Request for Waiver/~~Deviation~~

1	(1) Purchase Order No.:	(2) Date: 2020.07.29	(3) WD No.: RFW-DTNPL-002-FM
(4) Quantity: 1	(5) Project Name/Contract No.: DTNPL	(6) ■ Waiver ☐ Deviation	(7) Recurring Waiver/Deviation ☐ Yes ■ No
(8) Part Name: DTN Payload	(9) Part No.: KPLO-551-10-3012	(10) Top Assy. No.: 1012-KB-001F	
(11) Mfg./Supplier Name: Lumir	(12) Vendor Code:	(13) Procuring Activity:	
(14) Title of Waiver/Deviation: DTNPL FM Thermal Vacuum Test 온도 프로파일이 EV spec과 다소 상이한 부분이 있음		(15) ■ Minor ☐ Major ☐ Critical	

(16) Detection, Status of the Order

☐ Design	☐ Procurement	☐ Manufacturing	■ Acceptance test	☐ Customer test
☐ Evaluation tests	☐ Incoming inspection	☐ In-process inspection	☐ Qualification test	☐ Customer inspection
		☐ Mandatory Inspection		☐ Other stage

(17) Description of Deviation/Waiver:

DTNPL FM Thermal Vacuum Test 온도 프로파일이 KPLO Environmental Design and Test Specification (KPLO-SP-320-002)의 Acceptance Level과 다소 상이하나 Acceptance Test에 문제가 없을 것으로 판단됨

※ Details are specified in DTNE-NCR-014

(18) Reason for Use:

1st Cold Soak에서 기준인 EV Spec 보다 Chamber 온도가 더 낮게 내려갔으나 (S/B: -35°C, Was: -39°C) 해당 시험시에는 DTNPL FM이 Off 상태이며 사용되는 부품의 온도특성(Storage Temperature)이 해당 온도에도 전혀 문제가 되지않고, FM Acceptance Test를 진행하는데 문제가 되지 않음.

-별첨 : DTNPL FM TVT관련 MRB_20200804A.pptx (해당 문서 내용 중 Storage Temperature 표)

2	(19) Action Date:	(20) ☑ Approve ☐ Conditional ☐ Reject	(21) ■ Use as is ☐ Repair ☐ Scrap ☐ Rework to dwg. ☐ Spec. Change ☐ Other (Below)	(22) Follow-up Req.: ☐ Yes ☑ No	(23) Due Date :

Authority / Date	Engineering / sig.	Product Assurance / sig.	Project Manager / sig
Subcontractor	표선국 2020.11.10	최재웅 2020.11.10	2020.11.10
Prime Contractor	2020.11.10	2020.11.10	2020.11.10
Customer			

3	(24) Follow-up Action-Actionee:		(25) Specifications Affected:
(27) Actionee Signature / Date:		(28) Follow-up Due Date :	(29) Remarks:

Material Review Board Action

1	(1) Project : DTN payload development		(2) MRB Log No. : MRB-DTNPL-014	(3) Date of Initiation : 2020.07.23.

(4) Spec. No. :	(5) Contract No. : N/A	(6) Quantity Affected : 1	(7) Total Lot Quantity : 1	(8) UER No. N/A

2	(9) Material Name : DTNPL	(10)Identification No. :	(11) Parts List : Base No. Indent with (10) : N/A	(12) Serial No. : 1012-KB-001F

(13) Manufacturer : Lumir	(14) Material Location : Lumir, Clean-room

(15) Description of Nonconformance :

DTNPL FM의 Thermal Vacuum Test (2020.07.20 ~ 2020.07.24) 중 Chamber 온도가 EV spec과 상이함:

※ Details are specified in DTNE-NCR-014

3	(16) Cause of nonconformance : 천문연 TVT chamber operator의 실수로 인해 DTNPL FM Thermal Vacuum Test 온도 프로파일이 KPLO Environmental Design and Test Specification (KPLO-SP-320-002)의 Acceptance Level과 상이하게 입력됨.

4	(17) Originator : 최재웅(QA) 김선구(TE)	Organization : Lumir

This Section For Material Review Board Use Only

5	(18) NC Disposition	■ Use as is; ☐ Rework to Dwg.; ☐ Repair; ☐ Scrap; ☐ Return to Supplier; ☐ Request Waiver; ☐ Special Disposition

(19) Disposition or Corrective Action :

- 결정 : DTNPL이 off된 상태에서 TVT 1st cold soak 온도가 규격 대비 4℃ 낮게(S/B: -35℃, was : -39℃) 세팅되어 약 40여분간 충격을 준것으로 판단되었으나, DTNPL에 탑재된 소자들의 온도규격이 -65℃~150℃/200℃와 -55℃~125℃/150℃여서 소자규격에 마진이 있고 DTNPL HW에 영향이 적을 것으로 판단되어 acceptance test 진행에 문제 없을 것으로 판단됨.
- 추가조치 :
  . TVT를 진행 중 DTNPL 정상동작 여부 추적 확인토록 하며, 환경시험 종료 후 TVT 온도 프로파일 부적합에 대해 waiver를 진행하도록 함.

(20) Engineer : 조진호 Date : 2020.7.23	(21) Product Assurance : 정철오 Date : 2020.7.23

(22) Program Manager : 이병선 Date : 2020.7.23	(23)Follow up Action	■Yes ☐No	(24) Date of Board Action : 2020.07.23.

Follow up Action :
TVT 온도 프로파일 부적합에 대해 ETRI로 waive 승인 요청을 환경시험 종료 후 진행함.

6	(25) Actionee Name and Activity :	Remarks :
	(26) Actionee : 루미르 Date : 2020.07.23.	

(27) Follow up Due Date : FM PTR 전	Project Manager : 오대수 Product Assurance : Date :	

LUMIR Harmony in Differences	Non-Conformance Report	Project	DTNE	
		NCR No.	DTNE-NCR-014	
		NC Date	2020-07-22	
		Critical Item	☐Yes ☒No	

Title	DTNPL FM Thermal Vacuum Test Temperature Issue				
NC Item	Item Name(Part Name)	DWG No.	Rev	Serial No.	Quantity
		KPLO-DTNPL-SCH	2.0	1012-KB-001F	1
	Next Higher Assembly	Procedure No.	Rev	Supplier of NC item	
	SBC PBA				
	Subsystem	NC observed location(Org.)	Model		
	DTNPL	KASI 청정실	☐EM ☐EQM ☐QM ☐PFM ☒FM		

Sec. A - Description of Nonconformance /Ref to Documents :

NC detected during	A1 - (Non-functional) Discrepancy	A2 - (Functional) Test Failure/Malfunction/Anomaly
	☐Receiving Insp./Test ☐Inspection ☐Manufacturing ☐Integration ☐Assy. Preparation ☐Alignment ☐Other:	☐Qualification Test ☒Acceptance Test ☐Function Test ☐Other:

Initiated by	Initiator/QA	Signature	Test Operator/Cognizant Engineer	Signature
	최재웅	최 재 웅	김선구	

NC Environment ☐Laboratory ☐Ambient Temp/Humidity ☐Acoustic Noise ☐EMC ☐Sine Vibration ☐Random Vibration ☐Shock ☒Thermal Vacuum/Thermal Cycle (Temp.: °F/ ℃, Pressure:) ☐Other:

Description(5W1H)

DTNPL FM의 Thermal Vacuum Test (2020.07.20 ~ 2020.07.24) 중 Chamber 온도가 EV spec과 약간 상이함

Contract/Subsystem/Equipment Requirements Violated: ☐Yes ☒No

Sec. B - Internal MRB Dispositions /Ref to Documents:

Decisions:

DTNPL FM Thermal Vacuum Test 온도 프로파일이 KPLO Environmental Design and Test Specification (KPLO-SP-320-002)의 Acceptance Level과 약간 상이하나 Acceptance Test에 문제가 없을 것으로 판단됨

Corrective/Preventive Actions:

Other related documents(If applicable):

Classification ☐Major ☒Minor

Customer Notification required ☒Yes ☐No

Requirements Violated ☐RFD ☒RFW ☐N/A Doc. No:

Disposition For Discrepancy:	Disposition For Test Failure/Malfunction/Anomaly:
☒Use As Is ☐Rework ☐Repair ☐RTV ☐Scrap ☐Other:	☐Retest ☐Re-inspect ☐SW change ☐Other:

Cause of NC:
☐Design ☒Human Error ☐Material ☐Procedure ☐On board Software ☐Handling ☐Workmanship ☐Test Software ☐Facility/Equipment ☐Jig/Fixture ☐Test Procedure ☐Other:

Signatures	Quality	Engineering	Product Assurance	Project Manager	
Name / Signature Date	QA LUMIR 03		PA LUMIR 01		

☐ **Sec. C1 – Customer held MRB** MRB No.:

☐ **Sec. C2 – Customer invited MRB**

Sec. D – Closeout

Decision:

Disposition:
☐Use As Is ☐Rework ☐Repair ☐RTV ☐Scrap ☐Retest ☐Re-inspect ☐SW change ☐Other:

Corrective/Preventive Actions:

PA Name/Signature:

Date:

Signatures	Quality	Engineering	PA	PM	Customer
Org. Name/Signature Date					

LUMIR Harmony in Differences	Non-Conformance Report	Project	DTNE
		NCR No.	DTNE-NCR-014
		NC Date	2020-07-22
		Critical Item	☐Yes ☒No

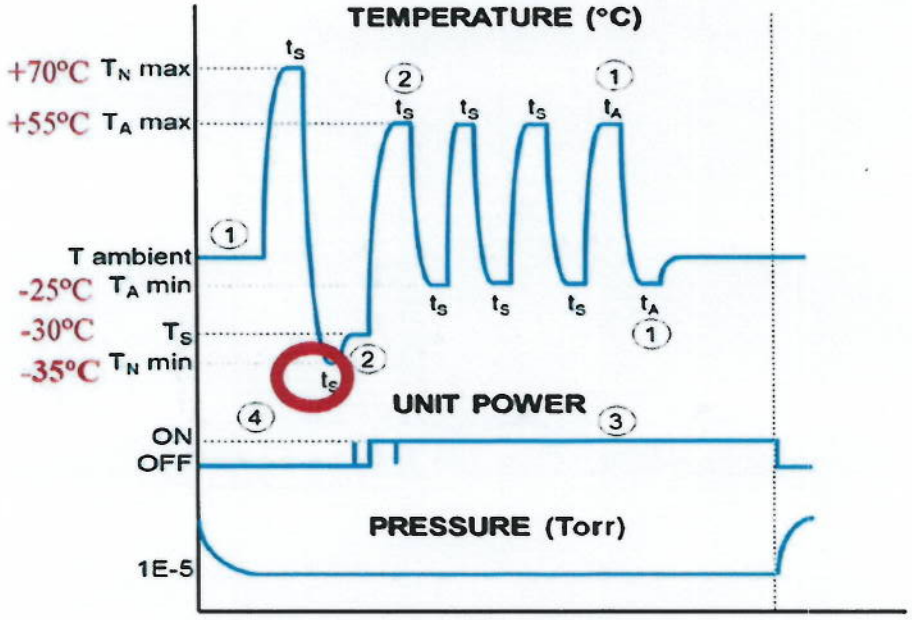
(Continuation Sheet for Any Additional Information and Actions with clear link to the NCR)

➔ Description

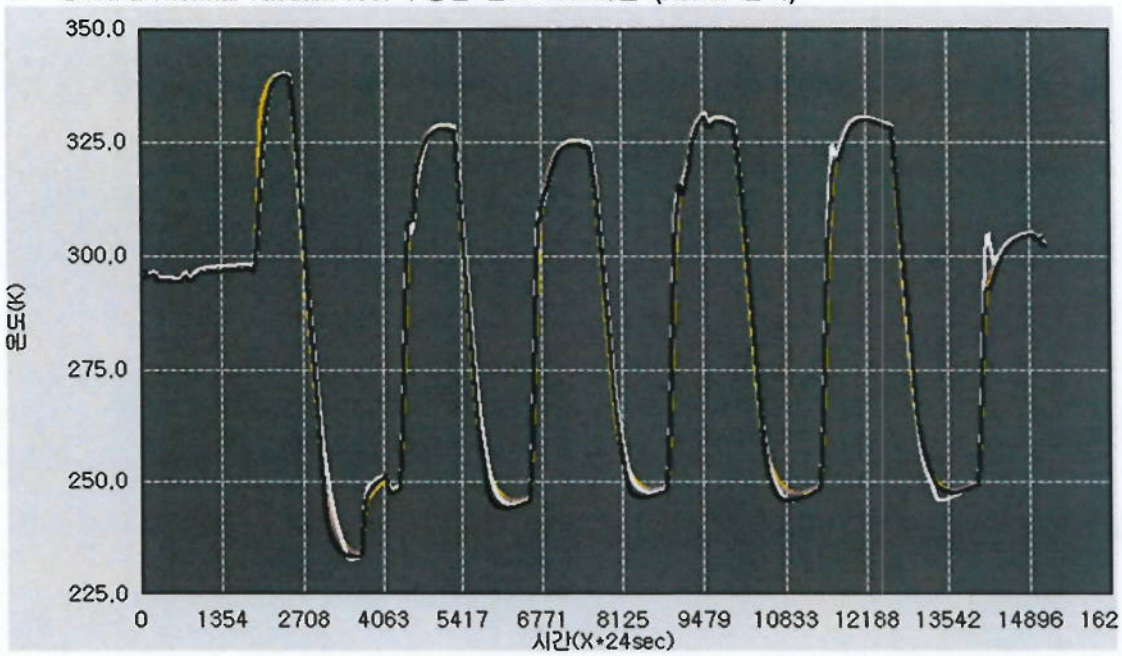
■ KASI에서 진행한 DTNPL FM Thermal Vacuum Test 중 Chamber의 온도가 DTNPL의 EV spec과 다소 상이함을 확인

- 1st Cold Soak 온도 (T_N)가 더 낮게 내려감 (DTNPL FM은 OFF 상태임)
  - S/B : -35°C
  - Was : -39°C

■ DTNPL Thermal Vacuum Test Temperature Cycling EV spec



■ DTNPL Thermal Vacuum Test 수행된 온도 프로파일 (Kelvin 단위)



➔ Root cause
- ■ KASI Chamber Operator의 Chamber Control 미흡으로 인한 Human Error 발생

➔ Decision 제안
- ■ 현상태 진행 (use as is)
  - Thermal Vacuum Test의 온도 프로파일이 DTNPL EV spec과 일부 상이한 부분이 있지만, Acceptance Test와 DTNPL의 기능에 영향이 없는 것으로 판단되어 Waiver 요청
  - DTNPL에서 사용하는 부품의 온도 정보를 별도 제출 (부품의 Storage Temperature 재확인)

DTNPL FM
Thermal Vacuum Test

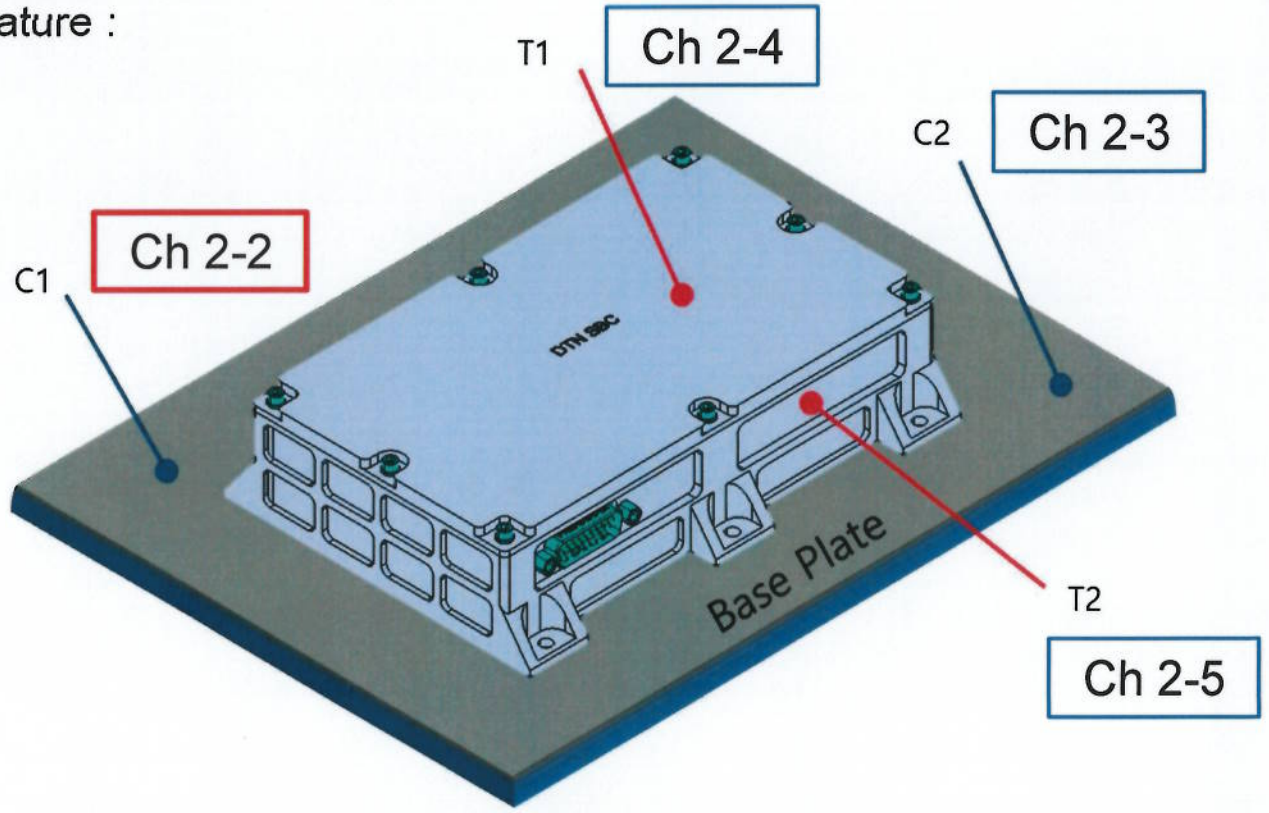
Material Review Board(MRB)

2020. 07. 23

LUMIR
Harmony in Differences

Description

- **Location of Thermal Sensors**
  - Control Temperature (@Base Plate)
    - C1 (Ch 2-2) : Main
    - C2 (Ch2-3) : Optional
  - Measurement Temperature :
    - T1 (Ch 2-4)
    - T2 (Ch 2-5)



Description

- **TV Test 온도 조건**
  - Environmental Design and Test Specification (KPLO-SP-320-002)

Table 3-1. Equipment Temperature Limits

	EQUIPMENT	TEMPERATURE LIMITS			Temp limits definition
		Non-operating (T_N)	Start-up (T_S)	Operating (T_O)	
PAYLOAD	LUTI	-15 / +55	-10	-5 / +40	S/C I/F
	DTNPL	-35 / +70	-30	-20 / +50	Baseplate
	POLCAM OB	-30 / +65	-25	-20 / +60	S/C I/F
	POLCAM EB	-35 / +70	-30	-20 / +50	Baseplate
	KGRS SU	-35 / +65	-30	-20 / +50	S/C I/F
	KGRS EU	-35 / +70	-30	-20 / +55	Baseplate
	KMAG Boom/Hinge	-70 / +90	-65	-55 / +70	S/C I/F
	KMAG Actuator	N/A / +50	N/A	N/A / +50	TBD
	KMAG FCE	-35 / +70	-30	-20 / +50	Baseplate
	ShadowCam	-40 / +70	-40 / +40	-40 / +40	ShadowCam I/F
PDTS	RF Switch	-35 / +60	-25	-20 / +50	Baseplate
	X-band Transmitter	-40 / +75	-30	-20 / +55	Baseplate
	APMU	-80 / +150	-75	-30 / +70	S/C I/F
	APEU	-35 / +65	-30	-20 / +55	Baseplate

Description

- **TV Test 온도 조건**
  - Environmental Design and Test Specification (KPLO-SP-320-002)
  - 3.1.2 Temperature Extremes

Equipment acceptance temperatures are :

$T_A min = T_O min - 5°C$

$T_A max = T_O max + 5°C$

Equipment qualification temperature are :

$T_Q min = T_O min - 10°C$

$T_Q max = T_O max + 10°C$

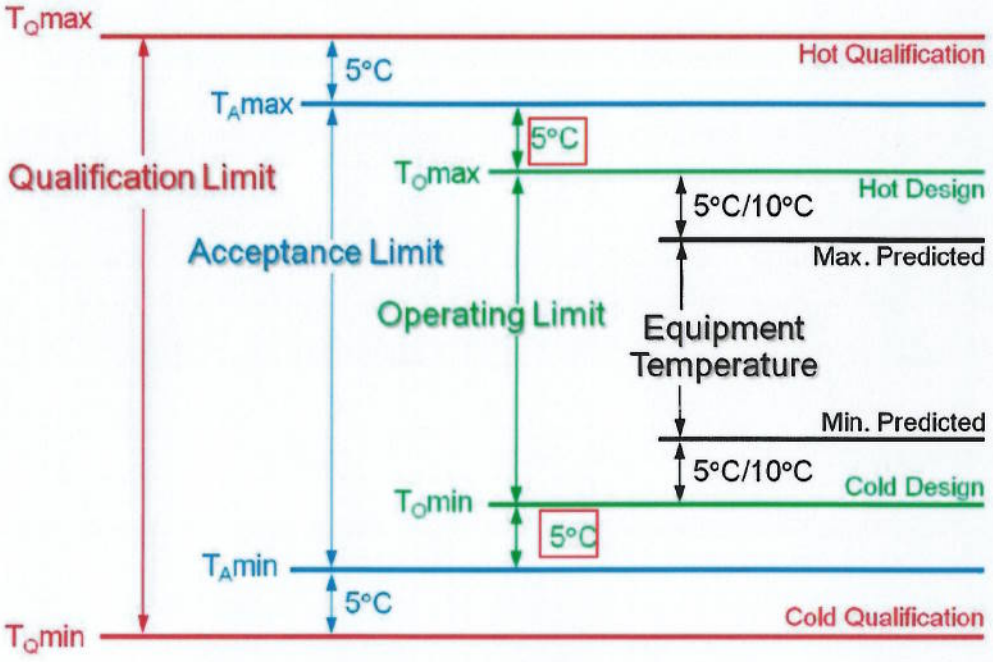
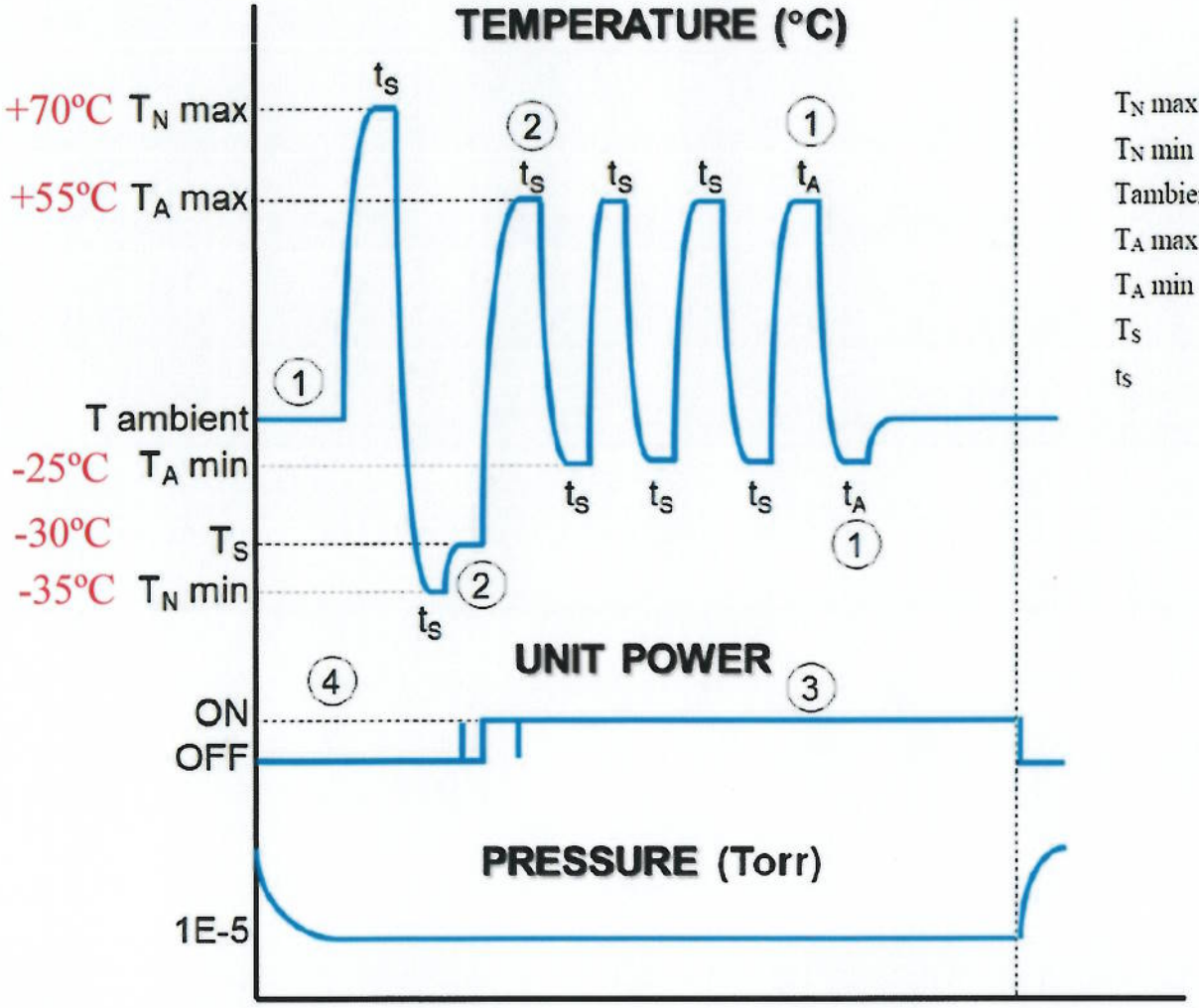


Figure 3-1. Temperature Design and Test Limits

LUMIR
Harmony in Differences

Description

- **TV Test Temperature Cycling**

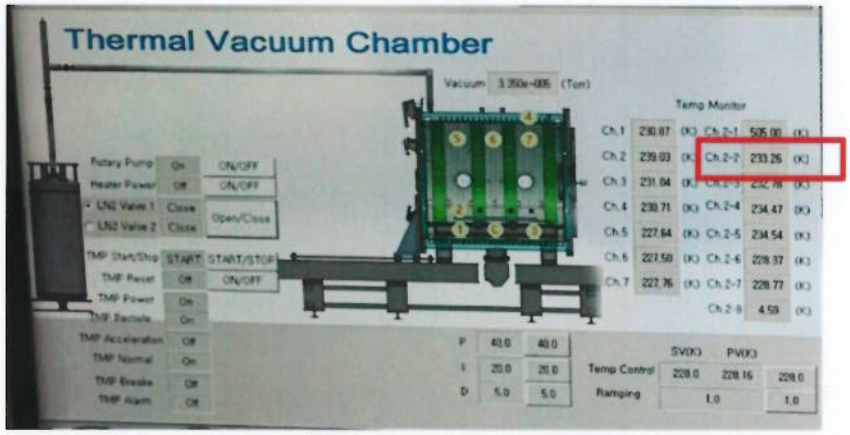


T_N max	Maximum non-operating temperature
T_N min	Minimum non-operating temperature
Tambient	Ambient temperature
T_A max	Maximum acceptance temperature
T_A min	Minimum acceptance temperature
T_S	Start-up temperature
ts	Minimum stabilized temperature time : 1 hr

LUMIR
Harmony in Differences

DTNE-NCR-014

- **현상**
  - 1st Cold Soak 온도 (T_N)가 EV Spec 대비 더 낮게 내려감
    - S/B : -35 ℃
    - Was : -39 ℃
- **경과요약**
  - 2020.07.21 09:03 (이상현상 확인)
    - 1st Cold Soak 온도가 -35 ℃ 보다 더 낮은 온도인 233.26K (-39℃)까지 내려간 것을 루미르 Test Operator가 발견 및 KASI Chamber Operator에게 전달
  - 2020.07.21 09:47 (조치)
    - KASI Chamber Operator가 -35 ℃로 올리도록 조치



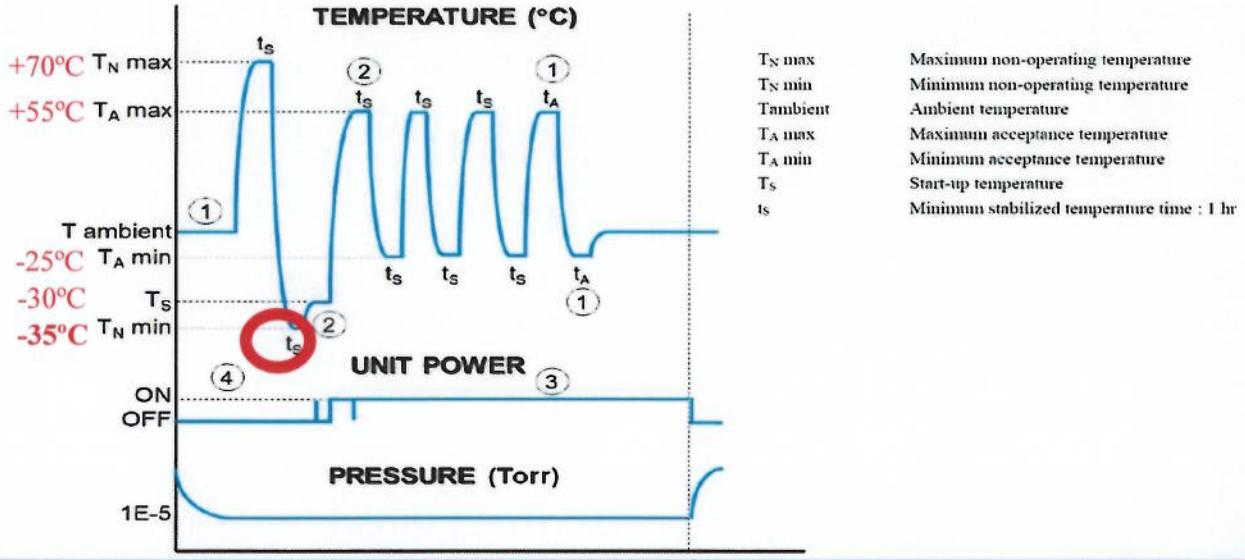
233.26K (-39 ℃)시의 Chamber 상황

LUMIR Harmony in Differences

Issue #1

- **Root Cause**
  - KASI Chamber Operator의 챔버 Control 미흡
- **영향성 분석**
  - 해당 시험은 DTNPL이 OFF된 상태에서 기준 대비 4℃ 더 Cold 충격을 주었으나 H/W에 문제가 생기지는 않았을 것으로 판단함
  - 사용하는 부품의 Storage Temperate의 경우 마진이 많음 (별첨 참고)
- **결론**
  - 열진공시험을 계속 진행하는 것으로 협의함
  - KASI Chamber Operator에게 주의를 줌

-35 ℃ 이어야 하나
-39.89℃ 로 Cold Soak



LUMIR
Harmony in Differences

(별첨) DTNPL FM 부품의 Storage Temperature

- **사용하는 부품 15종 모두 Storage Temperature가 -55 ℃까지는 가능함**
  - 수행되었던 1st Cold Soak 온도인 -39℃에서 부품의 Damage 없음

Item No.	Part Number (FM)	Function Characteristics	Generic Procurement Specification	Detail Procurement Specification	Manufacturer/ Country	Quality Level (FM)	Storage Temperature Range
1	3DFN32G08VS4704 MS	IC, Module, NAND Flash, 32Gbit (4G x 16), 3.3V	MIL-PRF-38535	3DPA-6800-1	3D PLUS	Class V.eq	-65~150
2	3DSD2G40VS5493 SS	IC, Module, Memory, SDRAM, 2Gbit, 3.3V	MIL-PRF-38535	3DPA-4760-3	3D PLUS	Class V.eq	-55~150
3	3DMR64M08VS4476 SS	IC, Module, Memory, MRAM, 3.3V	MIL-PRF-38535	3DPA-4620-03	3D PLUS	Class V.eq	-55~125
4	5962R0722701VFA	IC, Linear, 12-Bit A/D Converter, 8-Channel, 50kSPS to 1MSPS	MIL-PRF-38535	MIL-PRF-38535	Texas Instrument	QML V	-65~150
5	5962F07A0501VXC	IC, Linear, QUAD HIGH SPEED DIFFERENTIAL RS422 LINE DRIVER	MIL-PRF-38535	MIL-PRF-38535	Honeywell	QML V	-65~150
6	5962F07A0401VXC	IC, Linear, QUAD HIGH SPEED DIFFERENTIAL RS422 LINE RECEIVER	MIL-PRF-38535	MIL-PRF-38535	Honeywell	QML V	-65~150
7	3DLV3302VS1619 MS	IC, Linear, Dual LVDS Driver and Receiver, 3.3V	MIL-PRF-38535	MIL-PRF-38535	3D PLUS	QML V.eq	-65~150
8	5962R8551401VPA	IC, Linear, Precision voltage refence, 5V	MIL-PRF-38535	MIL-PRF-38535	Analog Devices	QML V	-65~150
9	5962R9950402VDA	IC, Linear, Quad Operational amplifier	MIL-PRF-38535	MIL-PRF-38535	Texas Instrument	QML V	-65~150
10	MSK5063HRH	Hybrid, Linear, RAD HARD, Positive Voltage Regulator, ADJ, 10A	MIL-PRF-38535	8218.1 Rev.B	MSK	Class H.eq	-65~150
11	5962R1320202VXC	Hybrid, Linear, RAD HARD, Positive Voltage Regulator, ADJ, 3A	MIL-PRF-38535	MIL-PRF-38535	Texas Instrument	Class K.eq	-55~150
12	3DPM0168-2-SS	Latch-Up Current Limiter, 2A	MIL-STD-883	MIL-STD-883	3D PLUS	Class K.eq	-55~150
13	5962-1620801QXF	IC, Digital, FPGA, RT4G, Radiation Tolerant	MIL-STD-883	WP0194, MIL-STD-883/V QC-12-024083	MICROSEMI	MIL-STD-883B	-55~125
14	XE64S-L43-40.000MHz	Hybrid, Crystal Oscillator, Class-2, 40MHz, 3.3V, HC/ACMOS Sq Wave Output	MIL-PRF-55310	OS-68338	XSIS	Class S.eq	-55~125
15	JANS2N2222AUB	NPN Silicon Switching Transistor	MIL-PRF-19500/255	MIL-PRF-19500/255	Microsemi	JANS	-65~200