

Comments on Availability

If Some Components have
not enough Life Time,
They should be repairable
in-situ.

Common Numbers are necessary for the Discussion

Acceptable Energy Reduction.

Number of Spare Modules.

How is the Operation Schedule ?

How many modules can we replace in a scheduled shutdown ?

Number of Critical Components.



MTBF / Life Time

SCRF PM Meeting @ FNAL Shuichi
Noguchi

If 2% Energy decrease is allowed.

Life Time / MTBF	500 Years	200 Years	100 Years
Number of Modules To be Repaired	32 0.2 % / year	80 0.5 % / year	160 1 % / year
Number of Shutdown	1 / 10 years	1 / 4 years	1 / 2 years
Duration of Shutdown	4 months + Tuning	6 months + Tuning	10 months + Tuning
Number of Spar Modules	2 x 2%	2 x 2%	2 x 2%

Critical Components

	Consequence of Failure	Operating Condition Load	Number	Life Time
Cold Window	Out of Operation Disassemble	1.6 msec. , 350 kW, 5 Hz	16000	Not well-known
Warm Window	Out of Operation Warm-up, Repair	1.6 msec. , 350 kW, 5 Hz	16000	Not well-known
Vac. Seal	Disassemble		96000	
RF Feed-Through	Disassemble		48000	
Piezo	Out of Operation Disassemble	10⁸ Pulses / year Max. 3 kN	16000	Not well-known
Tuner Motor	Out of Operation Disassemble	Not Frequent	16000	

If the Components are
Repairable in the Tunnel,
We do not need Spar Module
and Long Shutdown.

Required Life Time / MTBF

- ◆ Assume Acceptable Energy Reduction is 2 %
- ◆ Life Time of 200 Years → 0.5 % / year Fail
- ◆ After 10 Years, 80 Modules have to be Repaired. It will take 40 Weeks.
- ◆ Life Time of 500 Years is Required.

Failure Modes

- ◆ Miss Operation
- ◆ Control Failure
- ◆ Lot
- ◆ Life Time