The MT300
RF Module, Final Power Stage

The final RF power section on MT300 transmitter is composed by:

1. **RF Driver: model MDL30.**
2. **90 deg. 2-way hybrid splitter.**
3. **A pair of final stage amplifiers mounting SD2931-10 devices.**
4. **Second; 90 deg. 2-way hybrid splitter.**

The MDL30 provides the first step of amplification of minimum 17dB gain in order to correctly drive the final stage. It is composed by a stage operating in class AB.

Below the technical specifications:

Vcc	**28 volts**
Idq	**200mA typ.**
Frequency range	**87.5 – 108 MHz**
Power Gain	**>17dB typ.**
Output Power	**>25 W**

The 2-way splitter is made by a 90 deg. Hybrid structure and provides to split in quadrature the input signal.

Below the technical specifications:

Frequency Range	**87.5 – 108 MHz**
Input Power	**50 W max.**
Return Loss, (s11)	**<17dB**
Return Loss, (s22 and s33)	**<15dB**
Isolation, (s32)	**>15dB**
Insertion Loss, (s21=s31)	**<0.6dB**

The final stage is an amplifier for FM Broadcast band, (87.5Mhz to 108MHz), with nominal output power or 300 watt CW, that also can operate at 390 watt CW. Normally it works compensating the losses

of the passive and linear circuitry that follows the amplifier, the directional coupler and the low pass filter.

The necessary typical pre-gain compensation is about 0.9dB. This means the RF amplifier output runs at 370 watt for a nominal 300 watt at the output connector.

The amplifier topology is a balanced amplifier, including a pair of single ended sections, each one using a high power MOSFET with the input/output matching network printed on the PCB.

The choice of using two RF devices has been decided in order to improve the raggedness of the amplifier in case of strong mismatched load at the output network. Thanks to the 90 deg. Hybrid isolation, the amplifier stages are not influenced by operational conditions changes of the load (antenna, filter, transmission line and so on).

Moreover, the amplifier is more stable and because of that more immune to the self-oscillations. The two hybrid RF devices allow the amplifier to produce output power (-6dB) even if one of them breaks or damages.

Below the technical specifications:

VCC nominal	**48V**
IDC (@ Full Power)	**11A typ.**
Idq	**180Ma typ.**
Frequency Range	**87.5 – 108 MHz.**
Power Gain	**18dB, typ.**
Output Power	**280 w - 370 w.**
Polarization Class	**B**

The 2-way combiner is a quadrature structure, and it provides the sum of each two final stage sections to have the max RF power at the common port. One unbalanced 50 Ohm RF resistor warranties the isolation between the input ports, in order to maintain the transmitter on duty in case one of the final stages will be on fault.

Below the technical specifications:

Frequency Range	**87.5 – 108 MHz**
Power Handling	**400 W Max.**
Return Loss, (s11)	**<-18dB**
Return Loss, (s22 and s33)	**<-18dB**
Isolation, (s32)	**>+18dB**
Insertion Loss, (s21=s31)	**<0.4dB**

The low pass filter has a particular elliptic configuration; this configuration has been chosen to guarantee the values of the harmonic components levels.

Below the technical specifications:

In band insertion loss	**<0.5dB**
Insertion loss @ 175Mhz	**>55dB**
In band Return Loss	**<-20dB**

The directional coupler is a block composed by 2 directional couplers and a quarter wave delay line. Both ports of each directional coupler are used. Two of them detect the reflected power, one detects the FWD power and the one is used for RF monitor. The function of the delay line is to have the reflected power signal detected at 90 deg. of electrical angle. In this way, it is possible to have a constant reflected power level versus the phase angle of that signal. The RF monitor is connected to the front panel to have a 0dBm nominal signal.

Below we can see a photo of the MT300 RF Module Amplifier