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DEVELOPMENT OF RELIABLE AND EFFICIENT GROUND SEGMENT FOR  
PICOSATELLITE-AGRICULTURE TECHNOLOGY: A CASE STUDY OF SPACEIN SDN BHD**Abstract**

The use of satellite technology in agriculture has gained significant attention in recent years. With the growing population and demand for food, it is crucial to increase agricultural productivity and efficiency. SpaceIn Sdn Bhd is a picosatellite manufacturing company that focuses on tackling the monitoring issues of agriculture in remote areas. In addition to developing a pocket-size satellite known as SpaceANT, SpaceIn Sdn Bhd is also developing a Ground Segment consisting of Ground Sensor Terminals (GST) and Ground Stations (GS), which is essential in utilizing satellite agriculture technology in completing the store and forward system cycle. The main objective of this development is to design and develop a reliable and efficient GS and GST system to enhance the communication link between the ground and satellite. The GST collects and transmits data from soil sensors while the GS communicates, sends commands to the satellites, and received the GST data collected by the PQ. The development includes a detailed GS and GST hardware components analysis, software development, test environment specification, and performance evaluation. The collected data is used for environmental monitoring applications in agriculture and farms. The Ground Segment development includes five sets of GST with Quadrifilar helix antennas distributed around Malaysia. The GS includes cross-yagi antennas, radio frequency equipment, and a controlled rotator to track and manage the antenna's azimuth and elevation. The system uses Gaussian Frequency Shift Keying(GFSK) and LoRa modulation of the RFM96W radio frequency module and Software-Defined Radio (SDR) to establish two-way communication with the Pocketqube satellite. The GS and GST system is designed to meet the functional and non-functional requirements of the satellite communication system. The GS and GST system provides a reliable and efficient communication link between the satellite and ground, enabling seamless data transfer between the entities. This design and development of the Ground Segments will contribute to advancing the satellite communication system and provide a foundation for future research in this field. Integrating satellite technology and ground sensor networks can significantly enhance agriculture productivity and environmental sustainability.