

## DISCUSSION PROPOSED IN THE ECSS-Level1 TRAINING

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The following is an introduction to the possible application of ECSS standards to the procurement of a star tracker. It is important to understand that the following is simply a discussion on ECSS standards and its potential application depending on the circumstances of the particular procurement, and therefore cannot be considered as the only solution, which will vary case by case. It is important also to understand that the discussion below is presented with the only intention of promoting an overlook of and first contact with the set of ECSS standards in order to get familiarized with it, and therefore cannot be used for a real case.

It is recommended that before continuing with the present paper, the reader has a close look to the tree structure of documents in the ECSS Website ([www.ecss.nl](http://www.ecss.nl) -> Standards -> ECSS Document architecture, and the scroll all the way down), and makes an opinion, one by one, on which document may be applicable and under which circumstances.

Please, see the next page for a short discussion.

The obvious document to be used would be **ECSS-E-ST-60-20 “Star sensors”**. Besides, the following document may be necessary:

1. ECSS-E-ST-20 “Electrical & electronics”, since the equipment contains electrical parts and electronic components. In particular EMC is always an issue. EMC requirements are covered in ECSS by ECSS-E-ST-20 itself (the generic EMC requirements) and ECSS-E-ST-20-07 “EMC” (the particular EMC ones), therefore the latter is generally applicable too.
2. ECSS-E-ST-40 “SW engineering” and ECSS-Q-ST-80 “SW Product Assurance” will be generally applicable, since the equipment contains SW. The level of application of these two documents will vary very much if the equipment is developed (including the SW) for the particular application, or it is an OTS (off-the-self) equipment which needs to be re-qualified for the particular environment of the application.
3. ECSS-E-10-02 “Verification” and ECSS-E-10-03 “Testing” are generally applicable to any equipment
4. ECSS-E-10-04 “Space environment” would be applicable, but heavily tailored (in general, only the part relevant to the environment that the equipment is going to be used).
5. An interesting discussion is the application of ECSS-E-ST-10-09 “Reference coordinate system”. The use of the appropriate reference system is of course a key issue for a star tracker, since attitude and positioning need to be referred to it. However, the selection of the appropriate reference systems is a system engineering issue, no decision at equipment level. Therefore, equipment manufacturers should receive their requirements on coordinate systems directly as requirements in the TS.
6. ECSS-E-ST-10-12 “Radiation dose” is fully applicable, since it specifies how to calculate the radiation received by any part (depending on a number of characteristics, including its position in the spacecraft and shielding), and the maximum total dose allowed
7. Among the communication (E50) standards, the one corresponding to the bus used in the spacecraft will be applicable. For example, if a CANbus is used, ECSS-E-ST-50-14 would be applicable. If a SpaceWire is used, ECSS-E-ST-50-12 would be.
8. ECSS-E-ST-60-10 is generally applicable to any control subsystem and equipment.
9. Q10/Q20 “PA/QA” are standards generally applicable to any Space development and procurement.
10. ECSS-Q-ST-30 “Dependability”, and specially HSIA (HW/SW interaction analysis)
11. ECSS-Q-ST-30-02 “FMEA/FMECA”
12. ECSS-Q-ST-30-11 “Derating” in the case of development of parts containing EEE components

13. ECSS-Q-ST-60 “EEE components”, in the case of development of re-qualification of parts containing EEE components
14. ECSS-Q-ST-60-13 “COTS (Commercial Off-The-Self)” if the equipment contains OTS EEE components.
15. ECSS-Q-ST-80 -> See ECSS-Q-ST-40 above
16. In general, the M standards are applicable to any procurement, heavily tailored