
Electronics issues for MTE

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TE/ABT

Outline:

- CAMAC eradication
- PPM limitations
- Electronics & Controls for
 - MTE only
 - CT only
 - CT-MTE hybrid
 - Dummy septum 15 “add-on” option
- P+M resources
- Summary

CAMAC eradication

- BE/CO has announced the stop of his support of CAMAC (hardware & software) for end of 2012.
 - CT extraction kickers use intensively CAMAC hardware for their integration within accelerator control system. They were not renovated as part of the D067 project in 1996 and left as installed in the 80' as it was expected to disappear with the introduction of new MTE schema.
 - Before the end of LS1, TE/EPC will have completed the renovation of the last power converters still connected to the control system across CAMAC. CT extraction kickers will then be the last user of CAMAC.
- No spare and lost of expertise for CAMAC system within BE/CO.
 - Most CAMAC equipment date from early 1980. No new hardware (power supplies, fans...) was bought any more after 1989.
 - BE/CO hardware spares are already 25 years old at least.
 - Not more possible for BE/CO to provide (already today) reliable spare for the various CAMAC cards (SCC-L2, QUAD) or Single transceivers.

→ If CT has still to be operational after LS1, it has to be consolidated during LS1.

PPM limitations

- Full PPM operation successfully implemented on BFA9 & 21 pedestal generators in 2010.
 - Dynamic discharge of primary capacitor bank between 2 kicks.
- No full PPM functionality available on BFA9 & 21 staircase, ERD1 and ERD2 generators:
 - Limitation mainly on the kick strength in case large difference between 2 kicks (high to low):
 - Partial discharge of primary capacitor bank after a pulse;
 - Implementation looks feasible:
 - Technique still to be selected,
 - Dynamic discharge mechanism or multiple resonant charging ;
 - Reliable operation of CX1159A thyatron with variable pulse amplitude still to be validated:
 - Potential show-stopper.

MTE only

- **Hardware:**
 - Produced, tested and ready for installation;
 - Conservative approach for homogeneity with MTE1.
- **Software:**
 - Controller level developed and validated;
 - Integration within FESA ongoing;
 - Integration within INCA still to be studied into details (retrofit to MTE1)
- **To be done:**
 - Dismantling of unused CT equipment;
 - Consolidation of electrical distribution in B359 (Conformity with latest electrical norms);
 - Consolidation of installation safety (Personal & Equipment);
 - Full re-cabling of installations in B359 (Clean-up and eradication of non-halogen free cables).
- **Open issue:**
 - Can only be done during long shutdown (≥ 6 months).

CT only

- **Hardware:**
 - Full consolidation needed of BFAs (pedestal and staircase) and ERDs;
 - Full consolidation of electrostatic 3M systems.
- **Software:**
 - Full consolidation needed (GM to FESA);
 - Full integration within INCA to be performed.
- **To be done:**
 - Complete set of new hardware to be produced (Possible reuse of some hardware from MTE only approach);
 - Consolidation of electrical distribution in B359 (Conformity with latest electrical norms);
 - Consolidation of installation safety (Personal & Equipment);
 - Full re-cabling of installations in B359 (Clean-up and eradication of non-halogen free cables).
- **Open issue:**
 - Can only be done during long shutdown
 - Resources not available in MTP for full CT consolidation (Can be partially retrieved from MTE only).

CT-MTE hybrid

- Full consolidation of CT Electronics & Controls mandatory for continued operation after 2012:
 - Eradication of obsolete hardware (CAMAC, electronics...);
 - Implementation of “full” PPM functionalities on CT equipment;
 - Conservative approach will be deployed for homogeneity with MTE1 & MTE only and uniform integration within INCA.
- To be done:
 - Complete set of new hardware to be produced;
 - As for MTE only, electrical distribution, installation safety (equipment and personal) have also to be consolidated and a full re-cabling has to be done.
- Open issues:
 - Rack space availability for Electronics & Controls in B359 for common exploitation of MTE & CT has to be studied in details;
 - Can only be done during long shutdown (≥ 6 months);
 - Resources not available in MTP for the additional CT consolidation.

dummy Septum 15 “add-on” option

- Hardware for radial remote displacement system (position and angle):
 - Positioning system based on standard “SERVO” controller;
 - No specific development needed if required performance within actual specification of controller used for other ABT systems.
- To be done:
 - Production of hardware controller;
 - Integration within accelerator infrastructure (rack, cabling, electrical distribution...)
 - Integration within accelerator control system (FESA, INCA...).
- Open issues:
 - Resources not available within MTP but should be feasible if no specific development required.

Resources Requirements (P+M)

Scenario and option	Resources		Feasibility
	kCHF	FTE	
CT only*	475	4.5	<ul style="list-style-type: none"> No PPM Only during long shutdown
MTE only*	325	3.1	<ul style="list-style-type: none"> Only during long shutdown
CT-MTE hybrid*	525	5.0	<ul style="list-style-type: none"> PPM operation of BFA9, BFA21 staircase, ERD1 and ERD2 generators to be confirmed Only during long shutdown
Thinner septum	-	-	<ul style="list-style-type: none"> No request
Dummy Septum	50	0.4	<ul style="list-style-type: none"> Resources (FTE) not available in MTP. Feasible if no specific developments required
Faster kicker			<ul style="list-style-type: none"> Included in FPS estimation
Stronger kicker	-	-	

* Including B359 reshuffling (75kCHF + 1FTE)

Summary

- If operation of CT still required after LS1, a consolidation of actual CT Electronics & Controls is mandatory during LS1.
- Migration from CT to **MTE only** or to **CT-MTE hybrid**, as well as consolidation of **CT only**, can only be done during a long shutdown (i.e. ≥ 6 months).
- “P+M” resources for a consolidation of the actual CT Electronics & Controls (**CT-MTE hybrid** or **CT only**) are not available within actual MTP and will have to be allocated according to priorities.
- Roadmap should be decided by end of 2011 at the latest in order to prepare properly LS1 activity during 2012.

TE/ABT – Options Summary

	Kickers		Septa		Controls		Total		Comment
	kCHF	FTE	kCHF	FTE	kCHF	FTE	kCHF	FTE	
CT only	240	2.0	390	1.0	475	4.5	1105	7.5	
MTE only	110	1.1	365	0.6	325	3.1	800	4.8	Some infrastructure upgrades are mandatory in B359
CT-MTE hybrid	260	2.3	390	1.0	525	5.0	1175	8.3	
Thinner septum			1000	3.0			1000	3.0	Excludes septum power supply, earliest 2016
Dummy septum			250	1.0	50	0.4	300	1.4	LS1, controls FTE not available
Faster kicker	7000	12.0					7000	12.0	long lead time, new building, no manpower, not realistic
Stronger kicker									not technically feasible