

UNIK 4700

Channel models

- Hata $\rightarrow$ Okumura-Hata
- Urban Tokyo
- antennas above roof top



NSB punctuality

94% in time
6% are delayed

0900 --- 0100

3h msh
hours 27h 6%

$\sim 14\% \rightarrow 14\%$

$\rightarrow \sim 50\%$ of NSB
in Rush hour and large

scattering & interaction

$$\frac{\ell}{70} \leq \lambda \leq 2-3 \ell$$

rain



1mm $\sim \lambda \dots 2-3 \text{ cm}$

$$\lambda = \frac{c}{f} = \frac{30 [\text{cm}]}{f [\text{GHz}]}$$

$$f [\text{GHz}] = \frac{30 [\text{cm}]}{\lambda}$$

$$= 0.7 \text{ cm}$$

$$\cdot 3 \text{ cm}$$

Interaction

rain

$f \sim 300 \text{ GHz}$ $\rightarrow 10 \text{ GHz}$

Assignments Part II

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)

for further information, see [F1-Future_Networks](#)

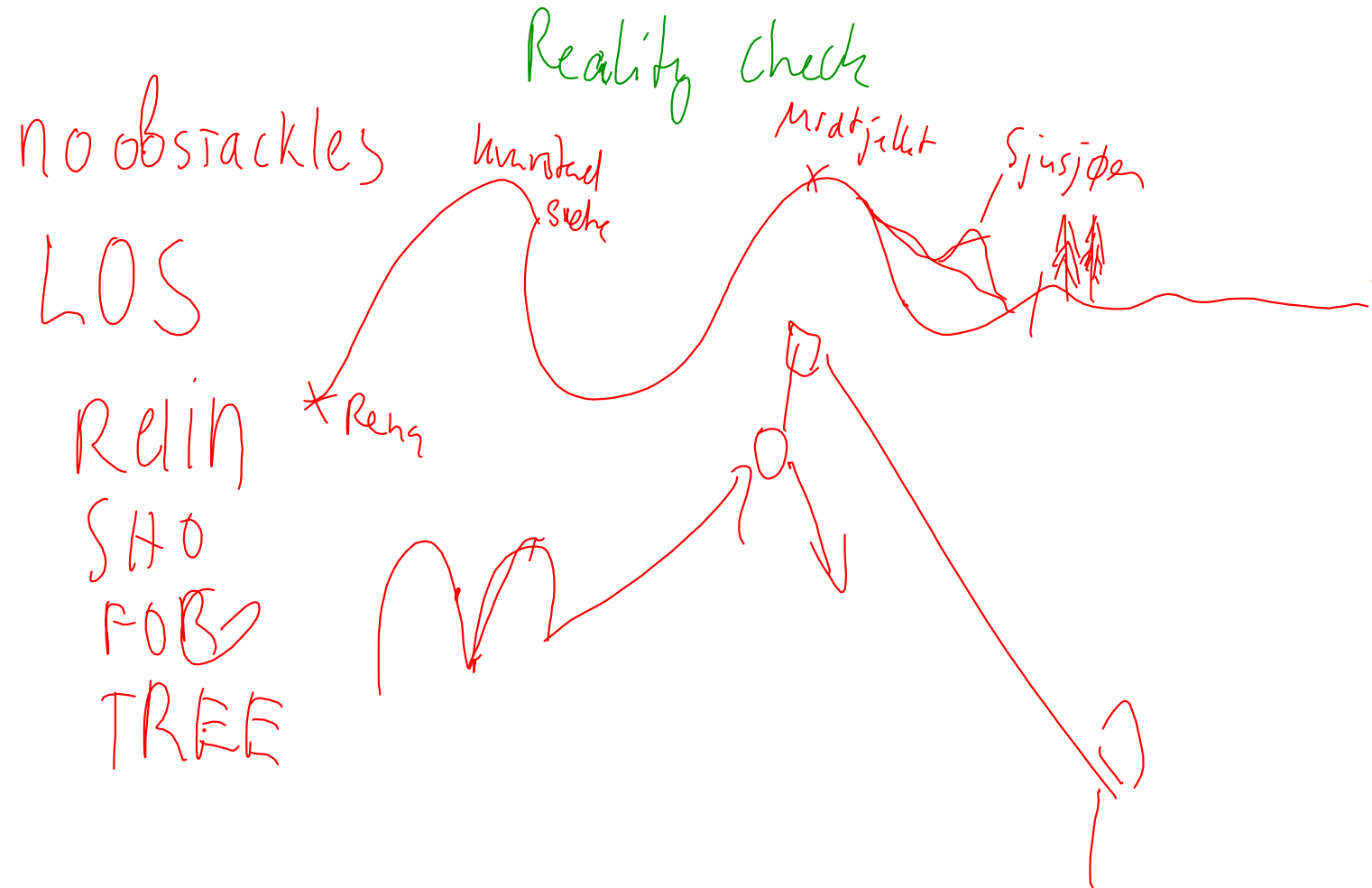
Seraj Technical

Kazi : buzz model
"disruptive innovation"
→ customer "owns"

Yun Ai : Distribution of inc. waves in microcell

Qihao Li : WIMAX for video system

Raul : WiFi for video system



Real world

- tree height

- hills

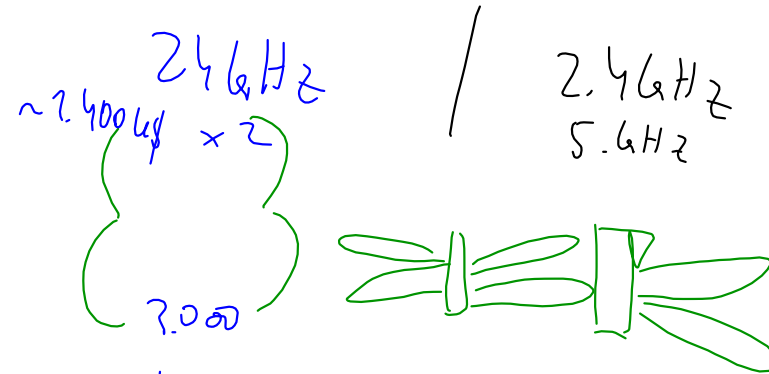
2.4 or 5-6 GHz

$$P_R = P_T G_T G_R L_{\text{path}}$$

33

33 dB

2.4 GHz beamwidth < 3.5°



- LOS
(- license)

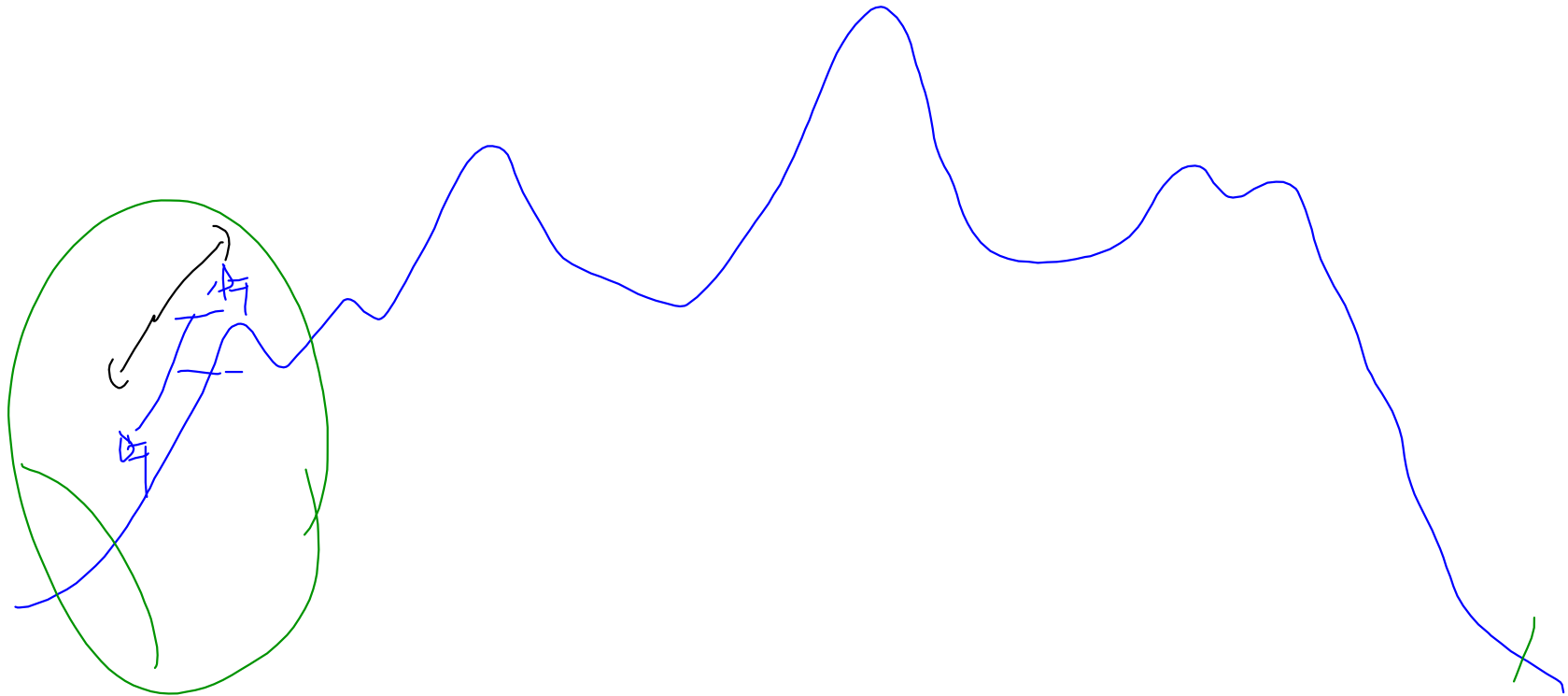
Capacity
range

- 30m max

- budget

range ?

Capacity ↓
Over Capacity



- 1 Overview
- 2 Introduction
 - goal
 - tech solution
- 3 tech solution
- 4 challenges
 - system
 - power, energy
- 5 conclusion / further steps



802.11a setting

CSThresh_ 6.31e-12 ;#-82 dBm Wireless interface sensitivity (sensitivity defined in the standard)

Pt_ 0.001

freq_ 5.18e+9

set noise_floor_ 2.512e-13 ;#-96 dBm for 10MHz bandwidth

L_ 1.0 ;#default radio circuit gain/loss

PowerMonitorThresh_ 1.259e-13 ;#-99dBm power monitor sensitivity

HeaderDuration_ 0.000020 ;#20 us

BasicModulationScheme_ 0

PreambleCaptureSwitch_ 1

set DataCaptureSwitch_ 0

SINR_PreambleCapture_ 2.5118; ;# 4 dB

SINR_DataCapture_ 100.0; ;# 10 dB

set trace_dist_ 1e6 ;# PHY trace until distance of 1 Mio. km ("infinty")

PHY_DBG_ 0

set CWMin_ 15

CWMax_ 1023

SlotTime_ 0.000009

set SIFS_ 0.000016

set ShortRetryLimit_ 7

set LongRetryLimit_ 4

set HeaderDuration_ 0.000020

set SymbolDuration_ 0.000004

set BasicModulationScheme_ 0

set use_802_11a_flag_ true

set RTSThreshold_ 2346

set MAC_DBG_ 0

Receiver sensitivity

- BT = -85 dBm
- Wireless = -95 dBm
- GSM ≈ -105 dBm
- UMTS ≈ -110 dBm

→ 1. Thermal noise $k T \cdot B$

2. Receiver noise figure

64844707

Expected outcome ?
 FER (BER) Jar file
 or Packet Error Rate

