

RF diagnostics, where and how many?

	Sector	Module	PETS	Structure
Number (3TeV)	48	~36k	72k	144k
Pulse shape / PETS power	✓	?	?	?
Phase, drive/main	✓			
Breakdown			✓	?

CLIC module review

Drive beam power production

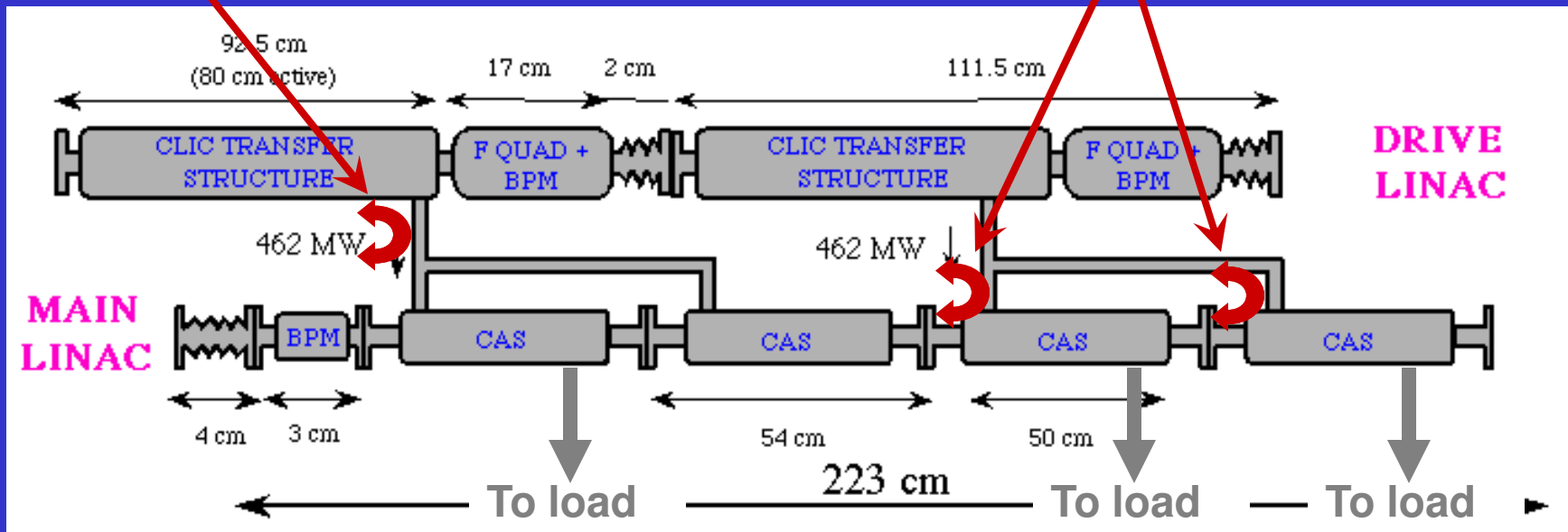
Pulse shape

Incident/transmitted/reflected

Directional couplers needed for good pulse shape and power measurements

After PETS?

Before Structure?



Pulse Shape and Energy Spread Compensation

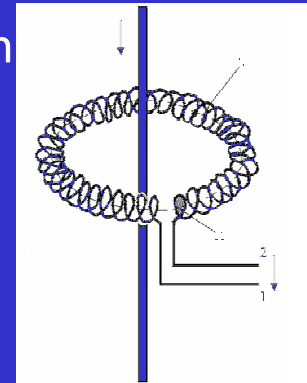
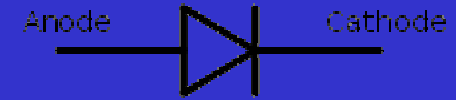
- Resolution:
 - 1/1000 achieved resolution
 - 1/10000 measurement resolution
 - $2^{14}=16384$, at least 14bit digitizer
- Precision
 - Not critical, 5%?
- Band Width ~100MHz?

Probably tricky

Exist 16bit, 200MS/s

Possible scenarios for breakdown detection in CLIC modules

1. By RF signal: Diode after load in transmitted power path
 - + high resolution of missing energy possible
 - + no need for directional couplers
 - needs to measure incident and reflected power for missing energy (once per sector) **(Maybe not – A. Andersson)**
 - radiation issues
2. By pick-up coils: Inductive pick-up for electrons emitted by breakdown
 - + differential signal for beam induced signal suppression
 - + easy and radiation hard
 - probably not linear with missing energy (tests in CTF2 ongoing)
 - requires space and impedance matching
3. By optical detection: Photodiodes with light guide facing vacuum pumping holes
 - + probably most sensitive solution
 - + no matching to structure RF parameters or impedance matching necessary
 - works only with tank version
 - radiation issues

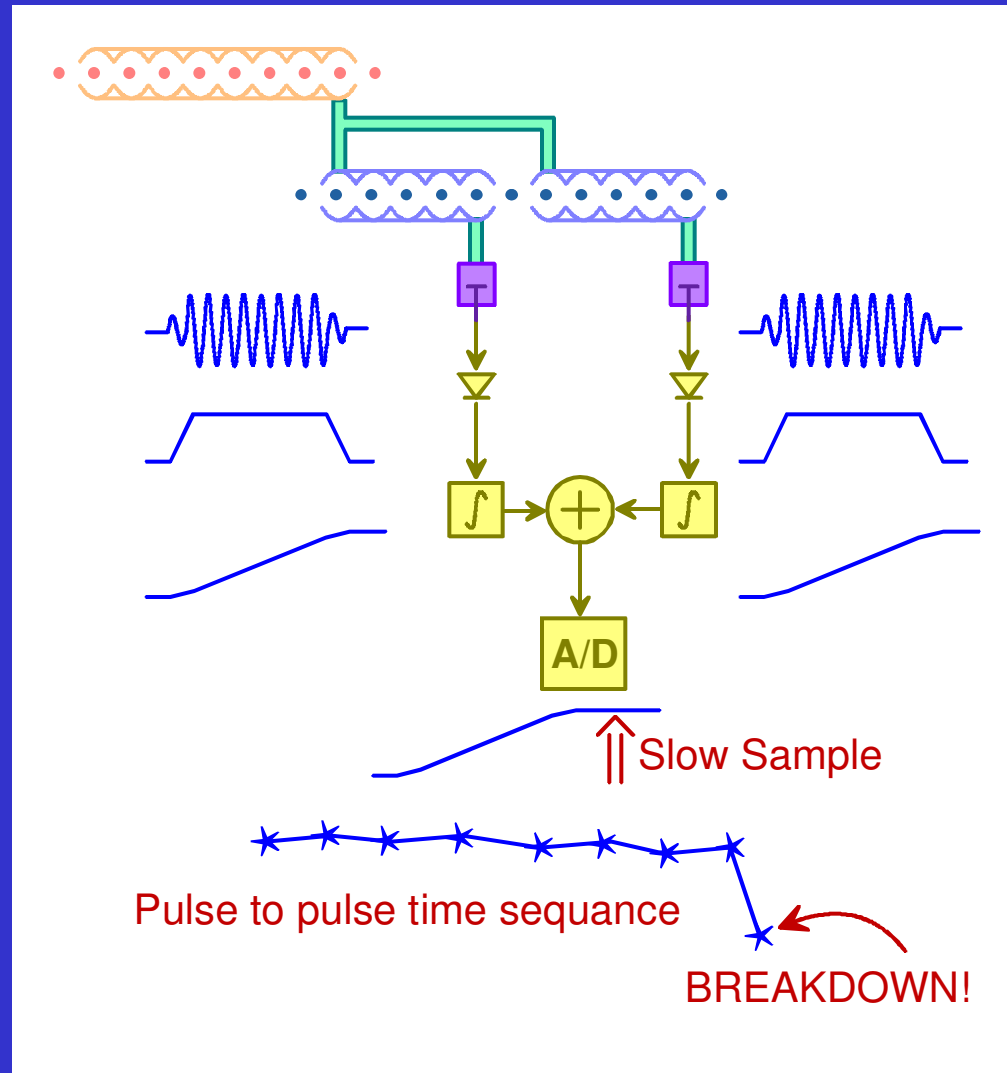


Jan Kovermann, September 2009

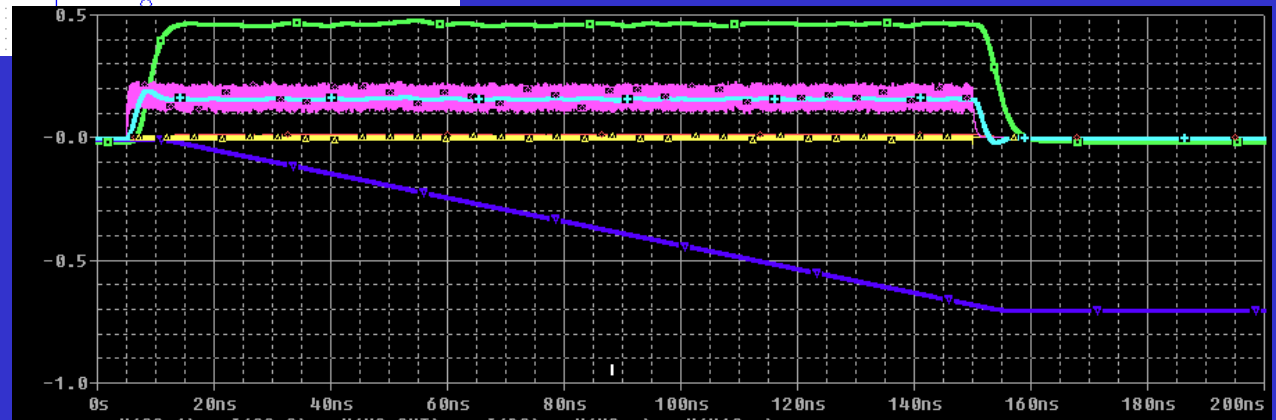
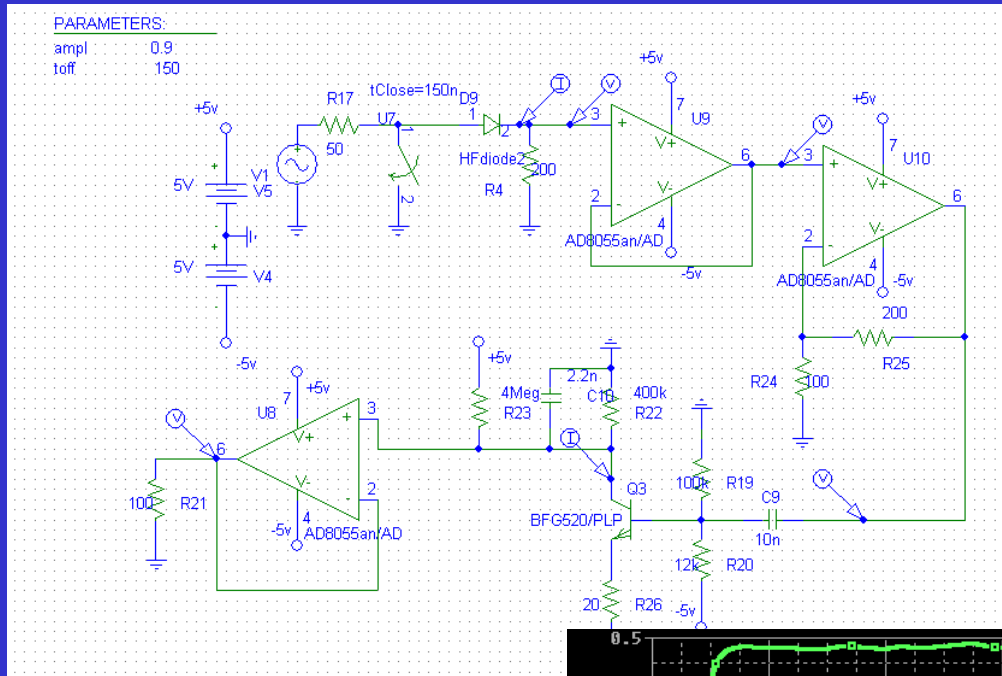
Breakdown detector – load signal

- Only interested in the pulse-to-pulse change in recorded power to load – breakdown should show up as lower integrated power than previous pulse
- Plenty of power available, no need for sensitive devices
- Can maybe use a cheap and dirty solution?
- Energy measurement → one data point per pulse, can use an integrator and slow sampling

Breakdown detector – load signal



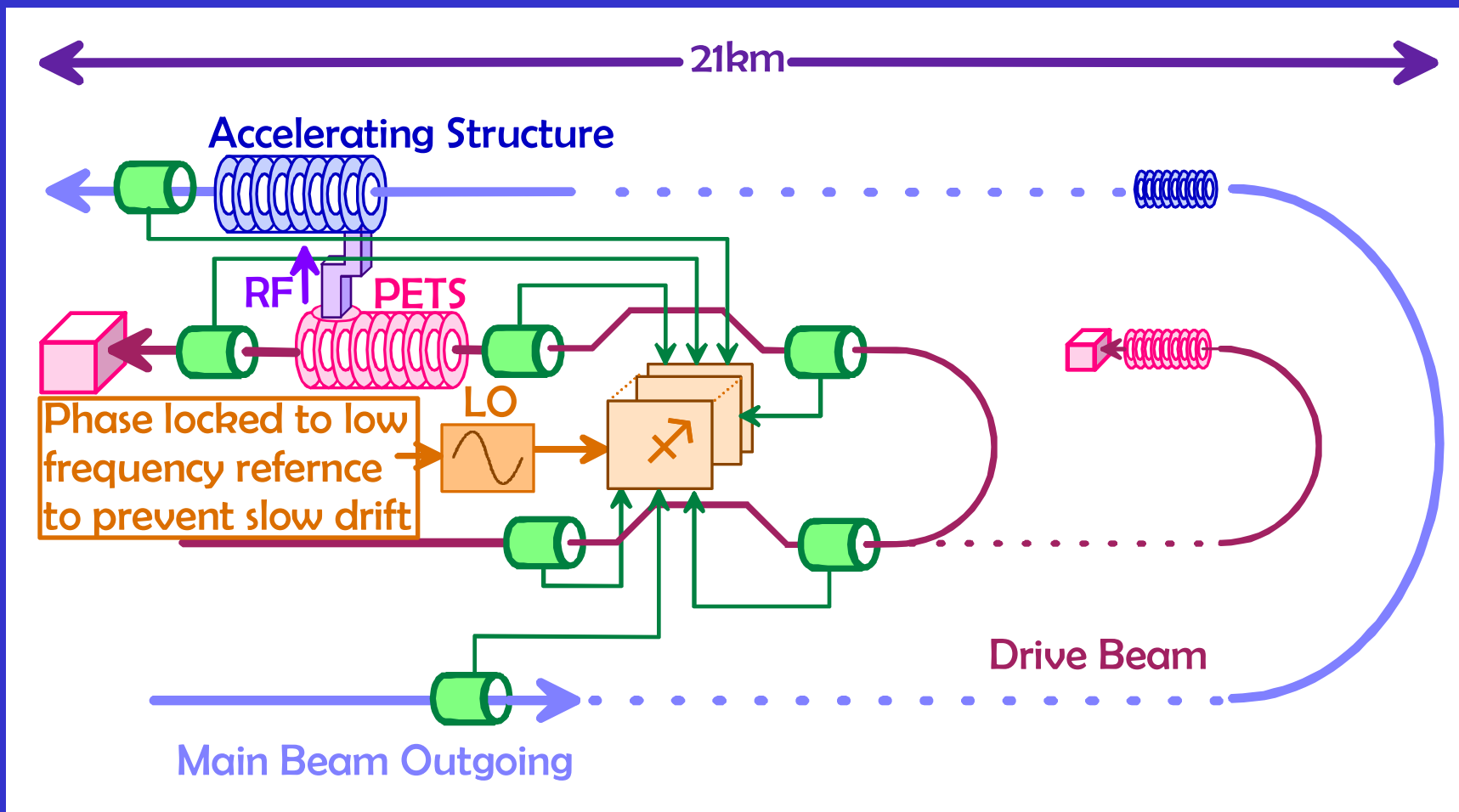
Cheap and dirty solution



Phase detection

- Does this really belong in module instrumentation?
- We have ways to adjust phase for each sector (after turnaround)
- Is there a further way to adjust average phase along a sector?
- Work is being carried out on two types of device to measure phase for each sector

Phase detection



Conclusions

- Serious work has to be done on these measurements in order to make them viable
- Specifications of resolution, accuracy, bandwidth and space limitations must be supplied