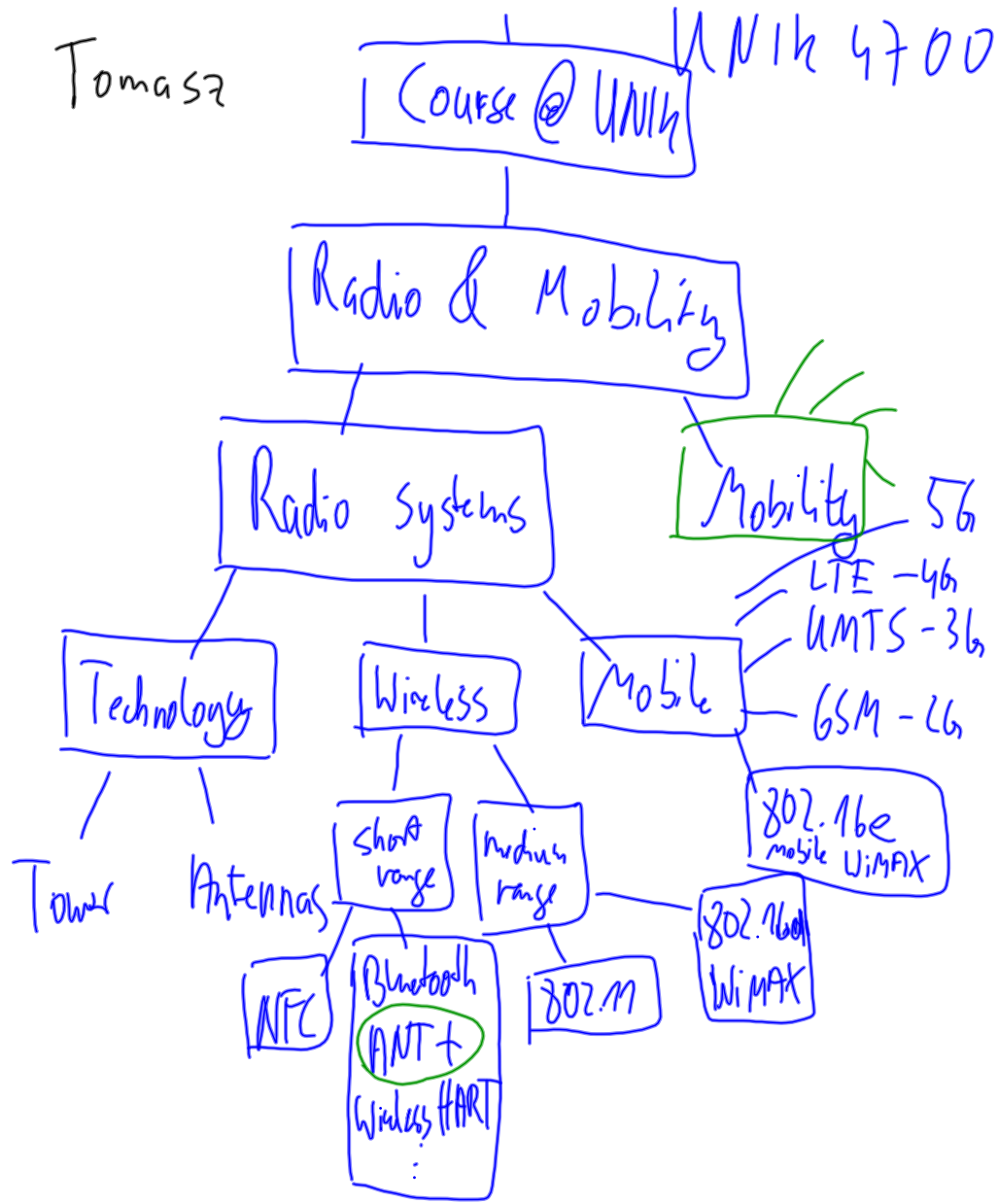
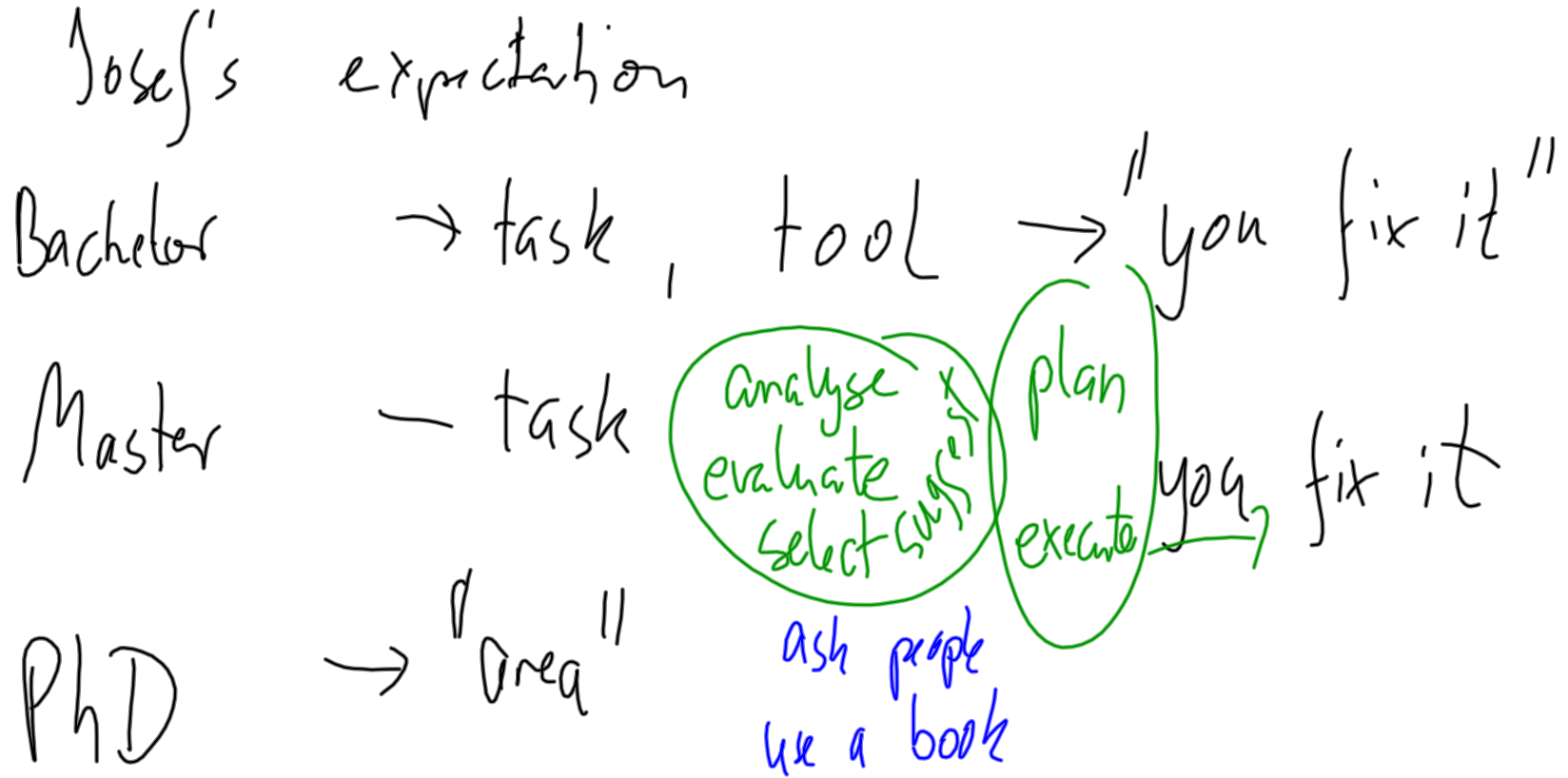


Tomasz

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## What To Achieve

Academic work

- how we build up list of references
- modelling approach
- detailed list of topic (*next slide*)

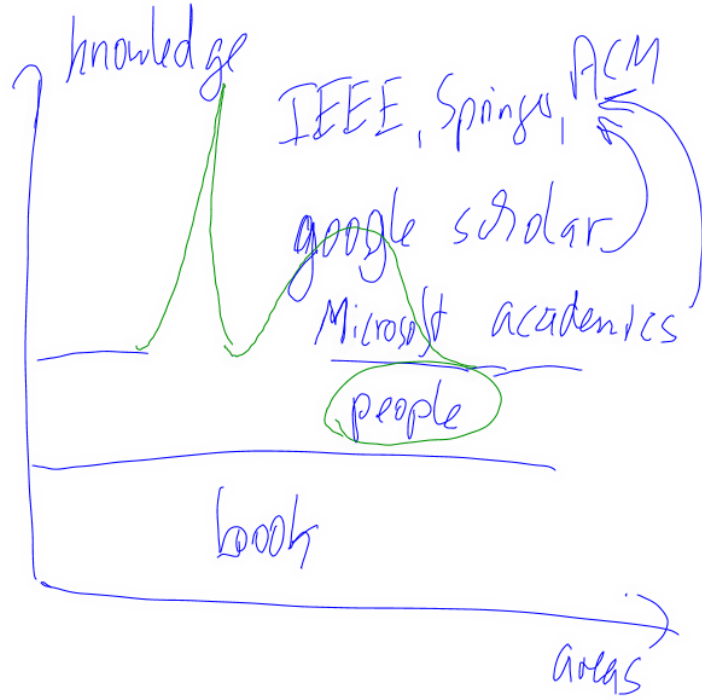
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# What To Achieve

## Academic work

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## Goals Mobility

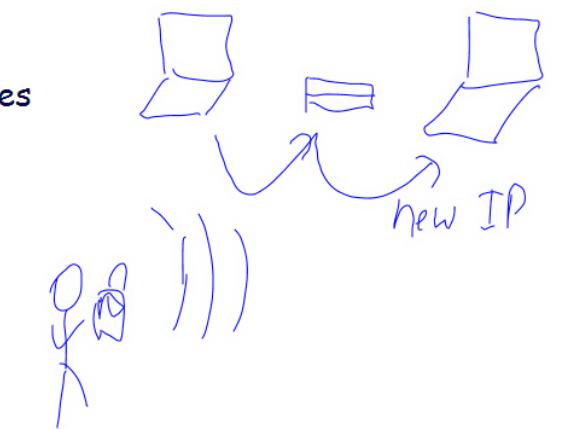
- identify the factors for mobility management
- know the characteristics of current mobility schemes
- address topics in current research

Mandatory

- knowledge of presentation material
- presentation and analysis of 3-4 papers
- simulation

Evaluation (draft)

- presentation of topics (own work)
- simulation results
- optional: (final exam)



handover LTE/UMTS  
and Wifi

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~~Assigned Topics 2012~~  
Potential topics for 2013

- Ali Zaher: RFID/NFC
- Dag Ove Eggum: Wimax
- Håvard Austad: Antennas
- Joachim Tingvold: Wave Propagation Parameters
- Johan Tresvig: Wireless HART, ++ISO100, Bluetooth, Zigbee
- Susana Rodriguez de Novoa: WLAN
- Thomas Aasebø: ANT+, Bluetooth, Zigbee
- Najji: Basics of Handover, examples from GSM and UMTS
- Gerard: Attenuation of tropical rain forest in GSM (?), Wifi and WiMAX

• Networks in emerging economies (Interact.org)

• handover 4G/Wifi

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## TOC - Basics Of Communication

- Electromagnetic signals ✓
- Nyquist Theorem ?
- Signal/noise ratio ? electronics
- Shannon Theorem ?
- Signal strength ?

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UNIK4700/9700-Introdu... UNIK4700/UNIK9700 Intr... What is "Super Wi-Fi"? Home | Welcome to New... Our Dream Internet for e... Mobilstråling - CWI

cwi.unik.no/wiki/Mobilstråling

- En GSM sektor antenna med 14,5 dB gevinst, som dekker en sektor (120 grader). Verdier er estimert basert på Kathrein 730 684 GSM antenne.
- et barn med 1,5 m høyde og varierende avstand fra antenne

**Mobilmast strålingsverdier in  $mW/m^2$**   
 kilde: <http://cwi.unik.no/wiki/Mobilstråling>

30 W, 14.5 dB antenne  
 16 m høy  
 400  $\mu W/m^2$   
 1 m avstand  
 3100  $\mu W/m^2$   
 15 m  
 3500  $\mu W/m^2$   
 100 m  
 Direct LOS  
 6700  $\mu W/m^2$   
 15 m høy  
 1700  $\mu W/m^2$   
 15 m høy  
 1300  $\mu W/m^2$   
 200 m  
 260  $\mu W/m^2$   
 200 m  
 500 m  
 angle of radiation

- Media:Standorberechnung-Mobilfunk.xls, adaptert fra <http://www.salzburg.gv.at/celltower> med norsk betegnelse og beregning av antenne

**Mobilstråling inn i kroppen** [edit]

For å beregne effekten av mobilstråling inn i kroppen må vi først se på sammensetningen av hudstrukturen, særlig ved hodet. Det som kjennetegner huden er den store andel av vann, som absorberer elektromagnetiske stråling veldig godt. Forskningen viser at strålingsintensiteten tar av med ... - *to be verified*, og at alt energi fra mobilstråling bli dermed forvandlet i varmeenergi.

Dermed er det åpningen i kroppen som ørene, nese, munn som la mobilstrålene kommer inn i kroppen.

**Mobilstråling og helse** [edit]

Den engelske Wikipedia <sup>[10]</sup> gir en omfattende diskusjon om mobilstråling og helse, hvor hovedessensen er gjengitt her: Mange vitenskapelige studier har gjennomført en analyse av mobilstråling. Disse studiene har blitt gjennomgått av internasjonale eksperter, som prøver å finne *evidence*. Alle studiene viser at det er usannsynlig at mobilstråling kan forårsake kreft hos mennesker.

Forskjellige vitenskapelige samarbeidsprosjekter i regi av COST har analysert helseaspekter, og har kommet med flere rapporter, bl.a. COST 281<sup>[11]</sup> om "potensielle helseaspekter fra mobile kommunikasjonssystemer". Gunnhild Oftedal og Anders Johnsson fra Norge deltok i COST 281, som hadde et eget kapittel om elektromagnetisk stråling og barn. COST samarbeid kunne ikke finne en eneste studie som viste en sammenheng mellom mobilstråling og helse. Det som viste seg ofte var at målinger av stråling var ikke korrekt, at interpretasjoner av resultater kunne misforstås eller at studiene hadde metodiske svakheter. Men studien pekte også på at noen effekter kunne ikke uttrykkes, bl. a. *biomolecular oscillations by thermomolecular reactions*.



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## The Five Myths Of Wireless

1. Wi-Fi is faster than Ethernet. While the raw data rate of Wi-Fi (11 Mbps) may be faster than the original Ethernet (10 Mbps), Wi-Fi's throughput efficiency is always less. Why? *lost packets, retransmit*
2. The longer the transmission range, the better. That may be true for some wireless communications, but for wireless LANs, a greater transmission range often results in more users per cell and lower per-user throughput. Why? *increase noise*
3. Wireless networks can be dangerous to your health. Almost all wireless LANs have radio output levels of less than 100 milliwatts (20 dBm). Is output power the real measure? *distance, attenuation*
4. 802.11g will make 802.11a obsolete. Lots of people think that 802.11g will kill 802.11a because it offers the same data rate as 802.11a (54 Mbps) plus backward compatibility with 802.11b. Other factors? *higher bandwidth for communication*
5. Wireless LANs are inherently insecure. Yes, there are security issues with the original 802.11b specification, but there are plenty of ways, including the use of VPNs and security gateways, to make wireless as secure as wired. True?

*Note: 802.11 is sending with different speeds for header and payload. Header is always transmitted at lowest speed, why? Sniff*

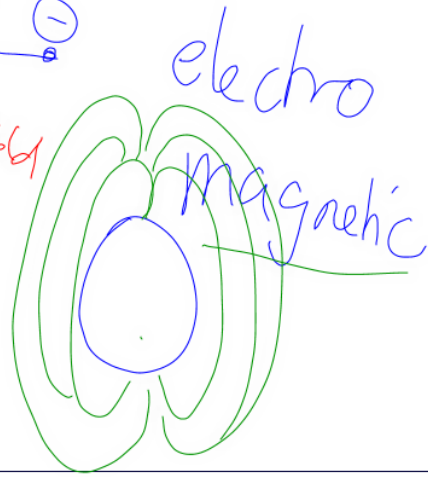
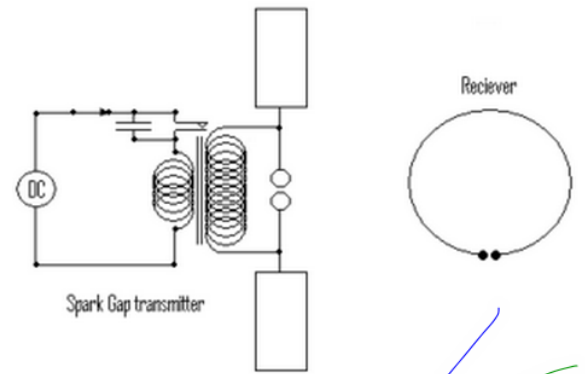
*wireless means shared media*

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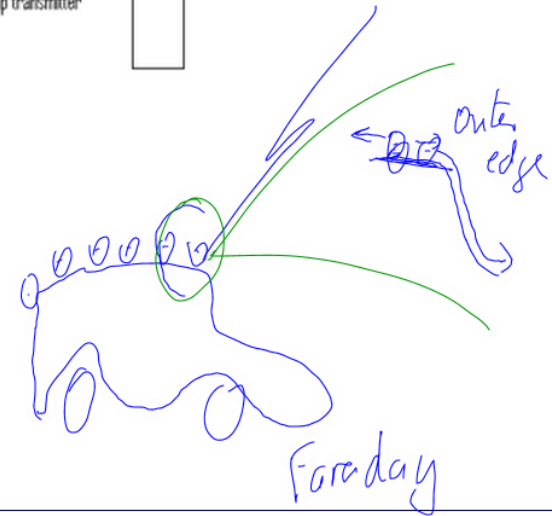
# The Real Researchers

- Michael Faraday (1791 - 1867),
- James Clerk Maxwell (1831 - 1879) and
- Heinrich Rudolf Hertz (1857 - 1894) established the theory for the understanding of electromagnetic waves

[Source: Magne Pettersen, Wikipedia]



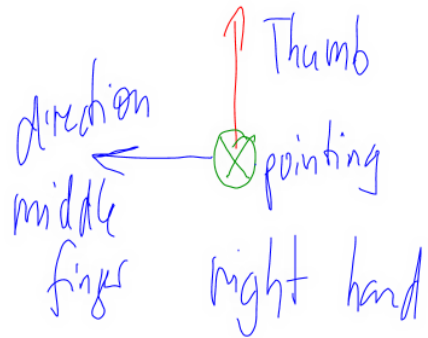
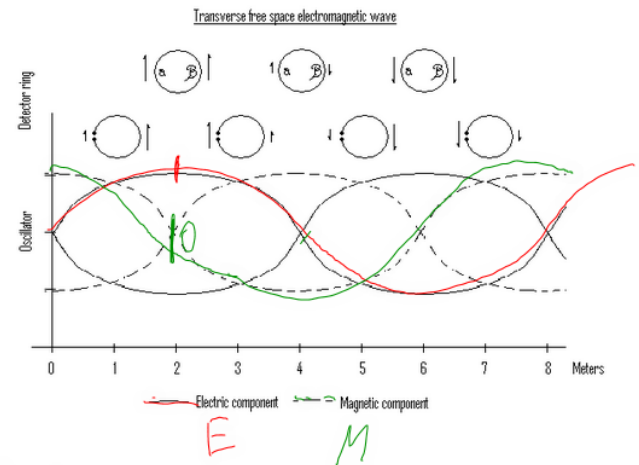
EM-wave



# Heinrich Hertz - The Electromagnetic Wave

Hertz did not realise the practical importance of his experiments. He stated that, "It's of no use whatsoever[...] this is just an experiment that proves Maestro Maxwell was right - we just have these mysterious electromagnetic waves that we cannot see with the naked eye. But they are there." [3]

Asked about the ramifications of his discoveries, Hertz replied, "Nothing, I guess." [3]



# History Of Wireless Communications

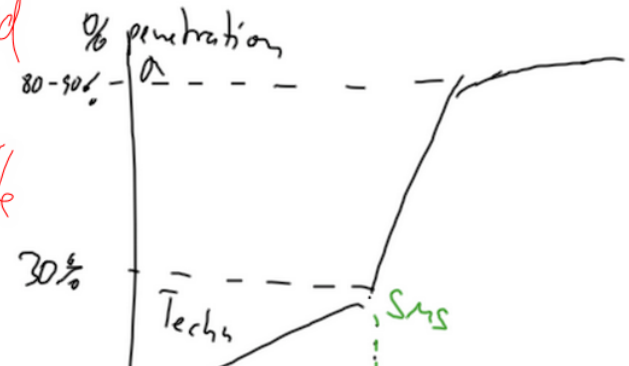
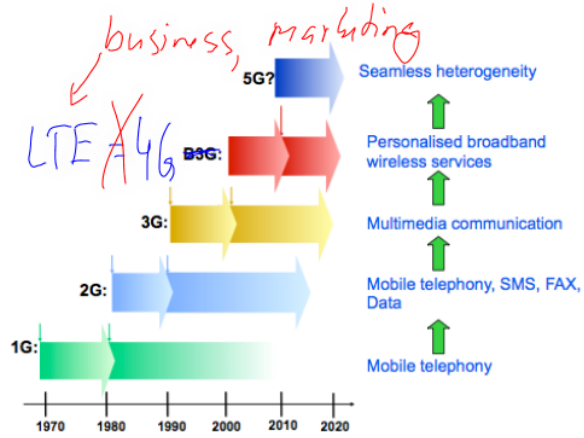
while 1G and 2G were all about radio interfaces,

- 3G and Beyond 3G (B3G) are all about services
- 4G is using mobile broadband everywhere
- 5G will be truly heterogeneous network

4G: ITU = (IMT-A)


## Comments

↑ 1 Gbit/s fixed  
 100 Gbit/s mobile



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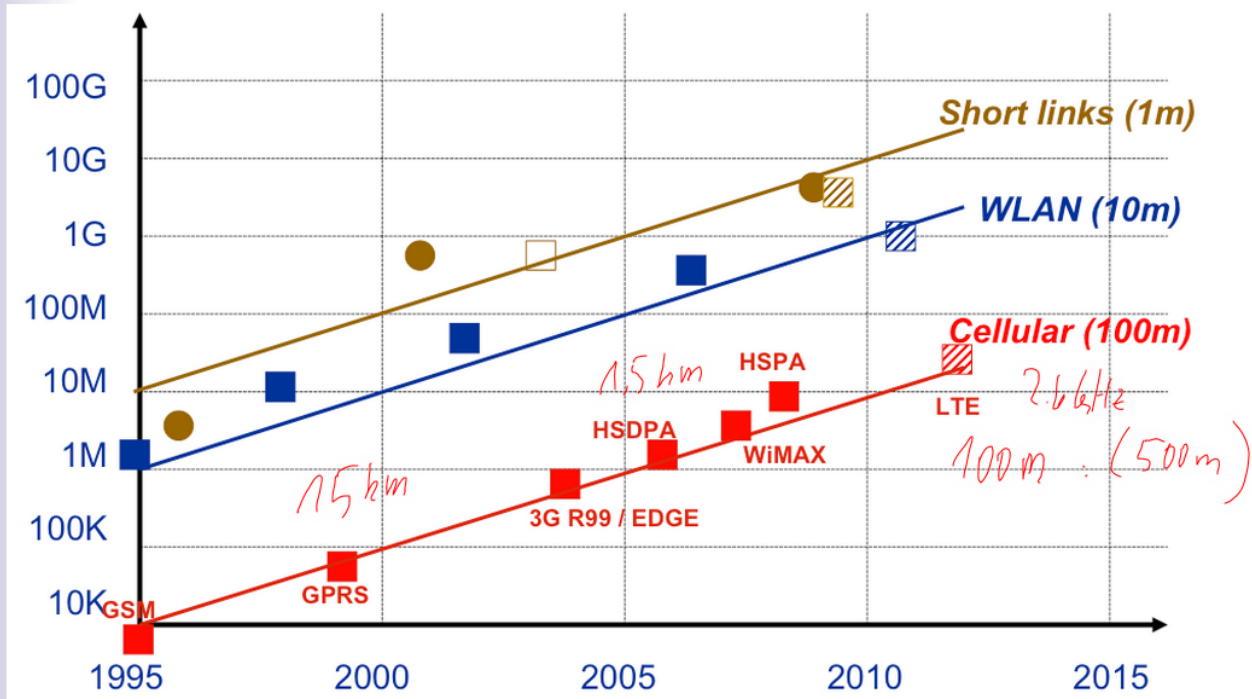


## Current Wireless Technologies

- Ultra short range
  - RFID, NFC
- Vicinity
  - Bluetooth, Wibree, Zigbee, WiMedia,
  - ANT+, Bluetooth Smart (Low Energy)
- Local area
  - Wireless LAN, 802.11 family
  - Wireless telephony: DECT (Digital Enhanced Cordless Telecommunications)
- Mobile Communications:
  - NMT
  - GSM
  - 3G: UMTS
  - IMT-A
  - 5G(?)

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# Mobile Communication



[Presentation G. Fettweis, IEEE VTC forum Baltimore],  
<http://www.ieeevtc.org/plenaries/vtc2007fall/28.pdf>



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www.zdnet.com/what-is-super-wi-fi-7000010802/

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Topic: Wi-Fi Discover Follow via: RSS Email

# What is "Super Wi-Fi?"

**Summary:** The Washington Post is reporting that the US Federal Communications Commission wants to "create super WiFi networks." So what are they talking about anyway?

By Steven J. Vaughan-Nichols for Networking | February 5, 2013 -- 01:27 GMT (17:27 PST)  
Follow @sjvn

According to The Washington Post, the US Federal Communications Commission's (FCC) chairman Julius Genachowski "wants to create super WiFi networks across the nation, so powerful and broad in reach that consumers could use them to make calls or surf the Internet without paying a cellphone bill every month." Oh yes, and this will be "free."

This new Wi-Fi "would be much more powerful than existing WiFi networks that have become common in households. They could penetrate thick concrete walls and travel over hills and around trees. If all goes as planned, free access to the Web would be available in just about every metropolitan area and in many rural areas."

*range | Capacity*

Later this decade we may get "super Wi-Fi," but it won't be free and its speeds will be in the 4G range.

In a statement, Genachowski said "Freeing up unlicensed spectrum is a vibrantly free-market approach that offers low barriers to entry to innovators developing the technologies of the future and benefits consumers."

That sounds like the best thing ever doesn't it? It only leaves me with one little question: "What the heck is super Wi-Fi anyway!?"

OK, so I'll tell you. First, it's not as new as it might sound. According to sources at the FCC, "This is not a new idea or proposal – it's about the availability and use of white space for unlicensed

**61** Comments  
0 Votes  
143 Likes  
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## Meeting Calendar

- will be published through this wiki: <http://cwi.unik.no/wiki/UNIK4700>
- see also lectures from earlier years

based on

- your topics
- the goal we want to achieve

*— knowledge in new areas*

*get the academic way of treating problems*

*\* 1 — book, scientific articles*

- evaluate them, decide on where to focus*
- present the results*

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