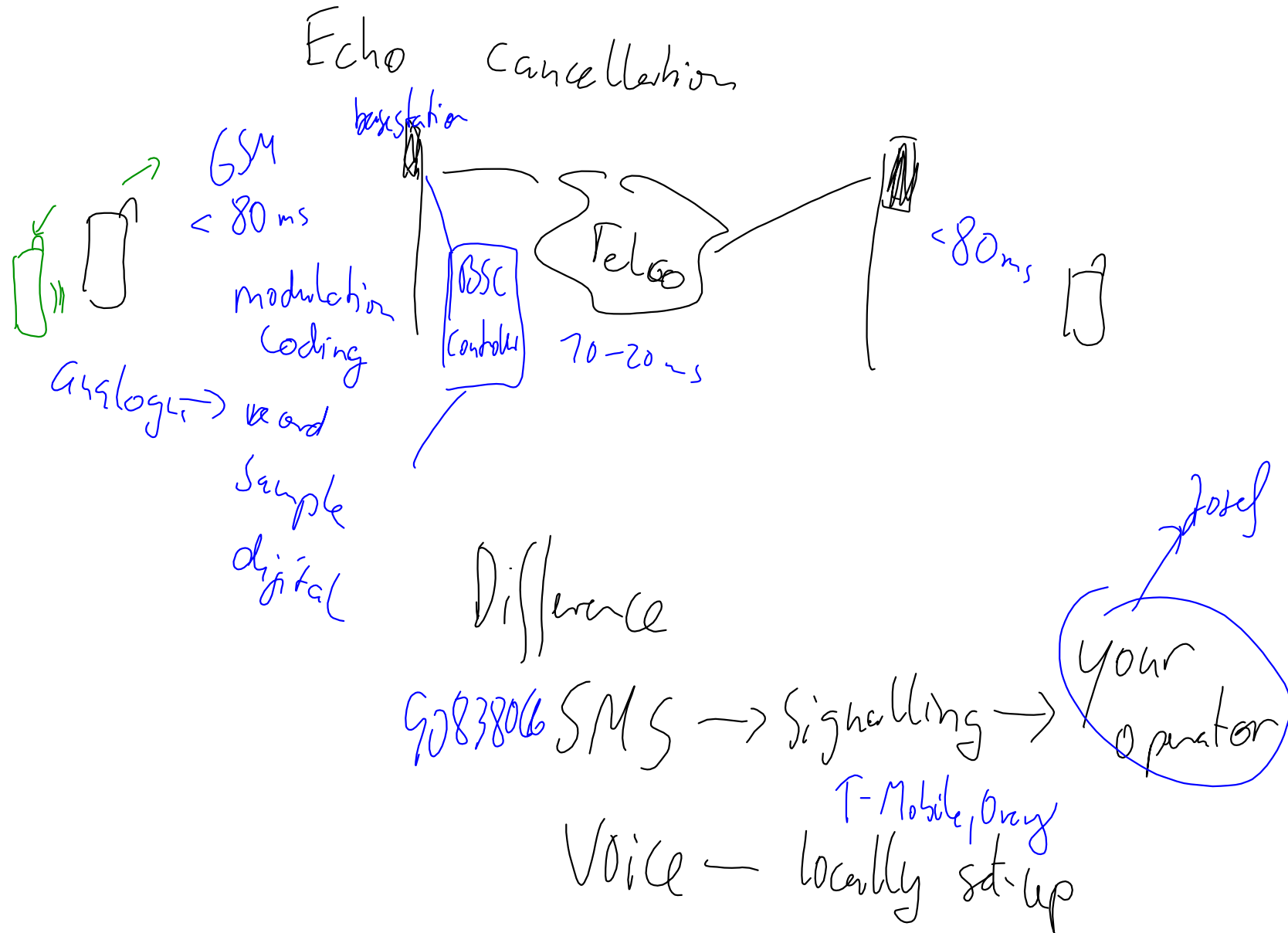
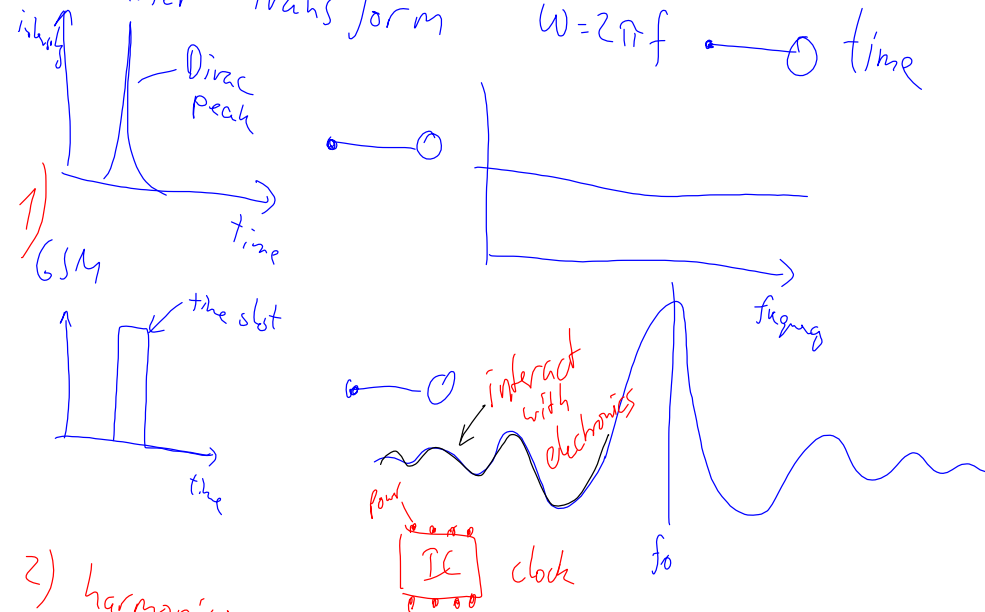




88.8 MHz radio FM

GSM/GPRS band	Messaging/Signalling	1800 MHz
	1 GSM slot	200 kHz

$$\omega = 2\pi f \quad \bullet \longrightarrow \text{time}$$


2) harmonics

$$n f_1 \pm m f_2 = f_{res} \quad / \quad f_1 - f_2 = 20 \text{ MHz}$$

5G $\xrightarrow{\text{Future}}$ 6G, 7G

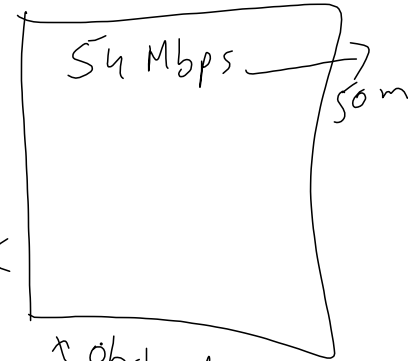
* THz

Non-ionization wifi

* T Rays

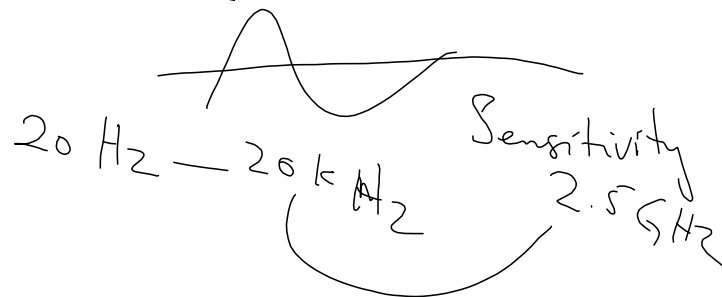
* No damage to electronic

* Less signal loss



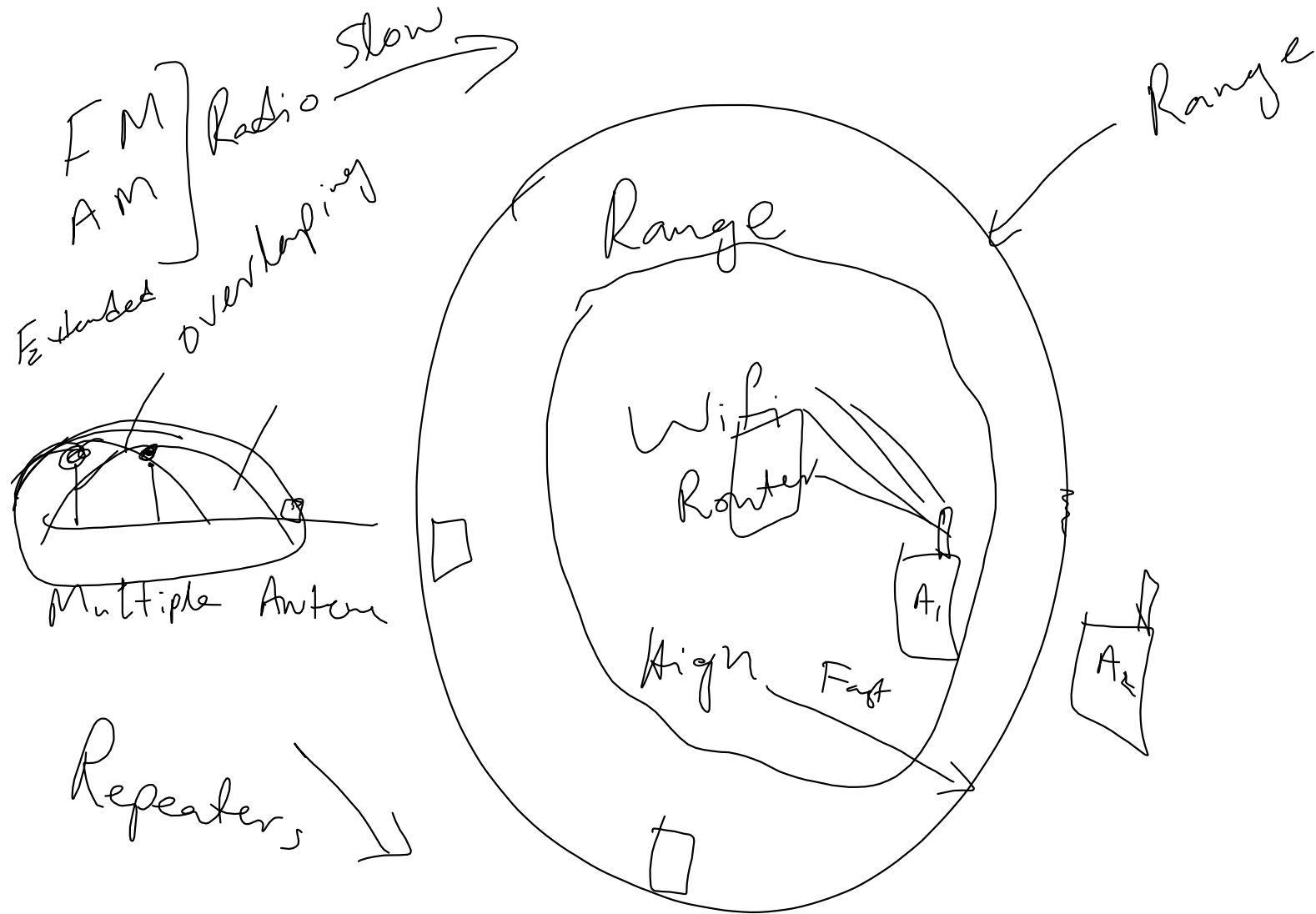
- * obstacles
- * Interfer
- * Data load
- * Data lag
- * Signal Strength

10 $\rightarrow$ 10
Wireless db — Analog



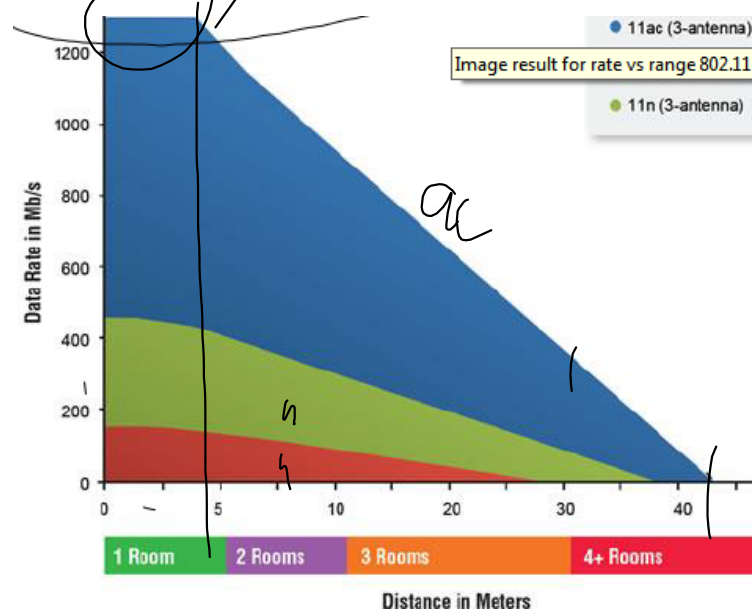
Range ^{Coverage}

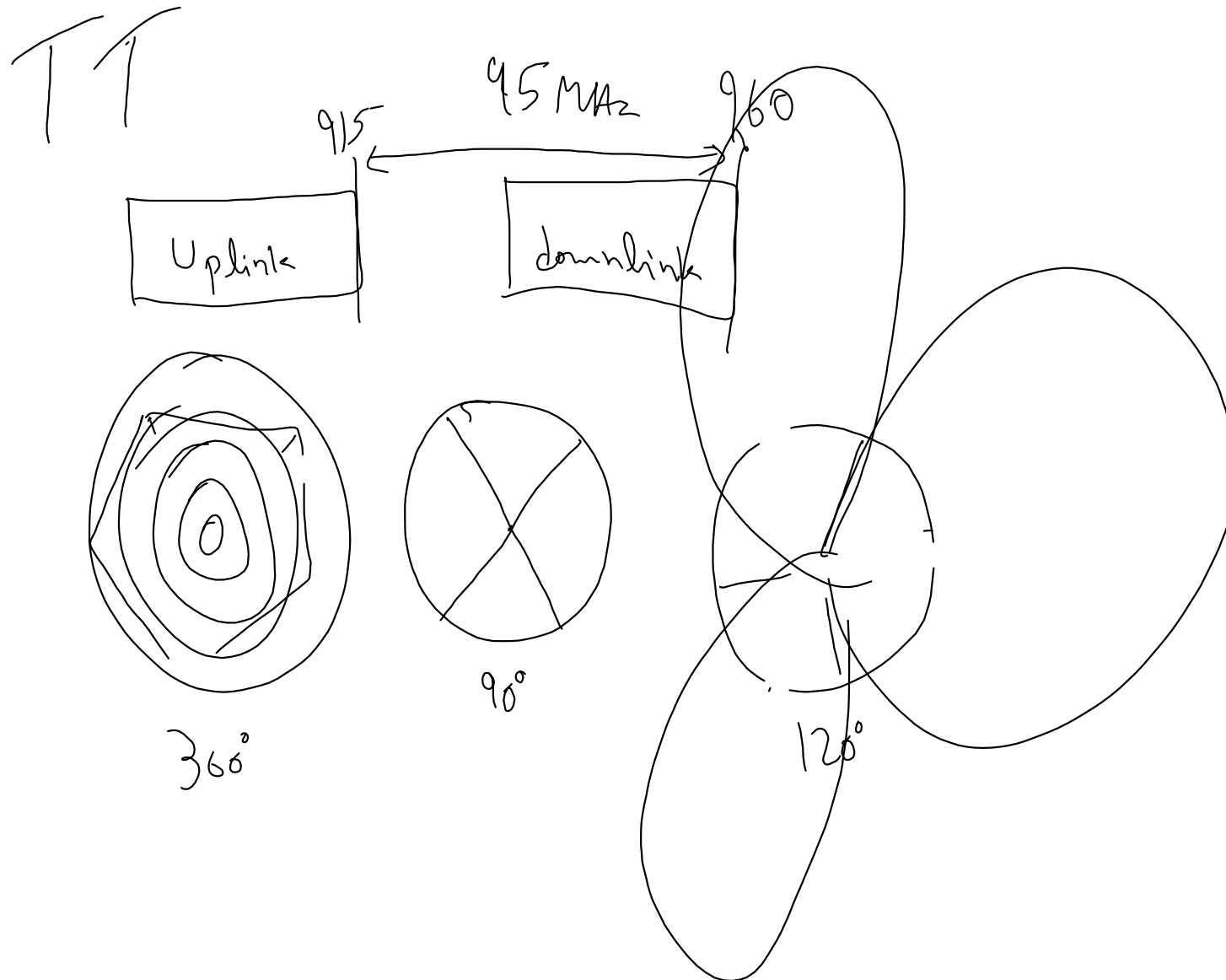
10³ $\rightarrow$ 20log
 $\downarrow$ 20
 60



	802.11n	802.11ac	802.11ad
Throughput	600 Mbps	3.2 Gbps	Up to 7 Gbps
Coverage	Home, 70 m	Home, 30 m	Room, <5m
Freq. Band	2.4/5 GHz	5 GHz	2.4/5/60 GHz
Antennas	4 x 4 MIMO	8 x 8 MIMO	>10 x 10 MIMO
Applications	Data, Video	Video	Uncompressed Video

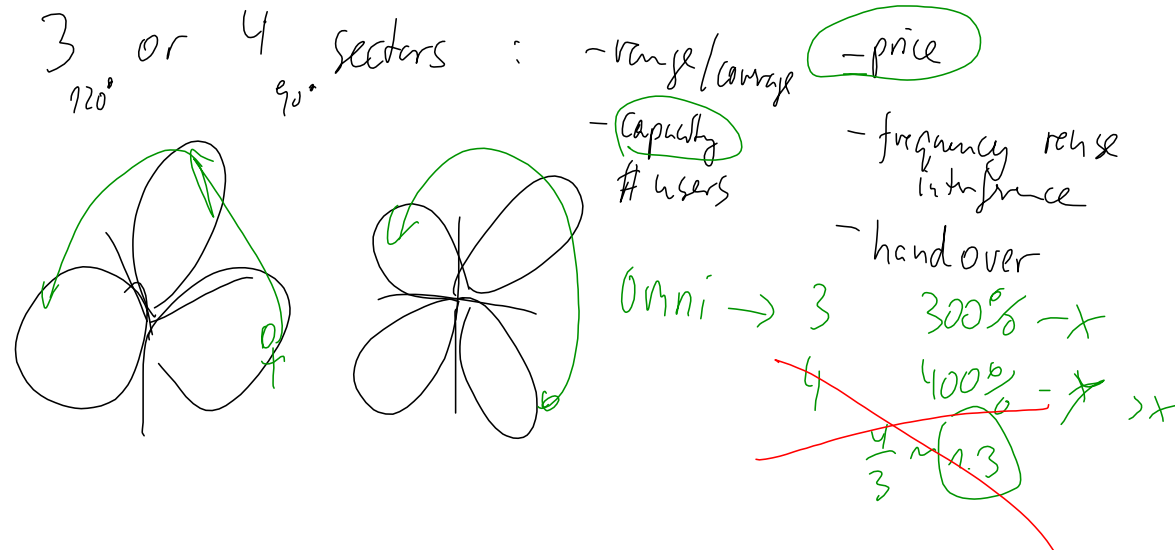
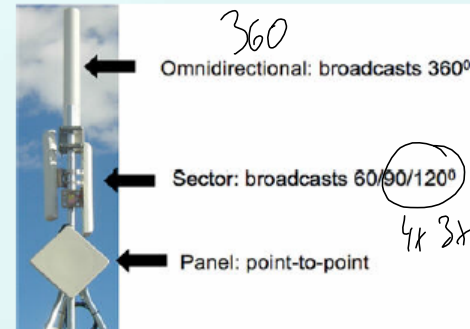
Manu
Marketing





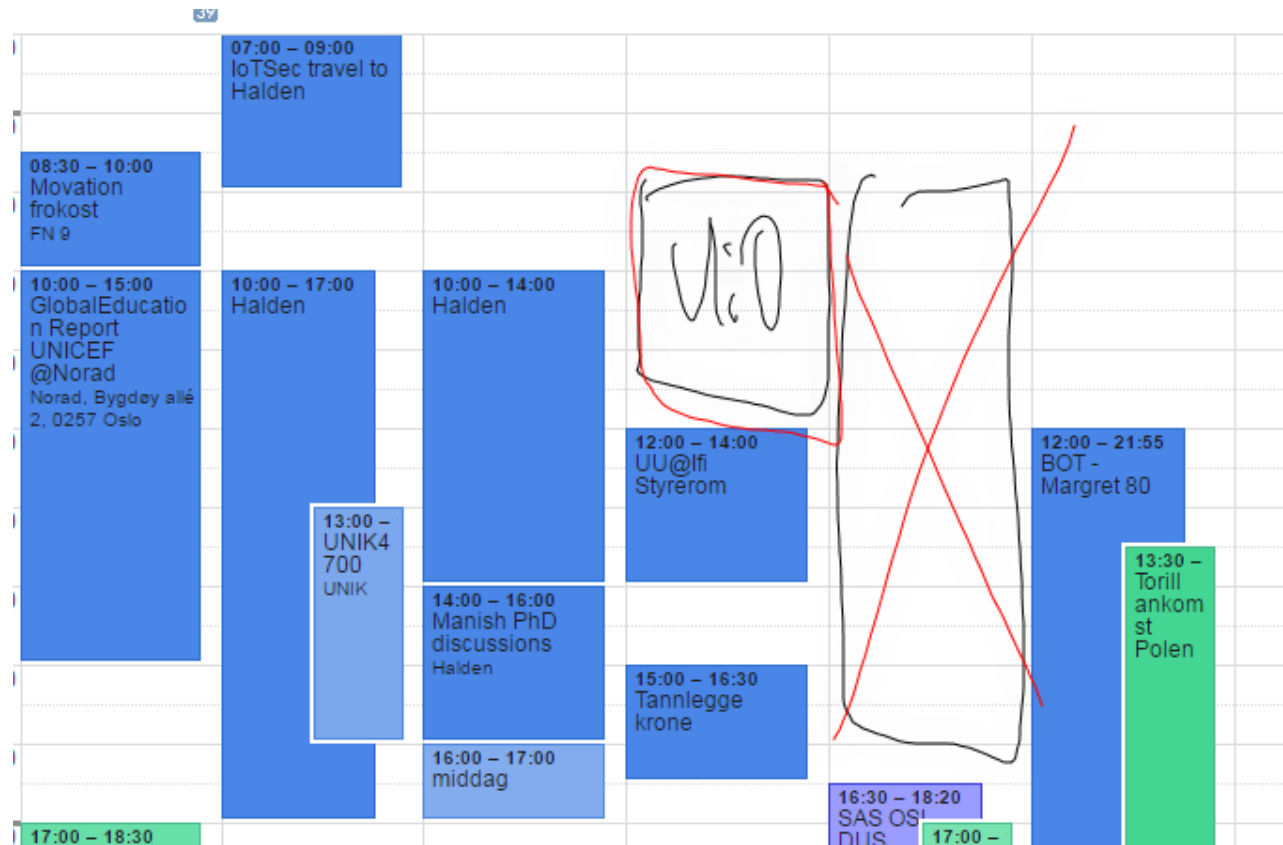
System Capacity

- Sectoring
 - Use directional antennas
 - Omni
 - Sector
 - Panel
- Frequency reuse of channels
- Cell splitting increases the number of BS deployed which allows orderly growth of the cellular system
- Limit the coverage area of each BS to small geographical area called cell.



Next lecture 29.9. 0900 - 1200
@ U:O

18.10. 1300 - 1600
@ UNIK



IMSI catcher NTNU

software defined base station FFI

s://www.google.no/webhp?sourceid=chrome-instant&ion=1&espv=2&ie=UTF-8#q=imsi%20catcher%20ntnu

[www.antenposten.no/.../new-report-clear-signs-of-mobile-surveillance-in-oslo-despi...](#)

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