<u>19th International Workshop on Laser Ranging, Oct.27-31, 2014 Annapolis, MD, USA</u></u>





Range Gate Generator with Pulse Position Modulation Capability

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Abstract

NICT has been in development of an optical communication integrated to the satellite laser ranging by using the fiber (optical communication)



technology in a ground network. It aims to integrate Fig.1 Picture of RGG (upper unit) the technology of the optical communications, the quantum detector and time frequency, and laser - - × RGGDiag(311.04MHz) Rel 1.60 ranging, and serves as an element of the Gate Generation PPM Parameter RGG Mode Parameter fundamental ground station which supports various Mode memory 💌 demands in the future satellite missions. Pulse N(Rate) M(Slot) Position Modulation (PPM) has been considered as 1060.96 Tinterval 256 Frame byte one of optimal modulation for super long distance Frame/SLR SLR-Period 1100662 communication channel under power limit condition SLR-Frequency 908.5 Hz since 1980s, and implementation have been Set undertaken on the space mission and ground station. Fig.2 GUI of RGG control software A high rate PPM communication and ranging was examined by NASA and ESA have succeeded in the Range Gate Generator PPM option up-link and down-link experiment between the moon Manual Time Set Switch LCD Display YY.DDD.HH.MM.SS YY.DDD.HH.MM.SS and the earth by up to about 600 Mbps. This paper I/F Card Reference Clock T1, T2, T3, T4 T5, T6, G1, G2 10MHz describes the design of one of key element device, a 10MHz->311.04MHz Switch / LCD I/F 1PPSout x 3 1PPS PLL/VCO Signal Buffer 0MHzout x 3 MHzout x 2 range gate generator (RGG) which enhanced provide FMC HPC/LPC Connector with PPM function to control pulsed laser as well as SD flash Card DDR3 Memory Ether Hub gate pulse. The RGG run up to 1 MHz PPM rate and PL (Programmable Logic) XC7Z045 FPGA generate 1/N times (N~1000 for example) gate to Laser Sequencer (VHDL) 10/100M 設定値 予測値更新 receive kHz SLR operation. We successfully transmit JSB Storage PS (Processing System) USB2.0 USB Serial ARM Cortex-A9 CPU / PetaLinux PRN15 to confirm error free by a PPM receiver(配信データ USB JTAG capable up to ~200Mbps) and obtain simulated SLR 16MB x2 **QSPI** Flash DDR3 Memory returns in a one of laboratory set up using optical 評価ボード(ZC706) fiber and delay line. Fig.3 Block diagram of RGG Fig.4 Block diagram of the System Table 1Major Specification OUT PPM Transmitter and Ranging station Telescope PD EDFA WDM **Specification** Item Space Interface Main-AMP Coppler Switch Optics External 10 MHz, 1pps(UTC) **Reference Freq.** To TIA N PD 折り返しん2 Beacon λ_1 PRF 1Hz – 1MHz Ranging Start PPM Target Mode -Fixed or Laser Disc. Transmitter -Moving up to 40,000,000km Optical/Timing λ3 LK (fo/N) RGG/ET System DATA Two way Cryostat SSPD



