Impedance Matching Between the Modulator and Magnetron for Turnkey Operation and Performance Optimization

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ScandiNova Modulator and New JRC’s Magnetrons

M100-i modulator design has a compact design and very flat waveform

![Graph showing anode voltage and current](image)

**ScandiNova M100-i Modulator**

**New JRC Magnetrons**

- **X band**
- **C band**
- **S band**
Mismatched Transient Impedance

Mismatched transient impedance causes the below anode current waveforms problems

- **Overshoot**
- **Sagging**
- **Rising**
- **Jitter**
- **Arcing**
Reason for Mismatched Transient Impedance

Impedance of modulator: inductance of pulse transformer
Impedance of magnetron: Anode voltage / current characteristics

Modulator output and magnetron circuit
Transient Impedance Matching

Impedance and performance chart of MX7621 X band 2 MW magnetron

Impedance at each anode current

Performance chart

Typical performance

Impedance [Ω] vs. Anode current [A]

Output power [MW] vs. Anode current [A]
Method of Matching Impedance

Reactance controlling methods

1. Inductance of circuit primary cable
2. Inductance of high voltage cable
3. Snubber or peaking capacitor
Improved Matched Impedance to S band magnetron

Reactance control: snubber, cable length

Frequency: 2998 MHz
Anode voltage: 46 kV, Anode current: 110 A, Output power: 3.1 MW
Pulse width: 4.5 μs, Duty ratio: 0.001

Anode voltage and Anode current waveforms
Improved matched impedance to \textbf{C band} magnetron

Reactance control: snubber, cable length

Frequency: 5712 MHz
Anode voltage: 45 kV, Anode current: 110 A, Output power: 2.6 MW
Pulse width: 4.0 μs, Duty ratio: 0.001

Anode voltage and Anode current waveforms
Improved Matched Impedance to X band magnetron

Reactance control: snubber, cable length

Frequency: 9300 MHz
Anode voltage: 38 kV, Anode current: 100 A, Output power: 2.0 MW
Pulse width: 4.0 μs, Duty ratio: 0.001

New JRC’s all S, C, and X band magnetrons can easily match the impedance of the ScandiNova modulator.
Dual Energy Mode System Requirements

- High dynamic range of RF power
- High stable oscillation at low power
- Shifted frequency at low energy mode
- Obtained quasi-wide dynamic range

Magnetron’s Current pushing

Above pushing characteristics can be controlled by our magnetron designing.

* Above principle idea has been disclosed in Varian patent pub. US2007/25505
Feature of New JRC magnetrons

- High power
- High stability
- Long life time
- Advanced thermal control technology

6 patents have been registered and additional 6 patents are pending.
Advanced designed ScandiNova modulator creates a flat top of the pulse with NewJRC’s magnetrons.

Matching transient impedance between ScandiNova modulator and New JRC magnetron has been completed.

Our customers can get the turn key packaged microwave source.

New JRC can suggest matching condition to our customers.