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DEFINITION OF APPLICATION FIELD OF THE STAND FOR THE VIDEO MONITORING SYSTEMS INVESTIGATION

Abstract. The paper presents the results of determining the areas of application of a laboratory stand designed for studying and researching CCTV systems.

The necessity of research of video cameras of the security alarm system, their testing at the organization of production and expediency of carrying out laboratory works by students of higher education institutions studying security systems is shown. The state of affairs in this area in post-Soviet countries is shown. Some requirements of the State educational standard on informativeness and expansion of opportunities of laboratory stands are given. The input parameters necessary for the design of video camera research stands are considered. The results of the study of the developed laboratory stand for the study and study of security television systems and the definition of areas for its application are presented. The structure of the stand and its parts is proposed. Developed recommendations for its use are given. The experience of conducting laboratory work on the study of the characteristics of security alarm cameras is analyzed. The possibility of studying robust filtering on the noise immunity of the video system, the influence of the illumination spectrum on the main qualitative characteristics of the video camera using the proposed stand is shown. A list of suggested to run the stand includes laboratory work "Studying the parameters, operation modes and configuration of video surveillance system NOVUS", "the Study of possibilities of various types of cameras when changing the light and characterization of the sensitivity of various types of cameras, Definition of focal length, angle of view and resolution of different types of cameras and lenses, Definition of the working area of observation, the far and the dead zone for various types of cameras and lenses", "Determination of conditionally dead zones for different recording speeds of the DVR and at different focal lengths" and "Determination of the volume and quality of recorded information from the value of the recording speed of the DVR", as well as research works "The signal processing with variable spectrum", "the Influence of robust filtering for noise immunity video", "Influence of illumination spectrum on the main qualitative characteristics of the camera" and "Comparative performance of analog and digital cameras."

Keywords: security television systems, robust filtering, lighting devices.

The novelty and originality of the proposed project for the modernization of the laboratory base of the Department of Radio Engineering and Info communication Safety of the Almaty University of Power Engineering and Telecommunications (AUPET) consist in the acquisition by students of the specialty "Radio engineering, electronics and telecommunications" (RET) of modern knowledge, technologies and skills in the field of security television.

The need for modernization of the teaching and laboratory fund of the department "Radio engineering and info communication security" is explained by the fact that this stand gives an opportunity for students to conduct not only study but also research work, which is one of the requirements of the state educational standard for specialties in the field of radio engineering. An analysis of existing alternative projects has shown that there is no similar laboratory equipment in competing universities for the training of specialists in the field of radio engineering and telecommunications. At the same time, modernization of the laboratory of the department "Radio engineering and info communication security" allows attracting an additional contingent of students for the specialty "RET" in AUPET. The weak side of the investment project is the impossibility of forecasting the profitability of financial investments. Creation of a

technically equipped laboratory for the educational process, corresponding to the world requirements and achievements in the field of CCTV systems, provides an increase in the competitiveness of AUPET in the market of providing educational services for training specialists in this field for the Republic of Kazakhstan.

Description of the laboratory stand. The laboratory stand is made in the form of three tables on which the equipment of the CCTV system is located, control and measuring devices, as well as communication channels and power supply system are laid. The general view of the laboratory stand is shown in Figure 1. The laboratory table No. 1 is a rack, on one of the walls of which there are two dome cameras, the lenses of which are aimed at the holder located on the opposite side of the table. The holder is designed to place on it posters in the form of test tables and any other graphic material required to remove the characteristics of the video cameras used. Also along the stand are guides for the cylindrical chamber, which allows you to change the distance from its lens to the holder. The feature of the table number 1 is the presence of darkening curtains (which are not shown in the illustrated drawings of the stand), which allow creating the required level of illumination inside the rack, which is also necessary when removing the characteristics of video cameras.

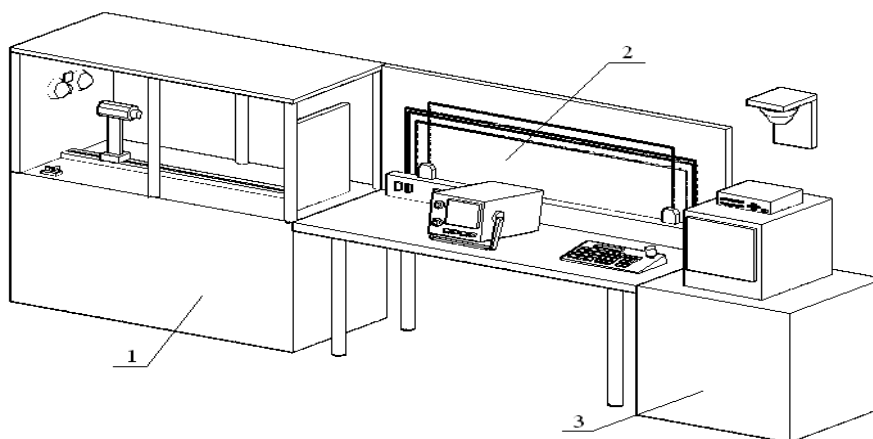


Figure 1 – Appearance of the laboratory stand
Legend: 1 - laboratory table number 1; 2 - laboratory table number 2;
3 - laboratory table number 3

The location of the various parts and equipment of the laboratory table No. 1 is shown in figures 2 and 3.

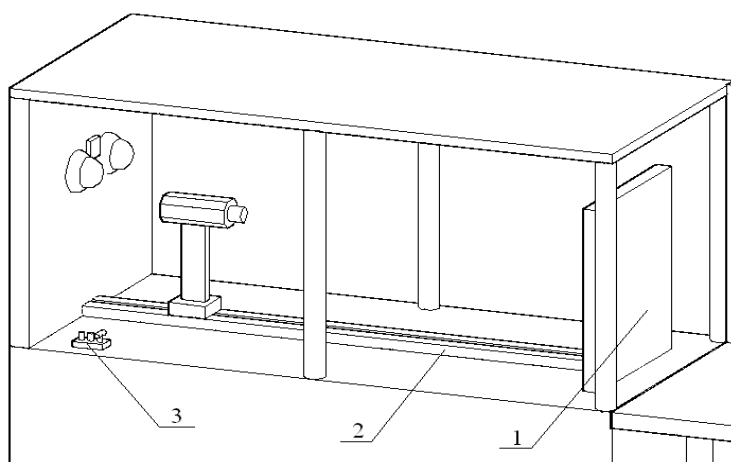


Figure 2 – Fragment of the laboratory stand
Legend: 1 - the holder; 2 - guides of the cylindrical chamber;
3 - connectors for connecting a coaxial cable.

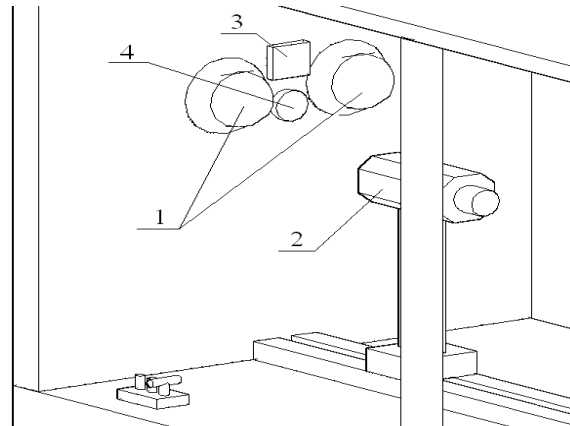


Figure 3 – Fragment of the laboratory stand

Legend: 1 - dome video cameras NVC-SC200D and NVC-HC200D;
 2 - cylindrical video camera NVC-825-DN with varifocal lens NVL-416D / IR; 3 - searchlight of visible spectrum of radiation (made on light-emitting diodes); 4 - IR-6 / 20-880 infrared radiation spectrum.

Also on the laboratory table № 1 is mounted a DC power supply unit with an output voltage of 12V, designed to provide power to video cameras.

The laboratory table №2 has communication cables laid along the back wall:

- 2 coaxial cables RC-75;
- 1 UTP cable 4x2 e5 cat;
- 1 optical single-mode cable.

Connection of video cameras to the video registration device via the optical communication channel is made by means of electro-optical (OVT-1) and opto-electrical (OVR-1) converters. Along the rear wall is also mounted a cable channel 80x100, in which cables of low-current power are laid and switches are mounted. Also on the laboratory table № 2 there is an oscilloscope C1-220 and a keyboard for controlling the rotary device (figure 4).

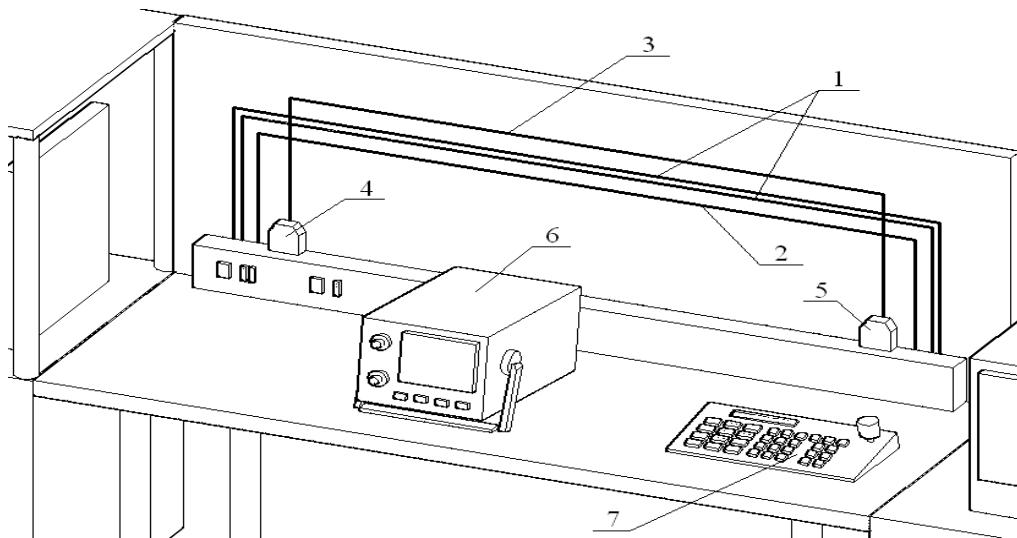


Figure 4 – Fragment of the laboratory stand

Legend: 1 - coaxial cables RC-75; 2 - UTP cable 4x2 e5 cat; 3 - optical single-mode cable; 4 - electro-optical converter OVT-1;
 5 - opto-electric converter OVR-1; 6 - oscilloscope C1-220; 7 - NV-KBD40 rotary device control keyboard

On the laboratory table № 3 is a video surveillance monitor and a digital video recorder. Behind the table, a dome video camera is attached to the wall. There is also a radio receiver configured to receive a video signal from a wireless video camera installed at the other end of the room (figure 5).

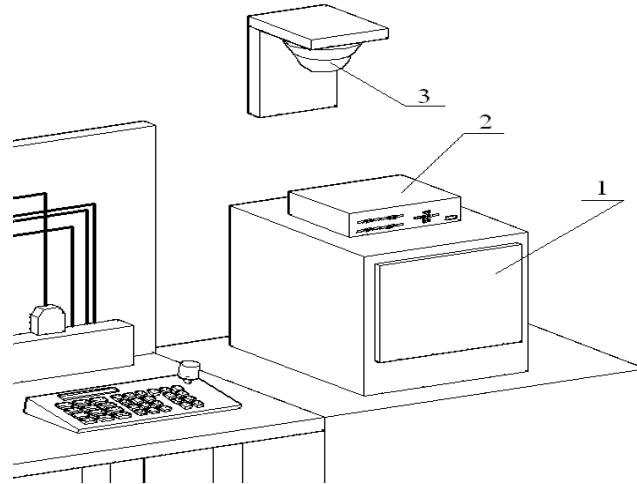


Figure 5 – Fragment of the laboratory stand
 Legend: 1 - video surveillance monitor NVM-015CH; 2 - digital video recorder NV-DVR1014;
 3 - dome rotary video camera CAMA-mini II NVC-MSD22DN

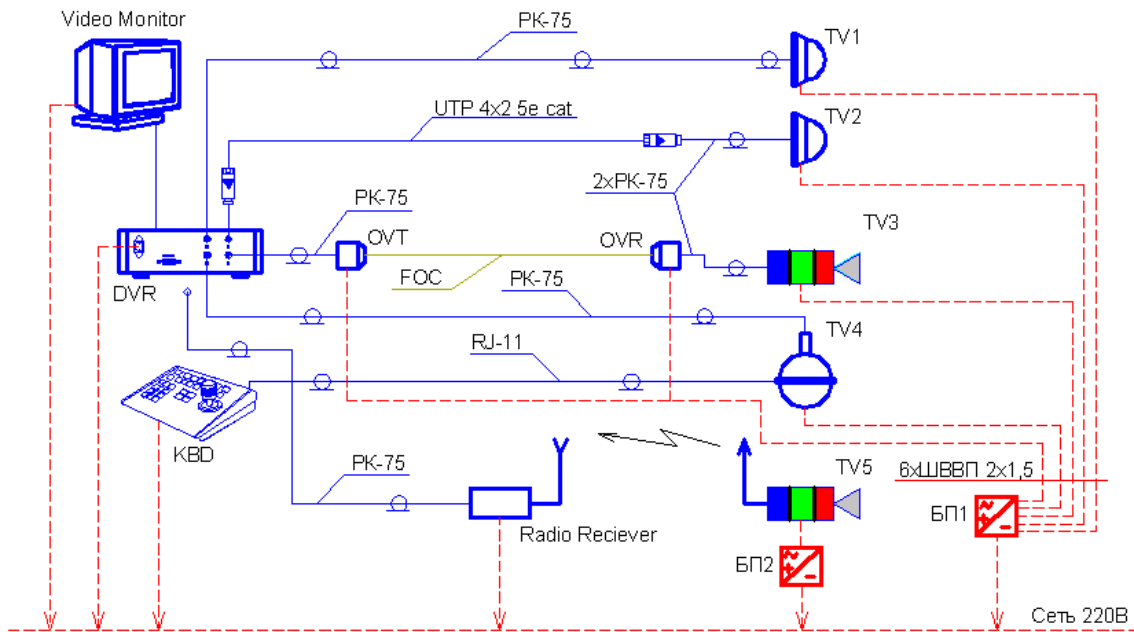
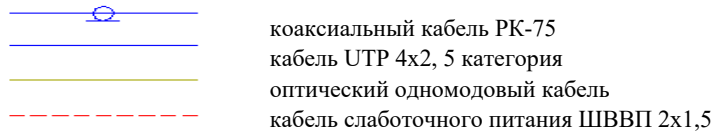


Figure 6 - Structural diagram of the laboratory network CCTV

Cable legends:



Structural diagram of building a laboratory network CCTV. The structural diagram of the laboratory network is shown in figure 6. The above equipment corresponds to the year 2015, later manufactured stands can be equipped with other equipment that is not inferior to the one described above.

Laboratory work № 1. Study of parameters, operation modes and configuration of the video surveillance system "NOVUS".

Laboratory work № 2. Investigation of the possibilities of different types of video cameras with varying illumination. Determination of the sensitivity characteristics of different types of video cameras.

Laboratory work № 3. Determination of focal length, angle of view and resolution of various types of video cameras and lenses.

Laboratory work № 4. Determination of the working area of observation, far and dead zone for different types of video cameras and lenses.

Laboratory work № 5. Definition of conditionally dead zones for different recording speeds of the DVR and for various focal lengths.

Laboratory work № 6. Determine the amount and quality of recorded information from the value of the recording speed of the DVR.

Research work № 1. A device for processing signals with a changing spectrum.

Research work № 2. The influence of robust filtering on the noise immunity of a video system.

Research work № 3. Influence of the illumination spectrum on the main qualitative characteristics of the video camera.

Research work № 4. Comparative characteristics of analog and digital video cameras.

The list of laboratory and research works can be significantly expanded, as the laboratory network of video surveillance has practically no restrictions.

Thus, when conducting educational work, students receive the necessary knowledge, skills and skills in the field of security television systems, and when carrying out research on subjects 1-3, patents for inventions were obtained [3,4,5].

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БЕЙНЕБАҚЫЛАУ ЖҮЙЕЛЕРІН ЗЕРТТЕУ БОЙЫНША СТЕНДТІҢ ҚОЛДАНЫЛУ САЛАЛАРЫН АНЫҚТАУ

Аннотация. Жоғары оқу орындарының студенттеріне, күзет сигнализациясының бейнекамераларын зерттеу, өндірісті ұйымдастыру кезінде оларды тестілеу қажеттілігі, күзет қауіпсіздік жүйелерін зерттеу және зертханалық жұмыстарды жүргізу орындылығы көрсетілген. Кеңес елдеріндегі осы саланың жағдайы көрсетілген. Ақпараттық мазмұнға және зертханалық стендтердің мүмкіндіктерін кеңейтуге арналған мемлекеттік білім беру стандартының кейбір талаптары берілген. Бейнекамераларды зерттеу стендтерін жобалауға қажетті кіріс параметрлері қарастырылған. Әзірленген зертханалық стендті зерттеу нәтижелері, бейнебақылау жүйелерін зерттеу және оны қолдану бағыттарын анықтау нәтижелері берілген. Стендтің құрылымы және оның бөліктері ұсынылады. Оны қолдануға әзірленген ұсыныстар берілген. Күзет дабылы бейнекамераларының сипаттамаларын зерттеу бойынша, зертханалық жұмыстарды жүргізу тәжірибесі талданады. Видеожүйенің шуылға қарсы қорғанысын, жарықтандыру спектрі ұсынылған стендті қолдана отырып, бейнекамераның негізгі сапалық сипаттамаларының әсерін зерттеу мүмкіндігі көрсетілген. Стендті орындау үшін зерттеу жұмыстары мен ұсынылған жұмыстарға келтірілген тізімі “NOVUS бейнебақылау жүйесінің параметрлерін, жұмыс режимдерін және конфигурациясын зерделеу”, “Жарықтандыру өзгерген кезде бейнекамералардың әртүрлі түрлерінің мүмкіндіктерін зерттеу” және “Бейнекамералардың әртүрлі түрлерінің сезімталдық сипаттамаларын анықтау”, “Фокустық қашықтықты, көру бұрышын және бейнекамералар мен линзалардың әртүрлі түрлерінің рұқсат ету қабілетін анықтау”, “Бейнекамералар мен линзалардың әртүрлі типтері үшін бақылаудың жұмыс аймағын, алыс және өлі аймақты анықтау”, “Бейнетіркегіштің әр түрлі жазу жылдамдығы үшін және әр түрлі фокустық қашықтықтар үшін шартты түрде өлі аймақтарды анықтау ” және “Бейнетіркегіштің жазу жылдамдығының мәнінен жазылған ақпараттың көлемі мен сапасын анықтау”, сондай-ақ “Өзгеретін спектрлі сигналдарды өңдеу құрылғысы”, “Бейне жүйенің шуылға қарсы қорғанысының берік сүзгілеудің әсері”, “Жарықтандыру спектрінің бейнекамераларға негізгі сапалық сипаттамаларына әсері” және “Аналогтық және сандық бейнекамералардың салыстырмалы сипаттамалары”.

Түйін сөздер: бейнебақылау жүйесі, берік сүзгілеу, жарықтандыру құрылғылары.

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ОПРЕДЕЛЕНИЕ ОБЛАСТЕЙ ПРИМЕНЕНИЯ СТЕНДА ПО ИССЛЕДОВАНИЮ СИСТЕМ ВИДЕОНАБЛЮДЕНИЯ

Аннотация. Показана необходимость исследований видеокамер охранной сигнализации, их тестирования при организации производства и целесообразность проведения лабораторных работ студентами вузов, изучающих системы охранной безопасности. Показано состояние дел этой области в постсоветских странах. Приведены некоторые требования Государственного образовательного стандарта по информативности и расширению возможностей лабораторных стендов. Рассмотрены входные параметры, необходимые для проектирования стендов исследований видеокамер. Приведены результаты исследования разработанного лабораторного стенда изучения и исследования систем охранного телевидения и определения областей для его применения. Предлагаются структура стенда и его частей. Приводятся разработанные рекомендации по его применению. Анализируется опыт проведения лабораторных работ по исследованию характеристик видеокамер охранной сигнализации. Показана возможность исследования робастной фильтрации на помехозащищенность видеосистемы, влияние спектра подсветки на основные качественные характеристики видеокамеры с применением предлагаемого стенда. Приведенный перечень предлагаемых для выполнения на стенде работ включает лабораторные работы “Изучение параметров, режимов работы и конфигурации системы видеонаблюдения NOVUS”, “Исследование возможностей различных видов видеокамер при изменении освещенности и определение характеристик чувствительности различных видов видеокамер”, “Определение фокусного расстояния, угла обзора и разрешающей способности различных типов видеокамер и объективов”, “Определение рабочей зоны наблюдения, дальней и мертвой зоны для различных типов видеокамер и объективов”, “Определение условно мертвых зон для различных скоростей записи видеорегистратора и при различных фокусных расстояниях” и “Определение объема и качества записанной информации от значения скорости записи видеорегистратора”, а также исследовательские работы “Устройство обработки сигналов с изменяющимся спектром”, “Влияние робастной фильтрации на помехозащищенность видеосистемы”, “Влияние спектра подсветки на основные качественные характеристики видеокамеры” и “Сравнительные характеристик аналоговых и цифровых видеокамер”.

Ключевые слова: системы охранного телевидения, робастная фильтрация, устройства подсветки.

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