

JET PROPULSION LABORATORY

INTEROFFICE MEMO
3390-75-47

TO: Distribution
FROM: R. P. Mathison
SUBJECT: Policy for the Design of Deep Space Telecommunication Systems

4 November 1975

Subject policy has been revised and approved by the Assistant Laboratory Directors for Tracking and Data Acquisition, Technical Divisions and Flight Projects. A copy is attached for your information.


R. P. Mathison

RPM:es
attach.

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POLICY FOR THE DESIGN OF
DEEP SPACE TELECOMMUNICATION SYSTEMS

This policy establishes the principal design criterion for telecommunication systems for JPL flight projects. It also identifies Telecommunications Division goals for improved use and reduced uncertainty of telecommunication system performance for deep space missions.

The flight project has the ultimate responsibility for ensuring the integrity of the link design. The Deep Space Network shares this responsibility by ensuring that DSN parameters and tolerances are properly interpreted by the flight projects.

The performance of the telecommunications system shall be specified by an expected value and an uncertainty distribution calculated from the design values, tolerances and estimated uncertainty distributions for the system parameters. The performance of each subsystem shall be specified by a design value and favorable and adverse tolerances which cover design uncertainties. The principal design criterion is that the system shall provide the functional performance required by the project under the conditions prescribed by the project and concurred in by the DSN, with the minimum design margin to cover performance uncertainties. This criterion is met when the expected value of received signal-to-noise ratio (in decibels) exceeds the design value of required signal-to-noise ratio by the designated multiple (prescribed by the project and concurred in by the DSN) of the estimated variance.


A single document, "The (Project Name) Telecommunication Design Control," governing the telecommunication system design and performance for the project shall be issued, normally by the project and concurred in by the DSN. The development and maintenance of the document shall be the responsibility of the Telecommunication System Cognizant Engineer for each project. The document shall be prepared according to established procedures and updated as required to meet project needs. DSN commitments of ground station performance in the document are controlled by the DSN.

Non-JPL flight projects supported by the DSN will be encouraged to use the identical criterion for telecommunication system design.


The Telecommunications Division will work continuously toward:

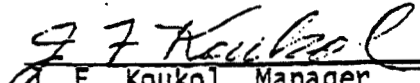
- Improving the accuracy of the expected value specifying link performance, particularly during the design phase of a project.
- Reducing the tolerances of link parameters.
- Reducing the number of link elements with separately assigned tolerances.
- Meeting the design-value as opposed to adverse tolerance performance.
- Taking advantage of link performance which exceeds the adverse tolerance value (by multiple data rate or other multi-mode designs).
- Separate specification of the spacecraft and ground portions of the link.

Concurred:


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23 September 1975