System Design and Performance Evaluation of High Altitude Platform: Link Budget and Power Budget

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***Abstract*—High altitude platform (HAP) is an emerging technology to cope with the increasing demand of multimedia applications, capacity and coverage of wireless service communication. The purpose of HAP is to provide broadband communication over wide area from a single node. Link budgeting, power system designing and planning for a 50 kg HAP has been presented. Moreover protocols for communicating with HAP are also investigated. The proposed link budget is based on simplex model over 31/28 GHz frequency band as this has been allocated by FCC as well as Frequency Allocation Board Pakistan for communication with HAPs. Power budget is presented for solar powered autonomous or unmanned airborne aircraft for line of sight (LOS) condition in the stratosphere at an altitude of 17 Km above ground level where air turbulence is nearly static and minimum cloud are present to maximize solar energy. Link budget with transmission power of 30 dBm using QPSK for varying code rates is proposed to minimize power consumption. The power system is designed for 10 hours of daylight and 14 hours of the night operation, direct energy transfer (DET) architecture is used with battery banks working at 80% depth of discharge (DOD). For communication, Digital Video Broadcasting protocol (DVB-S2) and Worldwide Interoperability for Microwave Access (WiMAX) 802.16e using QPSK modulation scheme are used. Number of simulations with varying code rates to minimize bit error rate, minimizing power consumption are carried out and results are presented. Results shows that DVB-S2 gives better performance with minimum signal energy which minimize power consumption.**

***Keyword*—High altitude platforms HAPs, Digital Video Broadcasting, Link budget, Power budget.**

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