TVT SET-UP

ACTION 1: GONDOLA INSTALLATION IN LSS
ACTION 2: SCAFFOLDING INSTALLATION IN LSS
ACTION 3: AMS INSTALLATION IN LSS
ACTION 4: Cryo Ground Support Equipment INSTALLATION
ACTION 5: TRD-GAS-Ground-Support-Equipment INSTALLATION
ACTION 6: INFRARED LAMPS INSTALLATION
ACTION 7: CABLELING ROUTING
ACTION 8: LSS PLATFORM MLI INSTALLATION
ACTION 9: FUNCTIONAL CHECK OUT, TEST-GSE INSTALL AND REMOVE
ACTION 10: SCAFFOLDING REMOVAL FROM LSS
ACTION 11: LSS DOOR CLOSURE
ACTION 12: TEST RUNNING
ACTION 13: LSS DOOR OPEN
ACTION 14: SCAFFOLDING INSTALLATION IN LSS
ACTION 15: FUNCTIONAL TEST, TEST-GSE INSTALL AND REMOVE
ACTION 16: IR LAMPS, CGSE, AMS_02, GONDOLA,... REMOVAL FROM LSS
ACTION 1: GONDOLA INSTALLATION IN LSS

STEP_1: GONDOLA FEET BLOCKS POSITIONING IN THE LSS SEISMIC TABLE
STEP_2: GONDOLA DOWNLOADING FROM THE TRUCK AND CLEANING
STEP_3: GONDOLA MOVING INSIDE ESTEC TEST AREA BY ESTEC AIR PALLET
STEP_4: GONDOLA PREPARATION (MINOR ACTIONS)
STEP_5: GONDOLA MOVING INSIDE LSS BY CRANE
STEP_6: GONDOLA FIXATION TO LSS SEISMIC TABLE

ACCESS NEEDED INSIDE LSS: LSS seismic table

NOTE:
1) Gondola shall be installed before AMS arrival at ESTEC
2) Due to the small clearance between AMS/Gondola and the scaffolding, there shall be some reference marks on the LSS seismic plate that will provide the reference for the location of the Gondola respect to the LSS seismic table (accuracy needed about 1-2 cm)
GONDOLA OVERALL DIMENSIONS

Rotation axis

~6.3m

~3.5m

Stand weight

~5.5 tons
GONDOLA HANDLING at ESTEC

GONDOLA WILL BE MOVED INSIDE ESTEC TEST AREA BY AIR-PALLET, LIFTED INSIDE THE LSS BY 30T CRANE

BY ESTEC AIR PALLET

BY PLF

~7.2m

DIRECTLY BY CRANE

PLF not available
Steel air pallet 4x4m 20 ton

OR

Wooden air pallet 5x5m 15 ton
GONDOLA LIFTING

This picture is not updated: it shows the gondola lifted by the PLF. The gondola will be directly connected to the crane. The crane hook will be closer to the gondola.
GONDOLA LIFTING
GONDOLA LIFTING
GONDOLA LIFTING
GONDOLA LIFTING
GONDOLA LOWERING
GONDOLA FIXATION TO LSS PLATFORM

Austenitic steel 316L

M24

FEET

GONDOLA NOT SHOWN, FEET WILL BE PREMOUNTED TO THE GONDOLA
FEET BLOCKS WILL BE PRE-INSTALLED IN THE LSS SEISMIC PLATFORM
FEET BLOCK INSTALLATION INTO THE LSS PLATFORM

- Feet-block insertion
- Feet-block rests on the bottom of the platform I beam
- Position adjusted
- Gondola lowered on the LSS platform, block pulled in position and bolted
GONDOLA IN LSS

GONDOLA FIXED TO THE PLATFORM
GONDOLA IS PRODUCED IN ITALY SUPPORTED BY ASI/INFN

INVOLVED IN THE PRODUCTION PROCESS

INFN Pisa (A.Basti, F.Bosi) is controlling production process at the Company, will support Gondola installation in LSS.

INFN Perugia (S.Lucidi, I.Panico) is supporting in the administrative aspects

INFN Roma (C.Gargiulo)

The production has been divided in two steps

1) BEAMS production COMPLETED
2) GONDOLA production STARTED:
   
   Production Start 1st March 09
   Production End 30th June 09

Corrado Gargiulo
BEAMS HAVE BEEN PRODUCED

All beams produced, SEPT 2008

Laser welding

Weld joint

316L

12 m

30 cm

AMS

Corrado Gargiulo CERN, MARCH 2009

All beams produced, SEPT 2008
GONDOLA PRODUCTION PROCESS VALIDATION

BEAM HEB 160
(160mm X 160mm)
GONDOLA PRODUCTION

WELDS INSPECTED
(dye penetrant)
AFTER CALENDERING
DON’T SHOW ANY DEFECT

BEAM HEB 160
(160mm X 160mm X 6000)
ALL THE BEAMS HAVE PASSED THE TESTS FORESEEN

TESTS BEFORE AND AFTER CALENDERING ON THE BEAM

Linear beam
- WELDS CHECK
  - Etching acid test
  - Dye penetrant test

- MAGNETIC PERMEABILITY MEASURE

Calendered beam
- WELDS CHECK
  - Dye penetrant test

- MAGNETIC PERMEABILITY MEASURE
ACTION 2: SCAFFOLDING INSTALLATION

STEP_1: SCAFFOLDING PARTIAL INSTALLATION BEFORE AMS ARRIVAL IN THE LSS
STEP_2: SCAFFOLDING INSTALLATION FINALIZATION AFTER AMS 90° ROTATION

ACCESS NEEDED INSIDE LSS: LSS seismic platform

NOTE:
A standard scaffolding is provided by ESTEC
In order to be used it needs to be modified. If modification will be not minor AMS shall contribute to these modifications.
Scaffolding modifications are under discussion with ESTEC.

Access points to AMS in the LSS, foreseen up to now, for all the different actions, are listed in this document in green.
The definition of the points that require access and the time when this access is needed are relevant to minimize scaffolding modification and installation sequence
SCAFFOLDING

THE SCAFFOLDING IS PROVIDED BY ESTEC, MODIFICATIONS TO THE SCAFFOLDING ARE NEEDED BECAUSE OF INTERFERENCE WITH GONDOLA AND AMS
SCAFFOLDING

LEVEL 1
SCAFFOLDING
SCAFFOLDING NAMING

LEVEL 1
(L1)

SCAFFOLDING PLATFORM REFERENCE NAMING USED IN THE NEXT SLIDES (Ex: L1-11)
LEVEL 2 (L2)

SCAFFOLDING NAMING

SCAFFOLDING PLATFORM REFERENCE NAMING USED IN THE NEXT SLIDES (Ex: L2-8)
ON LSS SEISMIC TABLE
ON SCAFFOLDING AT LEVEL 2
LSS MOVABLE PLATFORM

Used to access inside the LSS at AMS top, in those locations not reachable from the scaffolding. Note: some constraints exist on the platform use.
SAFFOLDING MOUNTING

AFTER GONDOLA INSTALLATION
SCAFFOLDING MOUNTING

SCAFFOLDING LEVEL 1
SCAFFOLDING MOUNTING

SCAFFOLDING LEVEL 2 (frame)
SCAFFOLDING MOUNTING

SCAFFOLDING LEVEL 2 (platforms)
SCAFFOLDING INTERFERENCE
AT 1ST FLOOR (four locations)
SCAFFOLDING INTERFERENCE AT 1ST FLOOR
SCAFFOLDING INTERFERENCE
AT 2nd FLOOR
SCAFFOLDING INTERFERENCE
AT 2nd FLOOR
In these two locations there could be preserved the original platforms (pink) under the condition that they have to be dismounted during the rotation and installed back after. If this is not possible a modification of these platforms is needed (light green).
**MINIMUM CLEARANCE.** Install these sections of the scaffolding before disconnecting the Gondola from the crane for a verification of the position of the gondola Vs the scaffolding.
MINIMUM CLEARANCE only during rotation
LARGER CLERANCE at rotation final phase
SCAFFOLDING MOD overall
SCAFFOLDING MOD overall
SCAFFOLDING MOD detail
SCAFFOLDING MOD detail

modified

N.2

original
SCAFFOLDING MOD detail

modified

original

N.2
SCAFFOLDING MOD detail

modified
SCAFFOLDING MOD detail

modified

original

N.4
SCAFFOLDING MOD detail

N.8

original

modified

20 cm
SCAFFOLDING MOD detail

N.2

modified

original
ACTION 3: AMS INSTALLATION IN LSS

STEP_1: AMS DOWNLOADING FROM TRUCK, CLEANING OF SHIPPING CONTAINER (PSS)
STEP_2: AMS MOVING TO ARTEMIS CLEAN ROOM BY ESTEC AIRPADS
STEP_3 DISASSAMBLE SHIPPING CONTAINER (PSS)
STEP_4: AMS PREPARATION IN ARTEMIS CLEAN ROOM
STEP_5: AMS MOVING INSIDE LSS BY CRANE
STEP_6: AMS FIXATION TO THE GONDOLA
STEP_7: AMS 90° ROTATION BY GONDOLA WARM GEAR
STEP_8: AMS 90° POSITION ADJUSTEMENT AND FIXATION
STEP_9: WARM GEAR REMOVAL
Access to the Test Area

To be moved around

PSS_MID

(shipping box)

~9.5 Ton

2.5(PSS)+7(AMS)

~4.3m

~3.2m

~5.2m
4303mm (169.4 inch)

3175mm (125 inch)

5207mm (205 inch)

2226kg (4908 lbs) empty, no panel
PLF
~1.95 Tons
~9.5 Tons
2.5(PSS)+7(AMS)

7.25m

Total
~11.5 Tons
AMS in PSS-MID

AMS 6850kg (15070 lbs) based on helium tank full
Access to the Test Area

To be moved around

AMS in PSS_MID shipping box without top cover and side panel

~9.1 Ton
2.2(PSS)+6.9(AMS)

~3.5m
Access to the Test Area

To be lifted

PLF

~1.95 Ton

~6.8m
Access to the Test Area

To be lifted

PLF
~1.95 Tons

AMS
~6.9 Tons

Total=~9 Tons
AMS MOVED AROUND ON AIR PALLET

LSS

NO CRANE CONTINUITY

AMS+PSS will be moved on AIR PADS

AIR_PADS

5x5x0.5m  15 ton
or
4x4x0.5m  20 ton
AIR PALLETs AVAILABLE AT ESTEC

Steel air pallet 4x4m  20 ton

Wooden air pallet 5x5m 15 ton
Crane 16T
6.9m HH

Door 6.3x6
(hxw)
30 T, 1T, 2T cranes

AMS in the area served by 30 T Crane

Cranes 10T, 3T 11m HH

AMS PREPARATION

Door 5.8x5.7m (hwx)
AMS
in the area served by 30 T Crane

Cranes 10T, 3T 11m HH

AMS PREPARATION

Door 5.8x5.7m (hwx)

30 T crane
AMS preparation in Artemis Clean Room
AMS preparation in Artemis Clean Room

DISASSEMBLE SHIPPING CONTAINER (PSS)
AMS going to LSS

WALL/VIBRATION BASEMENT 5250mm
AIR PADS MAX OVERALL WIDTH 5102mm
In alternative it is possible to use the 4x4m air pallet (TBD)
AMS going to LSS
AMS going to LSS

AMS in the 30T crane served area
AMS LIFTING
AMS LIFTING
AMS LOWERING in LSS
AMS MOUNTING ON THE GONDOLA
AMS MOUNTING ON THE GONDOLA

AMS FIXATION TO GONDOLA

ACCESS NEEDED AT THE FOUR BRACKETS: SCAFFOLDING L2-9C, L2-10C, L2-11C, L2-12C
AMS ROTATION

AMS ROTATION BY GONDOLA

ACCESS AT THE GONDOLA BLOCKING PINS (BOTH SIDES) AND AT THE WORM GEAR (ONE SIDE): SCAFFOLDING L2-1, L2-5
AMS ROTATION

AMS ROTATION BY GONDOLA

ACCESS AT THE WORM GEAR (ONE SIDE). SCAFFOLDING L2-1 OR L2-5 (WORM GEAR CAN BE MOUNTED ON EITHER SIDE OF THE GONDOLA)
AMS ROTATION

AMS ROTATION BY GONDOLA

ACCESS AT THE WORM GEAR (ONE SIDE). SCAFFOLDING L2-1 OR L2-5 (WORM GEAR CAN BE MOUNTED ON EITHER SIDE OF THE GONDOLA)
AMS ROTATION

AMS ROTATION BY GONDOLA

ACCESS AT THE WORM GEAR (ONE SIDE): SCAFFOLDING L2-1 OR L2-5 (WORM GEAR CAN BE MOUNTED ON EITHER SIDE OF THE GONDOLA)
AMS TEST ORIENTATION

AMS STOP AT 90°

ACCESS AT THE GONDOLA BLOCKING PINS (BOTH SIDES) AND AT THE WORM GEAR (ONE SIDE): SCAFFOLDING L2-1, L2-5
AMS FINAL POSITION WITH REFERENCE TO MAIN RADIATORS INCLINATION (INCLINOMETER)
ACTION 4: Cryo Ground Support Equipment INSTALLATION

STEP 1: CGSE_LSS-OUT INSTALLATION
STEP 2: CGSE FEEDTHROUGH AT A9 FLANGE
STEP 3: CGSE_LSS-IN PARTIAL INSTALLATION
STEP 4: CGSE_LSS-IN INSTALLATION COMPLETION AND CONNECTION TO AMS (after AMS installation and 90° rotation)
STEP 5: CGSE lines test

NOTE: CGSE installation shall start before AMS arrival at ESTEC based on CGSE components availability
PL13 = SS Vacuum Jacketed line 10m available at CERN (SJTU)
PL7B = SS corrugated line 16m (4x4m) available at CERN (MIT)
Line from HX to pump length ~5m.

HX available at CERN
HEAT EXCHANGER

Overall (800x680x3030)

All measure in mm

Can be moved by hand, no need of a crane

Corrado Gargiulo
HEAT EXCHANGER

HX
OD=30mm/ OD=30mm/ OD=40mm
TOTAL LENGTH=22000mm = (2500X8+2000)
HALF SERIAL HALF PARALLEL
From Magnet

To Pump

2nd Cold bayonet, available at CERN

Bimetal Al/SSsteel
HEAT EXCHANGER

Lay-out at CERN with the large Heat Exchanger

Heat Exchanger
HEAT EXCHANGER

Lay-out at CERN with the large Heat Exchanger
PL13

Lay-out at CERN with the large Heat Exchanger
Collar for thermal decoupling the bayonet from the A9 flange

We shall place a thermocouple and heater (and maybe MLI) at the flange or at the external surface of the green collar.
COLD BAYONET

PL13
CGSE LSS IN
ON THE WAY IN
FROM A9 FLANGE
CGSE LINES CONNECTED INSIDE THE LSS

1. EMERGENCY VENT LINE [BD06]
2. EXTERNAL VALVES AIR/N2
3. FLIGHT VENT PUMP LINE
4. CURRENT LEADS EXHAUST [DV11]
5. COOL DOWN CIRCUIT [DV16B]
6. VAPOUR COOLED SHIELD [MV 34B]
7. FLIGHT VENT [DV15]
8. PVVV VENT LINE [DV20]
CGSE LSS IN

CURRENT LEADS EXAUST (DV11)

VAPOUR COOLED SHIELD (MV 34B)

BD06
EMERGENCY VENT LINE

PVVV
VENT LINE (DV20)

COOL DOWN CIRCUIT (DV16B)
1) EMERGENCY VENT LINE [BD06] (CHIMMY)
2) EXTERNAL VALVES AIR/N2
3) FLIGHT VENT PUMP LINE

Cryo-Lines NOT SHOWN

CURRENT LEADS EXAUST (DV11)

BD06 EMERGENCY VENT LINE

PVVV VENT LINE (DV20)

COOL DOWN CIRCUIT (DV16B)

EXTERNAL VALVES AIR/N2

VAPOUR COOLED SHIELD (MV 34B)

FLIGHT VENT (DV15)
DV15 and MV34B

Flight Vent (DV15)
Flange DN38CF 70mm

Vapour cooled shield (MV34B)
Flange DN16CF 34mm

5.5m
3.5m
2.5m

T-joint ISO K 63
A9 flange
Flange ISO K 63
Flange ISO K 63

Corrado Gargiulo
Vapour cooled shield (MV34B)

SS 65 mm corrugated line

ISO K 63 at SS corrugated line

Adaptor CF-16 (34mm-OD flange) VS ISO K 63

CF-16 (34mm-OD flange) tapped M4

Installed in CERN clean-room

CF-16 (34mm-OD flange) w/ thru holes and a tapped M4 flange (6mm thick) behind it; needs longer M4 screws 0.75"OD x 0.036"W tubing

Vapour cooled shield (MV34B)

Flange DN16CF 34mm
Flight Vent (DV15)

- 38 CF (70mm-OD flange)
- Adaptor 38-CF (70mm-OD flange) Vs ISO K 63
- ISO K 63 at SS corrugated line
- SS 65 mm corrugated line
Cool Down Circuit (DV16B)

Current Leads Exaust (DV11)

6.5m

5m

T-joint KF 50

Flange KF 50

A9 flange

Cold bayonet
Current Leads Exaust (DV11)

SS corrugated line DN50mm
Flange ISO KF 50
Adaptor CF-16 (34mm-OD flange) Vs ISO KF 50
CF-16 (34mm-OD flange)
Cool Down Circuit (DV16B)

- Flange ISO KF 50
- SS corrugated line DN50mm
- Adaptor CF-16 (34mm-OD flange) Vs ISO KF 50
- CF-16 (34mm-OD flange)
DV20

PVVV VENT LINE (DV20)
Flange DN16KF

Flange KF16
SS CORRUGATED DN-16

9m

Flange KF16
N2 gas feed for external valve

SS FLEXIBLE ND-6mm W-1mm

FLANGE KF16

Isolation Valve for PVVV & Internal Valves (He Gas)

Flange DN16CF 34mm
Pipe OD= 6mm, ID 4mm

Lower Support Ring

N2 Gas feed For External Valve Operation
Flange DN16CF 34mm
Pipe OD= 6mm, ID 4mm
FLIGHT VENT PUMP EXAUST

FLANGE KF16
FLANGE KF16
SS CORRUGATED DN-16

8m

Flange KF 16

Flange KF16
CGSE SUPPORTS AT GONDOLA
1 **EMERGENCY VENT LINE [BD06]**
Chimney inside LSS for safety; temporary line 1m above work access, reuse flexible line from CERN clean room, attached to LUSS/ECAL lamps support. Line installation will be after AMS installation and 90° rotation and after LUSS/ECAL lamps support installation.
ACCESS needed for installation: Scaffolding L2-10A,B,C

2 **EXTERNAL VALVES AIR/N2**
Pipe OD 6mm x 1mm W; routed through A9 flange. The line can be preinstalled in the LSS before AMS installation and the connection to AMS finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange

3 **FLIGHT VENT PUMP LINE**
Exhaust line from the flight vent pump, routed outside through A9 flange, purpose is to avoid helium contamination inside the chamber. Pump will only be used in atmospheric pressure conditions from the time the MV34 is closed (physical access required) to the time the LSS door is closed before pumping down starts.
This line will be installed in the LSS:
a) after AMS installation and 90 degree rotation providing there will be access by the LSS movable platform
b) will be connected to AMS in advance (the full length or a portion of it), outside the LSS, and lifted together with AMS in the LSS providing will be well secured (TBD).
ACCESS needed for installation:
a) LSS movable platform (TBD), Scaffolding L2-12C, LSS seismic table, A9 flange
b) LSS seismic table, Scaffolding L1-11, A9 flange
4 CURRENT LEADS EXHAUST [DV11 A/B]
SS corrugated line DN 50mm, routed outside through A9 flange.
The line is in two sections jointed by a “T” that also connects to the cool down circuit line. Sections length are 6.5m and 5m.
The section that goes to the A9 flange (5m) will be preinstalled before AMS installation.
ACCESS needed for installation: LSS seismic platform, Scaffolding L1-11, A9 flange
The section that goes to AMS port DV11 (6.5m) will be installed
a) after AMS installation and 90 degree rotation providing there will be access by the LSS movable platform
b) will be connected to AMS in advance, outside the LSS, and lifted together with AMS in the LSS providing will be well secured (TBD). This section is supported by devoted brackets to the Gondola rotating frame, close to the brackets used for AMS fixation to the Gondola (line-brackets design under definition).
ACCESS needed for installation:
a) LSS movable platform (TBD), LSS seismic table, Scaffolding L2-9C
b) LSS seismic table, Scaffolding L2-9C

5 COOL DOWN CIRCUIT [DV16B]
SS corrugated line DN 50mm. The line is in two sections jointed by a “T” that also connects to the current leads exhaust line. Sections length 6.5m and 5m. Both the sections will be preinstalled before AMS installation and the connection to AMS will be finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange
6 VAPOUR COOLED SHIELD [MV 34B]
SS corrugated line DN 65mm, routed outside through A9 flange. The line is in two sections jointed by a “T” that also connects to the flight vent line. Section length 5.5m and 3.5m.
The section that goes to the A9 flange (3.5m) will be preinstalled before AMS installation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange.
The section that goes to AMS port DV11 (5.5m) will be installed
a) after AMS installation and 90 degree rotation providing there will be access by the LSS movable platform
b) will be connected to AMS in advance, outside the LSS, and lifted together with AMS in the LSS providing will be well secured (TBD). This section is supported by devoted brackets to the Gondola rotating frame, close to the brackets used for AMS fixation to the Gondola (line-bracket design under definition).
ACCESS needed for installation:
   a) LSS movable platform (TBD), LSS seismic table, Scaffolding L2-12C
   b) LSS seismic table, Scaffolding L2-12C

7 FLIGHT VENT [DV15]
SS corrugated line DN 65mm, routed outside through A9 flange. The line is in two sections jointed by a “T” that also connects to the vapour cooled shield line. Sections length 2.5m and 3.5m. Both the sections will be preinstalled before AMS installation and the connection to AMS will be finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange

8 PVVV VENT LINE [DV20]
SS corrugated line DN16? (9m) routed outside through A9 flange. The line will be preinstalled before AMS installation and the connection to AMS will be finalized after AMS installation and 90° rotation.
ACCESS needed for installation: LSS seismic table, Scaffolding L1-11, A9 flange
ACTION 5: TRD-GAS-Ground-Support-Equipment INSTALLATION

STEP_1: TRD-GAS_GSE_LSS-OUT INSTALLATION
STEP_2: FEEDTHROUGH AT C2 FLANGE
STEP_3: TRD-GAS_GSE_LSS-IN INSTALLATION AND CONNECTION TO AMS
          (after AMS installation and 90° rotation)
STEP_4: test
Three 1/8" stainless steel lines from TRD-GAS to C2 flange will be routed inside a copper tube with 8mm inner diameter. The copper tube will get some heater resistors and DALLAS temperature sensors to keep it above -30 degC. The copper tube will finally be wrapped in MLI.

**ACCESS NEEDED INSIDE LSS:** LSS seismic table, Scaffolding L2-3,L2-9A, C2 Flange, trd-gas_GSE pipe clamping points (TBD)
ACTION 6: INFRARED LAMPS INSTALLATION

STEP_1: Install lamps supports and lamps
(STEP_2: Route the infrared lamp power supplies cables to B3 & B4 flanges) *
(STEP_3: test)*

* covered in the next action

ACCESS NEEDED:

NOTE: as base line the lamps will be installed as late as possible in order to avoid to damage them during the installation of other hardware but, due to the number of lamps and the complexity of the overall lay-out, the installation will be in different steps
IR LAMPS

Corrado Gargiulo
77 LAMPS

TRACKER RAD
8 LAMPS (RAM)
8 LAMPS (WAKE)

TRD
8 LAMPS
RAM
MAIN RADIATOR
6 LAMPS
LAMPS FRAME for ECAL &LUSS
LAMPS FRAME for ECAL & LUSS

...fixed to the Gondola, drilled for venting...
LAMPS FRAME for ECAL & LUSS

...lamps assembly adjustable for both installation and final position adjustment...
LAMPS for MAIN RADIATORS,
fixation to the GONDOLA
LAMPS SUPPORT FOR TRD
LAMPS SUPPORT FOR TRD
...possibility to mount the TRD lamps either at RAM or WAKE side ...
LAMPS SUPPORT FOR TRACKER RADIATORS
LAMPS SUPPORT FOR TRACKER RADIATORS

...possibility to rotate the support to allow for scaffolding removal ...
LAMPS VS SCAFFOLDING
LAMPS VS SCAFFOLDING
LAMPS VS SCAFFOLDING
ACTION 7 CABLES ROUTING

STEP_1: Install cable trays
STEP_2: Route AMS power and data cables to B5 and C6 flange
STEP_3: Route AMS thermocouples cables to C1 flange
STEP_4: Route the infrared lamps power supplies cables to B3 & B4 flanges
STEP_5: test
B3 & B4 flanges will be reserved for the infrared lamp power supplies
C1 flange is for AMS thermocouples
B5, C6 flange is for AMS power and data
CABLES ROUTING
ROUTES OVERALL LENGTH
CABLES ROUTING
WAY-OUT: LSS FLANGES
1 INSTALL CABLE TRAYS
ACCESS needed for installation: Scaffolding L2-2,L2-3,L2-7, B3, B5, C6 flanges
CABLES TRAYS SUPPORT AT LSS WALL

FIX BY CABLE FROM TOP?
OR USE ANY AVAILABLE SUPPORT AS IN THE PICTURE?
2 POWER AND DATA CABLES TO B5 AND C6 FLANGES

Power and data cables shall be connected at AMS side before AMS is installed in the LSS (connected already from test beam at CERN, or connected and checked at ESTEC in Artemis clean room)
Fiber-optic_ST_cables, from TCP to B5 flange, will have a feed-through provided by ESTEC that will house (glued inside) the fiber original connector (see next slide)
All the cables will be grouped in two bundles secured to the USS in an accessible area at AMS-X,+Y and AMS-X,-Y
When in the LSS the bundles will be unrolled and routed on the cable trays to the port B5 and C6.
Fiber-optics cables will be installed once in the LSS (not easy access to TCP)

Note: in case of problem during cable testing IPA, TCP, J and JPD, Baroswitch need to be reached
LSS IN  |  LSS OUT

Glued inside the blue feed-through
3 THERMOCOUPLE CABLES

AMS will be equipped with a maximum of about 432 thermocouples whose cables will be grouped in a large bundle secured to the USS in an accessible area at AMS –X,+Y, close to the cable tray that goes to C1 flange. The large bundle will consist in 24 small bundles (bundles diameter about 7mm), where each bundle is constituted of 18 twisted pairs. When in the LSS the large bundle will be unrolled and routed on the cable tray to the port C1. The connection to a DCU (Data Collection Unit housing) and to the flange is being clarified by J.Burger with ESTEC.

ACCESS needed for installation: LSS seismic platform, Scaffolding L2-10C, L2-2, L2-3, C1 flange.
THERMOCOUPLE TWISTED PAIRS AND CONNECTOR
3 IR LAMPS CABLES

AMS TV test will be equipped with IR lamps whose cables will be grouped in a maximum number of 9 bundles each bundle consisting in 12 twisted pair Wires will come from different locations and grouped in the cable tray to flange B3 and B4

ACCESS needed for installation: Different locations based on lamp final lay-out (under definition), LSS seismic platform, Scaffolding L2-2, L2-3, B3 and B4 flange,...
ACTION 8: INSTALL MLI ON LSS SEISMIC TABLE

STEP_1: Install MLI on LSS seismic table

The Seismic Table

ACCESS needed for installation: LSS Seismic table
ACTION  9: FUNCTIONAL CHECK OUT (magnet ON)

STEP_1: install TEST-GSE
STEP_2: functional check-out
STEP_3: remove TEST-GSE
1-3 Install and after functional check-out remove GSE

**GSE COOLING DURING PRE-TEST**

<table>
<thead>
<tr>
<th>Technical Information</th>
<th>HV-180E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Article-no.</td>
<td>8 518 001</td>
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<tr>
<td>EAN-no.</td>
<td>40 22167 518 019</td>
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<td>Diameter blade</td>
<td>cm 45</td>
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<td>Power</td>
<td>Watt 135</td>
</tr>
<tr>
<td>Voltage/frequency</td>
<td>V-/Hz 230/50</td>
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<tr>
<td>Power settings</td>
<td>4</td>
</tr>
<tr>
<td>Colour</td>
<td>block</td>
</tr>
<tr>
<td>Dimensions retail package</td>
<td>LxWxH (cm) 59.0 x 22.0 x 55.0</td>
</tr>
<tr>
<td>Weight retail package</td>
<td>kg 8.9</td>
</tr>
<tr>
<td>Dimensions master carton</td>
<td>LxWxH (cm) 59.0 x 22.0 x 55.0</td>
</tr>
<tr>
<td>Weight master carton</td>
<td>kg 8.9</td>
</tr>
<tr>
<td>Number of packaging units</td>
<td>pieces 1</td>
</tr>
</tbody>
</table>

ACCESS needed for installation: Scaffolding L2-10AB,C and L2-11A,B,C…

2 functional check-out

ACCESS needed: LSS seismic table, Scaffolding, LSS movable platform
<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>TVT/EMI Testing at ESTEC</td>
<td>74 days</td>
<td>9/16/09</td>
<td>11/28/09</td>
</tr>
<tr>
<td>29</td>
<td>Test Stand at ESTEC</td>
<td>3 days</td>
<td>9/16/09</td>
<td>9/21/09</td>
</tr>
<tr>
<td>30</td>
<td>Install Test stand in LSS</td>
<td>4 days</td>
<td>9/21/09</td>
<td>9/25/09</td>
</tr>
<tr>
<td>31</td>
<td>Scaffolding install</td>
<td>2 days</td>
<td>9/25/09</td>
<td>9/27/09</td>
</tr>
<tr>
<td>32</td>
<td>Ship to ESTEC</td>
<td>5 days</td>
<td>9/22/09</td>
<td>9/27/09</td>
</tr>
<tr>
<td>36</td>
<td>Setup TVT Mechanical</td>
<td>17.25 days</td>
<td>9/28/09</td>
<td>10/15/09</td>
</tr>
<tr>
<td>37</td>
<td>Cleaning of shipping containers</td>
<td>1 day</td>
<td>9/28/09</td>
<td>9/29/09</td>
</tr>
<tr>
<td>38</td>
<td>Move to Assy area / Disassemble PSS</td>
<td>1 day</td>
<td>9/29/09</td>
<td>9/30/09</td>
</tr>
<tr>
<td>39</td>
<td>Install ECGSE</td>
<td>4 days</td>
<td>9/30/09</td>
<td>10/2/09</td>
</tr>
<tr>
<td>40</td>
<td>Setup of CGSE</td>
<td>8 days</td>
<td>9/30/09</td>
<td>10/7/09</td>
</tr>
<tr>
<td>48</td>
<td>Set up AMS in LSS</td>
<td>14.25 days</td>
<td>9/30/09</td>
<td>10/15/09</td>
</tr>
<tr>
<td>49</td>
<td>Install AMS in LSS</td>
<td>2 days</td>
<td>9/30/09</td>
<td>10/1/09</td>
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<tr>
<td>51</td>
<td>Scaffolding install</td>
<td>0.25 days</td>
<td>10/2/09</td>
<td>10/2/09</td>
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<tr>
<td>52</td>
<td>Connect vent lines and cable / TRO Gas setup</td>
<td>1 day</td>
<td>10/2/09</td>
<td>10/3/09</td>
</tr>
<tr>
<td>53</td>
<td>Test cables and lines</td>
<td>2 days</td>
<td>10/3/09</td>
<td>10/5/09</td>
</tr>
<tr>
<td>54</td>
<td>Thermocouple Connection and Verification</td>
<td>2 days</td>
<td>10/4/09</td>
<td>10/6/09</td>
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<tr>
<td>55</td>
<td>Lamps and Heaters install</td>
<td>2 days</td>
<td>10/6/09</td>
<td>10/8/09</td>
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<tr>
<td>56</td>
<td>Lamps and Heaters checkout</td>
<td>2 days</td>
<td>10/8/09</td>
<td>10/10/09</td>
</tr>
<tr>
<td>57</td>
<td>1. Functional checkout before vacuum / Charge Mag</td>
<td>2 days</td>
<td>10/10/09</td>
<td>10/12/09</td>
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<tr>
<td>58</td>
<td>Scaffolding removal</td>
<td>2 days</td>
<td>10/13/09</td>
<td>10/15/09</td>
</tr>
</tbody>
</table>

by J.HEILIG
ACTION 12: TEST RUNNING
ACTION 13: LSS DOOR OPEN
ACTION 14: SCAFFOLDING INSTALLATION IN LSS
ACTION 15: FUNCTIONAL TEST, TEST-GSE INSTALL AND REMOVE
ACTION 16: IR LAMPS, CGSE, AMS_02, GONDOLA,… REMOVAL FROM LSS
## NON AMS (FLIGHT) MATERIALS INSIDE LSS DURING TVT

<table>
<thead>
<tr>
<th>NON AMS (flight) MATERIALS inside LSS</th>
<th>ITEM</th>
<th>COMPONENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel 316L</td>
<td>GONDOLA</td>
<td>structure</td>
</tr>
<tr>
<td>Steel 316 (A4)</td>
<td>GONDOLA</td>
<td>fasteners</td>
</tr>
<tr>
<td>Steel 304 (A2)</td>
<td>GONDOLA/ IR lamps/ CABLE TRAYS</td>
<td>fasteners</td>
</tr>
<tr>
<td>Ultem 1000</td>
<td>GONDOLA</td>
<td>4 bearings at AMS trunnions I/F</td>
</tr>
<tr>
<td>Teflon coating</td>
<td>GONDOLA</td>
<td>bushing and shaft at gondola main axis</td>
</tr>
<tr>
<td>Al alloy</td>
<td>IR LAMPS</td>
<td>support</td>
</tr>
<tr>
<td>Al alloy</td>
<td>CGSE</td>
<td>bracketery</td>
</tr>
<tr>
<td>Al alloy</td>
<td>CABLE</td>
<td>cable trays</td>
</tr>
<tr>
<td>Copper</td>
<td>TRD-Gas-GSE</td>
<td>tube to C1 flange</td>
</tr>
</tbody>
</table>

in work
LSS PORT LEVELS
SECTION B - B

B PORTS

Corrado Gargiulo
CERN, MARCH 2009
SECTION C - C

C PORTS