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| <b><i>Title</i></b>            | EPIC MOS Health & Safety Alarms and Actions                                                     |
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## EPIC MOS Health & Safety Alarms and Actions

### Request of changes (EPIC-EST-TN-009)

Nicola La Palombara

This document summarises all the changes to be performed on:

- the Issue 1.1 of ESA “**Technical note on Instruments Health & Safety Alarms and Actions** (XMM-SAX-VILSPA/1999-0032/TN)”, with reference to the EPIC MOS section;
- the **ESOC Operation Database**, with reference to the applicable alarm/warning limits.

All change requests here reported replaces the previous ones, included what proposed for the database on past November 19<sup>th</sup> (e-mail of N. La Palombara). This is done with two aims:

- 1) to have a full agreement between the Technical Note and the Operation Database;
- 2) to have a complete set of Alarm/Warning actions which are as simple as possible to be implemented and handled at ESOC level, especially in view of the Commissioning phase.

#### 1) Limits Values and/or Actions to be modified on Instrument Telemetry Parameters

The following comments are based to the MOS1 database but they are applicable even to the corresponding MOS2 items. The applicable limits are reported only for those parameters which have different limit values in the Technical Note and in the Database: for all the other parameters the present limit values are still valid. The alarm actions are reported when they need to be changed or inserted in the Technical Note.

##### E1001 - D Prim PW consum

Hard limit min: 0.3 A

Hard limit max: 0.6 A

##### E1002 - D.P.S. Temp #1

Action for E1002 hard limit min must be:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform FOP procedure :

“Switch on S/C EMCS1 electronics substitution heaters”

3/ When E1002 > (-10 ° C)

Then

Perform FOP procedure :

“Switch off S/C EMCS1 electronics substitution heaters”

And re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

##### E1003 - D.P.S. Temp #2

Action for E1003 hard limit min must be:

SPACON to :

1/ Disable CCS commanding to MOS1  
2/ Perform FOP procedure :  
    *"Switch on S/C EMCS1 electronics substitution heaters"*  
3/ When E1003 > (-10 ° C)  
    Then  
        Perform FOP procedure :  
            *"Switch off S/C EMCS1 electronics substitution heaters"*  
        And re-enable CCS commanding to MOS1 at the start of next observation  
    Else  
        Leave CCS commanding to MOS1 disabled until further notice

#### E1006 - D +15V PW supply

Hard limit min: + 13.5 V  
Hard limit max: + 16.5 V

#### E1007 - D -15V PW supply

Hard limit min: - 16.5 V  
Hard limit max: - 13.5 V

#### E1022 - D Door HOP Current Limiter Status

If = 1 (ON) then:  
SPACON to perform Action [MOS1-1]

#### E1023 - D Venting Valve HOP Current Limiter Status

If = 1 (ON) then:  
SPACON to perform Action [MOS1-1]

#### E1024 - D Filter Wheel Coil 1 Current Limiter Status

If = 1 (ON) then:  
SPACON to perform Action [MOS1-1]

#### E1025 - D Filter Wheel Coil 2 Current Limiter Status

If = 1 (ON) then:  
SPACON to perform Action [MOS1-1]

#### E1026 - D Annealing Heater Current Limiter Status

If = 1 (ON) then:  
SPACON to perform Action [MOS1-1]

E1027 - D Shroud Heater Current Limiter Status

If = 1 (ON) then:

SPACON to perform Action [MOS1-1]

E1076 - C EMAE -6V line

Hard limit min: - 6.5 V

Hard limit max: - 5.5 V

E1077 - C EMAE +6V line

Hard limit min: + 5.5 V

Hard limit max: + 6.5 V

E1078 - C EMAE -13V line

Hard limit min: - 14 V

Hard limit max: - 12 V

E1079 - C EMAE +13V line

Hard limit min: + 12 V

Hard limit max: + 14 V

E1084 - V EMVC temp. # 1

Action for E1084 hard limit min must be:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform FOP procedure :

*"Switch on S/C EMCS1 electronics substitution heaters"*

3/ When E1084 > (-10 ° C)

    Then

        Perform FOP procedure :

*"Switch off S/C EMCS1 electronics substitution heaters"*

        And re-enable CCS commanding to MOS1 at the start of next observation

    Else

        Leave CCS commanding to MOS1 disabled until further notice

E1085 - C EMCR temp. # 1

Action for E1085 hard limit min must be:

SPACON to :

1/ Disable CCS commanding to MOS1  
2/ Perform FOP procedure :  
    *"Switch on S/C EMCS1 electronics substitution heaters"*  
3/ When E1085 > (-10 ° C)  
    Then  
        Perform FOP procedure :  
            *"Switch off S/C EMCS1 electronics substitution heaters"*  
        And re-enable CCS commanding to MOS1 at the start of next observation  
    Else  
        Leave CCS commanding to MOS1 disabled until further notice

#### E1087 - V EMVC temp. # 2

Action for E1087 hard limit min must be:  
SPACON to :  
1/ Disable CCS commanding to MOS1  
2/ Perform FOP procedure :  
    *"Switch on S/C EMCS1 electronics substitution heaters"*  
3/ When E1087 > (-10 ° C)  
    Then  
        Perform FOP procedure :  
            *"Switch off S/C EMCS1 electronics substitution heaters"*  
        And re-enable CCS commanding to MOS1 at the start of next observation  
    Else  
        Leave CCS commanding to MOS1 disabled until further notice

#### E1088 - C EMCR -13V line

Hard limit min: - 14 V  
Hard limit max: - 12 V

#### E1089 - C EMCR +13V line

Hard limit min: + 12 V  
Hard limit max: + 14 V

#### E1090 - C EMCR temp #2

Hard limit min: - 20 °C  
Soft limit min: - 10 °C  
Soft limit max: + 50 °C  
Hard limit max: +50 °C

Action for E1090 hard limit min must be:  
SPACON to :  
1/ Disable CCS commanding to MOS1  
2/ Perform FOP procedure :  
    *"Switch on S/C EMCS1 electronics substitution heaters"*  
3/ When E1090 > (-10 ° C)  
    Then  
        Perform FOP procedure :  
            *"Switch off S/C EMCS1 electronics substitution heaters"*  
        And re-enable CCS commanding to MOS1 at the start of next observation  
    Else

Leave CCS commanding to MOS1 disabled until further notice

### E 1253 - EMCH focal plane normal range temperature

For all conditions the applicable limits are:

Hard limit min: - 150 °C

Soft limit min: - 125 °C

Soft limit max: N/A

Hard limit max: N/A

Action [MOS1-3] for E1253 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EPIC CCD Substitution Heater"*

3/ When E1253 > ( - 125 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EPIC CCD Substitution Heater"*

Re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

### E1260 - EMAE focal plane redundant thermal control temperature

For all conditions the applicable limits are:

Hard limit min: - 150 °C

Soft limit min: - 125 °C

Soft limit max: +40 °C

Hard limit max: N/A

Action for E1260 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EPIC CCD Substitution Heater"*

3/ When E1260 > ( - 125 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EPIC CCD Substitution Heater"*

Re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

### E1261 – EMCH Vacuum Monitor

For all conditions all limits are N/A

### E1262 - EMCH secondary radiator temperature

For all conditions the applicable limits are:

Hard limit min: N/A

Soft limit min: - 100 °C

Soft limit max: N/A

Hard limit max: +100 °C

E1265 - EMCH Door bellow pressure

1) For launch, before door opening (E1256=1)

Hard limit min: 0.5 Bar

Soft limit min: 2 Bar

Soft limit max: N/A

Hard limit max: N/A

2) After door opening (E1256=0):

All limits are N/A

E1308 - EMCH focal plane extended range temperature

For all conditions the applicable limits are:

Hard limit min: - 150 °C

Soft limit min: - 125 °C

Soft limit max: +40 °C

Hard limit max: +135 °C

Action for E1308 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EPIC CCD Substitution Heater"*

3/ When E1308 > ( - 125 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EPIC CCD Substitution Heater"*

Re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

Action [MOS1-5] for E1308 hard limit max must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"MOS1 annealing heaters switch off"*

3/ When E1308 < + 40 ° C

Then

Re-enable CCS Commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

E1310 - EMCH FW motor temperature

Action for E1310 hard limit min must be modified as follows:

SPACON to:

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS1 Electronics Substitution Heater"*

3/ When E1310 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS1 Electronics Substitution Heater"*  
 Re-enable CCS commanding to MOS1 at the start of next observation

Else  
 Leave CCS commanding to MOS1 disabled until further notice

Action [MOS1-6] for E1310 hard limit max must be replaced by Action [MOS1-1]:

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform IFOP procedure :  
     *"MOS1 emergency switch off"*  
 3/ Leave CCS commanding to MOS1 disabled until further notice

### E1311 - EMAE electronics temperature

Action for E1311 hard limit min must be modified as follows:

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform IFOP procedure :  
     *"Switch-on S/C EMCS1 Electronics Substitution Heater"*  
 3/ When E1311 > ( - 10 ° C)  
     Then  
         Perform FOP procedure:  
             *"Switch-off S/C EMCS1 Electronics Substitution Heater"*  
         Re-enable CCS commanding to MOS1 at the start of next observation  
     Else  
         Leave CCS commanding to MOS1 disabled until further notice

### E1312 - EMAE focal plane nominal thermal control temperature

For all conditions the applicable limits are:

Hard limit min: - 150 °C  
 Soft limit min: - 125 °C  
 Soft limit max: +40 °C  
 Hard limit max: N/A

Action for E1312 hard limit min must be modified as follows:

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform IFOP procedure :  
     *"Switch-on S/C EPIC CCD Substitution Heater"*  
 3/ When E1312 > ( - 125 ° C)  
     Then  
         Perform FOP procedure:  
             *"Switch-off S/C EPIC CCD Substitution Heater"*  
         Re-enable CCS commanding to MOS1 at the start of next observation  
     Else  
         Leave CCS commanding to MOS1 disabled until further notice

### E1315 - EMCH electronics temperature

Action for E1315 hard limit min must be modified as follows:

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform IFOP procedure :  
     *"Switch-on S/C EMCS1 Electronics Substitution Heater"*  
 3/ When E1315 > ( - 10 ° C)

Then  
     Perform FOP procedure:  
         *"Switch-off S/C EMCS1 Electronics Substitution Heater"*  
     Re-enable CCS commanding to MOS1 at the start of next observation  
 Else  
     Leave CCS commanding to MOS1 disabled until further notice

## 2) SVM Out-of-Limits to be changed or inserted

For the limits of the S/C acquired Thermal Monitoring parameters the same values and actions of the Instrument ones must be used, i.e.:

### T4033 - TH U+X EMCH1

Hard Limit min: - 20  
 Soft Limit min: - 10  
 Soft Limit max: + 40  
 Hard limit max: +50

Action for T4033 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS1 Electronics Substitution Heater"*

3/ When T4033 > ( - 10 ° C)

    Then

        Perform FOP procedure:

*"Switch-off S/C EMCS1 Electronics Substitution Heater"*

        Re-enable CCS commanding to MOS1 at the start of next observation

    Else

        Leave CCS commanding to MOS1 disabled until further notice

### T4035 - TH U-X EMVC1

Hard Limit min: - 20  
 Soft Limit min: - 10  
 Soft Limit max: + 40  
 Hard limit max: +50

Action for T4035 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS1 Electronics Substitution Heater"*

3/ When 4035 > ( - 10 ° C)

    Then

        Perform FOP procedure:

*"Switch-off S/C EMCS1 Electronics Substitution Heater"*

        Re-enable CCS commanding to MOS1 at the start of next observation

    Else

        Leave CCS commanding to MOS1 disabled until further notice

### T4037 - TH U-X EMDH1

Hard Limit min: - 20  
 Soft Limit min: - 10

Soft Limit max: + 40

Hard limit max: +50

Action for T4037 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS1 Electronics Substitution Heater"*

3/ When T4037 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS1 Electronics Substitution Heater"*

Re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

#### T4065 - TH U+X-EMAE1

Hard Limit min: - 20

Soft Limit min: - 10

Soft Limit max: + 40

Hard limit max: +65

Action for T4065 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS1 Electronics Substitution Heater"*

3/ When T4065 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS1 Electronics Substitution Heater"*

Re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

#### T4034 - TH U+X EMCH2

Hard Limit min: - 20

Soft Limit min: - 10

Soft Limit max: + 40

Hard limit max: +50

Action for T4034 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS2

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS2 Electronics Substitution Heater"*

3/ When T4034 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS2 Electronics Substitution Heater"*

Re-enable CCS commanding to MOS2 at the start of next observation

Else

Leave CCS commanding to MOS2 disabled until further notice

#### T4036 - TH U-X EMVC2

Hard Limit min: - 20  
Soft Limit min: - 10  
Soft Limit max: + 40  
Hard limit max: +50

Action for T4036 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS2

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS2 Electronics Substitution Heater"*

3/ When T4036 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS2 Electronics Substitution Heater"*

Re-enable CCS commanding to MOS2 at the start of next observation

Else

Leave CCS commanding to MOS2 disabled until further notice

#### T4038 - TH U-X EMDH2

Hard Limit min: - 20  
Soft Limit min: - 10  
Soft Limit max: + 40  
Hard limit max: +50

Action for T4038 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS2

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS2 Electronics Substitution Heater"*

3/ When T4038 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS2 Electronics Substitution Heater"*

Re-enable CCS commanding to MOS2 at the start of next observation

Else

Leave CCS commanding to MOS2 disabled until further notice

#### T4032 - TH U+X-EMAE2

Hard Limit min: - 20  
Soft Limit min: - 10  
Soft Limit max: + 40  
Hard limit max: +65

Action for T4032 hard limit min must be modified as follows:

SPACON to :

1/ Disable CCS commanding to MOS2

2/ Perform IFOP procedure :

*"Switch-on S/C EMCS2 Electronics Substitution Heater"*

3/ When T4032 > ( - 10 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EMCS2 Electronics Substitution Heater"*

Re-enable CCS commanding to MOS2 at the start of next observation

Else

Leave CCS commanding to MOS2 disabled until further notice

Moreover, for the below SVM parameters the following limits and actions must be included in the Technical Note:

#### T4000 - TEMP EMDH1 ANP1

For all conditions the applicable limits are:

Hard limit min: - 150 °C

Soft limit min: - 125 °C

Soft limit max: +40 °C

Hard limit max: +135 °C

Action for T4000 hard limit min must be as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"Switch-on S/C EPIC CCD Substitution Heater"*

3/ When T4000 > ( - 125 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EPIC CCD Substitution Heater"*

Re-enable CCS commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

Action for T4000 hard limit max must be as follows:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure :

*"MOS1 annealing heaters switch off"*

3/ When T4000 < + 40 ° C

Then

Re-enable CCS Commanding to MOS1 at the start of next observation

Else

Leave CCS commanding to MOS1 disabled until further notice

#### T4002 - TEMP EMDH2 ANP1

For all conditions the applicable limits are:

Hard limit min: - 150 °C

Soft limit min: - 125 °C

Soft limit max: +40 °C

Hard limit max: +135 °C

Action for T4002 hard limit min must be as follows:

SPACON to :

1/ Disable CCS commanding to MOS2

2/ Perform IFOP procedure :

*"Switch-on S/C EPIC CCD Substitution Heater"*

3/ When T4002 > ( - 125 ° C)

Then

Perform FOP procedure:

*"Switch-off S/C EPIC CCD Substitution Heater"*

Re-enable CCS commanding to MOS2 at the start of next observation

Else

Leave CCS commanding to MOS2 disabled until further notice

Action for T4002 hard limit max must be as follows:

SPACON to :

1/ Disable CCS commanding to MOS2

2/ Perform IFOP procedure :  
     *"MOS2 annealing heaters switch off"*  
 3/ When T4002 < + 40 ° C  
     Then  
         Re-enable CCS Commanding to MOS2 at the start of next observation  
     Else  
         Leave CCS commanding to MOS2 disabled until further notice

### 3) TM Exception packet messages

The following comments are based to the MOS1 database but they are applicable even to the corresponding MOS2 items. Please note that they are referred to the originally delivered database and not to the ESOC Operation Database which, for some items, can be different from the previous one.

For the MOS TM exception packets below reported, the relevant action must be modified as follows:

#### 3xx03 – Unsuccessful Command Acceptance (3,2) TM packets

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform the IFOP procedure:  
     *"Stop MOS1 observation"*  
 3/ Re-enable CCS commanding to MOS1 at the end of the current observation

#### 3xx04 - Unsuccessful Command Execution (3,4) TM packets

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform the IFOP procedure:  
     *"Stop MOS1 observation"*  
 3/ Re-enable CCS commanding to MOS1 at the end of the current observation

#### 30007 - Full Scientific Buf.

INSCON to log the warning in the Log Book

#### 30010 - LBR Protocol Error

INSCON to log the warning in the Log Book, along with the value of parameter E1633 of this packet which identifies the specific reason of the error

#### 30011 – Failed Initialization

SPACON to :  
 1/ Disable CCS commanding to MOS1  
 2/ Perform IFOP procedure:  
     *"RBI cold reset"*  
 3/ Re-enable CCS commanding to MOS1 at the end of the current observation

#### 30012 - HBR Fifo Full

INSCON to log the warning in the Log Book

#### 30014 – Thermal Control Alarm

INSCON to:  
 1/ log the time of the warning start (first warning packet)  
 2/ log the value of TM parameter E1308 (focal plane temperature) at warning start  
 3/ log the value of TM parameter E1712 (annealing heater switch status) at warning start  
 4/ log the value of TM parameter E1713 (secondary shroud heater switch status) at warning start  
 5/ SPACON to send TC E42 to get TM packet 30024  
 6/ INSCON to log the value of TM parameters E1554 and E1555 (TM packet 30024) at warning start

If the warning eventually stops, INSCON to:

7/ log the time of warning stop (last warning packet)

8/ log the value of TM parameter E1308 (focal plane temperature) at warning stop.

9/ log the value of TM parameter E1712 (annealing heater switch status) at warning stop.

10/ log the value of TM parameter E1713 (secondary shroud heater switch status) at warning stop.

11/ SPACON to send TC E42 to get TM packet 30024

12/ INSCON to log the value of TM parameters E1554 and E1555 (TM packet 30024) at warning stop

### 30015 – Filter Wheel Position

If The experiment door is closed

Then

disregard the warning message

Else

INSCON to log in the Log Book :

a) the time when the warning was issued

b) the value of TM parameter E1254 (Filter Wheel nominal stop sensor status) of packet 30015

c) the value of TM parameter E1257 (Filter Wheel position) of packet 30015

d) the value of TM parameter E1258 (Filter Wheel redundant stop sensor status) of packet 30015

SPACON to

e) disable CCS commanding to MOS1

f) perform a new Filter Wheel synchronization

g) re-enable CCS commanding to MOS1 at the end of the current observation

### 30048 – Unsuccessfull Switch Opening

SPACON to :

1/ Disable CCS commanding to MOS1

2/ If TM parameter E1711 <> 3584 and E1711 <> 3840

Then

Execute IFOP procedure :

*"MOS1 switch off"*

Else

Remove power to MOS1 instrument

EndIf

3/ Leave CCS commanding to MOS1 disabled until further notice

### 30049 – Current Limiter Activation

SPACON to :

1/ Disable CCS commanding to MOS1

2/ If TM parameter E1711 <> 3584 and E1711 <> 3840

Then

Execute IFOP procedure :

*"MOS1 switch off"*

Else

Remove power to MOS1 instrument

EndIf

3/ Leave CCS commanding to MOS1 disabled until further notice

## 4) S/C Attitude lost

In case of S/C attitude loss, the following actions have to be performed asap:

SPACON to :

1/ Disable CCS commanding to MOS1

2/ Perform IFOP procedure:

*"MOS1 switch-off"*

3/ Leave CCS disabled to MOS1 until S/C attitude is recovered