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THE SYSTEM DESIGN OF THE SATELLITE COMMUNICATIONS BASED ON ANALYZING RF  
IMPAIRMENTS AND QOS CONSTRAINTS

**Abstract**

With increasing demand of satellite telecommunications services and the lack of spectral resources, the optimal system design of communication links with the aim of increasing the efficiency is necessary. Tradeoff between the criteria of spectral efficiency, power efficiency, cost and time with satisfying required quality of service in designing communication systems must be accomplished perfectly. The first step in designing any complex system is to properly define the requirements, convert them into implementation requirements and define the evaluation criteria. In this article, the requirements are evaluated at three levels of the service, communication links and technical specifications. Communications service requirements fall into two categories QoS parameters and traffic model. QoS parameters are included latency, jitter, packet loss that is defined based on data type. According to the requested traffic model, the total capacity of the telecommunications network is extracted. Then, the calculated capacity is converted to the characteristics of communication links by tradeoff between the parameters of the communication protocol, the modulation type, the coding type, and considering the quality of service constraints. Finally, the link characteristics must be translated into the technical specifications for the designer. In this paper, three levels of requirements are analyzed and then relation between them is extracted. In order to determined technical specifications the model of RF and digital impairments is presented. In the first step, acceptable range of the amplitude and phase distortion is estimated for each of the components including LNA, power amplifiers, filters, frequency converters and digital processing according to the link characteristics and the available technologies. The initial estimation is optimized in a loop with considering the technical evaluation criteria and the cost and time constraints. Evaluation criterions of the design are BER, EVM, ACI and PAE.