3159

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 the technology of the optical communications, the quantum detector and time frequency, and laser ranging, and serves as an element of the fundamental ground station which supports various demands in the future satellite missions. Pulse Position Modulation (PPM) has been considered as one of optimal modulation for super long distance communication channel under power limit condition since 1980s, and implementation have been undertaken on the space mission and ground station. A high rate PPM communication and ranging was examined by NASA and ESA have succeeded in the up-link and down-link experiment between the moon and the earth by up to about 600 Mbps. This paper describes the design of one of key element device, a range gate generator (RGG) which enhanced provide with PPM function to control pulsed laser as well as gate pulse. The RGG run up to 1 MHz PPM rate and generate 1/N times (N~1000 for example) gate to receive kHz SLR operation. We successfully transmit PRN15 to confirm error free by a PPM receiver(capable up to ~200Mbps) and obtain simulated SLR returns in a one of laboratory set up using optical fiber and delay line.

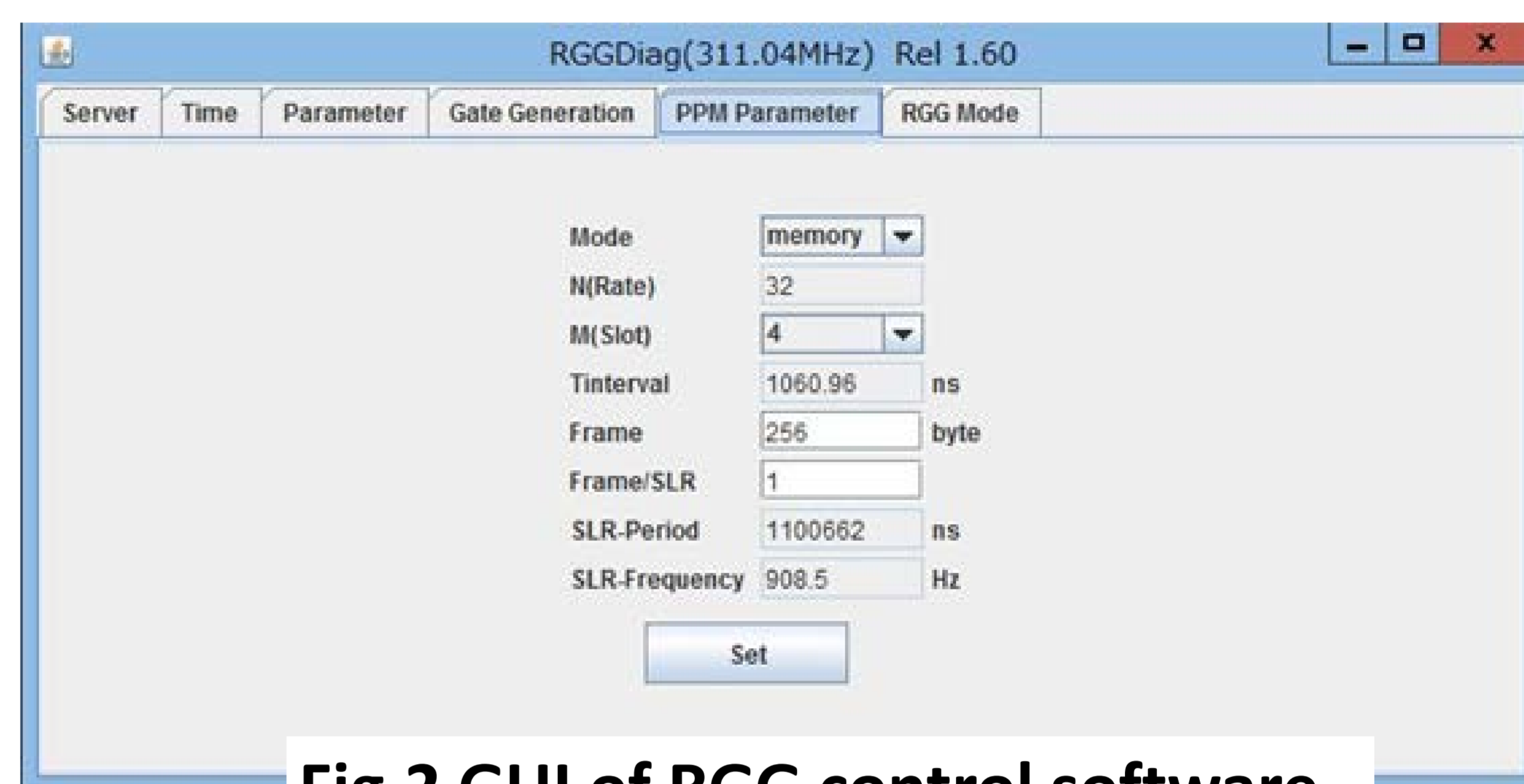**Fig.1 Picture of RGG (upper unit)**
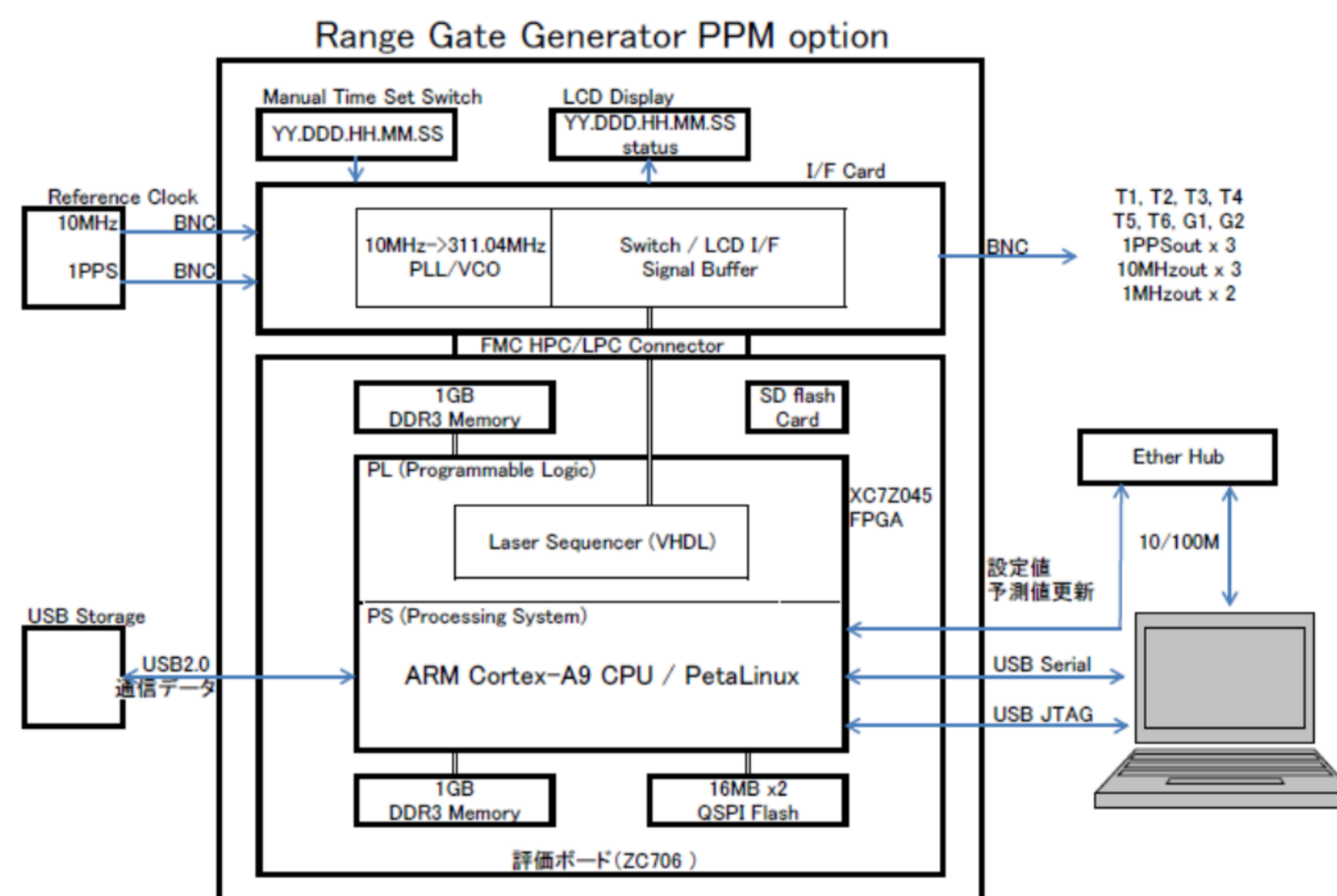

Fig.2 GUI of RGG control software

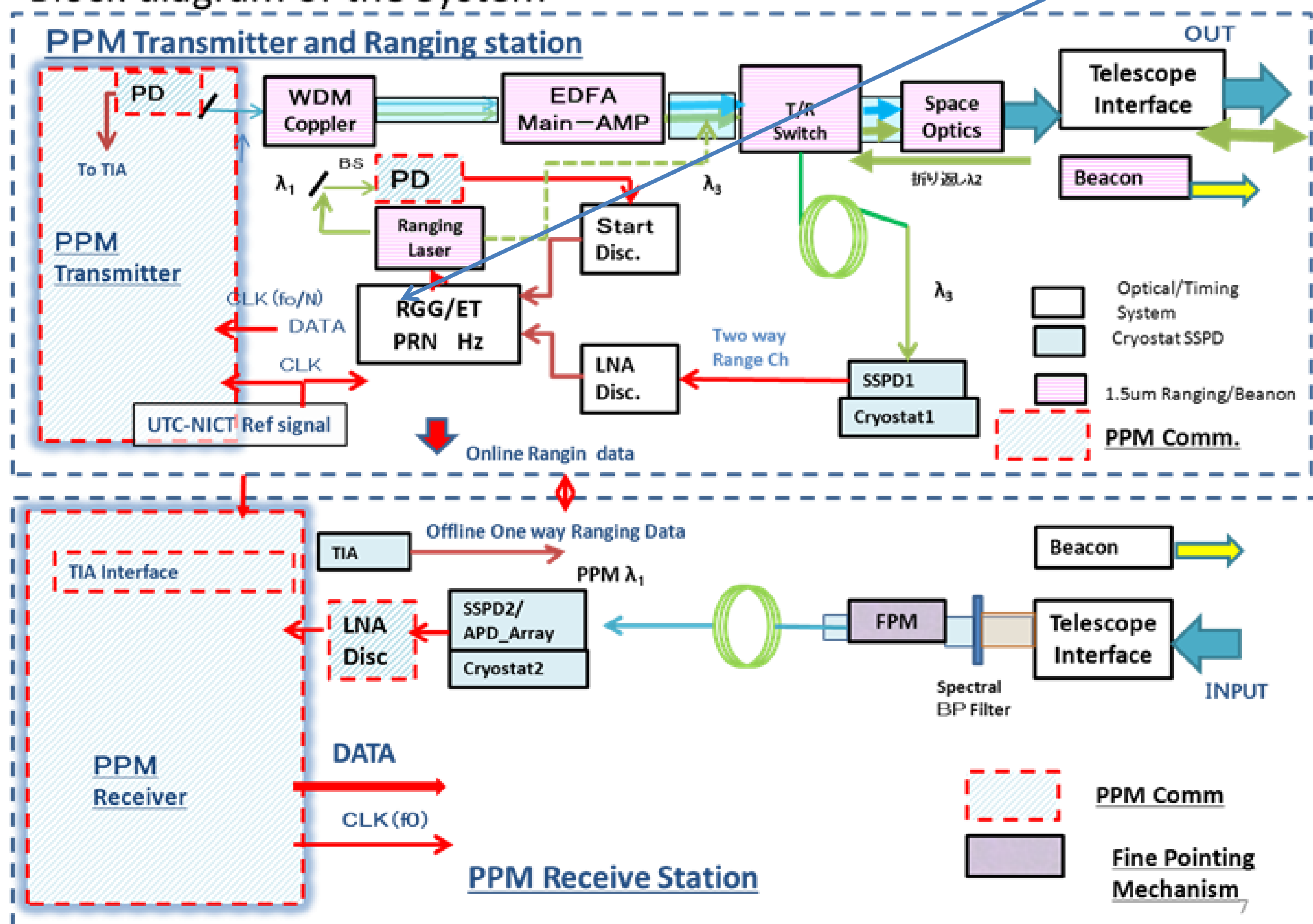**Fig.3 Block diagram of RGG**

Fig.4
Block diagram of the System

Table 1 Major Specification

Item	Specification
Reference Freq.	External 10 MHz,1pps(UTC)
PRF	1Hz－1MHz
Target Mode	-Fixed or -Moving up to 40,000,000km
Operation Mode	-SLR mode -PPM mode M=2-256 SLOT RATE 311.04MHz PPM rate= 1MHz 1 frame=8-256 Byte PsudoRondomNoise15degree Or User Supplied Data -PPM in SLR mode
UTC sync. Mode	-sync at station clock -sync at target (SLR mode only)
Collision Avoidance	Each shot shift fire timing falls in collision band