

MAGNETRON TRANSMITTERS FOR HIGH-RESOLUTION RADARS

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95 GHz, 2 kW radar transmitters with the output pulse duration of 10 ns and the pulse repetition frequency of 40 kHz are presented. The transmitters are based on the spatial-harmonic magnetron with cold secondary-emission cathode. Transmitter design solutions and characteristics are described.

In this presentation, we describe recently developed transmitters which can be effectively used in high-resolution radar systems. The transmitters are based on the spatial-harmonic magnetron with cold secondary-emission cathode [1, 2]. In comparison with classical magnetrons, such magnetrons feature a high both peak and averaged power along with small weight and long lifetime advantages. Besides, spatial-harmonic magnetrons can operate effectively at the frequencies as high as 95 and 140 GHz. Until recently, such magnetrons have been used for the development of high power radar transmitters with the pulse duration in the range from 50 to 400 ns, and with the pulse repetition frequency (PRF) of up to 10 kHz [3–5]. Our latest studies have shown that these magnetrons can be operated with the pulse duration as low as 10 ns and with the PRF up to 40 kHz, provided that a specially designed magnetron modulator is used. These studies have resulted in the development of a 95 GHz radar transmitter with the peak power of 2 kW and with the above noted pulse characteristics. A high quality of the output RF pulses in terms of the jitter and the pulse-to-pulse stability is also an attractive feature of the transmitter. The pulse jitter is typically 1 ns and the pulse-to-pulse frequency stability is about 10^{-7} .

The transmitters are produced as single units with an air cooling system incorporated in them. The availability of a comprehensive control and diagnostic system is an important feature of these transmitters. All principal parameters of the transmitter units are controlled in real time, and the values of these parameters are stored in log-files what simplifies essentially transmitter troubleshooting. Simultaneously, the transmitter controller provide a safe transmitter operation by automatically controlling its parameters and switching off the transmitter in the case of dangerous situations.

The transmitters have network capabilities allowing remote control and data receiving through a network. Both local and remote control of the transmitters is possible. The RS 232 interface is used for the transmitter connection with a host computer.

To conclude, the results of this presentation show that spatial-harmonic magnetrons with cold secondary-emission cathode can be effectively used for the development of transmitters for high-resolution radar systems. 95 GHz, 2 kW transmitters with the output pulse duration of 10 ns and with the PRF of 40 kHz have been developed and tested.

References

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**МАГНЕТРОННЫЕ ПЕРЕДАТЧИКИ ДЛЯ
РАДАРОВ С ВЫСОКОЙ
РАЗРЕШАЮЩЕЙ СПОСОБНОСТЬЮ**

*А.А. Беликов, Р.В. Кожун, Б.В. Труш, Д.М. Ваврив,
В.А. Волков*

Представлены радарные передатчики (95 ГГц, 2 кВт) с выходным импульсом длительностью 10 нс и частотой повторения 40 кГц. Передатчики основаны на пространственно-гармоническом магнетроне с холодным вторично-эмиссионным катодом. Описаны конструкторские решения и характеристики передатчика.

**МАГНЕТРОННІ ПЕРЕДАВАЧІ ДЛЯ
РАДАРІВ З ВИСОКОЮ РОЗДІЛЬНОЮ
ЗДАТНІСТЮ**

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Наведено радарні передавачі (95 ГГц, 2 кВт) з вихідним імпульсом довжиною 10 нс та частотою повторення 40 кГц. Передавачі засновані на просторово-гармонічному магнетроні з холодним вторинно-емісійним катодом. Описано конструкторські вирішення та характеристики передавача.