Commission C: Signals & systems

MULTIMEDIA WIRELESS COMMUNICATION SYSTEMS AT MULTI-WAVELENGTHS PERTAINING TO INFORMATION TECHNOLOGY

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ABSTRACT:

With the successful implementation and commercially viable of DVB(digital video broadcasting) technology over satellite path , the authors aims to implement this DVB technology to their fixed multimedia wireless communication system operating at 60, 30 & 11 GHz and later on to a mobile computing unit to be operational at around 900 MHz carrier frequency. This system is devoted to the simultaneous propagation study on all of these frequencies. This will also be useful in studying various atmospheric effects on radio communications, in adopting suitable modulation techniques etc. on the basis of which a successful wireless system can be designed.

INTRODUCTION

Scientist and technologists all over the world are now thinking of using wireless path as their communication media which can provide the user real mobility. Current global system for mobile communication (GSM) and other digital cellular technologies have been very successful in providing untethered communications and wireless access to the public switched telephone network which has been growing at rates of 30-50% per year. The rapid growth of the Internet and the increasing use of portable computing devices suggest that wireless Internet access will grow to be a large market. Additionally, high performance satellite based DVB (Digital Video Broadcasting) services are already in operation. Therefore, Multimedia wireless system development should have a very bright future. Accordingly best talents are engaged in this challenging effort of implementing total wireless solutions from user handheld unit to access points to backbone networks. They are also thinking of implementing interactive multimedia mobile communication, which will enable the user to enter into a global information superhighway.
The above implementation of global superhighway will be successful only through proper wireless modeling, which in turn requires extensive radio wave propagation studies over years for different localities and climatic conditions.

EXPERIMENTAL SET-UP

The above background information motivates the authors to develop total wireless solution for multimedia wireless communication. The schematic of the system is as shown in the fig1.
There are 4 cells namely cell1, cell2, cell3 and cell4 where each cell is defined as the geographical area of typically 100 meter over which a wireless communication is to be established between a mobile user and a fixed Base station. Cell 1 and cell 2 are the two neighboring cells whereas cell3 and cell4 are another two remote neighboring cells. The four base stations are placed at the center of each cell. All the four Base stations have their wireless connectivity with their respective wireless mobile handsets using the carrier frequency of 900 MHz (f1), 900 MHz + 200 KHz (f2), 900 MHz +400 KHz (f3) and 900 MHz + 600 KHz (f4). The two neighboring base stations are connected by an MSC (Master Switching Center). So to have a total integrity among the four base stations two MSC namely MSC1 and MSC2 are required. As shown in fig.1 MSC1 connects cell1 and cell2 whereas MSC2 connects cell3 and cell4 through wired networks.

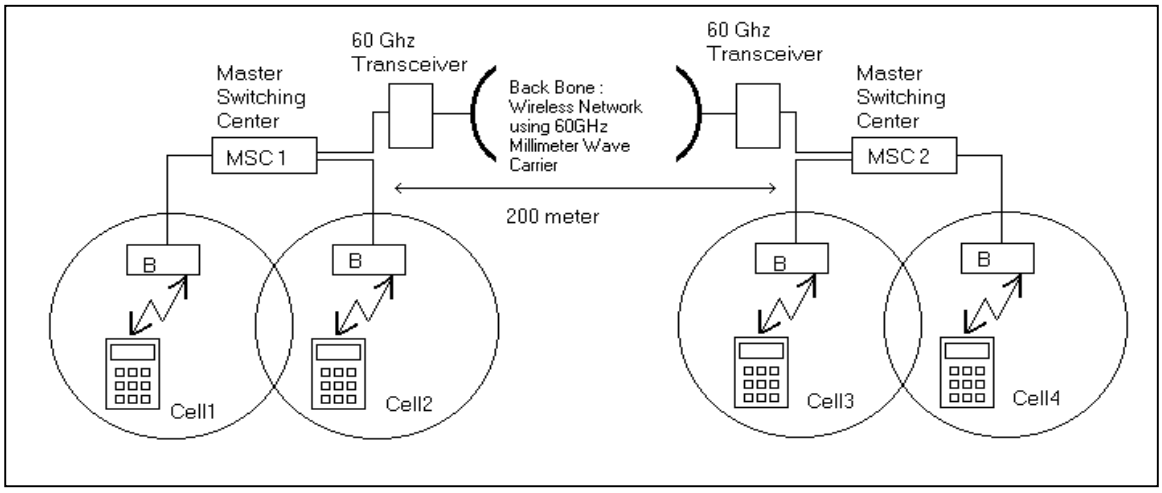

Fig. 1: The schematics of the multimedia wireless system

Each MSC is physically separated by a distance of around 200m and is linked with the wireless network using millimeter wave carrier. Thus the total system is providing full duplex communication with higher data rate of 2 MBPS approximately, for which 60GHz and 30GHz are the forward path and reverse path frequencies. Additionally another 11GHz system is kept as a redundant channel.

The QPSK modulation technique has been adopted in the transmitter unit in order to achieve such higher data rate of 2 MBPS. To establish multimedia communication the PC has been utilized as the sources of audio, video and data. The quality of the video should be as good as DVB (Digital Video Broadcasting) channels and to achieve this an MPEG2 encoder card has been fitted inside the PC. This is shown as in the fig2.

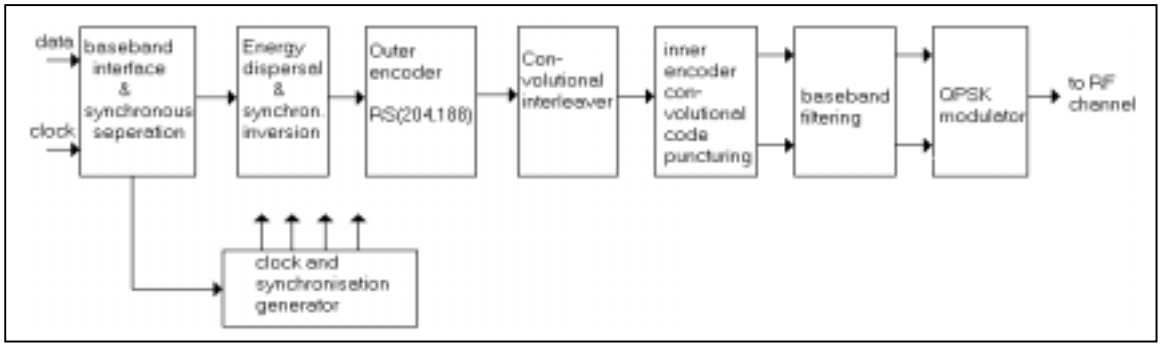

Fig.2: Block diagram of signal processing at the transmitting end

In order to revert back the original transmitted multimedia based data the QPSK demodulation has been adopted. The schematics of the receiver unit is as shown in the fig.3.

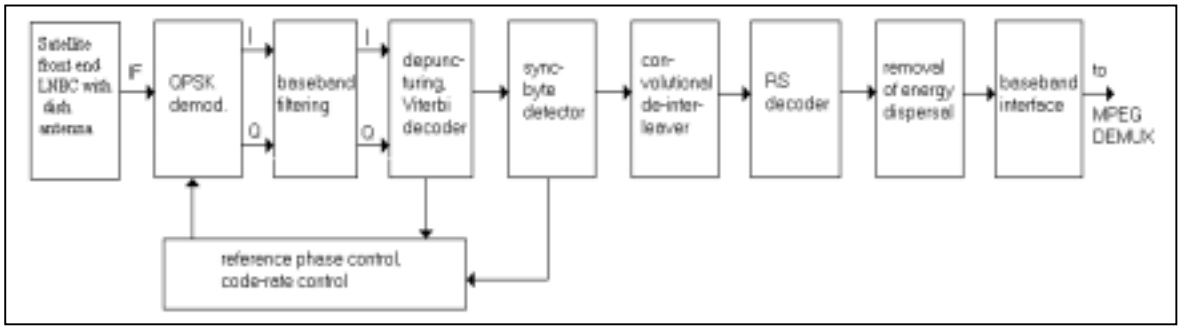

Fig. 3: Block diagram of signal processing at the receiving end

RESULTS

A multimedia wireless link has been established all over the four cells using 900 MHz, 11GHZ, 30GHz and 60GHz as different carrier frequencies. To avoid interference Spread Spectrum Technology has been utilized at 900 MHz only.

DISCUSSION & CONCLUSIONS

The above communication system is devoted to the propagation study on multimedia signal [1] and ultimately it will highlight the propagation effect on each of the multiple simultaneous frequencies e.g. 60GHz, 30GHz, 11GHz and 900MHz. Both carrier level and signal level spatial and temporal variations will be recorded and analyzed over the year and suitable modulation techniques would be suggested accordingly.
The same will be useful in studying the following atmospheric effects on radio communications:

1. Simultaneous rain attenuation at 60GHz, 30GHz, 11GHz and 900MHz.
2. Rain induced scattering effects on signals.
3. Multi path effect due to obstruction of radio path by buildings and other man made structures in urban area.
4. Bit error rate performance evaluation on actual data.

Statistical variation will be estimated over the measured data and outage percentage will be computed. Such data based study will enrich the authors to design the wireless system for a particular location.

REFERENCES

[1]. S. R. Saunders," Antennas and Propagation for wireless communication systems", published by John Wiley & Sons, Ltd.,1999.