NAJI KADAH

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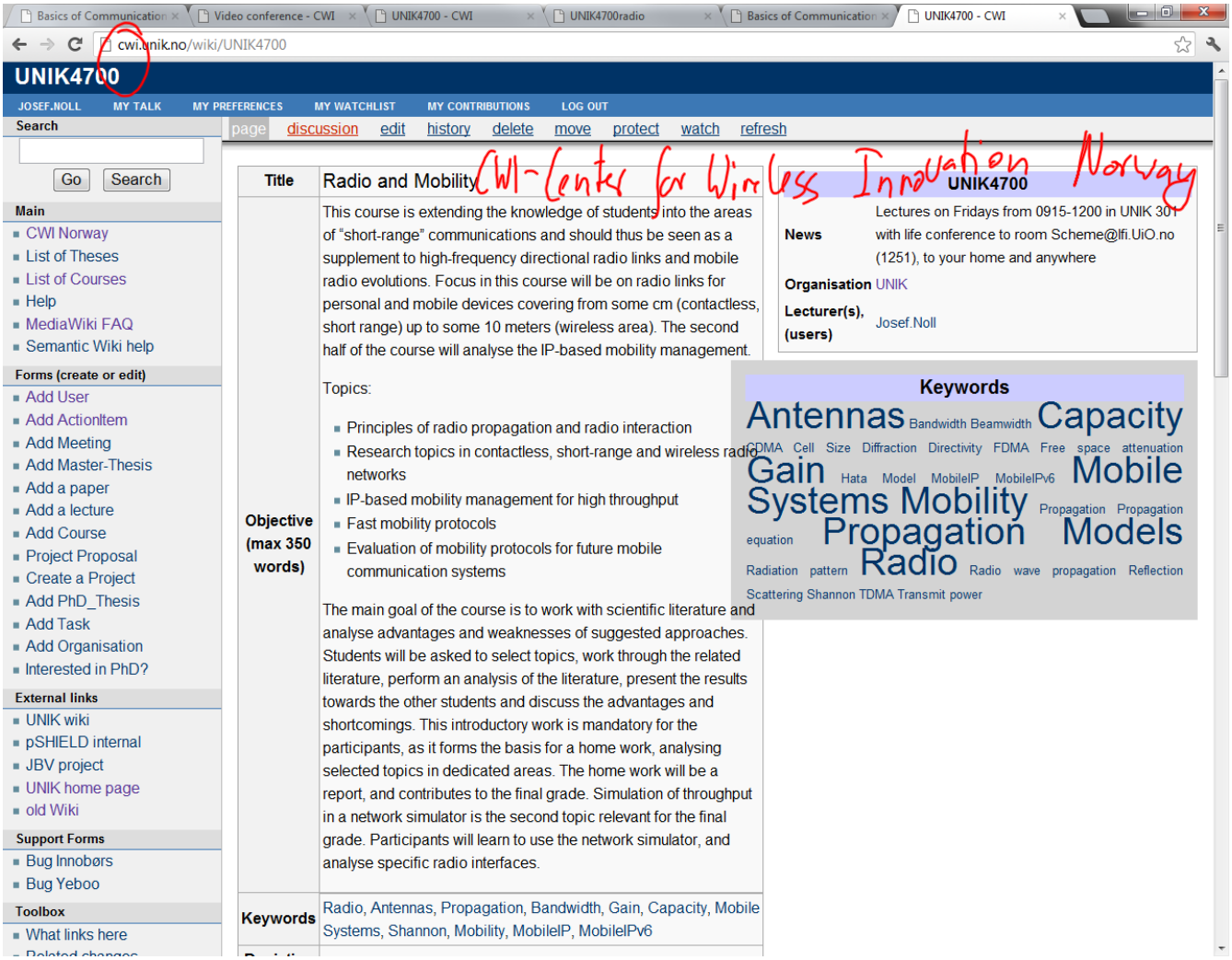
Basics of Communication
Video conference - CWI
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UNIK4700radio
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Create a Project
Add PhD_Thesis
Add Task
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pSHIELD internal
JBV project
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Bug Yeboo
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page
discussion
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history
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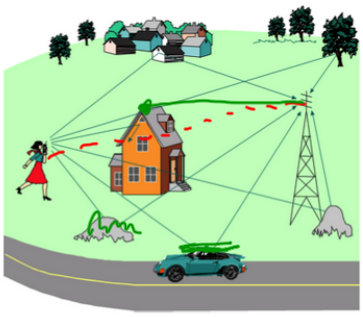
protect
watch
refresh
CWI - Center for Wireless Innovation Norway
Title
Radio and Mobility
Objective (max 350 words)
This course is extending the knowledge of students into the areas of "short-range" communications and should thus be seen as a supplement to high-frequency directional radio links and mobile radio evolutions. Focus in this course will be on radio links for personal and mobile devices covering from some cm (contactless, short range) up to some 10 meters (wireless area). The second half of the course will analyse the IP-based mobility management.
Topics:
Principles of radio propagation and radio interaction
Research topics in contactless, short-range and wireless radio networks
IP-based mobility management for high throughput
Fast mobility protocols
Evaluation of mobility protocols for future mobile communication systems
The main goal of the course is to work with scientific literature and analyse advantages and weaknesses of suggested approaches. Students will be asked to select topics, work through the related literature, perform an analysis of the literature, present the results towards the other students and discuss the advantages and shortcomings. This introductory work is mandatory for the participants, as it forms the basis for a home work, analysing selected topics in dedicated areas. The home work will be a report, and contributes to the final grade. Simulation of throughput in a network simulator is the second topic relevant for the final grade. Participants will learn to use the network simulator, and analyse specific radio interfaces.
Keywords
Radio, Antennas, Propagation, Bandwidth, Gain, Capacity, Mobile Systems, Shannon, Mobility, MobileIP, MobileIPv6
UNIK4700
News
Lectures on Fridays from 0915-1200 in UNIK 301 with life conference to room Scheme@lfi.UiO.no (1251), to your home and anywhere
Organisation
UNIK
Lecturer(s), (users)
Josef.Noll
Keywords
Antennas
Bandwidth
Beamwidth
Capacity
CDMA
Cell
Size
Diffraction
Directivity
FDMA
Free
space
attenuation
Gain
Hata
Model
MobileIP
MobileIPv6
Mobile
Systems
Mobility
Propagation
Propagation
equation
Propagation
Models
Radio
Radiation
pattern
Radio
wave
propagation
Reflection
Scattering
Shannon
TDMA
Transmit
power

What Will We Learn Today



LOS ~~Line-of-sight~~

NLOS multipath

- reflection
- diffraction
- Scattering

- basics of radio communication
- sampling theorem
- typical radio transmission
- what effects the signal strengths

1 h Basics of communication

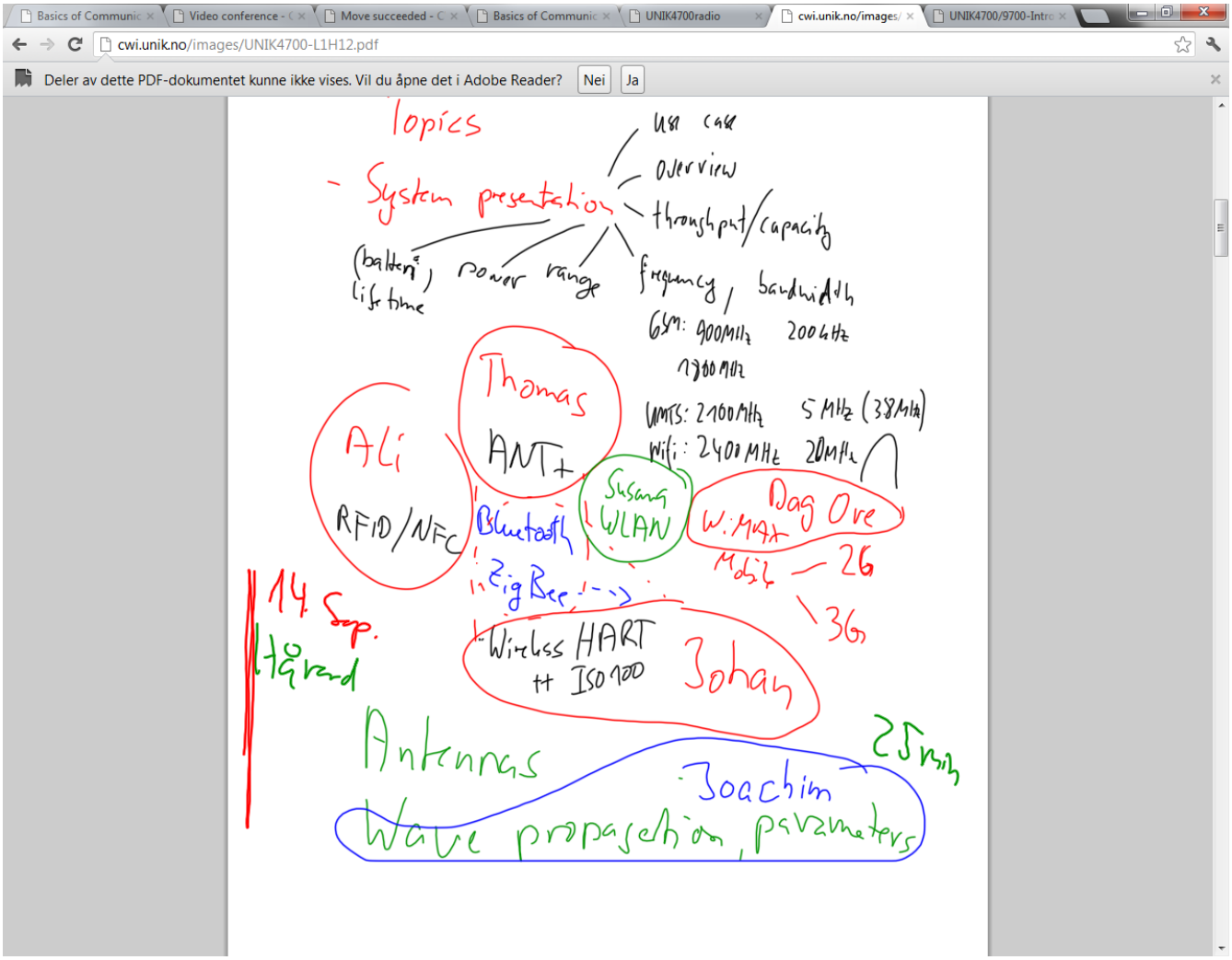
→ break

Schedule for presentations ✓

Block seminar Thurs – Friday

physical meeting 11:00 15:00

Questions regarding literature ✓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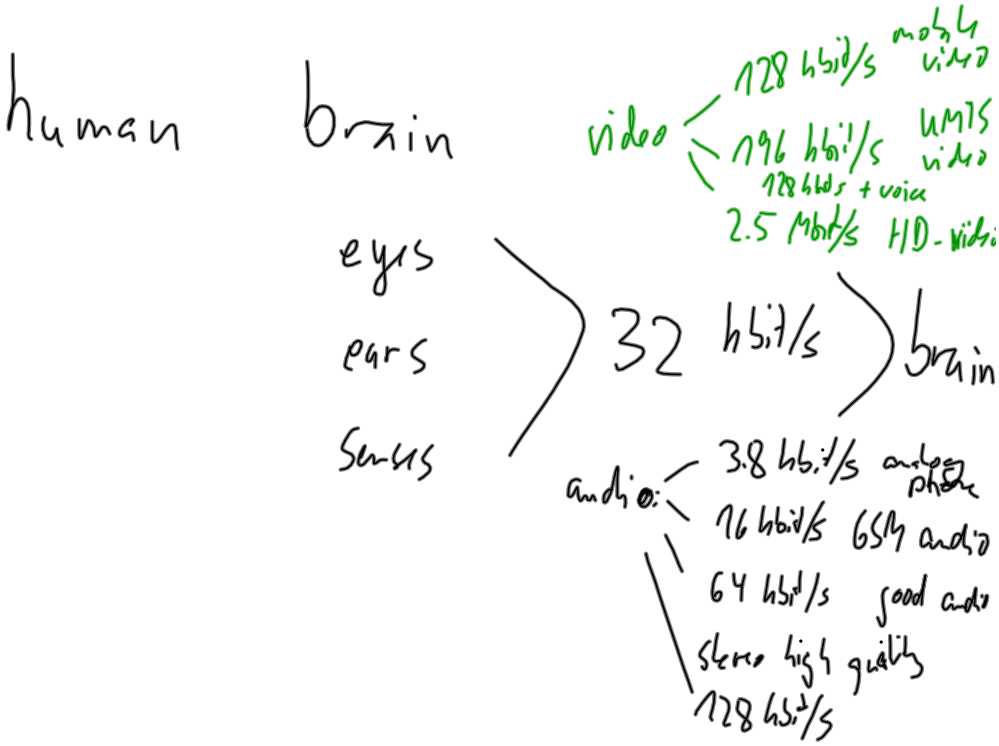
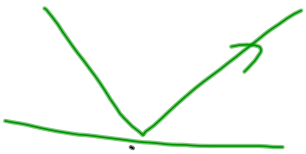
Topics
- System presentation
User case
Overview
throughput/capacity
(battery) lifetime
power
range
frequency / bandwidth
GSM: 900MHz 200kHz
1800MHz
UMTS: 2100MHz 5 MHz (3.84MHz)
Wifi: 2400 MHz 20MHz
Thomas
ANT+
Ali
RFID/NFC
Bluetooth
ZigBee
Susana
WLAN
Dag Ove
W-MAX
Mobil
26
36
14 Sep.
Wireless HART
++ ISO100
Johan
Antennas
25 min
Joachim
Wave propagation, parameters


human brain
eyes
ears
senses
32 bit/s
brain
video
128 kbit/s
196 kbit/s
128 kbit/s + voice
2.5 Mbit/s
audio:
3.8 kbit/s
16 kbit/s
64 kbit/s
stereo high quality
128 kbit/s

Reflection



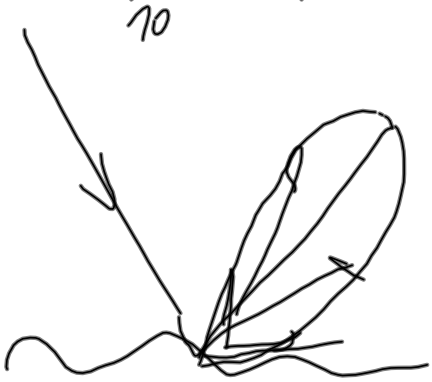
ideal reflection

Diffraction

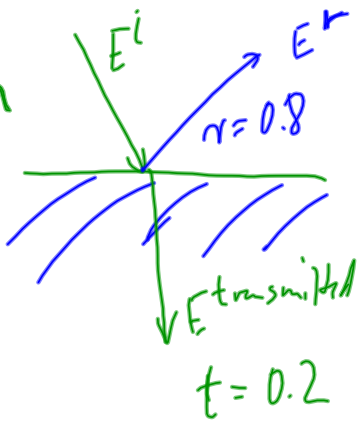
corner → point
edge → cylinder wave

Scattering ← reflection on rough surfaces hitting an object

$\frac{\lambda}{10} < d < 10\lambda$

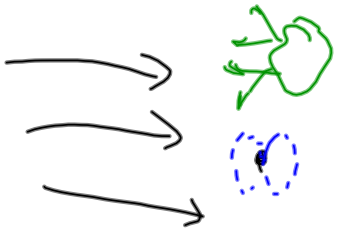


Reflection & absorption



reflection coefficient $\vec{r} = \frac{\vec{E}_{reflected}}{\vec{E}_{incident}}$

scattering



Wavelength

$f \rightarrow \lambda$ $\quad c = \lambda \cdot f \quad [\frac{m}{s}]$ $\quad \lambda = \frac{c}{f} = \frac{3E8\ \frac{m}{s}}{1E6\ MHz}$

$$\lambda = \frac{c}{f} = \frac{3E10\ \frac{cm}{s}}{1E9\ GHz}$$

$$\lambda = \frac{300\ m}{f\ [MHz]}$$

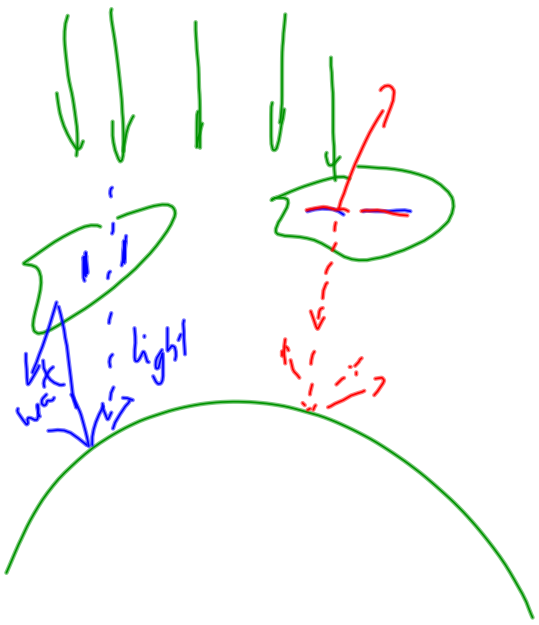
FM = 100 MHz
↝ $\lambda = 3\ m$

f [GHz]	$\lambda = \frac{30\ cm}{f\ [GHz]}$
+450 MHz	
GSM 0.9	~ 30cm
UMTS 2.1	~ 15
Wifi 2.4	~ 12
LTE 2.6	~ 11
↳ LTE800	
Wifi 5.1	~ 6

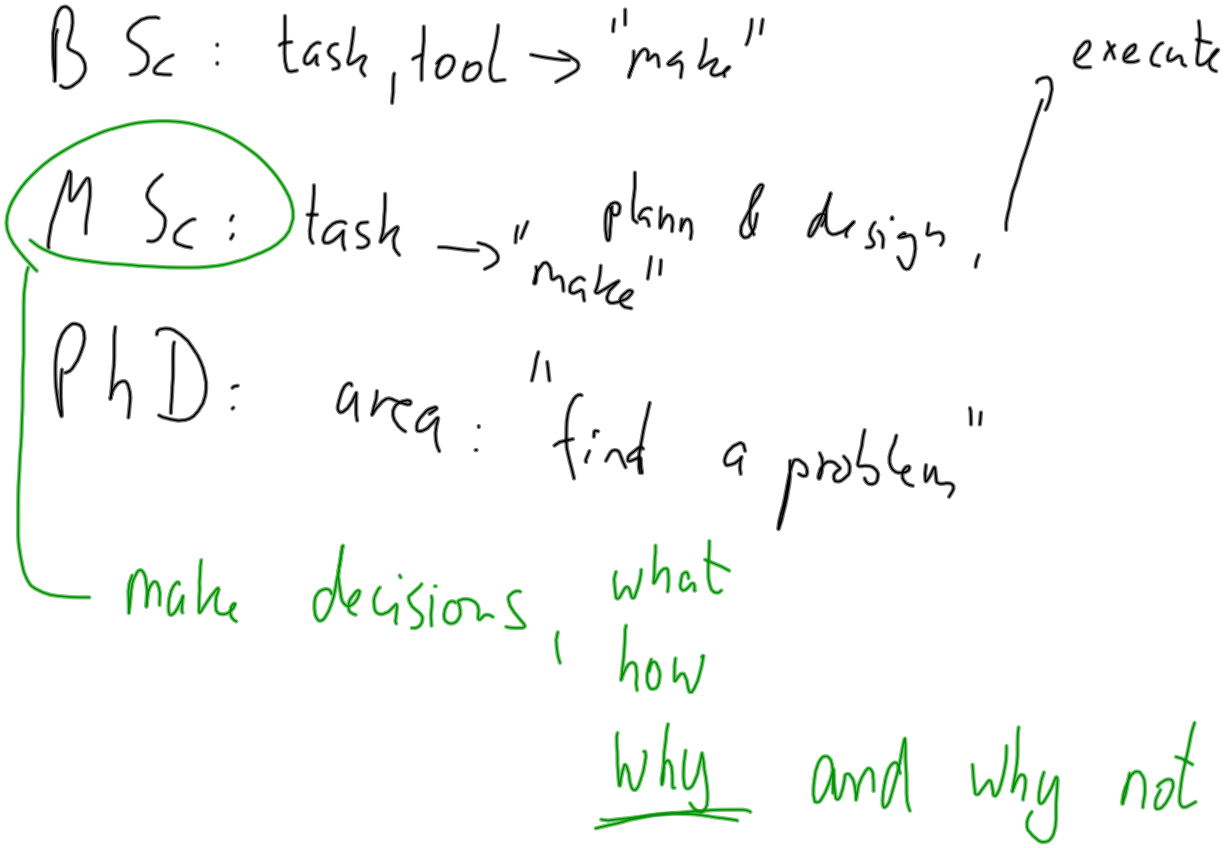
$\lambda < d < 10\lambda$

- branches ($\frac{\lambda}{10}$)
  stems, branches, trunks
- $\frac{\lambda}{2} - \lambda$
  "every vegetation" } snow on trees

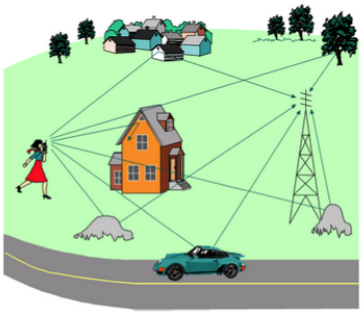
Orientation of ice crystals in clouds



Assignment: Gerard attenuation of equatorial forest on Wi-fi 2.4GHz and Wi-MAX 3.5GHz


B Sc : task, tool → "make"
execute
M Sc : task → "plann & design, "make"
PhD : area : "find a problem"
make decisions, what
how
why and why not

What Will We Learn Today



- basics of radio communication
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- typical radio transmission
- what effects the signal strengths

Transmit Power Tx
incl. antenna gain
Receiver sensitivity
attenuation & scattering
interference – GSM
noise – UMTS
SNR signal to noise ratio
coding, modulation gain
bandwidth