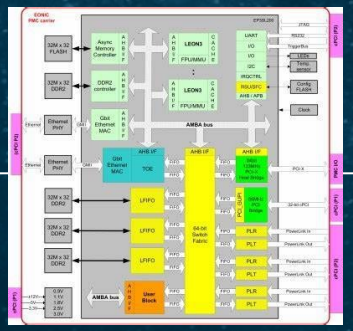
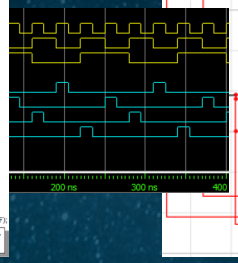
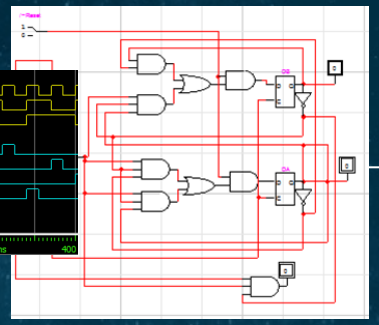
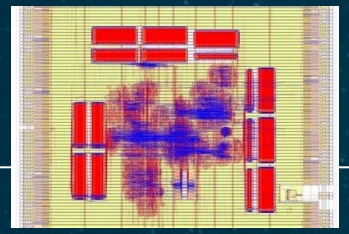
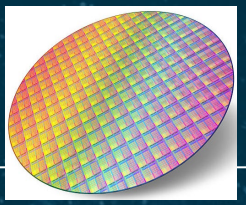
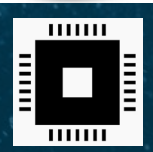
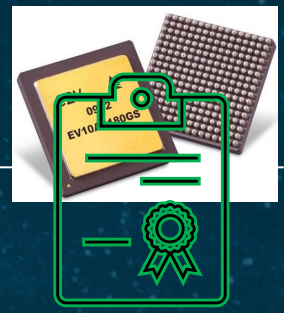
new ECSS standards
ASIC, FPGA and IP Core
engineering and product assurance:
ECSS-E-ST-20-40C
ECSS-Q-ST-60-03C

ADCSS 2023 – 13th November 2023
Agustín Fernández León (TEC-E)
Isabelle Conway (TEC-Q)

ECSS Update for ASIC-FPGA-IP Core development

ECSS-Q-ST-60-02C "ASIC and FPGA Development" **is now obsolete and superseded by**

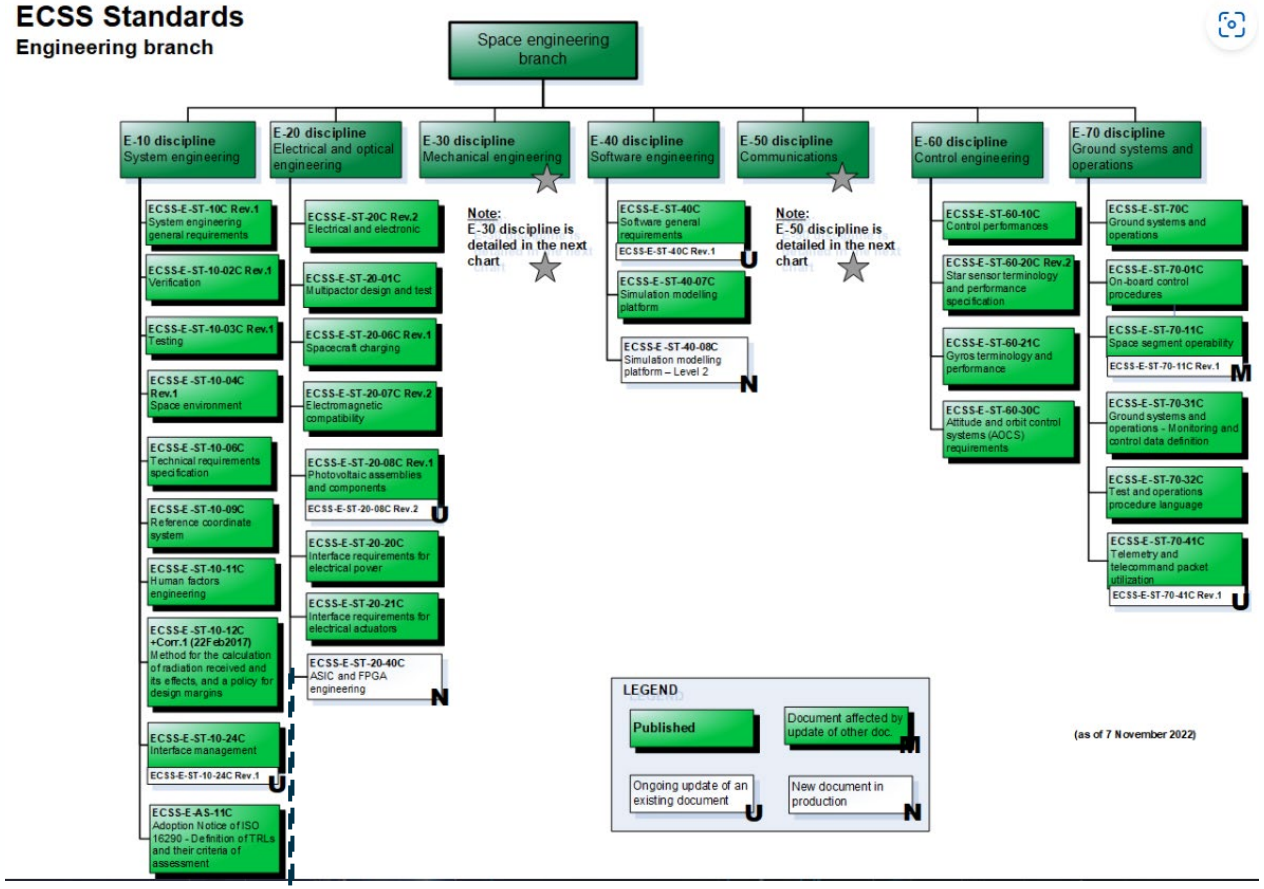
- **ECSS-E-ST-20-40C** - ASIC, FPGA and IP Core Engineering – 11th October 2023
- **ECSS-Q-ST-60-03C** – ASIC, FPGA and IP Core Product Assurance – 11th October 2023

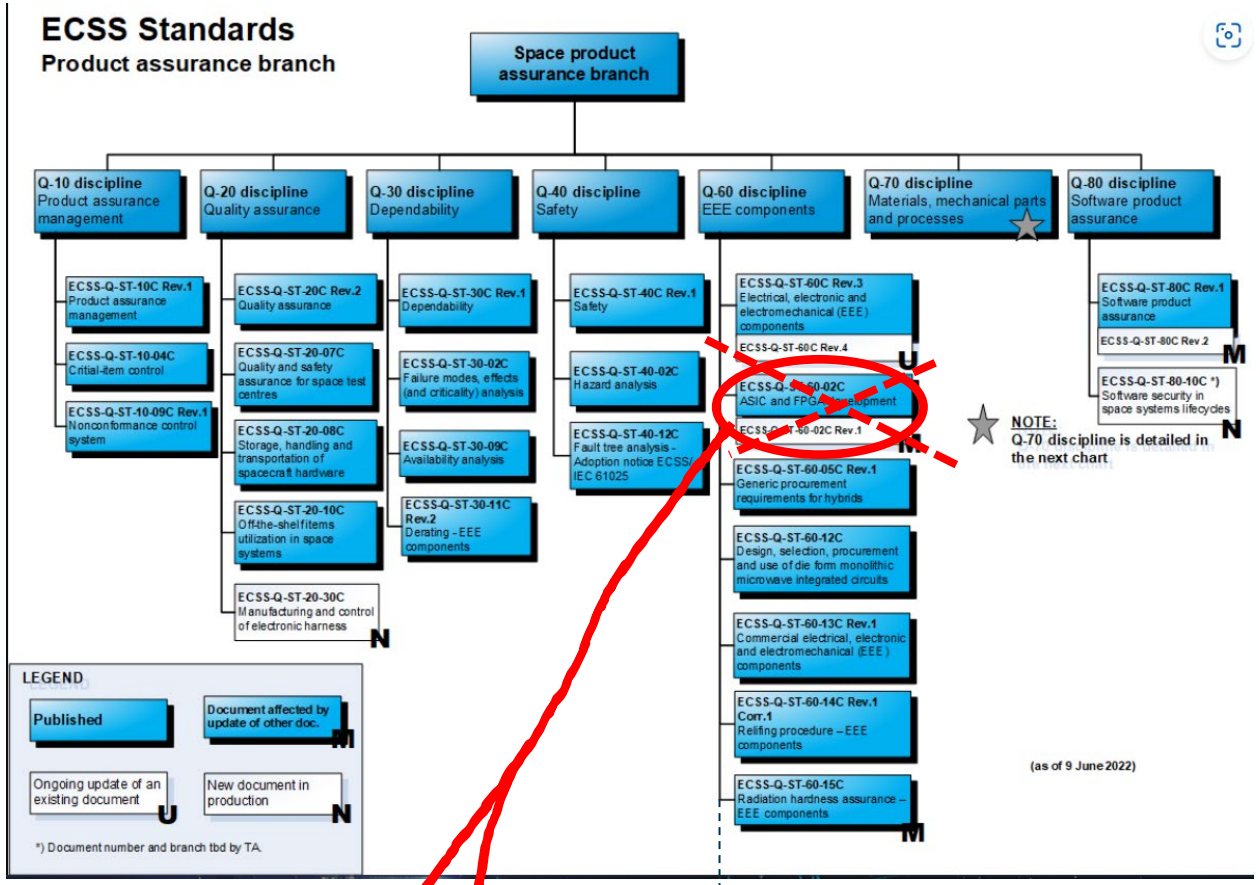
These 2 new ECSSes are the result of the **collaborative engineering efforts of ASIC, FPGA and IPO Cores (= "DEVICE") engineering experts and product assurance experts** (gathered in a common ECSS WG created in 2019).

Analogous to the co-engineering requirements in software standards,

- TEC-EDM is book captain for ECSS-E-ST-20-40
- TEC-QQS is book captain for ECSS-Q-ST-60-03

Old ECSS Q-60-02 (2008) standard is superseded by two: E-20-40 and Q-60-03 (11 Oct 2023)





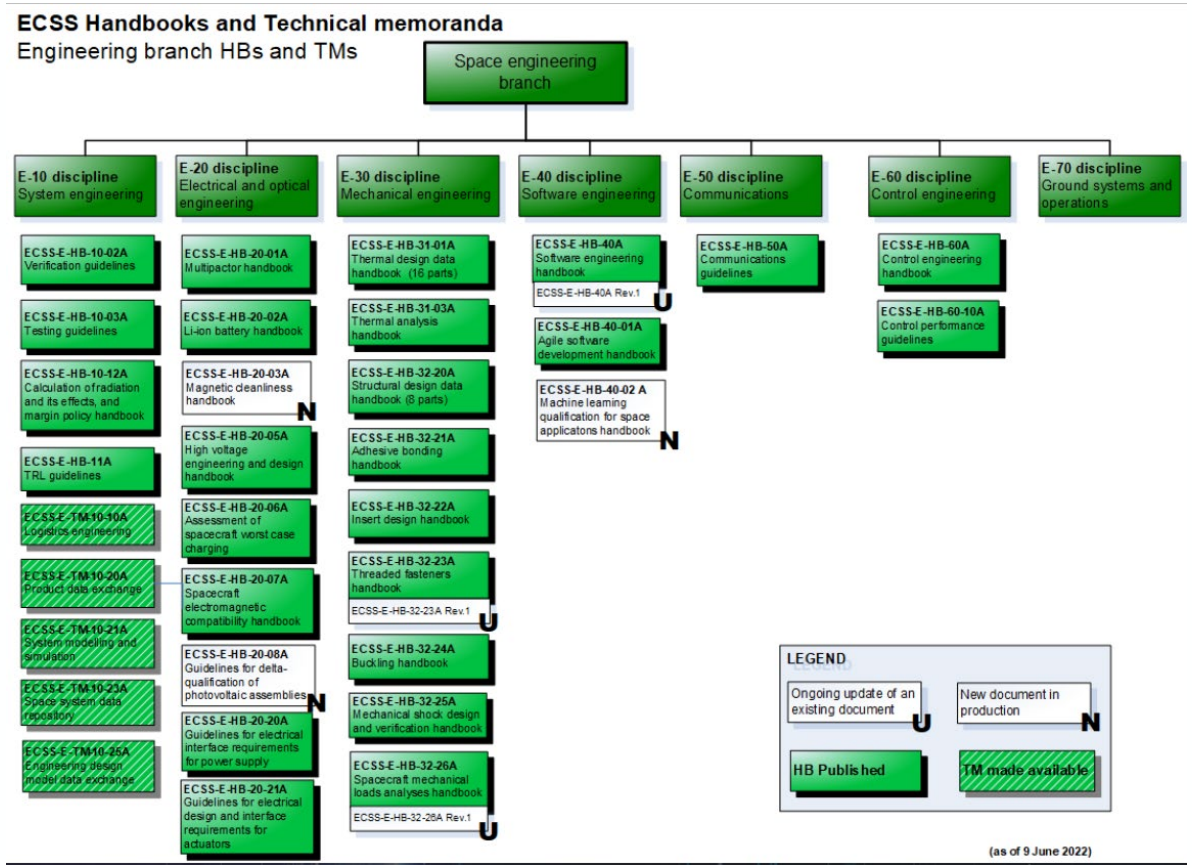
ECSS-E-ST-20-40C

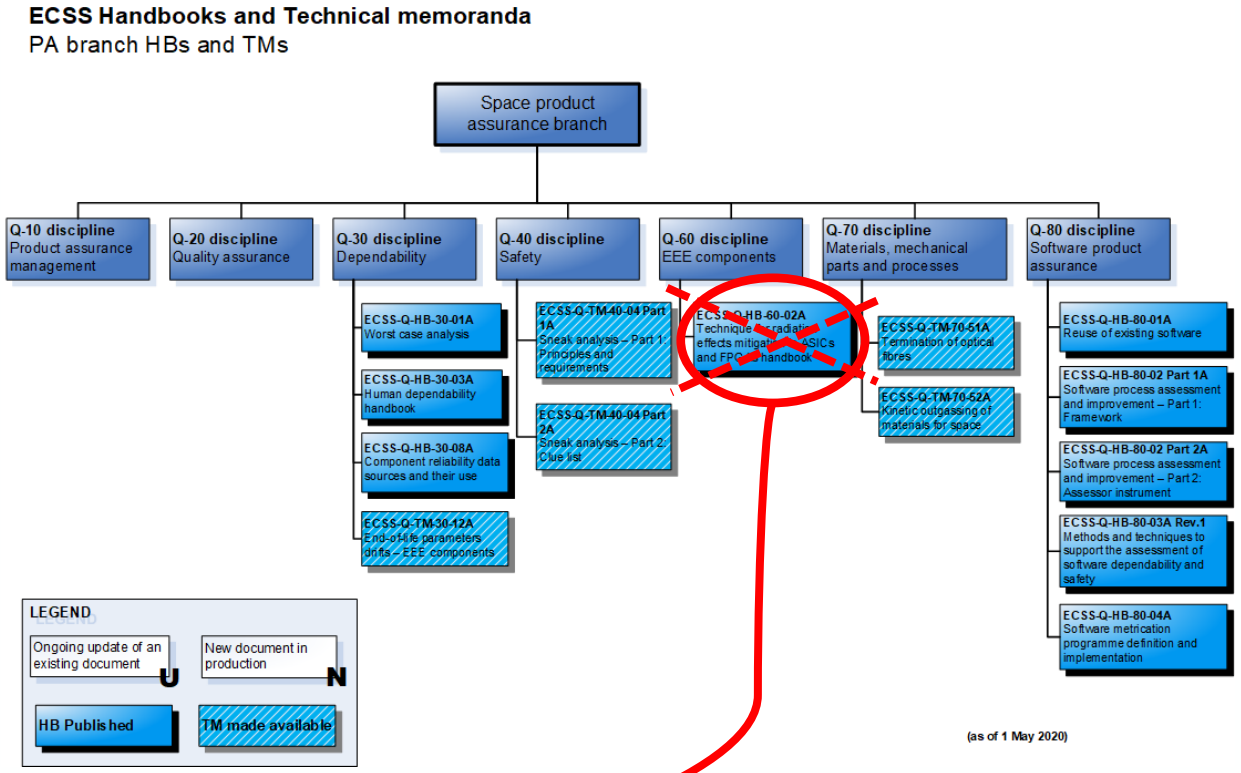
"ASIC, FPGA and IP Core engineering"
(Sep 2023)

ECSS-Q-ST-60-03C

"ASIC, FPGA and IP Core product assurance"
(Sept 2023)

ECSS HB on rad effects mitigation techniques for ASICs and FPGAs moves to E branch with slightly new name





ECSS-E-HB-20-40A

"Engineering Techniques for radiation effects mitigation in ASICs and FPGAs" (Sept 2016)

New standards: improving the FORMAT

- **higher clarity**, simplicity
- **better and new definitions** of terms used in the context of this standard. Some definitions eliminated (not used)
- consistent **terminology** , also wrt new SW ECSS-E-ST-40 /Q-ST-80 stds, clarifying terminology differences between M/Q/Product Assurance stds and terminology choices in E-ST-20-40/ECSS-Q-ST-60-03
- Minimize dispersion of requirements between main chapters and normative annexes (DRD = Document Requirements Definition)
- Minimize redundancies (particularly inside each std, E and Q).

New standards: improving the CONTENT

- requirements for **ASIC** (digital and analog), **FPGA** and **IP Cores all in one same standard, but clearly differentiated**
- Separation of **engineering** (in E-ST-20-40) versus **product assurance** requirements (in Q-ST-60-03C)
- **More comprehensive sets of requirements** for Specifications, Development, Verification and Validation Plans
- **Introducing the notion of "generic flow" and "flow variations":** parallel/sequential sub-module developments, phase iterations, additional intermediate reviews or merging reviews (depending on device type, complexity and criticality)
- special attention:
  - **HW-SW co-engineering** (coordinated with ECSS-E-ST-40 SW engineering WG), when using embedded "processing units" using Software
  - **Analogue/Mixed ASICs**
  - **re-use of IP Cores** and **development of new IP Cores**
- new Annexes and figures with **pre-tailoring** of flows and requirements per device **type** and its **criticality**
- Compatible with constantly evolving IC technologies, higher functional complexities, CAD tools
- Compliance to ECSS Q, E and M branches

new standards separate Engineering and PA requirements

ECSS-E-ST-20-40C (2022)

5 DEVICE engineering
- 5.1 General requirements
- 5.2 DEVICE Definition Phase
- 5.3 DEVICE Architecture Definition Phase
- 5.4 DEVICE Design and Verification Phase
- 5.5 DEVICE Detailed Design Phase
- 5.6 DEVICE Layout Phase
- 5.7 DEVICE Implementation Phase
- 5.8 DEVICE Validation, Qualification and Acceptance Phase

6 Pre-tailoring according to DEVICE criticality and type

+ 12 Annexes (9 DRDs)

ECSS-Q-ST-60-03C (2022)

5 Product Assurance programme implementation
- 5.1 Organization and responsibility
- 5.2 DEVICE product assurance programme management
- 5.3 Risk management and critical item control
- 5.4 Supplier selection and control
- 5.5 Tools and supporting environment

6 DEVICE Process Assurance
- 6.1 DEVICE development lifecycle
- 6.2 Requirements applicable to all DEVICE engineering processes/phases
- 6.3 Requirements applicable to individual DEVICE engineering processes and activities
- 6.4 Process Assessment and improvement

7 DEVICE product quality assurance
- 7.1 Product quality objectives and metrication
- 7.2 IP Core or DEVICES intended for Reuse

8 DEVICE Configuration Management
- 8.1 DEVICE Configuration Management planning and control
- 8.2 Configuration Management implementation
- 8.3 Configuration Control

9 Tailoring by DEVICE criticality

+ 5 Annexes (3 DRDs)

ECSS-Q-ST-60-03C : what's old

ECSS-Q-ST-60-03 does not modify the generic ECSS requirements previously defined in ECSS-Q-ST-60-02: PA requirements (ECSS-Q-ST-10), QA requirements (ECSS-Q-ST-20), Dependability requirements (ECSS-Q-ST-30), and Configuration (ECSS-M-ST-40).

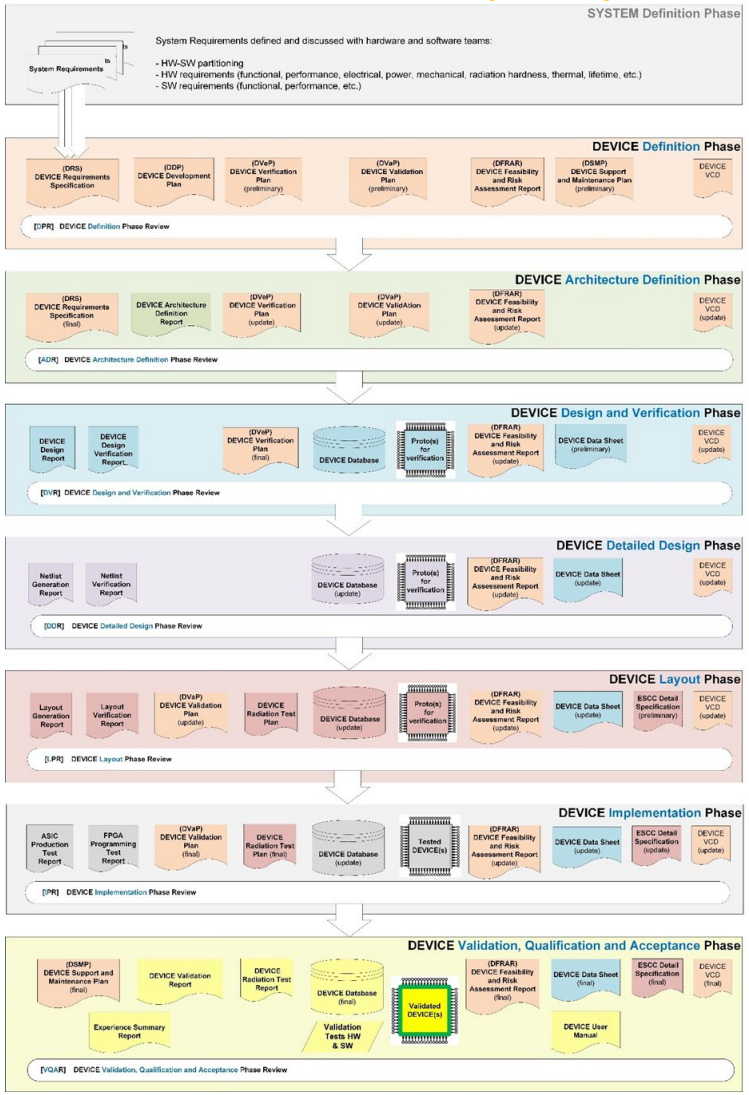
ECSS-Q-ST-60-03 translates the requirements of these ECSSes and adapts them to the context of the DEVICE engineering domain defined in ECSS-E-ST-20-40 (e.g. workflow and phase reviews)

ECSS-Q-ST-60-03C : what's new

- Co-engineering with ECSS-E-ST-20-40
  - Including alignment to ECSS-E-ST-20-40 development flow and phase reviews (see slide 9)
- Tailoring by criticality
- Reuse of both IP Cores and complete DEVICE – with qualification status assessment and definition of delta-qualification activities in the context of a given project in a DEVICE Reuse File, as well as license/IPR requirements
- Assessment and maintenance of qualification status
- Deactivated and Unreachable DEVICE functions
- Metrication programme
- Security Assurance
- Process Assessment and Improvement
- Independent Verification and Validation for Category A

New development flow figures

ECSS-E-ST-20-40 (2023)



old ECSS-Q-ST-60-02C (2007)

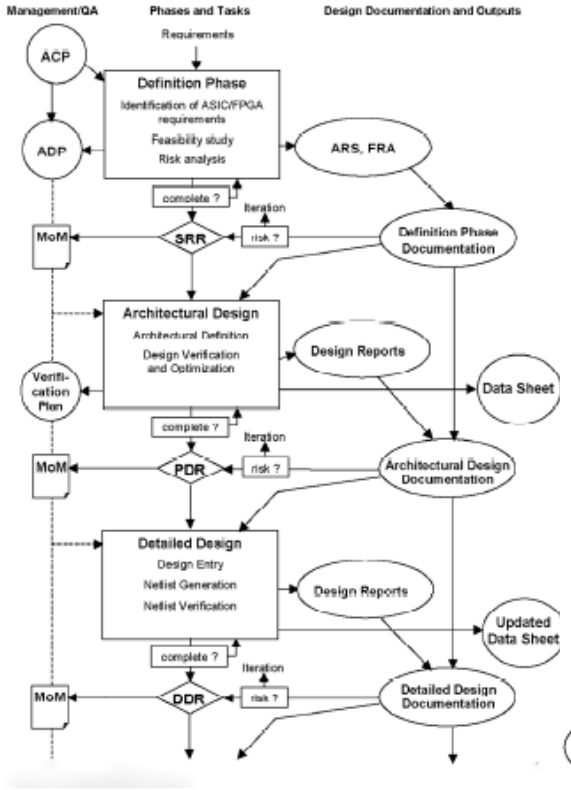


Figure 5-1: Development flow (example)

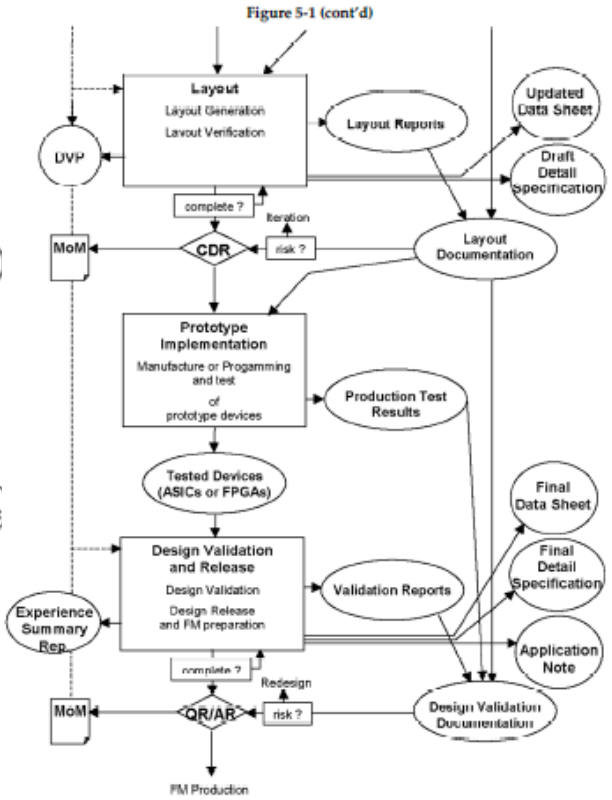
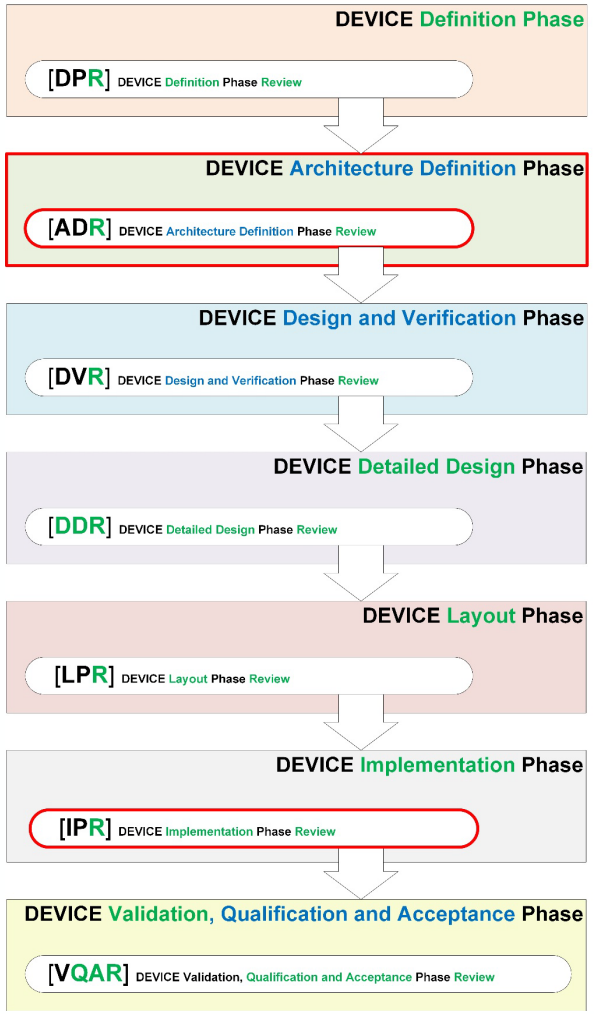


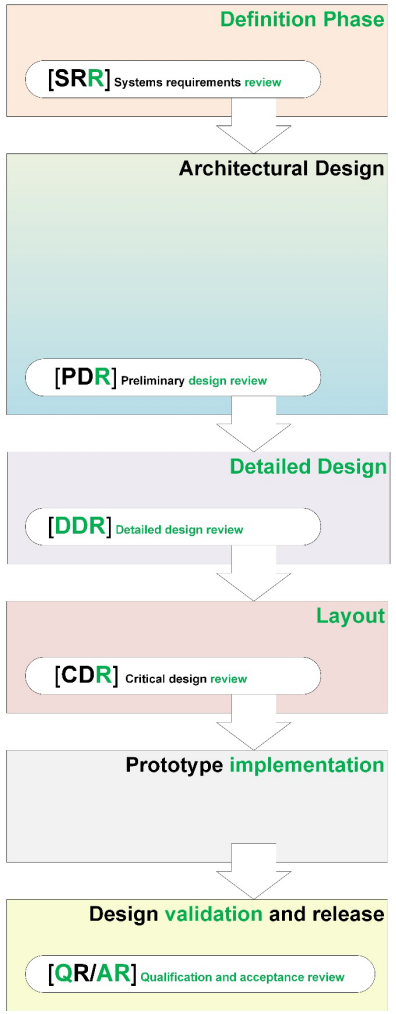
Figure 5-1: Development flow (example) – continued

Some changes in generic development flow

ECSS-E-ST-20-40 (2023)

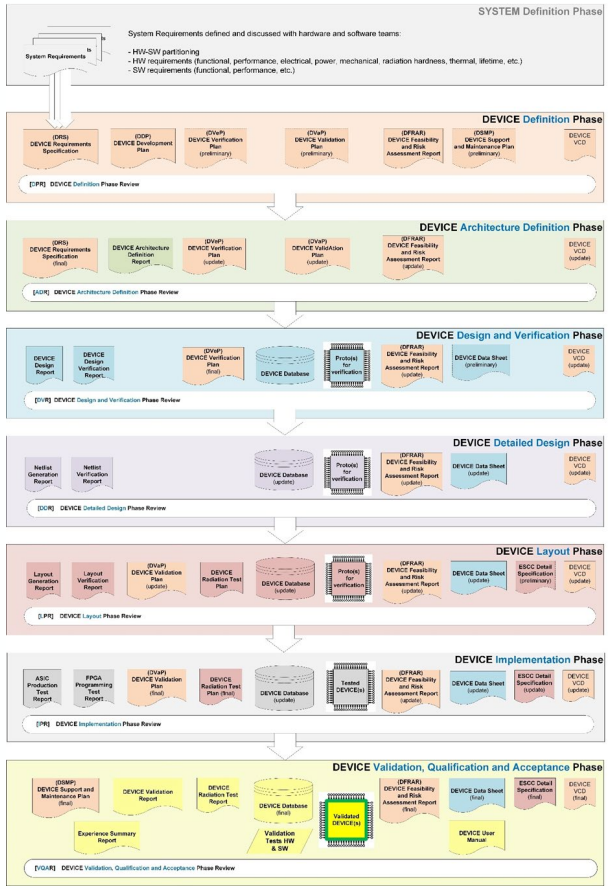


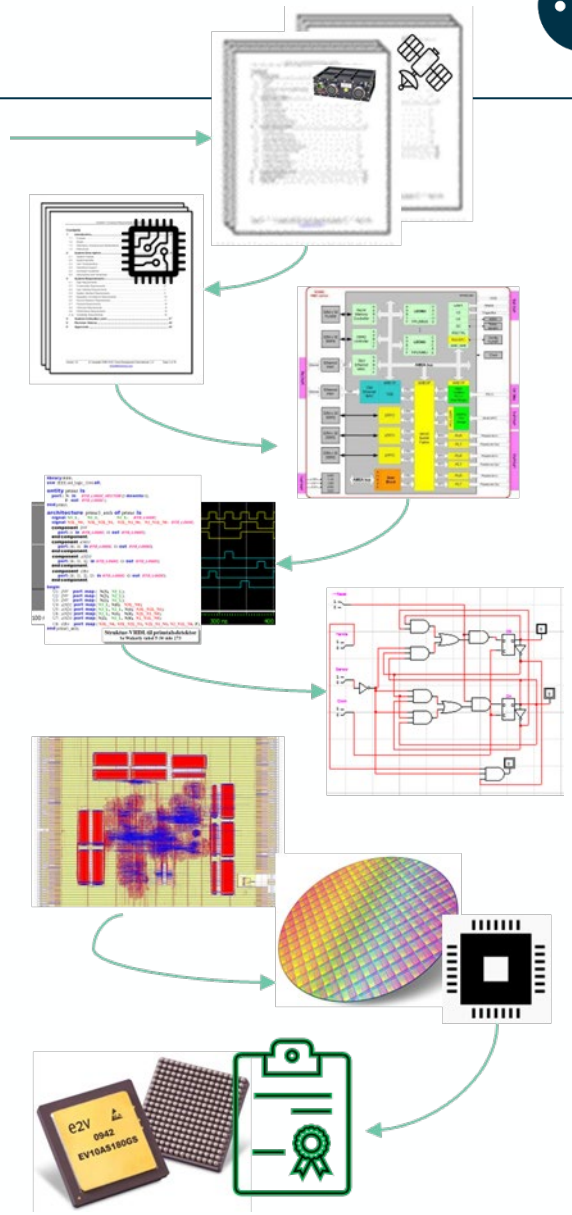
old ECSS-Q-ST-60-02C (2007)



Applying the 2 new standards starting now!

ECSS-E-ST-20-40 + ECSS-Q-ST-60-03C





BACK UP slides

Timeline: NEW ECSS Stds for ASIC, FPGA and IP Core

Aug 2017 - preliminary list of 28 Change Requests proposed by ESA Microelectronics Section

Apr 2018 - 42 change requests proposed by 11 ASIC/FPGA experts from European companies and institutes (including TAS, ADS, RUAG, Arquimea, Cobham Gaisler, TESAT, IMEC, CNES) at a dedicated meeting at ESTEC

Oct 2019 - New ECSS-E-ST-20-40 & Q-60-03C WG kick-off : 10 members, 37 experts (TAS, ADS, OHB, GMV, TESAT, Cobham Gaisler, BSC, Ariane, RAL, CNES, DLR and ESA)

Aug 2022 - ECSS-E-ST-20-40 & Q-60-03C in Public Review between Aug 23rd -> Jan 2023

Q3 2023 - publication of new standards after WG processed **318** requests for changes

- ECSS-**E**-ST-20-40 ASIC, FPGA and IP Core engineering
- ECSS-**Q**-ST-60-03C Rev.1 ASIC, FPGA and IP Core product assurance