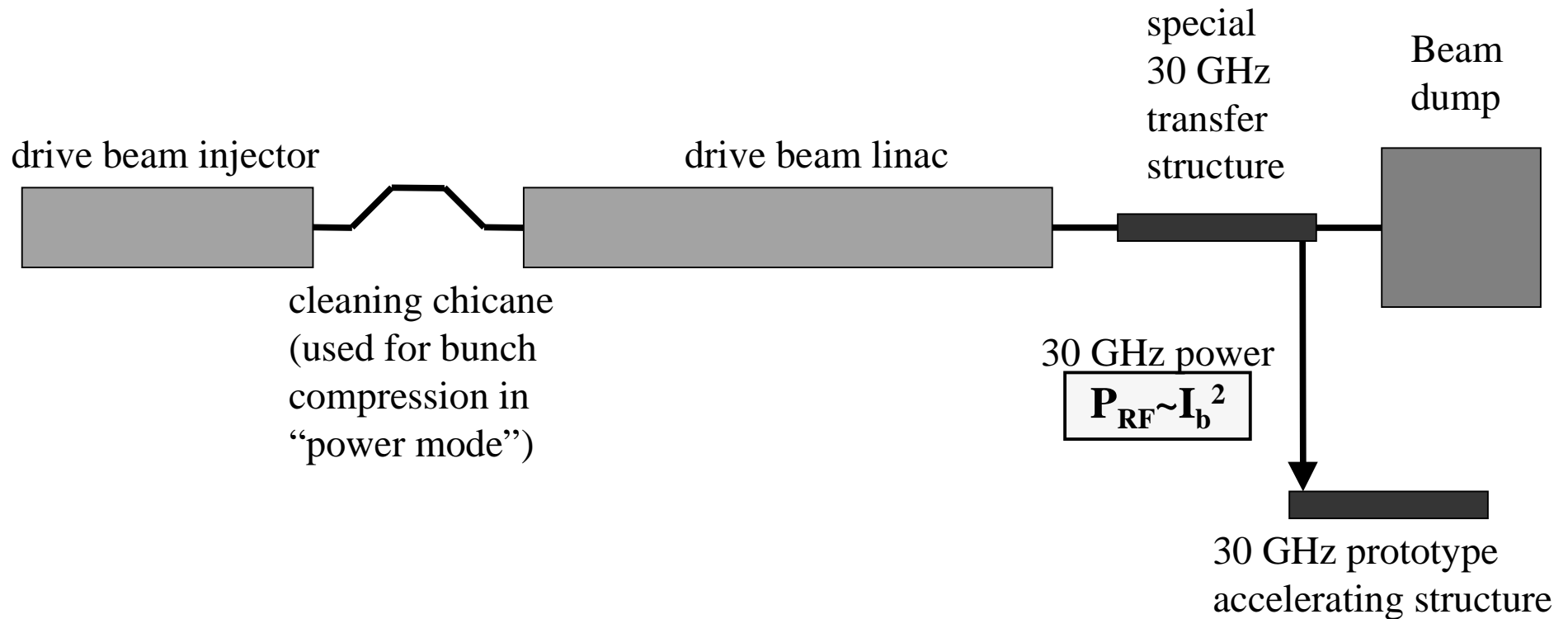


**HIGHER CURRENT AND HIGHER REPETITION RATE:
WHAT WOULD BE THE CONSEQUENCES
ON THE CTF3 INJECTOR ?**

H. Braun

CTF3 power mode vs. nominal parameters

	3 GHz power / structure	pulse length	beam current	charge / pulse	bunch frequency	bunch charge	rep. rate	mean current	beam energy
initial	30 MW	1.56 μ s	3.5 A	5.5 μ C	3 GHz	1.16 nC	5 Hz	27.5 μ A	150 MeV
nominal	30 MW	1.56 μ s	3.5 A	5.5 μ C	1.5 GHz	2.33 nC	5 Hz	27.5 μ A	150 MeV
power mode	60 MW	200 ns	5 A	1 μC	3 GHz	1.66 nC	30 Hz	30 μA	204 MeV



Why a request for a new mode of operation ?

Recently the appearance of heavy damage in 11.4 GHz NLC prototype structures as well as in 30 GHz CLIC prototype structures unleashed a considerable R&D activity to overcome these problems of “show stopping” potential.

In this context it became apparent that:

The CLIC study needs a 30 GHz high power RF source in between end 2001 (CTF II shutdown) and 2005 (CTF3 nominal phase) !

Moreover, it became clear that it would be desirable to have a repetition rate higher than the nominal 5 Hz of CTF 3 to speed about RF conditioning and to do long-term structure fatigue tests.

	CTF II	CTF 3 nominal phase	CLIC (one structure)	ideal source for prototype testing
frequency	30 GHz	30 GHz	30 GHz	30 GHz
power	200 MW	300 MW	240 MW	300 MW
pulse length	3-15 ns	140 ns	120 ns	5-150 ns
rep. rate	5 Hz	5 Hz	100 Hz	100 Hz

Options considered for 30 GHz power source for prototype testing:

1. extension of CTF II running until end of 2002
2. development of a high power gyrokystron in industry
(lead time ≥ 2 years)
- 3. intermediate CTF3 power source using the CTF3 drive beam linac of the initial phase (available end of 2003)**
- 4. increasing the CTF3 repetition rate to 30 Hz**

Options 3 & 4 have consequences for the injector design.

Implications for injector:

- gun has to provide peak current consistent with 5 A of beam current after bunching and energy scraping
- the gun pulser has to provide a variable pulse-length of ideally 10 ns-1540 ns
- the gun pulser has to be able to cope with the higher repetition rate
- the charge per pulse in high current mode is less than nominal and the mean current from the linac increases by a small amount compared to nominal parameters. Thus the gun HV supply specifications are not affected !
- the “power mode” uses the initial phase injector layout (using two 3 GHz prebunchers, no SHB’s)
- the single bunch beam dynamics of the initial phase has to be checked for 1.7 nC single bunch charge (less than nominal!)
- the 3 GHz prebunchers have to be able to cope with the increased beam-loading
- the buncher has to be capable to cope with the increased beam-loading. Contrary to all other accelerating structures the buncher input power cannot be increased significantly for the “power mode”, since no RF pulse compression is used for the buncher.
- the “power mode” has to be available in the CTF3 initial phase, that means 2003
- Modifications for the “power mode” should not compromise the nominal performance by a significant amount !