

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Fixed and Broadcast Communications (2)

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DESIGN OF A CIVIL COMMUNICATION SYSTEM ON HIGH ALTITUDE PLATFORMS

Abstract

By the end of 2009, there are about 720 million mobile users in China, and more than 600 million users are GSM users. Meanwhile, there are about 700 thousand GSM base stations totally in China. So it is becoming important to keep a stable coverage of communication networks. But it is impossible to keep it with terrestrial base stations only, e.g. there are 4457 base stations deployed (China Mobile Co. only) in Sichuan earthquake in 2008 and there are more than 40 thousand of base stations deployed in the snow disaster in Feb, 2009 in Guizhou Province. In this paper, we design a supplement communication system via high altitude platforms(HAPs) for a GSM network system which is compatible with the terrestrial cellular networks, to support the civil users in a disaster relief and the recovery of the mobile network. Oestges ever presented a HAPs communication system with a maximum coverage of 500km diameter in 2001, but it needs the user terminal with a special design. CAPANINA project, which is funded by European Commission, presented a solution even supporting the broadband network, but the maximum coverage diameter with one airship is only 60km, and it is designed to support the IEEE 802 series protocol for the broadband network. Our system is designed to harmonize with the GSM communication system and supports the normal mobile telephone. The frequency resource reuse is discussed, and the multi-beam antenna is adopted, which is mature for our satellite communication system. Four sceneries are analyzed in detail, i.e. 30/130km, 10/130km, 10/50km, and 5/50km (beam diameter/coverage diameter). Both the uplinks and the downlinks are simulated, the user capacity of the system is calculated. It shows that the maximum coverage diameter with one airship operating in the stratosphere at the altitudes of 20km is 130km, the maximum real time voice links (with a data rate of 12kbps) is about 12000 links. The 5/50km scenery is suitable for a user dense area, e.g. a city area, and the 10/130km scenery is suitable for a suburban area. The HAPs communication system can be fulfilled based on the design result.