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Telecommunications Systems Design Techniques Handbook

A handbook has been published which describes analytical techniques for modern telecommunications systems. The handbook presents the design and analysis of tracking, telemetry, and the command functions utilized in these systems with particular emphasis on deep-space telecommunications. Antenna requirements are also discussed.

The handbook is organized into 10 sections. Section I, the introduction, describes the purpose and the scope of the material. A telecommunications system is described in section II, including the tracking function involving angle tracking, a Doppler system, and a ranging system. The types of tellecommunications links, link performance, and link parameters are also included.

Section III covers various parameters that are used in system development. Design control tables and formats indicate how these parameters are documented. Section IV covers the subject of radio tracking. It includes phase-lock loop receiver characteristics and Doppler tracking.

Telemetry system design is discussed in section V. This section describes channel quality, telemetry system efficiency, the data rate capacity of the telemetry channel, telemetry system optimation, and includes a comparison of single and multiple subcarrier telemetry channels. The section is followed by appendices covering telemetry system loss analysis, the maximum data rates for a PCM/PM (pulse-code-modulated/phase-modulated) telemetry system with square-wave subcarriers, and optimum modulation angles for a two-channel telemetry system.

Section VI describes the command systems used in deep-space telecommunications. Antenna patterns are discussed in section VII. This includes pointing error, pointing and polarization losses, antenna noise temperature and noise spectral density, and the choice of antenna patterns.

Section VIII describes the choice of signal frequencies. The discussion includes carrier frequencies and bandwidth considerations and constraints. The appended information to this section covers the frequency dependence of data return and the effect of interfering signals on system performance. Telecommunications performance prediction and analysis are included in section IX. Finally, section X discusses some critical system interfaces and hardware specifications.

The handbook provides a number of tables outlining various performance criteria. Block diagrams and performance charts are also presented. Each section includes reference material for additional reading on the described subjects.

Note:

Requests for further information may be directed to:

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