

Please visit: <http://cwi.unik.no/wiki/UNIK4700>

starting at 09:15

marshed Mohamed

- Interference
- 12Sep2014 - Wave Propagation
- 19Sep2014 - Radiation equation, Antennas
- 26Sep2014 - Propagation models: Yun Ai
- 26Sep2014 - Frequency range and type of wireless communications - Raul
- GSM and UMTS (cell breathing)
- 17Oct2014 - LTE - Solomon
- 17Oct2014 -Voice in LTE - Mikhail Yakubovich
- 10Oct2014 - WiFi long range standards - Mohsen
- 10Oct2014 - WIMAX - Qihaoli
- 10Oct2014 - Security in NFC - Seraj

#### Part II assignments

- Cell capacity, System capacity
- Traffic Modelling
- Mobility
- Basic Internet (free access to basic information (text & pictures) on the Internet)
- inverse MVNO: the customer owns the access network
- WLAN system for video communication
- ... (any other topic which you might find interesting)
- 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
- Najj: Basics of Handover, examples from GSM and UMTS
- Gerard: Attenuation of tropical rain forest in GSM (?), Wifi and WIMAX

#### Earlier Assignments

- LTE - Andreas
- WRAN - Hemdan
- WIMAX - Reidar
- WiBree - Anders T.
- WiMedia - Eystein
- Wireless USB - Simen
- NFC - Shabnam
- Wireless HART - Magnus

#### Ali Zaher - NFC (2012)

- [Media:Master thesis lu NFC.pdf](#)
- [Media:UNIK4700 Security in NFC.pdf](#)
- [Media:Specific\\_absorption\\_rate\\_nfc.pdf](#)
- [Media:medical\\_devices\\_nfc.pdf](#)
- [Media:Components of the RFID System.pdf](#)
- Book:RFID Handbook Fundamentals and Applications in Contactless Smart Cards
- Radio Frequency Identification and Near Field Communication Third Edition,
- Parts related to passive devices Type 1 tags and NFC-A Tech: [Media:NFC\\_forum](#)

#### Dag Ove Eggum: WIMAX (2012)

- [File:Achieving Wireless Broadband with WiMax.pdf](#)
- [Media:IEEE 802.16 Standards - The working group and documents.pdf](#)
- [Media:Sleep Mode Operation - WiMax.pdf](#)
- [Media:The WiMax IEEE 802.16e Physical Layer Model.pdf](#)
- [Media:Wimax - Current Performance Benchmarks and Future Potential.pdf](#)

#### Håvard Austad:

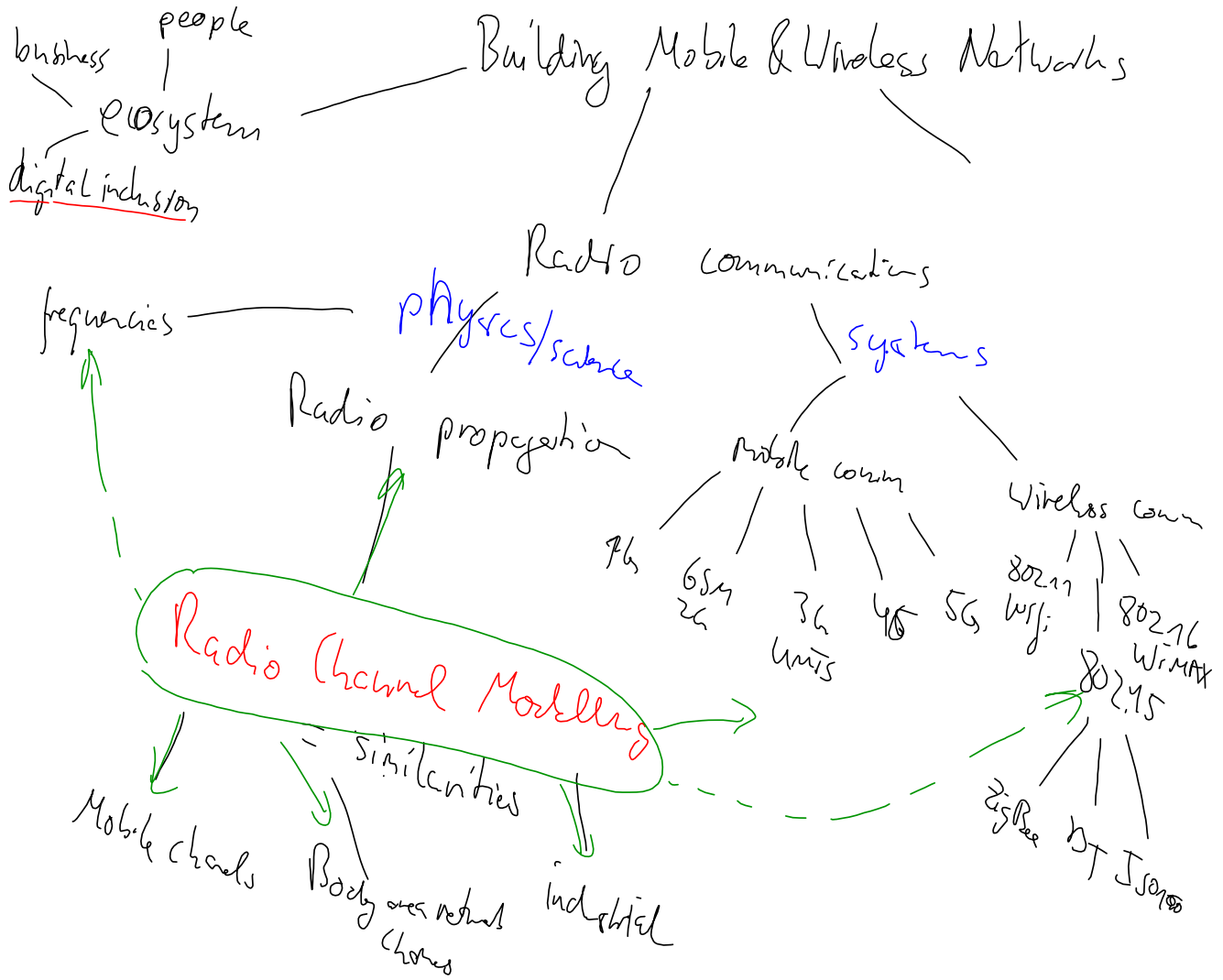
- [Media:UNIK4700-Antennas.pdf](#) Introduction to patch antennas
- Book: Stallings; Wireless Communications & networks

## Potential set-up

- short phone/conf for status every week
- block seminar (complete day) 1/month
- tentative seminar dates:

28Aug, (10)/11Sep, (8)/9Oct, 29(30)Oct,  
(26)/27Nov, Exam (10)/11Dec

- phone call: every Friday at 09:15 during lecture hours (some to be delayed to Monday)



[http://cwi.unik.no/wiki/Simulations\\_of\\_handover\\_in\\_wireless\\_communications](http://cwi.unik.no/wiki/Simulations_of_handover_in_wireless_communications)

- 1 Wireless Handover Simulations
  - 1.1 Participants
- 2 Handover Scenarios
  - 2.1 Scenario 1: UMTS, GSM handover
    - 2.1.1 Input Parameters
    - 2.1.2 Analysis and explanation
    - 2.1.3 Conclusions
  - 2.2 Scenario 2: Leaving the ferry
    - 2.2.1 Input Parameters
    - 2.2.2 Analysis and explanation
    - 2.2.3 Conclusion
  - 2.3 Scenario 3: Walking in the park
    - 2.3.1 Input Parameters
    - 2.3.2 Conclusion
- 3 System parameters
  - 3.1 Output Parameters
  - 3.2 Implementation
  - 3.3 System parameters for WiMAX 802.16e
  - 3.4 References
- 4 Propagation models
  - 4.1 Parameters
    - 4.1.1 Input Parameters
    - 4.1.2 Output Parameters
  - 4.2 Models
    - 4.2.1 Free Space
    - 4.2.2 Okumura
    - 4.2.3 Hata model
    - 4.2.4 Lee's model
    - 4.2.5 ETSI vehicular
  - 4.3 MATLAB Code
  - 4.4 Discussion
- 5 Antennas

[\[edit\]](#)**Wireless Handover Simulations**

Handover Scenarios

System parameters

Propagation models

Antennas

Fading

Simulation results

Software &amp; Background

One of the ongoing discussions in radio systems is the required time for handover between access points. This wiki page explains the background for the software package: **Radio network planning and handover: Programming framework for radio propagation and handover evaluation**. It provides an overview over the phenomena, gives a set of typical input parameters for wireless/mobile simulations and presents typical results for mobile and wireless handover.

The main goal by creating the software simulation tools addressed

- Understand the typical cell/coverage sizes in mobile and wireless systems.
- Understand on how cell size and cell dimensions affect handover.

Simulations

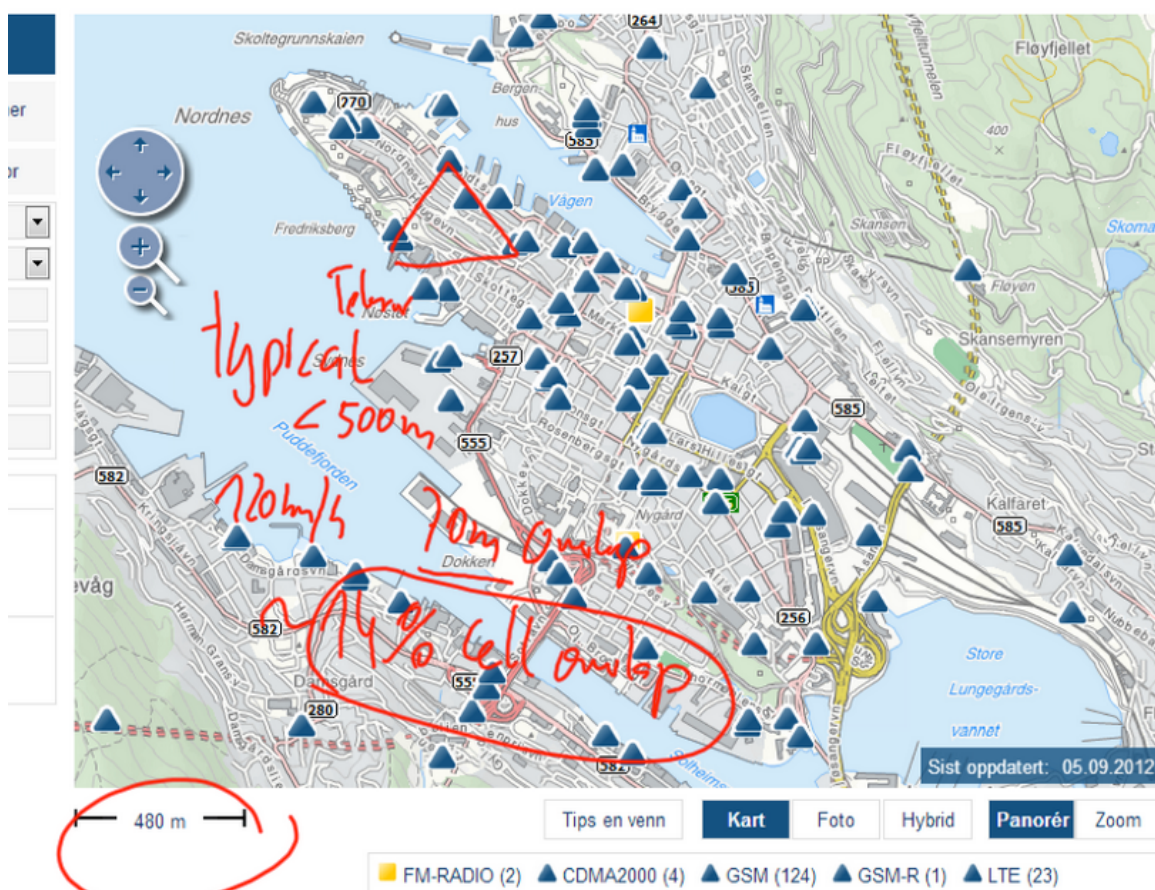
- [Click here to read more about our scenarios...](#)
- [Click here to see the simulation results](#)

## Participants [\[edit\]](#)

The initial work was performed as part of the UNIK4700 course on Radio and Mobility in autumn 2012. [UNIK4700H12Participants](#) contributed to the first solution, and invite everyone to contribute to the simulation tool.

handover is dominated by capacity and quality considerations

- previously: coverage



## **TOC - Network Building**

- *Future Networks: Heterogeneity, Basic Internet, Video Distribution Networks*
- *Coverage simulations*
- *Traffic simulations*
- *Network Capacity simulations*



Antennas:

- gain

$$g \sim \left( \frac{D}{\lambda} \right)^2$$

max as compared to

$$10 \log \left( \frac{P}{P_0} \right)$$

$$20 \log \left( \frac{E}{E_0} \right)$$

- directivity

$$\Theta_{3dB} \sim \frac{\lambda}{D}$$

isotropic  
30 dB

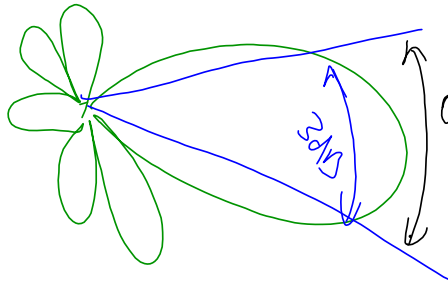
$$\frac{P}{1W}$$

$$dB_m$$

$$\frac{P}{1mW}$$

$$\frac{D}{\lambda}$$

dimension



Typical values

Type	Gain	Microstrip
mobile phone	~ 3 dB	magnetic gap
Base station	~ 14-20 dB	
dish directivity	~ 25-40 dB	

**History, Now and Future**

- History
- Pioneers: Maxwell, Hertz,...
- 1G, 2G, ... 5G networks
- Frequencies and Standards
- Future Challenges

**A-Basics of Communication**

- Electromagnetic Signals *Myquist*
- Radio Communication Principles
- Digital communication: Signal/Noise Ratio
- Signal strength and Capacity: Shannon

**B-Antennas and Propagation**

- Free Space Propagation
- Antennas, Gain, Radiation Pattern
- Multipath Propagation, Reflection, Diffraction
- Attenuation, Scattering *know*
- Interference and Fading (Rayleigh, Rician, ...)
- Mobile Communication dependencies  $E_b/N_0 \sim SNR$

**C-Propagation models**

- Environments (indoor, outdoor to indoor, vehicular) *reduce*
- Outdoor (Lee, Okumura, Hata, COST231 models)
- Indoor (One-slope, multiwall, linear attenuation)

**D-System Comparison**

- Proximity: RFID, NFC
- Short Range: ZigBee, Bluetooth, ANT+,...
- WLAN/Wifi/802.11...
- Mobile: GSM, UMTS, IMT-A (WiMAX, LTE)

**E-Mobility**

- Mobile Network mobility
- IP mobility

**F-Network Building**

- Future Networks
- 5G Heterogeneous Networks
- Basic Internet
- Video Distribution Networks
- Coverage simulations
- Coverage simulations *Simulation*
- Traffic simulations
- Network Capacity simulations

Building ... Networks

# Course Topics (adopt)

$$C = B \cdot \log_2(1 + SNR)$$

*Proximity (Personal Area Networks)*  
*open, example: WPAN*  
*- "Physics"*

*Proximity (start from earlier assignments)*  
*& literature, Wikipedia*  
*? chip inside?*

## ⌘ The real researchers [\[edit\]](#)

- 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]

## ⌘ Heinrich Hertz - The electromagnetic wave [\[edit\]](#)

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]

## ⌘ The real researchers [\[edit\]](#)

Guglielmo Marconi (1874 - 1937) experimented with Hertz waves in 1894/1895

- used 50000 UK pound on a transatlantic experiment in 1901
- brought electromagnetics to life

[Source:Magne Pettersen, Wikipedia]

## ⌘ The real researchers - Graham Bell [\[edit\]](#)

- Graham Bell (1874 -1922) invented the phone,...
- but who invented also the mobile phone back in 1924?

Bell considered his most famous invention an intrusion on his real work as a scientist and refused to have a telephone in his study

[Source:Magne Pettersen, Wikipedia]

Note for Josef (keywords, discuss with Neill):

- has synonyms
- relates to