TIMING BETWEEN BEAM AND RF

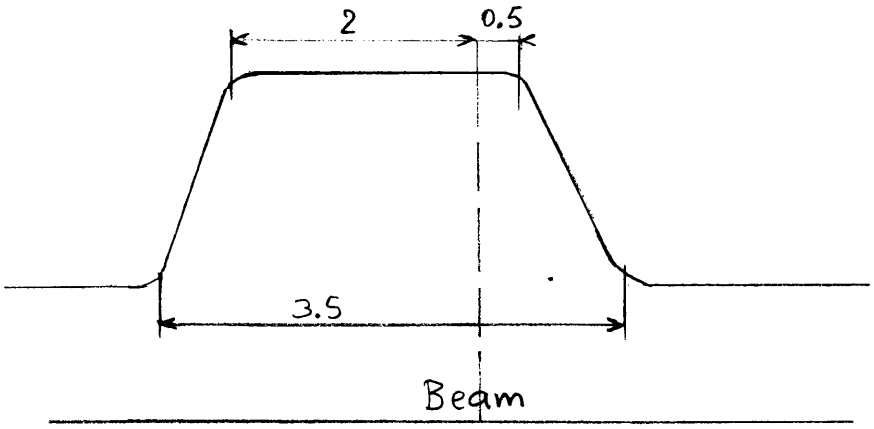
B. Canard, L. Rinolfi

INTRODUCTION

Measurements were made on 1st June 1989. Signal ECMO1 (Electron Current Monitor) was used as a reference for the beam. It is placed just after the gun and the distance between this monitor and each coupleur, giving the signal PSI, is very well known[1].

PULSE LENGTH

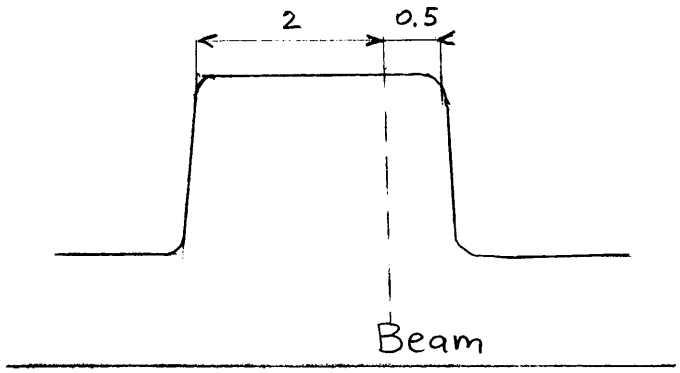
For cavities without LIPS (25, 35) the minimum filling time is 1.35 μs. A margin of 0.5 μs is taken after the beam has passed. In order to have some margin and keep the component lifetime reasonable, the RF pulse in the cavity should be 2 μs before the beam is passing.



(in μs)

Fig. 1

For the prebuncher and the buncher the minimum filling time is 1.6 μs. For the same reasons, the RF pulse is adjusted as below



(in μs)

Fig. 2

2 This klystron is equipped with a pin switch system to decrease the pulse length and reduce the reflected power in the buncher.

For cavities with LIPS (13, 27, 31), the optimum [2)] for a maximum energy gain is obtained for a filling time as shown in Fig. 3.

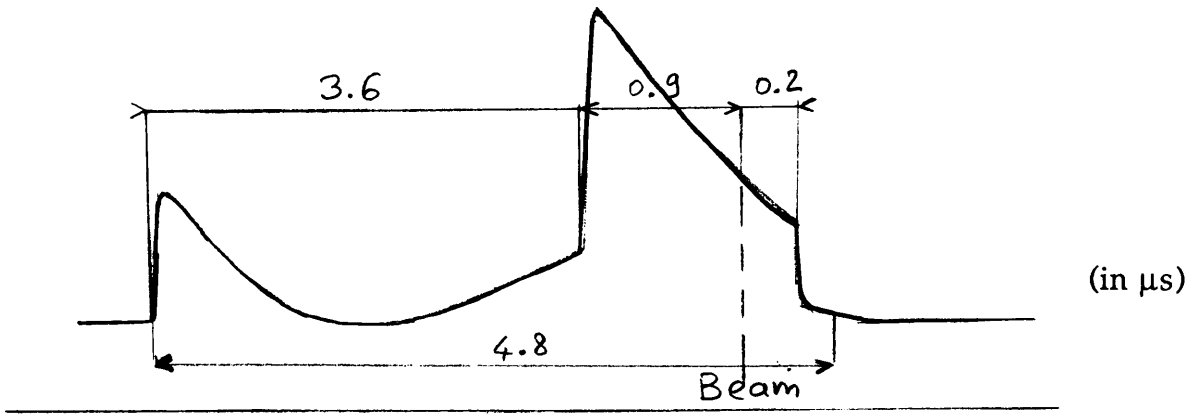


Fig. 3

In order to define properly the pulse length, a pin switch system has been mounted on the corresponding klystrons.

PRINCIPLE OF THE MEASUREMENT

Four signal are observed simultaneously with a trigger VX.DMDK which arrives roughly 6 μs before the beam. It counts 29900 RF periods of 52 ns and acts as a stable trigger relative to the beam.

The signal from the ECM is always set at the middle of the photograph.

All the signal used have a known delay of 600 ± 20 ns between the source and the patch panel RA023 in the local control room.

Each photograph presents the same sequence :

trace 1 : booster klystron pulse

trace 2 : ECM signal (Beam)

trace 3 : PPI for each klystron

trace 4 : PKI or PSI

CONCLUSION

The following adjustments were made to meet the pulse length requirements:

1) Start booster pulse length 0.5 μs early in order to provide the 3.6 μs of filling time for LIPS 13 before beam is passing

2) klystron 03 : OK

3) klystron 13 : start 0.4 μs early the RF pulse

4) klystron 25 : start 1.5 μs early the RF pulse

5) klystron 27 : should be observed

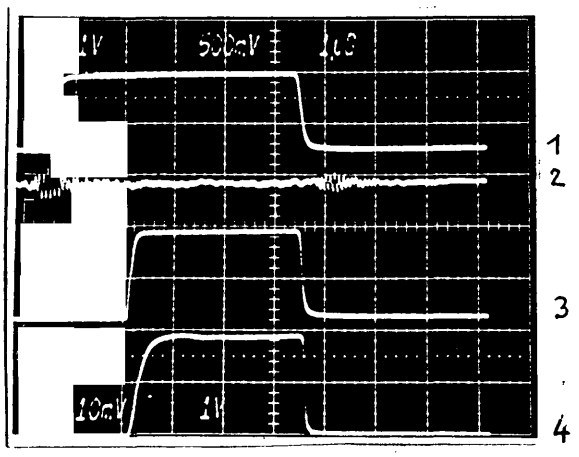
6) klystron 31 : start 1 μs early the RF pulse and start the phase inversion late by 0.4 μs

7) klystron 35 : OK.

References

1) A. Bellanger et al, PS/LPI Note 86-39

2) R. Bossart et al, PS/LP Note 89-08.



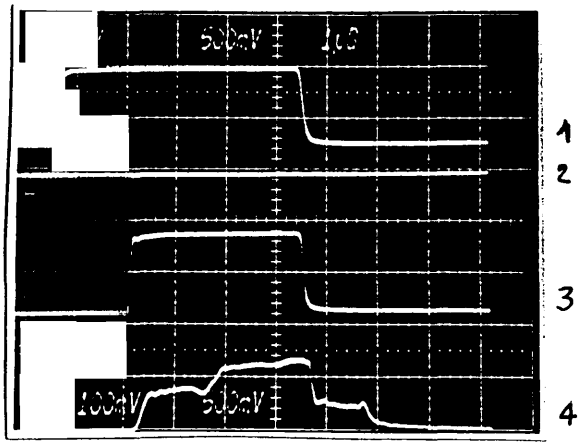
① Booster klystron 1 V/ div

② ECM 10mV/div

③ PPi 03 500mV/div

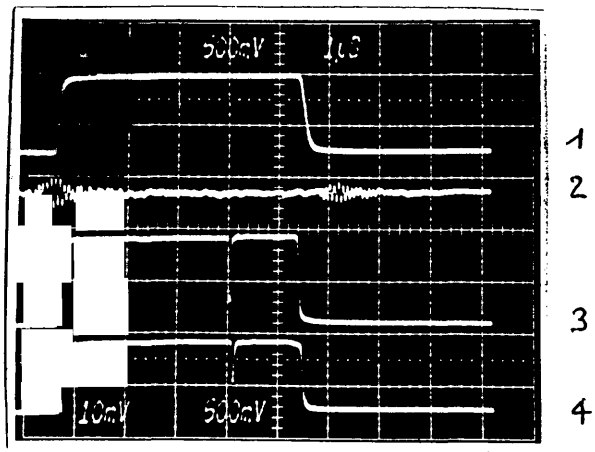
④ PKi 03 1V/div

1 µs/div



② ECM 100 mV/div

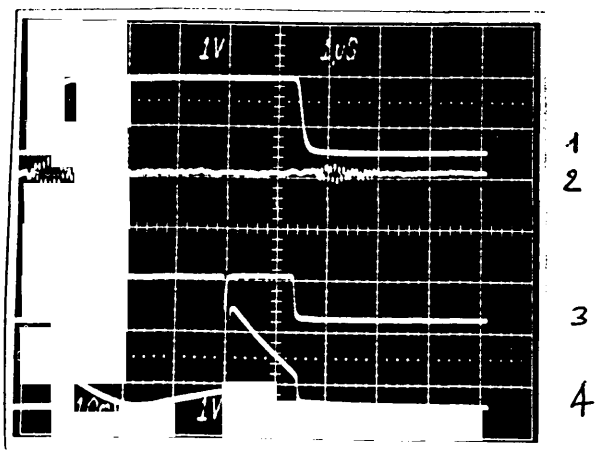
④ LBNV 500 mV/div



② ECM 10 mV/div

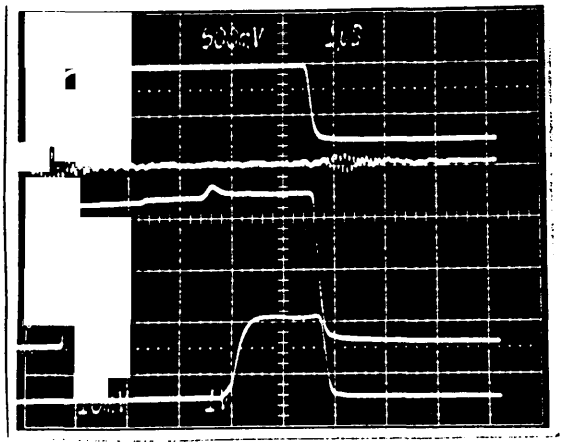
③ PPi 13 500 mV/div

④ PKi 13 500 mV/div



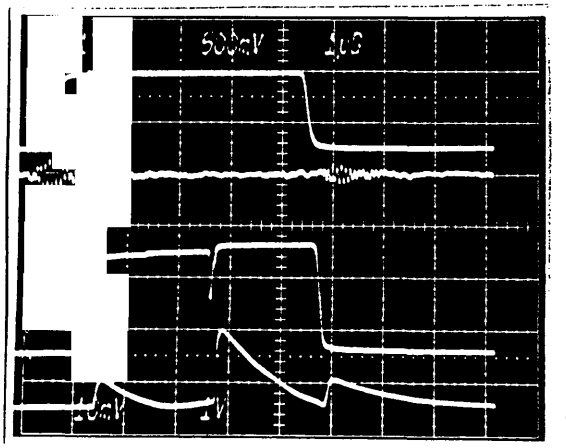
③ PPi 13 1V/div

④ PSi 13 - 1 1V/div



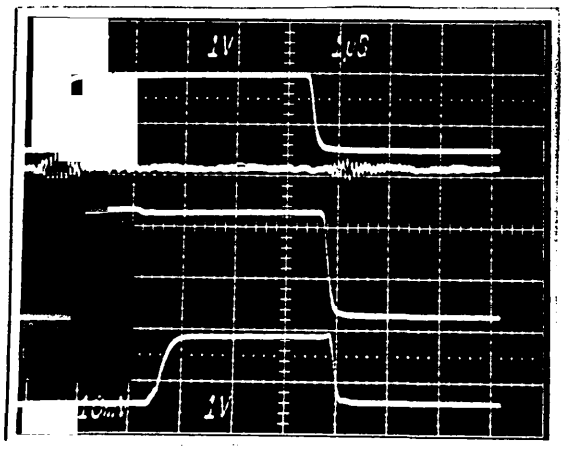
① Booster klystron 1 V/div
② ECM 10 mV/div
③ PPi 25 500 mV/div
④ PSi 25-1 1 V/div

Klystron 27 not available



③ PPi 31 500 mV/div
④ PSi 31-1 1 V/div

(The phase inversion timing was readjusted later on)



③ PPi 35 1 V/div
④ PSi 35-1 1 V/div