Bundesnetzagentur

Campus Networks Germany 2022

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CONNECTED GERMANY 2022

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Experiences in Vertical Use

1. Reason for Local licenses
2. Frequency ranges for vertical industries
3. Licensing procedures
4. License Fees
5. information on deployment

Reason for Local licenses

1. so far **spectrum access solutions only via third party** operators
2. PC showed interest in a **large variety** of different **business cases,**
3. CEPT Report 67 requests **LRTC** for regulation, example: BEM
4. **individual rights** of frequency use guarantees **available services**
5. **needs of industry** differ from those in public mobile radio, e.g. uplink-downlink ratio
6. campus networks for tailored treatment of **confidential information**
7. support for **new solutions** for industrial processes, as e.g. robotics

Frequency Ranges

Available for use:

1. 3700 – 3800 MHz: Procedure opened 19.11.2019
2. 24.25 – 27.5 GHz (26 GHz): Procedure opened 01.01.2021

Planned in future:

a) 40.5 – 43.5 GHz, EC mandate, LRTC, sharing FS, FSS
b) ≈ 60 GHz, EC mandate, LRTC, license exempt
c) 6425 – 7125 MHz, considered at WRC-23

Licensing procedure characteristics

3700 – 3800 MHz: Procedure opened 19.11.2019

- EC Implementing Decision (EU)2019/235
- **bandwidth** portions of n x 10 MHz (n = 1...10), 100 MHz @max,
- **individual license** on application (first come first served),
- **limited** to **owners** or tenantries of plot **of land**, or by commission
- for **private use** only (distinction from spectrum auctioned 05/2019)
- Examples: company premises, industrial parks, exhibition grounds, theatres, television studios, stadiums, ...

26 GHz: Procedure opened 01.01.2021,

- EC Implementing Decision (EU)2019/784
- **bandwidth** portions n x 200 MHz, 50 MHz@min, 3250 MHz @max,
- **individual license** on application (first come first served),
- for **private** and **public use, shared with FS and FSS**

➢ in both ranges: electronic application form

Obligations for vertical use

- frequency **usage concept**, deduction of bandwidth demand,
- radio **interference reduction**,
- one **reference BS** if indoor,
- interference **mitigation measures** for radio compatibility,
- reconfiguration **expenses on** each **licensee**,
- **operator agreements** for neighboring use,
- if no agreement regulatory **FS limits** can be applied:
  - 3700 – 3800 MHz: 32dB(µV/m) @3m, 5MHz,
  - 24.25 – 27.5 GHz: 65dB(µV/m) @3m, 200MHz,
- use it or lose it.

3700-3800 MHz: License Fees

$$\text{Fee} = 1000€ + B * t * 5 * (6A_1 + A_2)$$

B: bandwidth,

t: term of licence,

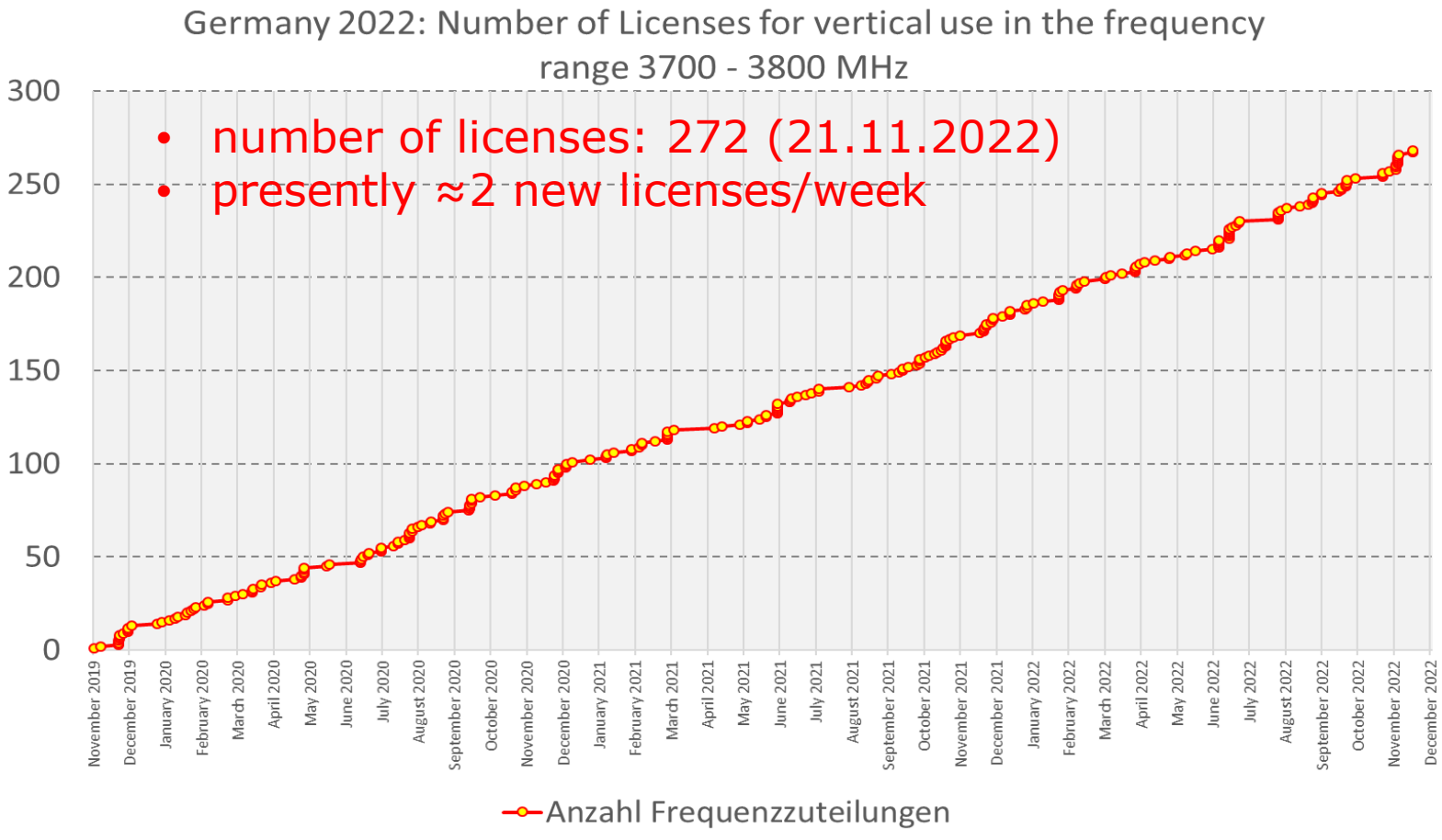
A: area category (A_1: residential and traffic, A_2: other),

some examples

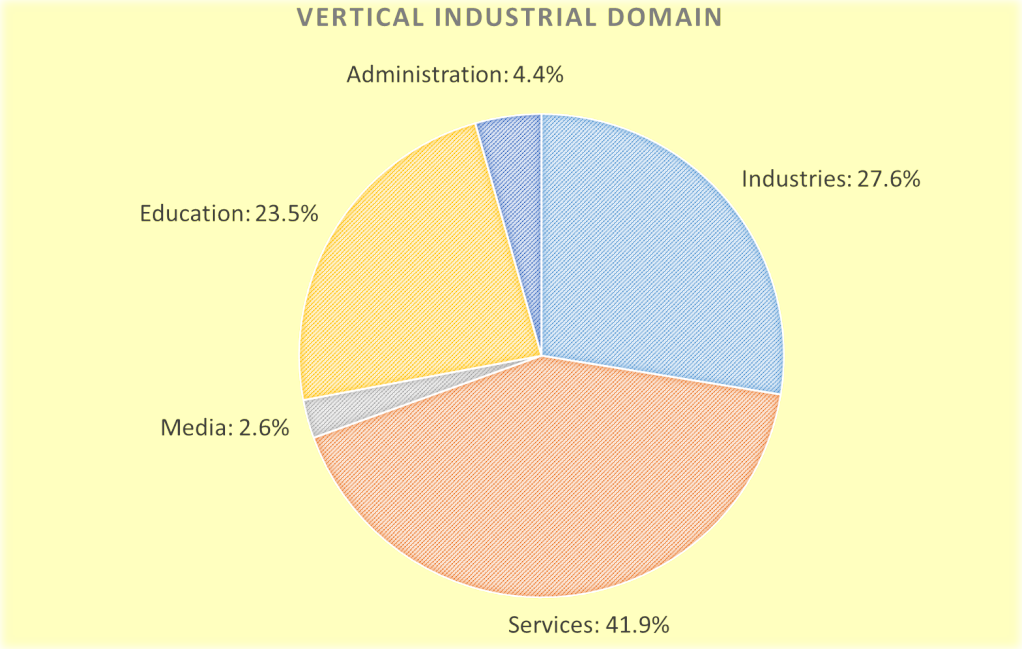
project	bandwidth [MHz]	terms of license [years]	Area A_1 [km²]	Area A_2 [km²]	Fee 3700-3800 MHz [€]
Industry 4.0	70	10	0.1	0	3100.00
Industry 4.0	100	10	2	0	61000.00
agriculture	50	10	0	1.5	4750.00
agriculture	80	10	0	5	21000.00
agriculture	80	1	0	1.5	1600.00

application forms, lists of licensees, fee calculation formular and results of public consultations availble on:
https://www.bundesnetzagentur.de/DE/Fachthemen/Telekommunikation/Frequenzen/OeffentlicheNetze/LokaleNetze/lokalenetze-node.html

3700 – 3800 MHz: License Number



3700 – 3800 MHz: Industrial Domains



Note: In some cases, classification is difficult

Industries: defense industry, intralogistics, IT, logistics, manufacturing industry, medicine, national defense, telecommunications, manufacturer, trade

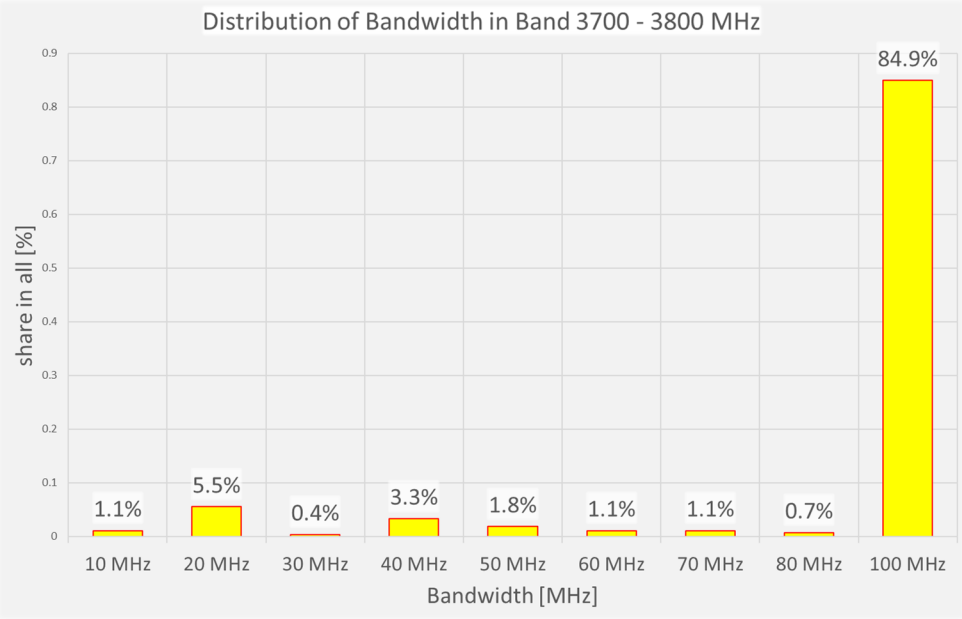
Education: industrial automation, IT, research, science and technology, telecommunications

Services: administration, advisory, mobile network provider, education, emergency management, healthcare, information technology, Internet provider, intralogistics, IT security, maintenance, production, research, robotics, security technology, system integration, telecommunications, telematics, trade, transport optimization

3700-3800 MHz: Industrial Branches

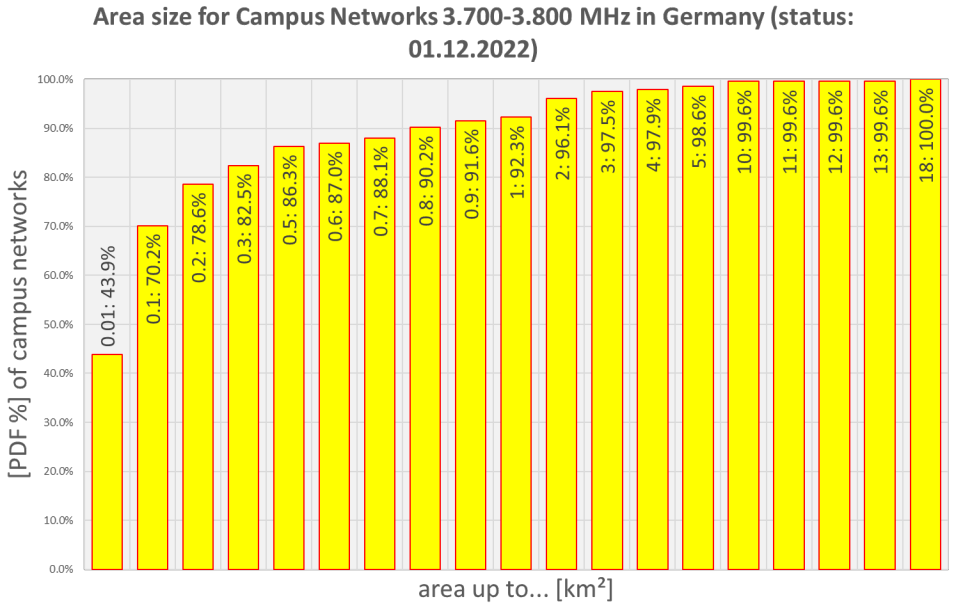
agricultural engineering, assembly technology, associations, automotive industry, autonomous driving, biopharmacy, chemical industry, cleaning technology, commercial vehicles, construction industry, culture & leisure, defense industry, electrical engineering, elevator manufacturer, emergency management, financial economy, handiwork, home appliances, industrial automation, industrial fair, IoT, IT manufacturer, IT security, IT, logistics, aviation, measuring device manufacturer, medicine, metal industry, metallurgy, municipal administration, office communication, pharmacy, R&D, retail trade, robotics, shipbuilding, social affairs, software, system integration, telecommunication, telecommunications manufacturer, telematics, transport

3700-3800 MHz: Used Bandwidth



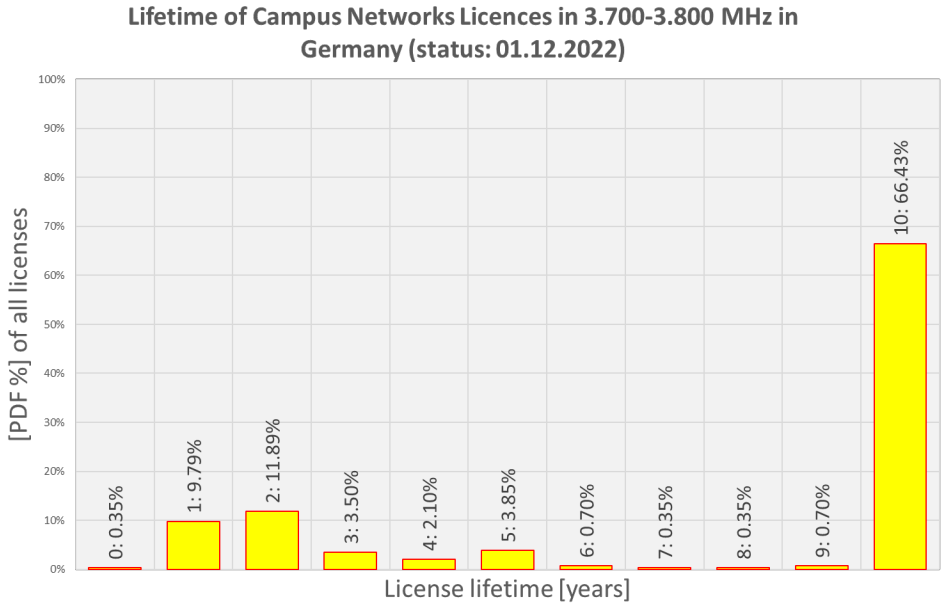
- >80% of applications are using the full bandwidth available,
- indication that probably more spectrum is needed for the vertical use
- in 26 GHz, 3250 MHz spectrum are waiting to be used

3700-3800 MHz: Used Area



- >95% of all networks and applications are smaller than 2 km²
- size shows the substantial difference to the mobile network services: the main focus of verticals is not area coverage

3700-3800 MHz: Lifetime of Licenses



- ≈70% of licenses use full 10 years
- other license durations are used according to the project

3700-3800 MHz: BITKOM Questionaire (repr)

553 industrial enterprises (> 100 employees) were consulted,

- 26% already introduced or are planning, 7% will implement vertical use **on their own**, 19% will **involve MNOs**
- 85% process networking to **connect/control production facilities**
- 79% real time **machine control**
- 74% **remote maintenance**
- 71% **assistence systems** in AR and VR
- 65% **autonomic driving**
- 40% **mobile roboting**

→ increases automasation, flexibility

→ improves logistics, efficiency, transparancy, controlability and data safety (sensitive data remain within enterprise premisis)

License Fees 26 GHz

$$Fee = 1000€ + B * t * 0{,}63 * (6A_1 + A_2)$$

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some examples

project	bandwidth [MHz]	terms of license [years]	Area A_1 [km²]	Area A_2 [km²]	Fee 24.25-27.5 GHz [€]
Industry 4.0	70	10	0.1	0	1264.60
Industry 4.0	100	10	2	0	8560.00
agriculture	50	10	0	1.5	1472.50
agriculture	80	10	0	5	3520.00
agriculture	80	1	0	1.5	1075.60

Deployment 24.25 – 27.5 GHz

- number of licenses: 16, 50% indoor applications,
- presently not considered as active industrial operation,
- probable reason: ≈(un)availability of equipment
- further reasons?

application forms, lists of licensees, fee calculation formular and results of public consultations availble on:
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growing use by verticals

thank you for your attention

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