



RF power generating System for the linear Ion Accelerator

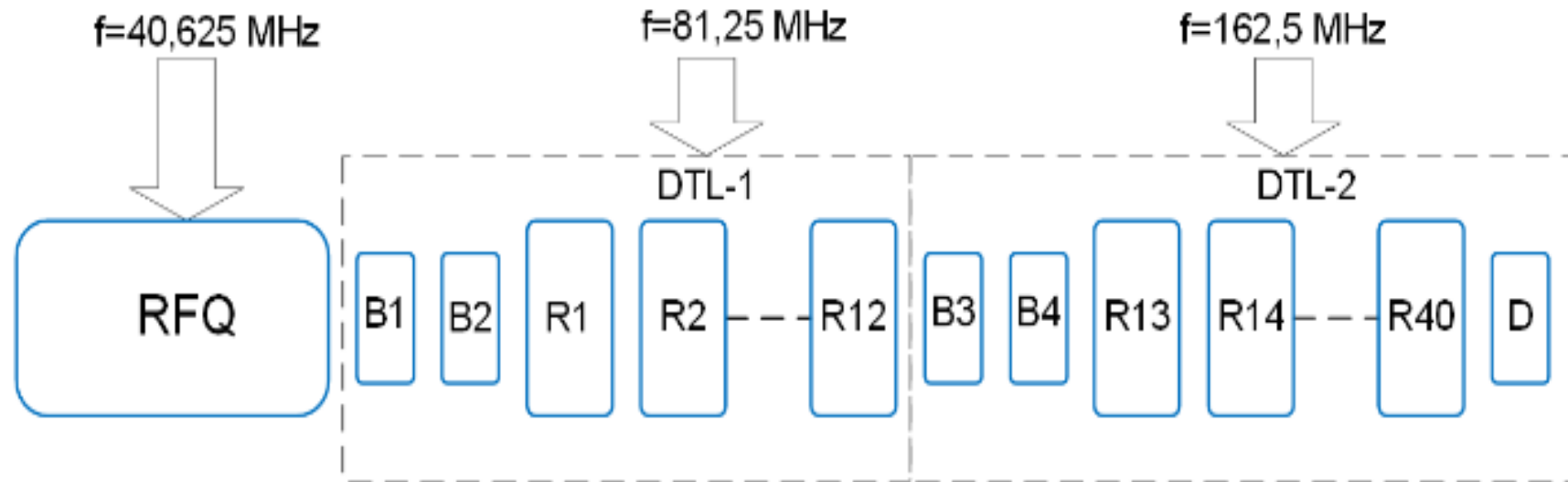
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Abstract

An RF power generating system based on solid-state amplifiers has been developed for the linear accelerator of heavy ions. The report contains information on the characteristics and composition of the system, presents LLRF structure for RFQ and DTL section.



The scheme of the accelerating channel



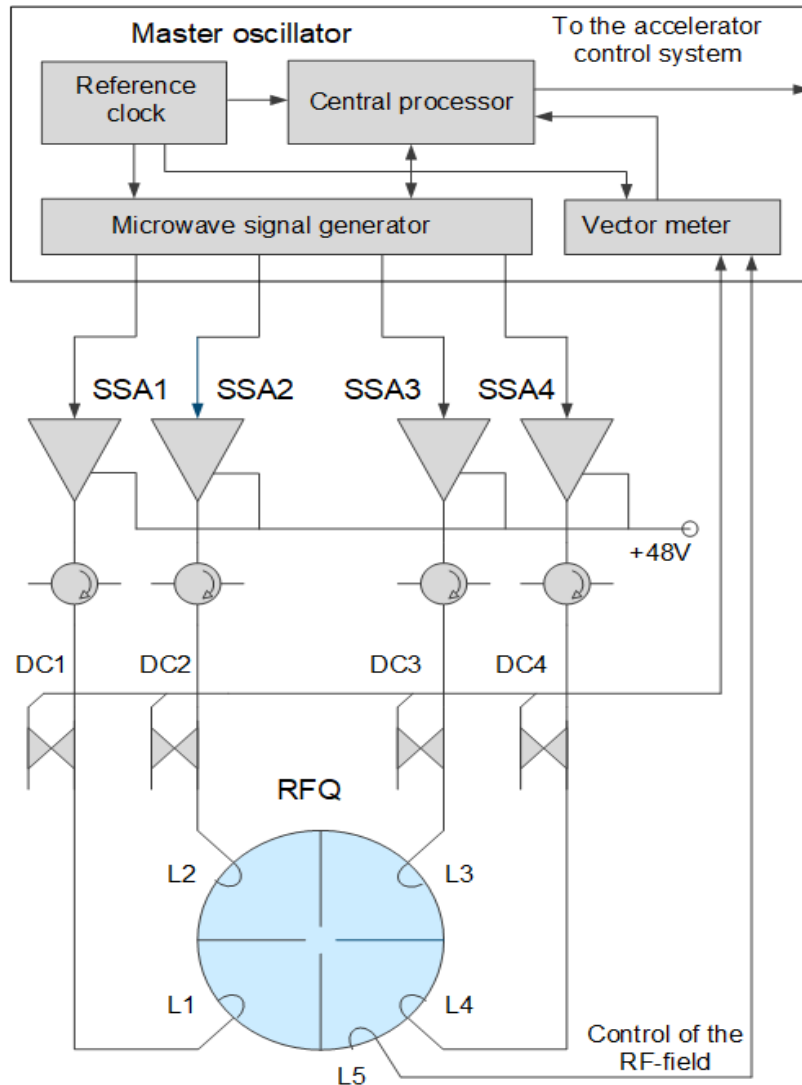
Ion acceleration occurs in a chain of linear accelerating sections consisting of an RFQ and two DTL structures- DTL1 and DTL2.

The beam matching between sections is carried out by the beam transport channels: low-energy LEBT between the source and RFQ, two medium-energy channels MEBT1 and MEBT2 between the accelerating structures.

After acceleration, the beam is directed to the charge exchange target by the high-energy beam transport channel HEBT.



The RF power generating system of RFQ



RFQ excitation circuit

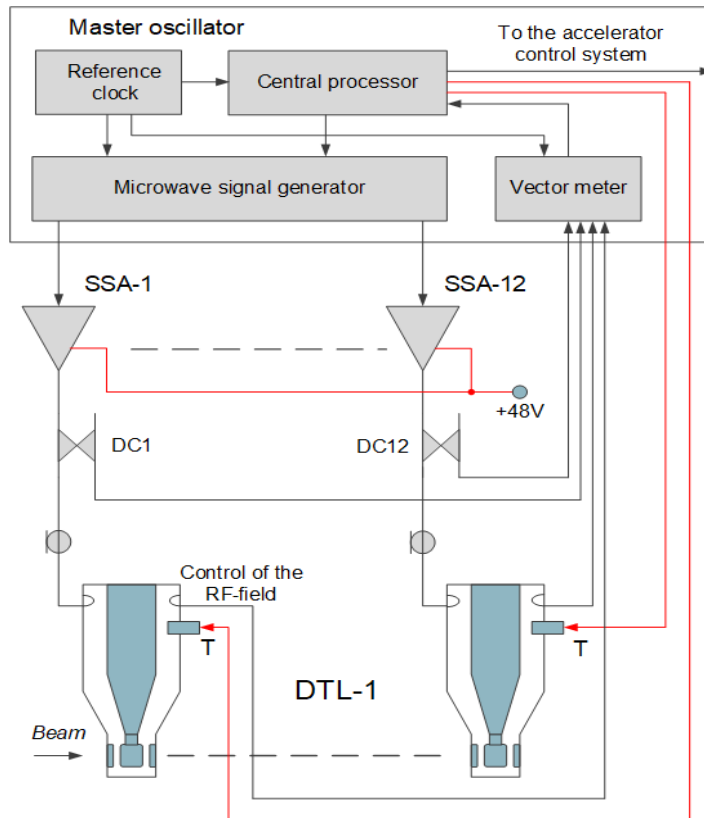
The calculated value of pulsed RF power consumption in the structure is 560 kW, including heating losses and beam power.

Four SSAs with an output power of 190 kW provide stable excitation of nominal power of the HF field in the structure. The phase synchronization of the high-frequency signals excited in the accelerating structure is provided by the master oscillator.

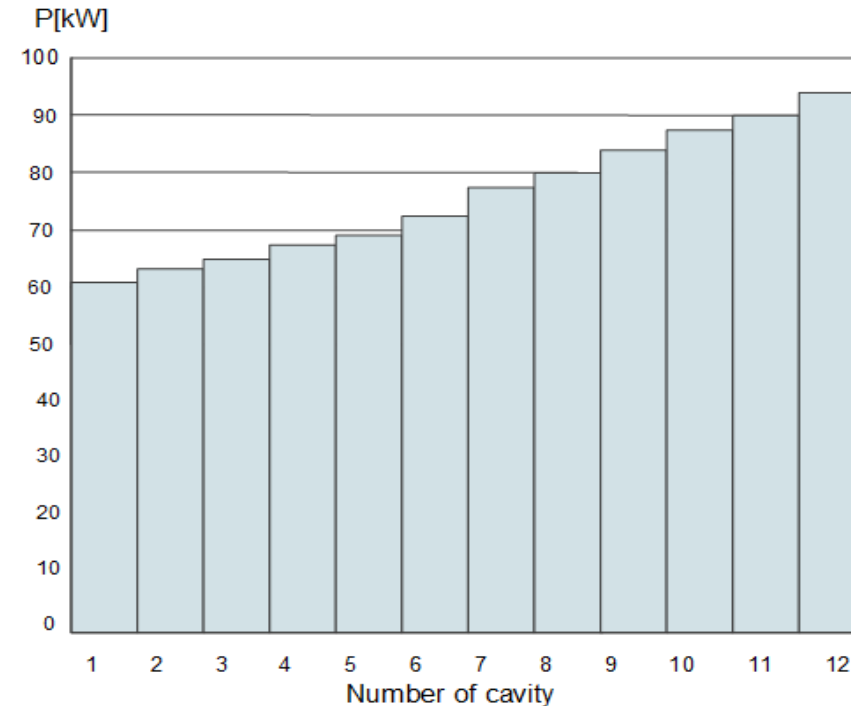
Feedback signals from the structure and from reflectometers are fed to the master oscillator unit, which is designated in the diagram as a vector signal meter.



The RF power generating system of DTL-1



DTL-1 resonator excitation circuit.

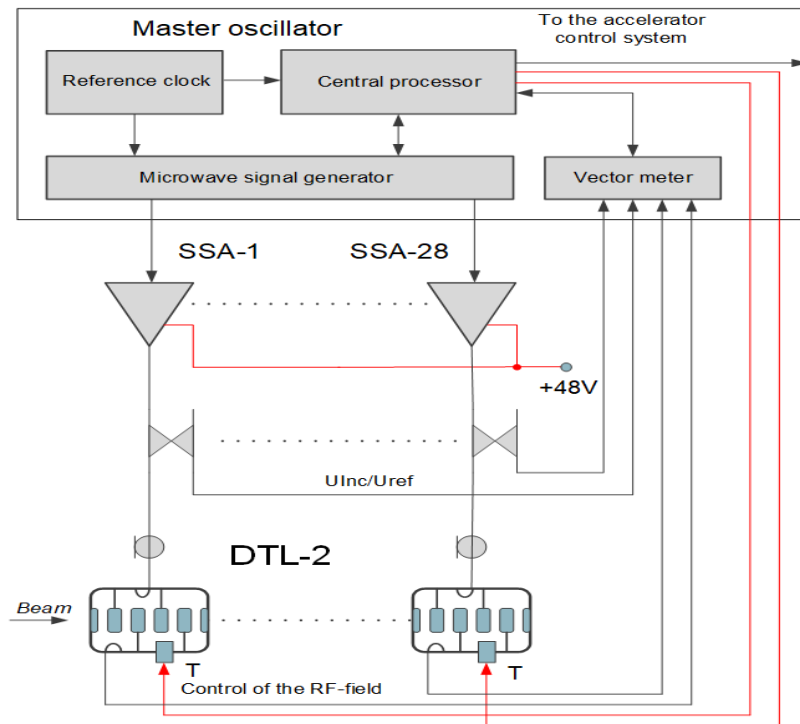


Distribution of RF power required for $\lambda / 4$ resonators

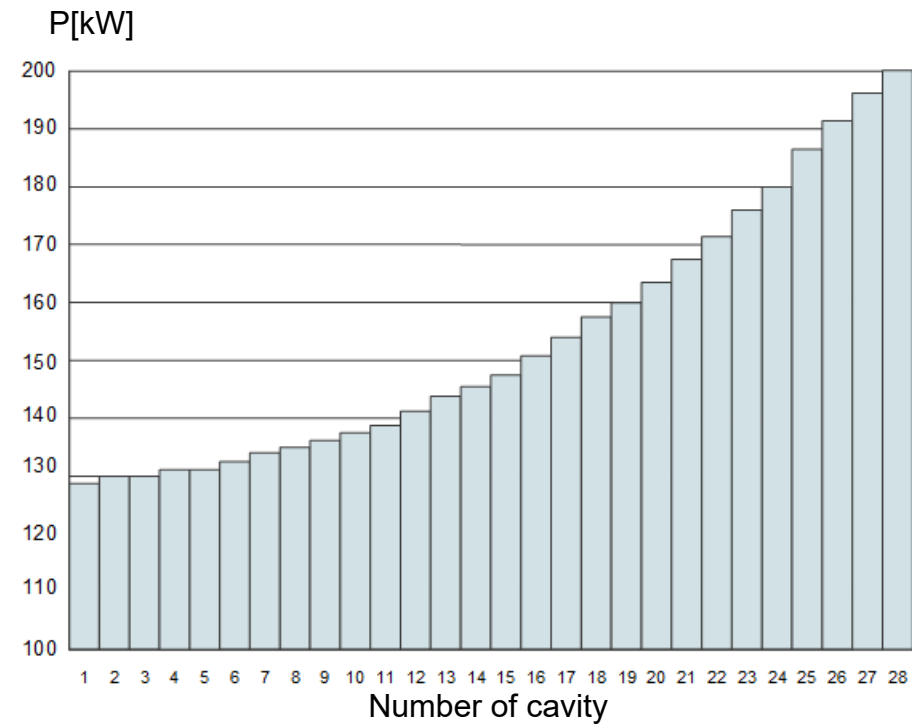
Each of the twelve resonators DTL-1 is excited through the high-frequency feeder by correspondent amplifier. The phase and amplitude at the amplifier's input are provided by the master oscillator.



The RF power generating system of DTL-2



DTL-2 resonator excitation circuit.



Distribution of RF power losses in IH resonators.

Twenty-eight SSAs provide accelerating resonators with the necessary power to create HF fields and accelerate the beam of charged particles. The resonant frequency of the resonators is tuned using mechanical plungers moved by stepper motors.