



*Spectrum Sharing
Between Private
Networks and Public
Mobile Networks in
Denmark*

Who am I - who is the DEA?

- Jeppe Tanderup Kristensen
 - M. Sc. from DTU (Technical University of Denmark)
 - 14 years in spectrum management
- DEA: Utilities Agency of Denmark
 - E.g. spectrum management

Problem faced in preparation for 5G

- A very simplified summary of the January 2020 public consultation

- Non-telecom industry parties:
 - “We want some 3.6 GHz spectrum for private 5G networks!”
 - “We don’t quite know exactly where and how.”
- Telecom industry parties:
 - “We want it all!”
 - “Dedicated spectrum for private networks is inefficient.”

Conventional solution to the issue at hand

- *How we would usually do it*

- Decide how much spectrum (e.g. 60, 80 or 100 MHz) to set aside for private networks
 - Individual licensing for each site/local area
- Put the remaining spectrum on auction for MNOs
 - NB: In Denmark MNO licenses do not require individual approval of base station deployment (only registration of basic data like location and band).

Spectrum sharing: the solution we took

- *Leasing obligation on spectrum*

- All 3.6 GHz spectrum (3.41-3.8 GHz) put on auction for MNOs
- 60 MHz of the auction spectrum (3.74-3.8 GHz) entailed a leasing obligation for private networks
- The 60 MHz and the associated leasing obligation to be auctioned separately

Leasing obligation

- *Leasing obligation on spectrum*

- The MNO who got the obligation has to lease the 60 MHz on pre-set set of conditions
- A standard contract has to be used
- The leasing price is fixed through a formula in the standard contract
 - Example: 50 MHz for use in a circular 5 km² will cost ~2900 DKK/year (~390€/year)
 - Covers the spectrum cost (auction fee+annual spectrum fee)

Leasing obligation

- *Technical provisions*

- Overall same regulatory provisions (LRTC) as the MNOs public network
- The interference delivered from the private network is PFD limited (may be deviated)
- A default synchronization scheme is set (may be deviated)

Leasing obligation

- *Result of the auction*

- Telia and Telenor won the obligation through their common RAN-company (TT-Netværket P/S, TTN)
 - In total TTN got 140 MHz of contiguous spectrum (3,66-3,8 GHz)

Leasing obligation

- *Strengths and weaknesses*

- Weaknesses:
 - Important that the MNO (TTN) honours the obligation – conflict could be burdensome on private networks
 - The application for private network is not to the DEA, e.g. applications don't enjoy the same legal recourse possibilities.
 - Difficult/impossible to change the obligation (e.g. extend the private network possibilities)

Leasing obligation

- *Strengths and weaknesses*

- Strengths:
 - In practice same situation for private networks as if the spectrum was dedicated, but “license” is given by MNO and not DEA
 - The MNO may utilize the spectrum where there are no private networks
 - Good incentive for the MNO (TTN) to offer alternatives to private networks (e.g. a 5G network slice)
 - Less regulatory involvement

Links

- For more details

- Information memorandum detailing the obligation (section 5.4):
https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_1.pdf
- Draft 3.5 GHz license for MNO (para 11):
https://ens.dk/sites/ens.dk/files/Tele/annex_f_-_draft_licence_3.5_ghz.pdf
- Draft standard leasing contract:
https://ens.dk/sites/ens.dk/files/Tele/annex_m_-_standard_contract_for_leasing_spectrum.pdf
- Contact jtk@ens.dk



Thank you for
listening!