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ENGLISH FOR SCIENCE AND ENGINEERING STUDENTS: Professional Reading

Учебно-методическое пособие по самостоятельной работе

для студентов направлений бакалавриата
РТФ, ФЭТ, ФВС, РКФ

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Contents

От авторов

Настоящее учебно-методическое пособие является составной частью УМК **English for Science and Engineering Students** для студентов направлений бакалавриата РТФ, ФЭТ, ФВС, РКФ.

Оно содержит профессионально-ориентированные тексты, рекомендованные для чтения при подготовке к устной части экзамена - презентации по профессиональной тематике.

Тексты пособия отобраны с учетом их информативности и соответствия последним достижениям науки и техники.

В приложении даны практические рекомендации по подготовке презентации.

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Text 1

WHAT ARE TELECOMMUNICATIONS?

Telecommunications, also called telecommunication, is the exchange of information over significant distances by electronic means. A complete, single telecommunications circuit consists of two stations, each equipped with a transmitter and a receiver. The transmitter and receiver at any station may be combined into a single device called a transceiver. The medium of signal transmission can be electrical wire or cable (also known as “copper”), optical fiber or electromagnetic fields. The free-space transmission and reception of data by means of electromagnetic fields is called wireless.

The simplest form of telecommunications takes place between two stations. However, it is common for multiple transmitting and receiving stations to exchange data among themselves. Such an arrangement is called a telecommunications network. The Internet is the largest example. On a smaller scale, examples include:

- corporate and academic wide-area networks (WANs);
- telephone networks;
- police and fire communications systems;
- taxicab dispatch networks;
- groups of amateur radio operators.

Data is conveyed in a telecommunications circuit by means of an electrical signal called the carrier or carrier wave. In order for a carrier to convey information, some form of modulation is required. The mode of modulation can be broadly categorized as either analog or digital. In analog modulation, some aspect of the carrier is varied in a continuous fashion. The oldest form of analog modulation is amplitude modulation (AM), still used in radio broadcasting at some frequencies. Digital modulation actually predates analog modulation; the earliest form was Morse code. During the 1990s, dozens of new forms of modulation were developed and deployed, particularly during the so-called “digital revolution” when the use of computers among ordinary citizens became widespread.

In some contexts, a broadcast network, consisting of a single transmitting station and multiple receive-only stations, is considered a form of telecommunications. Radio and television broadcasting are the most common examples.

Telecommunications and broadcasting worldwide are overseen by the International Telecommunication Union (ITU), an agency of the United Nations (UN) with headquarters in Geneva, Switzerland. Most countries have their own agencies that enforce telecommunications regulations formulated by their governments.

1.1. Match the English terms with their definitions.

1. transceiver	a. a term used to describe telecommunications in which electromagnetic waves (rather than some form of wire) carry the signal over part or all of the communication path
2. wireless	b. a series of points or nodes interconnected by communication paths
3. modulation	c. a method of sending text messages by keying in a series of electronic pulses, usually represented as a short pulse (called a “dot”) and a long pulse (a “dash”)
4. network	d. a combination of transmitter/receiver in a single package
5. amateur radio	e. the addition of information to an electronic or optical carrier signal
6. Morse code	f. a hobby enjoyed by several hundred thousand people in the United States and by over a million people worldwide a hobby enjoyed by several hundred thousand people in the United States and by over a million people worldwide

1.2. Match the verbs in box A with the nouns in box B to make phrases (according to the text) and translate them.

A	B
1. electromagnetic	a. modulation
2. signal	b. wave
3. electrical	c. field
4. optical	d. fiber
5. amplitude	e. telecommunications regulations
6. Morse	f. wire
7. transmitting	g. transmission
8. to convey	h. code
9. to enforce	i. station
10. carrier	j. information

1.3. Match up the words which have a similar meaning.

A	B
1. combine	a. general
2. predate	b. spread out
3. deploy	c. join
4. common	d. numerous
5. multiple	e. precede

1.4. Fill in the table according to the text.

	Forms of the medium of signal transmission	
	Examples of telecommunications network	
	The oldest form of analog modulation	
	The earliest form of digital modulation	
	The most common forms of telecommunications	
	Organizations for overseeing telecommunications and broadcasting	

1.5. Read the text again and answer the questions.

1. What is telecommunication?
2. What does a single telecommunications circuit consist of?
3. What kind of device are the transmitter and receiver combined into?
4. What is wireless (transmission and reception)?
5. Which network is the largest?
6. How is data in a telecommunication circuit conveyed?
7. How can the mode of modulation be broadly categorized?
8. When were dozens of new forms of modulation developed and deployed?

1.6. Read the following sentences and say whether they are true (T) or false (F).

1. Telecommunication is the exchange of information by electric means.
2. A complete, single telecommunications circuit consists of two stations, each equipped with a transmitter.
3. The transmitter and receiver at any station may be combined into a single device called a transceiver.
4. The medium of signal transmission can be electrical wire or cable (also known as “copper”), optical fiber or electromagnetic fields.
5. The free-space transmission and reception of data by means of electromagnetic fields is called wireless.
6. The simplest form of telecommunications takes place between three stations.
7. Internet is the largest telecommunications network.
8. Data is conveyed in a telecommunications circuit by means of an electronic signal.
9. The mode of modulation can be broadly categorized as either analog or digital.
10. Amplitude modulation (AM) is the earliest form of analog modulation.

Text 2

LAN vs WAN

Local area networks and wide area networks are essentially the same in many aspects. They only differ in the area that is covered by the network. LANs are networks that are limited to a small geographic location. The computers connected to the network could be in a single room, a few rooms, or spread out in an entire building. WANs, on the other hand, cover great distances and are not limited to a single location. The biggest and most popular example of a WAN is the internet, which spans the whole globe and has millions of computers connected to it.

LANs are very common nowadays, it is commonplace in a work environment and even at home. It is necessary to implement a local area network in order to connect multiple computers to the internet using a single DSL line. With regard to speed, LAN usually operates at much higher rates compared to WAN. This is largely due to the proximity of the computers and the lack of congestion in most cases. It is common to experience up to 80 or 90 mbps in a LAN while achieving 10 to 20mbps is already a great achievement for WAN.

LAN can be more secure due to the fact that all the computers are within a specific area and are physically easier to secure. The data on a wide area network needs to pass across public phone lines in order to reach its intended destination. The data is then vulnerable to attack by anyone with the right skills to penetrate your network. Unlike LAN, there is just no physical way of securing it, that’s why electronic features are the only defense structure in place.

Cost also varies greatly between the two. Deploying a LAN is relatively much easier and cheaper than a WAN. It wouldn’t require more than the cables, some switches, and optionally, routers to those who want to connect to the internet. With WAN, the long distances that the data travels would need miles and miles of cabling, or in some cases satellites. Signal deterioration is also a very real problem for WANs, that’s why repeaters are used at intervals to amplify or rebuild the original signal.

Summary:

- LAN covers a small area while WAN covers a significantly larger area.
- LAN speeds are also significantly faster than WAN.
- LAN is more secure than WAN.
- WAN is much more expensive to implement than LAN.

2.1. Match the English terms with their definitions.

1. amplitude modulation	a. a device or, in some cases, software in a computer, that determines the next network point to which a packet should be forwarded toward its destination
2. local area network	b. a device that channels incoming data from any of multiple input ports to the specific output port that will take the data toward its intended destination
3. internet	c. a method of impressing data onto an alternating-current carrier waveform
4. switch	d. a device that receives a digital signal on an electromagnetic or optical transmission medium and regenerates the signal along the next leg of the medium
5. router	e. a worldwide system of computer networks
6. repeater	f. a group of computers and associated devices that share a common communications line or wireless link to a server

2.2. Match up the words which have a similar meaning.

A	B
1. span	a. in respect of
2. area	b. considerably
3. implement	c. extend
4. with regard to	d. defenseless
5. rate	e. sputnik
6. vulnerable	f. space
7. satellite	g. put into operation
8. significantly	h. speed

2.3. Read the text again and answer the questions.

1. How do LANs and WANs differ according to their geographic location?
2. What is the biggest and most popular example of a WAN?
3. What should be done in order to connect computers to the internet?
4. Which of the networks operates at higher rates: LAN or WAN?
5. Why can LAN be more secure than WAN?
6. Which of the networks is easier and cheaper to deploy and why?
7. What is a very real problem for WANs?
8. What are repeaters used for?

2.4. Read the following sentences and say whether they are true (T) or false (F).

1. LANs and wide WANs are very different in many aspects.
2. LANs are networks that are limited to a small geographic location.
3. WANs are not limited to a single location.
4. WAN usually operates at much higher rates compared to LAN.
5. LAN is much more expensive to implement than WAN.

Text 3

REMOTE CONTROL

The widespread use of television remote controls has turned people in coach potatoes. We can change channels, adjust the sound and the picture, and do a lot of other actions on the teletext systems with the push of a button.

A remote control is a device for controlling equipment from a short line-of-sight distance. This electronic device is used for operating the television set wirelessly. The remote control can be contracted to “remote” or “controller”. Usually remote controls are consumer infrared (IR) devices used to command from a distance to televisions or other consumer electronics .

Most of modern remote controls communicate with their respective devices via IR signals and a few via radio signals. Television IR signals can be mimicked by a universal remote which is able to emulate the functionality of most major brand television remote controls. They are usually powered by small AAA or AA or sometimes A23 size batteries.

One of the earliest examples of remote control was developed in 1898 by Nicola Tesla. He demonstrated a radio-controlled boat to the public during an electrical exhibition in New-York. Tesla called his boat a “teleautomation”. In 1903 Leonardo Torres Quevedo presented the “Telekino” at the Paris Academy of Science. The “Telekino” consisted of a robot that executed commands transmitted by electromagnetic waves. It meant the world’s first apparatus for radio control and was a pioneer in the field of remote controls. The first remote controlled model aeroplane flew in 1932 and the use of remote control technology for military purposes was worked intensively during the Second World War.

The first remote which was intended to control a television was developed by Zenith Radio Corporation in 1950. The remote called “Lazy Bones” was connected to the television by a wire. A wireless remote control called the “Flashmatic” was developed in 1955. It worked by shining a beam of light onto a special cell but the cell did not distinguish between light from the remote and light from other sources. The “Flashmatic” also had to be pointed very precisely at the receiver in order to work. In the 1970s remote controls used ultrasonic tones.

A modern remote control contains keys and electronic components similar to those of a calculator. The keys are connected by wires which cross beneath each individual key. Pressing a key completes an electrical circuit and a signal is sent to a microchip which, in turn, sends a series of on-off electrical pulses to a light-emitting diode (LED) at the front of the handset. A code spelt out by the length and spacing of these pulses switches on the LED. The LED flashes on and off to send an infrared beam to the receiving ‘eye” on the television set.

Since the first remote control there have been a lot of stages of its development. Nowadays the remote control is used in military, space, video games, photography and other fields of science.

“Couch potatoes” are people who spend most of their time sitting on a couch (sofa) watching television.

3.1. Decide if the statements are true or false.

1. Couch potatoes are very useful vegetables.
2. A modern remote control looks like a calculator.
3. Remote controls are powered by solar energy.
4. A wireless handset was created in 1955.
5. A remote control is only used to change channels.
6. The first remote control was developed and demonstrated in 1988.
7. The controller called “Lazy Bones” was attached to the television by a wire.
8. The LED flashes on and off to send an ultraviolet beam to the receiving “eye” on the TV set.
9. The “Flashmatic” had to be pointed to very accurately at the receiver in order to work.
10. The Telekino robot executed commands transmitted by sound waves.

3.2. Answer the questions on the text.

1. What can you do using remote control?
2. How does a remote control work?
3. What consumer IR devices can work with remote controls?
4. How do modern remotes communicate with their respective devices?
5. What batteries do remote controls need?
6. How are modern remote controls used?
7. Is a remote control a useful device? Prove your answer.

3.3. Read paragraph 6 again and complete the gaps to show how a remote control works.

1. You press a key.
2. … .
3. A signal is sent to a microchip.
4. … .
5. These pulses switch on the LED.
6. … .

3.4. Complete the table.

Noun	**Verb**	**Noun**	**Adjective**
adjustment	1	8	useful
2	beam	9	wireless
contraction	3	10	long
4	exhibit	precision	11
use	5	similarity	12
operation	6	13	light
7	sound	14	electrical

3.5. Match the words to make expressions. Translate them.

1. to shine	a. commands
2. to change	b. and the picture
3 to execute	c. channels
4. respective	d. wirelessly
5. to adjust the sound	e. the functionality
6. to operate	f. a beam of light
7. widespread	g. very precisely
8. to be pointed	h. waves
9. to emulate	i. devices
10.electromagnetic	j. use

3.6. Match the words with similar meaning.

1. precise	a. through
2. field	b. to process
3. via	c. to contain
4. to operate	d. to regulate
5. to emulate	e. accurate
6. to consist	f. ray
7. to adjust	g. to carry out
8. to transmit	h. to imitate
9. beam	i. to send
10.to execute	j. sphere

3.7. Match the words with opposite meaning.

1. to receive	a. darkness
2. light	b. different
3. push	c. short
4. similar	d. to expand
5. to complete	e. civil
6. long	f. uselessness
7. to contract	g. pull
8. functionality	h. common
9. military	i. to transmit
10.individual	j. to start

3.8. Translate the following word-groups.

Teletext system, line-of-sight distance, remote control technology, consumer electronics, brand television remote control, light-emitting diode, pulse switch, light beam, radio control, a remote controlled model aeroplane.

Text 4

HACKERS

The word “hacker” is derived from the verb “to hack through” that means “to break through”. The word combines two meanings: one negative – “hacker”, and the other – positive and is regarded as “master” or “expert”. While speaking about computers the verb “to hack” stands for two operations – to crack the system or to repair it. The idea of these both actions is the same – the mode, the computer and its programs work in.

The first hackers were the students of Massachusetts Institute of Technology (MIT). They were interested in creating innovative, stylistic, and technically clever circuits. During the spring of 1959 a new course was offered at MIT – a freshman programming class. Instead of creating a better circuit , hackers began to create a faster and more efficient program – with the least number of lines of code. Soon they formed a group and worked out the first set of hacker’s rules called the “Hacker’s Ethics”. The members of this group were engaged in writing and exchanging new programs and perfecting the hardware. They worked at MIT’s Artificial Intelligence laboratory and over the years introduced many innovations: LIFE – a game about survival; LISP – a new kind of programming language; the first computer chess game; the CAVE – the first computer adventure and SPACEWAR – the first video game.

There are four generations of hackers in the history of computer revolution. Each generation made its contribution to computer technology.

The first generation hackers came into being in the late 1960s – the early 1970s. They were university students of computer science departments. Using the time-sharing mode these hackers converted general-purpose computers (mainframes) into virtual personal ones.

The second generation hackers refer to the late 1970s. Their names are associated with the invention and production of personal computers. Following the Hacker’s Ethics they opposed the commercialism of the Internet by creating programs and making them available to everybody, the so-called “freeware” or “shareware”.

The third generation hackers appeared in the early 1990s. They created a lot of educational, application, and video games and programs for personal computers.

The present generation of hackers transformed the military Arpanet into a total digital world called the Internet.

But in the late 1990s the word ‘hacker’ began to associate with the word ‘cracker”. Today it refers to the people who intentionally crack the access control and penetrate into other people’s computers in unauthorized ways. Such hackers read private e-mails, steal confidential information, misappropriate and infect the computer programs. They cause great damage to economics, business, banking, and many other aspects of people’s relations. Moreover, it is unsettling to know that a great deal of computer crimes go undetected and a lot of computer criminals remain uncaught.

4.1. Choose a suitable title for the text.

1. Hackers and their role in information technology.
2. The four generations of hackers.
3. Computer revolution.

4.2. Read and translate the derivatives.

to operate	operation	operator	
to program	program	programming	programmer
to create	creating	created	creator
to change	to exchange	exchanging	changeable
to innovate	innovation	innovator	
to contribute	contribution	contributor	
to produce	production	productive	product
to intend	intention	intentional	intentionally
technology	technological	technologically	technologist
technique	technical	technically	technician

4.3. Match the expressions with their Russian equivalents.

1. to crack the system	а. преступление, совершенное с помощью компьютера
2. innovative circuit	прикладная программа
3. freshman programming class	б. незаконно присвоить программу
4. computer crime	в. причинять вред
5. to misappropriate the program	г.взломать блок управления доступом
6. computer science department	д. курс программирования для первокурсников
7. to perfect the hardware	е. взломать систему
8. application program	ж. факультет вычислительной техники и ПО
9. Artificial Intelligence laboratory	з. инновационная схема
10. to crack the access control	и. ремонтировать систему
11. to cause damage	к. совершенствовать комплектацию
12. computer technology	л. лаборатория искусственного интеллекта
13. to repair the system	м. компьютерные технологии

4.4. Give the English equivalents.

1. набор правил
2. персональный компьютер
3. противостоять коммерциализации
4. бесплатное программное обеспечение
5. неправомочный путь
6. бесплатное ПО
7. условно-бесплатное ПО
8. работать в режиме
9. образовательная программа
10. язык программирования
11. конфиденциальная информация
12. электронное письмо
13. режим разделения времени
14. обмениваться программами

4.5. Match the words with similar meaning.

1. hacker	a. data
2. to perfect	b. processing
3. to misappropriate	c. improvement
4. to convert	d. cracker
5. efficient	e. equipment
6. operation	f. manufacturing
7. innovation	g. to steal
8. production	h. to transform
9. hardware	i. to improve
10. information	j. productive

4.6. Match the words with opposite meaning.

1. to combine	a. public
2. negative	b. use
3. a freshman	c. positive
4. private	d. to contribute
5. innovative	e. to separate
6. damage	f. early
7. to steal	g. out-of-date
8. late	h. to repair
9. to crack	i. a senior student
10. clever	j. silly

4.7. Decide if the statements are true or false.

1. Modern hackers are experts in repairing computers.
2. The first generation hackers created the Internet.
3. Creation, use and spreading harmful programs for PCs is a criminal offence.
4. The stylistic circuits of modern computers are the same as in 1960s.
5. Hackers have played an important role in the history of computer revolution.
6. The students of the first freshman programming class started with creating a better circuit.
7. The third generation hackers appeared in the early 1980s and they developed a lot of educational programs.
8. The first video game was introduced in the early 1960s.
9. Using the time-sharing mode the hackers transformed virtual PCs into general-purpose computers.
10. From the very beginning the aim of hackers was to steal private information.

4.8. Answer the questions on the text.

1. What is the origin of the word “hacker”?
2. What does the verb “to hack” mean?
3. What were the first hackers interested in?
4. How many generations of hackers are there in the history of computer revolution?
5. Did every generation contribute to computer technology? How?
6. What was the “Hacker’s Ethic”?
7. How do modern hackers cause damage to some aspects of people’s relations?
8. Is it possible to detect and punish computer criminals?

Text 5

SUPERCONDUCTIVITY

Superconductivity is a phenomenon observed in several metals and ceramic materials. When these materials are cooled to temperatures ranging from near absolute zero (0 degrees Kelvin, - 273 degrees Celsius) to liquid nitrogen temperatures (77K, -196C), their electrical resistance drops with a jump down to zero.

Superconductivity was once thought to be physically impossible. But in 1911 it was discovered by a Dutch physicist K.Onnes. He found the electrical resistivity of a mercury wire to disappear suddenly when cooled below a temperature of 4 Kelvin (-269 C). He also discovered that a superconducting material can be returned to its normal state either by passing a sufficiently large current through it or by applying a sufficiently strong magnetic field to it.

The temperature at which electrical resistance is zero is called the critical temperature and this temperature is a characteristic of such materials as zinc, mercury, tin and aluminium. Superconductivity can also occur in various metallic alloys and some heavily-doped semiconductors. Superconductivity does not occur in noble metals like gold and silver. The ceramic critical temperature is much higher than metal one. The value of the critical temperature is dependent on the current density and the magnetic field.

In a superconductor below its critical temperature there is no resistance and so superconducting materials can carry large amounts of electrical current for long periods of time without losing energy as heat. As a negatively-charged electron moves through the space between two rows of positively-charged atoms, it pulls inward on the atoms of the lattice. This distortion attracts a second electron to move in behind it. An electron in the matrix can interact with another electron.

The two electrons forming a weak attraction travel together in a pair and encounter less resistance. In a superconductor electron pairs are constantly forming, breaking and reforming flow with little or no resistance. The current is carried then by electrons moving in pairs called Cooper pairs. The second electron encounters less resistance, much like a passenger car following a truck on the motoway encounters less air resistance.

The future of superconductivity research is to find materials that can become superconductors at room temperature. Once this happens, the whole world of electronics will be revolutionized.

5.1. Match the words that have the similar meaning.

1. field	a. ordinary
2. demands	b. result in
3. use	c. enough
4. get	d. change
5. vary	e. apply
6. lead	f. requirements
7. common	g. obtain
8. sufficient	h. sphere

5.2. Match the words that have the opposite meaning.

1. easy	a. high
2. conductor	b. huge
3. below	c. solid
4. low	d. above
5. lose	e. difficult
6. tiny	f. insulator
7. liquid	g. find

5.3. Choose the equivalents to the Russian words.

проводимость	conductive	conduction	conductor
сопротивление	resistive	resistor	resistance
разнообразный	variation	variable	variety
зависимость	dependence	dependent	dependently
плотный	density	dense	densely
двигаться	motion	move	moving
взаимодействовать	interact	interactive	interactivity
физик	physics	physical	physicist

5.4. Choose the appropriate word and fill in the blank with it.

1. The electrical resistance of some materials … down to zero.
   a. goes up b. drops c. changes
2. The critical temperature is the temperature at which electrical … is zero.
   a. resistance b. conductivity c. capacity
3. Superconductivity does not … in noble metals such as gold and silver.
   a. take part b. take off c. take place

4. If the large current … through the superconductor it returns to its normal state.
   a. is produced b. is passed c. is converted

5. The value of critical temperature depends on the … density and the magnetic field.
   a. voltage b. resistance c. current

6. Superconductors carry large amount of current for long periods of time without … energy as heat.
   a. losing b. getting c. producing

7. Electron pairs in a superconductor form, break and reform … with little or no resistance.
   a. variation b. conductor c. flow

8. Scientists try to find materials which can … superconductors at room temperature.
   a. change b. become c. attract

5.5. Find the words in the text that correspond to the following definitions.

1. the ability of a substance to prevent electricity from passing through it (para 1)
2. the overall physical condition of something (para 2)
3. to cause to have an effect, to use (para 2)
4. metal made by melting and mixing two or more metals (para 3)
5. to fail to keep or hold something wanted or valued (para 4)
6. a force that pulls something to something else (para 4)
7. to have or experience problems, difficulties (para 5)

5.6. Translate the following word combinations.

1. liquid nitrogen temperatures
2. sufficiently large current
3. magnetic field application
4. superconductivity theory development
5. useful superconductors quality
6. heavily-doped semiconductors
7. ceramic critical temperatures
8. critical temperature value
9. negatively-charged electron
10. strong electron interaction
11. high current density

5.7. Fill in the blanks with the following words.

possible	**discovery**	**lose**	**how**	**superconductors**	**production**
	unbelievable		**continue**	**extremely**	

In 1987 American physicist Paul Chu informed about sensational 1...: he and his colleagues produced superconductivity at an 2... before temperature 98K in a special ceramic material. At once in all leading laboratories throughout the world 3… of critical temperature 100K and higher (that is, above the boiling temperature of liquid nitrogen) were obtained. Thus, potential technical uses of high temperature superconductivity seemed to be 4… and practical. Scientists have found a ceramic material that works at room temperature. But getting superconductors from the laboratory into 5… will be no easy task. Some of them tend to break when produced, others 6… their superconductivity within minutes or hours. All are 7… difficult to fabricate into wires. Moreover, scientists lack a full understanding of 8… ceramics become superconductors. This fact makes developing new substances largely a random process. It will 9… until theorists give a fuller explanation of how superconductivity is produced in new materials.

5.8. Translate the sentences into English.

1. Достижения в области сверхпроводимости означают революцию в технологии и промышленности.
2. Явление сверхпроводимости было открыто голландским физиком в 1911 году.
3. Приложение сильного магнитного поля к сверхпроводнику возвращает его в нормальное состояние.
4. Представленная модель оказалась полезной для понимания электромагнитных свойств сверхпроводников.
5. Ученые сделали много открытий в области сверхпроводимости.
6. Они обнаружили, что металлокерамическое соединение становится сверхпроводником при температуре значительно выше 23К.
7. Голландский профессор считал, что свойства сверхпроводимости будут ценными и полезными, так как это позволит передавать электрические сигналы без потери энергии в проводах.
8. Разработка была слишком дорогой, чтобы использоваться для базовых исследований в области сверхпроводимости.

5.9. Answer the following questions.

1. What is superconductivity?
2. When is the electrical resistance of superconductors reduced to zero?
3. What did the Dutch physicist discover?
4. Can the superconducting materials return to their normal state? When?
5. Does the superconductivity take place in all the metals?
6. What does the value of critical temperature depend on?
7. Why can superconducting materials carry electric current for long periods of time?
8. What is the practical value of superconductivity?

Text 6

SUPERCONDUCTING DIPOLES

One of the world's first practical applications for high-temperature superconductors is a miniature dipole antenna developed at the University of Birmingham. Michael Mehler of the department of Electronic and electrical engineering has demonstrated in the laboratory an efficient dipole constructed from yttrium barium copper oxide ceramic material and operating at liquid nitrogen temperatures (77K).

Two obvious questions arise: why use superconductors when losses in conventional antennas aren't usually great and what's the practical value of an antenna if it has to be immersed into liquid?

The answers to both these questions have to do with the dipole size. There are many situations in which a full-size HF dipole, for example, would be out of place. Anything larger than a few tens of centimeters long would be difficult to accommodate on a fighter aircraft during its passage through the atmosphere. Scaling down a standard half-wave dipole or loop antenna to around a tenth of its normal size would thus be extremely advantageous.

Obviously it is not possible to get such a miniature antenna to radiate, though the losses under normal circumstances would be extremely large. Not only would the dipole impedance be very low it would have a large reactive component. Matching would be difficult and losses, even in a copper radiating element, would be high.

Attempts to circumvent resistive losses have been made in the past using conventional metallic superconductors operating at about 4K in liquid helium. Such attempts though successful have been unpractical and prohibitively expensive for everyday applications. Mehler fabricated a 550MHz dipole a 20mm long from the new ceramic material. Surrounded be a glass dewar containing liquid nitrogen, the tiny assemble radiates just as well as full-size copper dipole.

As far as practicalities go, the ceramic dipole is connected to its RF source by means of wire wrapping and silver paint, no real problem. Nor is the refrigerant. Liquid nitrogen is cheap and readily available.

Michael Mehler is now refining the hardware and also developing other practical configurations such as loop antenna, etc.

6.1. Find the synonyms and translate them.

1. to understand	a. to improve
2. antenna	b. environment
3. to circumvent	c. to suit
4. to refine	d. little
5. surroundings	e. to overcome
6. to match	f. conditions
7. tiny	g. to diminish
8. to happen	h. aerial
9. circumstances	i. to comprehend
10. to scale down	j. to occur

6.2. Fill in the blanks with the following words.

by means of	**be out of place**	**to accommodate**	**liquid**
copper	**resistive**	**antennas**	

1. This efficient dipole operated at … nitrogen temperatures.
2. Conventional metallic superconductors were used to circumvent … losses.
3. The ceramic dipole is connected to its RF source … wire wrapping.
4. The scientists are now developing different kinds of loop … .
5. A large antenna would be difficult … on a fighter aircraft.
6. In some situations a full-size HF dipole would … .
7. The tiny dipole antenna is able to radiate as well as full-size … dipole.

6.3. Translate the following word groups into Russian.

1. a few tenth of a centimeter	6. matching network
2. fighter aircraft	7. copper radiating element
3. under normal circumstances	8. to be out of place
4. wire wrapping	9. full-size copper dipole
5. loop antenna	10. standard halve-wave dipole

6.4. Choose the appropriate word to fill in the blank with it.

1. A miniature dipole antenna … at the University of Birmingham.
   a. is developing b. is developed c. has developed
2. It is of great importance … the half-wave dipole to about a tenth of its normal size.
   a. to reduce b. to increase c. to produced
3. The dipole … is very low and losses are rather high.
   a. conduction b. voltage c. resistance

4. Scientists used conventional … superconductors operating at 4K in liquid helium to prevent resistive losses.
   a. metal b. ceramic c. liquid

5. Conventional superconductors were very … for everyday applications.
   a. cheap b. useful c. expensive

6. It's not a problem to connect the ceramic dipole to its RF source … wire wrapping and silver paint.
   a. because of b. due to c. by means of

7. Transmitting antenna … electromagnetic oscillations into electromagnetic waves.
   a. is converted b. converts c. converting

6.5. Read the text and find the words to match with their definitions.

Heike Onnes, professor of physics at Leiden University, expected that superconductivity would be valuable because it would allow for the transmission of electrical power without a loss of energy in the wires. Those early hopes were dashed by the observation that there were few materials that became superconducting at temperatures above 4K and that those materials stop superconducting if you try to pass much current through them. This is why for the next five decades most of the research in this field was centered on finding materials that could remain superconducting while carrying appreciable amounts of current. But that was not the only requirement for practical devices. The people working on them also needed to find superconducting materials that weren't too expensive and that could be drawn into thin, reasonably strong wires.

In 1962 researchers developed the first commercial superconducting wire, an alloy of niobium and titanium. At that time, the most promising application appeared to be in the giant magnets physicists used for particle accelerators, as superconducting magnets were able to offer much higher magnetic fields than ones made from ordinary coper wire.

With this and other similar applications in mind, engineers succeeded in building the world's first 10-tesla magnet using superconducting wire. Although a scientific and technical triumph, magnet was a commercial failure. Development costs ran to more than $200000, well above the fixed-price contract $75000.

1. very useful or helpful (para 1)
2. not to continue doing something (para 1)
3. large enough to be noticed or measured (para 1)
4. to some degree but not very or extremely, fairly (para 1)
5. likely to succeed or to be good (para 2)
6. to achieve the correct or desired result (para 3)
7. almost the same as something else (para 3)
8. a lack of success in some effort (para 3)

6.6. Translate the following sentences into English.

1. Антенна — это устройство, которое используется для излучения и приема радиоволн.
2. Передающая антенна преобразует электромагнитное колебание в электромагнитные волны.
3. Электромагнитное излучение, создаваемое антенной, обладает свойствами направленности и поляризации.
4. Только часть энергии источника антенна преобразует в электромагнитные волны, остальная часть расходуется в виде тепловых потерь.
5. Первые антенны были созданы Г.Герцем в 1888 году, когда он проводил эксперименты, чтобы доказать существование электромагнитных волн.
6. Форма, размеры и конструкция созданных антенн очень разнообразны и зависят от рабочей длины волны и назначения антенны.
7. Излучающая часть антенны, как правило, изготавливается с применением проводящих электрический ток материалов.

6.7. Answer the following questions.

1. What is the dipole antenna constructed from?
2. In what situation is a full-size HF dipole out of place?
3. What are the disadvantages of using a miniature antenna?
4. Were the attempts to prevent resistive losses successful?
5. What is the ceramic dipole?
6. What is the application of liquid nitrogen?

Text 7

RISE OF THE NANOWIRE TRANSISTOR

We cherish our smartphones for delivering entertainment and information on the go, but their need for daily charging is a problem. Battery life can't get any shorter than it is today. So when new smartphone models come on the market with microprocessors based on the latest foundry process, the increase in the number of transistors in the chips should be balanced by a reduction in the power that each transistor consumes.

This power reduction per transistor can be accomplished with today's workhorse device: the silicon FinFET. (It's so named because the channel through which current flows is shaped like a vertical fin.) But continuing progress further into the future will require an overhaul of the transistor's architecture. This overhaul will see the FinFET's silicon fin shrink vertically to become a nanometer wire made from semiconductors other than silicon.

The superior semiconducting alternatives include germanium and 111-V materials (so called because they combine group 111 element such as gallium with a group V element such as arsenic). They transport charge faster and allow the production of transistors that can deliver the same amount of current as their silicon counterparts but at a lower voltage, saving power.

The change in geometry from fin to wire saves power in a different way. The gate, whose voltage controls the flow of current through the channel, can surround four sides of a nanowire channel but only three sides of a fin. So in the nanowire configuration, the gate is more effective at pinching off unwanted current that might otherwise leak through the channel, again saving power.

The building blocks of the CMOS circuits of today's processors require two types of transistors: one that transports electrons and another that carries holes, their positive counterparts. The scientists from the University in West Lafayette championed germanium-based nanowire transistors for both types of devices. Meanwhile, a team of researchers from universities in Singapore showcased the promise of an 111-V approach. And Niamh Waldron, principal engineer from the European microelectronics center, reported about the performance advances yielded by the pairing of an electron-transporting 111-V transistor with a hole-transporting germanium transistor.

7.1. Match the words to make an expression and translate them.

1. battery	a. flow
2. to reduce	b. electrons
3. nanometer	c. power
4. current	d. transistor
5. nanowire	e. life
6. to transport	f. wire
7. silicon	g. channel

7.2. Translate the following word groups into Russian.

1. daily charging problem
2. transistor number increase
3. charge transportation speed
4. gate voltage control
5. CMOS circuits building blocks
6. germanium-based nanowire transistor
7. hole-transporting germanium transistor
8. transistor power reduction

7.3. Match the words which have the similar meaning.

1. to deliver	a. to go up
2. information	b. stream
3. to increase	c. consumption
4. to reduce	d. data
5. flow	e. efficiency
6. requirement	f. to provide
7. performance	g. to decrease

7.4. Find the words in the text that correspond to the following definitions.

1. a very small piece of hard material (called silicon) in a computer or other device that contains many electronic circuits
2. change of something completely in order to improve it
3. getting smaller in amount, size or value
4. a quantity of something
5. someone or something that has the same job or purpose as another
6. a device that can be opened and closed to control the flow of electrons
7. to keep something from being lost or wasted
8. progress in the development or improvement of something

7.5. Fill in the blanks with the following words or word groups.

operating **charge carriers** **capability** **new process**
nanowires **highlight** **defects**

The process of making nanowire devices draws heavily on its in-house technology for making 111-V-based FinFETs. Here, the 111-V crystals are grown in V-shaped grooves in silicon, and the majority of the 1… you'd ordinarily get are annihilated when the growing crystals meet the groove walls. To change a fin into a nanowire, one part of the fin composed of indium phosphide is etched away to leave indium gallium arsenide (InGaAs) 2… .

Waldron and her colleagues first reported encouraging initial results for their InGaAs nanowires in 2014. They have now improved them by introducing a 3… for adding an undisclosed material to the gate.

Electrical measurements at an 4… voltage of 0,5 volt – which is about two-thirds of that used in circuits made with Intel's most modern process - 5… the superiority of the new gate. Transconductance which reflects how quickly

6… move in the channel has almost doubled to 2,200 microsiemence per micrometer.

The other key characteristic for assessing the suitability of these transistors is the subthreshold swing. This is related to the switching 7… of the device and is governed by the quality of the interface between the transistor's channel and its gate dielectric.

APPENDIX

How to Give a Successful Presentation?

An essential task at the pre-preparatory stage is to ask yourself the following questions:

- What is the purpose of my presentation?
- What are the main points that I would like to get across?

Start getting ready for your presentation a few weeks before you are due to speak.

Collect the materials on which you would like to base your presentation.

Make a careful selection from the collected materials.

Here are some tips for the learner to start the presentation process:

- Make the first plan of the presentation (you can modify it later).
- Remember to give your presentation a logical structure:

  Introduction - tell the audience what you're going to say

  Main Body - say it, developing the above mentioned issue(s).

  Conclusions - sum up what you've just said
- Make the first draft of your presentation. Read it carefully. If any of the information is not related to the topic, remove it.
- If there are issues which you cannot express in a precise or clear way, it is probably because you do not really understand them yourself. So it is better not to talk about them.
- Never read from your notes. You should know the material you want to present well enough not to need your notes. If you don't, perhaps you're not ready to give your presentation.
- Keep to the time! Do not exceed the time limit. It is better to shorten the presentation by two minutes than to extend it by two minutes.
- Follow the plan of your presentation! Do not digress! Usually digressions take more time than we think. Successful presenters have "spontaneous digressions" well thought over and well planned.
- Leave time for questions from the audience. Questions may help you to get your message across better.

Some final tips concerning your manner of presentation:

- Speak clearly.
- Make pauses in places which you consider critical for your presentation; this emphasizes the importance of the information you wish to convey to the audience.
- Try to control your body language; avoid excessive gesticulation.
- Maintain eye contact with your listeners but do not focus on one person.
- Don't turn your back to the audience if you want to show something on the screen and don't 'talk to the screen' either.
- Don't stand in the light of a projector covering the screen.
- Don't forget to thank the audience for their attention and encourage them to ask questions. If you are not sure about the answer of if you simply do not know it, don't be afraid to admit that, but suggest the source in which the answer can be found.

The sentences and phrases below follow the logical progression of a well-balanced presentation. This is a list of phrases to help you make a professional presentation in English.

Good presenters always use language (sometimes single words, sometimes phrases) which shows where they are in their presentation. These 'signposts' make it easier for the audience to:

- follow the structure of the presentation
- understand the speaker more easily
- get an idea of the length and content of the presentation.

Welcoming	
Good morning (afternoon, evening) everyone. I'd like to welcome you all here. Thank you all very much for coming today.	- Доброе утро / Добрый *день / вечер.* Я хотел(а) бы поприветствовать вас всех здесь. - Спасибо, что пришли (на презентацию).
Introducing yourself	
Let me introduce myself; my name is … and I am	- Позвольте представиться, меня зовут … и я …
Introducing your presentation	
The purpose of my *presentation / talk* today is to …. In my presentation today I'll be *talking about ... / reviewing...*	- Цель моей презентации … - В моей презентации я буду *говорить о / делать обзор* …

I’m going to talk about … Firstly, …, after that I’ll …, and finally I’ll … .	- Я буду говорить о … - Во-первых, я … , далее …, и наконец я … .
Explaining that there will be time for questions at the end	
If *you have any questions / there are any questions* you’d like to ask, please leave them until the end, when I’ll do my best to answer them. Please, feel free to interrupt at any time if you’d like to ask a question. But if you don't mind, I’ll deal with questions at the end of my talk.	- Если у вас появятся вопросы, которые вы хотели бы задать, пожалуйста, задайте их в конце презентации, я буду рад(а) ответить на них. - Вы можете прервать меня в любую минуту, если хотите задать вопрос. Но если не возражаете, я отвечу на вопросы в конце своего выступления.
Starting the presentation	
To *begin / start* with … . Let’s *start / begin* by looking at … . I’d like to begin by . Let’s begin. OK, let’s get started.	- Начнём с того, что … . - Начнём с просмотра … - Я хотел(а) бы начать с … - Давайте начнем. - Хорошо, давайте приступим.
Choosing a section of the presentation	
So, that’s an overview of	- Итак, перейдем к заключению …
Beginning a new section of the presentation	
Now let’s move on ... . Moving on to the next part, I’d like to … .	- А сейчас перейдем к … . - Рассматривая следующий вопрос, мне бы хотелось … .
Referring to visuals	
I’d like you to take a look at this *chart / table / figure* , which shows …	Я хотел(а) бы, чтобы вы взглянули на *эту схему, график, диаграмма, схема, таблица, чертёж / таблицу / этот рисунок,* которая (-ый) показывает …
If you look at this graph, you’ll see ...	Если вы посмотрите на этот график, то увидите…
The figures in this table show ...	Цифры в этой таблице показывают…
As you can see from this pie chart …	Как вы можете видеть на этой секторной диаграмме…
Just have a look at this chart for a moment.	Взгляните на эту диаграмму.

Dealing with difficult questions	
I'll come back to that question later in my presentation. If you don't mind, I'll deal with questions at the end of my talk.	- Если можно, я вернусь к этому вопросу чуть позже. - Если вы не возражаете, я отвечу на вопросы в конце выступления.
Concluding and summarising the presentation	
Well, that brings us to the end of the final section. Now, I'd like to summarise by … . To sum up then, let me …	- Наконец, мы подходим к последней части презентации. Мне бы хотелось подвести итог … . Подводя итог, позвольте мне…
Inviting questions	
That brings the presentation to an end. If *anyone has any questions / there are any questions, I'll be pleased / I'll do my best* to answer them. Now I'm ready to answer your questions. If there are no (more) questions, thank you for your interest.	- Презентация закончена. - Если у кого-либо есть вопросы, я *буду рад / постараюсь* ответить на них. А сейчас я готов(а) ответить на ваши вопросы. Если вопросов (больше) нет, спасибо за проявленный интерес.
Referring to a previous point made	
As I mentioned earlier … .	- Как отмечалось раньше … .
Answering questions	
Sorry, could you say that again, please? If I've understood your question correctly, you would like me to … I'm sorry. I didn't hear you. Would you mind repeating your question?	Извините, не могли бы вы сказать это еще раз? Если я правильно понял(а) ваш вопрос, вы хотели бы, чтобы я…? Извините, я не расслышал(а). Не могли бы повторить ваш вопрос?
Finishing and thanking	
Thank you for your attention. Finally, I'd like *to finish / to end* by thanking you (all) *for your attention / for coming today*.	- Спасибо за внимание. - По окончании презентации я хочу поблагодарить всех *за внимание / за то, что вы пришли на презентацию.*

Использованная литература

Интернет-ресурсы:

http://www.buzzle.com

http://searchtelecom.techtarget.com/definition/telecommunications

http://www.differencebetween.net/technology/difference-between-lan-and-wan/