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## USER OPERATION AND MAINTENANCE MANUAL

RADIO-REFLECTOMETER 2-12 GHz  
Part No. RRF-2/12



**1<sup>st</sup> Edition  
June 2008**

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## **1. INTRODUCTION.**

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This instruction manual contains information on installation and operation of the 2-13 GHz sweep reflectometer with built-in radiometer.

### **1.1 General Description.**

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2-13 GHz sweep reflectometer with built-in radiometer is intended for measuring the density profile of the edge plasmas, the electron temperature profile and its fluctuations.

Base principle of operation is an effect of total reflection RF signal by layer plasma with critical density.

## 2. SPECIFICATIONS.

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### 2.1 Electrical Specifications.

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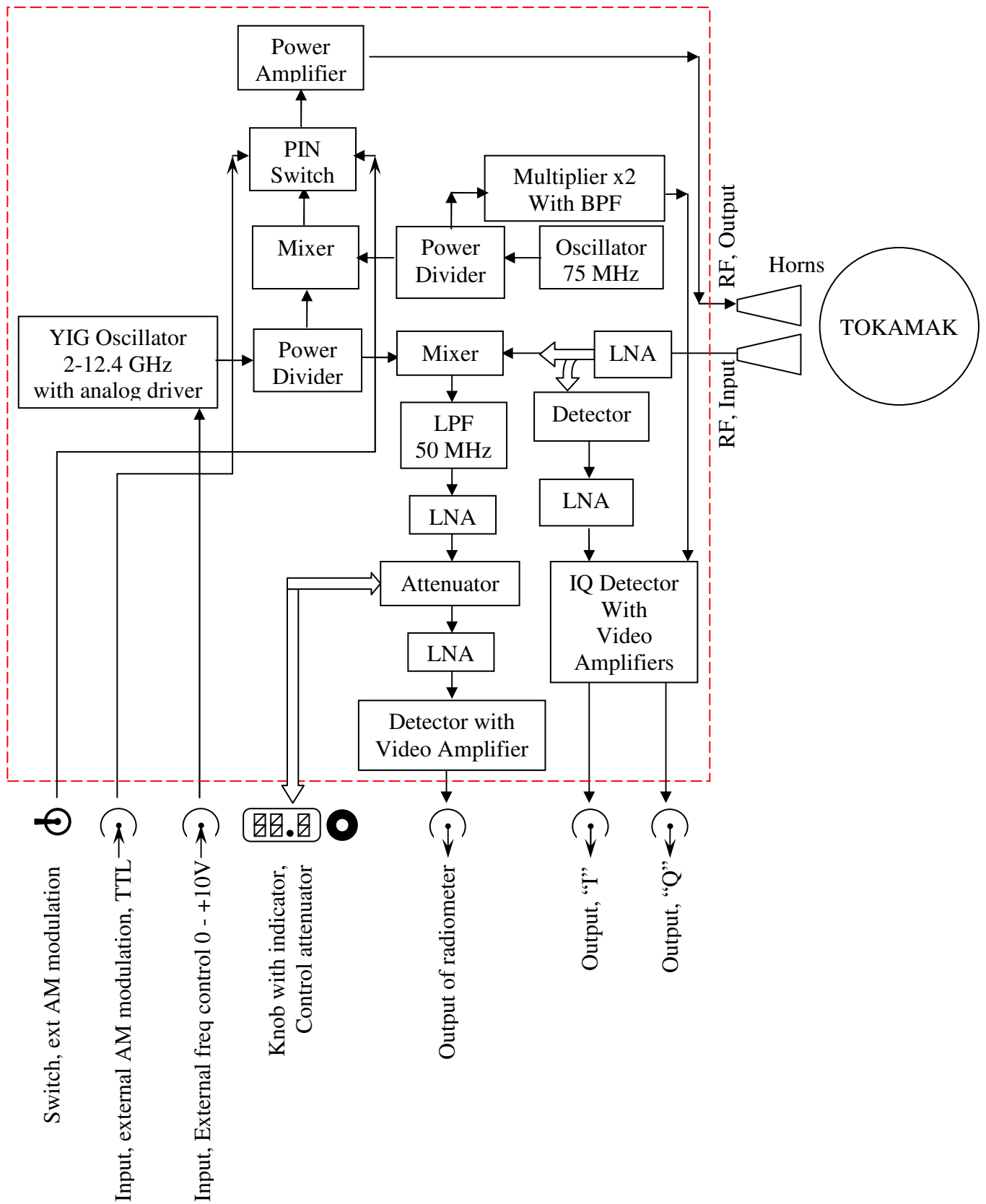
1. Operating Frequency	2-12.4 GHz;
2. Output power	20 mW (min)
3. Control voltage	0 - +10V;
4. Min Sweep Time	1 ms;
5. Accuracy setting	20 MHz;
6. Antenna gain	7-13 dB;
7. Control connectors	BNC;
8. RF connectors	SMA;
9. AC Power	220 VAC;
Reflectometer	
10. IF Frequency	150 MHz;
11. Time Resolution	1 $\mu$ s;
Radiometer	
12. Frequency analyze	fo +/-50 MHz;
13. Built-in attenuator	0-30.5 dB with step 0.5 dB;

### 2.2 Mechanical Specifications.

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14. Size	470x120x250 mm;
15. Weight	10 kg.

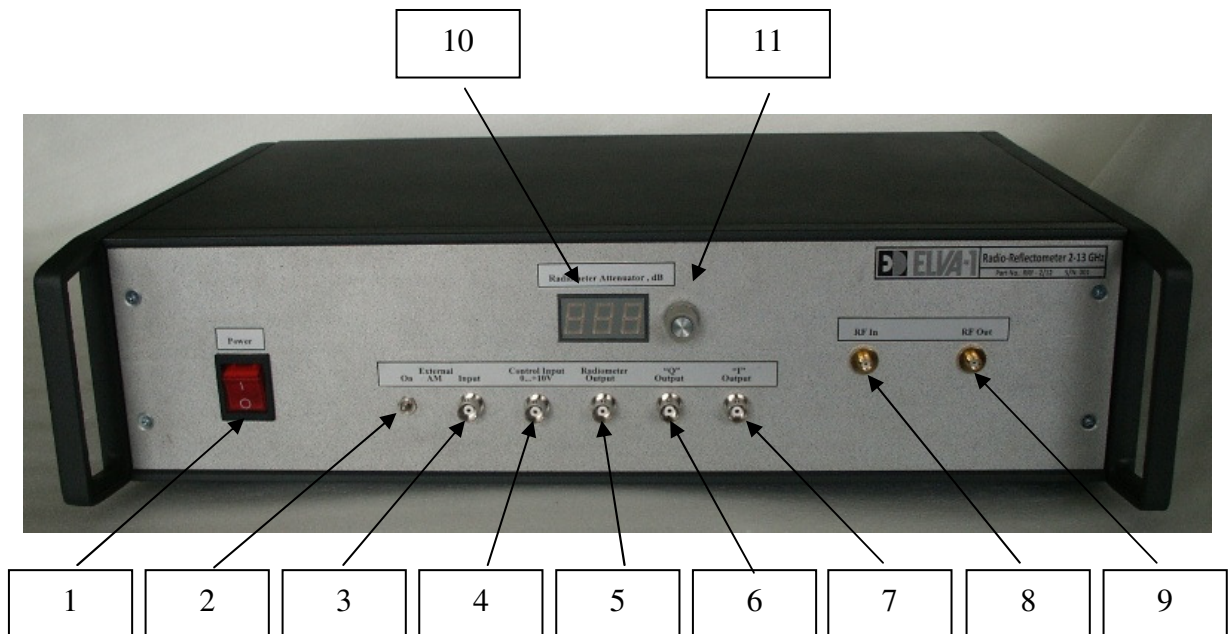
**2.3 Block-diagram of the interferometer.**



Picture No1. Block-Diagram of the reflectometer.

## 2. 4 Front panel.

Disposition of the plugs and knobs on the front panel of the reflectometer is the following:

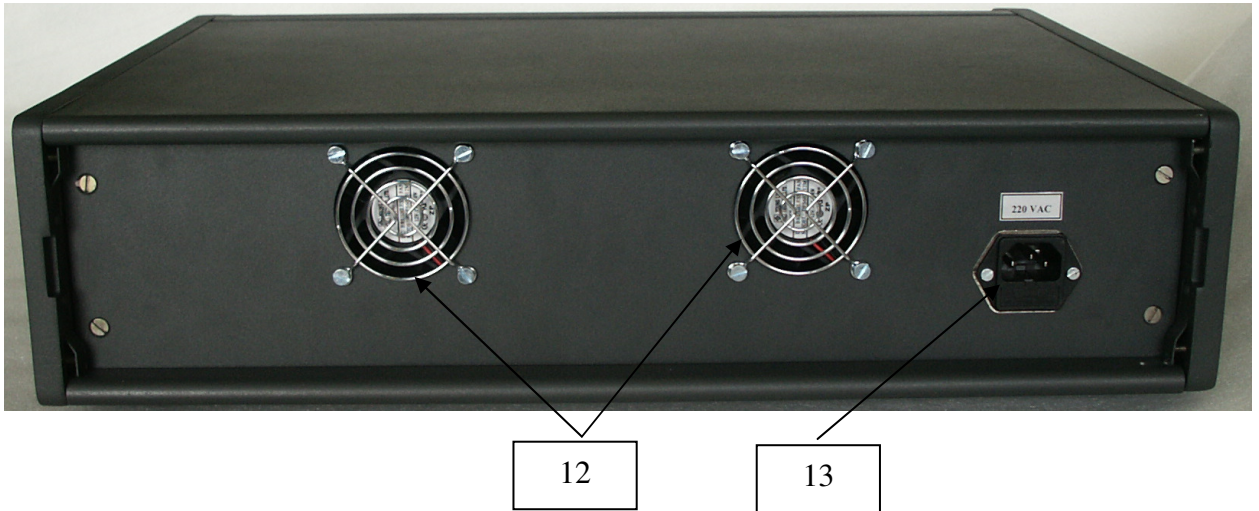


Picture No2. Front panel of the reflectometer.

1. Power switch;
2. Switch, set external AM modulation;
3. Input for external AM modulation, TTL (BNC);
4. Input for frequency control, 0 ...+10V (BNC);
5. Output of radiometer channel (BNC);
6. Output "Q" (BNC);
7. Output "I" (BNC);
8. RF input (SMA);
9. RF output (SMA);
10. Indicator of set attenuation in dB;
11. Knob, set attenuation level.

## 2. 5 Rear panel.

Disposition of the plugs on the rear panel of the reflectometer is the following:



Picture No3. Rear panel of the reflectometer.

- 12. Fans;
- 13. Power plug with fuse, 220 VAC.

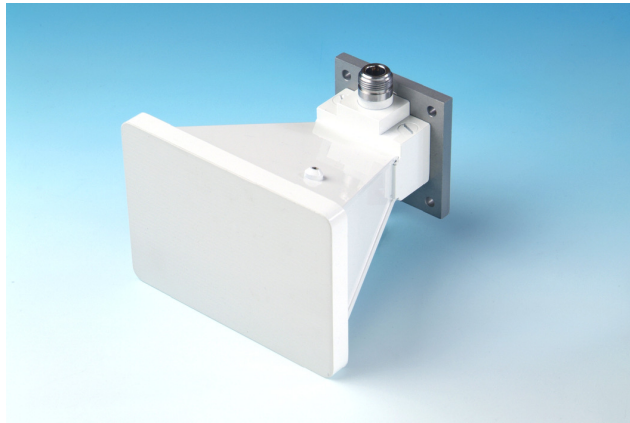
### 3. INSTALLATION.

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#### 3.1 Assembly procedure.

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The reflectometer is completed with two antennas WBH2-18 (Q-par Angus Ltd) and coaxial cables with SMA connectors for connection antennas with the system. The picture of antenna is presented below, antenna sizes: 119 x 86 mm ext. aperture, 119 mm long. Parameters of antenna is presented in 4.2.



Picture No4. Antenna WBH2-18.

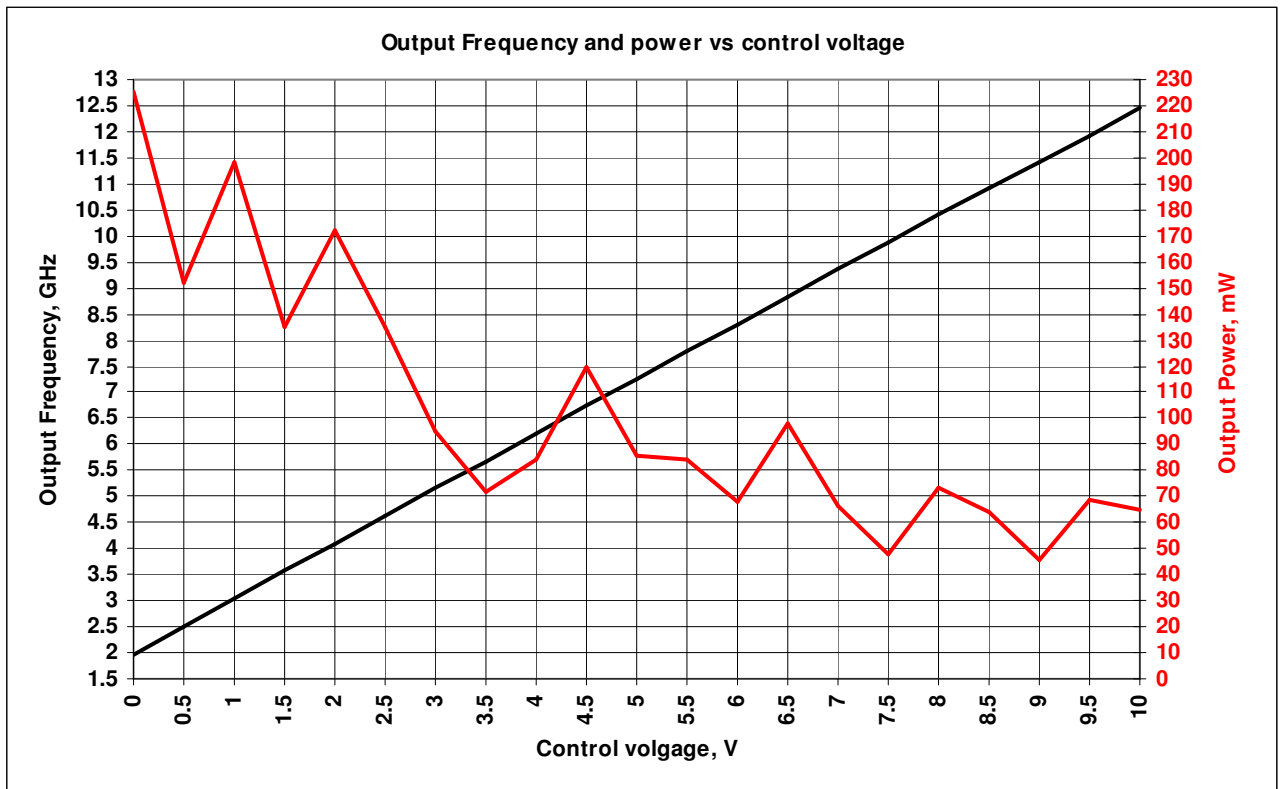
After installation antennas near TOKAMAK window connect antennas by supplied coaxial cables to RF input / output on the front panel. Then connect external voltage source (0...+10 V) to the frequency control input (10). The system is ready for using and can be switched ON by power switch (1).

Operation frequency is controlled by external voltage. Measured data is presented in 4.1.



## 4. MEASURED DATA.

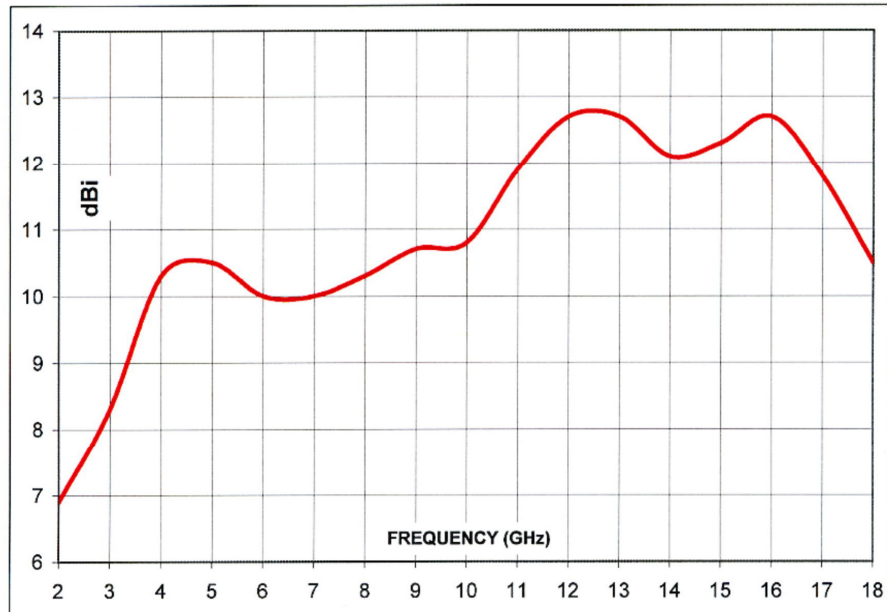
### 4.1 Output frequency and power vs. control voltage.



## 4.2 Parameters of antennas.

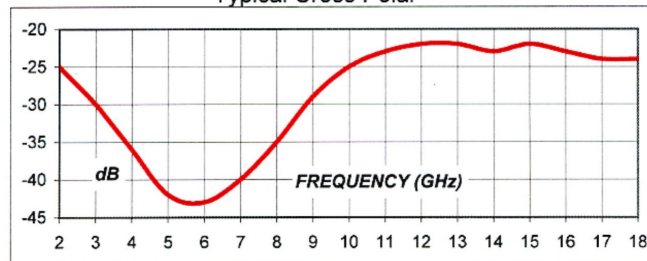
### Typical Antenna Gain

This is calculated by reference to standard gain horn antennas, and cross checked with reference to the antenna beamwidth, with an estimated error of +/- 0.8dB.



The recommended far field range for this antenna is > 1.7 Metres

### Typical Cross Polar



### 3dB Beamwidth

