Radio Reflections from Meteor Trails*

Hershberger¹ raised the question of whether a multiplicity of resonances had been observed in radio reflections from meteor trails at frequencies near the plasma frequency similar to those observed from positive columns in the laboratory. Note that resonances might be observable according to the laboratory observations is available. However, meteor trails at frequencies near the plasma frequency, and requires the plasma waves to have a wavelength <0.4 cm for a column of radius 1 m. This restriction on the wavelength of the plasma waves might lead to a situation where the structure of the subsidiary resonances would not be discernible.

On the other hand, the dispersion relation which gives rise to the waves

\[ (\omega^2 - \omega_p^2)\eta_1 = \frac{\gamma k T_e}{m} \nabla^2 \eta_1 \]

with a circumference of one wavelength, placed about \( \lambda/8 \) in front of a reflecting screen. It is easily coupled to a 50 Ω coaxial system by means of a \( \lambda/2 \) balun. When made of thin rods, its tuning is rather sharp, with a bandwidth of a few percent. The impedance of the quad is hardly affected by the presence of the horn in its center. Careful tests showed that the quad has a negligible effect on the shape and side-lobe level of the main antenna beam at decimeter wavelengths.

A Novel Duplex Feed*

For observing lunar occultations of radio sources, a dual-frequency feed has been designed to use on one of the 90-ft paraboloids (\( f/D = 0.4 \)) at this observatory. The requirement was to add a long-wavelength (≈3 meters) feed on the same axis as the existing 21-cm waveguide feed-horn.

The quad, or "unfolded folded-dipole," seemed to lend itself to this application, as shown in Fig. 1. The quad is a square loop with a circumference of one wavelength, placed about \( \lambda/8 \) in front of a reflecting screen. It is easily coupled to a 50 Ω coaxial system by means of a \( \lambda/2 \) balun. When made of thin rods, its tuning is rather sharp, with a bandwidth of a few percent. The impedance of the quad is hardly affected by the presence of the horn in its center. Careful tests showed that the quad has a negligible effect on the shape and side-lobe level of the main antenna beam at decimeter wavelengths.

The system arrived at seems to be a simple and effective feed for any two widely-differing wavelengths.

An Investigation of the Properties of Synthesized Nonuniformly Spaced Antenna Arrays*

It is the purpose of this communication to present some preliminary results on the properties of nonuniformly spaced antenna arrays which were synthesized with the aim of suppressing the sidelobe levels. Most antenna synthesis work with this type antenna has been concerned with large inter-element spacings; here we are concerned with the closely spaced arrays so that attention is on the sidelobe level rather than the grating lobes.

For synthesizing these arrays, a procedure similar to that of Andreasen¹ has been used, in which a digital computer is employed to systematically vary the inter-element spacings until a significant decrease in the sidelobe level has been obtained. Using this procedure, it has been possible to develop an empirical method for predicting the approximate element positions for a nonuniform array having greatly decreased sidelobe levels. Furthermore, it has been possible to investigate the effect of current tapering as well as nonuniform spacings for further sidelobe reduction.

Using the technique described above, antennas with reduced sidelobe levels were successfully synthesized for arrays involving 10 to 24 elements; the technique is immediately applicable to larger arrays, but beyond this the computation time would become prohibitive for the type of computer used in these investigations. Table I summarizes the results. Shown for comparison purposes is a Chebyshev tapered array with half-wave spacing, which has the same sidelobe level as the corresponding nonuniform array, and an over-all length as close as possible to the nonuniform array length. The results presented in Table I clearly indicate that the attempts to reduce the sidelobe level have been successful. Since the approximate maximum sidelobe level of a linear array is −13 dB, reductions ranging from 6 dB for a 10-element array to 10 dB for a 22-element array have been realized.

In order to present the results of the synthesized arrays in a form suitable for future design work, the spacings were plotted versus the number of elements, and

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