



# MEDIA SERVICES ON MOBILE BROADBAND

LTE IN COMBINATION WITH "ALL-IP", MAY PROVIDE THE INDUSTRY WITH THE MOMENTUM TO SUCCEED



# SPECTRUM USAGES IN THE TV UHF BAND

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## Two examples of increased spectrum usages

1. LTE as a broadcasting technology
2. LTE as a complementing broadcasting service



# EXAMPLE 1

## BROADCASTING TV IN THE USA

### Current situation of TV in the USA

54-72 MHz,  
76-88 MHz,  
174-216 MHz, and  
**470-698 MHz**

US Digital TV  
standard: ATSC



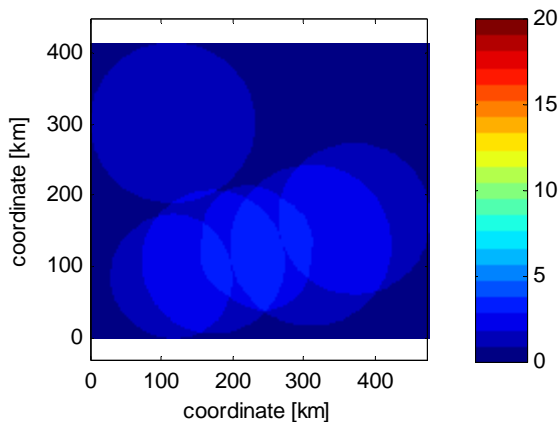
**Task: improve the spectrum use**

# NUMBER OF TV CHANNELS

## DATA FROM FCC TV DATA BASES FOR EXAMPLE MARKETS

### Lincoln-Kearney-Hastings

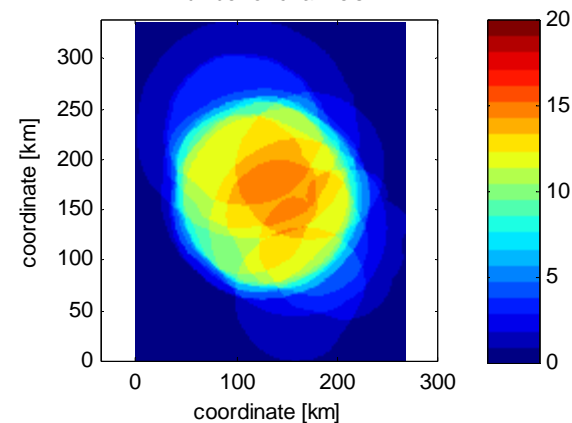
number of channels



Exemplary US TV markets				
	<i>RDU</i>	<i>SFBA</i>	<i>LIN</i>	<i>PHIL</i>
Population per km <sup>2</sup>	2,500	3,000-6600	1,167	4,405
#TV transmitter sites (100m clustering)	8	7	6	9
total #TV channels	10	20	6	17
max # overlapping TV channels	9	20	3	15

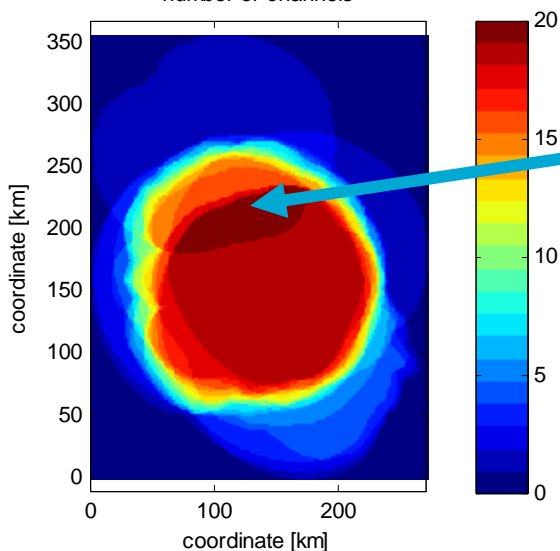
### Philadelphia

number of channels



### San Francisco Bay Area

number of channels

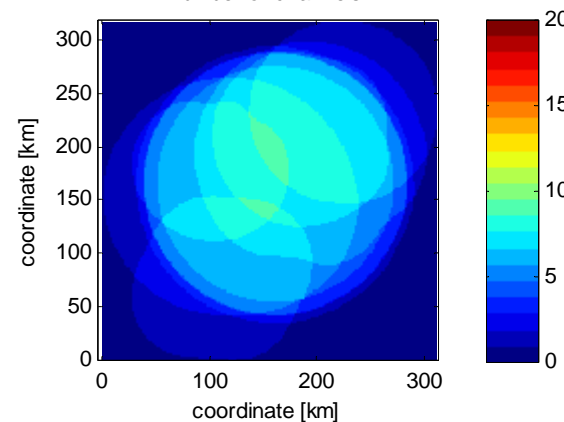


**Peak: 20 channels  
= 120 MHz**

Remaining 180 MHz  
are underused due to  
reuse

### Raleigh-Durham

number of channels

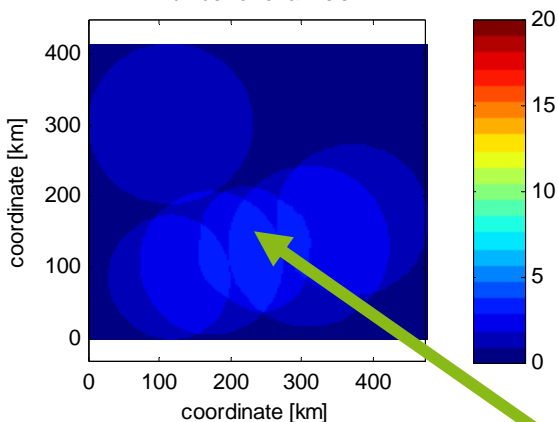


# NUMBER OF TV CHANNELS

## DATA FROM FCC TV DATA BASES FOR EXAMPLE MARKETS

### Lincoln-Kearney-Hastings

number of channels

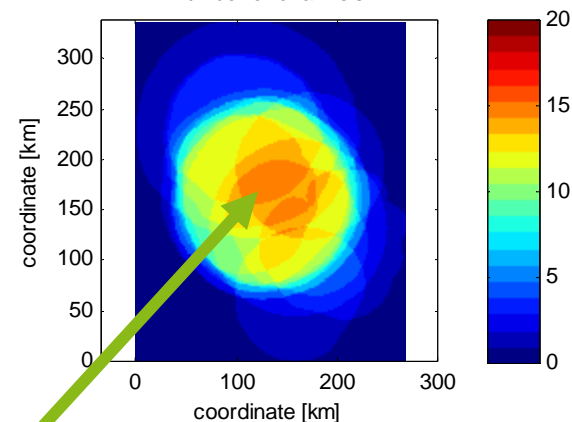


**Assumption:**

per TV channel  
1 HDTV + 1 SDTV  
program (= 13 Mb/s)

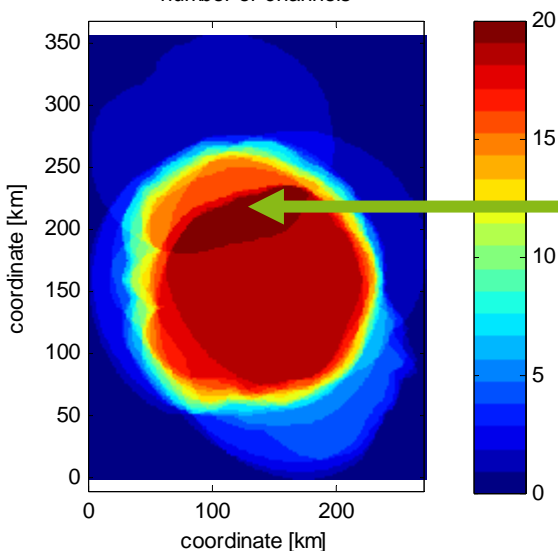
### Philadelphia

number of channels



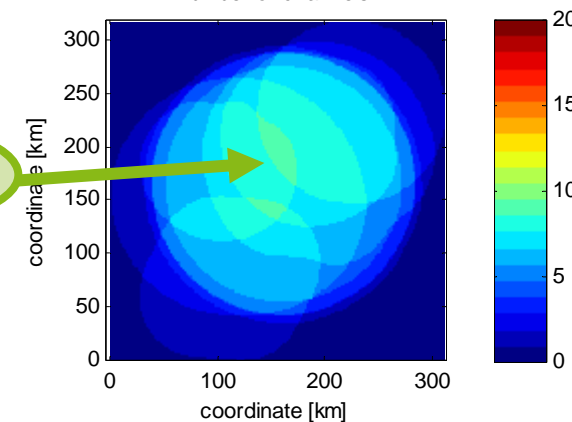
### San Francisco Bay Area

number of channels



### Raleigh-Durham

number of channels



39 Mb/s

195 Mb/s

260 Mb/s

117 Mb/s

# LTE MBMS PERFORMANCE FOR TV DISTRIBUTION

## Simulation assumptions

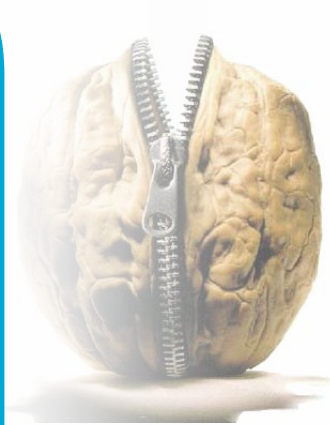
- › Cellular network with hexagonal grid
  - 19 sites with 3 sectors
  - wrap-around
  - Inter-site distance (ISD): 2 - 10 km
- › Transmit power: 20 W
- › Antenna height: 32 m
- › Carrier frequency: 600 MHz
- › Receive antenna: roof-top Yagi antenna (10 dBi), co-polarized with transmit antenna



# TV SPECTRUM REQUIREMENT FOR LTE MBMS – PEAK SERVICE AREA

- › Peak service rate: 260 Mb/s (20 channels)
- › MBMS spectral efficiency: 3.1 b/s/Hz (ISD of 2km)
- › Total spectrum requirement:  $260 \text{ Mb/s} / 3.1 \text{ b/s/Hz} = 84 \text{ MHz}$

- Today's TV services could be provided with **84 MHz via LTE MBMS** compared to **300 MHz via ATSC**
- **216 MHz** could be freed for more usages
  - **37%** by **channel sharing** (program stream multiplexing)
  - **63%** of the savings is due to the **LTE SFN**



# TV SPECTRUM REQUIREMENT FOR LTE MBMS – RURAL AREA

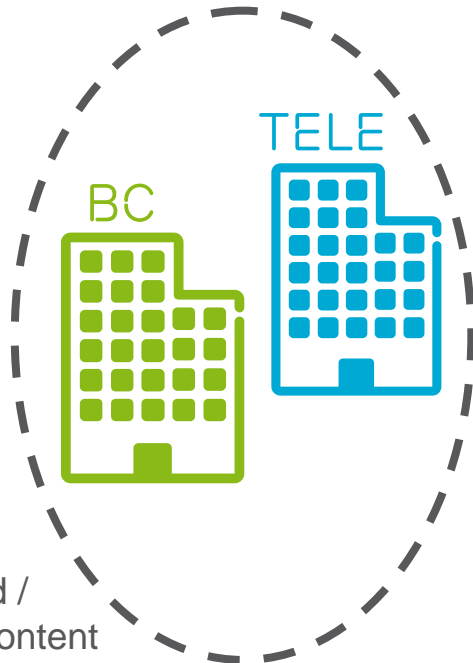
- › Rural areas: inter-site distance of 10km rather than 2km
- › Service rate (Lincoln): 39 Mb/s (3 channels)
- › MBMS spectral efficiency: 1 b/s/Hz (ISD of 10km)
- › Total spectrum requirement:  $39 \text{ Mb/s} / 1 \text{ b/s/Hz} = 39 \text{ MHz}$

- 84 MHz seem also sufficient for rural areas
  - reduced MBMS spectral efficiency (larger inter-site distances)
  - smaller number of TV programs



# EXAMPLE 2

## A COLLABORATIVE TV LANDSCAPE



Mobile broadband LTE/HSPA/GSM MBMS

- low tower
- low power

DTV network

- high tower
- High power

- Content
- Aggregated / packaged content

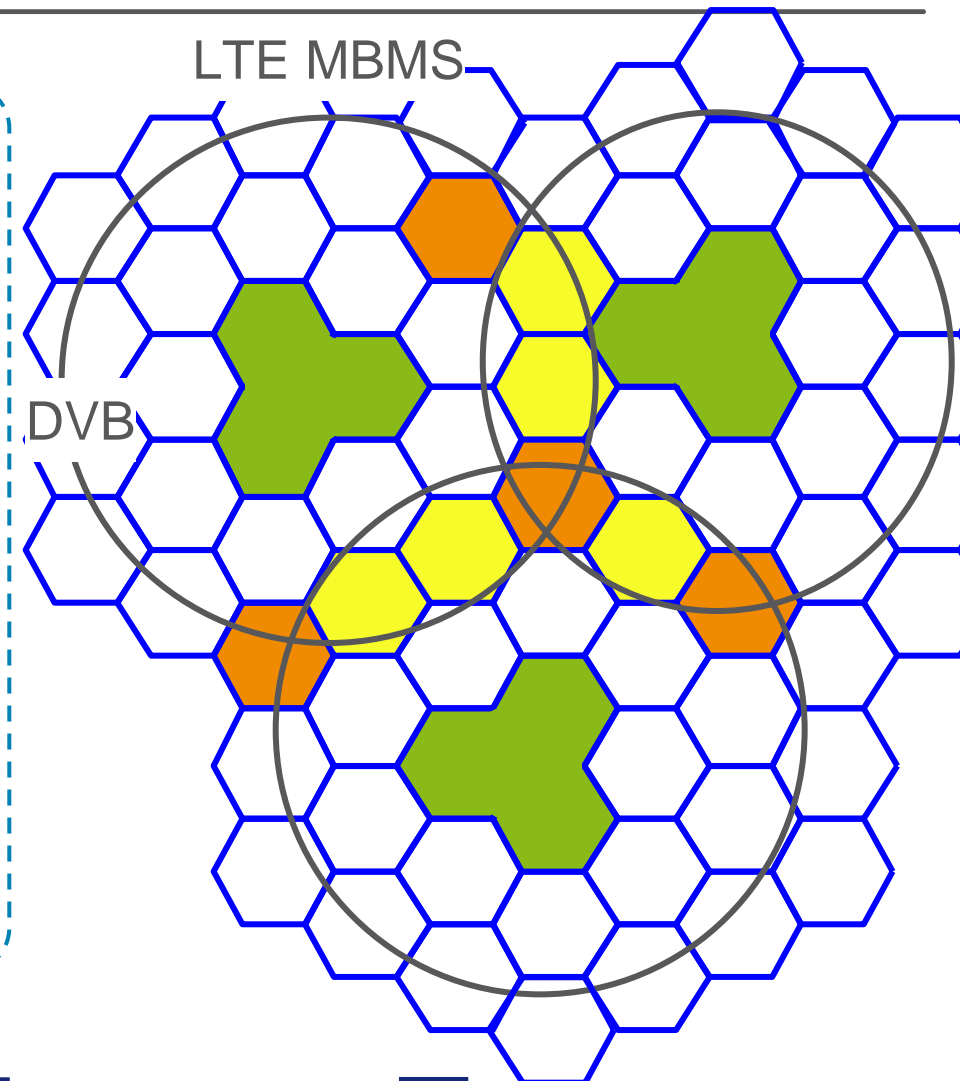
Can be locally produced, or from any provider in any country and distributed in many networks





# COMPLEMENTARY LTE MBMS


In the band 470 – 698 MHz (UHF)


- › to operate under **licensed conditions**
- › **planned** in relation to an existing DVB plan
- › **downlink only**
- › **true broadcasting and unicasting**
- › a **variable bandwidths** scheme could be used to match the various sizes of “white spaces”
- › **interaction**, via other bands (for the uplink)



 "High/normal" power, large number of LTE channels

 "Normal/reduced" power, medium number of LTE channels

 "Low" power, medium number of LTE channels

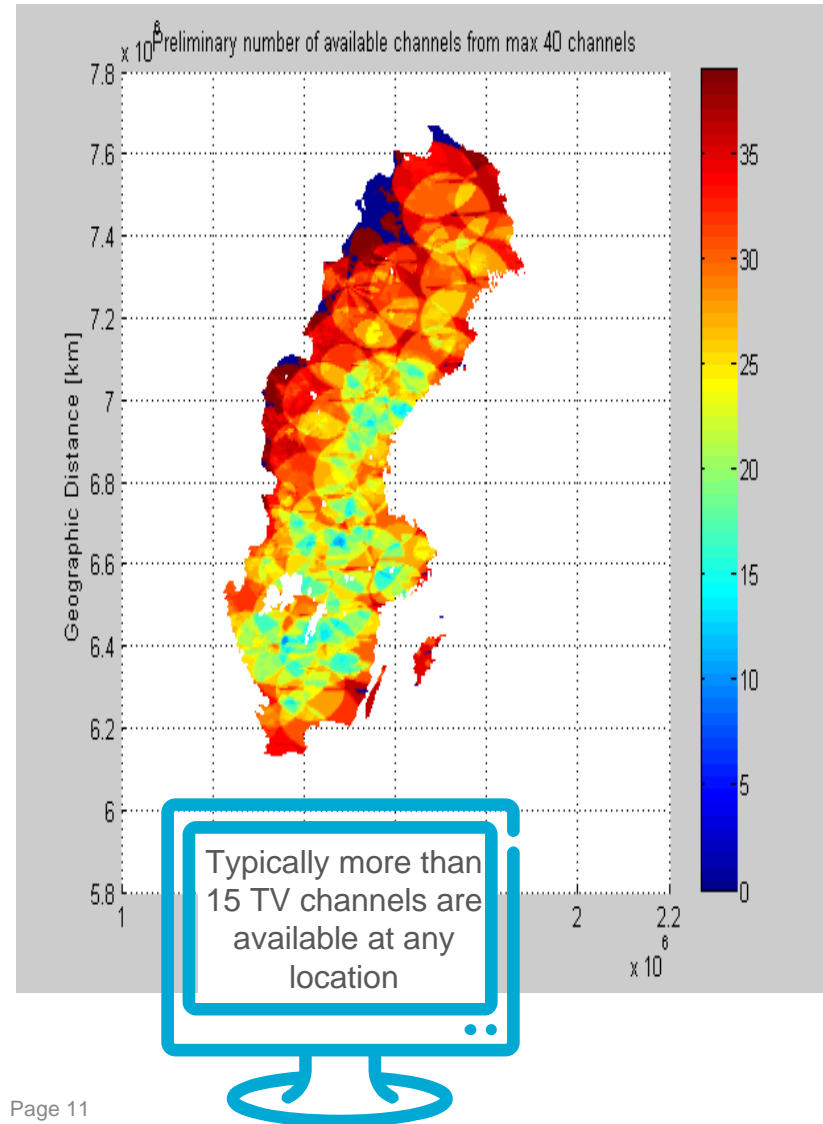
 "Low" power, reduced number of LTE channels, smaller cells

# "GREY SPACES"

## AN EXAMPLE

- › real DVB-T transmitters from ITU database
- › not all neighbouring countries' allocations are included, and excluding the DD band
- › DVB roof-top antennas → ~54 dB(uV/m) receive signal
- › "Safety" zone added for margin for co-channel interference from LTE - MBMS
- › adjacent channel LTE MBMS RF power level is the limiting factor

*Notably, different assumptions will lead to different availability numbers; especially, if other field strength values are to be used.*

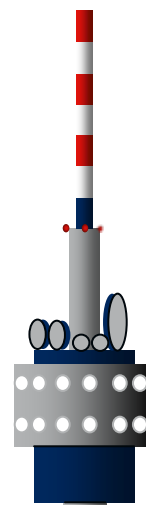
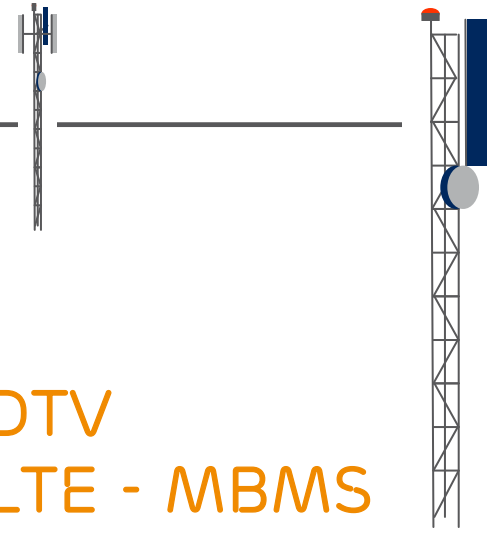


# THE NEW TV LANDSCAPE

## THE HOME SCREENS



- DTV
- LTE - MBMS
- IPTV
- WEB-TV
- INTERACTION
- SIM
- BLUETOOTH
- WLAN
- DLNA



# CONCLUSIONS

## MEDIA SERVICES ON MOBILE BROADBAND USING LTE

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1. there is a potential of LTE for broadcasting  
business cases need further assessments
  - deployed by partnering and reusing infrastructure
    - > for mobile TV reception
    - > supporting both linear TV and interactive TV
    - > according to demand, what programs to provide via linear or interactive TV
    - > more content in spectrum from freed spectrum
  
2. Broadcasting and LTE MBMS in coexistence and collaboration, a perfect fit in the “grey” spectrum in combination with the UHF band as well as other bands:
  - licensed; planned, and downlink only
  - variable bandwidths, and aggregation of channels
  - significant capacity increase, mobile, indoor and interactivity
  - all screen sizes
  - according to demand, what programs to provide via linear or interactive TV
  - more content in “grey” spectrum satisfying the demands for the new TV experience



**ERICSSON**