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PRELIMINARY DESIGN AND GROUND VERIFICATION OF X-BAND SAR SYSTEM FOR SMALL
SATELLITE APPLICATION**Abstract**

Synthetic Aperture Radars(SARs) have a merit of being able to observe a target regardless of rain, clouds, and night. This characteristic makes the SAR a notable instrument for space observation compared to optical sensors. The SAR sensors for space applications were usually confined to large or medium size satellite because of the need for active antenna and high power in the past. So Only large size satellites with hundreds kilogram can mount SAR sensors, These days, the technological advances and increase of concerns for SAR image is leading to the development of high performance and low-cost SAR attached to small satellite. The Satellite Technology Research Center (SaTReC) at the Korea Advanced Institute of Science and Technology (KAIST) is designing a SAR system based on the next generation small satellite (NEXTSat) standard platform having a weight of 100kg class. On the basis of the rich development experience with many satellites and space core technologies, it is possible to design miniaturized SAR system which offers an good performance for price. The key parameters of the SAR system being developed by SaTRec are as follows. - X-band frequency - Antenna for small satellite - Size/weight - High agility/pointing accuracy - Various imaging modes: - Power and data management - good balance of resolution, transmitted peak power, duty cycle and noise equivalent radar cross section and so on. The SaTReC developed AutoSAR(Automotive Synthetic Aperture Radar) system as a precedent study for development of SAR payload, The key features of the AutoSAR system are as follows - Frequency : X-band - Resolution : $\pm 1\text{m}$ - Chirp Bandwidth : 300Mhz - Power Amplifier : 10W peak. - Chirp pulse duration : 2us - 10us - PRF : 1Khz - 5Khz - Duty Cycle ± 15 - Sampling Rate : 800Mbps - ADC Quantization Bit : 12bits - Vehicle Velocity : $\pm 80\text{km/h}$ - Antenna Gain : $\pm 20\text{dB}$ We, SaTReC acquired AutoSAR raw data through a field validation test and processed SAR image. The AutoSAR system is expected to have operational flexibility and can be used for a variety of small satellite applications