

DAΦNE TECHNICAL NOTE

INFN - LNF, Accelerator Division

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Note: **CD-1**

DAΦNE TIMING

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Choice levels and operations:

PARTICLE TYPE (e^+ , e^-)

BUNCH (1-120)

OPERATION PROCEDURE

The first choice level (e^+ , e^-), sets:

- a) Positron converter, gun current, flux concentrator
- b) Linac phase, RF power
- c) Transfer lines
- d) Pulsed magnet and spectrometer polarity
- f) Injection-extraction kicker power supplies
- g) Inflector and kickers on the right ring.

The second choice level (# bunch) sets:

- a) the relative phase between Damping Ring (DR) RF and DAΦNE RF
- b) the trigger.

The third level sets operation procedure, this is an ensemble of the machine states:

- 0) Stand by
- 1) Injection in DR
- 2) Extraction DR + injection DAΦNE
- 3) Linac beam on the spectrometer
- 4) Linac on Beam Test Facility (BTF).

The triggered pulsed elements for each operation are:

- 0) Gun
- 1) Gun, Modulators, DR kickers
- 2) DR Kickers, transfer line pulsed magnet (DHPTT01, DHPTT02), spectrometer pulse magnet (DHPTS01), DAΦNE Kickers
- 3) Pulsed magnets HV OFF
- 4) Gun, Modulators, DHPTS01
- 5) Gun, Modulators.

Triggered elements list:

- a) Gun
- b) Modulators
- c) DHPTS01
- d) BTF
- e) Kickers DR
- f) DR Diagnostics
- g) DHPTT01, DHPTT02
- h) DAΦNE inflectors
- i) DAΦNE kickers
- l) DAΦNE diagnostics
- m) DAΦNE Feed-back
- n) Experiments.

*Trigger features:*repetition rate:

- | | |
|----------------|------------|
| a), b), d), e) | 50 pps |
| c), g), h), i) | 1÷5 pps |
| f), l), m), n) | High freq. |

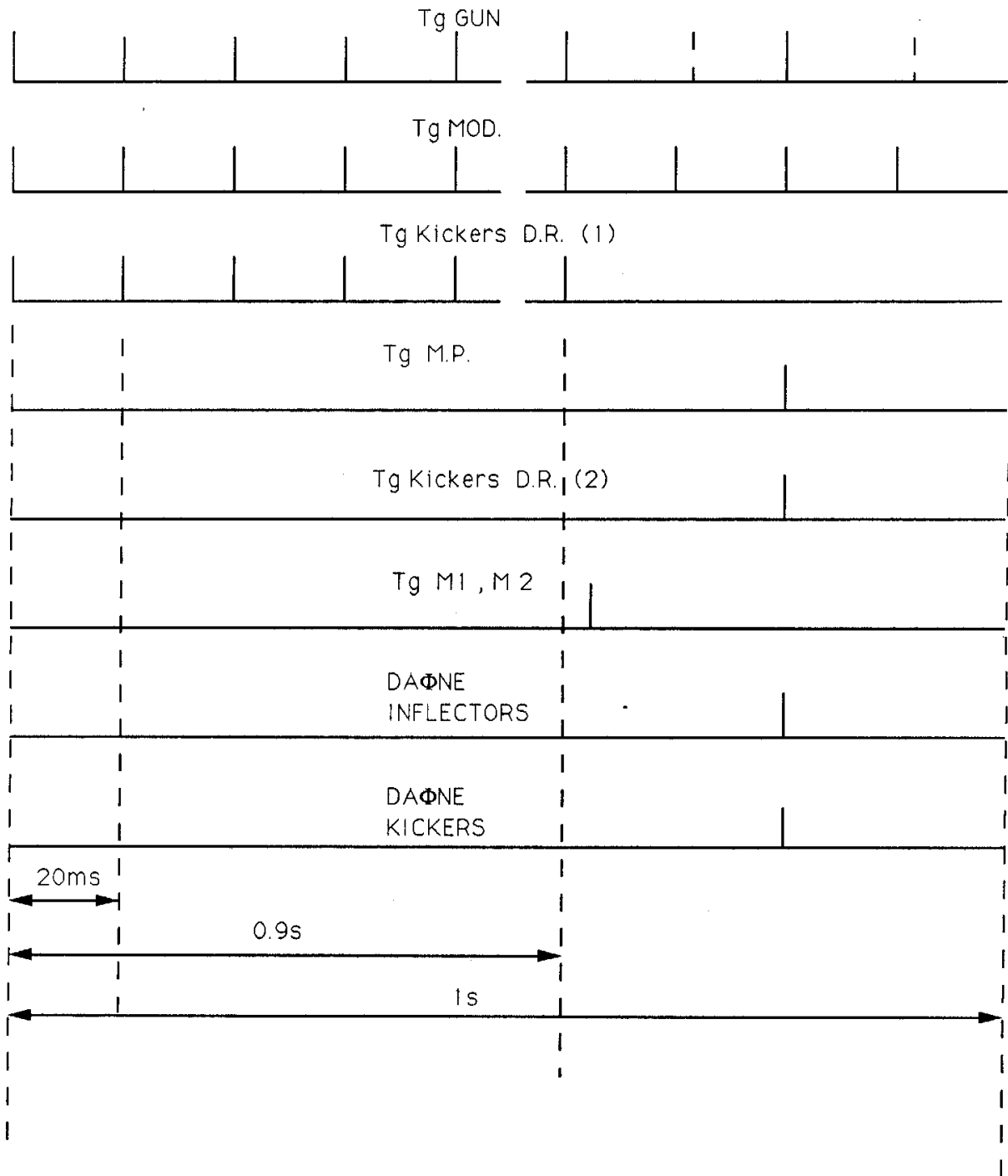
Trigger stabilities:

- | | |
|----------------|------------|
| f), l), m), n) | < 100 psec |
| a), b), e), i) | < 1 nsec |
| c), g), h) | < 1 μsec |

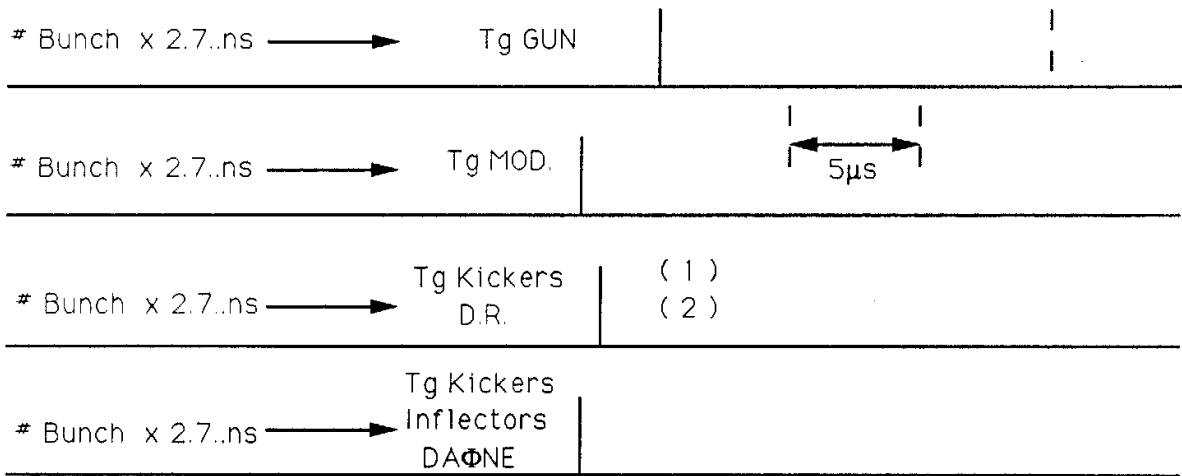
Requirements:

- The DR and DAFNE RF must be synchronized one respect to the other better than 100 psec.
- All the pulsed magnets and gun triggers must be synchronized with the 50 Hz and DAΦNE RF.
- The spectrometer pulsed magnet must be triggered at the same time of the extraction from the DR, to avoid the beam goes back in the Linac if DHPTT02 doesn't work well.
- Each kicker ensemble (DR, DAΦNE e⁺ and e⁻) needs one trigger pulse and four programmable delay to synchronize the kicker pulses one respect to the other and respect the beam crossing.
- All the pulsed elements need local trigger for maintenance etc.
- The Linac has a complete timing system; it permit to work at 50 Hz with an internal or external clock. For the operation it is necessary to insert on the gun and modulators low power line a delay or an inhibit.

a



b



SHIFT D.R. RADIO FREQUENCY 2.7 ns x # Bunch

All the elements for electron bunches injection must be delayed ~ 110 ns because the transport line e+ is ~ 30.5 m longer.

c

