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RADIO LICENSE COST

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1. Background

We are often asked what is the cost of obtaining a radio license for ground station service to communicate with the customer satellites. Receiving the downlink transmission from the satellite does not require a radio license, but sending any uplink data to satellite does. The cost is dependent of various parameters (like the used frequency, bandwidth and purpose). This document gives couple of generic examples to describe the ball park of additional cost set by the radio law. The complete degree of law is available in Finnish and Swedish language in link address https://www.finlex.fi/fi/laki/alkup/2021/20211257.

2. Scope and applicability for the degree of law about administrative frequency fees

The Ministry of Transport and Communications Agency has issued a degree of law (257/2021, Helsinki on 23 December 2021) about administrative frequency fees and other fees charged for the frequency administrative performance.

The pursuant to the decision of the Ministry of Transport and Communications, pursuant to Section 8 of the State Basic Payment Act (150/1992), as it is in Act 348/1994:

Section 1 - General provisions

§1 Scope of application

This regulation provides for frequency fees and other fees to be collected from public-law services related to the frequency management of the Finnish Transport and Communications Agency, as well as their payment bases.

Section 2 - Frequency fees

§ 2 Frequency fee amount and collection

The Finnish Transport and Communications Agency collects an annual fee higher than the cost value of the performance referred to in section 6, subsection 3 of the State Payment Basis Act (150/1992) based on the economic value and frequency administrative costs of the radio frequencies granted, reserved or protected for use in section 39 of the Electronic Communication Services Act (917/2014) and the performance referred to in section 1 of this subsection, the performance referred to in section 44 of the same act and section 2 of this subsection and the performance referred to in section 50 of the same act and section 2a of this subsection, and the annual payment according

to the cost value referred to in section 3 of this subsection:

1) the right to possess and use a radio transmitter or licensed radio transmitters of a radio network, radio system or radio station (radio license);

2) allocation of radio frequencies;

2 a) protecting the radio receiving station from interference and

3) administration of frequencies related to military national defense.

The frequency fee for the performance referred to in subsection 1, point 1 is charged in accordance with the provisions of §4–11 and §14. The length of the annual frequency fee payment period is a maximum of 13 months. The holder of the radio license is obliged to pay the annual frequency fee regardless of whether the radio license is terminated or canceled during the payment period.

A frequency reservation fee is charged for the performance referred to in subsection 1, point 2, in §12, and a frequency fee is charged for the performance referred to in subsection 1, point 2a, in accordance with the provisions in §12a. The military radio communication frequency management fee for the performance referred to in subsection 1, point 3 is charged in accordance with the provisions of section 13.

Section 3 - Criteria for determining the frequency fee

When determining the frequency fee for a radio transmitter, radio network, radio system or radio station, the Finnish Transport and Communications Agency must take into account the following general determination criteria in a more detailed manner below:

1) the number of frequencies assigned or reserved for use, the quality of the right of use and the width of the reference band;

2) a frequency range assigned or reserved for use;

3) the population of the radio system access area; mixed

4) which radio device group the radio transmitter belongs to.

In addition to what is stipulated in subsection 1, the Finnish Transport and Communications Agency must also take into account the number of radio transmitters in use or the method of use of the frequencies assigned for use when determining the frequency fee for the possession and use of certain radio transmitters, radio networks or radio systems in the manner regulated below.

Section 4 - General frequency fee

In accordance with the general determination criteria referred to in section 3, subsection 1 above, the frequency fee charged is determined in accordance with the following formula and the coefficients, calculated quantities and concepts defined in subsections 2–8:

```
B0 • K1 • Kasuk • S • €1295.50
```

The relative bandwidth of radio frequencies (B0) is the ratio of the number of frequencies to the reference bandwidth (Bref). The amount of frequency applied in determining the frequency fee is the amount of frequency allocated for use or reserved for the radio network or system (B) multiplied by the right-of-use factor (Kj) based on the quality of the right of use. The relative bandwidth is determined according to the following formula:

```
B0 = (B • Kj) / Bref
```

The reference bandwidth (Bref) is 25 kHz, except for the frequency fee for radio link transmitters above 960 MHz, where the reference bandwidth applied in the fee is 14 MHz.

The values of the right-of-use coefficient are determined in section 1 of the appendix. If frequencies have been assigned or reserved for use with different access rights, the frequency amount is the sum of the frequency amounts calculated by access rights.

The frequency range coefficient (K1) is determined on the basis of the frequency range assigned or reserved for the use of the licensee's radio transmitter or radio network, radio system or radio station's licensed radio transmitters. If frequency ranges with different frequency range coefficients have been assigned and reserved for use, the highest of the coefficients of these ranges is applied. The applicable frequency range coefficients are determined in section 2 of the appendix.

The population coverage factor (Kasuk) is determined based on how many inhabitants are in the right-of-use area of a radio transmitter or radio network, radio system or radio station in relation to the population of Finland. The population coverage factor is 1 for the access right area covering the whole of Finland. However, the population coverage factor is at least 0.05 for the granted right to own and use a local mobile communications network, and a fixed 0.01 when imposing a frequency fee for the granted right to own and use a radio transmitter, radio system or radio network other than a mobile communications network, an official radio network, a mass communication network or the 2 GHz land network of a satellite system or a fixed wireless access network radio system.

The basic fee coefficient (S) is a radio system or radio transmitter group-specific coefficient, which is used to relate the effect of the basic fee referred to in subsection 8 to the frequency fee charged. The applicable basic payment coefficients are determined in section 3 of the appendix.

The basic fee is a calculated value assigned to the right to use a frequency amount equal to the reference band, which is used when determining the frequency fee for the radio transmitter. The basic fee is 1,295.50 euros.

3. Examples for the radio license and protection costs

Example of S-band uplink license

According to the degree of law described above the example calculation for satellite control traffic with 2075MHz frequency using 500kHz bandwidth would be following the formula below. The traffic in this example assumes a coordinated fixed position ground station license.

```
Frequency fee = B0 • K1 • Kasuk • S • 1295.50 €

B0 = Cube Root[(B*Kj)/Bref] →

B0 = [(B*kj)/Bref]^1/3
```

The reason for using the cube root comes from addition to §6 degree of law for ground stations.

```
B is the bandwidth = 500 kHz

The frequency range coefficient Kj = 1

The frequency factor = (960,001-2200 MHz) K1 = 1.0

The basic fee coefficient (S) = 6

The basic fee (P) = 1 295.50

The reference bandwidth (Bref) = 25 kHz

The population coverage factor (Kasuk) = 0.01
```

So the calculation formula for relative bandwidth of radio frequency is

```
B0 = (500*1/25)^(1/3) = 2.7144
```

And then the annual radio license cost is 210.99€/year:

```
Frequency fee = 2.7144*1*0.01*6*1295.5 = 210.99
```

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Example of S-band data downlink protection cost

If the ground station's reception is protected, the same calculation formula is applied for the protection in accordance with section §12a of the payment regulation. Successful protection sets additional restrictions for other frequency users.

The traffic in this example assumes a coordinated fixed position ground station license. An example calculation for ground station receiving protected data traffic with 2245MHz frequency using 1500kHz bandwidth would follow the formula below.

```
B is the protected receiving bandwidth = 1500 kHz
The frequency range coefficient Kj = 1
The frequency factor = (960,001-2200 MHz) K1 = 1.0
The basic fee coefficient (S) = 6
The basic fee (P) = 1 295.50
The reference bandwidth (Bref) = 25 kHz
The population coverage factor (Kasuk) = 0.01
```

So the calculation formula for relative bandwidth of radio frequency is

```
B0 = (1500*1/25)^1/3 = 3.915
```

And then the annual data downlink protection cost is 304.30€/year:

```
Frequency fee = 3.195*1*0.01*6*1295.5 = 304.30
```

4. Examples of the radio license costs in VHF/UHF-band

Example of VHF-band uplink license

An example calculation for satellite control traffic with 149MHz frequency using 30kHz bandwidth would be following. The traffic in this example assumes a coordinated fixed position ground station license.

```
B is the bandwidth = 30 kHz
The frequency range coefficient Kj = 1
The frequency factor = (146,001-174 MHz) K1 = 1.9
The basic fee coefficient (S) = 6
The basic fee (P) = 1 295.50
The reference bandwidth (Bref) = 25 kHz
The population coverage factor (Kasuk) = 0.01
```

So the calculation formula for relative bandwidth of radio frequency is

```
B0 = (30*1/25)^1/3 = 0.1063
```

And then the annual radio license cost is 156.94€/year:

```
Frequency fee = 0.1063*1.9*0.01*6*1295.5 = 156.94
```

Example of UHF-band data downlink protection cost

An example calculation for ground station receiving protected data traffic with 400MHz frequency using 50kHz bandwidth would be following. The traffic in this example assumes a coordinated fixed position for ground station license.

```
B is the bandwidth = 50 kHz

The frequency range coefficient Kj = 1

The frequency factor = (146,001-174 MHz) K1 = 2.0

The basic fee coefficient (S) = 6

The basic fee (P) = 1 295.50

The reference bandwidth (Bref) = 25 kHz

The population coverage factor (Kasuk) = 0.01
```

So the calculation formula for relative bandwidth of radio frequency is

```
B0 = (50*1/25)^1/3 = 1.260
```

And then the annual data downlink protection cost is 195.87€/year:

```
Frequency fee = 0.1260*2.0*0.01*6*1295.5 = 195.87
```

5. Appendix – Sizes of multiplications applied in frequency charges (selection for satellite ground stations)

1) Access rights coefficients

Radio equipment group License K j

- Radio link transmitters of less than 960 MHz, Local common channel Kj = 1
- Radio link transmitters of more than 960 MHz, Local common channel Kj = 1

2) Frequency domain coefficients

The applicable frequency range coefficients are as follows:

Frequency domain	K 1
0 – 28 MHz	0,2
28,001 – 87,5 MHz	0,9
87,501 – 108 MHz	1,5
108,001 – 146 MHz	1,7
146,001 – 174 MHz	1,9
174,001 – 380 MHz	2,0
380,001 – 470 MHz	2,0
470,001 – 862 MHz	2,0
862,001 – 960 MHz	1,4
960,001 – 2200 MHz	1,0
2200,001 – 3100 MHz	0,6
3100,001 – 5000 MHz	0,4
5000,001 – 10700 MHz	0,3
10700,001 – 19700 MHz	0,25
19700,001 – 39500 MHz	0,2
39500,001 – 55000 MHz	0,1
Over 55000 MHz	0,03

3) Basic fee coefficients

23) Co-ordinated fixed satellite traffic ground stations	6

4) System coefficients

The applicable system coefficients are as follows:

Number of mobile devices	Stepped number (number $_p$)	K_{6b} (0,25 • number $_p$)
1	1	0,25
2 – 4	2	0,5
5 – 8	5	1,25
9 – 14	9	2,25
15 – 24	15	3,75
25 – 34	22	5,5
35 – 44	30	7,5
45 – 59	40	10
60 – 79	55	13,75
80 – 99	70	17,5
100 or more	95	23,75

The applicable system coefficients when determining the frequency fees for radio stations sent into space by satellite systems are as follows:

Number of radio stations	Stepped number (number $_p$)	K_{6b} (1 • number $_p$)
1	1	1
2 – 3	2	2
4 – 5	4	4
6 – 7	6	6
8 – 9	7	7
10 – 14	9	9
15 – 19	13	13
20 – 27	18	18
28 – 39	25	25
40 – 49	32	32
50 or more	40	40