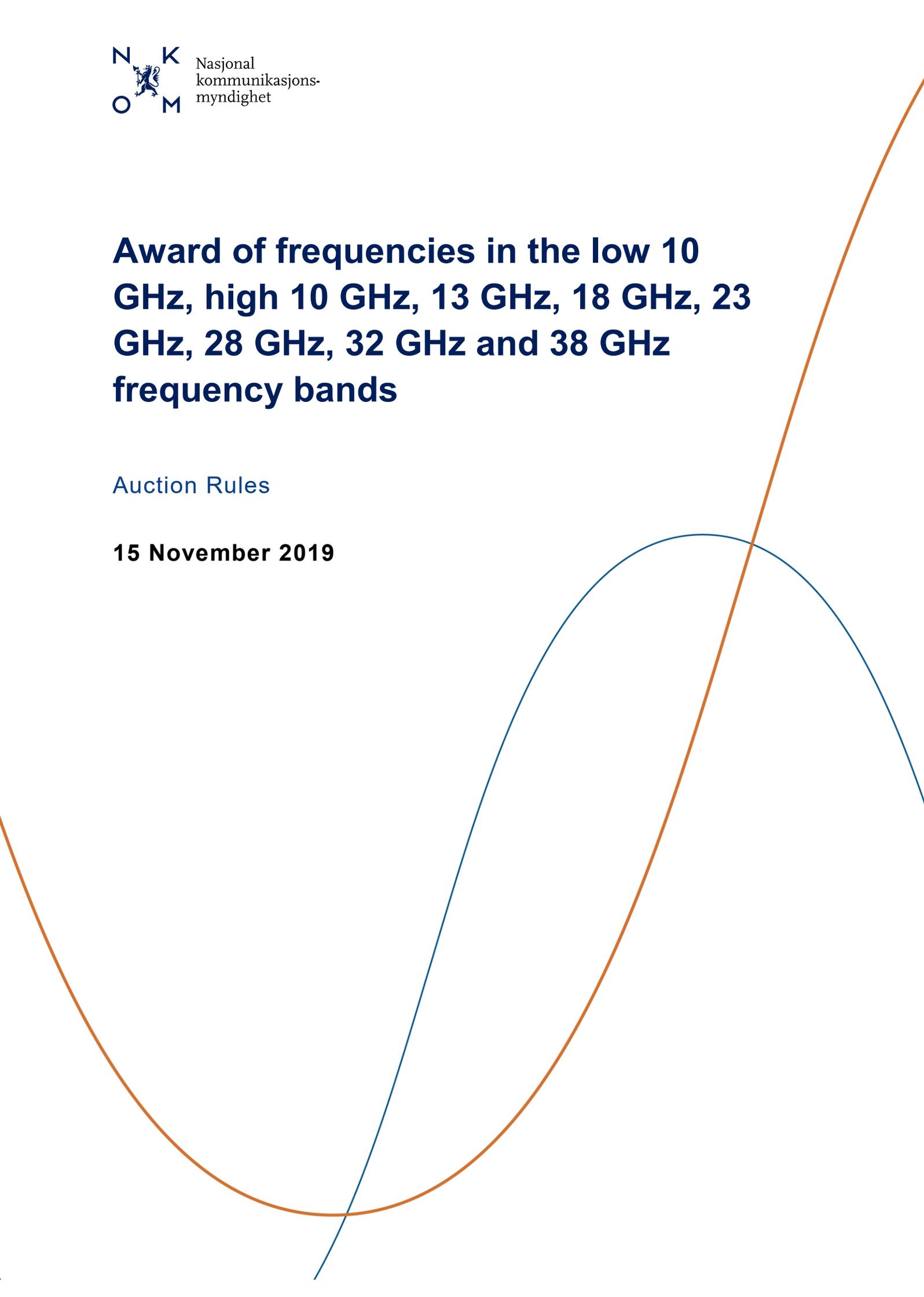# Award of frequencies in the low 10 GHz, high 10 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz, 32 GHz and 38 GHz frequency bands

Auction Rules

15 November 2019

Contents

Tables

1 Introduction

In this document the Norwegian Communications Authority (Nkom) presents the auction rules for the award of spectrum in the low 10 GHz, high 10 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz, 32 GHz and 38 GHz frequency bands (the 'award bands').

The auction will determine who will be awarded the spectrum available, the specific frequencies assigned to each participant and the price they will be required to pay to be awarded their corresponding licences. The final auction rules constitutes together with the overall framework for the award, the regulations for the award.

The time schedule may be altered and the process postponed. All specific dates in this document might be changed due to alterations in the time schedule.

2 Overall framework

The document "Tildeling til radiolinje overordnet regulering – Auksjon av frekvensbåndene lav 10 GHz, høy 10 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz, 32 GHz og 38 GHz (Auksjon#27)" (the overall framework for the award) (in Norwegian only) published 15 November 2019, states the overall objectives and the overall framework for the award, including auction format, reserve prices and spectrum cap.

3 Spectrum available for this award

3.1 Available spectrum

The spectrum available has been divided into frequency blocks for its assignment. In order to adopt a channel plan that facilitates the use of spectrum for harmonised use, the spectrum available includes the following blocks in the available bands:

Band	Spectrum available
Low 10 GHz	5 blocks of 2x28 MHz, 1 block of 28 MHz (unpaired), 1 block of 2x6 MHz and 1 block of 2x4 MHz
High 10 GHz	6 blocks of 2x28 MHz and 1 block of 2x4 MHz
13 GHz	4 blocks of 2x28 MHz and 1 block of 2x14 MHz
18 GHz	10 blocks of 2x55 MHz, 1 block of 2x6.875 MHz and 1 block of 2x13.75 MHz
23 GHz	12 blocks of 2x28 MHz and 3 blocks of 2x7 MHz
28 GHz	2 blocks of 2x56 MHz
32 GHz	6 blocks of 2x56 MHz and 1 block of 2x28 MHz
38 GHz	9 blocks of 2x56 MHz

Table 1 – Spectrum blocks available

The spectrum blocks available in each of the award bands are illustrated in the overall framework for the award section 4.3. Each of the available blocks are labelled with a letter (starting with A for the low 10 GHz band, and the number of the block starting from the lower frequency block, i.e. A1 for the block 10000-10004 / 10350-10354 MHz).

3.2 Two-stage process for the assignment of frequency-generic lots and then specific frequencies

The frequencies available will be assigned using a two-stage process:

- The first stage will determine the assignment of frequency-generic lots. For this stage, the available frequency blocks are grouped into categories. The blocks in each category are then offered as identical lots. Each frequency-generic lot will correspond to a frequency block within the category, but (except in the case of categories that contain a single lot) will not correspond to a specific frequency block. In this stage bidders can bid for lots within each category, without being able to specify which specific frequency blocks they wish to acquire.

- The second stage will determine the specific frequency blocks that will be assigned to the winners of frequency-generic lots, under the guarantee that the frequency blocks assigned to each winner within a category will be contiguous. Where possible, the process will also seek to guarantee contiguity across adjacent lot categories.

3.3 Frequency blocks available

The frequency blocks available are indicated in the table below:

Band	Frequency block	Frequencies
Low 10 GHz	A1	10000-10004 MHz with 10350-10354 MHz
	A2	10004-10032 MHz with 10354-10382 MHz
	A3	10032-10060 MHz with 10382-10410 MHz
	A4	10060-10088 MHz with 10410-10438 MHz
	A5	10088-10116 MHz with 10438-10466 MHz
	A6	10116-10144 MHz with 10466-10494 MHz
	A7	10144-10150 MHz with 10494-10500 MHz
	A8	10322-10350 MHz (unpaired)
High 10 GHz	B1	10150-10154 MHz with 10500-10504 MHz
	B2	10154-10182 MHz with 10504-10532 MHz
	B3	10182-10210 MHz with 10532-10560 MHz
	B4	10210-10238 MHz with 10560-10588 MHz
	B5	10238-10266 MHz with 10588-10616 MHz
	B6	10266-10294 MHz with 10616-10644 MHz
	B7	10294-10322 MHz with 10644-10672 MHz
13 GHz	C1	12751-12779 MHz with 13017-13045 MHz
	C2	12779-12793 MHz with 13045-13059 MHz
	C3	12891-12919 MHz with 13157-13185 MHz
	C4	12919-12947 MHz with 13185-13213 MHz
	C5	12947-12975 MHz with 13213-13241 MHz
18 GHz	D1	17706.87-17713.75 MHz with 18716.87-18723.75 MHz
	D2	17713.75-17727.5 MHz with 18723.75-18737.5 MHz
	D3	17727.5-17782.5 MHz with 18737.5-18792.5 MHz
	D4	17782.5-17837.5 MHz with 18792.5-18847.5 MHz

	D5	17837.5-17892.5 MHz with 18847.5-18902.5 MHz
	D6	17892.5-17947.5 MHz with 18902.5-18957.5 MHz
	D7	17947.5-18002.5 MHz with 18957.5-19012.5 MHz
	D8	18002.5-18057.5 MHz with 19012.5-19067.5 MHz
	D9	18057.5-18112.5 MHz with 19067.5-19122.5 MHz
	D10	18112.5-18167.5 MHz with 19122.5-19177.5 MHz
	D11	18167.5-18222.5 MHz with 19177.5-19232.5 MHz
	D12	18222.5-18277.5 MHz with 19232.5-19287.5 MHz
23 GHz	E1	22064-22092 MHz with 23072-23100 MHz
	E2	22092-22120 MHz with 23100-23128 MHz
	E3	22120-22148 MHz with 23128-23156 MHz
	E4	22148-22176 MHz with 23156-23184 MHz
	E5	22176-22204 MHz with 23184-23212 MHz
	E6	22204-22232 MHz with 23212-23240 MHz
	E7	22232-22260 MHz with 23240-23268 MHz
	E8	22260-22288 MHz with 23268-23296 MHz
	E9	22288-22316 MHz with 23296-23324 MHz
	E10	22316-22344 MHz with 23324-23352 MHz
	E11	22344-22372 MHz with 23352-23380 MHz
	E12	22512-22519 MHz with 23520-23527 MHz
	E13	22519-22526 MHz with 23527-23534 MHz
	E14	22526-22533 MHz with 23534-23541 MHz
	E15	22561-22589 MHz with 23569-23597 MHz
28 GHz	F1	28332.5-28388.5 MHz with 29340.5-29396.5 MHz
	F2	28388.5-28444.5 MHz with 29396.5-29452.5 MHz
32 GHz	G1	32207-32263 MHz with 33019-33075 MHz
	G2	32263-32319 MHz with 33075-33131 MHz
	G3	32319-32375 MHz with 33131-33187 MHz
	G4	32375-32431 MHz with 33187-33243 MHz
	G5	32431-32487 MHz with 33243-33299 MHz
	G6	32487-32543 MHz with 33299-33355 MHz
	G7	32543-32571 MHz with 33355-33383 MHz
38 GHz	H1	37058-37114 MHz with 38318-38374 MHz
	H2	37114-37170 MHz with 38374-38430 MHz
	H3	37226-37282 MHz with 38486-38542 MHz
	H4	37282-37338 MHz with 38542-38598 MHz
	H5	37338-37394 MHz with 38598-38654 MHz
	H6	37394-37450 MHz with 38654-38710 MHz
	H7	37450-37506 MHz with 38710-38766 MHz
	H8	37730-37786 MHz with 38990-39046 MHz
	H9	37786-37842 MHz with 39046-39102 MHz

Table 2 – Frequency blocks available

3.4 Frequency-generic lots

The frequency blocks available have been grouped into the categories of frequency-generic lots as indicated in the table below:

Band	Lot category	Blocks included	Lot bandwidth	Number of lots
Low 10 GHz	L10-1	A1	2x4 MHz	1
	L10-2	A2-A6	2x28 MHz	5
	L10-3	A7	2x6 MHz	1
	L10-4	A8	28 MHz	1
High 10 GHz	H10-1	B1	2x4 MHz	1
	H10-2	B2-B5	2x28 MHz	4
	H10-3	B6	2x28 MHz	1
	H10-4	B7	2x28 MHz	1
13 GHz	13-1	C1	2x28 MHz	1
	13-2	C2	2x14 MHz	1
	13-3	C3-C5	2x28 MHz	3
18 GHz	18-1	D1	2x6.88 MHz	1
	18-2	D2	2x13.75 MHz	1
	18-3	D3-D12	2x55 MHz	10
23 GHz	23-1	E1-E5	2x28 MHz	5
	23-2	E6-E11	2x28 MHz	6
	23-3	E12-E14	2x7 MHz	3
	23-4	E15	2x28 MHz	1
28 GHz	28	F1-F2	2x56 MHz	2
32 GHz	32-1	G1-G6	2x56 MHz	6
	32-2	G7	2x28 MHz	1
38 GHz	38-1	H1-H2	2x56 MHz	2
	38-2	H3-H7	2x56 MHz	5
	38-3	H8-H9	2x56 MHz	2

Table 3 – Categories of frequency-generic lots

3.5 Reserve prices

The reserve prices have been set in the overall framework for the award. The reserve prices per lot are:

Band	Lot category	Reserve price per lot (NOK)
Low 10 GHz	L10-1	14,000
	L10-2	95,000
	L10-3	21,000
	L10-4	48,000
High 10 GHz	H10-1	16,000
	H10-2	107,000

	H10-3	95,000
	H10-4	95,000
	13-1	107,000
13 GHz	13-2	54,000
	13-3	107,000
	18-1	27,000
18 GHz	18-2	53,000
	18-3	210,000
	23-1	67,000
	23-2	99,000
23 GHz	23-3	25,000
	23-4	99,000
28 GHz	28	197,000
32 GHz	32-1	197,000
	32-2	76,000
	38-1	197,000
38 GHz	38-2	173,000
	38-3	152,000

Table 4 – Reserve prices

3.6 Spectrum cap

There are two spectrum caps, which have been set in the overall framework for the award. The spectrum caps establish the maximum total bandwidth a bidder is permitted to acquire in the auction:

- a cap of 370 MHz on the total amount of spectrum that each operator may hold across the Low 10 GHz, High 10 GHz and 13 GHz bands; and

- a cap of 2545 MHz on the total amount of spectrum that each operator may hold across the Low 10 GHz, High 10 GHz, 13 GHz, 18 GHz, 23 GHz, 28 GHz, 32 GHz and 38 GHz bands.

4 Licence terms and conditions

4.1 Geographic scope

The spectrum licence will be assigned for terrestrial frequency use on the Norwegian mainland, the internal waters[1] and out to 12 nautical miles from the baseline, with the exception of Svalbard, Jan Mayen and the Norwegian dependencies.

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[1] Section 3 of Act no. 57 of 27 June 2003 concerning Norway's territorial waters and related zones.

4.2 Licence duration

Licences for spectrum in the Low 10 GHz, High 10 GHz, 13 GHz and 18 GHz frequency bands will expire on 31 December 2044.

Licences for spectrum in the 23 GHz, 28 GHz, 32 GHz and 38 GHz frequency bands will expire on 31 December 2037.

The start date of the licences will be in accordance with annex 1 to the overall framework for the award, the document "Tildeling til radiolinje - Oversikt over ressurser i auksjonen" (in Norwegian only) dated 15 November 2019.

4.3 Usage

Spectrum licences will be technology and service neutral subject to Section 5 in the draft licences, see Annex 3. The frequencies must be used for terrestrial radio applications capable of providing electronic communications services.

The licence will be tradable, including sale, lease etc. according to the Electronic Communications Act Section 6-5.

Specific usage restrictions, technical conditions etc. are specified in the draft licences for each of the auction bands.

4.4 Sector fees

The licensee is required to pay annual sector fees to Nkom. These will be levied from the start date of the licence.

With reference to Section 12-1 of the Electronic Communications Act, the model for sector fees is laid down in Regulations No. 386 of 20 March 2017 concerning sector fees and charges payable to the Norwegian Communications Authority. Information on sector fees payable to Nkom is available on www.nkom.no.

The annual sector fees in table 5 are estimated fees based on numbers for 2018. However, the annual sector fees will be updated every year. The actual sector fees a licensee will have to pay may therefore differ from the estimated numbers in table 5.

Band	Lot category	Estimated sector fees per lot based on numbers for 2018 (NOK)
Low 10 GHz	L10-1	45,000
	L10-2	70,000
	L10-3	47,000

	L10-4	35,000
High 10 GHz	H10-1	45,000
	H10-2	70,000
	H10-3	70,000
	H10-4	70,000
13 GHz	13-1	64,500
	13-2	55,000
	13-3	64,500
18 GHz	18-1	48,000
	18-2	51,500
	18-3	72,000
23 GHz	23-1	56,000
	23-2	56,000
	23-3	47,500
	23-4	56,000
28 GHz	28	63,000
32 GHz	32-1	60,500
	32-2	52,600
38 GHz	38-1	58,000
	38-2	58,000
	38-3	58,000

Table 5 – Estimated annual sector fees based on numbers for 2018

5 Overview of the auction process

5.1 Two stages

The spectrum available is packaged into blocks, which are then grouped into categories of frequency-generic lots. The specific frequency blocks that will correspond to frequency-generic lots will be determined with the objective of ensuring that operators who are assigned multiple frequency-generic lots in a given category are assigned contiguous blocks in relation to these frequency-generic lots.

The auction process consists of two stages:

- the *lot assignment stage* will determine the assignment of frequency-generic lots amongst bidders, on the basis of a multi-round bidding process; and
- the *frequency assignment stage* will determine the assignment of frequency blocks to each winner of frequency-generic lots.

5.2 Lot assignment stage

The lot assignment stage is a multi-round process to determine the number of lots that will be assigned to each bidder in each of the lot categories.

In the lot assignment stage, the spectrum is offered as frequency-generic lots in the lot categories identified in section 3.3. Lots within each category are identical within this stage.

In the event that a bidder is allocated more than one lot in a given lot category, then the frequency blocks corresponding to these lots will be contiguous. Where possible, bidders who win lots across lot categories that are adjacent within a band (in the Low and High 10 GHz bands, the 18 GHz band,23 GHz band and 32 GHz band) will also be assigned blocks that are contiguous across these categories.

To determine the number of lots that will be assigned to each bidder in each lot category, the lot assignment stage will use a Combinatorial Multi-Round Ascending (CMRA) bidding process, in which bidders can make bids for 'packages' of lots, defined by indicating the number of lots in each category that are included in the package. Each bid has one bid amount, which is the price that the bidder offers to pay to be assigned all of the lots in the package. Bids cannot be only partially accepted (i.e. if the bid is selected as a winning bid, then the bidder will be assigned all the lots in the package; otherwise, the bidder will not be assigned any lots in relation to this bid).

Bids will be made over the course of rounds, during which Nkom will indicate a round price for each lot category, and bidders will be able to select the package of lots for which they bid at these prices (calculated as the sum of round prices of all of the lots included in the package – the 'round price of the package'). Such bids are called 'headline bids'. In addition, bidders may also make 'additional bids' for other packages, for which they can specify a bid amount that must not:

- exceed the round price of the package;
- be less than 90% of the round price of the package (except in specific circumstances where the bid is relevant for the calculation of 'relative caps' on other bids, as explained below);
- exceed any relative cap applicable to the bid, which arise from the activity rules.

There are activity rules that set some constraints on the bids that the bidder may submit when the bidder reduces its bidding 'activity', which is measured on the basis of its headline bid.

After each round, Nkom will assess the highest value of bids that could be achieved by selecting at most one bid from each bidder given the lots available. The lot assignment stage

will end after the first round in which it is possible to achieve this highest value by accepting exactly one bid from each bidder who has submitted a headline bid in the most recent round – these will be the winning bids (in the event that there are multiple combinations of bids that meet this criterion, one of these will be selected using the tie-breaking criteria described below).

At the end of the lot assignment stage, each bidder with a winning bid will be assigned the lots in the package of its winning bid, and required to pay the corresponding bid amount.

5.3 Frequency assignment stage

The frequency assignment stage will determine the assignment of frequencies in each of the award bands.

The frequency assignment stage will provide an opportunity for those bidders with options for the frequency blocks they could be assigned (in correspondence with the lots they have won in the lot assignment stage) to make bids for those various options.

The first step will be for Nkom to shortlist the 'candidate plans' in each band, which are the assignments of frequency blocks that satisfy the requirement that

- each bidder is assigned a number of contiguous frequency blocks in each lot category that exactly correspond to the frequency-generic lots it has been assigned in that category; and
- unsold lots within a lot category are also contiguous.

Where possible, the list of candidate plans will be narrowed further to ensure that (at least some) bidders who are assigned frequency blocks in different, but adjacent, lot categories within a band receive contiguous blocks across those categories.

For bands where more than one plan has been shortlisted, Nkom will list the alternative frequency assignments that each bidder could be assigned in that band. Nkom will then run a sealed-bid process in which bidders who could be assigned different options are invited to bid for their preferred options. The bidding process will be run simultaneously for all bands.

Nkom will then select for each band a candidate plan which yields the maximum value of bids, and calculate prices on the basis of opportunity costs, as explained below.

6 Requirements for participation in the auction

6.1 The participants

Any person or undertakings registered in the European Economic Area (EEA) or Switzerland may register for the auction. Note that the undertakings must be registered with an organisation number from The Brønnøysund Register Centre (www.brreg.no) before a frequency licence will be issued.

In cases where persons or undertakings would be treated as a single economic unit, with respect to Article 53 (1) of the EEA agreement (Article 101 (1) of the TEU Treaty), only one of these may register as a bidder. This implies that two or more undertakings within the same corporate group may not register for the auction.

Persons or undertakings may be refused to participate in the auction to prevent activities that may cause a non-insignificant risk of security-threatening activities, based on the Security Act[2] Section 2-5.

6.2 Financial situation

A person or undertaking cannot participate in the auction if the person or the undertaking:

- is in suspension of payments
- has entered into debt settlement negotiations/proceedings
- is insolvent or is subject to a petition of bankruptcy or winding-up, or has passed a resolution for a voluntary winding up
- has gone into bankruptcy/liquidation

6.3 Prohibition of collusive behaviour

Agreements or concerted practices which have as their object or effect the prevention, restriction or distortion of competition, i.e. collusive behaviour regarding bidding or bidding strategies, are prohibited under Section 10 of The Competition Act.

6.4 Registration

Only persons or undertakings who register in accordance with the provisions set in these auction rules, cf. Section 7, are allowed to participate in the auction.

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[2] Act of 1 June 2018 No. 24 relating to National Security

7 The registration process

7.1 Required registration documents

Valid registration for participation in the auction requires submission/delivery of the following registration documents:

1) The registration form provided in Annex 1.
2) Certificate of Registration that states signature requirements and power of procuration.
3) Description of ownership and organizational structure of the participant, e.g. if the participant constitutes, together with a parent company or a subsidiary or subsidiaries, a company group. Participants must inform Nkom if there are shareholders or companies with determinative influence over the participant that originate from or has relations to countries that Nkom does not have a security agreement with.
4) Bank guarantee with wording conform to the template in Annex 2.
5) Written power of attorney for the financing bank/institute issuing the bank guarantee.

7.2 Bank guarantee and initial eligibility

The bank guarantee is payable on first demand.

The Norwegian State acts as self-insurer, consequently central bodies and categories of bodies governed by public law are exempted from presenting a bank guarantee. Nkom decides which bodies fall under the exemption.

The guarantee must be issued by a financial institution registered in the EEA or Switzerland, and otherwise meet the requirements stipulated by Nkom, see Annex 2.

The guarantee must be valid until **30 November 2020**.

The guarantee will determine the initial eligibility of the bidder. Each NOK 25,000 of guarantee will provide one initial eligibility point, so the bidder's initial eligibility will be equal to the amount of its bank guarantee divided by NOK 25,000, rounded down to the nearest whole number.

The initial eligibility of a bidder will constrain the lots that the bidder will be able to include in any package it bids for in any round of the auction, in accordance with Section 11.2.8, and thus the packages of lots it may win.

Bidders may submit more than one bank guarantee. The initial eligibility of the bidder will be determined in relation to the total amount across all the bank guarantees provided by the bidder.

See Section 12.3 on payment under the guarantee.

7.3 Registration time frame

Registration documents can be delivered to Nkom from **15 November 2019**.

The registration deadline is **12 March 2020, 1200 Norwegian time**.

7.4 Delivery of documents for registration

Nkom must receive the registration documents before the final date for registration **12 March 2020, 1200 Norwegian time**. Three different ways of delivery is possible:

- delivery in person or by courier at Nkom's premises in Lillesand,
- sent by regular mail, or
- sent electronically (original bank guarantee documents must be received by Nkom (either delivered in person, by courier or sent by regular mail) before **26 March 2020**).

If registration documents are to be delivered in person or by courier, please inform Nkom beforehand. Please contact Tor Inge Kvaksrud (tik@nkom.no) or Maria Iversen (miv@nkom.no) by e-mail or phone, telephone number; + 47 22 82 46 00.

Address for delivery by courier:
Nasjonal kommunikasjonsmyndighet
Nygård 1
N-4790 Lillesand – Norway

Address for delivery by regular mail:
Nasjonal kommunikasjonsmyndighet
Postboks 93
N-4791 Lillesand – Norway

Address for electronically delivery:
fastetjenesterauksjon@nkom.no with a copy to tik@nkom.no and miv@nkom.no

Mark the envelope or e-mail "Auction # 27".

7.5 Valid registration

Nkom must receive the registration documents before **12 March 2020, 1200 Norwegian time**. If the registration documents are delivered electronically, Nkom must receive the original bank guarantee documents before **26 March 2020**.

The person or undertaking assumes the risk of ensuring that:

- All registration documents are complete and duly signed and in accordance with all requirements.
- All registration documents are received by Nkom before **12 March 2020, 1200 Norwegian time**, and that the original bank guarantee documents are received to Nkom before **26 March 2020** in case of electronically delivery.

Nkom will assess the registration documents and decide whether a registration is valid or not based on the provisions set in the auction rules. Nkom may allow rectification of minor errors or incorrections. Nkom will not extend the deadline for registration unless extraordinary circumstances occur.

Nkom will notify the person or undertaking whether the registration is considered valid or not within three working days after the deadline for registration.

If the registration is made electronically and Nkom has considered that a registration is valid, but the original bank guarantee documents is not received to Nkom before 26 March 2020, Nkom will revoke the person's or undertaking's right to participate in the auction.

7.6 Principal legal consequences of registration

Person or undertakings that register for participation in the auction accepts to be legally bound in accordance with the rules set in the overall framework for the award and the auction rules.

8 General rules on bidding

8.1 Assumption that bids are submitted on behalf of bidder

The representative(s) stated in the registration form will be considered authorized to act on behalf of the person or undertaking stated as bidder in the registration form.

Nkom will assume that any bids submitted in the auction using the authentication credentials given to the authorised representative(s) are submitted on behalf of the relevant bidder.

8.2 Liability for foreseeable situations

The bidder is liable for all foreseeable situations, such as circumstances on bidder´s side, for instance delay, technical failures, breakdowns of the bidder´s machinery/equipment, unavailability of the authorised representative(s) and the loss or damage of confidential material and information received from Nkom.

8.3 Principal legal consequences of bidding

Bids are unconditional and irrevocable. Bids remain binding until 30 November 2020. Bidders may be released from their bids by notification from Nkom before this date.

Bidders are liable for the full amount of their licence price as determined in the auction, which will be equal to the sum of its lot assignment prices and its frequency assignment prices.

Bidders receiving a notification in accordance with the rules are obliged to pay their corresponding prices in the manner and to the place of payment stated by Nkom, see Section 12.

9 Exclusion from the auction

Breach of rules set in the overall framework and auction rules may lead to exclusion.

If a bidder is excluded from the auction, the bidder will remain liable for its bids and any payment following from these bids in case that the excluded bidder would have become a winner. However, an excluded bidder may not be awarded a licence.

Nkom may decide to void bids of a bidder who has been excluded. Voiding of bids may require a recalculation of winning bids and prices.

10   The auction process

10.1 Time frame

Bidders shall participate in the preparations that Nkom require for the auction, including individual mock auctions before the real auction.

Bidders will receive an auction system user manual before the mock auction scheduled in April 2020. Bidders will only be allowed to participate in the auction if they have participated

in the mock auction and other mandatory preparations the Nkom may decide to include before the auction starts.

The real auction will begin on **6 May 2020**. The initial bidding schedule for the lot assignment stage will be announced to bidders the day before the start of the auction.

Unless otherwise announced, bidding will be conducted within normal business hours on each business day until bidding has stopped. The actual progress of the auction will be decided on a day-to-day basis and set at the discretion of Nkom.

10.2 Preparations for the bidders

Upon application, Nkom will give to each applicant a code and a set of passwords to be used in any further communications between Nkom and the applicant before and during the auction. Nkom will provide these to the authorised representative(s) stated as the bidder´s representative in the registration form.

The auction will be conducted over the public Internet using an Electronic Auction System (EAS). Upon qualification, Nkom will provide each qualified bidder with the necessary authentication credentials (digital certificate, user name and login password) to access the EAS. Nkom will provide these to the authorised representative(s) stated as the bidder´s representative in the registration form.

Any loss or damage of received confidential material must immediately be reported to Nkom.

The EAS will run in a standard web browser. No specialist software is required. Bidders will need a reliable broadband Internet connection. Registered bidders will be provided with a user manual for the EAS, which will include recommendations for configuring your computer to use the EAS and a list of supported web browsers. Bidders will need to install the digital certificates provided by Nkom for authentication purposes on any computer they may intend to use to access the auction system. Detailed instructions for installing the digital certificates used for authentication, accessing the auction system and submitting bids will be provided in the auction system user manual.

Bidders are obliged to participate in the mock auction where they will have the opportunity to test their computers and familiarise themselves with the auction system.

11 Conduct of the auction

11.1 General rules for all stages

11.1.1 Bid rounds

A round is a fixed time window during which bidders may submit their bids. Rounds are scheduled by Nkom.

Once Nkom has scheduled a round, the following information will be available from the bidder interface of the EAS:

- the time at which the round is scheduled to start;
- the scheduled duration of the round; and
- the time at which the round is scheduled to end

Nkom may reschedule a round in accordance with Section 11.1.4.

11.1.2 Submission of bids

Bidders may only submit bids during the time window specified by Nkom for each round. Bids must be submitted using the EAS.

Submitting bids using the EAS involves the following two steps:

- First, the bidder must enter the bids it wishes to submit in the round into a bid entry form provided by the EAS. The completed form needs to be submitted to the auction server, where the bids will be checked against the auction rules. If the set of bids is invalid, the bid entry form will be reloaded with an error message informing the bidder of the reasons why the set of bids entered is invalid.
- If the set of bids is valid, the bidder will be provided with a bid confirmation form, pre-filled with the set of bids checked by the auction system. The bidder will then have the option to confirm the bids that have been checked or revert to the bid entry form (where the bids may be modified and then re-submitted for checking). Once the bidder has confirmed a set of bids in a round it cannot amend or withdraw any of the bids submitted, nor submit any further bids in that round.

Bids are only taken into consideration if the confirmation has been received by the auction server within the specified round time (including any extension period that may apply to the bidder as set out in Section 11.1.3). Confirmations received outside this time window will be rejected.

Once the auction server has received the bid confirmation form from the bidder, the auction system will provide an acknowledgement page to the bidder setting out the details of the bids submitted. This acknowledgement page will be displayed on the bidder's interface until the round ends, allowing the bidder to verify that the auction server has received the bid confirmation form. It is the responsibility of the bidder to check the acknowledgement page provided by the auction system, and to alert Nkom if it believes that it has not been able to successfully submit its bids due to a technical error in the EAS.

11.1.3 Round extensions

If the scheduled end time of a round is reached and a bidder has not made its bids in the round in accordance with Section 11.1, then the round will be automatically extended by up to 30 minutes (the 'extension period'), if the bidder is granted an extension.

All bidders who do not submit a bid in a round and who are granted an extension will be allowed to submit bids during the extension period. Bidders who are not granted an extension will not be allowed to submit bids during the extension period.

The extension period may be less than 30 minutes if all bidders who have been granted an extension submit their bids before the extension period reaches its maximum duration of 30 minutes.

Each bidder will begin the auction with two extensions rights for the lot assignment stage.

In the first round of the lot assignment stage, a bidder will be granted an extension if it has not made its bids in the round in accordance with Section 11.1.

In any subsequent round of the lot assignment stage, a bidder will be granted an extension if:

- it has at least one extension right remaining;
- it has not made its bids in the round in accordance with Section 11.1; and
- its eligibility in the round is greater than zero.

A bidder who is granted an extension will have an extension right deducted from its pool of extension rights remaining.

In the frequency assignment stage, a bidder will be granted an extension if it is eligible to submit a bid, but has not made a bid in the round in accordance with Section 11.1.

11.1.4 Exceptional circumstances

In the case of exceptional circumstances during any stage of the auction, Nkom has the discretion to:

- reschedule a round that has been scheduled but has not yet started;
- postpone the end of a round in progress or the release of round results;
- postpone the scheduling of a round;
- cancel a round that is underway or has already been completed;
- grant additional extension rights to a bidder;
- exclude one or more bidders from the auction; and/or
- cancel the auction.

Nkom determines whether a situation of exceptional circumstances has arisen. Exceptional circumstances could include, for example, widespread technical failure or concern about possible collusion amongst bidders.

11.2 Lot assignment stage

11.2.1 Overview

The lot assignment stage determines how frequency-generic lots are assigned amongst bidders. It takes place over multiple rounds of bidding.

Nkom will set a round price per lot for each lot category for each round. Each bidder can then indicate the package of lots (i.e. the number of lots in each category) it wishes to acquire at the prevailing round prices. This defines the bidder's headline bid for the round. Headline bids are relevant for the activity rules, which set limits on the bidding options available to bidders. In addition, the bidder can optionally make additional bids for other packages. Any such additional bids cannot exceed the round price of the package and cannot be below 90% of the round price of the package (except for bids that determine the relative caps on other bids). All bids must satisfy any applicable constraints arising from the activity rules. Only one of the bids submitted by the bidder will become a winning bid. Bids from the same bidder are mutually exclusive.

Each bidder may keep a list of eligible bids for up to 50 distinct packages. All of the bids submitted by a bidder which determine the relative caps on other bids will remain eligible. All other bids submitted by the bidder will continue to be eligible unless:

- they fall below 90% of prevailing round prices (as a result of price increments);
- they are discarded in order to allow the bidder to submit new bids for additional packages.

A bid can only be discarded if:

- it does not determine the relative caps on other bids;
- discarding the bid is necessary to keep the number of packages for which the bidder keeps eligible bids at 50; and
- it is not an eligible bid for a package for which the bidder has submitted a headline bid in earlier rounds.

At the end of a round, Nkom will consider all the possible combinations of eligible bids that include at most one bid from each bidder and which can be satisfied with the lots available. The value of any such combinations of bids is calculated as the sum of bids in the combination.

If any of the combinations which achieves the highest possible value includes a bid from each bidder who has submitted a positive headline bid in the most recent round, then the auction ends, and one such combination will become the combination of winning bids (ties broken first to maximise the sum of eligibility points of lots assigned, then at random). Otherwise, a further round is needed, with a higher price for lot categories in which the demand from bidders clashes.

Notice that the requirement that the winning combination has to include exactly one eligible bid from each bidder who is still making headline bids guarantees that bidders are not at risk of leaving the auction empty-handed, unless they stop making headline bids or unless they explicitly make a bid for an empty package.

Also notice that some bids at prevailing prices could be outbid by bids at lower prices if the latter allowed assigning a greater number of lots. Therefore, bidding could end even if there is excess demand at prevailing prices (i.e. across the headline bids in the latest round), if some bidders have made additional or earlier bids that are included in the winning combination. At the same time, bidding may continue even if it were feasible to accept all the headline bids submitted in the latest round, as the highest value of bids might be achieved when accepting some additional or earlier bids and leaving some of the headline bids in the latest round out.

11.2.2 Lots offered in the lot assignment stage
Spectrum is offered in the lot categories listed in section 3.3.

11.2.3 Bids
A bid is a price offer to acquire a package of lots indicated by the bidder.

There are two types of bids:

- **headline bids**; and

- **additional bids**.

A bid is only eligible to become a winning bid if:

- it is at least at the minimum offer for the corresponding package, calculated as set out below; and
- if it has not been discarded in order for the bidder to make bids for additional packages, under the provisions set out in Section 11.2.4 below.

We call such bids **eligible bids**.

11.2.3.1 *Headline bids*

A headline bid must be placed at round prices, i.e. with a bid amount that is equal to the sum of round prices for all of the lots in the package (we call this the **round price of the package**). During a round, bidders can make a headline bid by indicating the number of lots they wish to acquire at the round prices, subject to not violating the spectrum cap or the activity rules (if applicable) outlined in Section 11.2.8 below, and the bid amount will be set automatically to the round price of the package.

In each round, each bidder may submit at most one headline bid. If in a given round (including any extension granted to the bidder under the provisions set out in Section 11.1.3) a bidder does not make a headline bid, or specifies an empty package for its headline bid, then its headline bid for that round is a bid of zero for an empty package (a package containing no lots). Headline bids are particularly relevant for the application of the activity rules and the calculation of price increments in the event that a further round is needed.

11.2.3.2 *Additional bids*

Additional bids can be at or below round prices. Bidders can optionally make multiple additional bids along with their headline bid, but are not required to do so.

Additional bids must be at least the minimum offer for the bid package (calculated as set out below), but cannot exceed the round price of the bid package. Additional bids must also satisfy any constraints arising from the activity rules and the other bids made by the bidder.

To make an additional bid, bidders need to specify the bid package and the amount of the additional bid. The EAS will automatically include in the bid form any packages for which the bidder held an eligible bid at the end of the preceding round, with a bid amount corresponding to the highest bid already submitted by the bidder for the package, indicate any constraints on the bid amount (i.e. the minimum offer, the round price and the relative cap if applicable), and whether the bid has fallen beyond the minimum offer for the package.

The bidder can then modify this amount, subject to satisfying the constraints. Upon submitting its bid form, the bidder will be notified of any bids which might be invalid, and the reason for this. If the bidder confirms its submission, then any invalid bids (i.e. with a bid amount below the minimum offer, above the round price or the applicable relative cap) will be discarded; in this case, any pre-existing bids for the package which remain valid will remain as eligible bids.

11.2.3.3 *Minimum offer for a package*

There is a **minimum offer** for each package in each round, which might differ across bidders depending on the relative caps that apply to the bidder in accordance with the activity rules set out below.

The minimum offer for a package for which the bidder has not already submitted a bid is 90% of the round price of the package.

The minimum offer for a package for which the bidder has submitted an eligibility-reducing bid, as defined in the context of the activity rules below, is the highest bid that the bidder has already made for the bid package.

The minimum offer for a package for which the bidder has not submitted an eligibility-reducing bid, but for which the bidder has submitted at least one other type of bid, is the greatest of the highest bid that the bidder has already made for the bid package and 90% of the round price of the package.

The EAS will indicate the minimum offer for any packages that the bidder enters in its bid form.

11.2.4 Maximum number of packages and discarding of bids

Bidders can maintain eligible bids for up to 50 non-empty packages. Once a bidder has reached this limit, then it may only be able to bid for other packages if it can discard the bids it has made for some packages in accordance with the rules below, so that the total number of non-empty packages for which the bidder maintains eligible bids remains at 50. Bidders can discard bids for at most ten packages in a given round.

It is not possible to discard bids that:

- determine the relative cap on other bids; or
- are for a package for which the bidder has made one or more headline bids and are at least at the minimum offer for the package.

If any bids are discarded, then:

- all the bids for the relevant packages will be discarded;
- the number of packages for which bids are discarded cannot exceed ten; and
- the total number of packages for which the bidder makes or holds an eligible bid in the round cannot be less than 50.

Subject to these requirements, the bidder can select the packages for which it wishes to discard bids.

The EAS will indicate for each of the packages in the bidder's bid form whether the bids for the package can be discarded.

A bidder may not withdraw or discard bids which it has already submitted and which remain eligible unless it needs to do so in order to be able to make bids for additional packages.

11.2.5 Default submission
In the event that a bidder does not submit a headline bid in a round (including any extension granted to the bidder under the provisions set out in Section 11.1.3), its headline bid will be a zero bid (i.e. a bid for a package containing zero lots and with a bid amount of zero).

11.2.6 Assessment of bids at the end of the round
After each round, Nkom will evaluate the eligible bids in order to determine whether the auction can close or whether a further round is required.

Only bids which remain eligible to become a winning bid are considered.

A **feasible combination** is a combination of eligible bids which includes at most one bid (which may be a headline bid or an additional bid) from each bidder, and where the demand expressed in the bid packages of the bids in the combination can be met with the lots available.

A feasible combination is **inclusive** if it includes one bid from each bidder (which may be the zero bid if the bidder has submitted this bid, or has stopped making headline bids).

The **assignment** that corresponds to a feasible combination involves:

- assigning to each bidder who has a bid included in the feasible combination (only) the lots in this bid's package; and
- not assigning any lots to any bidders for who do not have a bid included in the feasible combination.

The **value** of a feasible combination is the sum of bids in the combination.

A feasible combination is **value-maximising** if it achieves the highest value across all feasible combinations.

The auction ends when a value-maximising feasible combination is inclusive. Otherwise, a further round is needed.

11.2.7 Round prices and price increments for ascending price rounds

In the first round, the round price for each lot category will be equal to the reserve price for lots in that lot category.

11.2.7.1 *Identifying lot categories that require a price increment*

If a further round is required, Nkom will determine for which lot categories round prices need to increase, on the basis of the following process. As for the evaluation of bids, only bids which remain eligible to become a winning bid are considered.

When assessing bids at the end of the round we have identified the value-maximising feasible combinations. A further round is necessary because none of these is inclusive. Therefore, in each of these combinations there is at least one bidder for whom no bid has been selected.

The first step is to identify the bidders who submitted a non-zero headline bid in the most recent round and for which there is a value-maximising feasible combination which does not include a bid from the bidder. Each of these bidders should face a price increase for the package for which they submitted a headline bid in the most recent round, as their current bid is not sufficient to guarantee that they would win any lots if the auction were to end at this point. We call these the 'omitted' bidders.

The following steps are run for each of the omitted bidders.

The second step is to run through a hypothetical decomposition of the headline bids submitted by an omitted bidder, in order to identify for each individual lot category if the bidder's demand in the headline bid can be accommodated given the bids made by other bidders (in which case the lot category would not require a price increment on the basis of this assessment) or not (in which case the lot category requires a price increment). To do so, we run through the following process for each of the lot categories for which the number of lots in the bidder's headline bid is greater than zero:

- we construct a hypothetical bid for a package that includes only the lots in this category that are included in the headline bid and no other lots (with a bid amount equal to the round price of this package);
- we then re-evaluate bids, replacing the headline bid from the omitted bidder with this hypothetical bid, and check if the bidder would still be an omitted bidder;
- if the bidder would not be an omitted bidder with this hypothetical bid, then its demand for this lot category on a standalone basis can be accommodated, and therefore we do not need to increase the price in this lot category on the basis of this assessment; otherwise, if the bidder would still be an omitted bidder with this hypothetical bid, then its demand for this lot category on a standalone basis cannot always be accommodated, and therefore we need to increase the price in this lot category.

It is possible that on the basis of the assessment above none of the lot categories might be identified as requiring a price increment. In this case, and only in this case, we run a further assessment for this bidder, which consists in an alternative hypothetical decomposition of the headline bids submitted by an omitted bidder, not by individual lot categories but by frequency band. This step assesses whether the bidder's demand for lots in that frequency band in its headline bid can be accommodated given the bids made by other bidders. If this is the case, then the lots in that band would not require a price increment on the basis of this assessment; otherwise all the lot categories in that band for which the bidder had included lots in its headline bid will require a price increment. To do so, we run through the following process for each of bands for which the number of lots in the bidder's headline bid is greater than zero:

- we construct a hypothetical bid for a package that includes only the lots in categories of lots for this band that are included in the headline bid and no other lots (with a bid amount equal to the round price of this package);
- we then re-evaluate bids, replacing the headline bid from the omitted bidder with this hypothetical bid, and check if the bidder would still be an omitted bidder;
- if the bidder would not be an omitted bidder with this hypothetical bid, then its demand for this lot categories in this band can be accommodated, and therefore we do not need to increase the price for lot categories in this band on the basis of this assessment; otherwise, if the bidder would still be an omitted bidder with this hypothetical bid, then its demand for the lot categories in this band cannot always be accommodated, and therefore we need to increase the price of the lot categories in this band for which the bidder had included lots in its headline bid.

It is also possible that on the basis of the assessment above none of the lot categories might be identified as requiring a price increment. In this case, and only in this case, we will increase the price for all lot categories for which the bidder had included lots in its headline bid.

11.2.7.2   *Level of price increment*

Nkom will determine the level of price increments.

11.2.8 Activity rules

11.2.8.1   *Eligibility points and activity*

Each lot will be assigned a number of **eligibility points**, indicated below.

Band	Lot category	Eligibility points per lot
Low 10 GHz	L10-1	1
	L10-2	4
	L10-3	1
	L10-4	2
High 10 GHz	H10-1	1
	H10-2	4
	H10-3	4
	H10-4	4
13 GHz	13-1	4
	13-2	2
	13-3	4
18 GHz	18-1	1
	18-2	2
	18-3	8
23GHz	23-1	4
	23-2	4
	23-3	1
	23-4	4
28GHz	28	8
32 GHz	32-1	8
	32-2	4
38 GHz	38-1	8
	38-2	8
	38-3	8

Table 6 – Eligibility points per lot

The **eligibility of a package** is calculated as the sum of eligibility points of all lots included in the package.

The **activity** of a bidder in a round is equal to the eligibility of the package of its headline bid in that round.

11.2.8.2   *Bidder eligibility*

Each bidder will be assigned a **bidder eligibility** level for each round:

- In the first round, the bidder eligibility will be the bidder's initial eligibility, set in accordance with Section 7.2.
- In subsequent rounds, the bidder eligibility will be equal to the smaller of its bidder eligibility and its activity in the preceding round.

Therefore:

- If in round *r* a bidder makes a headline bid with activity smaller than its bidder eligibility, then its bidder eligibility will be reduced going forward; specifically, in this case its bidder eligibility in round *r+1* will be set to its activity in round *r*.
- If in round *r* a bidder makes a headline bid with activity equal to or greater than its bidder eligibility, then its bidder eligibility will be maintained for the following round; specifically, in this case its bidder eligibility in round *r+1* will be set to its bidder eligibility in round *r*.

Given this, a bidder who submits a headline bid with activity smaller than its bidder eligibility at the start of the round will have its bidder eligibility reduced for the following round. We call such headline bids **eligibility-reducing bids**.

11.2.8.3   *Relative caps*

Eligibility-reducing bids establish some constraints on the bidder's bids for packages with eligibility between its previous and its new activity level for all future rounds. These constraints are called **relative caps**, and will constrain the bids that the bidder can make for packages with an eligibility that is:

- greater than the eligibility of the package of the eligibility-reducing bid; but
- not greater than its bidder eligibility at the time of submitting the eligibility-reducing bid.

Any bid that is subject to a relative cap cannot exceed:

- the bidder's highest bid for the package of the eligibility-reducing bid (including bids submitted in previous rounds and any bids that the bidder may submit along with the bid subject to the cap) – we call this the **anchor bid**; plus
- the difference in the round prices of the package of the bid subject to the cap and the package of the eligibility-reducing bid, in the round in which the bidder submitted the eligibility-reducing bid.

The cap on the bid subject to the cap is relative to the anchor bid, which is the highest bid that the bidder submits for the package of the eligibility-reducing bid that established the cap.

This means that the bidder may be able to increase a bid subject to a relative cap if it can (and does) increase its anchor bid.

The EAS will indicate for each of the packages in the bidder's bid form whether the bids for the package are subject to a relative cap, and if so the EAS will also indicate the package of the anchor bid and the applicable cap given the current level of the anchor bid.

> Suppose that in round r a bidder has eligibility n and submits an eligibility-reducing bid for package X, with eligibility m.
> Then this will create a relative cap on any bid that the bidder may submit for packages whose eligibility is greater than m, but not greater than n. Suppose that package Y is one of these packages, then, from round $r+1$ onwards, any bid that the bidder makes for package Y will be constrained by this relative cap.
> When calculating the value of the relative cap on Y, we need:
> the bidder's highest bid on X (the package of the eligibility-reducing bid that generated the cap) – denote this by B_X; and
> the price difference between Y and X in the round in which the bidder made the eligibility-reducing bid (round r) – denote this as $P_Y - P_X$.
> Then the relative cap requires that any bid for Y must not exceed $B_X + P_Y - P_X$.

Example 1: Relative cap

11.2.8.4   *Activity rules for the submission of headline bids*
A bidder with zero bidder eligibility will not be able actively to submit a headline bid that is not the zero bid.

A bidder may only submit headline bids for packages with eligibility not greater than the bidder's initial eligibility, and which do not violate the spectrum cap (i.e. the total MHz across all the lots included in the package cannot exceed the spectrum cap). Subject to these requirements being met, a bidder with bidder eligibility greater than zero may submit a headline bid for a package if:

- the eligibility of the package is not greater than its bidder eligibility in the round; or
- otherwise, if the eligibility of the package is greater than its bidder eligibility in the round, the bids submitted by the bidder satisfy the relative caps.

Where relevant, the bidder may be able to submit additional bids alongside its headline bid in order to ensure compliance of with the relative caps, subject to such bids being permitted under the activity rules for the submission of additional bids.

The EAS will indicate for each of the packages in the bidder's bid form whether the bidder could submit a headline bid for the package (subject to potentially increasing the anchor bid if bids for the package are subject to a relative cap).

11.2.8.5 *Activity rules for the submission of additional bids*

A bidder may only submit headline bids for packages with eligibility not greater than the bidder's initial eligibility, and which do not violate the spectrum cap (i.e. the total MHz across all the lots included in the package cannot exceed the spectrum cap). Subject to these requirements being met, a bidder may submit additional bids for any packages, subject it satisfies all of the following constraints:

- the bid does not exceed the round price of the package;
- the bid is not lower than the minimum offer for the package; and
- if the bid is for a package with eligibility greater than the bidder's bidder eligibility in the round, the relative cap.

Compliance with the relative caps is assessed on the basis of all the bids included in the bid form. Where relevant, the bidder may be able to submit further additional bids in order to ensure compliance with the relative cap, subject to such bids also being subject to the constraints above.

11.2.9 Information available at the end of each round

At the end of each round, Nkom will inform each bidder of:

- whether a further round is needed;
- the lot categories for which the price will be increased in the following round;
- its own bidder eligibility for the following round; and
- a list of all the eligible bids for the bidder at the end of the round.

11.2.10 End of the lot assignment stage

When the lot assignment stage ends, one of the inclusive, value-maximising feasible combinations will become the combination of winning bids, applying if necessary the following tie-breaking criteria:

- if there are several inclusive, value-maximising feasible combinations, only those which maximise the sum of eligibility points of the lots that are assigned in their assignment will be considered;
- if several combinations remain for consideration, one of these will be selected at random.

Each bidder will then be assigned the lots included in the package of its winning bid and will be required to pay this bid – this is the **lot assignment price** for that bidder.

11.2.11 Information available at the end of the lot assignment stage

At the end of the lot assignment stage, Nkom will inform each bidder of its winning bid (which may be the bid for zero lots if the bidder has not submitted a headline bid in the most recent round).

11.3 Frequency assignment stage

11.3.1 Overview

The frequency assignment stage will determine the specific frequencies assigned to bidders who have been assigned lots in the lot assignment stage. The process is run separately for each band, but simultaneously. Nkom will first calculate the possible assignments of blocks in each of the lot categories and assess whether any bidders have alternative options. Where bidders have alternative options for one or more bands, then a single round will be run, in which bidders will be able to make one submission with any bids they wish to make for their preferred options, for all bands. Nkom will then calculate the winning assignment plan and notify results for all bands.

11.3.2 Identification of candidate plans

Nkom will identify the **candidate plans** for each band, which are those assignments of blocks in which:

- each bidder receives a number of frequency blocks in each category that exactly corresponds to the number of frequency-generic lots they have won in that category;
- each of the bidders who have been assigned multiple lots in a given lot category received is assigned a contiguous set of frequency blocks in that category;
- all the unsold frequency blocks in each category form a contiguous set of frequency blocks in that category; and
- for bands for which Nkom has adopted special provisions for contiguity across different lot categories, these are met.

11.3.2.1 *Identification of candidate plans for the low 10 GHz frequency band*

The frequency blocks in the low 10 GHz frequency band have been grouped into different lot categories, and there are some special provisions for contiguity across different lot categories. Specifically:

- if the winner of the only lot in L10-1 has also won lots in L10-2, but not in L10-3, then the bidder will be assigned a set of contiguous frequency blocks in L10-2 that is contiguous to L10-1;
- if the winner of the only lot in L10-3 has also won lots in L10-2, but not in L10-1, then the bidder will be assigned a set of contiguous frequency blocks in L10-2 that is contiguous to L10-3; and
- if the winner of the only lot in L10-1 has also won the only lot in L10-3 and some lots in L10-2, then the bidder will be assigned a set of contiguous frequency blocks in L10-2 that is either contiguous to L10-1 or to L10-3, or both.

In order to identify the candidate plans for this band, Nkom only needs to determine the assignment of frequency blocks in category L10-2, as follows:

- if one bidder has won L10-1, L10-3 and all of the lots in L10-2, then there is only one candidate plan, which is that in which this bidder is assigned all of the frequency blocks in L10-2;
- if one bidder has won L10-1, L10-3 and some, but not all, lots in L10-2, then the candidate plans will be those which result from assigning to this bidder the corresponding frequency blocks that are closer to L10-1 and then placing the remaining winners and unsold in all possible orders, and those which result from assigning to this bidder the corresponding frequency blocks that are closer to L10-3 and then placing the remaining winners and unsold in all possible orders;
- otherwise, the candidate plans will be those which result from
    (a) if the bidder who has won the lot in L10-1 has also won any lots in L10-2, then assigning to this bidder the corresponding frequency blocks that are closer to L10-1;
    (b) if the bidder who has won the lot in L10-3 has also won any lots in L10-2, then assigning to this bidder the corresponding frequency blocks that are closer to L10-3; and
    (c) then placing the remaining winners and unsold in all possible orders.

11.3.2.2 *Identification of candidate plans for the high 10 GHz frequency band*
The frequency blocks in the high 10 GHz frequency band have been grouped into different lot categories, and there are some special provisions for contiguity across different lot categories. Specifically:

- if the winner of the only lot in H10-1 has also won lots in H10-2, but not in H10-3, then the bidder will be assigned a set of contiguous frequency blocks in H10-2 that is contiguous to H10-1;
- if the winner of the only lot in H10-3 has also won lots in H10-2, but not in H10-1, then the bidder will be assigned a set of contiguous frequency blocks in H10-2 that is contiguous to H10-3; and

- if the winner of the only lot in H10-1 has also won the only lot in H10-3 and some lots in H10-2, then the bidder will be assigned a set of contiguous frequency blocks in H10-2 that is either contiguous to H10-1 or to H10-3, or both.

In order to identify the candidate plans for this band, Nkom only needs to determine the assignment of frequency blocks in category H10-2, as follows:

- if one bidder has won H10-1, H10-3 and all of the lots in H10-2, then there is only one candidate plan, which is that in which this bidder is assigned all of the frequency blocks in H10-2;
- if one bidder has won H10-1, H10-3 and some, but not all, lots in H10-2, then the candidate plans will be those which result from assigning to this bidder the corresponding frequency blocks that are closer to H10-1 and then placing the remaining winners and unsold in all possible orders, and those which result from assigning to this bidder the corresponding frequency blocks that are closer to H10-3 and then placing the remaining winners and unsold in all possible orders;
- otherwise, the candidate plans will be those which result from
    (a) if the bidder who has won the lot in H10-1 has also won any lots in H10-2, then assigning to this bidder the corresponding frequency blocks that are closer to H10-1;
    (b) if the bidder who has won the lot in H10-3 has also won any lots in H10-2, then assigning to this bidder the corresponding frequency blocks that are closer to H10-3; and
    (c) then placing the remaining winners and unsold in all possible orders.

11.3.2.3 *Identification of candidate plans for the 13 GHz frequency band*
The frequency blocks in the 13 GHz frequency band have been grouped into different lot categories. However, there are no special provisions for contiguity across different lot categories.

In order to identify the candidate plans for this band, Nkom only needs to determine the assignment of frequency blocks in category 13-3, by grouping all unsold lots under 'unsold', and then creating all the possible orders in which winners and unsold could be placed within this category.

11.3.2.4 *Identification of candidate plans for the 18 GHz frequency band*
The frequency blocks in the 18 GHz frequency band have been grouped into different lot categories, and there are some special provisions for contiguity across different lot categories. Specifically:

- if the winner of the only lot in 18-2 has also won lots in 18-3, then the bidder will be assigned a set of contiguous frequency blocks in 18-3 that is contiguous to 18-2.

In order to identify the candidate plans for this band, Nkom only needs to determine the assignment of frequency blocks in category 18-3, as follows:

- the candidate plans will be those which result from
    (a) if the bidder who has won the lot in 18-2 has also won any lots in 18-3, then assigning to this bidder the corresponding frequency blocks that are closer to 18-2; and
    (b) then placing the remaining winners and unsold in all possible orders.

11.3.2.5 *Identification of candidate plans for the 23 GHz frequency band*
The frequency blocks in the 23 GHz frequency band have been grouped into different lot categories, and there are some special provisions for contiguity across different lot categories. Specifically:

- if only one bidder has won lots in 23-1 and also in 23-2, then this bidder will be assigned a set of contiguous frequency blocks in 23-1 that is contiguous to 23-2 and a set of frequency blocks in 23-2 that is contiguous to 23-1;
- if more than one bidder has won lots in 23-1 and also in 23-2, then the candidate plans will be those in one of these bidders is assigned a set of contiguous frequency blocks in 23-1 that is contiguous to 23-2 and a set of frequency blocks in 23-2 that is contiguous to 23-1.

In order to identify the candidate plans for this band, Nkom needs to determine the assignment of frequency blocks in categories 23-1, 23-2 and 23-3. Nkom will determine the candidate assignments of frequency blocks for categories 23-1 and 23-2 as follows:

- if no bidders have won lots both in 23-1 and 23-2, the candidate assignments of frequency blocks for these two categories will be those which result from placing the remaining winners and unsold in all possible orders within each of these two categories, and combining each possible order for 23-1 with each possible order for 23-2;
- if only one bidder has won lots both in 23-1 and 23-2, the candidate assignments of frequency blocks for these two categories will be those which result from assigning to this bidder the corresponding frequency blocks in 23-1 that are closer to 23-2 the corresponding frequency blocks in 23-2 that are closer to 23-1, and then placing the remaining winners and unsold in all possible orders within each of these two categories, and combining each possible order for 23-1 with each possible order for 23-2;
- if more than one bidder have won lots both in 23-1 and 23-2, the candidate assignments of frequency blocks for these two categories will be those which result from each

possibility that includes assigning to one of these bidders the corresponding frequency blocks in 23-1 that are closer to 23-2 the corresponding frequency blocks in 23-2 that are closer to 23-1, then placing the remaining winners and unsold in all possible orders within each of these two categories, and combining each possible order for 23-1 with each possible order for 23-2.

Nkom will determine the candidate plans for category 23-3 by placing the winners and unsold in all possible orders within each this category.

The candidate bandplans will be those that result from taking all possible combinations that include one of the candidate assignments of blocks in 23-1 and 23-2, and one of the candidate assignments of blocks in 23-3.

11.3.2.6 *Identification of candidate plans for the 28 GHz frequency band*

All of the frequency blocks in the 28 GHz frequency band have been grouped in one lot category, and therefore there are now special provisions for contiguity across different lot categories. In order to identify the candidate plans for this band, Nkom will group all unsold lots under 'unsold', and then create all the possible orders in which winners and unsold could be placed in the band.

11.3.2.7 *Identification of candidate plans for the 32 GHz frequency band*

The frequency blocks in the 32 GHz frequency band have been grouped into different lot categories, and there are some special provisions for contiguity across different lot categories. Specifically:

- if the winner of the only lot in 32-2 has also won lots in 32-1, then the bidder will be assigned a set of contiguous frequency blocks in 32-1 that is contiguous to 32-2.

In order to identify the candidate plans for this band, Nkom only needs to determine the assignment of frequency blocks in category 32-1, as follows:

- the candidate plans will be those which result from
    (a) if the bidder who has won the lot in 32-2 has also won any lots in 32-1, then assigning to this bidder the corresponding frequency blocks that are closer to 32-2; and
    (b) then placing the remaining winners and unsold in all possible orders.

11.3.2.8 *Identification of candidate plans for the 38 GHz frequency band*

The frequency blocks in the 38 GHz frequency band have been grouped into different lot categories. However, there are no special provisions for contiguity across different lot categories.

In order to identify the candidate plans for this band, Nkom only needs to determine the assignment of frequency blocks in each of the three lot categories, by grouping all unsold lots under 'unsold', and then creating all the possible orders in which winners and unsold could be placed within this category, and then taking all possible combinations that include one of the candidate assignments of blocks in 38-1, one of the candidate assignments of blocks in 38-2, and with one of the candidate assignments of blocks in 38-3.

11.3.3 Identification of frequency options for each bidder

Nkom will identify, for each band and each bidder, the alternative combinations of frequency blocks that might be assigned to the bidder in at least one of the candidate assignments for that band. We call these the bidder's 'frequency options'.

In some instances, some bidders will have a unique frequency option for a given band, in which case they will be directly assigned that option for that band. In other instances, some bidders may have alternative options, in which case they will be allowed to make bids for the alternative options to express their preferences.

Consider a simplified case where we have only four blocks in a band (labelled X1 to X4), all of them in the same category. Suppose that bidder1 and bidder2 are assigned one lot each, and bidder3 is assigned two lots:

- for bidder1: X1, X2, X3 and X4;
- for bidder2: X1, X2, X3 and X4; and
- for bidder3: X1-2, X2-X3 and X3-X4.

Example 2: Identification of frequency options

11.3.4 Bidding process for the frequency assignment stage

A bidding process is only required if any bidder has more than one frequency option for any of the bands. Such bidders are the **assignment bidders**.

The bidding process will consist of a single sealed-bid round in which each assignment bidder will be allowed to submit a single set of bids for its alternative frequency options. Bids for different frequency options for a given band are mutually exclusive – the bidder will be assigned exactly one option for each band.

Assignment bidders are not required to submit bids in the frequency assignment stage. An assignment bidder who does not submit any bids for its frequency options will not have to pay a frequency assignment price, but will still be assigned one of its frequency options.

By submitting bids for some or all of its frequency options, an assignment bidder may be able to obtain a frequency option that it prefers over its alternative frequency options. However, this may be subject to the assignment bidder paying a 'frequency assignment price', calculated as described in Section 11.3.4.3. Where applicable, frequency assignment prices will be charged in addition to the bidder's lot assignment price.

11.3.4.1 *Making bids in the frequency assignment stage*
A frequency assignment bid is the maximum price, in whole NOK, that the assignment bidder is offering to pay to be assigned a specific frequency option. Assignment bidders will be assigned exactly one frequency option in each band; therefore bids for alternative frequency options for the same band are mutually exclusive.

At the scheduled round start time, the EAS will present each assignment bidder with the bid entry form that lists the bidder's frequency options in all of the bands. Assignment bidders may then enter a bid for each of its frequency options in bands where they have multiple options.

An assignment bidder does not need to enter a bid for all the frequency options for which it can bid. The bid for frequency options for which the assignment bidder does not enter a bid will be zero. The assignment bidder may still be assigned one of these options, but in this case its frequency assignment price will be zero.

Assignment bidders should enter all the bids they wish to submit into the form. The assignment bidder must then submit its bids in accordance with the procedure described in Section 11.1.

11.3.4.2 *Determination of winning frequency assignment plans*
The *total value* of a candidate plan is the sum of the bids from each assignment bidder for the frequency option it would be assigned in this candidate plan.

The winning frequency assignment plan must achieve the maximum total value across all of the candidate plans for that band. If several candidate plans achieve the maximum total value for a given band, then one of these will be randomly selected as the winning frequency assignment plan for that band.

Following from example 2, suppose that for the bidders submit the following bids:

- bidder1: NOK 1,000 for X1, NOK 0 for its other options;
- bidder2: NOK 10,000 for X2, NOK 0 for its other options; and
- bidder3: NOK 10,000 for X3-X4, NOK 0 for its other options.

In this case the value of the candidate winning plans would be:

- plan i: NOK 1,000 + NOK 10,000 + NOK 10,000 = NOK 21,000;
- plan ii: NOK 0 + NOK 0 + NOK 10,000 = NOK 10,000;
- plan iii: NOK 1,000 + NOK 0 + NOK 0 = NOK 1,000;
- plan iv: NOK 0 + NOK 0 + NOK 0 = NOK 0;
- plan v: NOK 0 + NOK 0 + NOK 0 = NOK 0; and
- plan vi: NOK 0 + NOK 0 + NOK 0 = NOK 0.

Therefore, the winning plan is candidate plan i.

Now suppose bidders submit the following bids instead:

- bidder1: NOK 1,000 for X1, NOK 0 for its other options;
- bidder2: NOK 10,000 for X1, NOK 0 for its other options; and
- bidder3: NOK 10,000 for X3-X4, NOK 0 for its other options.

In this case the value of the candidate winning plans would be:

- plan i: NOK 1,000 + NOK 0 + NOK 10,000 = NOK 11,000;
- plan ii: NOK 0 + NOK 10,000 + NOK 10,000 = NOK 20,000;
- plan iii: NOK 1,000 + NOK 0 + NOK 0 = NOK 1,000;
- plan iv: NOK 0 + NOK 10,000 + NOK 0 = NOK 10,000;
- plan v: NOK 0 + NOK 0 + NOK 0 = NOK 0; and
- plan vi: NOK 0 + NOK 0 + NOK 0 = NOK 0.

Therefore, the winning plan in this case is candidate plan ii.

Example 3: Determination winning frequency assignment plan

11.3.4.3 *Determination of frequency assignment prices*
Frequency assignment prices are calculated for each band separately.

The *minimum price for an assignment bidder* in a given band is:

- the maximum total value across all candidate plans that would be achieved if all the assignment bids from this assignment bidder were set to zero; minus
- the sum of bids made by each other assignment bidder for the frequency option it is assigned in the winning frequency assignment plan.

The *minimum price for a group of assignment bidders* in a given band is:

- the maximum total value across all candidate plans that would be achieved if all the assignment bids from all the assignment bidders in the group were set to zero; minus
- the sum of bids made by each assignment bidder not in the group for the frequency option it is assigned in the winning frequency assignment plan.

The frequency assignment prices for each band, consisting of one price for each of the assignment bidders with more than one option in that band, are in whole NOK and must satisfy the following conditions:

- the frequency assignment price for each assignment bidder is at most its bid for the frequency option it is assigned in the winning frequency assignment plan;
- the frequency assignment price for each assignment bidder is at least its minimum price;
- the sum of the frequency assignment prices for each group of assignment bidders must be at least the minimum price for the group;
- the sum of the frequency assignment prices across all assignment bidders is the smallest across all possible frequency assignment prices for that band that satisfy the conditions above; and
- the sum of squared differences between each assignment bidder's minimum price and its frequency assignment price is the smallest across all possible frequency assignment prices for that band that satisfy the conditions above.

Following from examples 2 and 3, consider the case where bids were:

- bidder1: NOK 1,000 for X1, NOK 0 for its other options;
- bidder2: NOK 10,000 for X2, NOK 0 for its other options; and
- bidder3: NOK 10,000 for X3-X4, NOK 0 for its other options.

and the winning plan is candidate plan i.

The minimum price for bidder1 is calculated as follows:
- if all bidder1's bids are set to zero, the maximum value across all candidate plans would be NOK 20,000 (achieved with plan i);
- the sum of bids by other bidders for their options in the winning frequency assignment plan is also NOK 20,000;
- therefore the minimum price for the group of bidder1 is NOK 0.

We can do the corresponding calculations for bidder2 and bidder3 to obtain that their individual minimum price is also NOK 0.

The minimum price for the group of bidders {bidder1 & bidder2} is calculated as follows:
- if all the bids from bidder1 and bidder2 are set to zero, the maximum value across all candidate plans would be NOK 10,000 (achieved with plan i or plan ii);
- the sum of bids by other bidders (bidder3) for their options in the winning frequency assignment plan is also NOK 10,000;
- therefore the minimum price for the group of {bidder1 & bidder2} is NOK 0.

We can do the corresponding calculations for the groups {bidder1 & bidder3}, {bidder2 & bidder3}, and {bidder1 & bidder2 & bidder3} to obtain that the minimum price for these groups is also NOK 0.

Therefore, the second and third conditions for the frequency assignment prices simply require that prices cannot be negative. There is only one set of prices that satisfies the first three conditions which achieves the smallest sum of prices, which is that in which all frequency assignment prices are zero. Therefore, in this example all bidders obtain their preferred option in this band without having to pay anything extra.

Conversely, consider the case where bids are:

- bidder1: NOK 1,000 for X1, NOK 0 for its other options;
- bidder2: NOK 10,000 for X1, NOK 0 for its other options; and
- bidder3: NOK 10,000 for X3-X4, NOK 0 for its other options.

And the winning plan is plan ii.

The minimum price for bidder1 is still NOK 0, as this bidder wins an option for which it has not made a positive bid:

- if all bidder1's bids are set to zero, the maximum value across all candidate plans would be NOK 20,000 (achieved with plan ii);
- the sum of bids by other bidders for their options in the winning frequency assignment plan is also NOK 20,000;
- therefore the minimum price for the group of bidder1 is NOK 0.

The minimum price for bidder3 is also still NOK 0, as:

- if all bidder3's bids are set to zero, the maximum value across all candidate plans would be NOK 10,000 (still achieved with plan ii, as bidder2 has made a higher bid for X1 than bidder1);
- the sum of bids by other bidders for their options in the winning frequency assignment plan is also NOK 10,000;
- therefore the minimum price for the group of bidder3 is NOK 0.

However, the minimum price for bidder2 is now NOK 1,000:

- if all bidder2's bids are set to zero, the maximum value across all candidate plans would be NOK 11,000 (achieved with plan i, in which bidder1 would be assigned X1);
- the sum of bids by other bidders for their options in the winning frequency assignment plan is also NOK 10,000 (only from bidder3, as bidder1 had bid NOK 0 for the option it is assigned);
- therefore the minimum price for the group of bidder2 is NOK 11,000 – NOK 10,000 = NOK 1,000.

We can run the calculations for groups of bidders to obtain that the minimum price is only positive for the group {bidder2 & bidder3}, where it is the same as for bidder2 individually.

Therefore, the second condition for the frequency assignment prices requires that the price for bidder2 must be at least NOK 1,000, and for other bidders prices cannot be negative. The third condition is automatically satisfied if the second condition is satisfied, as if the price for bidder2 is at least NOK 1,000 then the sum of prices for bidder2 and bidder3 is also at least NOK 1,000.

There is only one set of prices that satisfies the first three conditions which achieves the smallest sum of prices, which is that in which the price for bidder2 is NOK 1,000

and the prices for bidder1 and bidder3 are zero. Therefore, in this example bidder2 obtain its preferred option, but in doing so it denies this option to bidder1, and thus the price for bidder2 is at the amount that is needed to outbid bidder1.

Example 4: Determination of frequency assignment prices

11.3.5 End of the frequency assignment stage

At the end of the frequency assignment stage, Nkom will inform each bidder of:

- the frequencies it will be assigned in each band in which it has won lots; and
- the frequency assignment price (if any) it has to pay for each of the bands.

The auction will then end.

11.4 End of the auction

At the end of the auction Nkom will inform all bidders of:

- the frequencies assigned to each bidder;
- the winning frequency assignment plan for each band; and
- the lot assignment and frequency assignment prices for that each bidder will be required to pay for its assignment (including the totals and a breakdown for each band).

The award process will then proceed to the payment and issuing of licences.

11.5 Transition period

Regulation for the transition period is described in the overall framework for the award Section 7.

11.6 In the event of unsold spectrum – reservation for reassignment

If one or more lots remain unsold when the auction ends, Nkom reserves the right to reassign frequencies assigned in this auction. Reassignment/adjustment of placement of frequencies will be done to ensure efficient spectrum management and to ensure that any unsold spectrum can be allocated and assigned on a contiguous basis. Nkom aims on an overall basis to ensure that each licensee in each band can be assigned contiguous frequencies. Any potential costs incurred by licensees arising from a possible reassignment

of frequencies will need to be borne by each licensee, and will not be covered by Nkom or by the auction revenue.

12   Payment and issuing of licences

12.1 Notification

After the auction has been concluded, winning bidders will receive a notification from Nkom. The notified winning bidders shall pay the lot assignment and/or frequency assignment price(s) in full within ten - 10 - business days after Nkom submitted the notification.

12.2 Payment of bids

Payment shall be made to:
Nasjonal kommunikasjonsmyndighet
Postboks 93
N-4791 Lillesand
Norway

DNB - acc.nr. 7694 05 01632

In case of international money transfers, the following additional information must be included:

IBAN: NO 79 7694 05 01632
SWIFT: DNBANOKKXXX
Bank: DNB

12.3 Cover under the bank guarantee

In case of non-payment, delayed or incomplete payment of the lot assignment and/or frequency assignment price(s), Nkom has the right to demand payment under the guarantee to cover the price(s) in full or any unpaid portion of the price(s).

If delayed payment is caused by events constituting force majeure under Norwegian law, Nkom will prolong the deadline for payment accordingly.

Nkom may claim damages under the guarantee.

12.4 Return of the bank guarantee

The guarantee is returned to the bidder in the case where:

- the application to register for the auction is rejected;
- the auction procedure has been completed and the bidder had no licence assigned; or
- the auction procedure has been completed and the bidder had a licence assigned and paid the full amount of the lot assignment and/or frequency assignment price(s).

12.5 Issuing of licences

The licence will be issued when a winning bidder has paid the price it is liable for its assignment, including its lot assignment price and its frequency assignment price for each band where applicable.

13 Announcement and publication of results

After winning bidders have been notified with the result of the auction, Nkom will make a public announcement with the following information:

- The number of bidders that participated in the action
- The identity of the winning bidders
- The lot assignment and frequency assignment prices for that each bidder will be required to pay for its assignment (including the totals and a breakdown for each band).
- The frequencies assigned to the winning bidders

All participants and licensees in the band will be notified before Nkom makes the public announcement.

The participants in the action shall not announce or publish information about the auction before Nkom has made the above mentioned public announcement.

Nkom will not publish information about losing bids, but is considering publishing the identity of losing bidders. Nkom will also assess the grounds for confidentiality for bid data if there are requests for disclosure.

Public disclosure of identity of participants and bids is subject to Norwegian Public Administration Act and the act relating to public access to documents in the public administration (Freedom of Information Act).

14   Communication with Nkom

14.1 Questions made in writing

Questions concerning the auction rules and the auction process can be addressed to Nkom. All interested parties are entitled to submit questions to Nkom. Questions and other communication should be made in writing to fastetjenesterauksjon@nkom.no with a copy to tik@nkom.no and miv@nkom.no.

Questions should be submitted in Norwegian with an English translation. The estimated response time to questions could be up to five working days. Nkom reserves the right not to answer questions received within the last five working days before the auction.

Nkom will publish all questions submitted and Nkom's answers on Nkom's website. The identity of the party who submitted the question will not be published.

14.2 Telephonic communication during test auction and real auction

A dedicated phone number at Nkom will be provided for registered bidders for use during the mock auction and the real auction in case a bidder needs to contact Nkom, for example if the bidder should experience technical problems.

Nkom will provide bidder´s representative(s) with caller codes for both the mock auction and the real auction. When contacting Nkom, the caller will need to state a code according to Nkom´s request in order to identify the caller as the bidder´s representative.