# IX. FREQUENCY MODULATION STUDIES

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## RESEARCH OBJECTIVES

Of current interest in this project are questions relating to new schemes for enhancing the capture performance of FM receivers. By capture we mean the phenomenon whereby the strength of a desired signal is so increased relative to an interfering signal or to background random noise that, after proper detection and low-pass filtering, the output is a relatively disturbance-free reproduction of the desired message. Some of the new schemes that are being developed give promise of lending themselves to antijamming applications. The question of what constitutes suppressible interference has received detailed consideration in order to achieve a clearer understanding of the nature and mechanism of the capture phenomenon. As a consequence, we have been led to problems relating to the transient and steady-state response of filters to frequency-modulated excitations. A new approach to the problem of FM transients is being developed which stresses the role played by the normal modes of the filter in the generation of FM and AM transients. This approach seems to offer a surprisingly clear picture of the mechanism that is involved, and it reduces the importance of the mathematical manipulations.

A detailed investigation of the theory of quasi-stationary analysis has also been completed. This study has led to the definition of a sluggishness ratio and an index of stiffness or sluggishness which are characteristic of every filter that may be characterized by a system function. The results of this study bear directly upon the problem of interference and upon the problem of reproducing sharp edges and detail in the response of selective filters and FM-to-AM conversion filters.

In addition to the theoretical work that is under way, laboratory measurements concerned with FM transients, quasi-stationary theory, and the performance of certain interference and noise-suppression schemes are in progress.

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