

## PROJECT OF A LARGE COLLECTING ARRAY AT NANÇAY

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Since 1970 the « decametric » radio astronomy group studies solar and Jovian emissions in the range 80 to 20 MHz. The existing equipment has been described by Boischot (1974). It was primarily designed to obtain high frequency and time resolution spectra. The experience gained during a mission to Arecibo when the 1000ft dish was used with the Nançay spectrographs showed the great interest of increasing the sensitivity by using a large collecting area.

Hence, a project of a 144 antennas array (72 left-hand and 72 right-hand polarized antennas) has been studied, which will allow to observe a source several hours a day, will have an instantaneous bandwidth of at least one octave, and a large collecting area providing a gain of 24 db in both polarizations, i.e. about 25 times the gain of our present antennas. The primary antenna is the so-called « Tee-Pee » antenna designed by Erickson and Fisher (1974) for the Clark Lake Radio Observatory (California). It is made of eight coppered-steel helices wounded on a conical structure (Fig. 1) allowing to observe frequencies between 120 and 20 MHz with a nearly constant gain. According to the sense of winding of the antennas, left and right hand circular polarizations may be obtained.

This type of antenna can be easily phased by a simple rotation around the cone axis — in practice by a simple commutation of the wires connected to the antenna output —. But this kind of phasing is frequency dependent, and limits the instantaneous bandwidth of the array (3 MHz at C.L.R.O.).

To secure a large enough bandwidth both this phasing by rotation and the usual phasing by delay-lines, which is achromatic, must be used. The grouping of the antennas has been optimized with a computer, to give the largest bandwidth and the longest tracking possibility, with a nearly constant gain.

The phasing by rotation will be used inside groups of  $2\text{ EW} \times 4\text{ NS}$  antennas, and the array will have  $6\text{ EW} \times 3\text{ NS}$  such groups, the relative phase of which can be changed by variable delay lines.

Fig. 2 gives an example of gain computation. The main characteristics of the array are summarized in Table 1.

## ELEMENTARY ANTENNA

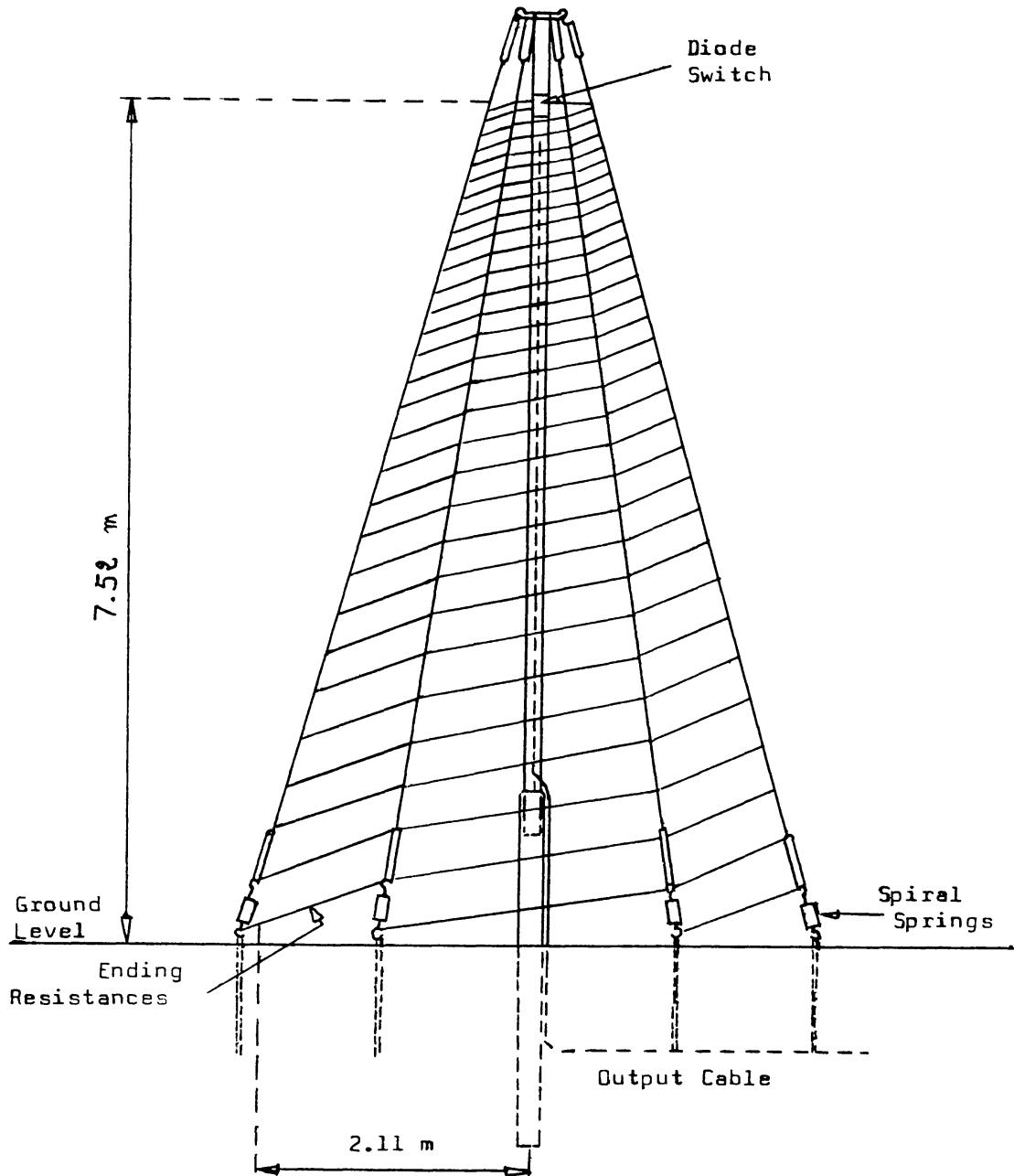


FIG. 1

Conical log spiral antenna (Tee-Pee). The central pipe and the wires going from top to bottom form the supporting structure on which eight electrical wires are wound. Actually this structure will be inclined at an angle of 20° southward.

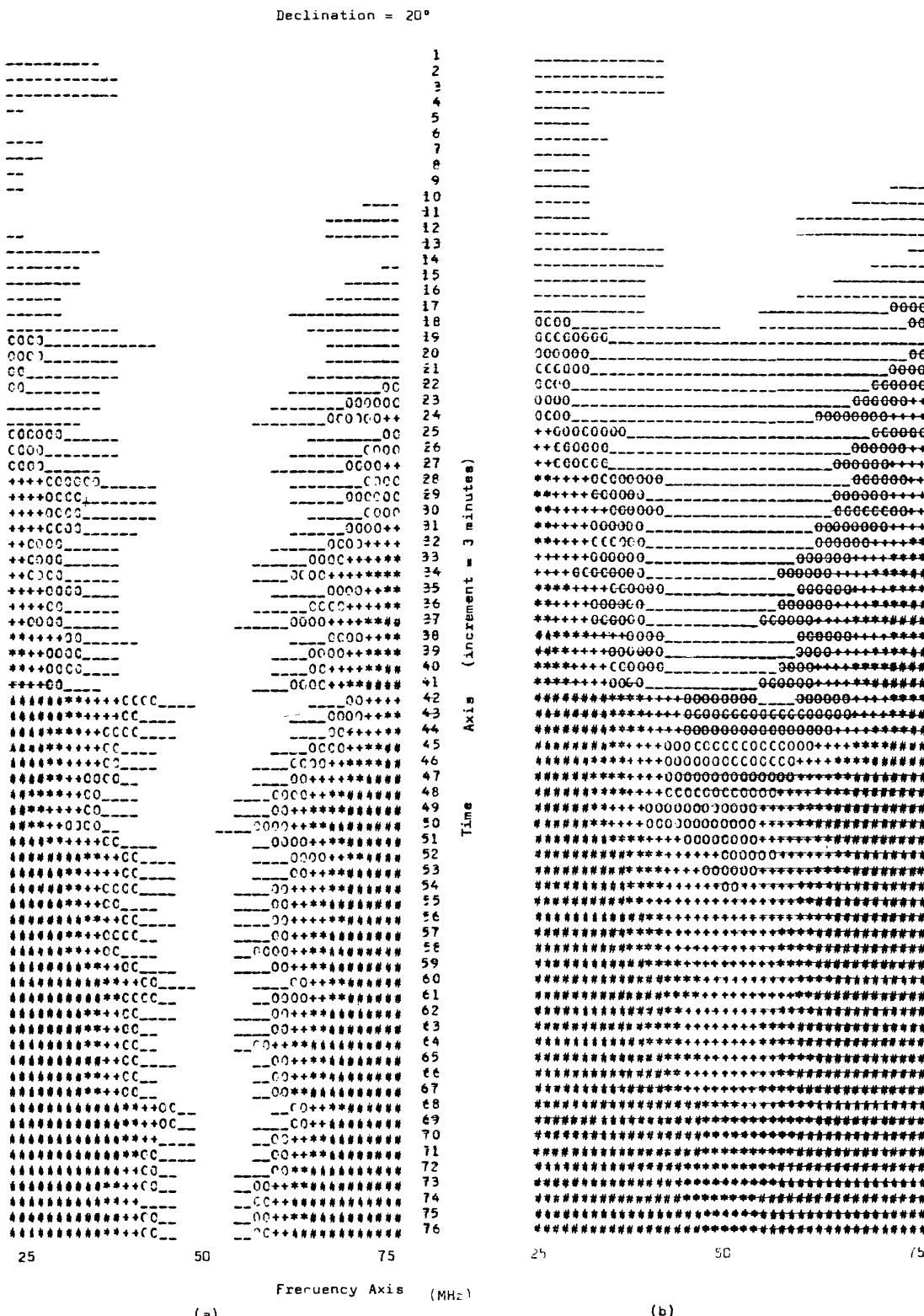


FIG. 2

Computer simulations showing the variation of the gain  $G$  for a group ( $2 \text{ EW} \times 4 \text{ NS}$ ) in terms of time and frequency. The different  $G$  ranges are sketched as follows:  
 $\# \#$  :  $G \leq 0.5$ ,  $**$  :  $0.5 < G \leq 0.6$ ,  $++$  :  $0.6 < G \leq 0.7$ ,  $00$  :  $0.7 < G \leq 0.8$ ,  
 $--$  :  $0.8 < G \leq 0.9$ ,  $-$  :  $0.9 < G \leq 1$ .

$G$  is normalized for the central frequency of the range and the local meridian passage.  
In figure 2b the primary pattern of the elementary antenna is introduced.

With such an array we hope:

1) to observe weak solar bursts as we did in Arecibo and specially fainter type III bursts the time profile of which is less complex than for intense bursts. Thus we shall be able to follow and complete the study of the mechanisms generating type III bursts (Aubier and Boischot 1972, Harvey and Aubier 1973, Aubier 1974, Daigne and Moller-Pedersen 1974, Daigne 1975). An additional purpose is the improvement of our knowledge of the relation between type IIIb and type III bursts (de la Noë and Boischot 1972), between type III

TABLE 1 - Characteristics of the Array.

Number of antennas	$2 \times 72$
Grouping of antennas	2 EW $\times$ 4 NS
Number of groups	6 EW $\times$ 3 NS
Gain	288 (24 dB)
Sensitivity with time constant $\tau = 1\text{s}$ and elementary bandwidth $b = 250\text{ KHz}$	8 Jy
Tracking Time	3h to 5h
Declination Range	$-25^\circ < \delta < +50^\circ$
Polarization	Left and right handcircular

and drift pair bursts (de la Noë and Moller-Pedersen, 1971), and of the center-to-limb effect of decametric storms (de la Noë 1974, Moller-Pedersen 1974). We shall be able to observe a much larger number of all types of solar emissions with a better resolution. Study of the fine structure emission in the harmonically related bands of type II bursts will allow to determine more precisely the conversion processes of plasma waves (Leblanc and Lecacheux 1975). Furthermore it will be possible to observe the quiet corona emission at fixed frequencies and then to improve the model of scattering of the electromagnetic radiation by density inhomogeneities (Aubier et al. 1971).

2) to study in more details the jovian emission, in particular the fine structures of the spectra: modulation lanes, millisecond bursts, Faraday fringes... The characteristics of these bursts are intimately related to:

- the physical conditions of the Jovian magnetosphere through the propagation of the electromagnetic radiation.
- the real nature of the emission.
- the nature of the interaction of the Io satellite with the emission sources (Conseil et al. 1971).

3) to observe galactic and extragalactic sources and to study the pulse shape and dispersion of pulsar emission at low frequencies, and the dynamic spectrum of interplanetary scintillations.

## PROGRAM

Only an array of 32 antennas will be achieved in 1975; the array will be completed in 1977 in order to make good observations of Jupiter and the Sun and perform a « stereo » experiment with the Planetary Radio Astronomy equipment aboard the NASA mission Mariner Jupiter Saturn 1977 (MJS 77) to which some of the members of our group are co-investigators.

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