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Problems of development a cold-cathode magnetron in pulse mode for application in an accelerator

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High efficiency and low construction costs of magnetron have a significant benefit for an accelerator RF feeding. Main disadvantage of magnetron is poor frequency stability. The disadvantage may overcome due to injection phase lock. This solution is ready for the pulsed mode operation of accelerator. Next step of a magnetron advantage development is application a secondary emission cold cathode. It allows next decrease construction costs and much increase lifetime. The last one allows decrease operation costs. Important problem is ignition of self-supported secondary emission from a cold cathode of a magnetron. Ignition of magnetron occurs on slop of the high voltage pulse applied to the cathode. After initiation the electron emission continues at the top of the following part of the pulse. Such an igniting method can contribute to the deterioration of frequency stability due to subsequent voltage fluctuations on the subsequent flat part of the pulse. Another way for good frequency stability is application magnetron type amplifier. That is an amplitron. Generally the amplitron have secondary emission cold cathode. The ampliton are ignited by input RF power. Main disadvantage of the amplitron is low gain. The gain is 13-20 db at high power. In compare injection phase lock scheme need input power to magnetron on 30 db and more low than magnetron power. That is means “amplification” more 30 db. Another amlitron disadvantage is more complicated design in compared with magnetron. Magnetron may be ignited by input RF power too. However, the optimal start frequency does not coincide with the generation frequency. So fast magnetron frequency tuning is need for development. Another approach is application stabilitron scheme of amlitron with ignition by slop of the high voltage pulse. It may allow achieving good frequency stability without seed RF power. Application of a coaxial magnetron is possible for similar goal.

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