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RF High-Power Testing within the ECSS Structure

RF Power & PIM Laboratory

NATIONAL INSTITUTE OF AEROSPACE TECHNOLOGY (INTA)

VERIFICATION ACTIVITIES

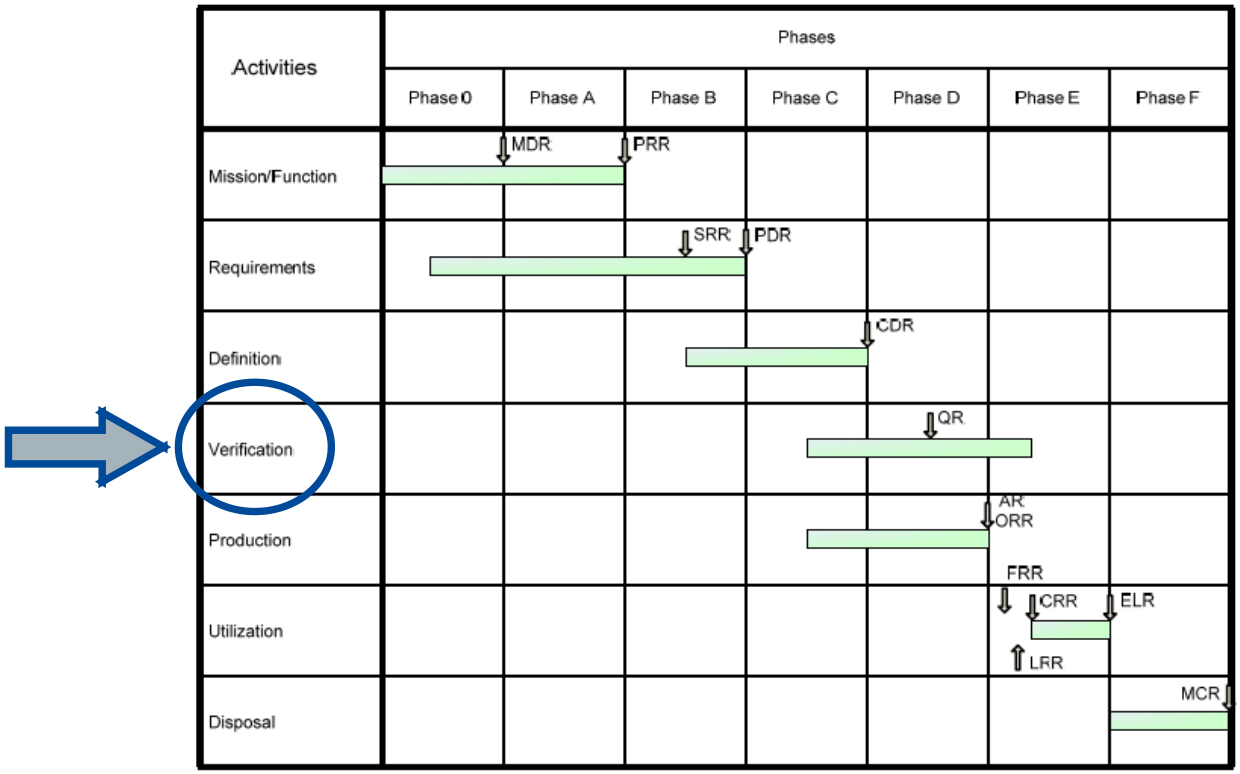

Figure 4-3: Typical project life cycle

AR	acceptance review	MDR	mission definition review
CDR	critical design review	ORR	operational readiness review
CRR	commissioning result review	PDR	preliminary design review
ELR	end-of-life review	PRR	preliminary requirements review
FRR	flight readiness review	QR	qualification review
LRR	launch readiness review	SRR	system requirements review
MCR	mission close-out review		

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VERIFICATION ACTIVITIES

5.1 Verification process

a. The verification process shall demonstrate that the deliverable product meets the specified customer requirements and is capable of sustaining its operational role through:

5.2.2 Verification methods

5.2.2.1 General

a. Verification shall be accomplished by one or more of the following verification methods:

1. test (including demonstration);
2. analysis (including similarity);
3. review-of-design;
4. inspection.

b. All safety critical functions shall be verified by test.

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VERIFICATION ACTIVITIES

The RF Power and PIM Laboratory is devoted to carry out *verification activities* in the field of the RF high power:

- *Corona*
- *Multipactor*
- *Passive Intermodulation (PIM)*
- *Power Handling*

VERIFICATION ACTIVITIES

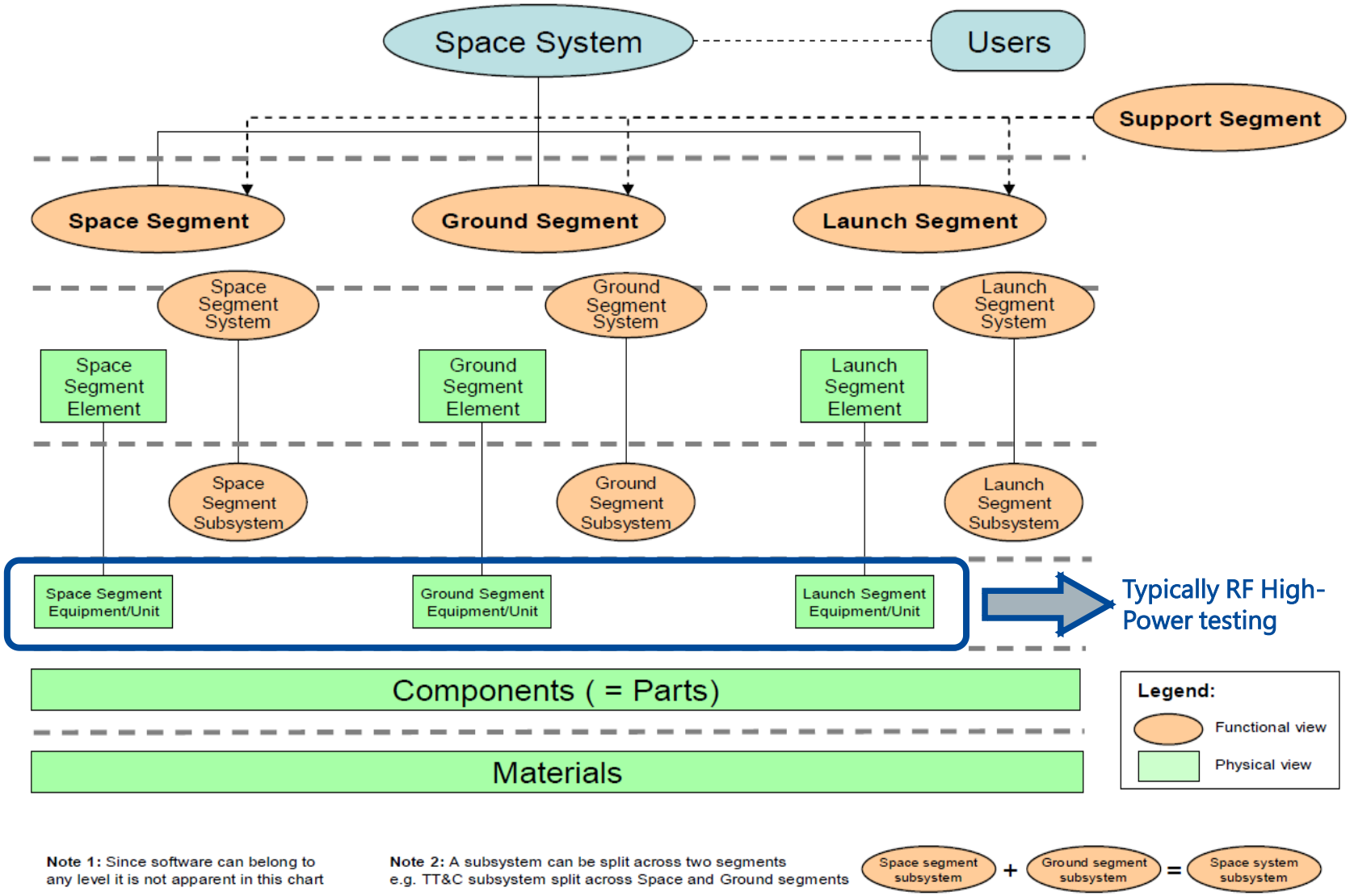

Figure 3-1: Space system breakdown

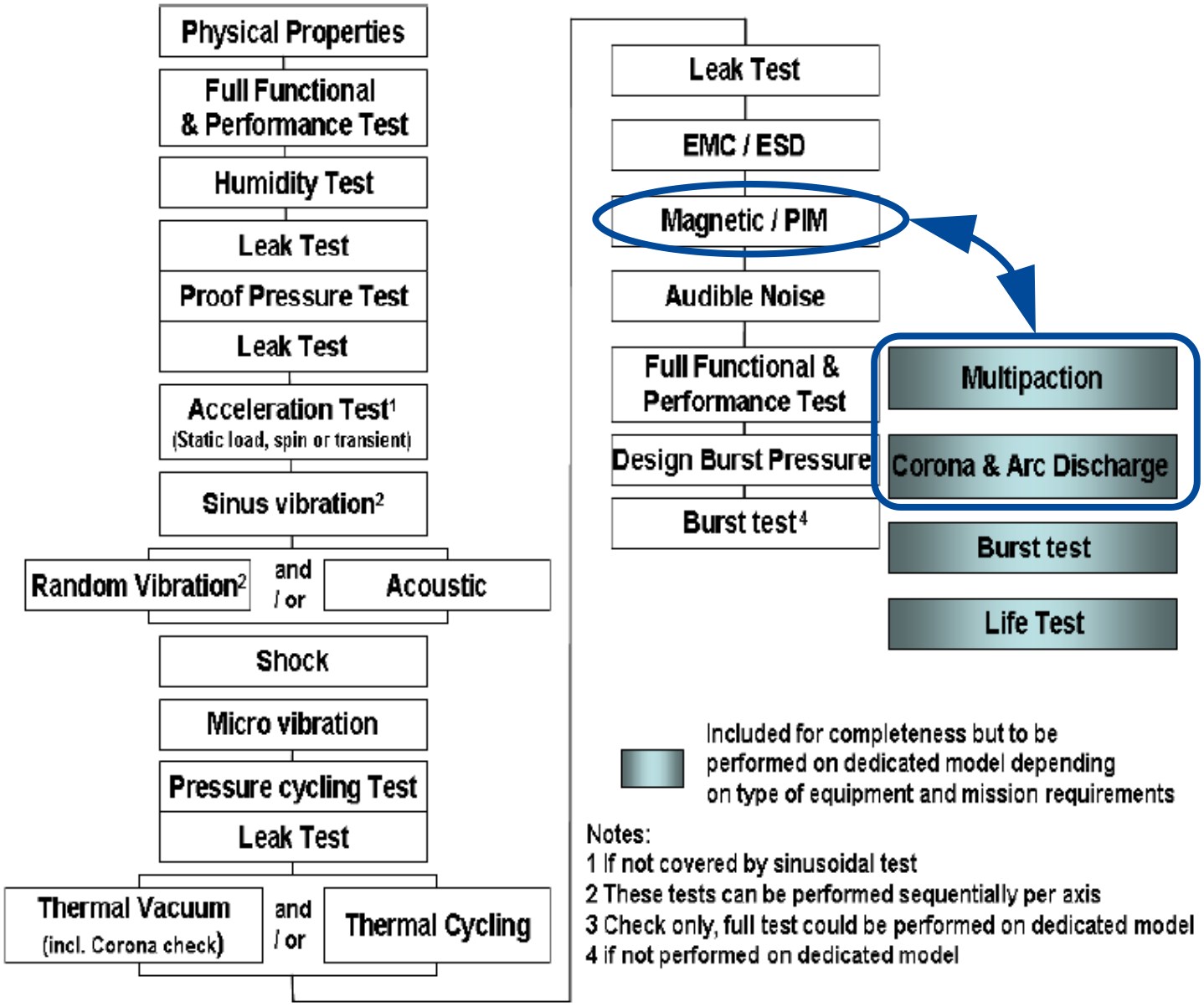

Figure 5-1: Space segment equipment test sequence

VERIFICATION ACTIVITIES

Test	Reference clause	Ref. to Level & Duration	Applicability versus types of space segment equipment												Application notes
			a	b	c	d	e	f	g	h	i	j	k	l	
Pressure cycling	5.5.3.3	See Table 5-2 No 12	X	-	-	R	R	R	R	-	-	-	-	-	only on sealed or pressurized space segment equipment. For c (battery) proof pressure, pressure cycling and burst are performed at cell level (i.e. component level).
Design burst pressure	5.5.3.4	See Table 5-2 No 13	X	-	-	R	R	R	R	-	-	-	-	-	
Burst	5.5.3.5	See Table 5-2 No 14	X	-	-	R	R	R	R	-	-	-	-	-	To be performed on dedicated model or at the end of the QM programme.
Thermal															
Thermal vacuum	5.5.4.1 & 5.5.4.2	See Table 5-2 No 15	R	X	R	R	R	X	R	R	R	R	-	R	
Thermal ambient	5.5.4.1 & 5.5.4.3	See Table 5-2 No 16	R	X	R	R	R	X	R	R	R	R	-	-	For l (solar panels), the thermal tests at ambient pressure are applicable only to the DVT (Design Verification Test) coupon - see ECSS-E-ST-20-08). Thermal Ambient test without vacuum test is applicable only to space segment equipment that operate under a non-vacuum environment during their entire lifetime. In assessing this, depressurisation failure should be considered.
Electrical / RF															
EMC	5.5.5.1	See Table 5-2 No 17	R	X	X	X	X	X	X	X	X	X	X	X	For equipment without electronic test are limited to Bonding test.
Magnetic	5.5.5.2		X	X	X	X	X	X	X	X	X	X	X	X	Magnetic test to be performed if justified by mission needs, in accordance with the EMCCP.
ESD	5.5.5.3	See Table 5-2 No 19	R	X	X	X	X	X	X	X	X	X	X	X	For k (solar array) and l (solar panels), the ESD test is covered by the ECSS-E-ST-20-08.
PIM	5.5.5.4	See Table 5-2 No 19	X	X	-	-	-	-	-	-	-	-	-	-	
Multipaction	5.5.5.5		X	X	-	-	-	-	-	-	-	-	-	-	To be performed on dedicated model.
Corona and arc discharge	5.5.5.6	See Table 5-2 No 20	R	R	R	-	-	-	-	-	-	-	-	-	To be performed on dedicated model. For condition of applicability of test, refer to 5.5.5.6.
Mission specific															
Audible noise	5.5.6.1		R	-	-	R	R	-	R	-	-	R	-	-	Required for space segment equipment for crewed space segment element.

Types of space segment equipment				Key
a Electronic, electrical and RF equipment	d Valve	g Thruster	j Mechanism	R Required
b Antenna	e Fluid or propulsion equipment	h Thermal equipment	k Solar array	X To be decided by the customer
c Battery	f Pressure vessel	i Optical equipment	l Solar panel	- Not required

NOTE 1: Tests are categorized into "R" or "X" depending on the sensitivity of the space segment equipment type to the specific environment, the probability of encountering the environment, and project specificity.

NOTE 2: All tests type are listed independently of their application status:
- the black shading indicates that the type of test is never required or optional
- the grey shading indicates that there is no test level and duration specified in the Table 5-2 since it is not a test where an environment is applied to the item under test

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Thanks for your attention!

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