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## COMPETITIVE SPECTRUM ALLOCATION IN MOBILE SERVICES SECTOR

*The paper provides an overview of a competitive procedure (contest), which was selected by the regulator to allocate a frequency spectrum in "digital dividend" in Russia at the national level, along with the legal requirements and regulatory environment of the procedure. The paper discusses the design of the frequency spectrum allocation, and the terms of releasing the spectrum formerly allocated to other services up to 2015, as well as the obstacles, new licencees are facing.*

*Keywords: mobile services; contest; auction; spectrum policy.*

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## КОНКУРЕНТНИЙ РОЗПОДІЛ СПЕКТРУ ПОСЛУГ МОБІЛЬНОГО ЗВ'ЯЗКУ

*У статті розглянуто проведення конкурентної процедури (конкурсу), яку було обрано регулятором для розподілу спектру у «цифровому дивіденді» у Росії на національному рівні, а також проаналізовано законодавчі вимоги та умови регулятора до проведення даної процедури. Вивчено організацію процедури розподілу спектру послуг, умови вивільнення спектру минулими користувачами, що використовують його на первинній основі до 2015 р., а також труднощі, з якими зіткнулись отримувачі ліцензій на спектр.*

*Ключові слова: послуги мобільного зв'язку; конкурс; аукціон; політика управління спектром.*

*Табл. 1. Літ. 10.*

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## КОНКУРЕНТНОЕ РАСПРЕДЕЛЕНИЕ СПЕКТРА УСЛУГ МОБИЛЬНОЙ СВЯЗИ

*В статье рассмотрено проведение конкурентной процедуры (конкурса), которая была выбрана регулятором для распределения спектра в «цифровом дивиденде» в России на национальном уровне, а также проанализированы законодательные требования и условия регулятора к проведению данной процедуры. Изучена организация процедуры распределения спектра услуг, условия его освобождения прежними пользователями, использующими спектр на первичной основе до 2015 г., а также трудности, с которыми столкнулись получатели лицензий на спектр.*

*Ключевые слова: услуги мобильной связи; конкурс; аукцион; политика управления спектром.*

**Introduction.** In accordance with the agreements reached at the World Radiocommunication Conference WRC-07 the frequency spectrum in the 790–862 MHz band in Region 1 is identified for Mobile Service since January 01, 2009 for 40 countries and since June 17, 2015 for the entire region. At WRC-12, the 694–790 MHz spectrum band was also identified for IMT.

The propagation characteristics in the "digital dividend" enhance the spectrum efficiency (as compared to higher spectral bands) in rural and urban (indoor) areas. This explains the considerable attention to spectrum bands below 1 GHz.

The development of the next generation of wireless technology is a top priority of many countries. In Russia the development of high-tech sectors has become the dominant trend of national economic policy. A significant part of the budget is

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assigned to these programs. The development of modern communication technology in many national economies faces the need to find an additional frequency spectrum; there also can be changes in technology use. Russia also suffers from the limited frequency spectrum, but to a large extent this problem is caused by the high consumption of spectrum for governmental purposes.

In 2012, a competitive spectrum allocation procedure for the right to deploy LTE (Long-Term Evolution) was held in the Russian Federation at the national level. The spectrum was allocated in the form of a contest (the so-called "beauty contest").

**Literature review, purpose, and methodology of the study.** According to the current studies, there are several forms of spectrum allocation for mobile services: auctions, contests, and lotteries (Frontier Economics, 2006; OECD, 2001). The chosen form of spectrum allocation design depends on a telecom market situation (Abramov, 2009; Dombrowski and Levchik, 2012), local legal environment (Legal environment of spectrum use: problems and decisions, 2011), and national regulator's policy issues (Frontier Economics, 2006; OECD, 2001; Kalugin, 2012; Tsvetkov et al., 2012).

**The object of the study** is the economic aspect of the spectrum policy.

**The purpose of the study** is to realize positive and normative economic analysis of the current spectrum management in Russia.

**The methodology of the study** is the system approach to industry markets.

**Contest for "digital dividend":**

**A. Legal framework for spectrum allocation.** In 2011, the regulator decided (State Radio Frequency Commission, 2011) to identify the following radio frequency bands for LTE: 791 to 862 MHz (digital dividend), 2500 to 2690 MHz and 2300 to 2400 MHz. The regulator recommended to further expand 694 to 876 MHz frequency band used for LTE ("Digital dividend-2").

The regulator established technological requirements to the minimum level of frequency spectrum availability for each operator spectrum for LTE as 2 x 30 MHz. This gave reasons to limit the number of licences provided to individual operators up to 4. In the "digital dividend" (791 to 862 MHz) the band for a single operator was set as 2 x 7.5 MHz. In this respect it was recommended to allocate the frequency spectrum in the form of a contest for the following lots (Table 1).

**Table 1. Allocated radio frequency bands for LTE**

Spectrum bands		Lot I	Lot II	Lot III	Lot IV
Spectrum allocated on a competition basis	791 to 862 MHz band	791–798.5/ 832–839.5 MHz	798.5–806/ 839.5–847 MHz	806–813.5/ 847–854.5 MHz	813.5–821/ 854.5–862 MHz
Additional "non-competitive" allocated spectrum	2500 to 2690 MHz band	2,560–2570/ 2,680–2690 MHz	2540–2550/ 2660–2670 MHz	2530–2540/ 2650–2660 MHz	2550–2560/ 2670–2680 MHz
	720 to 791 MHz band	727.5–735/ 768.5–776 MHz	720–727.5/ 761–768.5 MHz	742.5–750/ 783.5–791 MHz	735–742.5/ 776–783.5 MHz

The licence validity is 7 to 10 years. Contest conditions require operators to invest in LTE deployment during the first 7 years.

**B. Comparative selection procedures.** Due to the fact that in Russia the frequency spectrum in the "digital dividend" is currently allocated to other services, a form of

spectrum allocation was established as a "beauty contest" (RF Government Resolution, 2006).

Let us dwell on the contest requirements for bidders, some of which describe their current activities, and the other part is related to future obligations of operators to deploy LTE.

*Competitive assessment of operators' current activities:*

1. The criteria that encourage wireless communication market demonopolization: an operator has a valid licence or may obtain a licence for LTE services.
2. Experience in providing various communications services.
3. Sanctions by the regulator (if any).
4. Failure to comply with the commitments taken for previous licences.
5. Length of operator's fiber-optic transmission line (FOL) network.

*Estimates of operator's future obligations of LTE deployment:*

1. Deployment of LTE networks at the regional level. All winners are required (imputed liability) to implement LTE communication services: a network should cover 60 regions (subjects) of the Russian Federation by 2018 and all regions in the respective lot by 2019.

2. Operator's obligations to invest in the deployment of LTE network at least 15 bln RUB (about 457 mln USD) annually for 7 years until the full execution of the required network deployment dynamics; the total amount is about 485 bln RUB (about 15 bln USD).

3. The expected data transmission rate from subscriber stations to LTE base stations.

4. Obligation to connect MVNO (mobile virtual network operator) communication operators.

8 applicants were qualified for the contest: 6 operators with Russian equity (Mobile TeleSystems (NYSE: MBT), MegaFon (RTS: MEGF), VimpelCom (NYSE: VIP), Rostelecom (RTS: RTKM), Summa Telecom, TransTeleCom) and 2 Russian divisions of Tele2 AB (NASDAQ: TLTO) Swedish telecommunications company (Tele2-Voronezh and Tele2-Omsk).

The first 3 participants are the largest mobile operators. Rostelecom has a monopoly in fixed-line services, although in recent years it actively develops a wireless services market. Summa Telecom and TransTeleCom should be regarded as the outsiders of the contest. The Swedish Tele2 AB' total share at Russian mobile communication market is less than that of the "big three" (the first 3 companies).

*The results of the contest.* The winners of the contest became the 3 largest Russian mobile operators, as well as the Russia's largest fixed-line services provider that actively develops wireless communications in recent years: Rostelecom (lot I), Mobile TeleSystems (lot II), MegaFon (lot III), and VimpelCom (lot IV).

**C. Contest requirements for spectrum release.** In most regions of the Russian Federation the spectrum in the 694–876 MHz and the 2500–2690 MHz frequency bands is allocated on the primary basis to various services (not to mobile service). This limits the ability of LTE network communications. Therefore, the "beauty contest" for the 791–862 MHz frequency band required the winners to implement organizational and technical measures for spectrum release (in the form of refarming, spectrum conversion, spectrum re-allocation between radio users etc.) not only for this

band, but for 694–876 MHz, and 2500–2690 MHz as well. This is due to subsequent non-competitive allocation of additional spectrum bands to winning operators.

The commitments to fund organizational and technical measures were entrusted not only to winners, but also (in the 2500–2530 MHz and the 2620–2650 MHz bands) to Russian first operator of LTE network (Scartel) in order to maintain its existing licence. According to the regulator, the contest winners shall coordinate implementation of organizational and technical measures through the so-called LTE Union.

Once the winners implement organizational and technical measures for the release of the spectrum, they will receive additional radio frequency band (in 2500–2690 MHz band) out of the contest. After it was decided by WRC-2012 to identify "Digital dividend-2" for mobile services, the regulator will also provide the winners with additional spectrum in the 720–750 MHz band and the 761–791 MHz band (Table 1).

Additionally, following the implementation of organizational and technical measures for the spectrum release, the regulator assumes to allocate additional spectrum in the 694–876 MHz to the winners without further comparative selection procedures (contest, auction etc.).

***D. Non-competitive granting of LTE licences in the 2500–2700 bands and the 2300–2400 MHz bands.*** In addition to allocation of "Digital dividend," the regulator has issued 3 additional licences on non-competitive basis (without comparative selection procedures) for LTE for 10 years in the 2500–2700 MHz frequency bands. At the same time two operators (MegaFon and MTS, who were participants in the contest for LTE spectrum allocation) received regional licences (in Moscow and Moscow Region), the third operator (Scartel – a former WiMAX network operator) received a national licence. In this spectrum bands, these operators were previously licenced for non-LTE technology. So the regulator obliged them to reform the spectrum.

In addition to the above operators, another operator (Osнова Telecom) received the national licence for LTE (frequency bands 2300–2400 MHz) for primary use in the public sector (State Radio Frequency Commission, 2009). However, subject to the existing spectrum allocation in Russian regions (i.e., spectrum allocation to other services) this bands can only be used in 40 (out of 83) Russian regions.

#### **Discussion:**

***A. Possibility to obtain multiple licences by a single operator.*** Terms and conditions of the contest contain no requirements on a limited number of licences for a single operator. That is, formally, one operator could be the winner of more than one lot. However, the above bid evaluating criterion (promoting de-monopolization of wireless market) assumed a significant reduction of the points during the bid evaluation (minus 70 points), if the operator has a valid licence or may receive a licence for LTE services did not permit to get more than one licence after calculation of the points and the evaluation of applications.

***B. Investment commitments of the licencees.*** As noted above, each winner took a number of financial commitments:

1. Investments in LTE deployment.
2. Investments in spectrum conversion.
3. Indemnity to former holders of the spectrum released under the terms of the contest in two regions of Russia (Moscow and Moscow Region).

*C. LTE deployment possibilities for small- and medium-sized operators.*

Obligations of winning operators taken in the course of the contest provide for MVNO use. As the frequencies are limited, application of this technology will enable small- and medium-sized regional operators to provide LTE services without a licence for the spectrum. At the same time, this technology permits reducing costs for large operators by sharing communication networks. However, it is clear that each winning operator will be guided by profitability considerations during the allocation of own capacities to potential competitors. Furthermore, the very execution of the accepted future commitments of contest participants is traditionally regarded rather problematic (Frontier Economics, 2006; OECD, 2001).

There was some inconsistency of actions during the participation in the contest of Tele2 Russian subsidiary. Two separate applications (Tele2-Voronezh and Tele2-Omsk) were filed by the company for this contest. Based on many considered evaluation criteria, applications from operators with better network infrastructure and longer experience would have a preferred position during the evaluation. As a result, in addition to other informal circumstances, the legal form of business for Tele2 in Russia did not permit it to ensure competitive position.

*D. Comparative analysis of LTE spectrum allocation models and a need for spectrum conversion.* The desire of the regulator to stimulate the development of communications, including spectrum conversion, on the account of private rather than public funds, is understandable. However, the very implementation of this idea may have different models.

*Model 1. Basic model of "spectrum in exchange for spectrum conversion".* Given the commitments assigned to the winners to release the occupied spectrum for LTE, the current model (adopted by the regulator) could be roughly described as "spectrum in exchange for spectrum conversion." According to this model, spectrum release should be done by the new licencees.

*Model 2. Alternative model "Spectrum allocation after conversion".* It is important to note that according to the second model, spectrum conversion should already be done by spectrum allocation procedures (auction, contest, and lottery).

*Model 3. Alternative model "Spectrum allocation (auction, contest, lottery) to fund spectrum conversion".*

*Comparison of the models.* Comparison of the models involves comparing by the key criteria.

1. Funding for spectrum conversion. The costs of spectrum conversion for LTE are estimated at 86–100 bln RUB (2.6–3 bln USD). Certainly, the anticipated cost of spectrum conversion is high enough to support the industry (in the case of Model 2). However, taking into account the importance of the issue for the development of the key sector of the national economy as well as partial (or full) compensation of these costs by holding such good revenue generating tool as an spectrum auction, the initial public funding of spectrum conversion looks quite reasonable.

2. Qualitative examination of spectrum conversion. Professional skills of Russian experts in communication are high enough and they are able to provide expert support on the spectrum conversion (Kalugin, 2012; Tsvetkov et al., 2012).

3. Spectrum auction (contest, lottery) proceeds vs. spectrum conversion costs. The possibility of compensation for spectrum conversion cost is largely dependent on

how effectively (based on expenditures) spectrum conversion could be executed by the public sector. Given the novelty and uniqueness of spectrum conversion problem for LTE deployment, it would be quite problematic to provide by the public sector high enough spectrum conversion efficiency (based on expenditures). However, involvement of private contractors on the bidding basis (tender procedures for spectrum conversion) for the implementation of this task could significantly reduce the costs of spectrum conversion. Perhaps, these contractors would be the same large operators. However, it is important that their participation would not be associated with the results of spectrum allocation that is explicitly observed in the last two models and would increase the competition and the spectrum use efficiency.

#### **Conclusion:**

1. The considered spectrum allocation (Model 1) was largely "controlled (predictable) process" driven by the regulator – from the moment when the regulator defined the general principles of LTE spectrum allocation up to the moment when contest results became available. In particular, the precontest regulator's decision to limit the number of participants to 4 operators was consistent with the overall logic for defining potential winners (the so-called "big four" operators). The subsequent formulation of evaluation criteria provided the most likely win for these "big four."

2. An important criterion in the contest documentation that affected the selection of winners was the length of own fiber-optic transmission line (FOL). According to this criterion, the 4 major federal operators (who won the contest) could get the maximum number of points. This criterion was proposed in 2011 by Temporal LTE Union (comprising the representatives of the same operators) during public hearing of the contest design. The official decision of the regulator on LTE deployment contains a statement supporting the LTE Union proposals.

3. The ability to obtain the spectrum for LTE deployment by relatively large discounter operator Tele2 (Swedish company), among other things, is complicated by the national security issue, namely the need for spectrum conversion on a competitive base, respectively, by access of the international operator to the technologies used for government communications. The above (second and third) LTE spectrum allocation models could solve this problem and, in addition, increase competition.

4. According to the selected spectrum allocation model, the positive results of the contest include the possibility to deploy LTE, as well as indirect income from upgrading communications technology as a result of government's appointment of proposed spectrum conversion.

5. The demonopolization criteria stated in the contest terms and conditions are partially achieved. However, the problem of improving competition in the industry remains unresolved.

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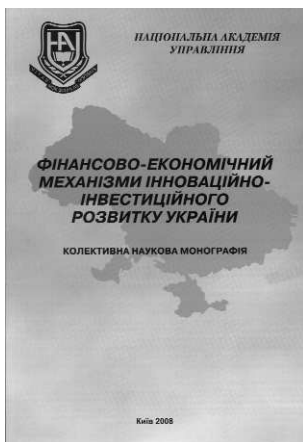
## КНИЖКОВИЙ СВІТ



СУЧАСНА ЕКОНОМІЧНА ТА ЮРИДИЧНА ОСВІТА  
ПРЕСТИЖНИЙ ВИЩИЙ НАВЧАЛЬНИЙ ЗАКЛАД

### НАЦІОНАЛЬНА АКАДЕМІЯ УПРАВЛІННЯ

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**Фінансово-економічні механізми інноваційно-інвестиційного розвитку України: Колективна наукова монографія / Кириченко О.А., Єрохін С.А. та ін.; За наук. ред. д.е.н., проф. О.А. Кириченко. – К.: Національна академія управління, 2008. – 252 с. Ціна без доставки – 25 грн.**

Монографія присвячена актуальній проблемі світової та вітчизняної економічної науки, викладені теоретико-методологічні питання формування стратегії інноваційно-інвестиційного розвитку національної економіки та формування її фінансово-економічного механізму. В основу викладу матеріалу монографії покладені багаторічні дослідження науковців в галузі економічної теорії, фінансів та банківської справи, які були апробовані на сторінках авторитетного журналу "Актуальні проблеми економіки" в 2004–2007 роках. В монографії обґрунтовано шляхи переходу економічної системи України від підприємства до рівня держави на більш високий цивілізаційний рівень за рахунок створення ефективного фінансово-економічного механізму інноваційно-інвестиційного розвитку.