

EARTH OBSERVATION SYMPOSIUM (B1)  
Earth Observation Data Management Systems (4)

Author: Mrs. Fitri Dewi Jaswar  
Astronautic Technology SDN BHD, Malaysia, 9w2fdj@gmail.com

Mr. Mohd Fadhil Sayuti  
Astronautic Technology SDN BHD, Malaysia, fadhil@atsb.my  
Dr. Ahmad Sabirin Arshad  
Astronautic Technology SDN BHD, Malaysia, sabirin@atsb.my

## HIGH DATA RATE MODULATOR IN 8GHZ SATELLITE TRANSMISSION SYSTEM

**Abstract**

Abstract— The recent proliferation of communication subsystem has increased critical problem which is the lack of available frequency spectrum. Due to this problem, bandwidth efficient modulation technique is introduced to maximize the use of available spectrum. Multi Phase Shift Keying is one solution to overcome this problem while maintaining the power efficiency. This technique is developed for high data rate transmission. High speed data rate is required for transmitting image data from payload to the ground segment. The operating frequency for image downlink is X-band, based on ITU regulation. This development is conducted by Astronautic Technology (M) Sdn Bhd and known as X band Transmission System (XTS). Mission study on the effectiveness of high data rate and the amount of image data could be downloading due to environment and satellite pass duration is also discussed. The digital hardware implementation is adopted in the baseband modulator development to provide flexibility. The flexibility and high data rate requirement challenge the designer to produce a reliable and robust system. Phase noise effect is the major factor that gives impact to the Error Vector Magnitude (EVM) performance. Multi PSK modulation techniques are also facing phase ambiguity problems. Alternative modulation such as OQPSK modulation technique, not only reduces the ambiguity problems but also reduce the power consumption requirement. Higher data rate is also achievable by using 8-PSK modulation technique with higher sensitivity to phase noise. In this development, power consumption for modulator is almost 10W and components reduction is needed. Excellent results is achieved in the XTS development where multi phase shift keying (QPSK & OQPSK) modulation with data rate 100Mbps at 10W RF output power produced EVM only 12%.