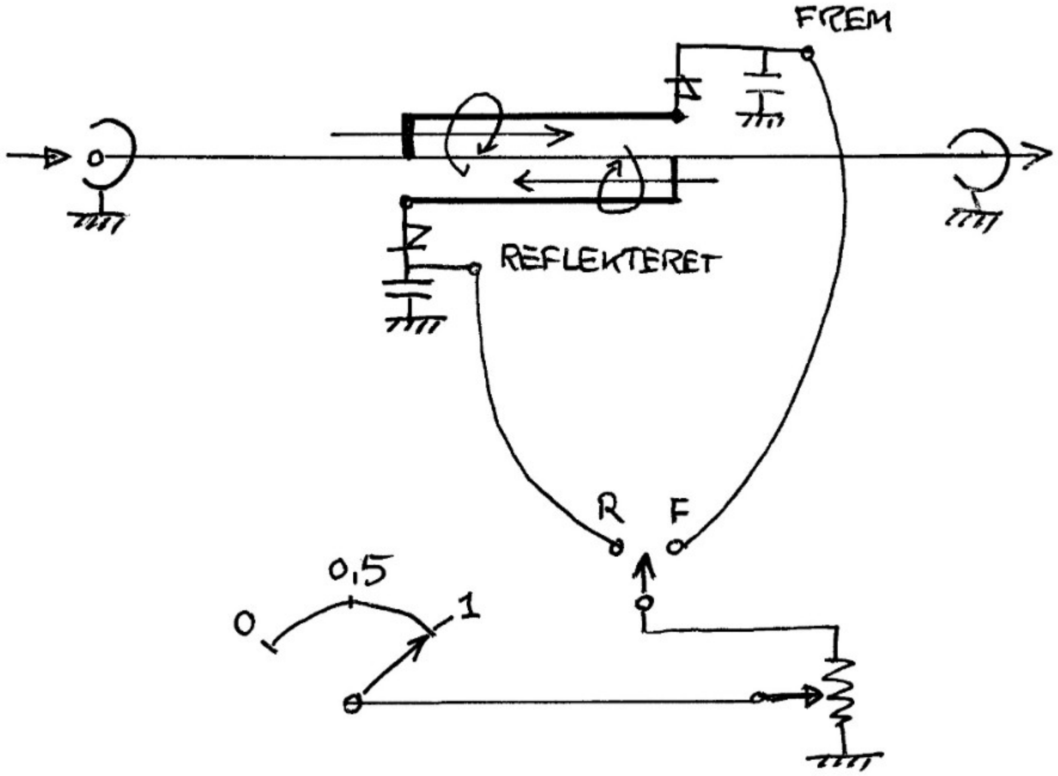




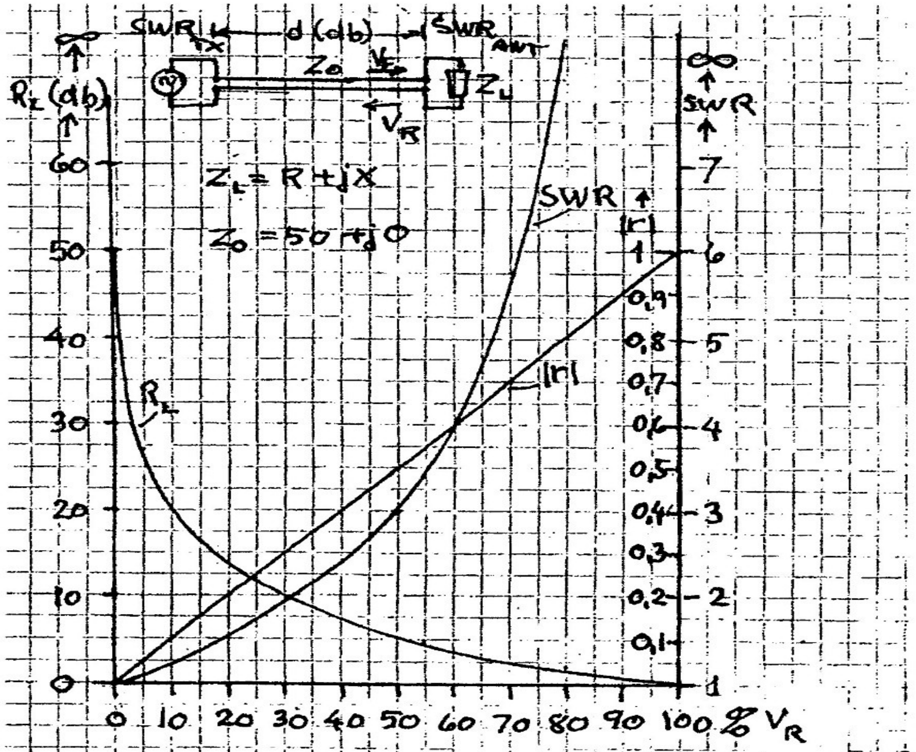
$$SWR = \frac{MAX}{MIN} = \frac{1{,}5}{0{,}5} = 3$$



RETNINGSKOBLER



MÅLING AF SWR



numerisk (størelse) (rent tal)

fase mellem V_R og V_F

$$\Gamma = \frac{V_R}{V_F} = \frac{Z_L - Z_0}{Z_L + Z_0} = |\Gamma|\angle\varphi = r_R + j\,r_X \text{ (Smithkortet)}$$

$$SWR = \frac{1+|\Gamma|}{1-|\Gamma|}$$

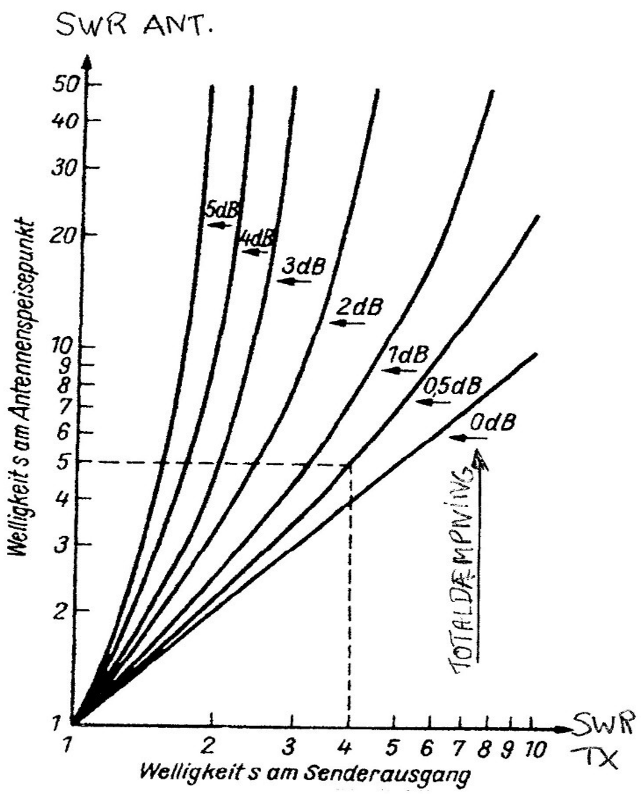
V_F → ← V_R

$$SWR = \frac{V_F + V_R}{V_F \div V_R} = \frac{1+|\Gamma|}{1-|\Gamma|}$$

$$|\Gamma| = \frac{SWR-1}{SWR+1}$$

SWR for Z_L ohms $= \frac{Z_L}{Z_0} / \frac{Z_0}{Z_L}$

$$R_L = 20 \cdot \log\frac{1}{|\Gamma|}$$



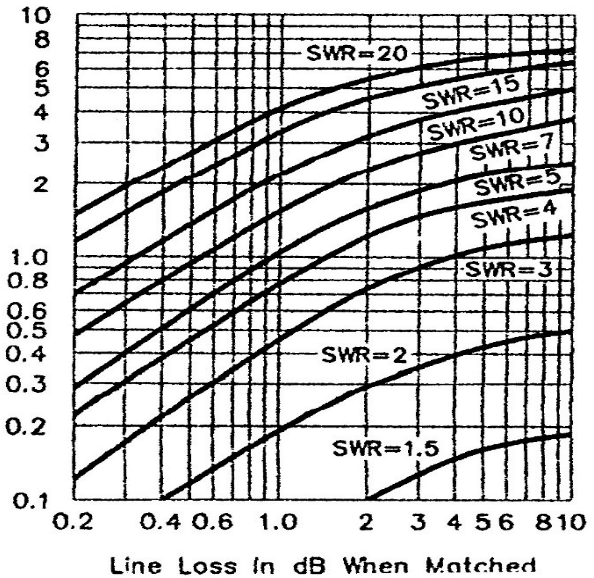


Fig 14—Additional line loss due to standing waves (SWR, measured at the load). See Fig 23 for matched-line loss. To determine the total loss in dB, add the matched-line loss to the value from this graph.

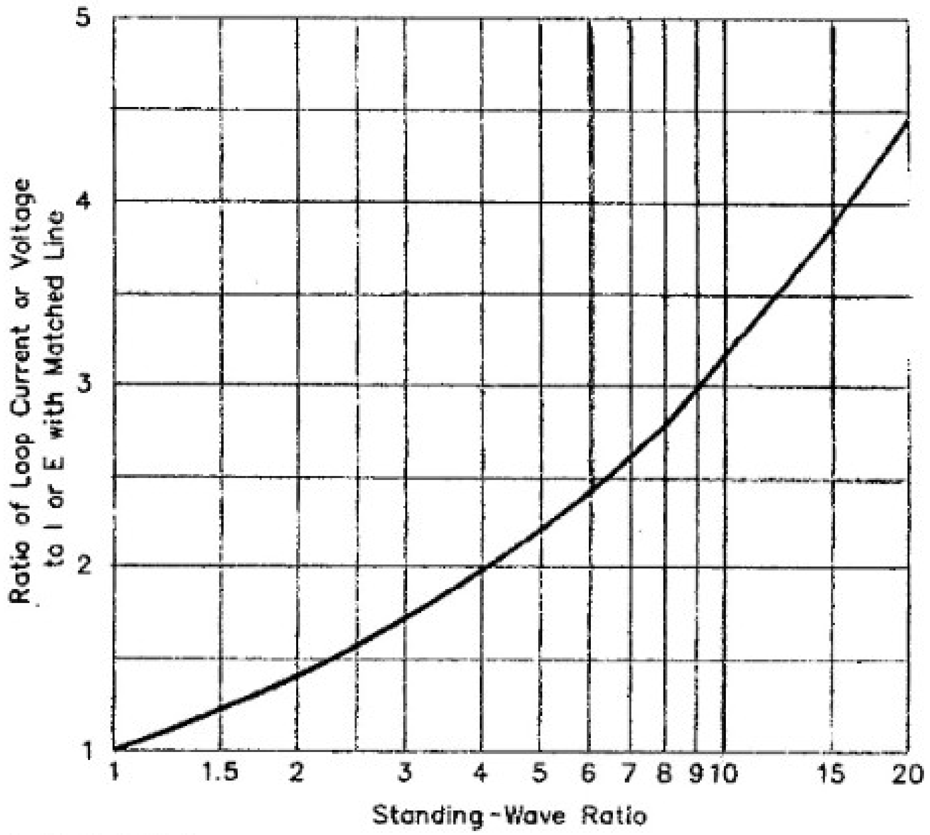
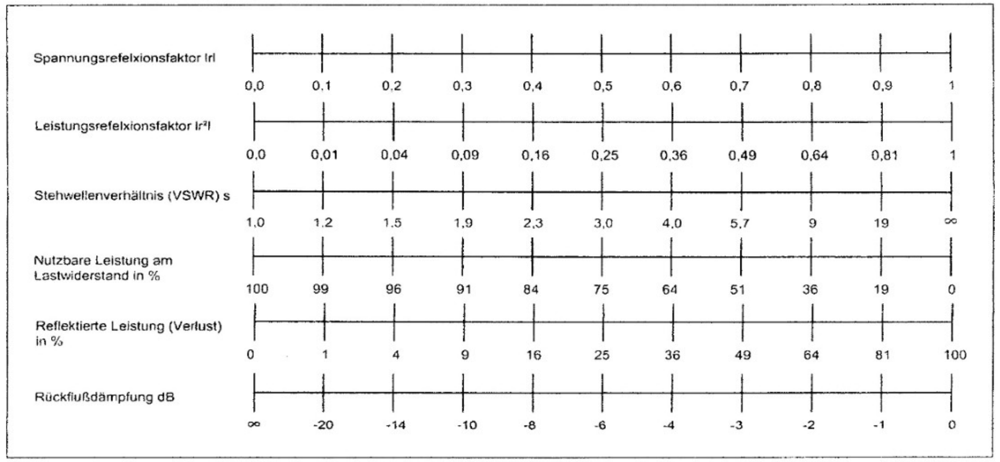


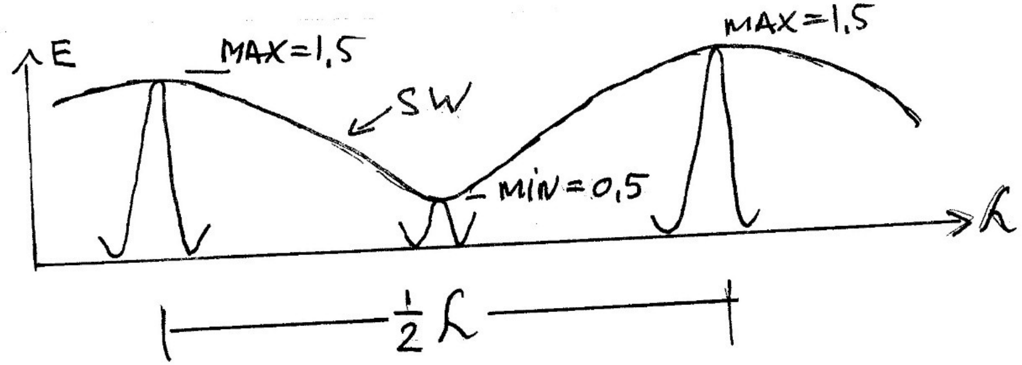
Fig 15—Increase in maximum value of current or voltage on a line with standing waves, as referred to the current or voltage on a perfectly matched line, for the same power delivered to the load. Voltage and current at minimum points are given by the reciprocals of the values along the vertical axis. The curve is plotted from the relationship, current (or voltage) ratio ≈ the square root of SWR.

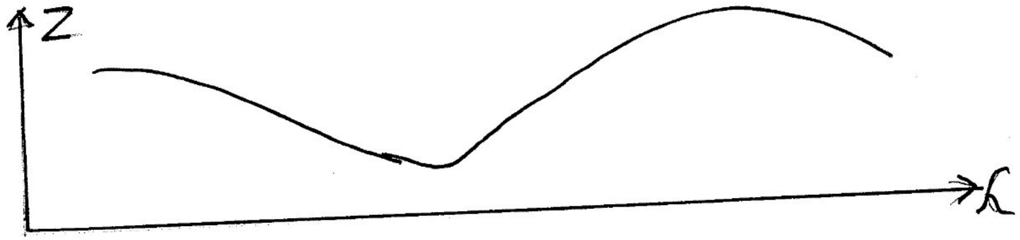


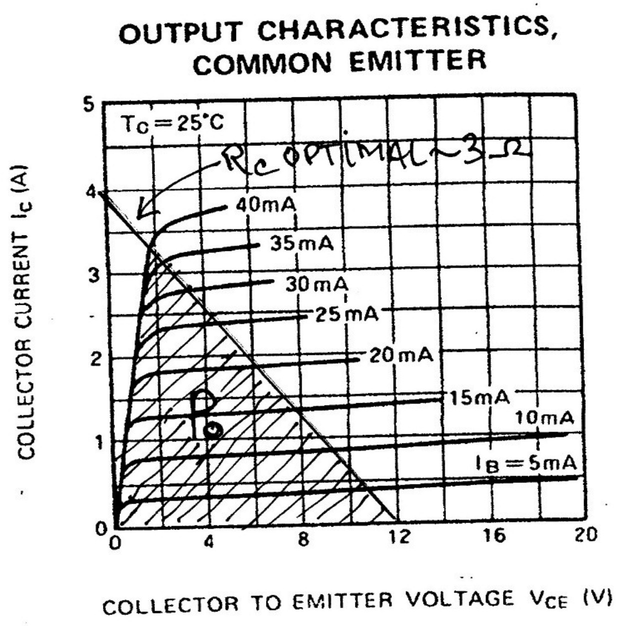
Spannungs-reflexionsfaktor	Leistungs-refelxionsfaktor	Stehwellen-verhältnis	Rückfluß-dämpfung	Reflektierte (Leistung)	Übertragene (Leistung)	Anpassfaktor
r	r^2	s	a_r in dB	in %	in %	m
0,01	0,0001	1,02	-40	0,01	99,99	0,98
0,05	0,0025	1,11	-26	0,25	99,75	0,90
0,1	0,01	1,22	-20	1	99	0,82
0,15	0,0225	1,35	-16,5	2	98	0,74
0,2	0,04	1,5	-14	4	96	0,67
0,25	0,0625	1,67	-12	6	94	0,6
0,3	0,09	1,86	-10,5	9	91	0,54
0,35	0,1225	2,08	-9,1	12	88	0,48
0,4	0,16	2,33	-8	16	84	0,43
0,45	0,2025	2,64	-7	20	80	0,38
0,5	0,25	3,0	-6	25	75	0,33
0,55	0,3025	3,44	-5,2	30	70	0,29
0,6	0,36	4,0	-4,4	36	64	0,25
0,65	0,4225	4,71	-3,7	42	58	0,21
0,7	0,49	5,67	-3,1	49	51	0,18
0,75	0,5625	7,0	-2,5	56	44	0,14
0,8	0,64	9,0	-1,9	64	36	0,11
0,85	0,7225	12,33	-1,4	72	28	0,08
0,9	0,81	19,0	-0,9	81	19	0,05
0,95	0,9025	39,0	-0,4	90	10	0,03
1	1	∞	0	100	0	0

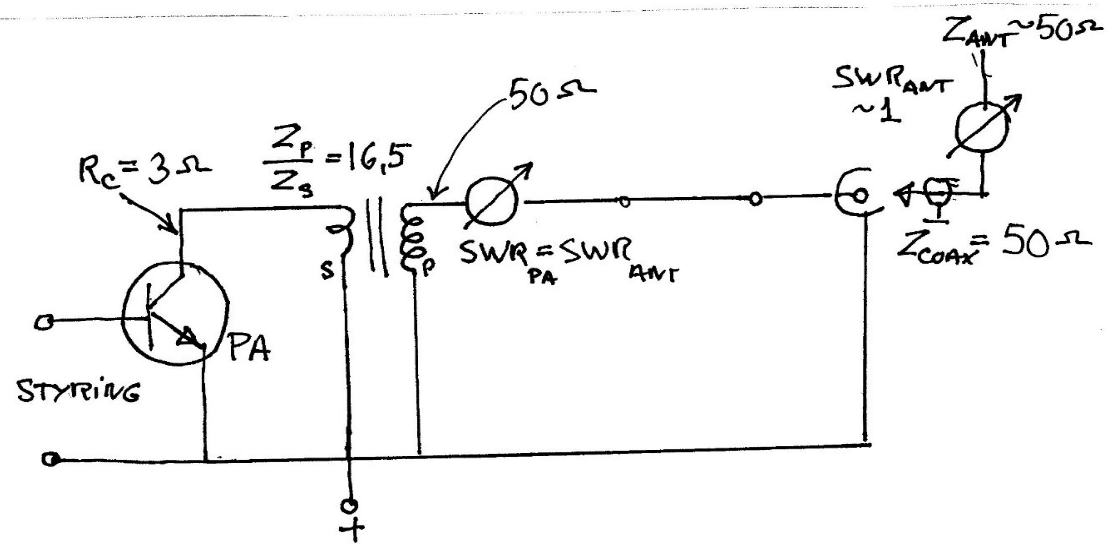
Z VARIERER LANGS TRANSMISSIONSLINIEN
NÅR DER FINDES SW.

MED P = E · I (W) KONSTANT
OG E (VOLT) DER VARIERER PR. $\frac{1}{2}$ λ
VIL $Z = \frac{E\,(VOLT)}{I\,(AMP)}$ OGSÅ VARIERE PR. $\frac{1}{2}$ λ

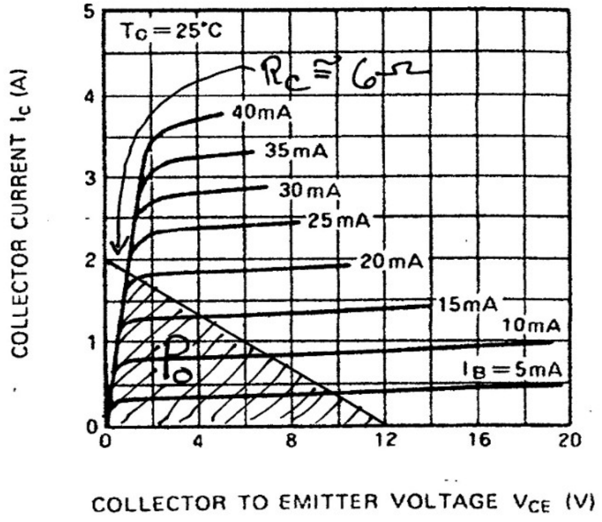


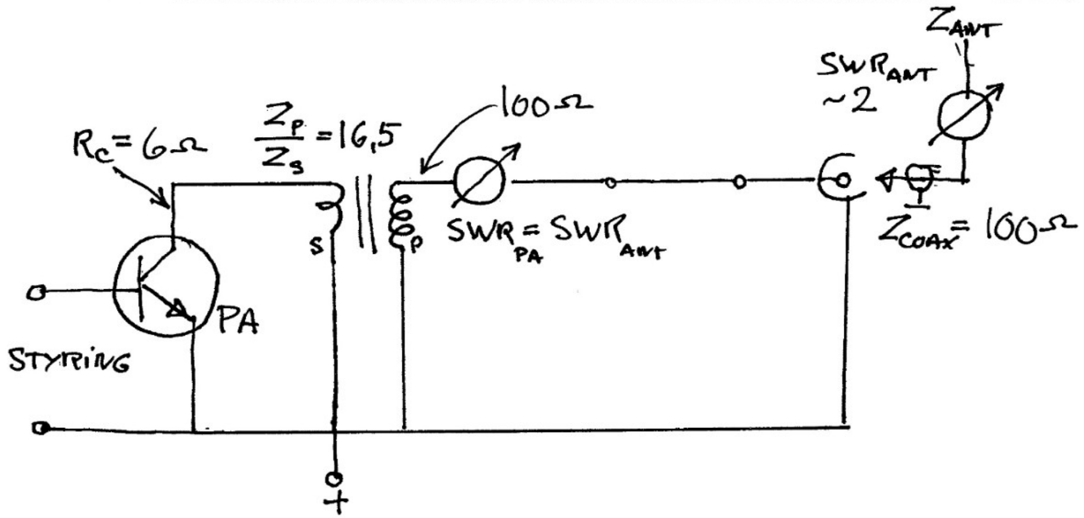



OUTPUT CHARACTERISTICS, COMMON EMITTER
Tc = 25°C
Rc OPTIMAL ~ 3 Ω
40mA
35mA
30mA
25mA
20mA
15mA
10mA
IB = 5mA
Po
COLLECTOR CURRENT Ic (A)
COLLECTOR TO EMITTER VOLTAGE VCE (V)
0
4
8
12
16
20
0
1
2
3
4
5


Rc = 3 Ω
Zp/Zs = 16,5
50 Ω
SWR_ANT ~1
Z_ANT ~ 50 Ω
S
P
SWR_PA = SWR_ANT
Z_COAX = 50 Ω
PA
STYRING
+

OUTPUT CHARACTERISTICS, COMMON EMITTER



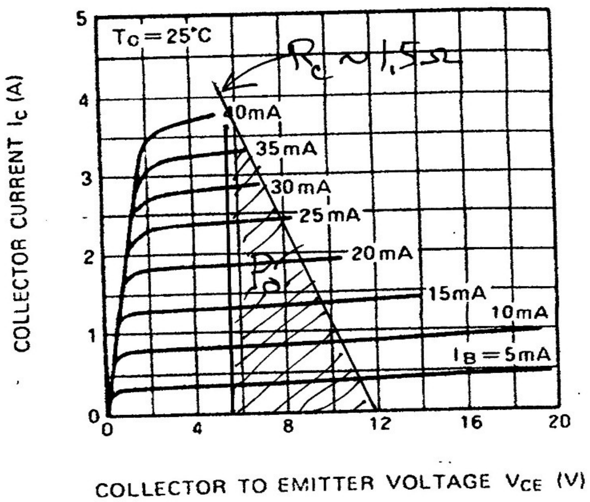


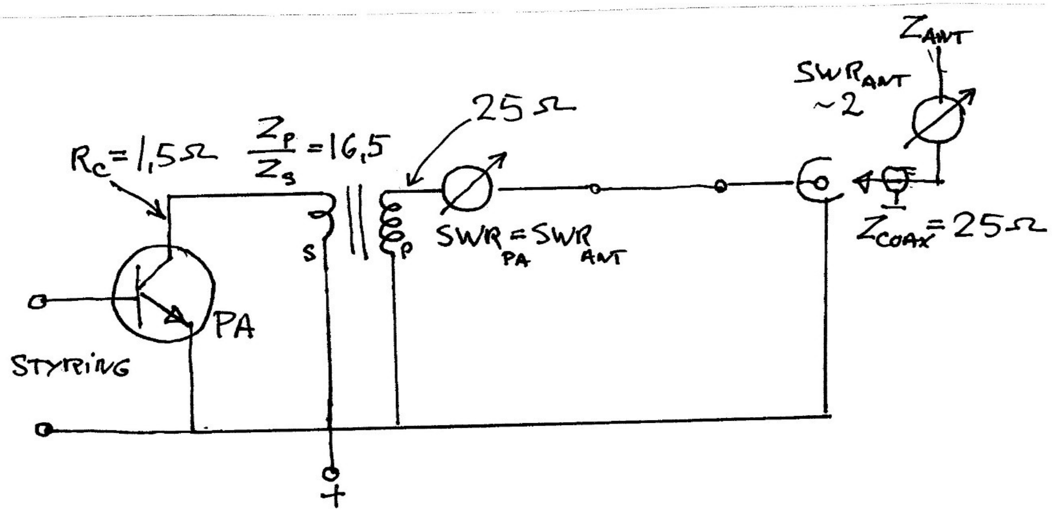
MITSUBISHI RF POWER TRANSISTOR

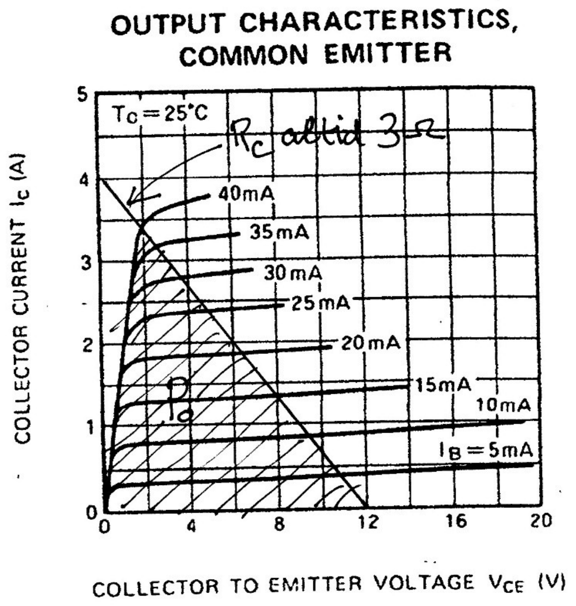
2SC1969

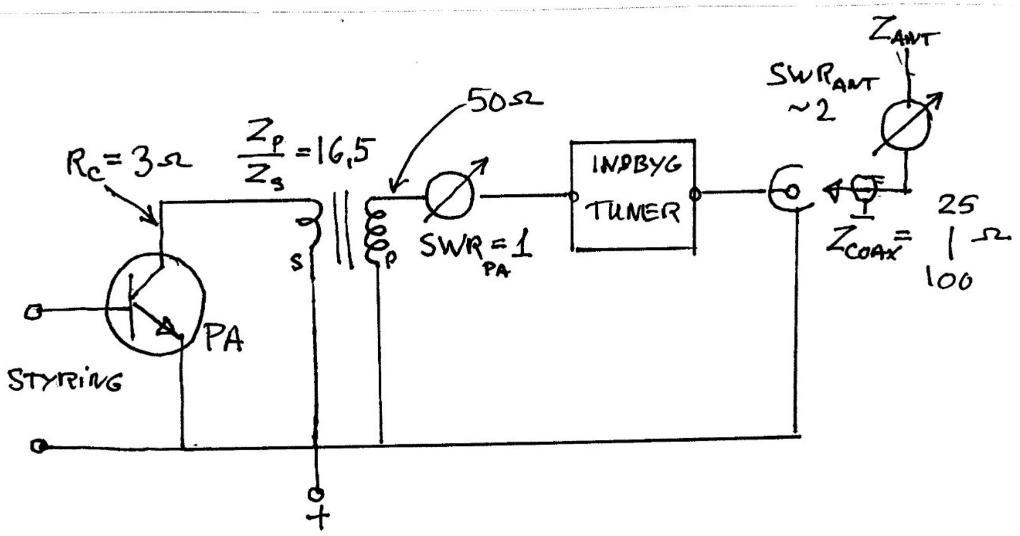
NPN EPITAXIAL PLANAR TYPE

OUTPUT CHARACTERISTICS, COMMON EMITTER






OUTPUT CHARACTERISTICS, COMMON EMITTER
Tc = 25°C
Rc altid 3Ω
40mA
35mA
30mA
25mA
20mA
15mA
10mA
IB = 5mA
Pd
COLLECTOR CURRENT Ic (A)
COLLECTOR TO EMITTER VOLTAGE VCE (V)
0
4
8
12
16
20
1
2
3
4
5

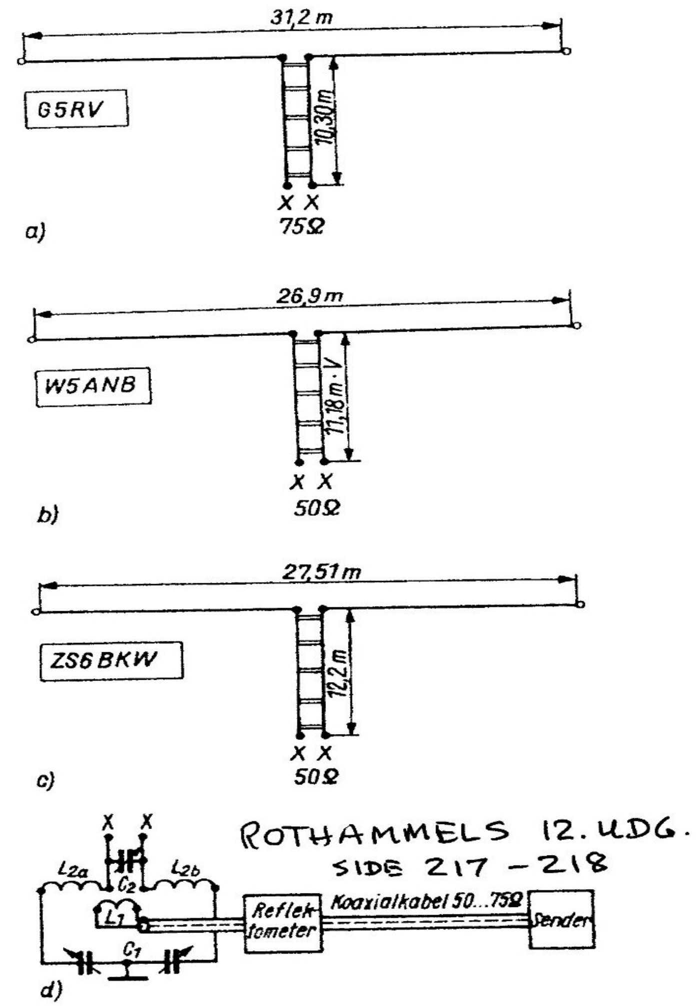

Rc = 3Ω
Zp/Zs = 16,5
50Ω
SWR PA = 1
INDBYG TUNER
SWR ANT ~2
Z ANT
Z COAX = 25 / 1 / 100 Ω
S
P
PA
STYRING
+

USING THE AUTOMATIC ANTENNA TUNER

The Automatic Antenna Tuner (hereinafter referred to as the "ATU") built into each **FTDX1200** is designed to ensure a 50-Ohm load for the final amplifier stage of the transmitter. We recommend that the ATU be used whenever you operate on the **FTDX1200**.

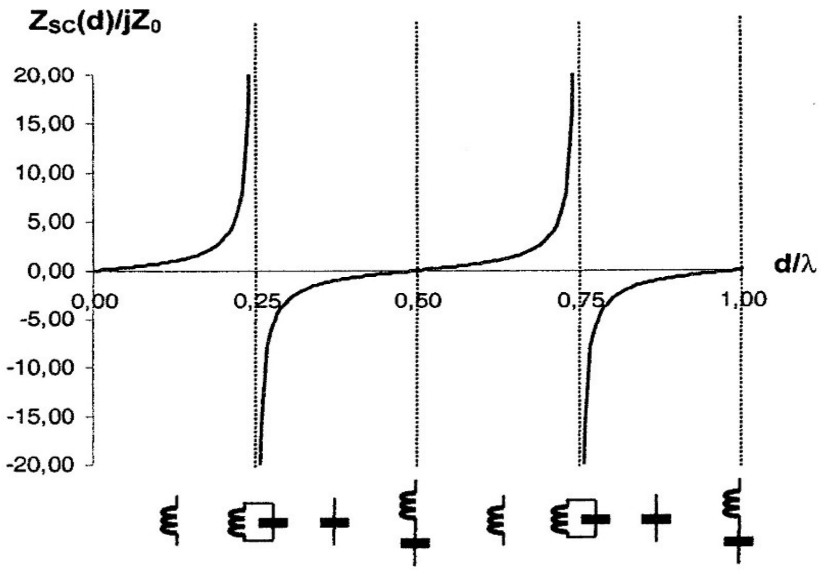
ADVICE:

- Because the ATU of the **FTDX1200** is located inside the station, it only adjusts the impedance presented to the transceiver at the station end of your coaxial cable feedline. It does not "tune" the SWR at the antenna feed point itself. When designing and building your antenna system, we recommend that every effort be made to ensure a low SWR at the antenna feed point.
- The ATU of the **FTDX1200** includes 100 memories for tuning data. Eleven of these memories are allocated, one per Amateur band, so that each band has at least one setting preset for use on that band. The remaining 89 memories are reserved for the 89 most-recent tuning points, for quick frequency change without the need to retune the ATU.
- The ATU in the **FTDX1200** is designed to match impedances within the range of 16.5 Ohms to 150 Ohms, corresponding to an SWR of 3:1 or less on the 160 through 6 meter amateur bands. Accordingly, simple non-resonant whip antennas, along with random-length wires and the "G5RV" antenna (on most bands) may not be within the impedance matching range of the ATU.

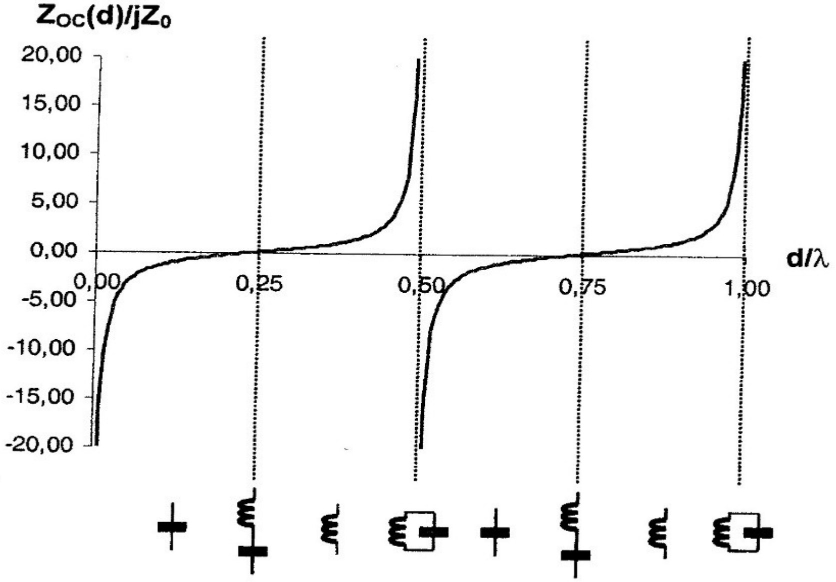


ROTHAMMELS 12. UDG.
SIDE 217 – 218

Bild 10.2.7
Multibandantennen nach dem G5RV-Prinzip:
a) - Ausführung nach G5RV
b) - Ausführung nach W5ANB
c) - Ausführung nach ZS6BKW
d) - Beispiel für ein Anpaßgerät



Figur 3.2 Impedans af kortsluttet stub som funktion af længden d.



Figur 3.4 Impedans af ubelastet stub som funktion af længden d.

Disse teoretiske antenneimpedanser Z = R+jX gælder for " En i rummet frithængende tråd"

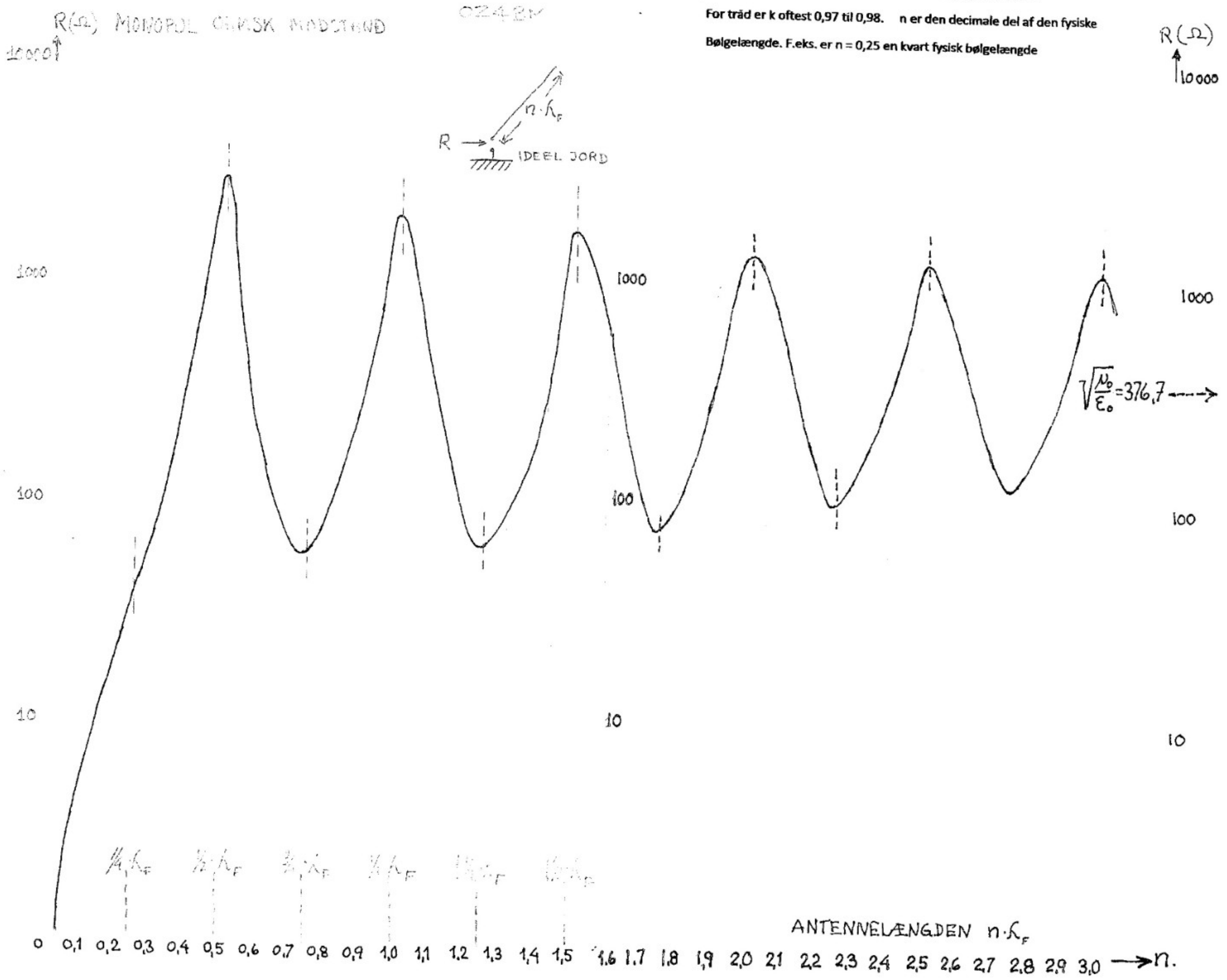
En praktisk højt og ret frithængende tråd vil være tæ , men Z bør måles før tilpasning.

Den her benyttede fysiske bølgelængde λ_F er den teoretiske elektriske

(λ = 300/f m) multipliceret med forkortningsfaktoren k

For tråd er k oftest 0,97 til 0,98. n er den decimale del af den fysiske

Bølgelængde. F.eks. er n = 0,25 en kvart fysisk bølgelængde



Disse teoretiske antenneimpedanser Z = R+jX gælder for " En i rummet frithængende tråd"

En praktisk højt og ret frithængende tråd vil være tæt på, Z bør måles før tilpasning.

Den her benyttede fysiske bølgelængde λ_F er den teoretiske elektriske

(λ 0/f mhz) multipliceret med forkortningsfaktoren k

For tråd er k oftest 0,97 til 0,98. n er den decimale del af den fysiske

Bølgelængde. F.eks. er n = 0,25 en kvart fysisk bølgelængde