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TR 79-055.1

POWER DENSITY MEASUREMENTS NEAR GTE *[Microwave]*
TRANSMITTING FACILITIES IN FLORIDA

by

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Re: your letter of 1/11/80

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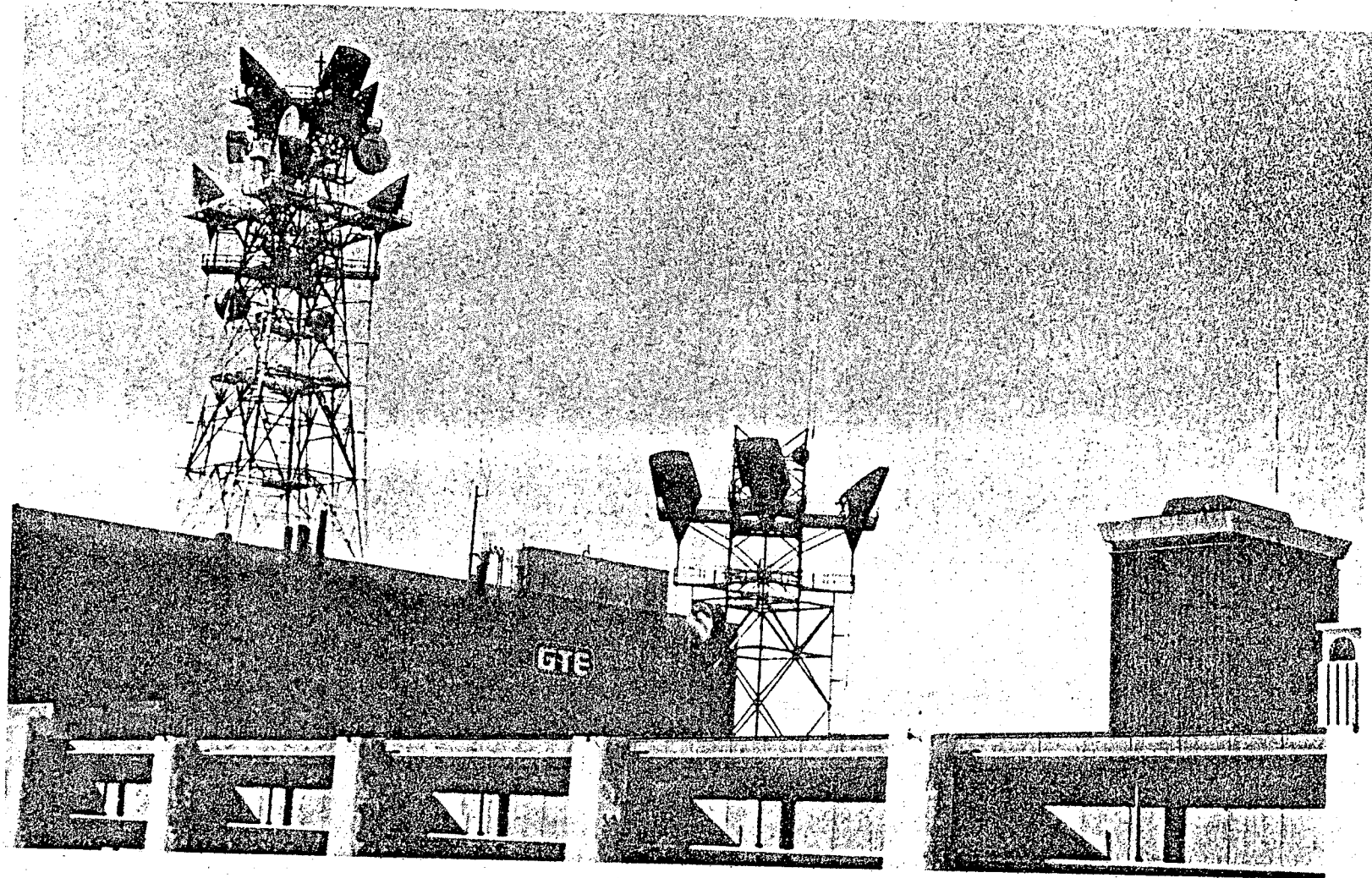
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TAMPA MAIN - GTE's Microwave Antennas Located in Downtown Tampa

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CONCISE SUMMARY

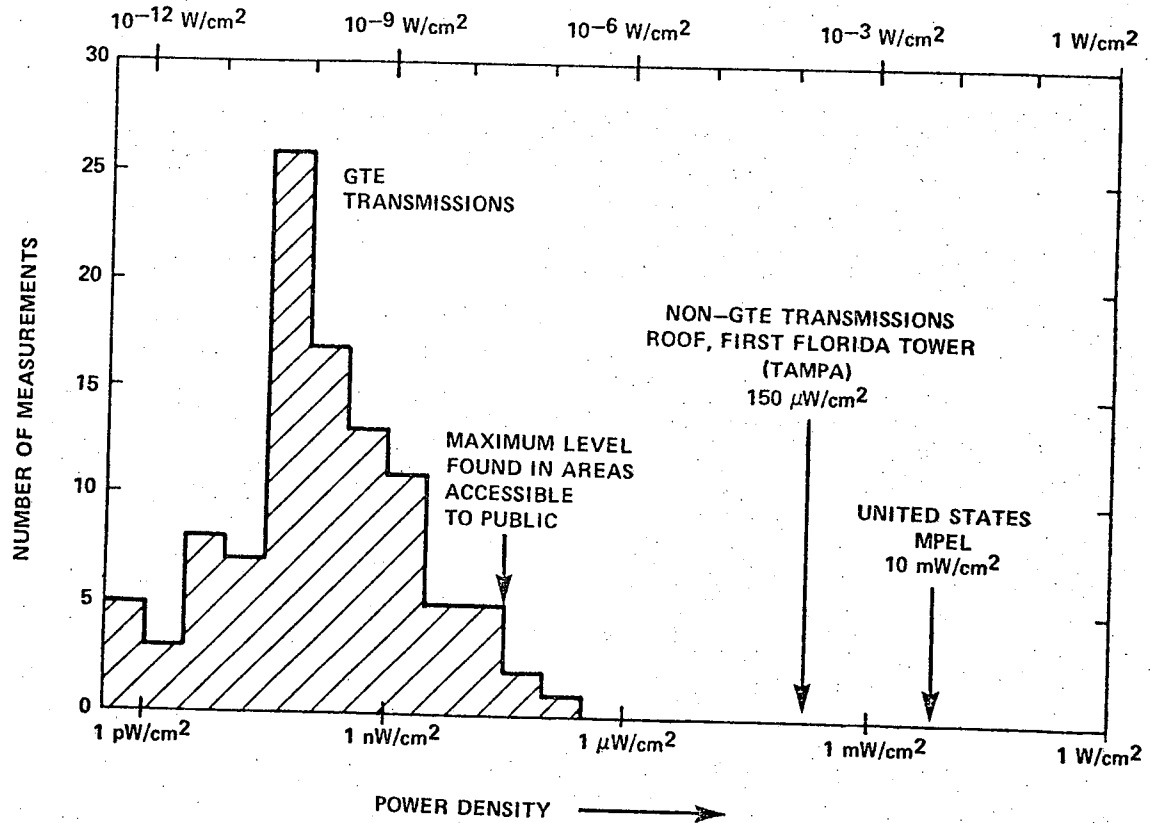
Recognizing present concerns about the magnitude of microwave power densities associated with transmission equipment, GTE Laboratories Incorporated, collaborating with GTE Service Corporation, undertook a program of power density measurements near three different types of GTE common-carrier transmission facilities in Florida. One site, Tampa Main, is a node with six outgoing routes of high traffic cross section. Another site, Clearwater, is a medium-density node in less populated surroundings. The third facility is the Homosassa earth station of GTE Satellite Corporation, located in a rural area. This report covers the results of those measurements, the techniques used, predictions and conclusions.

Over 250 measurements were made at 63 different locations within line-of-sight and in the radio rooms of these transmission facilities. These measurements revealed that the power density encountered was always less than 30 nanowatts/cm² (3×10^{-8} W/cm²) in any area accessible to the general public. This level is 1/333,000 that of the present U.S. guideline for maximum permissible exposure level (MPEL), 10 milliwatts/cm² (1×10^{-2} W/cm²). The distribution of the measurements is shown in the accompanying figure with relation to the MPEL. [Current revision proposals to the MPEL would only reduce the figure in the region above 2 GHz to 5 milliwatts/cm² (5×10^{-3} W/cm²).]

Calculations show that anticipated growth of GTE's transmission facilities or increases in link cross section will not significantly alter the maximum levels found. Further, this report shows that computations using standard electromagnetic methods allow reliable upper-bound predictions to be made of the levels likely to be encountered. The methods used are applicable to antennas of any type or vintage. The highest power density always occurs at ground locations not too far from a microwave relay tower, near the point where the edge of the antenna pattern's main lobe begins to come close to the earth's surface, irrespective of antenna sidelobe properties.

The ambient levels within GTE's transmission facilities accessible to company personnel were found to lie between 20 and 200 nanowatts/cm² (2×10^{-8} to 2×10^{-7} W/cm²).

GTE Labs employed special instrumentation comprising directional antennas, filters and very sensitive RF detectors, along with careful calibration and attention to possible sources of spurious readings, in order to measure such low-power density levels. Existing commercial "radiation monitors" are insensitive and wholly inadequate for these kinds of measurements. Finally, the highest power densities encountered in the Tampa area, on the roof of a tall building, were found to be produced by non-GTE sources such as UHF and VHF transmitting antennas.



(NOTE: The horizontal scale is logarithmic and there are three orders of magnitude (a factor of 1000) between adjacent labeled, marked points. Thus, 1 W/cm² = 1000 mW/cm², etc.)

Distribution of Florida Field Measurements; Transmissions from GTE Antenna