

Participation of A. Raspletin in developing and realization of black & white television standards

To 100-year Anniversary of A. Raspletin

by Evgeniy Sukharev

In the field of TV technologies scientists' cohort the special place occupies famous scientist and academician of USSR Academy of science A. Raspletin [1].

The problem of standardization in the field of television equipment had arose since its first steps when TV sets were being designed on the based of rotating disk with holes (Nipkov disk).

18th to 21st of December of 1931 the second All-Union conference on television took place. Until 13th of October, 1930 when the first All-Union conference on television happened there was no any systematical-ly coordinated activity in this direction though the success in television was evident.

On that conference the first television standard was discussed. Parameters were accepted in accordance to international practice: 30 lines (Nipkov disk with 30 holes), 12.5 fps (disk turns), 4×3 aspect ratio, 1260 image elements. It provided interoperability of domestic and foreign transmitting and receiving equipment.

Under leadership of A. Raspletin in December of 1932 in the Central radio laboratory in Leningrad [2] the samples of TV sets compliant to new standard were developed and manufactured. Those were the TV with mirror screw and TV with lens disk [3]. New technical solution enhancing TV parameters A. Raspletin obtained the author invention certificates (№ 35895 from 27.08.32, № 39832 from 14.05.33, № 45629 from 27.12.37).

First electronic television system on 180 lines at 25 fps was created in the beginning of 1935 in Leningrad by the team led by Y. Ryftin [4]. In September 1937 the experimental Leningrad TV Center (OLTC) was put in action. It was designed and built by the team of engineers and technicians consisted of V. Kreitzer, A. Zheleznov, V. Diakonov, L. Pisarevskiy, M. Popov, G. Chashnikov. OLTS worked with 240 lines at 25 fps progressive scan. Simultaneously in the laboratories of All-Union R & D Institute (VNIIT) according to All-Union radio Committee (VRK) the developing of first in our country air (massive) VRK TV set was conducted. VRK was dedicated to receiving OLTC signals. The receiver had being designed under leadership of A. Raspletin and V. Kenigson.

Upon time of setup and testing of OLTC equipment the VKR TV receiver successfully provided monitoring functions.

Creators of the first electronic VRK TV set had solved lots of new and complex tasks for those times related to less learned wideband amplification technology and

pulse technology as well as to amplification and generation circuits in VHF band. Important role in that belongs to A. Raspletin. He had solved number of problems related to obtaining linear deflection the electronic beam of receiving tube and synchronization of TV set's scan modules (author invention certificates (№ 196/73 from 21.01.37, № 55778 from 13.02.37, 196/100 from 02.03.37, № 64334 from 13.10.39, № 60314 from 31.03.40). The results obtained were based on theoretical researches of A. Raspletin which were published in "VNI-TOE proceedings" under "Theory of scan devices in cathode television" caption. For accelerating 6 kV voltage circuit used in VKR TV set A. Raspletin obtained the author certificate 196/6741 from 29.11.40.

In 1937-1938 in Moscow installation and setup of TV center equipment were conducted. It was purchased in USA and designed for transmission of 343 lines at 25 fps interlaced TV images. At the same time in Leningrad the Kozitskiy factory was adopting the mass production of TK-1 TV set being manufactured under American documentation and partly based on American valves, parts and blocks. The TV set was complex and expensive model based on 33 radio valves. Its setup and testing in the mass production conditions demonstrated huge difficulties and need high qualification those years. The TK-1 TV sets manufacturing lasted in 1938-1941.

VRK and TK-1 TV sets were mainly used for collective watch of TV programs. That's why the need of creation the TV set with enlarged screen had appeared.

One of the first work in that field was conducted in the Television Institute where in 1938-1940 under leadership of A. Raspletin by I. Zavgorodnev the first projection TV sets with taken-out 1,0×1,2 m (TE-1) and 2×3 m (TE-2) screens were created based on TK-1 TV set. TV image obtained on the receiving tube screen by means of lens had being projected on the light-thru screen made of mat glass.

VRK and TK-1 TV sets were the only model capable receiving OLTS and MTC programs those years. But they were big and complex. To simplify TV receiver A. Raspletin had published an article "To the question of simplification of electrical part of TV receiver radio circuit" appeared in the IEST magazine (№ 4/1938). But very soon A. Raspletin declined the idea of simplification the circuits of mass TV sets being aware that the special attention should be paid to enhancing technical and operating characteristics of TV sets and lessening their production cost. Yet in 1937 under his leadership it was

ИЗВЕСТИЯ ЭЛЕКТРО ПРОМЫШЛЕННОСТИ СЛАБОГО ТОКА

ТЕЛЕВИЗИОННЫЙ ПРИЕМНИК ТИ-3

А. А. РАСПЛЕТИН

Связи на основе новых аппаратур, созданных в комплексе современного оборудования телевизионной сети, является телевизионный приемник индивидуального типа. Построить модель относительно по сравнению, которое сейчас является развитием этого направления телевизионной техники.

Достаточно указать, что на выставках в Нью-Йорке было представлено 14 американских фирм, разработавших приемники индивидуального типа. Также на Лондонской выставке (Радиомир 1939 г.) демонстрировались местные телевизоры ЭИ фирм В. Гарлана путем совместной работы нескольких фирм разработана и сделана промышленно первый стандартный приемник (модель Э-1) индивидуального пользования, изготов-

Так, в 1937 г. была разработана первая модель индивидуального приемника домашнего типа ТИ-1, который в дальнейшем была проработан и предложена своей новой тип приемника ТИ-2.

В 1939 г. была произведена разработка более совершенного телевизора ТИ-3, который стоит на уровне современного развития телевизионной техники и в настоящее время требует дальнейшей доработки для. Этот приемник имеет объем серийного выпуска первой промышленности в 1940 и 1941 гг.

Телевизионный приемник ТИ-3 предназначен для приема телевизионных программ четкостью 500-641 строк, он допускает опосредованную, а также радиодиффузную передачу в диапазоне волны 10-200 м.

Премированные и получившие грамоты участники 5-й Всесоюзной заочной радиовыставки

ПО ТЕЛЕВИДЕНИЮ

Почетная грамота (вне конкурса) — 1500 руб.

Расплетин А. А. (Ленинград) — индивидуальный домашний телевизор.

Вторая грамота — 1000 руб.

Козырев В. К. и Сидов С. А. (Ленинград) — индивидуальный домашний телевизор.

Из премированных экспонатов 5-й заочной радиовыставки

Телевизор

Инж. А. А. Расплетин

Как известно, телевизионные приемники, предназначенные для домашнего пользования, имеют сложную и в среднем числе ламп и наиболее просты конструктивных приемников достигают до 10-20. Вследствие этого их стоимость весьма высока. В настоящей статье описывается приемник, отличающийся от существующих отсутствием и значительным простотой, экономичностью и компактностью. При разработке данного приемника приняты во

он дурарито — для удобства установки и в частоте. Приемники этой схемы дают возможность сократить число ламп в приемнике с шести до четырех, без уменьшения чувствительности и сущим изменением конструкции.

Поступающий на диоды сигнал через катушку связи L_1 передается на сеточный контур, образующий индуктивностью L_2 и емкостью C_1, C_2 и C_{21} . C_{21} есть суммарная

The fragments of A. Raspletin articles

started development of the first individual desktop TI-1 TV receiver model. Than it was re-designed (TI-2 model) and in 1939 the more featured TI-3 TV set [5] was designed. Alexander Raspletin had tuned up the one of laboratory TV set prototype's circuit and presented it in 1941 at the 5th All-Anion correspondent exhibition, and obtained the First Prize of 1500 rubles.

TI-3 TV receiver became the object of mass production by "Radist" Leningrad-based factory and it obtained 17TN-1 name (which had the meaning of "desktop TV set, first model, and 17 cm screen diameter"). The specialists from NIIT and Kozitskiy factory came to "Radist" and 17TN-1 TV set was manufactured under leadership of E. Mishin.

Today the funds of Polytekhnicheskiiy Museum contain the 17TN-1 TV set produced by "Radist" Leningrad-base factory in 1940. The examination of its electrical scheme conducted by museum's science worker B. Chujko had shown that it is almost identical to the principal scheme described in [5, 7, 8].

For the home television development history the 17TN-1 TV set is interesting since it is the first domestic desktop TV set of vertical design with electronic image scan. Just its early model is the country first TV receiver based on direct amplification scheme. In other words it is the forefather of most massive KVN-49 TV set and one of TV devices fully compliant to home radio industry requirements of the 40s beginning of XX age.



A. Raspletin's laboratory worker A. Klopov prepares 17TN-1 TV sets to formal acceptance on "Radist" factory



17TN-1 TV set designed by A. Raspletin

TN-1 TV set was adopted to reception of Moscow and Leningrad TV centers signals and had being manufactured up to the beginning of Great Patriotic War. During that time about two thousands TV sets of that model were produced and sold in Moscow and Leningrad stores.

A. Raspletin, N. Kurchev and E. Fridberg in the Television institute had developed and made (in experimental facility) the small amount of 17TN-3 TV sets (about 200 units). At the same time in "Radist" factory V. Kenigson, M. Toybin, S. Orlov, N. Luchishin and A. Klopov developed and tested the 23TN-4 TV set prototype based on CRT with 23 cm screen diameter.

The existence of two TV broadcast standards (343 lines in Moscow and 240 lines in Leningrad) decelerated the home television development. TV sets needed to be re-tuned for OLTC and MTC programs reception. Due to that reason yet in 1938 the special commission on developing global Union TV broadcasting standard project was organized. It contained well known TV specialists: A. Breitbart, I. Dzhigit, Y. Kaznacheev, S. Kataev, S. Novakovskiy, A. Raspletin and others. In the end of 1938 the project of the new TV broadcast standard on 441 lines at 25 fps interlaced was developed and approved on 27th of December in 1940 [10]. This standard defined the main parameters of broadcast television [11]. It was planned to make the transition to new standard of existed TV centers finished to the end of 1941.

In March, 11-13, 1941 on "Radist" factory the conference was going on which discussed the results of experimental exploitation of test mass TV sets samples of 17TN-1 and 17TN-3 models. On the conference A. Raspletin spoke with the keynote on 17TN-3 TV set characteristics and results of developing the TVs with big screen. He underlined the need of accelerating works towards transition to the new 441 line standard and finishing that transition in 1941, and to make "Radist" factory designing the equipment produced already compliant to the new standard.

The conference had set up to start mass manufacturing of 17TN-3 TV set as the most simple and cheap type of mass TV and to develop two new TVs of first and second class to 1942. Simultaneously with their designing it should carried out the work on the TVs with big (1.2 square meter) and medium (1 square meter) screens.

The war had broken the developing TV broadcasting in the country. In the war years TV broadcasting had being developing in USA only where it was moved to higher standard of 525 lines at 30 fps.

In 1944 the Interdepartmental commission was created which was ordered to form the main standard parameters. The commission's staff probably completely reflects initiators of 625/50 system. Commission members were A. Breitbart, V. Gorshunov, I. Dzhigit, Y. Kaznacheev, S. Kataev, S. Novakovskiy and A. Raspletin. Instead of the prewar "Television. Main parameters of television broadcasting" OST 40-60 the commission had offered another document – 441/50 standard "Substantiation and the project of news USSR television standard". In 1945 the GOST 78-45 was approved giving the project a status of a law, and in 1946 the Interdepartmental Normal was approved. These governmental solutions had opened the wide road to 625/50 broadcasting realization. They were historical with no doubts [13].

A. Raspletin had answered to new standard need by developing the offers about mass TV set [14] and its design principals [15] which he presented on the science session in NII-108 25 on April 25-28, 1945 and on Popov radio electronics society TV section in May 6-10 1946 devoted to Radio Day.

In keynote the author examined characteristics of the future mass TV receiver making notes on nuances and types of a radio part, selector and scan device, power supply and antenna in terms new television standard project.

НАУЧНО-ИССЛЕДОВАТЕЛЬСКИЙ ИНСТИТУТ № 608
НИИЭП—СССР

**СБОРНИК ДОКЛАДОВ
ПО СЕКЦИИ ТЕЛЕВИДЕНИЯ
НА НАУЧНОЙ СЕССИИ НИИ-108, ПОСВЯЩЕННОЙ
30-ЛЕТИЮ СО ДНЯ ИЗОБРЕТЕНИЯ РАДИО
А. С. ПОПОВЫМ
(25—28 апреля 1945 г.)**

ИНЖЕНЕР А. Д. РАСПЛЕТИН

О НАСОВЕНОМ ТЕЛЕВИЗОННОМ ПРИЕМНИКЕ

Краткое содержание. Автор рассматривает характеристики будущего массового телевизионного приемника, устанавливаемого на объектах и типах радиочастот, телевизионного и радиорелейного устройств, отвечающего основным и дополнительным и простоту самого телевизионного стандарта.

ИЗДАНИЕ ИНФОРМАЦИОННОГО ОТДЕЛА 1945—10
МОСКВА • 1945

Для обеспечения массового выхода телевизионных приемников необходимо наличие стандартных условий. Основания их всех можно назвать следующие:

1. Достаточно высокий уровень техники телевизионного приема, позволяющий осуществлять наиболее действующий приемник, обеспечивающий с технической стороны и экономическую приемлемость конструкции.
2. Наличие качественных материалов, совершенства деталей и узлов, необходимых для изготовления и эксплуатации аппаратуры.
3. Наличие производственной базы, позволяющей и выпуску довольно сложной телевизионной аппаратуры.

Поскольку в нашей стране создавались условия могут быть использованы на практике.

Средством системы техники телевизионного приема стали на уровне 1941 года, когда стандартной промышленностью были разработаны и запущены в серийное производство телевизионные приемники П ТН-3 и П ТН-3. Эти приемники стояли на уровне образцов, изготовленных в США, Англии и Германии, и были технически сложными и удороженными изделиями, изготовленными методом сложной обработки крупносерийного производства.

За время войны техническая оснащенность их себе развила у нас не только. Однако на тот момент вполне целесообразно работы в области радиоселективных средств применительно к радио и выделению звука, часто достигаем в Европе в своем существовании и только выделением.

Это обстоятельство, естественно, повлияло и на дальнейший уровень техники телевизионного приема, так как все достигнутое, достигнутое на войне делами в области радиоселективных и селективных устройств, вошедших в приемники при разработке телевизионной аппаратуры.

Что касается вопроса об обеспечении частотостабильности условий для вытеснения телевизионной аппаратуры, то в этом отношении на время войны создали такие условия, которых, конечно, мы не могли не достичь. За последние годы нашей промышленности вполне массовой вытеснил ряд новых конструкций деталей, вытеснившие, изготовленные и изготовленные излучатели и системы звуковой аппаратуры МСБ. По мере вытеснения изделий большие возможности для быстрого развития телевизионной техники и промышленности в мирный период.

Однако даже наличие всех этих условий еще не является достаточным для разрешения вопроса в крупносерийном выпуске выделенной телевизионной аппаратуры. Для этого еще необходимо создать такие условия, чтобы промышленность, поставив на производство какой-либо аппарат, могла работать и разрабатывать его промышленно изготовитель аппаратуры приемника, не опасаясь, что через некоторое время аппарат уже устарел и должен быть заменен другим, более совершенным, тем же.

Предельный шаг в наш и зарубежный, полагая, что качество телевизионной, даже в наиболее совершенном телевизионном исполнении, все еще недостаточно высоко. Стремление к улучшению качества телевизионной аппаратуры и необходимости совершенствования телевизионного стандарта являются объективной потребностью промышленности и населения

МОСКОВСКОЕ РАДИО—ТЕЛЕВИЗНОЕ РАДИОТЕХНИЧЕСКОЕ
И ЭЛЕКТРОНИКА № А. С. ПОПОВА
ИНСТИТУТ. ТЕЛЕФОН: 6-6-10, 6-6-11, 6-6-12

НАУЧНАЯ СЕССИЯ

**ПОСВЯЩЕННАЯ
ПРОБЛЕМЕ
„ДНЯ РАДИО“**

5. Программа работы сессии.

Пять утренних лекций—10—12 ч.
Пять вечерних лекций—18—20 ч.
Выступления поочередно—8 ч.
Выступления в прерывах 17 и 18 ч.

Повторные лекции в дни сессии:

1. Выступление члена Академии Наук СССР А. В. Брусилова
2. Доклад председателя Совета по Радиофизике и Радиотехнике Академии Наук СССР академика—д. А. Брусилова
3. Доклад члена Академии Инженерно-технических наук СССР—
К. В. Шапорова.
4. Предварительные работы Инженерно-технических наук СССР.

6. Работа секций.

1. Радиоселективные устройства	10. Телевизионные системы (включительно)
2. Приемники	11. Радиоселективные устройства (включительно)
3. Радиоселективные устройства	12. Телевизионные системы
4. Радиоселективные устройства	13. Телевизионные системы
5. Радиоселективные устройства	14. Телевизионные системы
6. Радиоселективные устройства	15. Телевизионные системы
7. Радиоселективные устройства	16. Телевизионные системы
8. Радиоселективные устройства	17. Телевизионные системы
9. Радиоселективные устройства	18. Телевизионные системы

Перечень докладов по специальным заседаниям.

а. Секция телеметрии
Губарева—С. В. Брусилов

б. Секция радиотехники
1. В. С. Брусилов
2. В. С. Брусилов
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ИЗДАНИЕ ИНФОРМАЦИОННОГО ОТДЕЛА 1945—10
МОСКВА • 1945

The fragment of A. Raspletin keynote on the science session in NII-108 and the fragments of keynotes list on Popov radio electronics society TV section

[The 625 standard: worldwide recognition]

On TV section of that session there were keynotes of S. Kataev ("Some details of modern TV equipment development"), A. Zheleznov ("Television transmitting devices"), B. Krusser ("Transmission television tubes") and A. Buchinskiy ("Receiving television tubes") were present.

A. Raspletin keynote [14] was not just ascertaining of that what achieved in prewar years but it examined long term trends of television development in USSR. He first drew the attention to the need of metrological base of TV sets manufacturing and creation of dedicated test & measure equipment.

A. Raspletin thought not just as designer but as manufacturing organizer saying: "It is necessary to create the conditions making the industry having either device produced able working and extending its manufacturing for a long time with no fear that several months later that device will get old and should be replaced with enhanced one".

In his keynote Alexander Raspletin had substantiated the requirement of fixing the main television parameters for relatively long term [15]. Upon developing the standard he recommended to increase the line number from 441 to 625, increase the number of TV channels and widen their bandwidths and so on. A. Raspletin was sure that the new standard will provide high quality image comparable with narrow film projector image. Multiprogram broadcasting also should provide high quality image due to enhancing some elements of equipment.

Raspletin was aware that the new stage had come requiring to step aside from previously dominating idea of simplification mass TVs circuits and the time came to pay attention to enhancing technical and operation parameters of TV set while lessening its manufacturing cost.

Over 60 years had passed since than. But even today his foresight and technical intuition still express. Almost all main key points formulated those years are life proved.

12th of October in 1945 the USSR Ministry Council issues the Directive "About actions on television development". It approves the reconstruction of Moscow TV center and the need of doing that as fast as possible to make the transition to TV broadcasting according to 625/50 standard. It also presumes building new TV centers in Leningrad and Kiev.

In March of 1946 Supreme Soviet of the USSR issues the law "About a plan of revival and development of USSR national economy for period of 1946-1950". The separate line of that plan is dedicated to television. In particular, it points "...to revival and technically re-equip the TV center in Moscow and build new TV centers in Leningrad, Kiev, Sverdlovsk...". So

the activity on transition of national television broadcasting to new and perspective standard was enforced by the Law of USSR.

Directives of Communist Party Central Committee dated 27th of January of 1947 confirm the already issued laws regarding reconstruction and building new TV centers. And finally the USSR Ministry Council on 24th of June in 1947 issues the act ordering the Ministry of communications means industry to organize manufacturing of the studio equipment and consumer TVs compliant with 625/50 standard. It should be noted that national television development had powerful support on the highest governmental level of our state. There was precise supervising over realization of solutions issued as well as work process.

A. Raspletin has supported his own thoughts about the need in mass TV set by creation in his laboratory the team of television specialists (A. Klopov, D. Kheifets etc.) for developing up-to-date circuit solutions of single and triple channel TVs (T-1 and T-2 models). Work results were put in reports used on Kozitskiy factory in Leningrad for introduction. One should note that T-1 and T-2 TVs models were adopted by the industry and became first new generation TVs designed for the 625 line standard. These are "Moskvich T-1" (designed by E. Genishta), "Leningrad T-1" and "Leningrad T-2" (designed by D. Kheifets) [16].

First "Moskvich" and "Leningrad" TVs wasn't mass though in the first years of 625/50 broadcasting system operation there were produced in large number. Really national TV set massively manufactured during about 20 years and used even longer became KVN. It was created in 1949 by V. Kenigson, N. Varshavskiy and I. Nikolaevskiy in VNIIT. First letters of engineers' names had formed the name KVN – the label of famous TV set. KVN was three-channel TV receiver. It used the circuit with 16 valves. It was extremely simple in use and overrode any of whenever and wherever manufactured receivers. TV set was highly reliable also. Up to these days there are pretty operable KVN's never been repaired or maintained.

First after war conference dedicated to 50 years of radio, left the visible track in television developing in the Soviet Union. And first of all it affected the development of common television standard of USSR.

Collected experience of exploitation and manufacturing of transmitting and receiving TV equipment allowed giving critical estimation to main statements of prewar 441 line standard project and let developing the new 625 line standard named as Interdepartmental Normal in 1946 [17].

The 625 line standard developed was approved on 31st of December in 1955 as the state All-Union standard for main parameters of television broadcasting system – GOST 7845-55 [18].

Standard defined the main parameters of television broadcast systems (black & white television) including number of scan lines, number of frames per second, radio channel width, scan method, polarity of transmission, modulation methods, radiation polarization, black level in the signal radiated, and the shift between the frequencies of video and audio transmitters.

Standard preserved the planned back in 1944 number of lines in the frame (625), number of frames 25 per second interlaced at 50 fields per second and aspect ratio 4:3 and maximum video signal bandwidth of 6 MHz [20].



"Moskvich T-1" and "Leningrad T-2" (exhibits of Polytekhnicheskij Museum)

In conjunction with the plan of further developing of national television issuing the state standard in that field became absolutely necessary as for television station network building, their exploitation and realization of intercity and international program exchange as for TV equipment manufacturing.

New USSR television standard was adopted by many. First country that in 1950 following USSR had adopted 625/50 standard was DDR. Here with the technical help of USSR on 4th of June the regular TV transmission in Berlin had started. At the same year Western Germany joined the standard with subtle modifications made. That laid the beginning of introduction the new standard by European countries and than by other world regions. At the end of 1952 the standard was adopted in Netherlands, Sweden, Italy, and Spain.

Triumph procession of the 625 line TV standard is the clear recognition of the success of Soviet science and industry of the end of 1940s and the beginning of 1950s.

In 1972 the GOST mentioned was extended and in 1992 it was sufficiently expanded and modified in accordance to the requirements of CCIR Rec. 472-2, 473-4, 655 and registered in USSR Gosstandard as GOST 7845-92.

So the base of GOCT 7845 is the 625 line TV standard project developed in 1944 in USSR.

In transition to the 625 line standard important role had played the national specialists team which first practically had being realizing the standard and creating new technical means confirming its advantages. That group included Mark Krivocheev who is the apprentice of A. Raspletin [20, 21].

In the great cohort of national television scientist the name of M. Krivocheev stays apart [20, 21, 22, 23]. His contribution to developing of national and worldwide television is widely known. The president of Russian Scientific & Industrial Corporation of radio engineering, electronics and communications by name of A. Popov the academician Y. Gulyaev in the preface to M. Krivosheev's book "International standardization of digital television broadcasting (Moscow, NIIR, 2008) noted: "Along with active participation in developing national TV broadcasting M. Krivocheev for many years works effectively in the field of international standardization. Over half a century he was linked to operation of 11th SG (TV broadcasting of ITU-R (former CCIR) since its creation in 1948 and since 1970s till 2000 he was its constant Chairman. With his direct participation over 150 international recommendations on TV broadcasting and communications were developed and they became common worldwide standards for TV centers, terrestrial and satellite systems. 11th RC was the only widely recognized forum working in the filed of standardization of TV broadcasting end-to-end signal path. In 2000 it joined the new research ITU-R commission (6X RC) in which M. Krivocheev continues his activity as its Honour Chairman and Control committee member".

Professor M. Bykhovskiy who is well know scientist in the field of radio engineering and electronics, describing in details that period of M. Krivosheev's activity has underlined in particular: "Important meaning has M. Krivosheev's activity related to creation of different television systems standards. These standards

present the basement for introduction and development in the world of TV broadcasting [20]".

In 1945 M. Krivocheev was forwarded to NII-108 for pregraduation practice and writing the diploma project. During his conversations with the institute's chief engineer A. Kugushev the last one asked him what he'd like to do. The answer was clear – the modern problems of television and at Raspletin's laboratory if possible. When amazed A. Kugushev asked "Why?" M. Krivocheev answered that yet in 1933 in the Pioneers Palace in his own town of Poltava he with other radio section members had built the television receiver with Nipkov disk and that he is familiar with Raspletin's article on television describing prewar developments of national TVs. Besides, his institute teacher professor S. Kataev who was head of television cathedra in Moscow institute of communications engineers recommended him doing that way.

Such so certain desire of M. Krivocheev had impressed A. Kugushev and he asked A. Raspletin to come his room. Such way their acquaintance took place. It was not a simple acquaintance. That meeting became the beginning of their creative contacts and good relations for many years.

Recalling the years of personal contacts with A. Raspletin Mark Krivocheev noted [24]: "In 1945 in MIIS it was formed a group of the future specialists on television engineering. Head of television cathedra professor S. Kataev sent me to pregraduation practice and diploma preparation to NII-108 in Raspletin's laboratory. He'd included me to the group of TVs developers (A. Klopov, D. Kheifets). I was tasked to calculate and develop the line scan generator with blanking diode (later it became my diploma theme)".

M. Krivocheev treated the task with responsibility and big enthusiasm. Alexander Raspletin chosen him for that complex and responsible block creation and underlined that scan block has to realize oldest dream of new standard creators – make it evident the quality of 625-line image.

This is how M. Krivocheev had described the relations climate in Raspletin's laboratory (laboratory №13!): "Along with veterans in laboratory were several yang specialists. They were charged by enthusiasm and purposefulness of A. Raspletin. All were aimed to work with maximum feedback and up to late evening. A. Raspletin has a good tradition. From time to time he set down to the each worker's table going deep into the theme and looking on models and, which is amazing, he remembered what he paid his attention to previous time. Though he was pretty strict in estimations he always could find good words making everyone aware in his ability to reach the goal.

Alexander Raspletin knew in details the physical processes going in television scan systems and hi could skillfully describing them by mathematical expressions aimed to calculation formulas creation. He checked deeply the new theoretical results due to sufficient increasing of parameters in the 625 line standard and using non-traditional circuits and he made the notes and always helped further advancing.

In 1945...1946 the provisioning of laboratory models being created with necessary raw materials was the complex task. So the developer's head besides creative ideas was occupied by finding their practical realization ways.

[The 625 standard: worldwide recognition]

Once getting seated to my table he as always had looked my writing books with calculation but this time he suddenly paid attention to the self made chassis, transformers, the machine with counter for making the deflection coils for 625 line scan, the tools and other stuff, and asked with the smile: "Where did you obtain the skills of not just theoretical works but also metalwork and electro mechanical ones?" Sure I was confused but he had proceeded with the topic and it became clear the Alexander Raspletin like me lost his father in the childhood and yet since the elementary school started working which gave him the responsibility for the job he does. I told him about one period of me life which became very important for me. It happened in the radio section of Poltava Pioneer Palace. The head of section was not approving any distraction from work and asking the help for any insufficient reason and he had being convincing us strictly to do the work by ourselves and in silence.

In the future Alexander Raspletin getting to my table joked: "So, you're working silently and trying to accomplish everything by yourself?"

In the summer of 1946 the generator included to the T-1 TV set model was assembled and launched by pulses from the synchronizing generator made in neighbor laboratory and under leadership of V. Gorshunov. Such was the 625 line raster first got lit [24]. Following that the signals creating vertical and horizontal lines were formed out for the ability raster's characteristics measuring as well as the number of signals for different images obtaining.

It was amazing sight since in comparison to the image consisted of 343 lines which had being aired those years by the re-built Moscow TV center the 625 lines made it possible increasing the quality of TV image sufficiently.

A. Raspletin was happy with that event and invited to look at the result achieved the staff of the institute including I Dzhigit, Y. Kaznacheev, V. Gorshunov, A. Zhelezov as well as S. Kataev, CEO of Moscow TV cen-

ter F. Bolshakov and chief engineer S. Novakovskiy, and the pioneers of 1931 year mechanical television V. Arkhangel'skiy and A. Slaman, and others.

Alexander Raspletin on those showings noted that American equipment on 343 lines used in MTC and experimental TV center in Leningrad operated in 240 lines both were the trial of a pen and that the 625 line standard will become the real basement for the transition of our country to electronic television and will allow creating huge television broadcasting network for many years. The life had proved his forecast. He was honestly happy when Krivocheev being already the head of studio facility if Moscow TV center on Shabolovka let Raspletin know in the autumn of 1943 that hi is trusted the first launch to air the TV program according to the 625 line standard on 3rd of September.

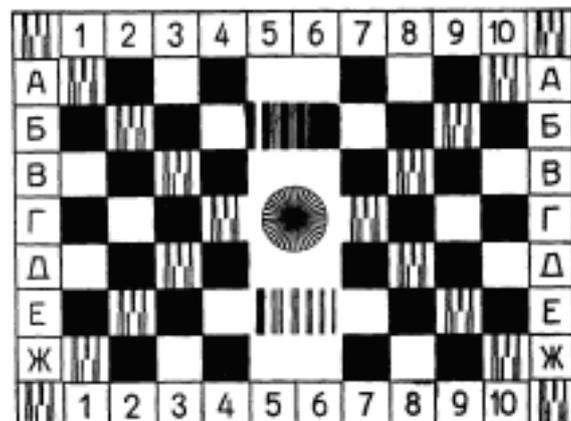
The veteran of national TV broadcasting L. Leites ion his article [23] wrote: "The first temporal equipment on the 625 line standard was developed by the staff of special engineering bureau in Fryazino (next to Moscow) under leadership of A. Fedorov and in cooperation with specialists from Germany. M. Krivocheev actively participated those works and first of all in their metrological provisioning, and in creating new testing charts, waveform monitoring measures using new line selector and other techniques offered by him.

It is no hard to imagine the efforts and intensions the head of studio facility spent keeping the pace of such reconstruction rhythm to provide accelerated



M. Krivocheev with the technician R. Ermakova provide control the last TV transmission of Moscow TV center in the 343 line standard. 17th of September in 1948

Extractions from additions №20 and №21 from "International standardization of digital television broadcasting" by M. Krivocheev



First test chart for TV paths testing according to the 625 line standard



A. Raspletin in 1963

process of engineering the first equipment for the 625 line standard and the installation of new equipment using at the same time old equipment in previous standard. Additionally M. Krivocheev should be constantly move between Fryazino and MTC (took early train to get to the engineering bureau and came back prior to translation preparation).

To check the TV paths on the new standard M. Krivocheev along with German specialist H. Chaw had developed the TV chart shown above.

The scan generator created by M. Krivocheev under leadership of A. Raspletin was used in "Leningrad T-2" TV set [18].

Exactly in that period A. Raspletin inculcated to M. Krivosheev the skills of complex approach in defining and estimating the tasks television faces. That complex approach he preserved for his and used it as the base of creative lifetime.

Back in 1946 giving high estimation to M. Krivosheev's diploma proceeding A. Raspletin recommended him for entering postgraduate course. M. Krivocheev could accomplish that recommendation in 1959 when he defended a thesis of "Engineering and research of the methods of measuring some parameters of television paths".

In July of 1946 the Bureau of new equipment (BNT) was created submitted with the science library [26] within the Soviet of radio location founded on 8th of September in 1943. Raspletin supported BNT not only verbally. He spoke with lectures and keynotes on most actual technical questions. Author of [26] proceeding V. Garnov had the luck to listen the lecture presented by Alexander Raspletin and the lector totally owned the attention of audience and he had given short and exact description leaving without answer no single unclear question.

By the initiative of A. Raspletin the constantly working showcase of newest radio measuring equipment was created in BNT. A. Raspletin attracted young M. Krivocheev to organizing and operating that showcase.

M. Krivocheev reminded A. Raspletin his own young years, work in Leningrad on the Comintern factory and the meetings and conversations with future academician A. Mints about television development trends. Alexander Raspletin liked Krivosheev's inquisitive mind, his assiduity and high erudition, and skillful of hands. He literally absorbed everything Alexander Raspletin told having so much to tell, share his thoughts about television development in the country.

And Alexander Raspletin had found the time for conversations with M, Krivocheev not only upon writing the diploma project but later on when Krivosheev was forwarded to Moscow TV center and appointed soon as the studio facility head and than as the head TV, VHF FM radio relay lines Department in Main radio Department of USSR Ministry of communications. On those meetings they discussed the problems of television development, creating television measuring equipment, the versions of frequency band plans for TV channels and other questions. It should be said that , the versions of frequency band plans for allocated in 1951 three TV channels in VHF band were actively discussed by M. Krivocheev with both A. Raspletin and B. Vvedenskiy who was the head of NII-108 laboratory №2 on radio waves research.

That plan had provided the ability of starting TV broadcasting in many cities as well as was used in preparation of first European convention in 1952 in Stockholm which made frequency band allocation to many USSR TV station in VHF band.

Alexander Raspletin despite of his huge working load in the field of radio location still expressed hot interest in television development in country. He was as attentive as always listening to M. Krivosheev's words about massive work done in the country and related to TV network creating. He was happy and proud with what that the equipment of TV centers, transmission stations and all TV sets were manufactured totally by our radio engineering industry and entirely on the base of domestic components and parts.

In 1957 M. Krivocheev had prepared the first projects of USSR Soviet of Ministry Directive about construction of the new Moscow TV center with the 500 m high tower for antennas as well as the project of technical task for design institute (GSPI) of Ministry of communications on designing that facility. That Directive was issued in 1st of March in 1958.

1950s had entered the history of TV because in that period was the one of most active increase of broadcast TV network in our country. Quantity of TV centers and powerful re-transmitting stations had arose up to 100. Radio relay lines and cable lines first appeared and were used for TV programs distribution. No other country featured so fast pace of TV network creation. M. Krivocheev made the sufficient contribution to those achievements [21].

It is interesting that in 1991 the patriarch of Soviet television and one of the 625 line standard authors professor S. Novakovskiy, became familiar with with M. Krivosheev's materials to the article [24] related to the beginning of TV broadcasting in the 625 line standard wrote: "M. Krivocheev from the very beginning of this standard introduction had been actively

[The 625 standard: worldwide recognition]

working in NII-108 on the Moscow TV center. Materials that are given present huge interest for TV broadcasting history. Working as a chief engineer in Moscow TV center I always valued high his activity in studio facility and his creative approach to the task accomplishing. I recommend these materials for publication. S. Novakovskiy".

A bit later S. Novakovskiy in proceeding [27] wrote: "One has to say that exactly M. Krivocheev as the studio facility head first launched to air the studio operating in 625/50 standard. It was actually the debut of young specialist who had become later the leading Soviet scientist in the field of television and made especially much in TV measuring field. He is known to worldwide TV specialists' society as the CCIR 11 SG (Television) Chairman.

M. Krivocheev underlined many times that he in his works kept strictly A. Raspletin's advises and recommendations mentioned above. They actually became foreseen and prophetic. Mark Krivocheev had noted one more fact played fundamental role in the development of receiving TV network in our country. In autumn of 1949 after launch the entire studio facility of MTC in 625 line standard (based on Shabolovka) many leading scientists and specialists had come to get familiar with the new TV center. Alexander Raspletin greeted the participants of that unique work had noted that he understand and highly valued their labor since he had participated the developing of first national laboratory system of electronic television within the group headed by Y. Ryfting in Leningrad R & D television institute [4]. Then he drew attention to the need of creation the science center related to receiving TV network. That idea was immediately supported by G. Kazanasky been present here who was the head of Main Administration of the Ministry of Communications.

A. Raspletin had lead M. Krivocheev to G. Kazanskiy and introduced as his follower who took part in the first TV sets on 625 lines engineering as well as in lots of discussions about strategy of receiving TV network development and had recommended to get him involved in issued proposal discussing.

G. Kazanskiy had conducted the meeting soon participated by representatives of All-Union NII-380 (R & D television institute) on which was issued the decision of creating in Moscow an appropriate affiliate of NII-380. The result was the Government Decision from 4th of March, 1950 about creating the NII-380 affiliate (MTFL) on the base of which the Moscow R & D television institute (MNITI) was created years later [28]. First head of MTFL was Boris Preobrazhenskiy.

MTFL was maturing thanks to USSR Ministry of communications as well. Upon technical tasks of television department the works were budgeted aimed to research of reception quality in the Moscow TV center coverage zone and examination of interferences from TV sets and means of their suppression etc. Yet in 1952 MTLF had developed and manufactured the set of projection television equipment with screen size of 12 sq. m for Hermitage movie theater and in 1953 the "Vanguard" TV set was created.

On 3rd of January in 1953 USSR Soviet of Ministry made institute the head organization on research and adoption in manufacturing the newest technical achievements in the field of receiving television equip-

ment. Unified UNT TV sets were designed and their mass production begun on more than 20 factories. In 1969 the manufacturing of unified color TVs designed by MNITI along with "Rubin" and "Electron" design bureaus. The beginning of 1980s enters the history when annually in the country over 10 millions of TVs were produced thanks to which television entered to the majority of families. MNITI today is the powerful base of national TV sets manufacturing and the leader of digital TV broadcasting introduction (N. Vilkova is president of MNITI). MNITI's vice-president on science K. Bystrushkin is the chief designer of TVs. All this confirms once more the importance and foresight of Alexander Raspletin.

Very successful was cooperation of Alexander Raspletin and Mark Krivocheev in Bureau of new equipment within Soviet on radio location. Here Krevosheev first time sensed the need of creation measuring equipment. It was especially clear at the end of 1947 when he as the head of MTC's studio facility was set responsible for TV measuring and operation control methods developing.

He discussed in details with A. Raspletin the ways of accomplishing that important technical tasks and shared with him the results achieved. Well known scientist and inventor in the field of electronic TV G. Braude wrote [4]: "After the end of Great Patriotic war besides iconoscopes the new and more advanced domestic television transmitting tubes begun delivered to TV centers... M. Krivocheev developed the technique of measuring quality values of transmitting tubes".

In 1959 M. Krivocheev entered new stage of his activity. For enforcing the science base of TV broadcasting development and by the order of USSR Ministry of communications N. Psurtsev he was moved to the NIIR on the position of television department and TV measuring laboratory head. By the initiative and with his direct participation new laboratories were created and TV themes range was sufficiently widened and deepened. Whole further destiny of M. Krivocheev is linked to active science work in NIIR as well as to international activity [21].

Especially importance in the science and technical activity of M. Krivocheev after 1970 had the works related to creation of worldwide standards for digital TV broadcasting. That stage of M. Krivosheev's activity described in details in M. Bykhovskiy proceedings [20, 22].

M. Krivocheev contributed lots of efforts and labor following Alexander Raspletin's words about the need of television metrology developing. He personally and in cooperation with his followers had fulfilled numeric science researches in that field, and obtained over 90 author certificates for invention as well as national and foreign patents. Based on them the thousands of devices and systems were produced which are still in use in TV network. In M. Krivosheev's book "Television measurements basics" (1967, 1976, 1989) the measures in almost all parts of TV path are considered. That book became the source of knowledge for many generations of specialists and it is re-published in USA, France, Spain, Hungary, Poland, Romania and other countries. Yet for many years M. Krivocheev is recognized as a founder and a head of TV measurements school in our country.

M. Krivocheev includes in the group of scientists and specialists directly related to the beginning of practical use of the space research achievements for TV broadcasting. He faced the equipment of TV broadcasting in that field upon developing the means for TV translations of first astronaut Yuri Gagarin and meeting him in Moscow on 14th of April, 1961 which was translated for the first time by all European stations of Intervisio and Eurovision networks [21].

In 1962 he was tasked by science leading of developing and creating the TV systems for first "Molniya-1" satellite communication system. With its help in April of 1965 there was first accomplished the transmission between Moscow and Vladivostok and other points. Krivocheev managed also the creation of unique "Olimpiada-80" test & measure set [21].

Head of EBU Department of new technologies D. Wood said words became popular: "During last 50 years the television had changed the society and the 11 Study Group professor Krivocheev had changed the television" (ITU-R, Doc. 11/128, 23 June, 1997).

So A. Raspletin and M. Krivocheev had met in braking for television years in the middle of last century when A. Raspletin was already recognized scientist and author of big number of articles and inventions on television and M. Krivocheev had been doing his first successful steps in television. Their acquaintance and first mutual works, and discussion of television's development ways pretty soon transformed to firm creative friendship. Wisdom, knowledge and experience of A. Raspletin had found the beneficial land in young student and engineer M. Krivosheev. Mark Krivocheev for all his life preserved most warm and honest feelings to this great man.

In conversations about A. Raspletin M. Krivoshev always underlines his deepest respect to him for his pioneer and fundamental contribution in foundation of electronic television in our country and his edgeless gratitude for that what Raspletin not only open him the road to practical activity on the start of television development but for that what Raspletin was his wisdom teacher.

"I'm happy that met A. Raspletin, – recalls M. Krivocheev – and after defending the thesis of my diploma I always got not only value advices but powerful charge for further work because Alexander Raspletin extremely hot and emotionally experienced the foundation and fast development of national TV broadcasting in 1950s".

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