

CORRESPONDENCE

Direct Measurement of Refractive Index by Radiosonde

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In an interesting article in the May 1960 issue of the Bulletin, Clinger and Straiton proposed that a standard radiosonde system could be adapted for direct measurement of radio refractive index. We have built a balloon-borne refractometer using standard radiosonde components and have been using it in research on the refractive index structure of the lower troposphere in Southern California. The system has been described and sample records were shown at the Joint Meeting of the International Scientific Radio Union and Institute of Radio Engineers, 2 to 5 May 1960, Washington, D. C.

In the system described by Clinger and Straiton, the analog computation of the wet-term and dry-term conductances would be carried out in the balloon-borne components of the system and telemetered to the ground. In our system, separate signals are telemetered to the

ground by conventional radiosonde transmitters. A simple analog computer on the ground converts the temperature and humidity information to refractive index which is then recorded as a continuous function of altitude. Reference altitudes are obtained by interrupting the otherwise continuous trace at the high reference contacts of the baroswitch unit. The pressure-altitude thus obtained is sufficiently accurate for radio-meteorological requirements and compares favorably with altitudes obtained by aircraft altimeters. Fast response sensors are required to detect thin layers in the atmosphere, so a wet-bulb temperature sensor wrapped with a fine cotton wick was substituted for the usual lithium-chloride strip. Experience has shown that fast response is important. For example, on one occasion the balloon-borne refractometer sounding was followed immediately by a standard radiosonde sounding. The refractometer indicated a gradient of refractive index of -0.250×10^{-6} per ft, whereas the radiosonde indicated a gradient of -0.040×10^{-6} per ft.

The schematic diagram of the Navy Electronics Laboratory system is shown in the figure. It has the advantage of using standard radiosonde transmitters and receivers and merely adding a simple analog computer at the receiver installation on the ground. Also, wet- and dry-bulb temperatures are measured separately and displayed on recorders as an aid in interpreting the refractive-index record and to improve the computed pressure-altitudes.

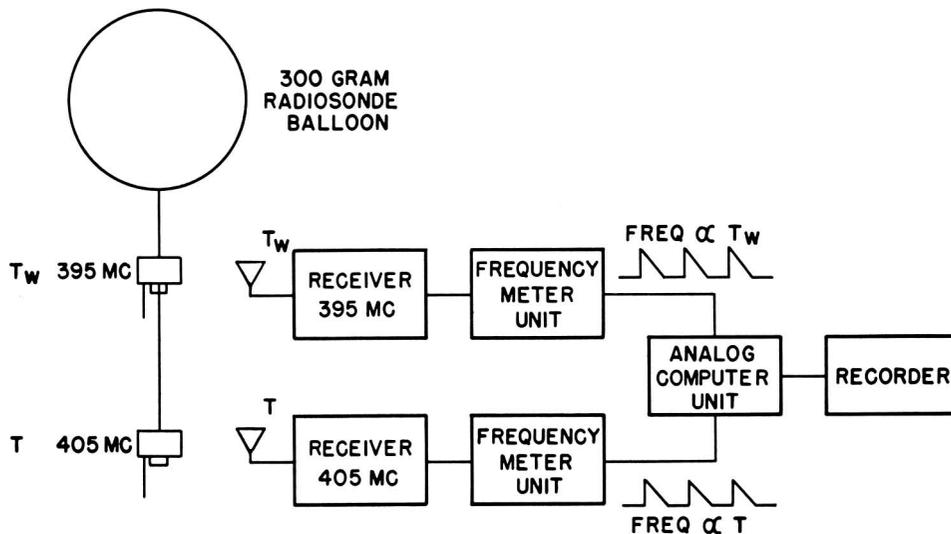


FIG. 1. The schematic diagram of the Navy Electronics Laboratory system.