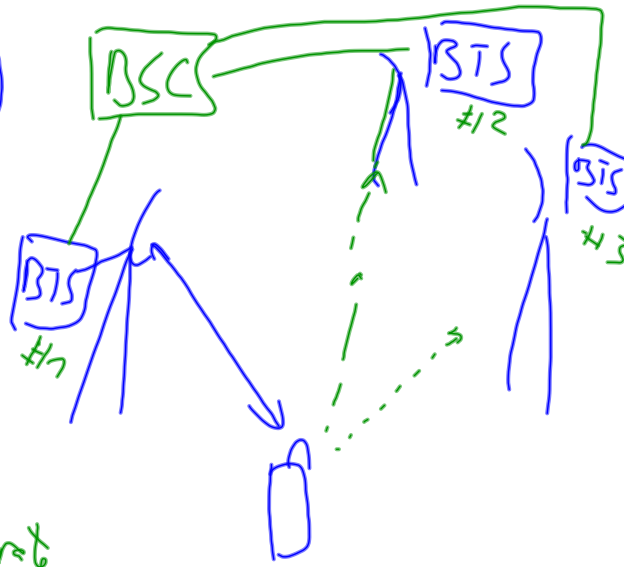
BTS (2G) role in handoff

= node B (3G)

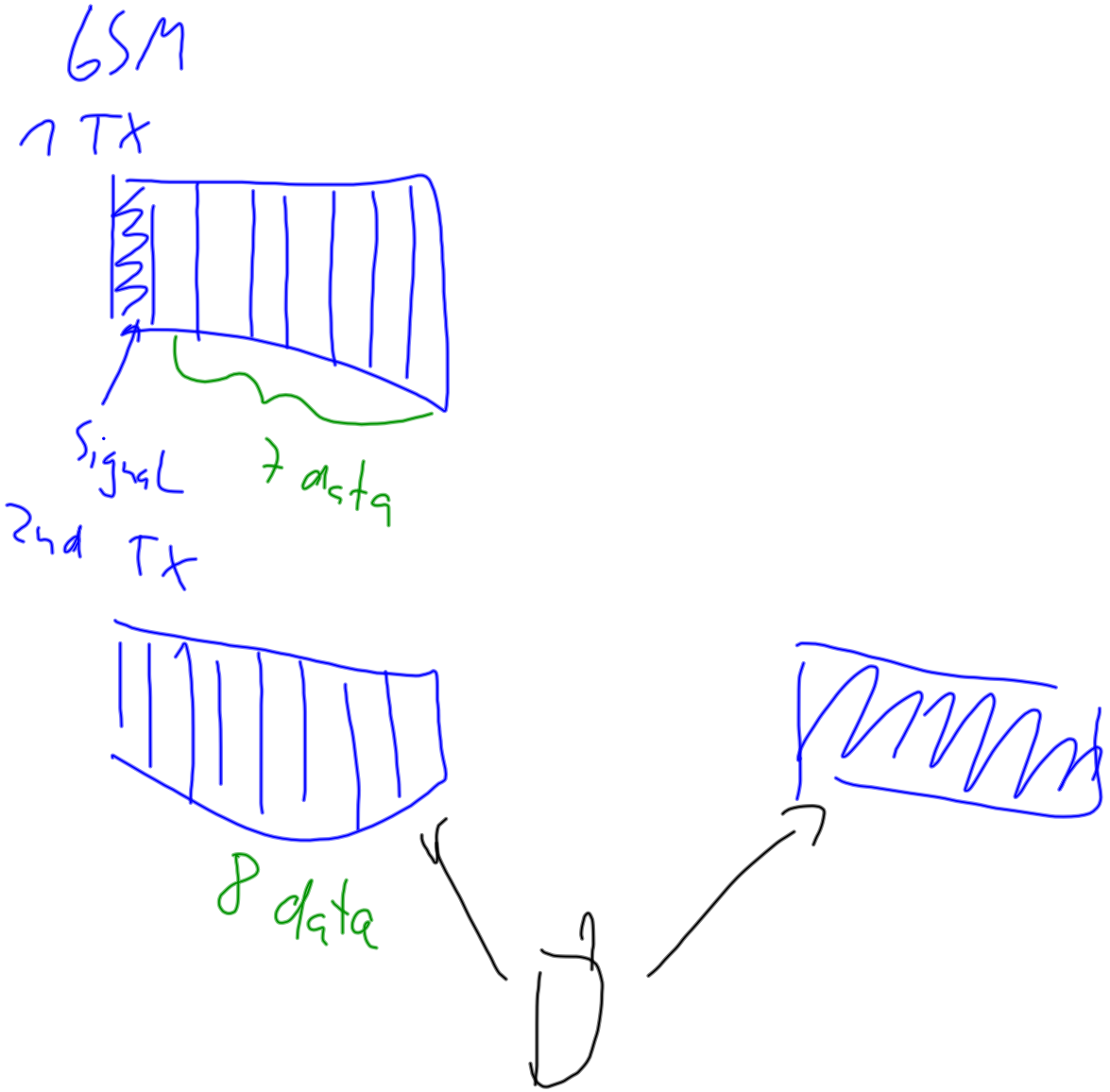


BTS & mob.

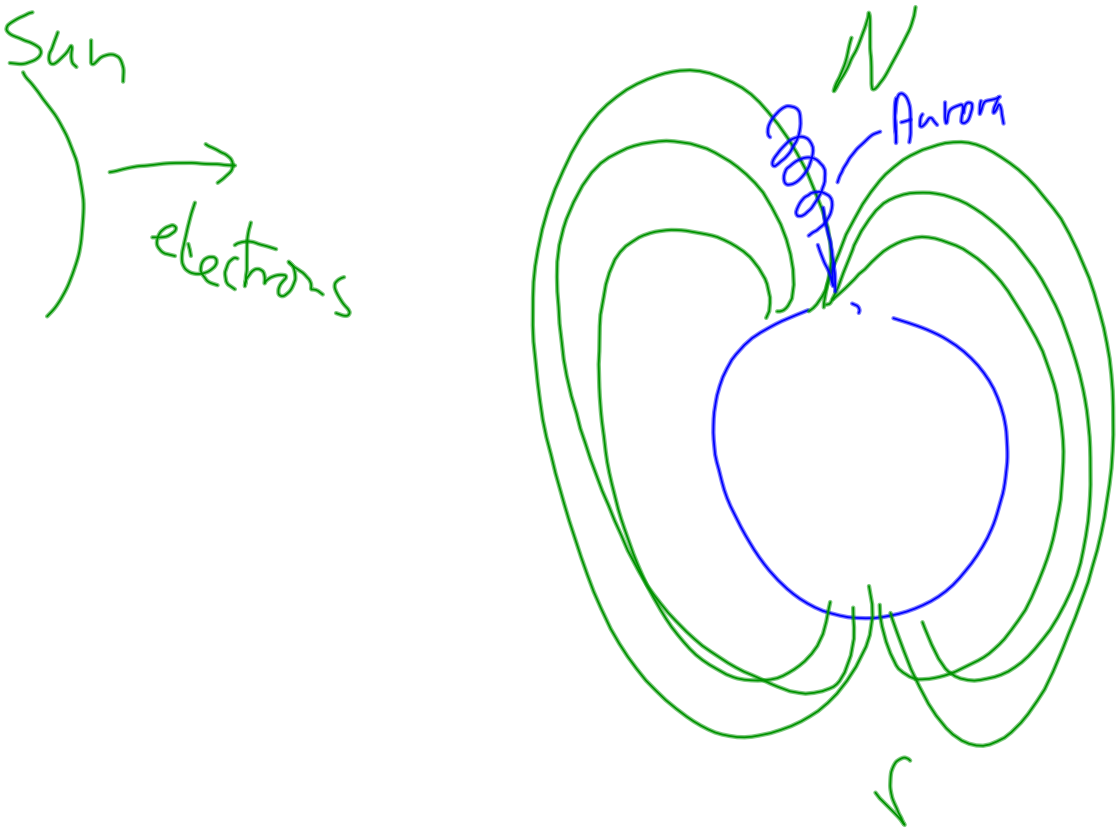
measure e.o.

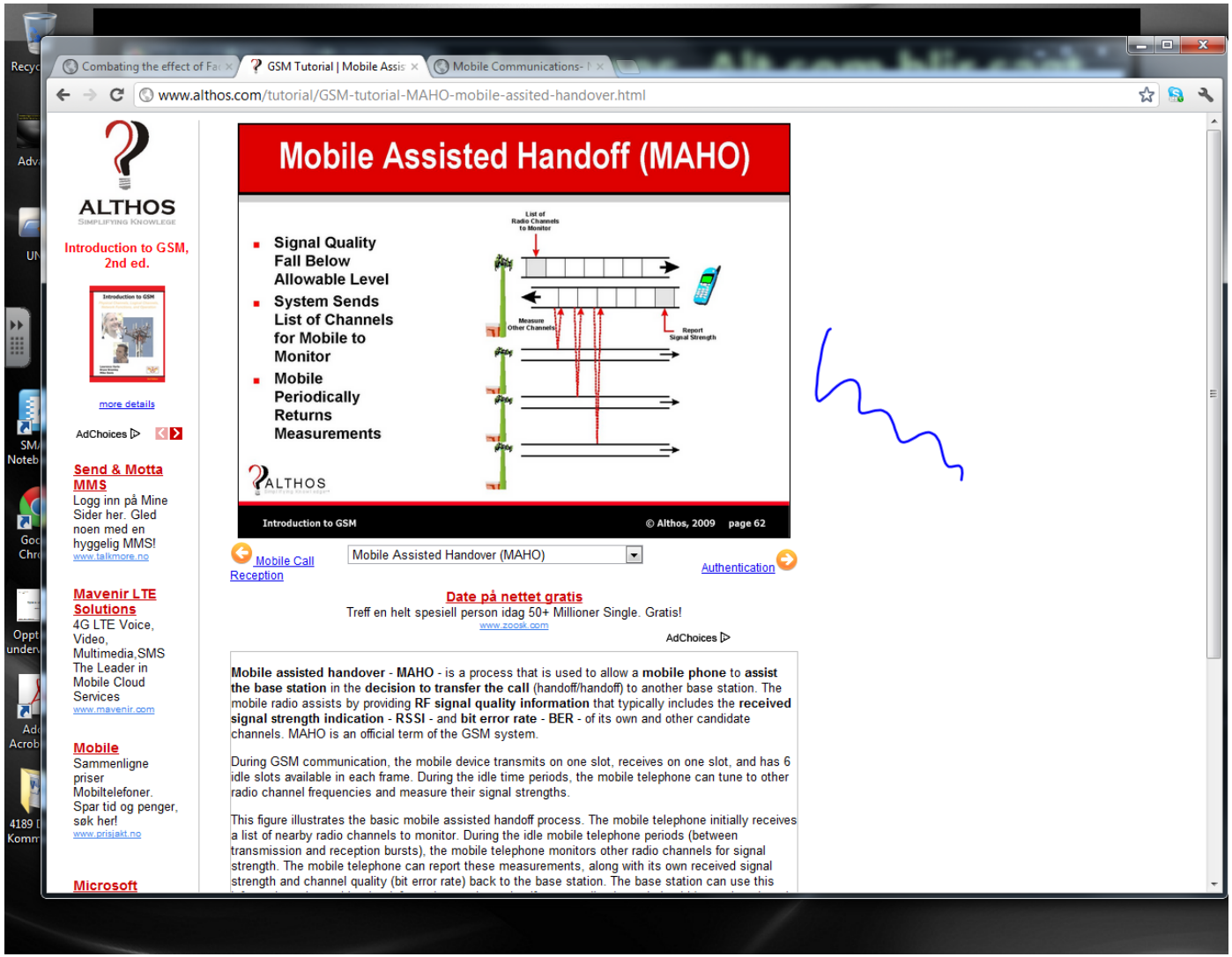
- receive power
- BER, Frame error rate
  bit error rate
- interference
- Neighbour cells signal

1. measure
2. BTS: ok handoff
   2.1 handoff existing call
   2.1 hand-on new cell


GSM
1 TX
Signal
7 data
2nd TX
8 data

MAHO see lecture 26. Jan




Combating the effect of Fa
GSM Tutorial | Mobile Assis
Mobile Communications- I
www.althos.com/tutorial/GSM-tutorial-MAHO-mobile-assited-handover.html
ALTHOS
SIMPLIFYING KNOWLEDGE
Introduction to GSM, 2nd ed.
more details
AdChoices
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Mobile
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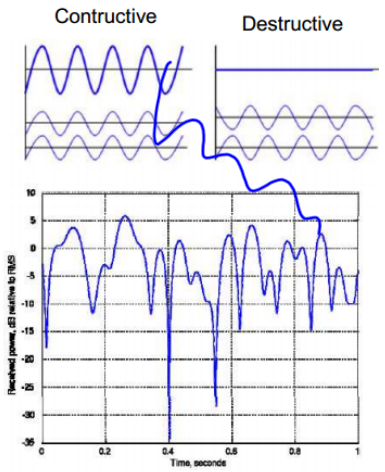
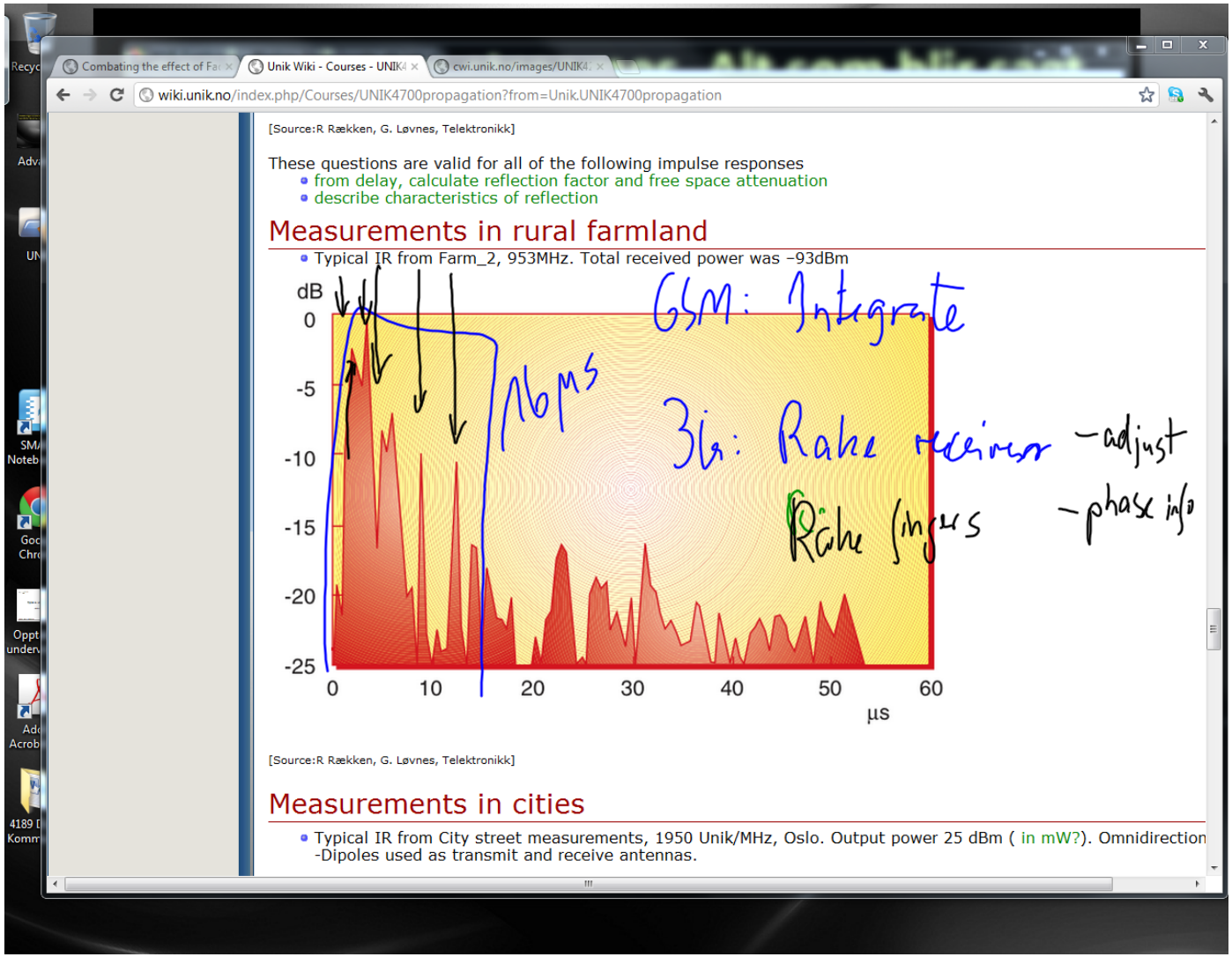
www.prisjakt.no
Microsoft
Mobile Assisted Handoff (MAHO)
Signal Quality Fall Below Allowable Level
System Sends List of Channels for Mobile to Monitor
Mobile Periodically Returns Measurements
List of Radio Channels to Monitor
Measure Other Channels
Report Signal Strength
ALTHOS
Introduction to GSM
© Althos, 2009 page 62
Mobile Call Reception
Mobile Assisted Handover (MAHO)
Authentication
Date på nettet gratis
Treff en helt spesiell person idag 50+ Millioner Single. Gratis!
www.zoosk.com
AdChoices
Mobile assisted handover - MAHO - is a process that is used to allow a mobile phone to assist the base station in the decision to transfer the call (handoff/handoff) to another base station. The mobile radio assists by providing RF signal quality information that typically includes the received signal strength indication - RSSI - and bit error rate - BER - of its own and other candidate channels. MAHO is an official term of the GSM system.
During GSM communication, the mobile device transmits on one slot, receives on one slot, and has 6 idle slots available in each frame. During the idle time periods, the mobile telephone can tune to other radio channel frequencies and measure their signal strengths.
This figure illustrates the basic mobile assisted handoff process. The mobile telephone initially receives a list of nearby radio channels to monitor. During the idle mobile telephone periods (between transmission and reception bursts), the mobile telephone monitors other radio channels for signal strength. The mobile telephone can report these measurements, along with its own received signal strength and channel quality (bit error rate) back to the base station. The base station can use this

Introduction

- Fading leads to-
  - Quick signal variation (Rayleigh, short term)
  - Slow signal variation (lognormal, long-term)
  - Inter-Symbol Interference (ISI)
- Various ways to combat fading-
  - Micro diversity
  - Macro diversity
  - Channel equilizer




Combating the effect of Fa
Unik Wiki - Courses - UNIK4
cwi.unik.no/images/UNIK4
wiki.unik.no/index.php/Courses/UNIK4700propagation?from=Unik.UNIK4700propagation
[Source:R Rækken, G. Løvnes, Telektronikk]
These questions are valid for all of the following impulse responses
from delay, calculate reflection factor and free space attenuation
describe characteristics of reflection
Measurements in rural farmland
Typical IR from Farm_2, 953MHz. Total received power was −93dBm
dB
0
-5
-10
-15
-20
-25
0
10
20
30
40
50
60
µs
GSM: Integrate
16µs
3G: Rake receiver
-adjust
-phase info
Rake fingers
[Source:R Rækken, G. Løvnes, Telektronikk]
Measurements in cities
Typical IR from City street measurements, 1950 Unik/MHz, Oslo. Output power 25 dBm (in mW?). Omnidirection
-Dipoles used as transmit and receive antennas.

Effect of fading (2)

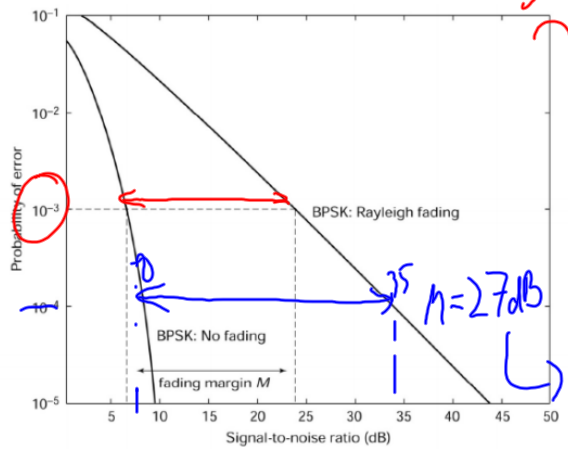
dB: $P_{Rx} = P_{Tx} - L_{loss} + G_{Tx} + G_{Rx}$

$P_{Rx} = -64\,dB_m = 41\,dB_m - 120\,dB + 8\,dB + 3\,dB$

BER for BPSK modulation without fading and with Rayleigh-fading

Fade margin M for BER=10^{-3} is17 dB

$P_{Sensitivity} = -81\,dB_m$



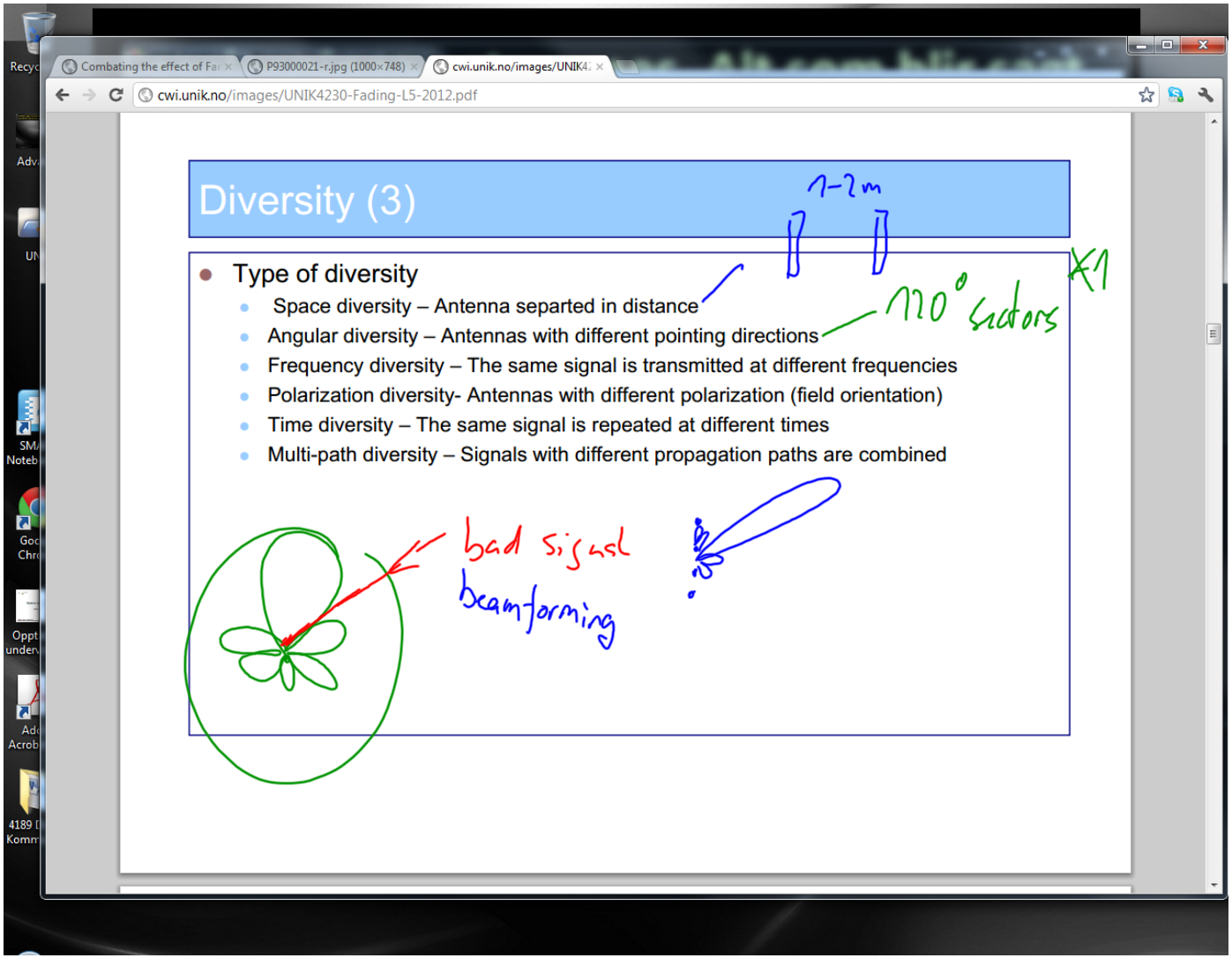
Fading Margin

$M = 17\,dB$

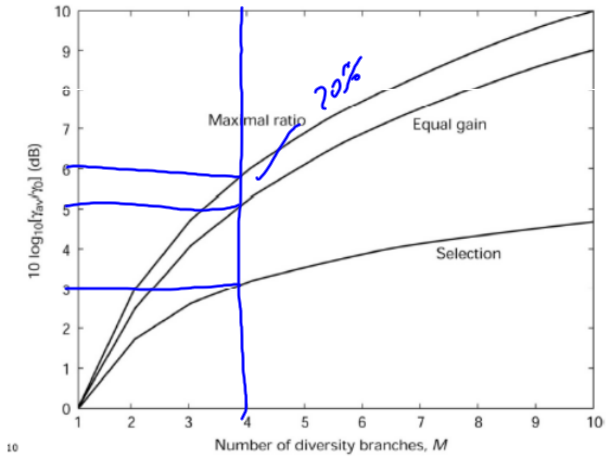
$BER = 10^{-3}$

$M = 27\,dB$

$P_{sens} = -91\,dB_m$

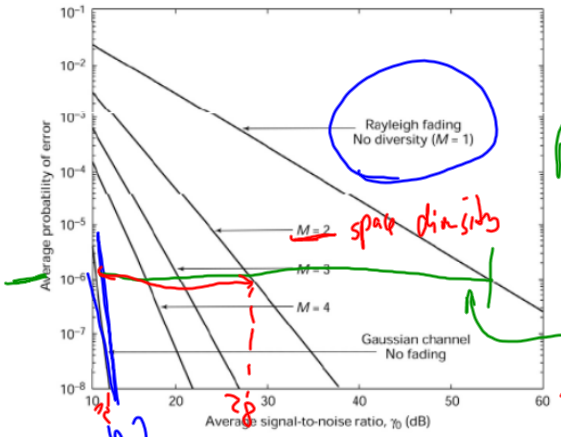

Combating the effect of Fa
P93000021-r.jpg (1000×748)
cwi.unik.no/images/UNIK4
cwi.unik.no/images/UNIK4230-Fading-L5-2012.pdf
Diversity (3)
1-2 m
x1
120° sectors
Type of diversity
Space diversity – Antenna separted in distance
Angular diversity – Antennas with different pointing directions
Frequency diversity – The same signal is transmitted at different frequencies
Polarization diversity- Antennas with different polarization (field orientation)
Time diversity – The same signal is repeated at different times
Multi-path diversity – Signals with different propagation paths are combined
bad signal
beamforming

All results are for an assumption of uncorrelated branches, with a correlation equal to ρ, performance is reduced approx. a factor √ (1-ρ)2



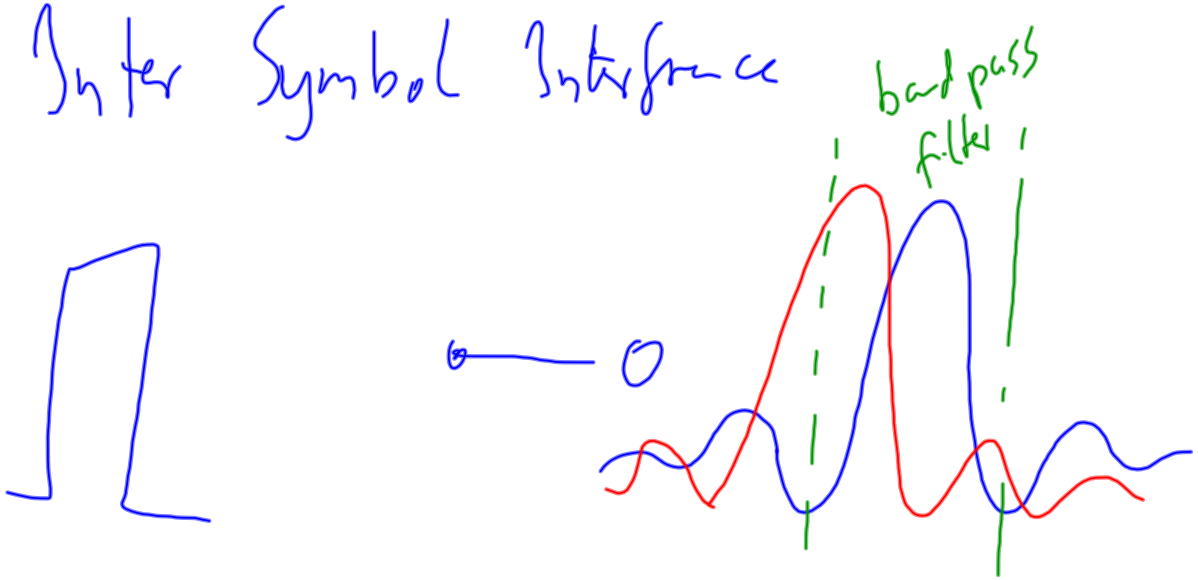
Performance improvement - SC

Performance improvement in terms of BER at diversity – SC -
Average BER for occupational testing for different number of diversity diversity channels (BPSK modulation):

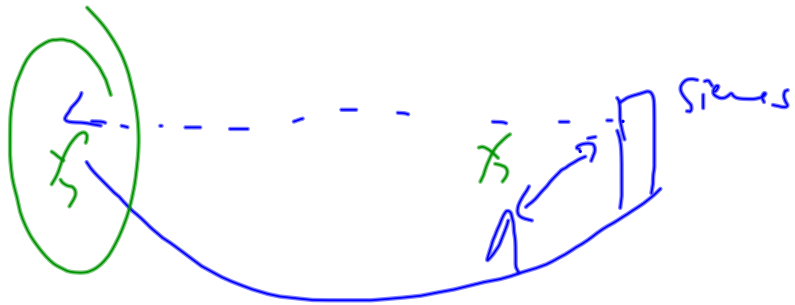


Data comm
BER = 10^{-6}
space diversity
~ 45dB
$\gamma_b \geq 18$ dB
no fading

Inter Symbol Interference



Oslo Lindberg SIEMENS

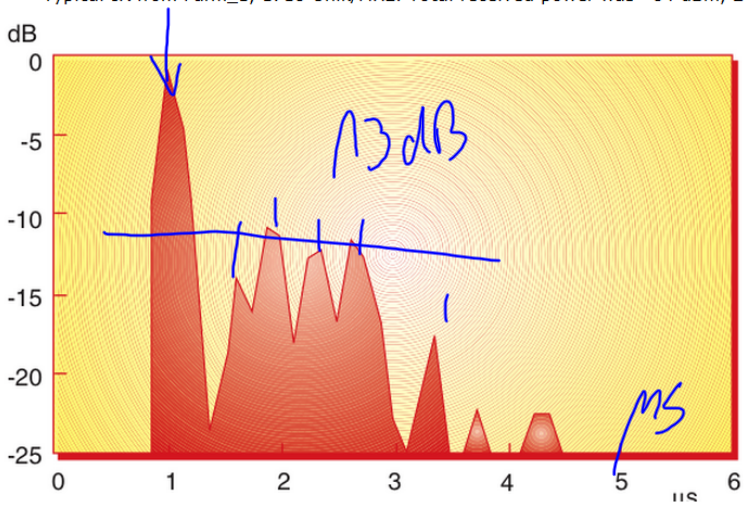


Reflection at a perfectly plane gives a reflection coefficient *r= -1*. When the surface gets rougher, reflection is still in t
main direction, but the reflected power is spread around the main reflection angle. Assuming that no absorption takes
then the total reflected power is constant.

When the surface becomes extremely rough, and with roughness >> *lambda*, then the reflected wave will be scatterec
any direction.

Measurements in rural farmland

- Typical IR from Farm_1, 1718 Unik/MHz. Total received power was –84 dBm, 20 dB above GSM sensitivity level



[Source:R Rækken, G. Løvnes, Telektronikk]

These questions are valid for all of the following impulse responses

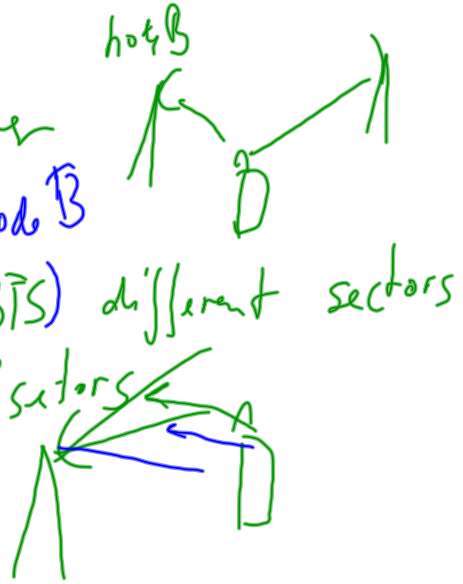
- from delay, calculate reflection factor and free space attenuation
- describe characteristics of reflection

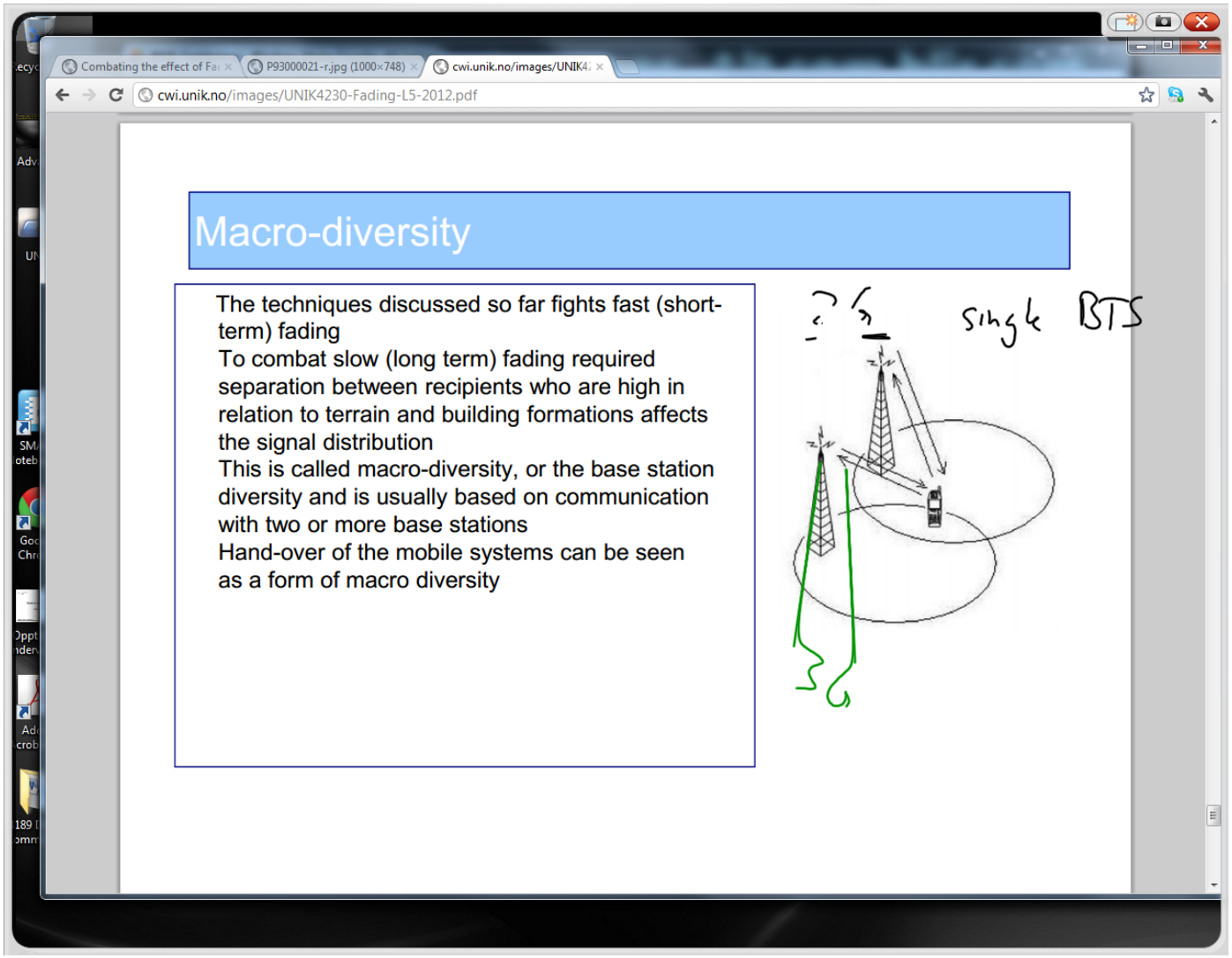
Measurements in rural farmland

Macro diversity

2G – "switch" BTS
- one BTS at a time

3G – soft handover
- softer handover




Combating the effect of Fa
P93000021-r.jpg (1000×748)
cwi.unik.no/images/UNIK4
cwi.unik.no/images/UNIK4230-Fading-L5-2012.pdf
Macro-diversity
The techniques discussed so far fights fast (short-term) fading
To combat slow (long term) fading required separation between recipients who are high in relation to terrain and building formations affects the signal distribution
This is called macro-diversity, or the base station diversity and is usually based on communication with two or more base stations
Hand-over of the mobile systems can be seen as a form of macro diversity
singk BTS