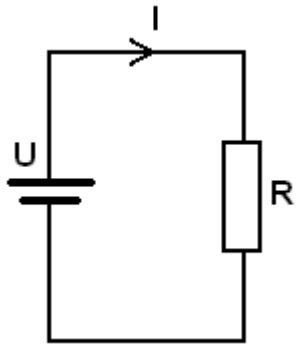
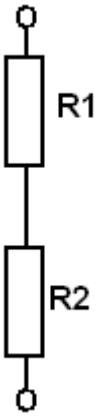
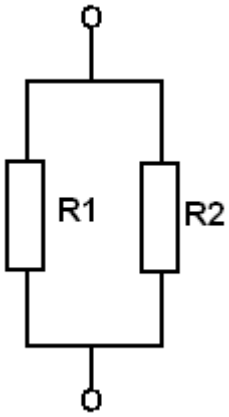
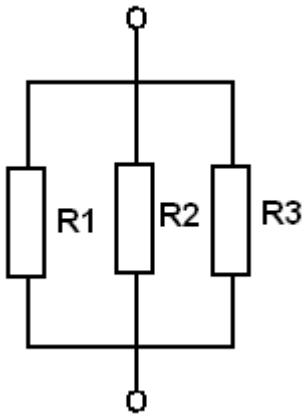
Formelsamling for Radioamatører

$U = R * I$ $R = \frac{U}{I}$ $I = \frac{U}{R}$	**Ohms lov** U = Spenning i Volt (V) R = Resistans i Ohm (Ω) I = Strøm i Ampere (A)	
$R_S = R_1 + R_2 + ...R_n$	**Seriekoblede motstander**	
$R_P = \frac{R_1 * R_2}{R_1 + R_2}$	**Paralellkobling med 2 motstander**	
$\frac{1}{R_P} = \frac{1}{R_1} + \frac{1}{R_2} + ... \frac{1}{R_n}$	**Paralellkoblede motstander**	

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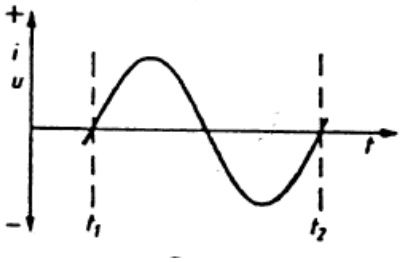
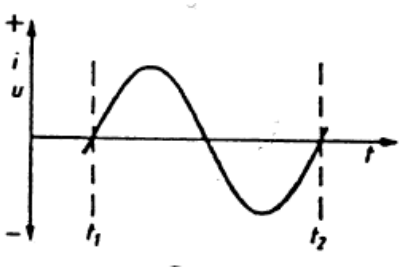
Formelsamling for Radioamatører

$P = U * I$ $P = R * I^2$ $P = \frac{U^2}{R}$	**Effekt** P = Effekt i Watt (W)	
$T = t_2 - t_1$ $f = \frac{1}{T}$ $\lambda = \frac{300}{f_{(MHz)}}$ $f_{(MHz)} = \frac{300}{\lambda}$	**Frekvens** f = Frekvens i Hertz (Hz) T = Tid i Sekunder (s) λ = Bølgelengde i Meter (m)	
$u = \frac{\hat{u}}{\sqrt{2}} = \hat{u} * 0{,}707$ $\hat{u} = u * \sqrt{2} = u * 1{,}41$ $i = \frac{\hat{i}}{\sqrt{2}} = \hat{i} * 0{,}707$ $\hat{i} = i * \sqrt{2} = i * 1{,}41$ $P = \frac{\hat{p}}{2} = \frac{\hat{u}}{\sqrt{2}} * \frac{\hat{i}}{\sqrt{2}} = \frac{\hat{u} * \hat{i}}{2}$	**Effektivverdi og spissverdi** u = Effektiv spenning i Volt (V) û = Spiss spenning i Volt (V) i = Effektiv strøm i Ampere (A) î = Spiss strøm i Ampere (A) P = Effekt iWatt (W) p = Spiss effekt i Watt (W)	

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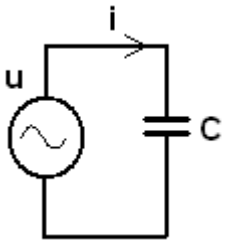
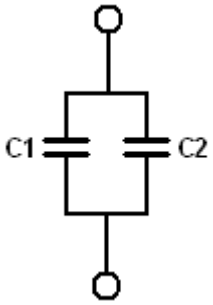
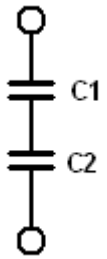
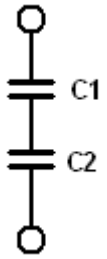
Formelsamling for Radioamatører

$X_C = \frac{1}{2 * \pi * f * C}$	**Kondensator** Xc = Kapasitiv reaktans i Ohm (Ω) π = 3,14 C = Kapasitans i Farad (F)	
$C_P = C_1 + C_2 + ...C_n$	**Paralellkobling av kondensatorer**	
$C_S = \frac{C_1 * C_2}{C_1 + C_2}$	**Seriekobling av 2 kondensatorer**	
$\frac{1}{C_S} = \frac{1}{C_1} + \frac{1}{C_2} + ... \frac{1}{C_n}$	**Seriekobling av kondensatorer**	

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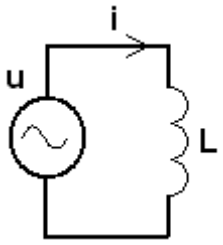
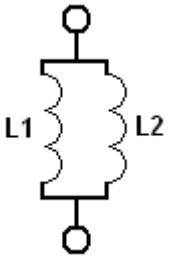
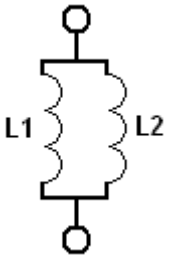
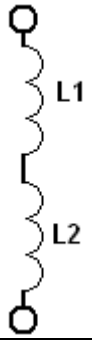
Formelsamling for Radioamatører

$X_L = 2 * \pi * f * L$	**Spole** X_L = Induktiv reaktans i Ohm (Ω) L = Induktans i Henri (H)	
$L_P = \frac{L_1 * L_2}{L_1 + L_2}$	**Paralellkobling av 2 spoler**	
$\frac{1}{L_P} = \frac{1}{L_1} + \frac{1}{L_2} + ... \frac{1}{L_n}$	**Paralellkobling av spoler**	
$L_S = L_1 + L_2 + ...L_n$	**Seriekobling av spoler**	

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Formelsamling for Radioamatører

Resonans

$$X_C = X_L$$

$$\frac{1}{2*\pi*f*C} = 2*\pi*f*L$$

$$f_0 = \frac{1}{2*\pi*\sqrt{L*C}}$$

$$L = \frac{1}{4*\pi^2*f_0^2*C}$$

$$C = \frac{1}{4*\pi^2*f_0^2*L}$$

$$Q = \frac{2*\pi*f*L}{R} = \frac{f_C}{Bw}$$

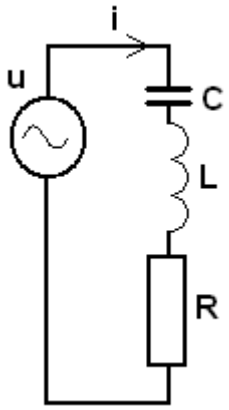
$$Z_S = X_C + X_L + R$$

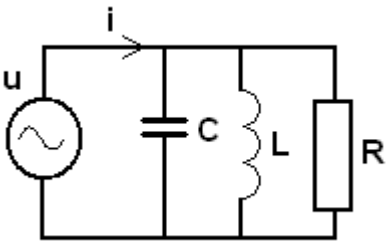
$$\frac{1}{Z_P} = \frac{1}{X_C} + \frac{1}{X_L} + \frac{1}{R}$$

f_0 = Resonansfrekvens i Hertz (Hz)

Q = Kvalitetsfaktor
fc = Senterfrekvens
Bw = 3 dB båndbredde

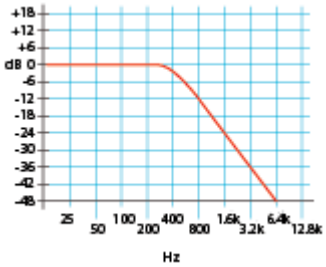
Zs = Serie impedans i Ohm (Ω)
Zp = Paralell impedans i Ohm (Ω)

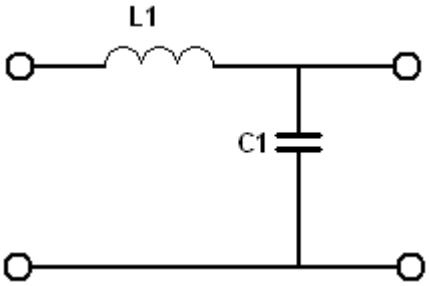




Lavpassfilter

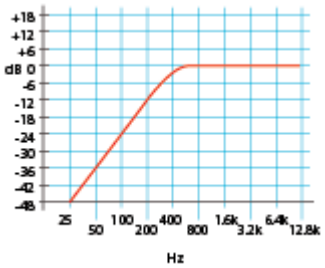
$$f_0 = \frac{1}{2*\pi*\sqrt{L*C}}$$

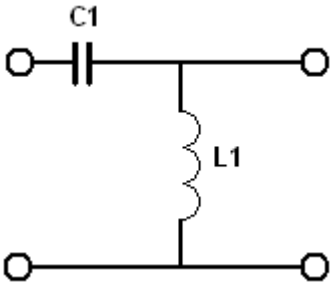




Høypassfilter

$$f_0 = \frac{1}{2*\pi*\sqrt{L*C}}$$





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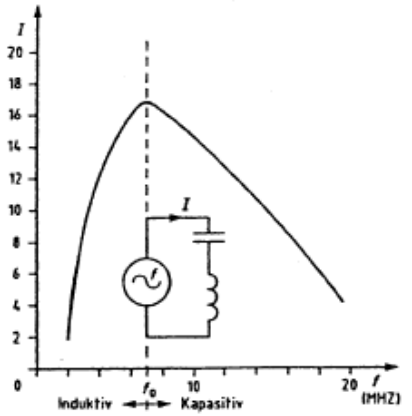
Formelsamling for Radioamatører

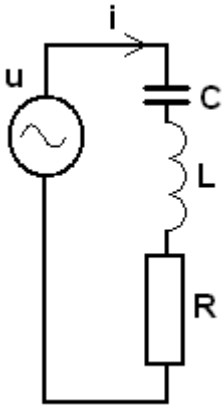
Båndpassfilter

$$f_0 = \frac{1}{2*\pi*\sqrt{L*C}}$$

$$Z_S = X_C + X_L + R$$

$$i = \frac{u}{Zs}$$



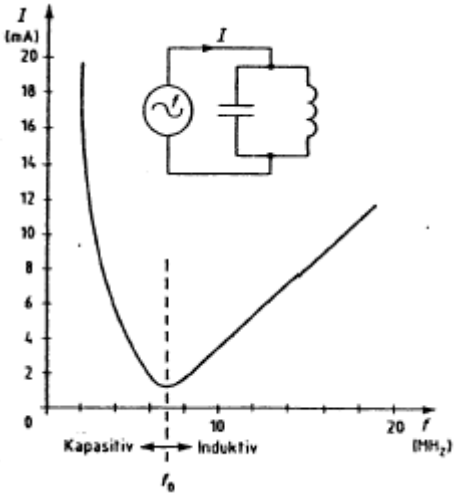


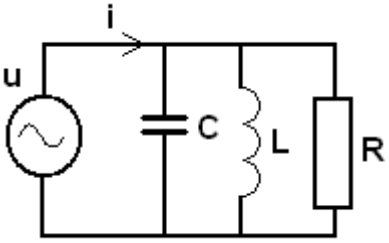
Båndsperrefilter

$$f_0 = \frac{1}{2*\pi*\sqrt{L*C}}$$

$$\frac{1}{Z_P} = \frac{1}{X_C} + \frac{1}{X_L} + \frac{1}{R}$$

$$i = \frac{u}{Zp}$$





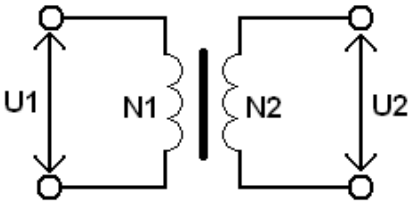
Transformering

$$n = \frac{U_1}{U_2} = \frac{N_1}{N_2}$$

$$P_1 = P_2 = u_1 * i_1 = u_2 * i_2$$

$$n = \frac{N_1}{N_2} = \sqrt{\frac{R_1}{R_2}}$$

U1 = Primærspenning
U2 = Sekundærspenning
N1 = Antall primærviklinger
N2 = Antall sekundærviklinger
n = Omsetningsforholdet



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Formelsamling for Radioamatører

SWR

$$SWR = \frac{1+\sqrt{\frac{P_{REF}}{P_{UT}}}}{1-\sqrt{\frac{P_{REF}}{P_{UT}}}}$$

Z0 = Referanse impedansen
ZL = Last impedansen

Hvis: $Z_L > Z_0$

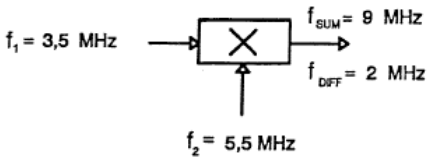
$$SWR = \frac{Z_L}{Z_0}$$

Hvis: $Z_L < Z_0$

$$SWR = \frac{Z_0}{Z_L}$$

Blandetrinn

$$f_{SUM} = f_1 + f_2$$
$$f_{DIFF} = f_2 - f_1$$



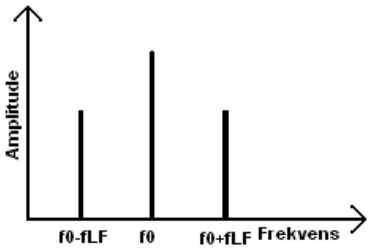
Amplitudemodulasjon

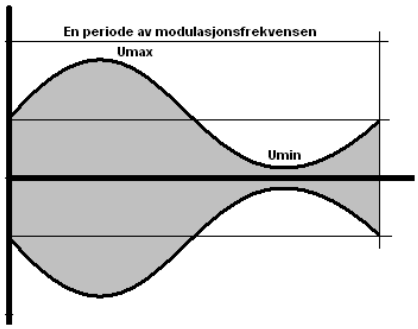
$$Bw = 2 * f_{LF}$$

$$m = \frac{U_{MAX} - U_{MIN}}{U_{MAX} + U_{MIN}}$$

fLF = Lavfrekvens i Hertz (Hz)

m = Modulasjonsgrad





SSB

$$Bw = f_{LF}$$

Frekvensmodulasjon

$$B_n = 2 * \Delta f + 2 * f_{LF}$$
$$B_n = 2 * (\Delta f + f_{LF})$$

Bn= Båndbredden på FM signalet
Δf = Deviasjon (Frekvensavvik)
2* Δf = Frekvenssving

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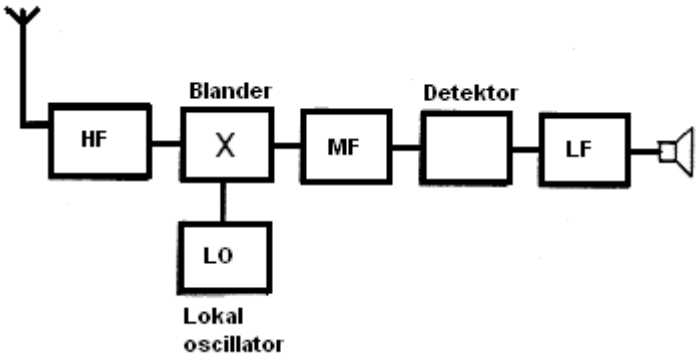
Formelsamling for Radioamatører

Superheterodynmottakeren



$$f_{HF} = f_{LO} \pm f_{MF}$$
$$f_{MF} = f_{HF} \pm f_{LO}$$
$$f_{SUM} = f_{HF} + f_{LO}$$
$$f_{DIFF} = f_{HF} - f_{LO} \Rightarrow (f_{HF} > f_{LO})$$
$$f_{DIFF} = f_{LO} - f_{HF} \Rightarrow (f_{HF} < f_{LO})$$

$$f_{HF} > f_{MF}$$
$$f_{SPEIL} = f_{HF} - (2 * f_{MF}) \Rightarrow (f_{HF} > f_{LO})$$
$$f_{SPEIL} = f_{HF} + (2 * f_{MF}) \Rightarrow (f_{HF} < f_{LO})$$

$$f_{HF} < f_{MF}$$
$$f_{SPEIL} = (2 * f_{MF}) - f_{HF} \Rightarrow (f_{MF} > f_{LO})$$
$$f_{SPEIL} = (2 * f_{MF}) + f_{HF} \Rightarrow (f_{MF} < f_{LO})$$

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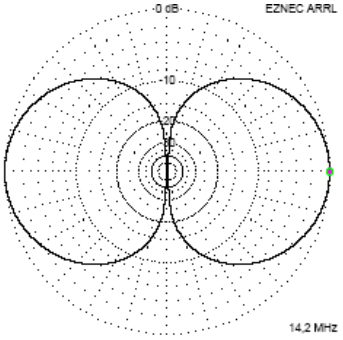
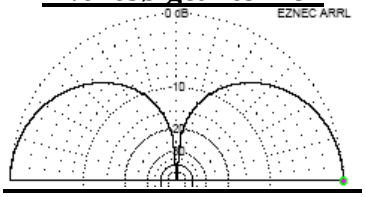
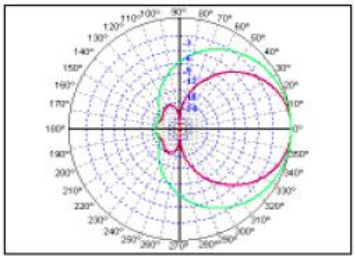
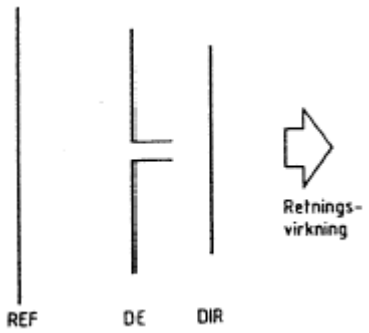
Formelsamling for Radioamatører

$L = \frac{142,5}{f_{(MHz)}}$	**Halvbølgedipol** L = Lengden i meter på antennen  Utstrålingsdiagrammet for en halvbølgedipol sett ovenfra. (N.B: Fritt rom.)	
$L = \frac{71,25}{f_{(MHz)}}$	**Kvartbølgeantennen**  Utstrålingsdiagrammet for en kvartbølge antenne sett fra siden. (N.B: Perfekt jord.)	
Typiske mål for en 3 elements Yagi-Uda antenne: *Driver element:* $L_{DE} = \frac{144,8}{f}$ *Direktor:* $L_{DIR} = \frac{138,7}{f}$ *Reflektor:* $L_{REF} = \frac{152,4}{f}$ *Avstand Driver - Direktor:* $S = \frac{45}{f}(Max\frac{60}{f})$ *Avstand Driver - Reflektor:* $S = \frac{21}{f}(Max\frac{33}{f})$	**Yagi-Uda antennen**  Utstrålingsdiagrammet for en 3 elements Yagi-Uda antenne sett ovenfra. Utstrålingsdiagrammet for en 3 elements Yagi-Uda antenne sett fra siden. (N.B: Fritt rom.)	

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Formelsamling for Radioamatører

DesiBel

Forholdet mellom effekt P2 og P1 og spenning U2 og U1 uttrykt i desiBel.

**********	Effekt (watt)	Spenning (volt)
Formel	$a[dB] = 10 * Log \frac{P_2}{P_1}$	$a[dB] = 20 * Log \frac{U_2}{U_1}$
Reversert formel	$P_2 = P_1 * 10^{\frac{a[dB]}{10}}$	$U_2 = U_1 * 10^{\frac{a[dB]}{20}}$
**********	**********	**********
desiBel	$\approx \frac{P_2}{P_1}$	$\approx \frac{U_2}{U_1}$
0 dB	1	1
1 dB	1,25	1,12
2 dB	1,58	1,25
3 dB	2	1,41
6 dB	4	2
9 dB	8	2,82
10 dB	10	3,16
12 dB	16	4
15 dB	32	5,6
20 dB	100	10
30 dB	1000	31,6

SI-prefikser

10^n	Prefiks	Symbol	Navn	Desimaltall
10^{12}	tera	T	Billion	1 000 000 000 000
10^{9}	giga	G	Milliard	1 000 000 000
10^{6}	mega	M	Million	1 000 000
10^{3}	kilo	k	Tusen	1 000
10^{2}	hekto	h	Hundre	100
10^{1}	deka	da	Ti	10
10^{-1}	desi	d	Tidel	0,1
10^{-2}	centi	c	Hundredel	0,01
10^{-3}	milli	m	Tusendel	0,001
10^{-6}	mikro	µ	Milliondel	0,000 001
10^{-9}	nano	n	Milliarddel	0,000 000 001
10^{-12}	piko	p	Billiondel	0,000 000 000 001

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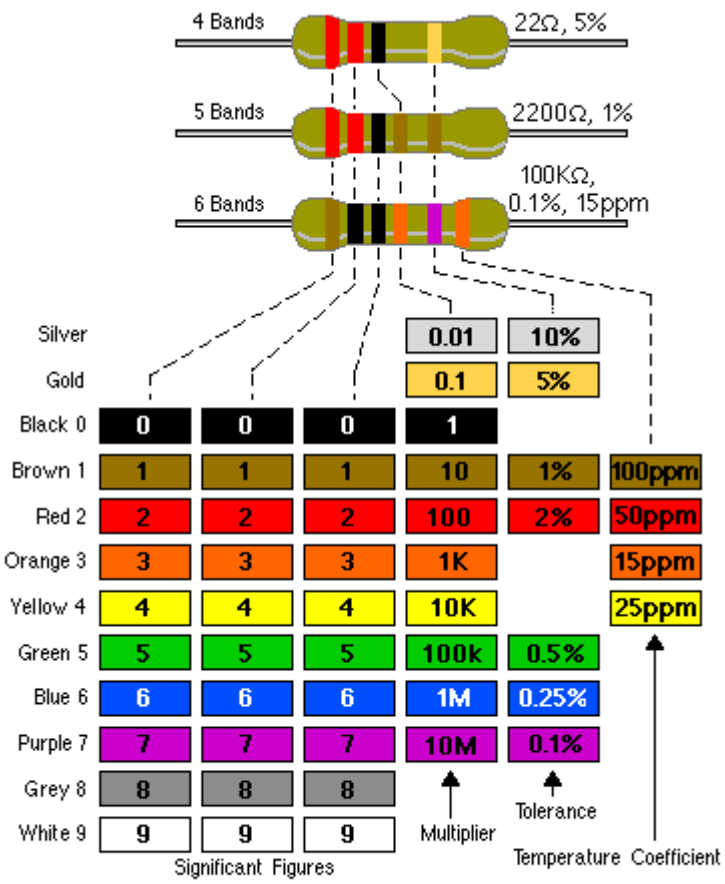

Resistor Color Code System

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