Master Oscillator PDR

Safety, risks and Quality

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Outline

- Safety issues
- quality assurance and quality control
- technical risks

Safety

- There are no immediate personal safety issues with the MO:
  - Standard electrical risks (230V / “Starkström”).
  - No high power RF (=< 10 dBm).
  - No chemicals or gases used.
  - No hazardous materials used.*
  - No ionising radiation.
  - No activiation.

* Temperature isolation materials need to be consistent with, or get and exemption From, fire regulations. Volume of material is low.

Safety: other systems

- No global safety systems are, or should be, dependent on the outputs from the MO, nor the derived outputs (timing signals). Most important this relates to:
  - PPS
  - MPS
- All systems should go to failsafe mode if timing/RF phase reference signal disappears.

Quality

- Important to assure the quality of in-house developed systems:
- Use of review process:
  - Internal technical cross-division reviews of detailed solutions such as schematics.
  - PDR
  - CDR, possible with external reviewer.
  - Long-time tests in lab and test-stand.

Technical risks

- If the MO is down, the whole of ESS is down:
  - Accelerator, target and experiments

- Mitigation: Active redundancy, two MOs are running in paralell, and the switchover is fast, even though manual.
  - A switch of the MO makes a restart of the accelerator necessary.

Risk	Effect	Mitigation
Vibration	DRO and other components affected, noise on output.	Stable mechanical chassis, loose coupling of sensitive components to rack. Reduced use of fans.
Temperature shifts	The DRO is sensitive, will give rise to drift.	Separate temperature regulated chamber for DRO and its electronics. Separate racks for MO.
Aging	Drift of Xtal.	Lock to Rubidium and GPS source.
EMI	Added noise to RF outputs.	Careful shielding of electronics.
Manpower	Delay of deployment, delay of integration towards ICS.	Possible to use signal generators, with reduced performance, for large part of commissioning.
Design not fulfilling specification	Linac not operating to spec.	COTS-like solutions are available, will be known in time before full operation.