Fermilab

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Technical Note

Modification of Linac 7651 driver to operate at 425 MHz.

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Scope

To modify a Linac 7651 driver to 425 MHz and test its operation for use in the PET project.

Modification

The following are the two major modifications done to the Linac 7651 driver.

A. Move tap point opening on Linac 7651 output section.

This was done by taking the existing 7651 Linac driver output section outer conductor and reversing it end to end. Then an inch and a half in length was removed to bring the tap port closer to the tube socket. Once this was done, the proper holes were drilled and tapped to match the existing sections to the new outer conductor.

Figure 1: 7651 Output Section Tap Point Modification.

An aluminum spacer was made to mate the newly shortened outer conductor to the existing inner conductor.

Figure 2: 7651 Output Spacer.

B. Matching circuit to 7651 cathode drive.

Figure 3: 50 Ω Matching Network for 7651 Input Section.

Results

The following data was obtained at the 4.5 kW level for the 425 MHz 7651 driver. All of the oscilloscope traces are on the 10 μ s / div. scale.

Burle 7651 Tube
 Filament Voltage = 6.3 V
 Screen Bias = 800 V
 Input Section Directional Coupler Factor = 40 dB
 Output Section Directional Coupler Factor = 39.89 dB

Frequency = 425 MHz
 Grid Bias Pulsed to - 40 V from - 130 V
 Anode Bias = 3.6 kV

Figure 4: Forward Power (420.2 W) to Input of 7651 Driver (1 V / div.).

Figure 5: Reflected Power (16 W) from Input of 7651 Driver (1 V / div.).

Figure 6: Forward Power (4.508 kW) Trace (1 V / div.) to 50 Ω Load from Output of 7651 Driver.

Figure 7: Reflected Power (62.4 W) Trace (1 V / div.) from 50 Ω Load to Output of 7651 Driver.

Figure 8: Plate Current (2.5 A) Trace (1 A / div.) of 7651 Driver.

Using the Linac Test Station, the following power curve was generated with the 425 MHz 7651 driver into a 50 Ω load.

Figure 9: 425 MHz 7651 Driver Power Curve.