

## IMPROVEMENTS OF LINAC FOR PICOSECOND SINGLE ELECTRON PULSE

Hitoshi Kobayashi, Toru Ueda, Toshiaki Kobayashi,  
Seiichi Tagawa and Yoneho Tabata

Nuclear Engineering Research Lab., Faculty of Engineering  
Univ. of Tokyo, Shirakata Shirane 2-22, Tokai-mura  
Ibaraki, 319-11, Japan

### Abstract

A 35 MeV S-band linac with capability of producing a picosecond single electron pulse ( $< 18$  ps,  $\sim 100$  amp. peak) is available to compose a picosecond pulse radiolysis system.<sup>1)</sup> After the installation,<sup>2)</sup> some improvements of the linac have been carried out.<sup>3)</sup> Improvements of the synchronization circuit and of the master oscillator of microwave have increased the stability of the picosecond single electron pulse considerably. The next program is to increase the intensity of the output beam. For that purpose, electron guns suitable for high speed pulse beam are being developed. Improvement of the focusing system of injector will be also tried.

### Synchronization Circuit

Microwave frequency of 119 MHz was used for the synchronization circuit in the original design. Microwave frequency of 476 MHz is used in the new circuit, and all of this circuit is constructed using the Motorola MC-1600 series logic modules.<sup>4)</sup> The time jitter of the synchronized pulse output is  $< \pm 5$  ps. The time scheme of this circuit is shown in Fig.1. The time jitter of measuring system has been reduced in a factor of 3 compared with the previous value. Cerenkov light accompanied with output beams was measured by a streak camera (Hamamatsu T.V). A single shot pulse, and an accumulated averaged signal obtained by memorizing 100 shots repeatedly are shown in Fig.2.

### Electron Gun

In the case of S-band linac, allowable width (F.W.H.M.) of the injected beam from an electron gun is 0.8 ns. The program of increasing the intensity of output beam has started. At first the improvement of the grid modulator of an electron gun has been done. The output pulse of the previous grid modulator (original) had the half width of 2.4 ns. An oscilloscope trace of output pulse gained by the improved one is shown in Fig.3. The half width is 1.6 ns. But the intensity of the output beam didn't increase as expected. Because the frequency response of the electron gun is not so good. Two different types of electron guns which have good frequency response are now being developed. One has a barium impregnated cathode (NJRC) and the other has a oxide cathode (Toshiba). They are now being improved using a test bench.

### Master Oscillator

The microwave frequency of 119 MHz was fundamental frequency and the stability of frequency was not so good ( $\sim 10^{-5}$ ). As a synchronization circuit is now available for 476 MHz, the master oscillator system has been changed from 119 MHz to 476 MHz. In the new master oscillator system, the very stable synthesizer (ANRITSU MG545 B) is used and the stability is  $3 \times 10^{-8}$  /day.

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Reference

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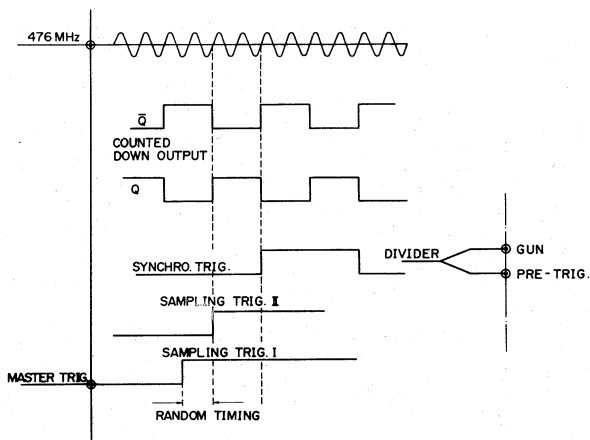


Fig.1 Time scheme of synchronization circuit

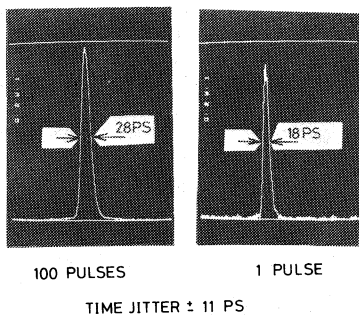


Fig.2 Streak camera trace of output beams

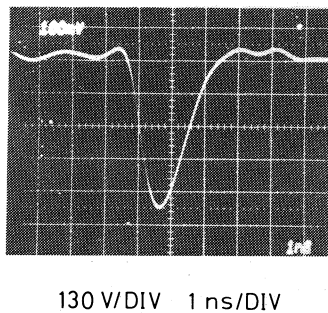


Fig.3 Oscilloscope trace of grid modulator