

A 12 GHz TV RECEIVER FOR DIRECT SATELLITE BROADCASTING

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ABSTRACT

The design and performance of 12 GHz TV receiver for direct Satellite broadcasting is described. The receiver consists of an image recovery low-noise mixer, a high-stability Gunn oscillator, a broad bandwidth IF pre-amplifier and a home-available cheap demodulation unit.

The mixer diode is a low-conversion-loss GaAs Schottky diode. The circuit was designed to optimize the system noise figure which is less than or equal to 4.5 dB (including 1.5 dB of IF pre-amplifier's contribution).

The local oscillator is a Gunn oscillator with a frequency-stabilized external cavity. Frequency variations over temperature were less than or equal to 0.02 MHz/°C.

In order to meet the special requirements, a parametric amplifier is used as a low-noise amplifier in the outdoor unit to improve G/T of station. The varactor cut-off frequency in parametric amplifier is above 600 GHz. The pump source is a Gunn oscillator at 62 GHz and the noise temperature of paramp is below 150°K over the pass-band.

The indoor unit consists of a second mixer, an IF amplifier, a limiter, a TV set, a sound demodulator and what not.

To be compatible with environmental variations, the outdoor unit is sealed and mounted with an integrated heater of 16W; the heater is automatically heated as the temperature becomes under 20°C.

The system received experimental program broadcasted by the Japanese direct broadcasting satellite for a long time in Nanjing, and an excellent result was achieved as expected.

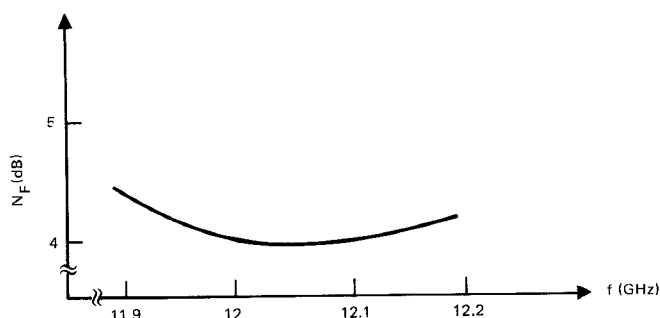


Figure 1. The noise figure of mixer

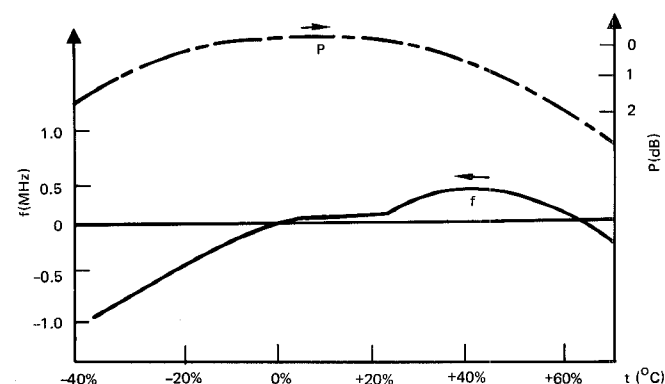


Figure 2. The variation of power output and frequency of Gunn oscillator versus the temperature

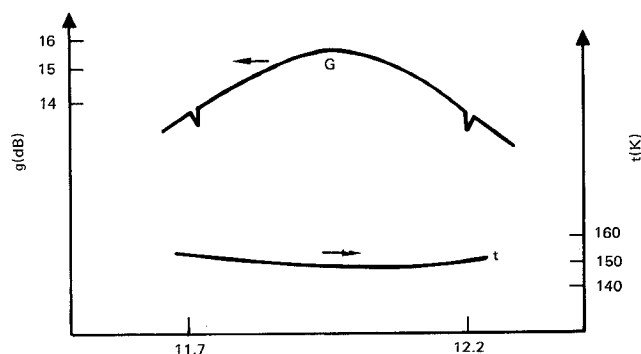


Figure 3. The response of noise figure and gain of parametric amplifier

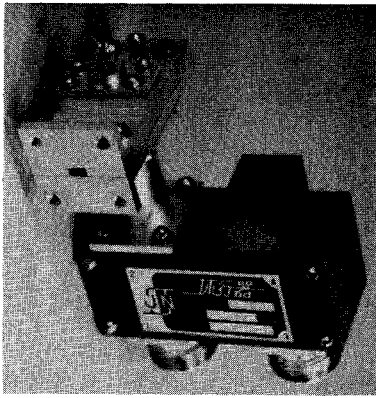


Figure 4. Parametric amplifier

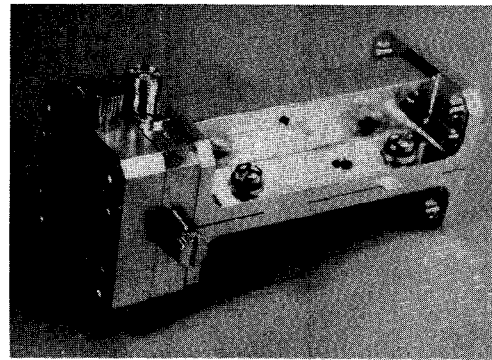


Figure 5. Low-noise mixer