UHF–LOAD

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In this paper the brief description of the HF-load construction in which the HF-power dissipates only in the walls from stainless steel, and the preliminary results of tests on the P_{imp} to 12 MW and P_{mean} to 8 kW are presented. The working frequency of the load is 2800 MHz.

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I. INTRODUCTION

In this paper for the first time the preliminary results of the UHF load development on the frequency 2800 MHz for dissipation of the mean and pulsed power up to 10 kW and 10 MW are presented.

II. DESCRIPTION OF THE LOAD

The load represents a two-camera coaxial line resonator being existed from the rectangular wave guide (90x45 mm) and it does not contain dielectric absorber materials — HF power dissipation takes place only in the skin-layer of load walls from stainless steel. In fig.1 shown is the principle schematic of the load interior that is the resonator (external tubes serving for organization of the cooling water stream in fig 1 are not shown).

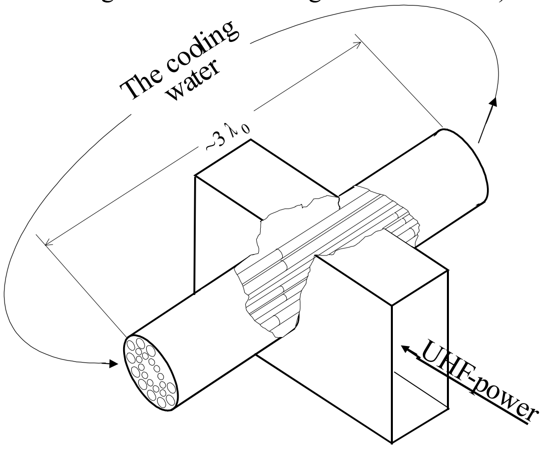

Fig. 1. The principal schematic of UHF load

The outer conductor of the coaxial line is two tubes from stainless steel with a diameter [Ø] 76 mm, which go in the rectangular wave-guide perpendicularly to its broad walls and finish on the inner surfaces of this walls (this means what inside the wave guide the tubes of Ø76 mm are absent). The inner conductor represents two concentric layers of tubes of Ø10 and Ø6 mm,* the axes of this t10 and t6 are placed on the circumferences Ø52 mm and Ø 32mm. On the Ø52 mm regularly with the period 30^0 10 t10 are placed and two periods rest without two t10 (fig. 1).

On the circumference Ø 32 mm 12 t6 are regularly placed; wall tube thicknesses of t76 equal 4 mm, of t10 and t6 equal 1 mm. Through t10 and t6 and on the outside surfaces of t76 the cooling water stream goes. The inner conductor (10 t10 + 12 t6) and external (2 t76) in the assembly with the rectangular wave guide and with edge partitions (two shortening plates with 22 openings into which 10 t10 and 12 t6 are inserted) represents a coaxial resonator, having a length

$$L \approx \frac{n \cdot \lambda_0}{2}, \quad (1)$$

where n = 1, 2, 3… and λ_0 is the length of the wave in a free space. In our case the resonator length is limited by the working zone dimensions of a vacuum furnace, where t10 and t6 with edge partitions and t76 with a rectangular wave guide are soldered together with hard alloys.

Matching the resonator with the input rectangular waveguide is achieved before soldering by selection of places of the shortening plates on the edges of left and right tubes (inside t76) and a place of the shortening plate in the rectangular waveguide (opposite to the input waveguide) and by selection of the rotation angle of the extended interval between the tubes t10 relative to the axis of the rectangular wave guide.

III. PARAMETERS OF THE FIRST EXPERIMENTAL MODEL LOAD

The frequency characteristic of the model load after soldering its parts in the assembly in the vacuum furnace is shown in fig. 2 (curve 1).

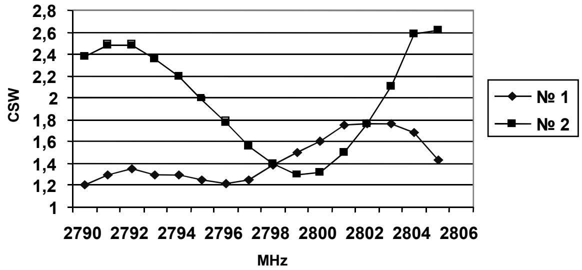

Fig. 2. The frequency characteristic of the UHF load

However, by this soldering not all seams become hermetical: from 44 seams on the solder tubes t10 and t6 with shortening partition 2 t10 and 2 t6 have vacuum leaks and, consequently, in these places insufficiently good contacts for working at high HF-power can taken place. Therefore the attempts of removing these defects at first by means of repeat soldering of defected seams by hard alloys, but in this case soldering was made using a burner in atmosphere, after that tin-lead alloys were used. In results after these difficult manipulations

* Further, to be brief, in the text the words "tubes Ø76 mm, Ø10 mm and Ø6 mm" will be marked as t76, t10, t6. All tubes are made from stainless steel.

and before the start testing on the high HF-power, the band characteristic had a form shown in fig. 2 (curve 2). At these manipulations some mistakes are admitted, for example, in the soldering operation in the atmosphere using hard alloys the local overheat took place, which gave a noticeable distortion of corresponding tubes; by soldering using tin-lead alloy in the vacuum space of the load some amount of acid etc get. The most probably the difference between curves 1 and 2 in fig. 2 is caused by bending observed on tree tubes t6.

IV. TESTING ON HIGH HF-POWER

In spite of discovered defects, after removing vacuum leaks we decide that testing on high HF-power is possible and advisable in order to clear the main question what is if only a minimum electrical strong of a similar load? After HF-training in the course of about 18 hours we reached a level of stable work at P_{imp}=8 MW, τ = 3.5 μsec, N = 300 Hz. In this regime in the course of 4.5 hours we not observed breakdowns. Moreover, during short- time (20 minutes) and without breakdown regime P_{imp}=12.7 MW, τ=2.5 μsec, N=50 Hz was achieved and with a little number of breakdowns in this regime we worked 2.5 hours.

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СВЧ-НАГРУЗКА

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Кратко описана конструкция СВЧ-нагрузки, в которой поглощение СВЧ-мощности осуществляется только в стенках из нержавеющей стали. Приведены предварительные результаты испытаний на импульсной мощности P_{imp} до 12 МВт и средней - до 8 кВт. Рабочая частота нагрузки 2800 МГц.

СВЧ-НАВАНТАЖЕННЯ

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Коротко описана конструкція СВЧ-навантаження, у якому поглинання СВЧ-потужності здійснюється тільки в стінках із нержавіючої сталі. Наведено попередні результати іспитів на імпульсній потужності P_{imp} до 12 МВт і середній - до 8 кВт. Робоча частота навантаження 2800 МГц.