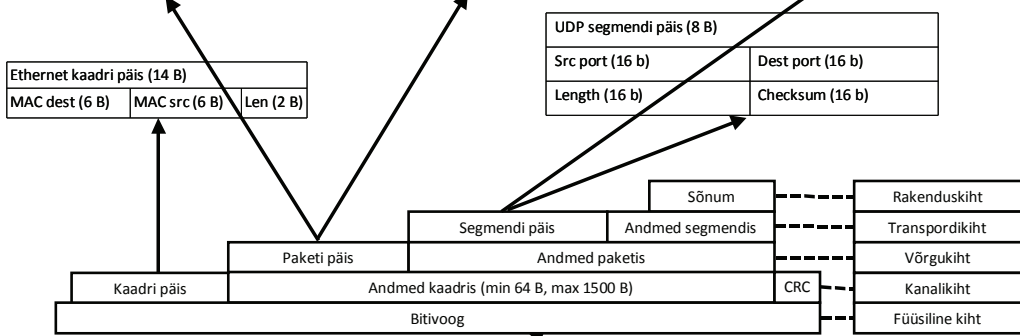
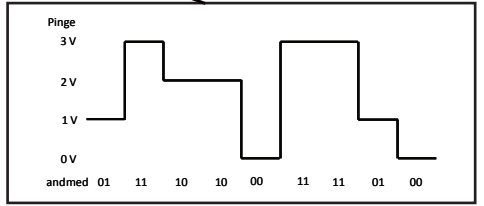


IPv4 paketi päis (20 B)				IPv6 paketi päis (40 B)			TCP segmendi päis (20 B)						
Ver (4b)	IHL (4b)	TOS (8 b)	Total length (16 b)	Ver (4b)	Traffic class (8 b)	Flow Label (20 b)	Source port (16 b)	Destination port (16 b)					
Identification (16b)		Flags (3b)	Offset (13 b)	Payload length (16b)	Next Header (8b)	Hop Limit (8b)	Sequence number (32 b)						
TTL (8b)	Prot (8b)	HCS (16 b)		Acknowledgement number (32 b)		Data offset (6 b)							
Source Address (32 b)		Destination Address (32 b)		Source address (128b)	Destination address (128b)	Res (4 b)	U R G K	A C S H	P S T	P S T	S Y N	F I N	Window (16 b)
Destination Address (32 b)						Checksum (16 b)	Urgent pointer (16 b)						



1 B (bait) = 8 b (bitti)
1 kbit/s = 1000 bit/s
1 Mbit/s = 1000 kbit/s

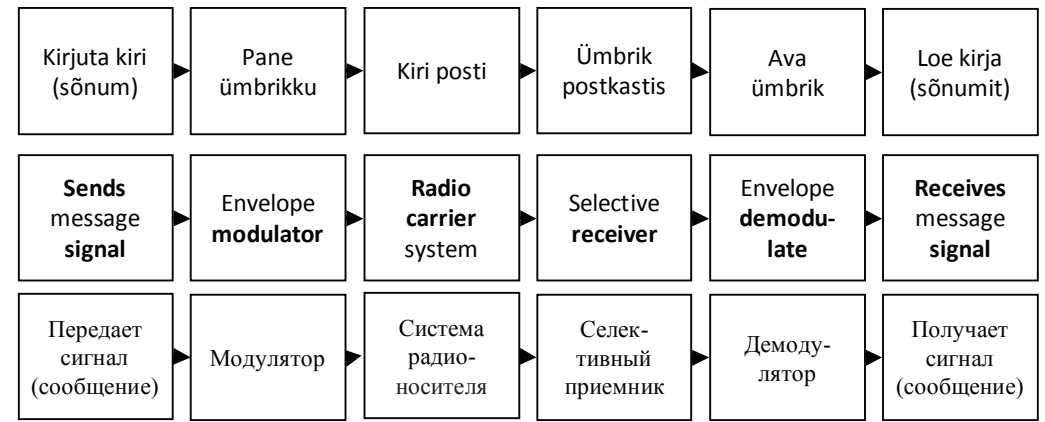
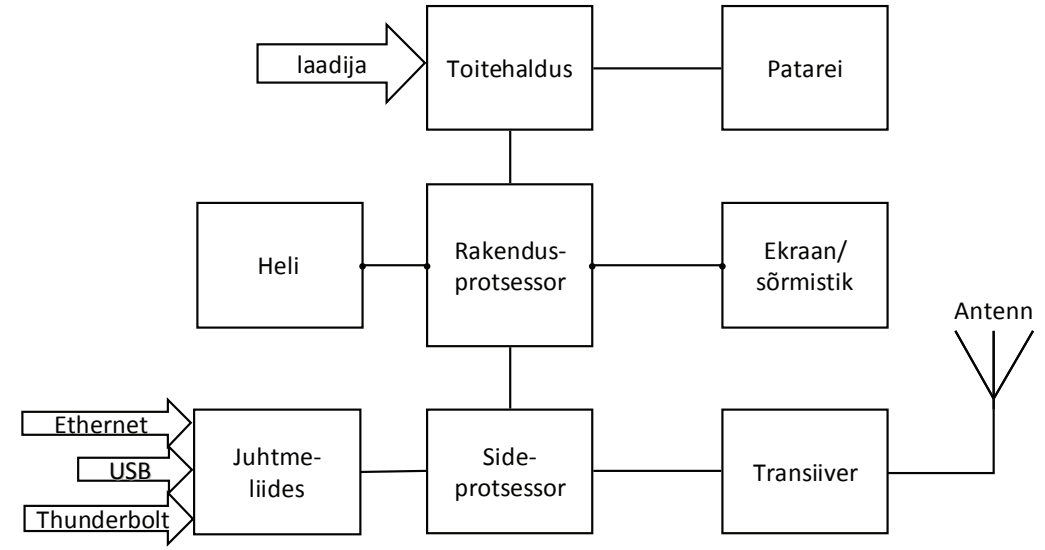


Tegid:
Avo Ots, Marika Kulmar, Ivo Mürsepp

Tudeng:

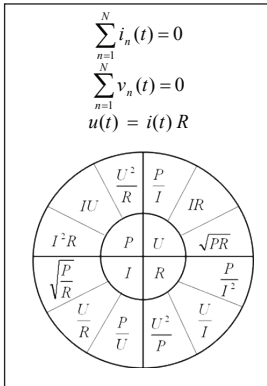
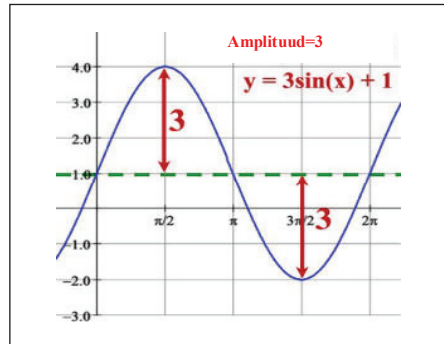
TTÜ telekommunikatsiooni õppetool Side (IRT3930)

sügis 2014 / ver 1.0/



$\log_{10} 2 = 0,3010$
 $\log_{10} 3 = 0,477$
 $\log_{10} 5 = 0,699$

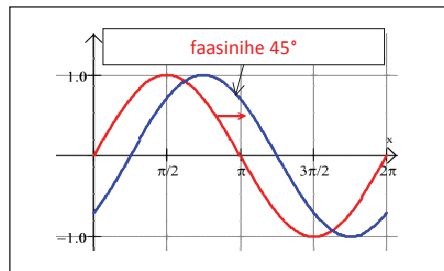
$1 \text{ dB} = 10 \cdot \log_{10} \frac{P_{\text{väljund}}}{P_{\text{sisend}}}$
 $1 \text{ dBm} = 10 \cdot \log_{10} \frac{P}{1 \text{ mW}}$



$Y=0,587G + 0,299R + 0,114B$
 $U=0,493(B-Y)$
 $V=0,877(R-Y)$

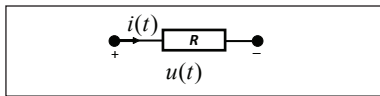
Video $f_d = 13,5 \text{ MHz}$
 kvantimisnivoosid 256
 $13,5 \times 8 = 108 \text{ Mbit/s}$
 YUV 4 : 2 : 2 => 216 Mbit/s

G.711	64 kbit/s
G.728	16 kbit/s
G.729	8 kbit/s
G.723.1	6,3 kbit/s

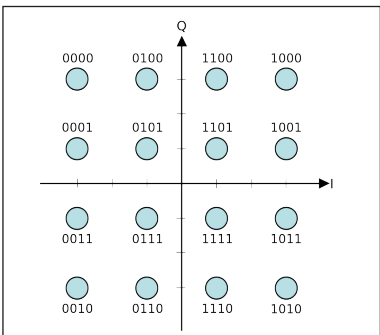


$u(t) = U_A \sin(2\pi ft + \varphi)$ $U_{ef} = U_A / \sqrt{2}$

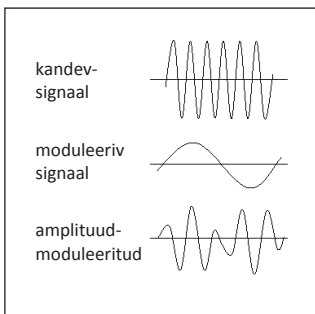
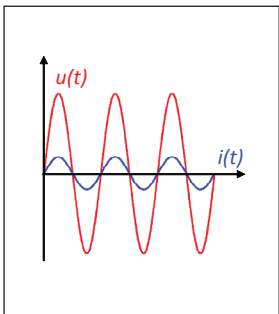
$p(t) = i(t) u(t) = i^2(t) R = \frac{u^2(t)}{R}$



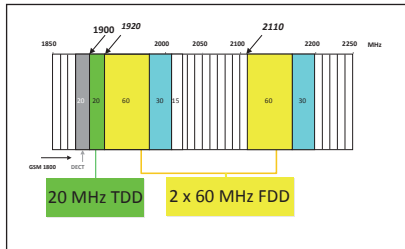
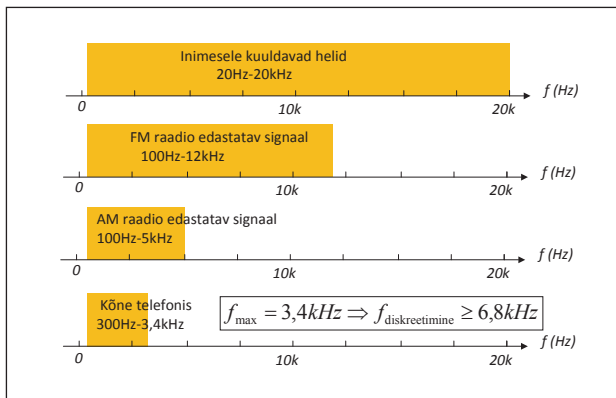
64 kbit/s, ITU-T G.711
 diskreetimisamm = $1/(2F_{\text{max}})$
 Diskreetimisamm 125 μs,
 kvantimisnivoosid 256



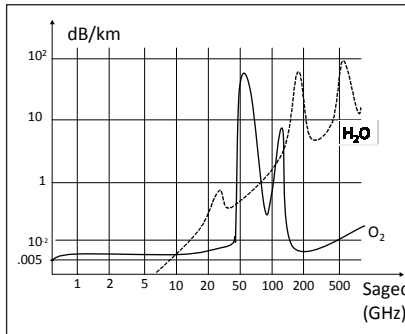
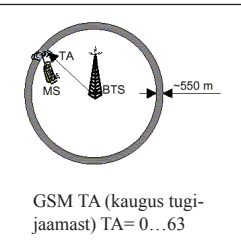
$C = W \cdot \log_2 \left(\frac{S}{N} + 1 \right)$
 S – signaali võimsus (W)
 N – müra võimsus (W)



$\sin \alpha \sin \beta = \frac{1}{2} [\cos(\alpha - \beta) - \cos(\alpha + \beta)]$
 $\cos^2 \alpha = \frac{1}{2} + \frac{1}{2} \cos 2\alpha$

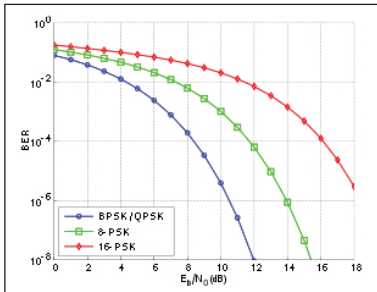


üleslüli 890 ... 915 MHz,
 (1710 ... 1785)
 allalüli 935 ... 960 MHz,
 (1805 ... 1880)
 duplekseristus 45 MHz, (95)
 kanali ribalaius 200 kHz
 Bitikiirus kanalil 270.833 kbit/s
 Kanaleid 124 (...374)
 Pöördusviis TDMA/FDD



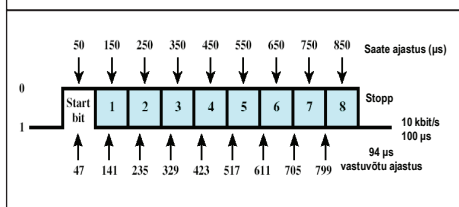
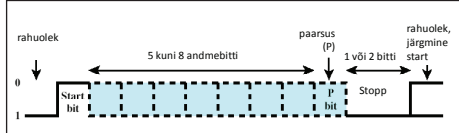
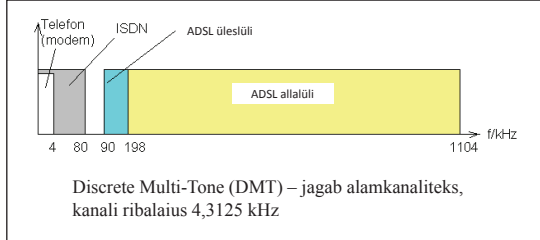
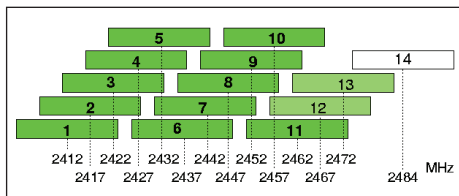
Sagedusala 2,4 GHz

kaugus	Sumbuvus (dB)
100 m	80,2
200 m	86,2
500 m	94,2
1 km	100,2
2 km	106,2
5 km	114,2
10 km	120,2



2400 - 2483,5 MHz, e.i.r.p. 100 mW,
 5150 - 5350 MHz, (200 mW, ruumis)
 5470 - 5725 MHz, (1W, ruumis/dues)

$\frac{P_r}{P_t} = \frac{(4\pi d)^2}{\lambda^2} = \frac{(4\pi f d)^2}{c^2}$



V.21 - 300 bit/s
 V.34 - 28,8 kbit/s
 V.92 - 56 kbit/s

Free Space Loss = $k + 20\log(d) + 20\log(f)$
 $k = 32,45$, d[km], f[MHz]
 $k = 92,45$, d[km], f[GHz]

$\text{signaali levikiirus} = \text{sagedus} \cdot \text{lainepikkus}$
 $\text{lainepikkus} (\lambda) = \frac{\text{raadiosignaali sagedus} (f)}{c}$
 $c = 3 \cdot 10^8 \text{ [m/s]} \Rightarrow \lambda = \frac{3 \cdot 10^8}{f}$

