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# Feasibility of DVB-H Deployment on Existing Wireless Infrastructure

INTERNATIONAL WORKSHOP ON CONVERGENT TECHNOLOGIES (IWCT) 2005

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# OUTLINE



- Motivation
- **DVB-H** Network Deployment
- System Model
- Simulation Results
- Conclusions

**Digital  
Video  
Broadcast  
Handhelds**



6th-10th June, Oulu, IWCT 2005





## MOTIVATION



- “... mass market demand for mobile multimedia entertainment is conditioned to the low cost provision of these services.”
- **DVB-H** allows IP broadcasting to mobile phones based on **DVB-T** (Digital Video Broadcast – Terrestrial)
- **DVB-H** is a good candidate for the provision of mobile multimedia services at low cost **BUT**
  - Much more severe propagation conditions than **DVB-T**
  - Requirement of similar coverage levels than 2G/3G

### THUS

- Higher powers or/and more transmitters will be required
- ➔ – Need for efficient network deployment of **DVB-H!**

- Investigate the **feasibility** of deploying **DVB-H** on **existing wireless infrastructure** to provide **indoor coverage**

6<sup>th</sup>-10<sup>th</sup> June, Oulu, IWCT 2005





# DVB-H Network Deployment



- **DVB-H** Network Configurations:

- **Shared Network**

- \* Shared multiplex with **DVB-T**
- \* **DVB-T** and **DVB-H** share the capacity of the RF channel
- \* One transport stream

- **Hierarchical Network**

- \* Shared multiplex with **DVB-T**
- \* Hierarchical modulation
- \* **DVB-T** in the High Priority stream
- \* **DVB-H** in the Low Priority stream

- **Dedicated Network**

- \* Exclusive use for **DVB-H**

6<sup>th</sup>-10<sup>th</sup> June, Oulu, IWCT 2005





# DVB-H Network Deployment



6th-10th June, Oulu, IWCT 2005

- **Main Problem:**

- Existing broadcasting infrastructure might **NOT** be able to transmit the required powers due to electromagnetic exposure limits
  - \* Very high operational costs for power levels ~50-60 dBWs
- **Additional transmitters are a must**



- Possible solution to reduce costs: **re-use cellular infrastructure**

- **Shared and Hierarchical configurations:**

- **DVB-H** indoor coverage  **DVB-T** indoor portable coverage
- **DVB-T** networks planned for rooftop reception

- **Dedicated configuration:**

- **Most suitable**
- Optimized for the desired capacity and coverage



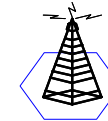


# System Model

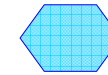


## Existing Wireless Infrastructure:

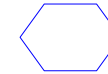
- **Broadcasting:** TV towers
- **Cellular:** 2G/3G sites



TV Tower 150 m



Cellular Site 35 m



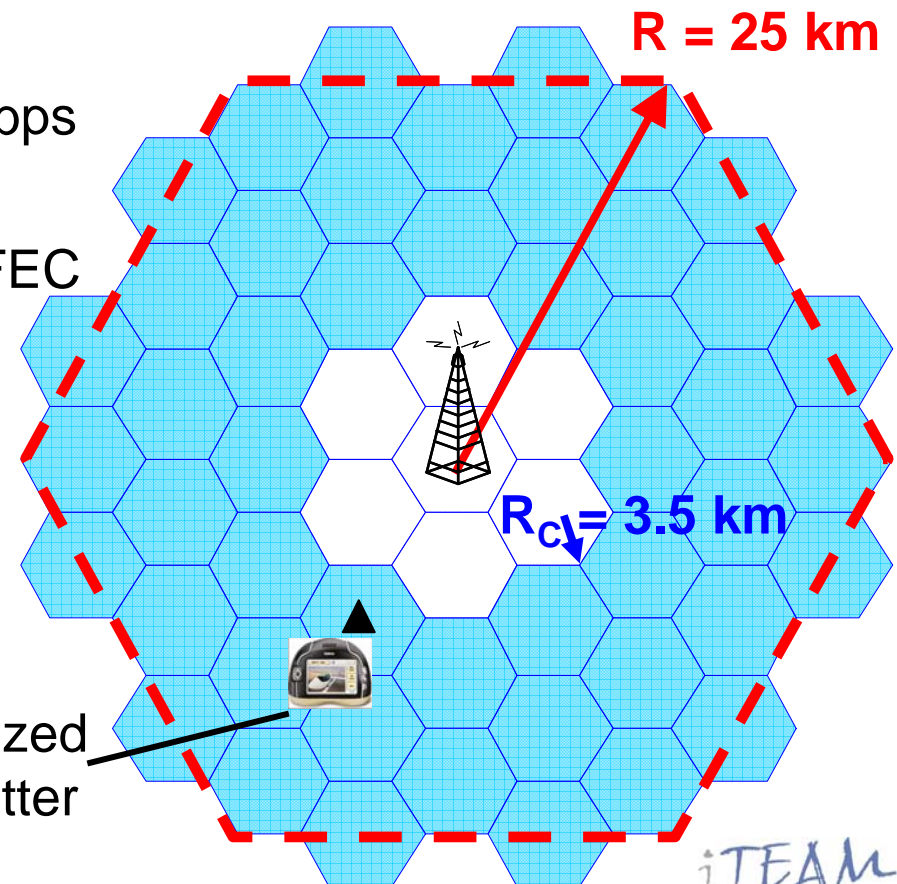
Cellular Site not used

## DVB-H System Parameters:

- Shared: "French mode" 22.1 Mbps
  - 8K, GI 1/8, 64QAM 2/3
- Dedicated: 10 Mbps, no MPE-FEC
  - 4K, GI 1/4, 16QAM 1/2

## Link Budget Parameters:

- Indoor coverage @ 700 MHz



receiver synchronized to **closest** transmitter

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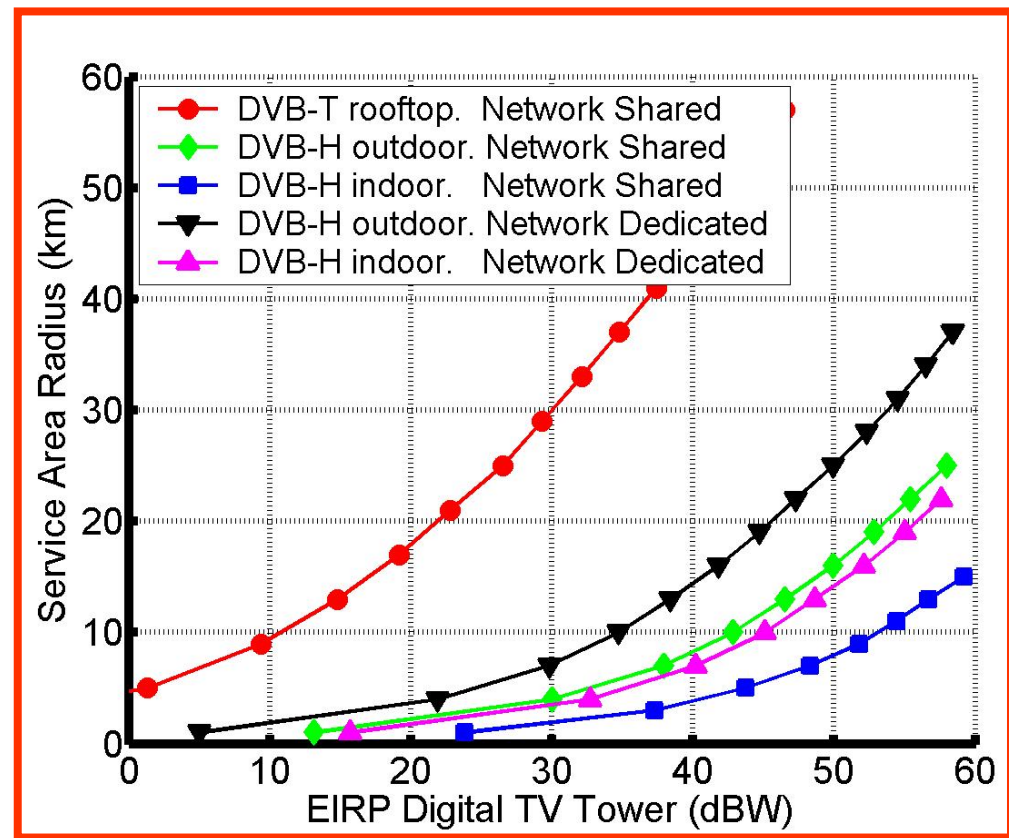
## Results (I)



- Only Broadcasting Infrastructure (Shared and Dedicated):
  - Coverage targets: **DVB-T** 99%, **DVB-H** 95%.

### “Coverage Area Radius vs. Power from the TV Tower”

- Huge differences in link budget between
  - **DVB-T rooftop**
  - **DVB-H indoor**
- Shared: **~40 dB**
- Dedicated: **~30 dB**
- **DVB-H outdoor +7dB**



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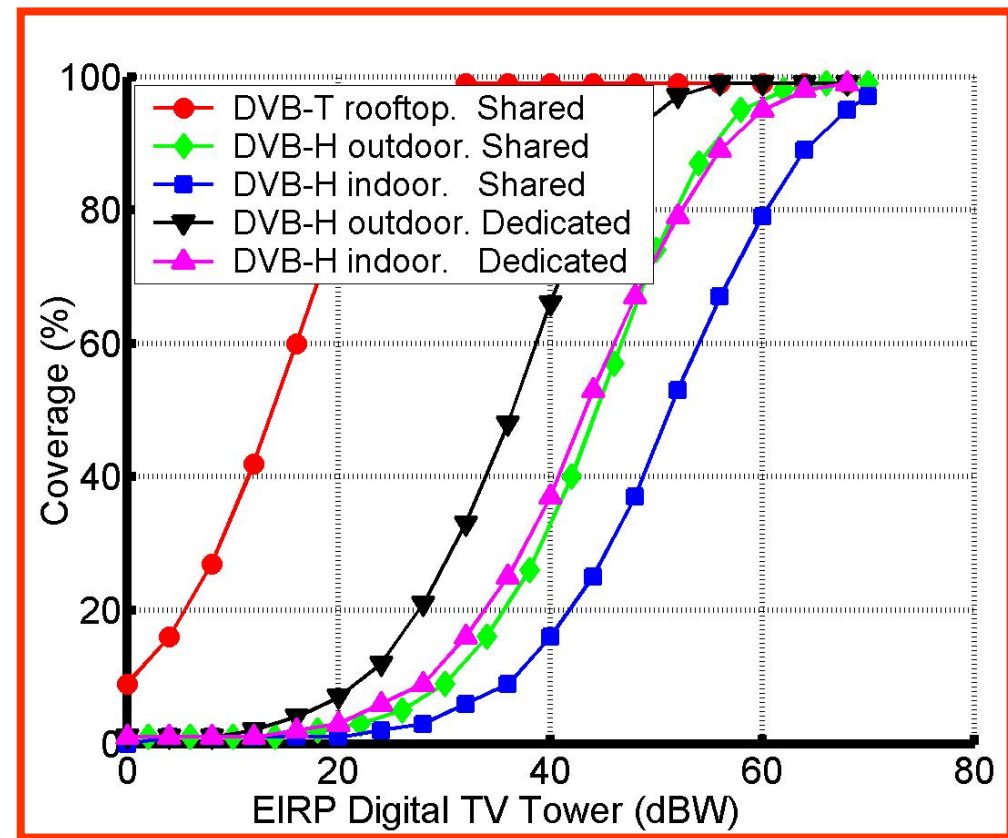




- Only Broadcasting Infrastructure (Shared and Dedicated):
  - Service area radius 25 km. **DVB-H** indoor coverage 95%.

## “Coverage vs. Power from the TV Tower”

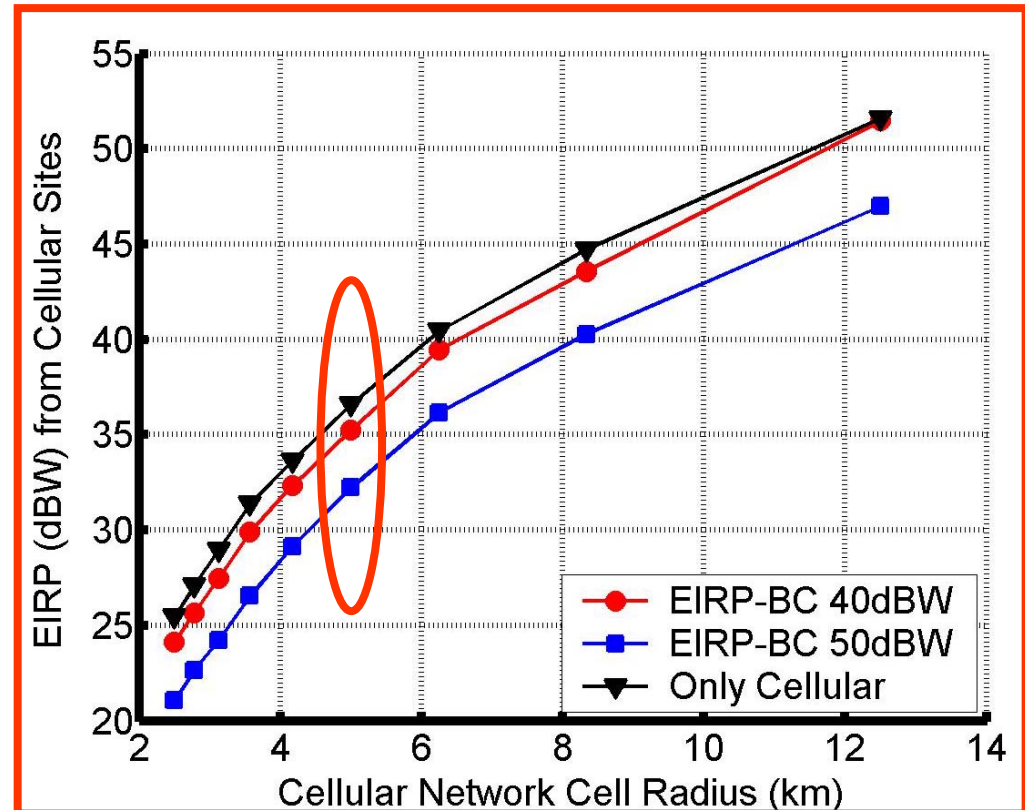
- Power Levels:
  - Shared **DVB-T** rooftop :
    - **30 dBW**
  - Dedicated **DVB-H** indoor:
    - **60 dBW**
- Coverage levels > 80% more difficult to achieve





- Broadcasting and Cellular Infrastructure (Dedicated):
    - Service area radius 25 km. **DVB-H** indoor coverage 95%.
- “Required power per DVB-H cellular site as a function of the cell radius of the cellular network”**

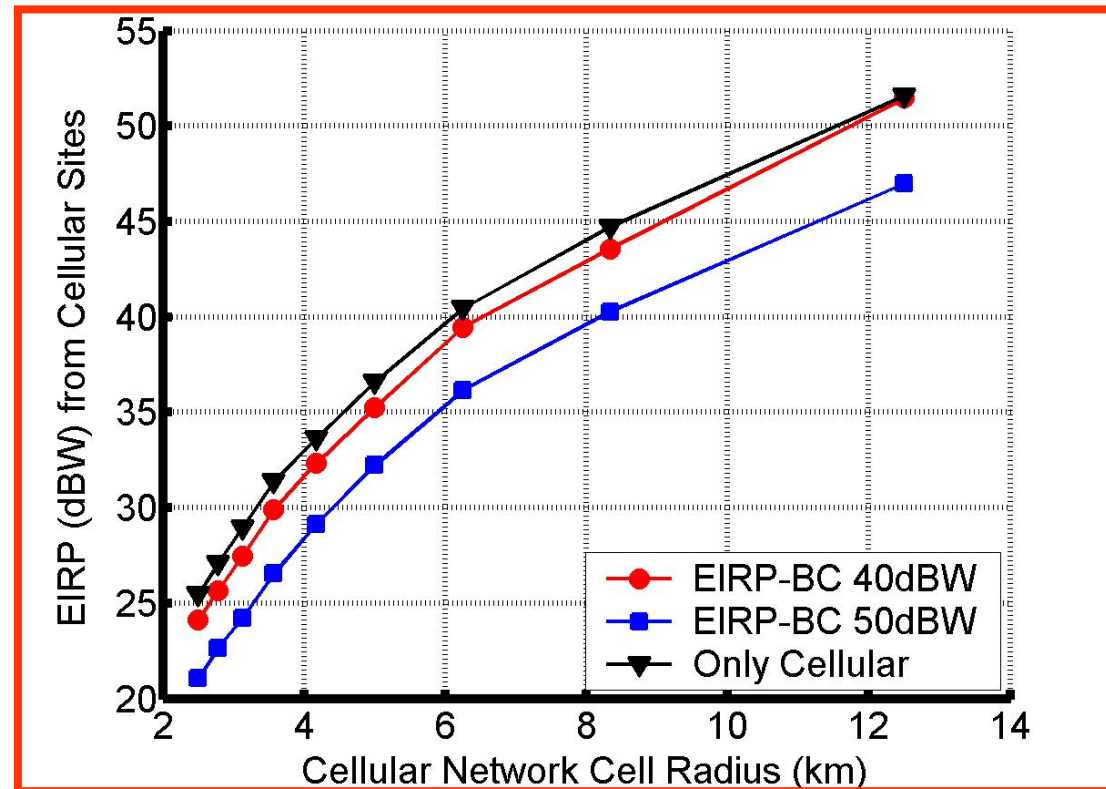
- Coverage from TV tower:
    - **40 dBW: 37%**
    - **50 dBW: 73%**
  - Number of Sites:
    - Radius **2.5 km: 109**
    - Radius **5 km: 31**
- **For 5 km cell radius power levels > 30 dBW**
- **Lower cell radii!**





- Broadcasting and Cellular Infrastructure (Dedicated):
  - Service area radius 25 km. **DVB-H** indoor coverage 95%.
  - Radius cellular network 2.5 km.

**“Required power per DVB-H cellular site as a function of the number of cellular sites employed”**





## Conclusions



- **Very high power levels** are required at the broadcasting sites for achieving **DVB-H indoor coverage**
- **Re-using cellular sites** is a **valid solution** to avoid excessive powers at the broadcasting sites
- The required **powers** at the **cellular sites** might **not** be **acceptable** for health concerns (e.g. more than 30 dBW) for **typical sub-urban cell radii** (e.g. 5 km)
- For **smaller cell radii** (e.g. 2.5 km) the power levels are feasible, but the required **number of sites** is **large**
- **Power Limits + Cost Model**
  - ➔ **Minimum Cost Deployment**

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# Thanks for your attention! Questions?

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