Draft document

GUIDELINES FOR ELECTRONICS DESIGN AND PRODUCTION READINESS REVIEWS

Abstract

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Distribution List

1. DESIGN REVIEWS

1.1 SCOPE OF THE REVIEW

The reviews should be reasonably exhaustive so that items are not overlooked. At the same time, the spirit of the review should be one primarily of helping the designers ensure the success of their system.

1.2 DATE OF THE REVIEW

The design must be almost finished and a prototype must have been built and evaluated. For the system design (e.g. readout system of a sub-detector) a large scale system test (several percent of the full detector) must have been done.

1.3 SPECIFIC POINTS TO BE ADDRESSED

The following specific points must be addressed:

(a) Requirements (Specifications):

What is the required performance of the system.

(b) Environmental conditions:

Radiation, temperature, accessibility, maximum power consumption, …

(c) Motivation for choice of architecture.

(d) Verification of performance:

Protoype studies;

Design Robustness (how is it ensured that all parts will meet the performance of the prototypes).

(e) Reliability studies:

How is reliability taken into account in the design;

How will the reliability of the components, final system be evaluated?

(f) Sensitivity to single point failure.

(g) Radiation hardness/tolerance studies.

(h) Plans for grounding, shielding and power distribution.

(i) Strategy for timing setup.

(j) Deadtime evaluation as a function of the L1A rate and LHC luminosity.

(k) Plans for calibration if necessary.

1.4 DOCUMENTS TO BE PRESENTED

The following table gives a list of documents to be presented to the review committee.

Technical Specifications	
Block Diagram / Schematic of the system	
Description of items being reviewed	
Summary of overall design methodology	
Description of environmental conditions	
Design	
Schematics and FPGA files	
Bill of material	
Timing and logic verification	Parameters used for simulation, Simulation outputs, …
Design rules for radiation hardness / tolerance	Qualified components, Redundancy, …
Testability analysis	Test coverage, Tooling description
Reliability study	Component stress analysis, Failure modes, System reliability estimate, Sensitivity to single point failure, …
EMC / EMI	Grounding, Shielding, Power distribution, Decoupling capacitances, Expected or measured nterference with neighbour systems, …
Power consumption	
Power supply turn-on sequence	
Sensitivity or worst case analysis	Temperature, Power supply voltages, Post irradiation, …
System thermal analysis	
Description of cooling system	
Safety aspects	Used materials, Protection (fuses, …), …
Design rules for special environmental constraints	Cold, Vibration, …
Calibration procedure	
Timing setup procedure	
Deadtime evaluation	
Prototype construction	
Prototype construction documents	
Description of assembly and test procedures	
Description of testing procedures	
Yield measurement	
Experienced problems	
Prototype testing & results	
Radiation component testing and results	
Radiation system testing and results	
System tests results	
Beam test results	
Reliability measurement	

1.5 PARTICIPANTS

Reviewers: small team (3 to 6), mix of experts, physicists and engineers, from other systems, experiments or laboratories (proposals from front-end electronics co-ordination, convenor, project leader).

Ex officio: TC and project.

Reviewees: a selection of people of most or all collaborating institutions. But the review is not considered to be public.

Neighbours: of the reviewed system, for information only.

1.6 PREPARATION AND RUNNING OF THE DESIGN REVIEW

The documents should be made available to the review committee at least two and preferably four weeks before the review. The documents must be available in a paper form. Some WWW or ftp address can also be made available (in addition to the paper form). The reviewers are asked to examine the documents thoroughly.

Reviewers choose specific subjects of the list of scope on which they concentrate their effort. All reviewers will come up with questions, many of them concerning points of detail.

The review itself should preferably be a discussion of the subjects given in the agenda and which the reviewers and/or reviewees consider to be important. Preferably no talk should be given, but an introduction and light guidance through each agenda point, with or without slides, by someone of the reviewee team. Slides for specific topics, problem areas and items people want to bring up are useful to have at hand.

2. PRODUCTION READINESS REVIEWS

2.1 SCOPE OF THE REVIEW

The PRR (Production Readiness Review) is meant to be the last paper exercise for any given project before starting series production and thus engaging important sums of money and manpower. The R&D phase is over and layout and design questions are no longer an issue and the design review has been held. The reviewees shall bear in mind that the findings and recommendations of the committee will depend also on the quality of the input they get and the supportive, open-minded approach from the review team.

2.2 DATE OF THE REVIEW

The PRR must be held after the design review has been done and before the procurement of components has started. Engineering changes since the design review must be minor. Major changes (e.g. change of architecture) should lead to a new design review.

2.3 POINTS TO BE ADDRESSED

In addition to the action points that the design review might have left, the following topics must be specifically addressed:

(a) Production organisation;

(b) Version control: how is it assured that correct schematics, parts lists, etc are utilised?

(c) Quality control organisation:

How is it ensured that the parts will be manufactured with uniform quality?

What are the plans for testing for functional performance and quality?

2.4 DOCUMENTS TO BE PRESENTED

The following table gives a list of documents to be presented to the review committee.

Engineering changes done since the design review	These are minor changes. Major changes would require an other design review.	
Final tests results		
Integration issues	Equipment installation issues	
	Interfaces issues	
	Installation description into next higher assembly	
Pre-production results	Performance specification compliance	
	Yield and failure analysis	
	System test with input/output interfaces	
	Electrical/Mechanical fixture finalised	
Documentation Engineering	Specification control drawing	
	Schematics	
	Parts lists	
	Assembly	
	Tooling	
	Test plan	
	Test procedure	
Documentation Manufacturing	Work instructions	
	Re-work/Repair procedures	
	Quality assurance & manufacturing flow chart	
Procurement	Spares requirements	
	Schedule	
	Vendor selection & approval	
	Procurement specification	Technical specification
		Inspected/tested parameters
		QA provision
		Lot acceptance testing
	Control system	Parts tracibility
	Receiving and incoming inspection	Parameters to be inspected and tested
		Sampling plan with acceptance/failure criteria
		Cold testing
		Burn-in
Manufacturing	Control system	Production control system
		Schedule
		Training production personnel
	Manufacturing organisation	
	Screening tests	Cold testing
		Burn-in
	Handling storing & shipment	
Quality Assurance	Quality organisation	
	Quality assurance plan	Corrective action for non conforming material
		Record keeping for tracibility and failure analysis
		Statistical quality control and analysis
		Incoming In-process & Final inspection
		ESD control
		Quality audits

2.5 PARTICIPANTS TO THE REVIEW

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