



Media background material 23.02.2012 Results of the auction of all mobile radio frequencies in Switzerland

1 Auction results

Auction result

Frequency band	Orange	Sunrise	Swisscom
800 MHz	20 MHz	20 MHz	20 MHz
900 MHz	10 MHz	30 MHz	30 MHz
1800 MHz	50 MHz	40 MHz	60 MHz
2.1 GHz FDD	40 MHz	20 MHz	60 MHz
2.1 GHz TDD	0	0	0
2.6 GHz FDD	40 MHz	50 MHz	40 MHz
2.6 GHz TDD	0	0	45 MHz
Auction price	154'702'000	481'720'000	359'846'000

FDD: Frequency Division Duplex => Two radio channels are needed for a connection

TDD: Time Division Duplex => Only one radio channel is needed for a connection

Changes compared to the current frequency allocation

Frequency band	Orange	Sunrise	Swisscom
800 MHz (awarded for the first time)	+20 MHz	+20 MHz	+20 MHz
900 MHz (currently "GSM")	-3.2 MHz	-0.4 MHz	+5.6 MHz
1800 MHz (currently "GSM")	-1.2 MHz	+9.2 MHz	+25.6 MHz
2.1 GHz FDD (currently "UMTS")	+10 MHz	-10 MHz	+30 MHz
2.1 GHz TDD (currently "UMTS")	-5 MHz	-5 MHz	-5 MHz
2.6 GHz FDD (awarded for the first time)	+40 MHz	+50 MHz	+40 MHz
2.6 GHz TDD (awarded for the first time)	0	0	+40 MHz

FDD: Frequency Division Duplex => Two radio channels are needed for a connection

TDD: Time Division Duplex => Only one radio channel is needed for a connection

Time frame for use of the individual frequencies (⇒ for further details see below)

- 800 MHz: The frequencies can be used from 1.1.2013. Because of existing DVB-T distribution networks in Graubünden and in the Upper Valais, individual frequency blocks in these regions can be used only from the end of 2013.
- 900 / 1800 MHz: After a transitional phase for any necessary conversion work, it will be possible to use the frequencies throughout the country at the latest from 1.1.2015 or from 1.1.2016 in the Basel and Geneva regions. Currently free frequencies in the 1800 MHz range can be used after the award of the licence.
- 2.1 GHz: Use is possible after the expiry of the existing UMTS licences from 1.1.2017. Currently free frequencies can be used after award of the licence.
- 2.6 GHz: The frequencies can be used after award of the licence.

2 Background and objectives

As early as 2008 the Federal Communications Commission (ComCom), together with the Federal Office of Communications (OFCOM), had discussed how available mobile radio frequencies and frequencies which would become available in 2014 (GSM) and 2017 (UMTS) could be awarded¹. It envisaged a new award of the entire Swiss mobile radio spectrum by auction. It therefore requested OFCOM to put up for discussion possible procedural variants within the framework of a public consultation. On the basis of the results of the consultation and further in-depth analyses, ComCom decided to award all the currently available frequencies and all those which will become available from 2014 (GSM) and 2017 (UMTS) within the framework of a single auction.

The following objectives were decisive in the choice of the award procedure:

- **All companies can take part in the award of frequencies:**
In view of the high level of tariffs in the Swiss mobile market, ComCom also considered the possibility of stimulating the market by the preferential award of a licence to a new network operator. However, it rated the chances of success of such a scenario as low: considerations of a technical, economic and legal nature led to the conclusion that promoting the entry of an additional provider with its own infrastructure would meet with little success. ComCom is therefore abstaining from any special measures aimed at promoting the entry of a new operator into the market. The auction for the entire available spectrum was therefore open on equal terms to all interested parties. In reality, then, no new mobile operator has actually applied for frequencies.
- **Optimal allocation of frequencies:**
As a result of awarding the spectrum in small blocks of frequencies, the participants in the auction were able to acquire flexibly a range of frequencies which corresponds to their needs and business models. Bidding restrictions in certain frequency ranges ensured that individual auction participants could not purchase all the frequency blocks. All existing mobile operators had the opportunity to acquire a promising range of frequencies.
- **An early allocation of frequencies brings legal security:**
To ensure that the mobile telephone networks can meet the future needs of customers, operators must be able to decide in good time on the technologies in which they want to invest and the capacities they wish to build. To make sure that operators have planning and investment security, they have to know their future spectrum availability as early as possible.

¹ The GSM licences expire at the end of 2013 and the UMTS licences at the end of 2016.

ComCom therefore got to grips with the award process at a very early stage and opted for a allocation of all mobile radio frequencies at once. Operators now know which frequencies they will be able to use until 2028.

- **Use of the latest technologies:**

A primary objective of ComCom is that the latest mobile radio technologies (e.g. LTE, cf. Sections 4.3 and 6) can be deployed in Switzerland as early as possible and that consumers can continue to benefit also in the future from high-quality, reasonably priced mobile telephony products. In the given circumstances, the chosen procedure can best contribute to stimulating competition in mobile radio in Switzerland.

- **A reasonable return:**

In accordance with the provisions of the legislation, a reasonable return must also be obtained for the frequencies, which represent a scarce public resource (cf. Section 4.4).

3 The award procedure

The competitive tender for the new award of all mobile radio frequencies in Switzerland was launched on 26 November 2010. On the basis of the numerous questions and comments relating to the procedure, in January 2011 ComCom extended the deadline for candidatures and examined the comments after a public consultation. At the end of May 2011 it revised a number of points in the invitation to tender and specified the deadline for candidates to participate in the auction as the end of September 2011.

Authorisation

Those applicants which were able to demonstrate that they could meet the licensing requirements (in accordance with Article 23 of the Telecommunications Act, TCA) and that the award of a radiocommunication licence to them would neither eliminate nor substantially adversely affect effective competition were approved by ComCom to take part in the auction. Furthermore, before the auction commenced, they also had to submit a bank guarantee which covered 50% of the minimum bid for the frequencies they were applying for.

4 Frequencies, constitution of blocks and minimum prices

4.1 Frequency blocks: the market determines the scope of the licence

In principle, the bidders are closer to the market than the licensing authority and they are better able to evaluate possible technological developments. Each operator is best able to assess the frequencies which is optimal for its network. It was therefore appropriate to assign the available frequencies in small blocks and hence to leave the decision as to how many licences and their spectrum to the market.

Depending on when individual frequency ranges become available, a fundamental breakdown of the frequencies into abstract frequency blocks of 2 x 5 MHz was undertaken. Exceptions arose in the case of individual frequencies already available in the 1800 MHz and 2600 MHz bands, where individual blocks with different bandwidths are being awarded. The timing of availability and technical spectrum-based reasons made the constitution of large frequency blocks essential in this case. For the auction, the available frequencies were split into a total of 11 categories. The categories differ in terms of frequency range, block size, period of use and minimum price (cf. the table).

4.2 Frequency categories and non-awarded frequencies

Category	Period of use	Number of blocks (lots)	Block size	Minimum price per lot [million CHF]	Non-awarded frequencies blocks
A: 800 MHz	16 years 1.1.2013 - 31.12.2028	6	2 x 5 MHz	21.3	0
B: 900 MHz	15 years 1.1.2014 – 31.12.2028	7	2 x 5 MHz	21.3	0
C: 1800 MHz	18 years Immediately – 31.12.2028	1	2 x 10 MHz	16.6	0
D: 1800 MHz	15 years 1.1.2014 – 31.12.2028	13	2 x 5 MHz	7.1	0
E: 2100 MHz TDD	18 years Immediately 31.12.2028	1	1 x 5 MHz	4.15	1
F: 2100 MHz TDD	12 years 1.1.2017 – 31.12.2028	3	1 x 5 MHz	2.7	3
G: 2100 MHz FDD	18 years Immediately – 31.12.2028	3	2 x 5 MHz	8.3	0
H: 2100 MHz FDD	12 years 1.1.2017 – 31.12.2028	9	2 x 5 MHz	5.4	0
I: 2600 MHz FDD	18 years Immediately - 31.12.2028	14	2 x 5 MHz	8.3	1
J: 2600 MHz TDD	18 years Immediately – 31.12.2028	3	1 x 15 MHz	12.45	0
K: 2010 – 2025 MHz	18 years Immediately – 31.12.2028	1	1 x 15 MHz	12.45	Frequencies not auctioned as there was no demand

4.3 Description of the frequency bands

800 MHz

These frequencies are part of the so-called "digital dividend", i.e. the radio frequencies which have become available as a result of more efficient use of the frequency spectrum following the switchover from analogue to digital terrestrial television. They are used primarily to provide mobile broadband services. With a view to a technology-neutral award of frequencies ComCom is not prescribing any specific transmission technologies. However, on the basis of international developments, it is expected that this frequency band will witness rapid deployment of the new technology for data transfer LTE (Long Term Evolution), which is the successor to UMTS. For LTE the 800 MHz spectrum is a complement to use of the 2.6 GHz spectrum.

900 MHz

Since the 1990s and for the next few years also, this frequency band has been and will continue to be used for the second-generation mobile telephony standard, the GSM standard (including GPRS and EDGE). With the growing availability of suitable terminals, the UMTS standard will also be increasingly used in this frequency band. The frequencies in the 800 MHz and 900 MHz ranges are of particular interest because of their good propagation characteristics.

1800 MHz

The 1800 MHz band, like the 900 MHz band, is a classic GSM band. The 1800 MHz frequencies are used on the one hand to provide adequate transmission capacities in areas of high mobile traffic and on the other hand they can be used to deploy nationwide mobile GSM networks. In the medium term, the use of LTE transmission technology within this frequency band is also expected.

2100 MHz

This frequency band is the classic UMTS band. In addition to UMTS-based voice services, it is also used for mobile data transfer (e.g. mobile TV, mobile internet), using the HSPA and HSPA+ extensions to UMTS.

2600 MHz

These frequencies have worse propagation characteristics and poorer coverage inside buildings than lower frequencies. They do, however, allow the use of LTE technology with very high transmission bandwidths. This means that very high data rates can be provided for coverage of areas with a high population density. Improved LTE provision, including the corresponding penetration of buildings, can, for example, be achieved by a corresponding complementary use of frequencies in the 800 MHz band.

4.4 Minimum prices

When radiocommunication licences are awarded by auction, ComCom, as the licensing authority pursuant to Article 39 para. 4 TCA, must set a minimum bid. Moreover, Article 23, para. 1 of the Ordinance on Frequency Management and Radiocommunications Licences (OFMRL) states in this regard that in the case of award of licences by auction, **adequate licence revenue** should be achieved and that the licensing authority may set a minimum bid for this purpose. The lower limit of this statutory minimum bid is equal to the sum:

- a. *of the licence fees discounted by the industry-standard interest rate congruent with the term, for the full term of the licence; and*
- b. *the administrative fees for the tender process and the award of the licence.*

The ordinance lays only down the amount at which the lower limit of the minimum bid is to be calculated. An upward revision of this may be made when defining a minimum bid.

For frequencies above 1 GHz, ComCom specified a minimum bid equal to the legally prescribed lower limit. For the frequencies below 1 GHz which are technically interesting with regard to propagation (800 MHz, 900 MHz), a minimum bid which is three times higher than the legally prescribed lower limit has been laid down, in the light of the expected high level of interest and the legal requirement for an appropriate return from the auction. In particular, this was also intended to guarantee an efficient auction process.

4.5 Bidding restrictions (spectrum caps)

In order to prevent undesirable auction results which would endanger competition in the mobile telephony market, ComCom imposed bidding restrictions ('spectrum caps') in individual frequency bands. Spectrum caps lay down the maximum extent of the frequencies which one bidder can acquire in the corresponding frequency band. The spectrum caps were defined in such a way that on the one hand competitive bidding takes place in the auction and on the other hand the existing operators in particular have an opportunity to acquire adequate spectrum.

The following spectrum caps were set:

- A bidder may acquire in total a maximum of 50% of all FDD frequencies
- Maximal 2 x 20 MHz in the 900 MHz band (GSM)
- and at the same time a maximum of 2 x 25 MHz in the 800 MHz *and* 900 MHz bands together

- Maximum 2 x 35 MHz in the 1800 MHz band (GSM)
- Maximum 2 x 30 MHz in the 2100 MHz band (UMTS)

These restrictions were imposed so that a financially strong bidder could not acquire more than half of all duplex frequencies and therefore all three existing operators, given a corresponding readiness to pay, had the possibility of acquiring sufficient spectrum.

5 The auction

In an analysis, different auction formats which might have been candidates for the award were assessed. The most appropriate format was determined to be a combinatorial clock auction (CCA - see Section 5.1). With a CCA, the bidders have the opportunity to assemble frequency packages which best suit their business model, without being exposed to the risk that at the end of the auction they will be encumbered with a frequency spectrum which they did not wish to acquire in that composition or which does not correspond to their needs.

Thus both the substitutability of the individual frequency bands and their complementary character can best be taken into consideration as they exist between the frequencies in the different frequency ranges (with the exception of the frequencies in category K; see table in Section 4.2). On the one hand, the bidders need frequencies in the lower frequency ranges which are of greater interest in terms of propagation characteristics, and on the other hand they also need frequencies in the higher frequency ranges, in particular to increase capacity in densely populated areas. All the frequencies in the categories A - J were therefore awarded simultaneously within the framework of the CCA. Bidders can bid on combinations of frequency blocks which are attractive from their point of view. Bids are evaluated within the package, which means that no bidder can win combinations of blocks on which it has not bid.

After the award of the categories A - J, the frequency block in category K would have been auctioned in an additional round with sealed bids being submitted (single round, sealed bid). In particular, this reduced the complexity of the CCA. But the frequencies in category K were not auctioned as there was no demand.

An experienced auctioneer

DotEcon Ltd, a company which specialises in spectrum auctions, was involved in the choice of the auction format and was also involved in the holding of the auction. The chosen auction system was already being used successfully in countries such as Denmark, Great Britain, the Netherlands, Norway, Sweden and Hong Kong and was adapted for the Swiss auction. This system allows secure bidding over the internet and has the advantage that the auction can be held remotely - i.e. bidders can bid from their company headquarters.

To prevent possible collusion and arrangements between the bidders, ComCom will only reveal the names of the candidates at the end of the auction, when the names of the winners, the acquired frequencies and the auction price will be notified.

5.1 Combinatorial Clock Auction CCA

The CCA is a multi-stage auction, which is composed of a **principal stage** and a **assignment stage**.

In the **principal stage** it is determined which (abstract) frequency range a bidder can bid for, taking into account the bidding restrictions (see Section 4.5). On completion of the main stage it is therefore clear how many blocks of frequencies the individual participants in the auction have acquired in the different frequency ranges and at what base price.

The **assignment stage** takes place after the principal stage and is used to determine the specific position of the acquired frequencies in the individual frequency bands. The aim is to award frequency blocks which are as contiguous as possible. The winners emerging from the principal stage have the possibility of bidding, in an additional stage, for those concrete frequency blocks which they consider to be the most valuable.

Total price

The total price which a winner has to pay consists of the sum of the prices from the principal stage (base price) and from the assignment stage. In both stages the combination which maximises revenue will be calculated from all submitted bids. In this context, a maximum of one bid per bidder will be taken into consideration. The price to be paid by the individual winners is set so that it corresponds to the minimum necessary bid which would have led to the same auction result. The auction price therefore effectively corresponds to the amount of the lowest bid which a bidder would have been able to make in order to acquire the frequencies he has won anyway. This provides an incentive not to bid strategically but to substantially disclose one's own willingness to pay.

Candidates had to bindingly and irrevocably specify in their candidature dossier the maximum number of frequency blocks in each category which they wished to acquire at the respective minimum prices. If, after analysis of these data, it turned out that the demand for frequency blocks was greater than the number of blocks available in the respective category in **none** of the categories, there would have been no scarcity and the first stage of the auction would not have been held. However, this was not the case.

6 Technological development

In order to provide the population with broadband multimedia mobile services (e.g. mobile internet), the mobile radio networks in Switzerland use the EDGE GSM data extension as well as UMTS with HSPA. HSPA (High Speed Packet Access) is an evolution of UMTS for the provision of higher data rates from the network to a mobile terminal and vice versa.

In view of the expected rapid increase in global mobile data traffic, the industry is developing new powerful, reasonable, spectrum-efficient mobile radio standards in order to further increase data rates and transmission capacities.

The further development stages are:

- **HSPA+** (Evolved High Speed Packet Access)

Market-ready devices which support this standard are available today. The standard allows:

- a doubling of voice capacity and a tripling of data capacity on the existing UMTS networks,
- a doubling of the data rate from the network to the mobile device and vice versa, compared to the existing HSPA,
- a reduction in network costs thanks to purely packet-switched transmission of voice and data,
- migration of networks to LTE.

- **LTE technology** (Long Term Evolution of UMTS)

LTE is a step further in the evolution of UMTS which has a completely new air interface. Characteristics of LTE are:

- 3 to 4 times higher spectrum efficiency than UMTS/HSPA (High Speed Packet Access) – at relatively low network costs (i.e. lower costs per transmitted bit),
- a significant increase in data rates on the downlink, up to 100 Mbps, and up to 50 Mbit/s on the uplink with a 20 MHz channel bandwidth,
- flexible channel bandwidths of 1.4 MHz, 2.5 MHz, 5 MHz, 10 MHz, 15 MHz and 20 MHz, requiring the smallest possible fragmentation of the frequency bands.

7 Licence

7.1 Term of the licence

The term of the licenses was specified as up to the end of 2028 for all frequencies. This was intended to give operators sufficient certainty, so that they can recoup the high investment in new technologies such as LTE. During the public consultation, the existing licensees considered a licence term of at least 15 years to be essential. This also reflects the general trend at the European level. A term which extends until the end of 2028 represents a period of 15 years, in relation to the GSM licenses which expire at the end of 2013.

7.2 Technology

The licences are being awarded essentially in a technology-neutral manner. The licensees are free, within the assigned frequency ranges, to use those mobile radio technologies which they consider appropriate to the implementation of their business models. The general technical conditions will be laid down in the annexes to the licence.

7.3 Conditions relating to utilisation

In order to ensure that the assigned frequencies are actually used for the provision of telecommunications services, the licences include a general obligation to use the assigned frequencies to provide telecommunications services. Additionally, the following conditions for coverage with mobile radio services on a company's own infrastructure are imposed, classified according to frequency bands:

- 800 MHz frequencies: coverage of 50% of the population by 31 December 2018 at the latest;
- 900 MHz frequencies: coverage of 50% of the population by 31 December 2020;
- 1800 MHz frequencies: coverage of 25% of the population by 31 December 2020;
- 2100 MHz FDD frequencies: coverage of 25% of the population by 31 December 2021 ;
- Licensees which have the right to use frequencies in the 2100 MHz TDD and 2600 MHz bands shall be subject to the general obligation of utilisation from 1 January 2019 onwards.

The aim of these requirements is to ensure that the assigned frequencies are actually used and that any violations in the context of a supervisory procedure can be punished. More extensive provision of the population with high-quality mobile services which exceed the minimum requirements will be achieved within the framework of competition between the mobile operators.

7.4 Protection from immissions and spatial planning

As with the current licences, the new licenses will also include provisions regarding compliance with the Ordinance on Protection from Non-Ionising Radiation (ONIR). In addition, licensees are in principle obliged to co-use sites outside building zones and to inform the cantons in good time about their network planning.