

AMS Integration List

Ground Equipment Needed

	VC integration stand	PSS (low config no panels)	As designed
1	Assembly Stand (rotation)	Rotating Assembly Stand (RAS)	TBD
2	Transfer CERN > Test Beam	TBD (PSS or RAS)	TBD
3	Rotation in test beam	RAS (low configuration)	TBD
4	Transport to ESTEC	PSS (mid config) with add on reinforcing structure	TBD
5	Thermal Test @ ESTEC	PSS (mid config) with slide frame replacements + Tower	TBD
6	Transport to EMI test @ ESTEC	Same as 4	TBD
7	EMI Test	Same as 5	TBD
8	ESTEC > KSC	PSS (low config with panels)	As designed

The Payload Integration Hardware (PIH) that will be delivered to CERN includes the following items:

- Upper USS (UUSS), installed in PSS with Assembly Fixture in place of the VC
- Lower USS (LUSS), installed in the LUSS Shipping Fixture
- Keel (in crate)
- Primary Support Stand (PSS), contains Upper USS, and Assembly Fixture

- 1 • Assembly Fixture (AF), installed in Upper USS
- 2 • Lower USS Shipping Fixture (LUSS SF), contains LUSS
- 3 • Multi-Purpose Lifting Fixture (MPLF), for lifting VC, LUSS, and LUSS SF
- 4 • Primary Lifting Fixture (PLF), for Lifting USS, PSS, and entire payload
- 5 • Intermediate Support Fixtures (ISF) (4X), used to stabilize USS during
- 6 VC/AF removal and installation

7
8 **NOTE: There is only ONE USS-02. It is used for STA and Flight.**

9 10 **STA PAYLOAD INTEGRATION (LMCO)**

11
12 The PIH arrives at CERN.

13
14 SCL completes Structural Test Article (STA) Cryomagnet and ships unit to Terni
15 SERMS facility for Acoustic and Vibration testing.

16
17 STA Cryomagnet arrives at CERN from Terni SERMS facility.

18
19 Install Intermediate Support Fixtures onto USS

20 Remove Assembly Fixture from USS

21 Install STA Cryomagnet (warm) in Flight USS

22 Remove ISF's

23 Install Experiment STA components for structural testing – **NO ROTATION**

- 24 • CAB - STA/Mass Sim
- 25 • UPS's - STA/Mass Sim
- 26 • CVB - STA/Mass Sim
- 27 • ACC – STA/Mass Sim
- 28 • Tracker – STA/Mass Simulator
- 29 • TTCS Boxes - STA/Mass Sim
- 30 • Lower TOF – STA/Mass Sim
- 31 • Upper TOF – STA/Mass Sim
- 32 • TRD – Flight M-Structure and Corner Brackets, Ocdon, Zenith Radiator
- 33 (TBD) and remaining components – STA/Mass Sim
- 34 • TRD GAS, Box S & C - STA/Mass Sim
- 35 • RICH – STA/Mass Sim
- 36 • ECAL - STA/Mass Sim (existing qualification unit)
- 37 • Lower USS Electronics Boxes - STA/Mass Sim
- 38 • Main Crates / Radiators – STA/Mass Sim
- 39 • Tracker Radiators - STA/Mass Sim

40
41 Ship STA Payload to Munich for structural testing (PSS in **TBD** Config)

42 43 **FLIGHT PAYLOAD INTEGRATION**

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1	Flight Cryomagnet integrated, tested and mapped at SCL, includes Flight VC	
2	(LMSO provided), Magnet Coils, Helium Tank, Straps, Cryocoolers, warm helium	
3	system (separate from Cryomag) and internal cryogenic system	
4	Flight Cryomagnet Avionics CAB, UPS, CDD, and Cabling arrives from SCL (?).	
5	STA Payload (includes the USS) returns from structural testing	
6	Flight Cryomagnet + Cryomagnet GSE delivered from SCL (warm/no vacuum)	
7	Installation of CGSE onto Cryomagnet (done in parallel)	(10 d)
8	Remove Experiment STA's from USS	10 d
9	Note: LUSS Available for ECAL and RICH installation	
10	Install ISF's	1/4 d
11	Remove STA Cryomagnet	1 d
12	Install Flight Cryomagnet (warm/no vacuum) into Upper USS	2 d
13	Install warm helium system	3 d
14	Warm helium system pump and purge	(3 w)
15	Rib protection Covers attached	1 d
16	Remove ISF's	1/2 d
17	Upper USS + Cryomagnet placed into RAS	1 d
18	Set up scaffolding	1 d
19	Install Vertical Plumbing Support Beams (2X) to VC	0 d
20	Install crate jigs	1 d
21	Install PDS	1/2 d
22	Install J-Crate, JT-Crate and JPD	0 d
23	Note: -All subsequent crate and box installations and testing include	
24	cables to PDS and J & JT-Crate (Dallas Temp. Sensor cabling TBD	
25	may require GSE)	
26	-PDS and J-Crate electrical interfaces to GSE until SSPF/KSC.	
27	Magnet electronics mounted	2 d
28	1. CAB	
29	2. CDD (P&S)	
30	3. UPS (0&1)	
31	4. Cabling	
32		
33	Install CCEB and cabling	1/2 d
34		
35	Subtotal Magnet/USS	24 d
36		
37	ACC-System	
38		
39	ACC clamps bolted to inner lower bore of VC	1d
40	Install fibres for laser alignment system	1d
41	16 Scintillator panels placed in inner bore resting on ACC clamps	5d
42	Install viton rings to support ACC to VC	5d
43	ACC clamps bolted to inner upper bore of VC	1d
44	Carbon composite cylinder with compliant brackets mounted at VC	1d
45	PMT's, fiber couplers, and optical fibers mounted to Conical flange	5d
46	Individual counter tests with ACC-EGSE per ACC	

1	provided test procedure	4d
2		
3	ACC Integration into AMS-02	14 D
4		
5	<u>AMS Tracker Integration</u>	
6	<u>This sequence assumes AMS can be rotated 180° for Tracker integration</u>	
7	Offline Preparation (>30m² semi-clean area needed)	
8	lower star tracker bracket previously installed	
9	Remove tracker (still on its support) from Container	
10	Perform reception tests	
11	Evtl. remove plane 1	
12	Evtl. install cable temporary support frame (CTSF) on plane 2	
13	Arrange and fasten +Z cables on CTSF	
14	Remove plane 5	
15	Install cable temporary support frame (CTSF) on plane 4	
16	Arrange and fasten -Z cables on CTSF	
17	Remove the -Z Tracker feet	
18	Remove the -Z conical flange	
19	Tracker related electronics Boxes Installation (In parallel with ACC test?!)	
20	Install: 8X (T-Crate + TPD)	
21		
22	Install Main Radiator Mid brackets 4X	
23	Install M-Crate (MPD already installed with TPD)	
24	Install GPS box	
25	Install TT Crate and TTPD	3 dp
26		
27	TTCS Installation (prior to Tracker installation)	
28		
29	The TTCS plumbing on vacuum case. (No welding on AMS)	
30	Install TTCS P&S (pipes to condenser points, to boxes & to evaporator	
31	connectors, preformed?(TDB)	5d
32	Install TT Wake and Ram condensers, Jigs, and cold plates	2 d
33	(Condensers pre fitted and heating wire pre soldered if preformed)	
34	Wrap tubing with MLI	1d
35	TTCS Cabling (TT crate must have been installed)	
36	(Crate cabling + heater & temp sensor cables for radiators+ TTCS)	2 d
37	(need list of GSE)	

1	Subtotal TTCS	10 d
2		
3		
4		
5	At this stage, the Tracker is ready to be inserted in the magnet case.	
6	Tracker foot related metrology needs to be done (where? How?)	
7	Tracker feet machined to tolerances	
8	Tracker Installation (Cryomagnet warm ,no vacuum and vertical)	
9	Preinstall tracker VC cabling brackets +Z, (with ACC)	2 d
10	<u>From this point no more pipe welding allowed in vicinity of tracker</u>	
11	AMS Vertical +Z on top Min 1m clearance below	
12	Install upper and lower inner annular VC MLI	1d
13		
14	Insert inner tracker + upper conical flange in cryomagnet bore,	
15	(crane lift with T-cruciform) support it with the 4 +Z tracker feet	
16		
17	From below Mount the –Z conical flange and fasten it to the	
18	Tracker cylindrical shell.	
19	Mount the –Z Tracker feet	
20	Tighten the 8 Tracker feet	2 d
21	Light tight around 8 tracker feet	1 d
22	Unroll from CTSF and arrange +Z layer 2,3,4 cables on the	
23	Magnet flange and plug them into T-Crate.	
24	Quick interface verification test (QIVT).	
25	Light tight around T-cables	4d
26		
27	Install the +Z cooling inner loop and outer loop on their jigs.	
28	Connect +Z cooling inner loop to thermal bars, mount on	
29	brackets and remove its jig (outer loop stays on its jig)	2 d
30	Remove the +Z CTSF	0 d
31	Mount plane 1 on the +Z conical flange (crane lift with T-cruciform)	
32	& light sealing	1 d
33	Mount and connect plane 1 cables. Arrange (do not fasten) them on	
34	magnet flange and plug them into T-Crate. (QIVT)	2 d
35	Mount outer cooling loop to plane 1, Attach copper bridges to	
36	plane 1 thermal bars, remove jig	1 d
37	Install Star Trackers (Port & Stbd), cable and connect thermal link	
38	To +Z outer loop	1d
39	QIVT	1dp
40	Star tracker metrology (T-axis with camera axis TBD!!)	1d
41	Connect and test Upper Laser Alignment hardware, fibers	1 d
42	Final +Z cable fastening (all the way)	

1	Rotate Cryomagnet Z upside down (-Z up)	1 d
2	Arrange the -Z cables (layer 5,6 and 7) on the Magnet flange and	
3	plug into T-Crate (QIVT) Light tightness.	4 d
4	Install the -Z cooling inner loop and outer loop on their jigs.	
5	Connect -Z cooling inner loop to thermal bars, mount on	
6	brackets and remove its jig (outer loop stays on its jig)	2 d
7	Remove the -Z CTSF	0 d
8	Mount plane 5 on the -Z conical flange – light tightness	1 d
9	Mount and connect plane 5 cables. Arrange them on magnet	
10	flange and plug into T-Crate (QIVT)	2 d
11	Mount outer cooling loop to plane 5, Attach copper bridges to	
12	plane 1 thermal bars, remove jig	1 d
13	Connect and test Lower Laser Alignment hardware, fibers	1 d
14	Rotate Cryomagnet +Z on top (vertical).	1 d
15	Connect the cooling loops together and leak test.	2 d
16	Fill and seal TTCS (procedure TBD need room temp = 18 degC)	1 d
17	(need list of EGSE)	
18	Functional test TTCS (cool USS or clean room to 15 degC !)	5 d
19	(Need list of test activities)	
20	Install temp trigger	
21	General Tracker test	6 d
22		
23	Tracker, TAS, Star Tracker (no baffle), & TTCS	57d
24		
25	Lower TOF installation	
26		
27	Offline Preparation	
28	Transport to the assembly room of:	
29	-Lower TOF detector	
30	-TOF supporting tool,	
31	-Test Rack with test electronics	
32	-Box containing cables	
33	-from Detector to S-Crates and	
34	-HV cables from SHV Bricks to Detector	
35	(all cables already labeled with savers on S-Crates end)	
36	-2 FM SHV Bricks and 2 FM S-Crates with Power cables	
37		
38	Rotate Cryomagnet -Z up	1 d
39		
40	Installation (Magnet warm)	
41	Tracker/TOF MLI (Tracker responsibility) installed	
42	Move Lower TOF into position	
43	Install X-Y Struts	
44	Strut tensioning (temporary)	2 d
45	Install S-Crates 2 & 3 (SPD installed with TPD) and SHV 2 & 3	1/2d
46		

1	This part is only partially performed at this stage, because the vertical struts are	
2	connected to the Lower USS and can be mounted only when LUSS with RICH and	
3	ECAL is installed, including the Aerogel container which is attached to the TOF	
4	honeycomb.	
5		
6	Total time for mechanics integration	3.5 d
7		
8		
9	Cabling of Lower TOF and Lower ACC	2 d
10	Test Lower TOF and ACC	2 d
11	(Functional test of cables)	
12		
13	Subtotal Lower TOF	8 d
14		
15	Test TRD after transport with flight electronics(Test UTOF)	10d
16	Mount TRD to upper TOF	5d
17	Mount LFCR boxes	1d
18	Mount bracket for star tracker baffle	5d
19	TRD/upper TOF ready for integration into USS	--
20		
21	TRD/upper TOF Integration in separate	
22	clean room at CERN subtotal	21d
23		
24	Mount TRD/upper TOF on USS	4d
25	Star Tracker baffle installation on M-Structure (2X)	1d
26	TRD Box S and Box C installed on USS	2d
27	Install Box S protective covers	1d
28	Mount U-crate, UPDx2, UG-crate, UGPD crate	1d
29	Mount upper TOF S-crates, SPD, SHVx2	1d
30	Cable TRD	2d
31	Cable TRD Gas	2d
32	Gas plumbing/testing	5d
33		
34	At THIS MOMENT start magnet cool down ? (Saving 2weeks)	
35		
36	Cable UTOF	2d
37	UTOF test	2d
38	Combined TRD upper ToF test	5d
39	Cable Upper ACC	1d
40	Cable LFCR	1d
41	Combined Upper/Lower TOF	2d
42		
43	TRD/UTOF integration on USS	26d
44		
45		
46	End of TRD & Upper TOF installation	
47		
48	Cryomagnet cool down to 1.8K (may require cryocooler (6 calendar weeks)	

1	cooling GSE)	
2	Cryomagnet ramping and testing	
3	(Do you really want to test the magnet before installing the RICH and	
4	ECAL? This will mean some restrictions on what you can do during this	
5	final installation phase.)	
6	Cooling could start after TRD-UTOF main installation	
7	Implies Magnet , TRD, UTOF working at the same time, save 2 weeks(?)	
8	Connect the CGSE to the magnet. Evacuate, purge, and leak test	
9	the magnet and CGSE.	10d
10	Cool the magnet from room temperature to 1.8 K, and fill with	
11	superfluid helium. This process will require all parts of the CGSE.	6w
12	The nitrogen pre-cooling system (300 to 80 K) may now be	
13	disconnected and removed.	
14	Carry out charging and stability checks. Check out the magnet	
15	electronics (CAB).	1w
16	The magnet can now be kept at 1.8 K (vent pump required) if tests	
17	at field will be required during or after RICH and ECAL installation.	
18	<u>Alternatively, the magnet may be allowed to warm up to 2.5 K and</u>	
19	<u>atmospheric pressure (this option is recommended). In either case,</u>	
20	<u>constant monitoring and supervision will be required.</u>	
21		
22	Sub Total (magnet cooled and charged)	59 d (- 14)d

23

24 **Parallel Installation on Lower USS (Hall location 2)**

25		
26	0. ECAL delivery and storage in the clean room	0
27	1. Move LUSSII and ECAL to the assembly area	1
28	2. E-Crates + EHV, RHV Bricks fixation + on LUSSII	1
29	3. Install 4 HV cable supports on LUSSII	1/2
30	4. Install 2 "EDR + Trigger" cable supports on LUSSII	1/2
31	5. Install ECAL on its "Table" * (1.5 m high) incl. the Teflon plates	1/2
32	6. LUSSII lowered on ECAL Brackets	1/2
33	7. Install 8 ECAL bolts in LUSSII (apply the pre defined torque)	2
34	8. HV Cable routing + plugging on EHV Bricks	2
35	9. EDR + Trigger" cable routing + plugging on E-Crates	2
36	10. Slow control cables (Dallas sensors) routing + heater cables	1/2
37	11. Connection between E-Crates and EHV Bricks	1/2
38	12. Exhaustive tests on ECAL	6
39	13. Install ECAL/RICH MLI	1/2
40		
41		
42		
43		
44		
45		
	Subtotal ECAL	18

42 **RICH**

44 **1. Preliminary work**

1
2
3
4
5
6
7
8

Arrive with all our containers to the assembly area dock. We will need same kind of machine to carry with care all these containers and introduce them in the clean room.

We also need the LUSS in the correct position for our integration.

2. LUSS works (in parallel)

Step	Description	Days
1	Unloading and storage in the clean room	
2	Move RICH & LUSS to assembly position	
3	Mount MLI between ECAL and RICH (responsible group?)	1/2
4	Install PMT Structure on LUSS	1
5	Install reflector on PMT Structure	1/2
6	Mount optical sealant between PMT Structure and reflector	1
7	Route internal DAQ cables on PMT Structure	1
8	Test DAQ system with local Unit tester (PEDESTALS)	1/2
9	RHV brick previously installed during ECAL installation	
10	Install HV cables clamps and Debris Shielding support structure	2
11	Route HV cables	
12	Route HV brick control cables	
13	Route cables (ERPD, DALLAS, AMS-wire, Trigger, Fast Trigger) on LUSS	1/2
14	Test including light tightness with temporary cover to close out mirror.	2
	Subtotal	9
	Subtotal for ECAL & RICH	19

9
10
11
12

Upper to Lower USS Integration (after start of magnet cool down)

15	Install Aerogel / NaF Radiator under Lower TOF	1
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16	Install ERPDs (0 & 1) on the Main Crates / Radiators	
17	Install Lower USS to Upper USS	1
18	Seal reflector and aerogel radiator	1
19	Install Lower TOF Z struts (TOF group)	2
20	Measure RICH Aerogel plane relative distance to PMT Structure using TOF fiducial marks.	1
21	Connect RICH to ERPDs	
22	Connect RICH to JT crate (AMS Wire, trigger and fast trigger)	1/2
23	Connect RICH to USCM (TBD) and heaters to PDS	
24	Connect ECAL to ERPDs	
25	Connect ECAL to JT crate (AMS Wire, trigger and fast trigger)	1/2
26	Connect ECAL to USCM (TBD) and heaters to PDS	
27	Test ECAL and RICH including light tightness	2
28	Install RICH Debris Shielding	1
	Subtotal	10

1
2
3

General AMS Testing and Final Integration

26	General test of all AMS without B-field (excluding Radiators) during magnet cool down.	59-10 = 49 (- 14=35)
	General test of all AMS with B-field	20
	Subtotal Test	69 (55)
	CERN Test Beam	
	Magnet warmed to 2.5 K and atmospheric pressure. Evacuate superfluid cooling loop. Fit transportation equipment to magnet vents. Parts of CGSE are required.	5 (c)
	Disassemble (partially) CGSE	3
	Install Payload into PSS (mid configuration)	(2)
	Transport AMS and CGSE by truck to CERN Test Beam (TBD)	1
	Reassemble CGSE	3

Install AMS on CERN test beam	(3)
Cool down magnet 2.5 to 1.8 K. Parts of CGSE are required. Top up helium level if necessary.	5 (calendar)
Charge Magnet	1/2
Test beam @ CERN 2 calendar weeks beam time	10
Discharge Magnet and warm up to 2.5 K and 1 atmosphere. Evacuate superfluid cooling loop. Fit transportation equipment to magnet vents. Parts of CGSE are required.	5 (calendar)
Deinstallation & Transport AMS back	(2)
Disassemble and Transport CGSE back	4
Subtotal CERN Test Beam	36 ½ d
Finalize & Radiators	
Integrate RICH and LTOF MLI	1
PDS, TTCS, CAB MLI installation	2
Install Zenith Radiators (4X)	5
Install Zenith Radiator cold plates (TBD)	0
Install wake Upper and Lower Main Crates / Radiators brackets	1
Remove wake USS Diagonal Strut	½
Disconnect wake crate ground straps	1
Remove TRD Gas Protective covers and Install Box S and C MLI enclosure	1
Remove Wake Crate Jig	5
Install Wake Radiator panel	
Connect CAB heat pipes	½
Connect wake Crate grounding straps	2
Install RAM Upper and Lower Main Crates / Radiators brackets	1
Disconnect RAM crate ground straps	1
Remove wake USS Diagonal Strut	1/2

Remove RAM Crate Jig	
Install RAM Radiator panel	5
Install GPS antennae	2
Connect RAM Crate grounding straps	
Remove TTCS cold plates	1/2
Install Wake and RAM Tracker Radiators	3
Remove TTCS Condenser Jigs	1/2
Test Heaters (TBD)	
Remaining MLI close-out	5
ECAL - Remove protection sheets on ECAL radiator (at the last moment)	
ECAL - Install bottom MLI + ECAL Brackets MLI	
AMS General Testing	
Subtotal Finalize & Radiators	37.5

1		
2	Preparation for ground shipping to ESTEC (Full Configuration)	
3		
4	Disconnect Electronics GSE from PDS and J-Crate	1/2d
5	Disconnect Cryomagnet GSE	2d
6	Install Payload into PSS (mid configuration)	1d
7		
8	Subtotal preparation	3.5d
9		
10		
11		
12	SCHEDULE ESTIMATE FOR TVT AND EMI TEST AT ESTEC	
13		
14	Shipping to ESTEC	3 d
15	Cleaning of shipping containers	1 d
16	Move into assy area	2 d
17		
18	Install EGSE	1 dp
19	Setup of Cryogenic Support Equipment (CGSE)	7 d
20	Unpack and install equipment	
21	Connect Pipelines	
22	ConnEctions to control and measuring system	

1	Cleaning of gas system and filling with pure gaseous He	
2		
3	AMS cooldown 4.2K->1.8K and filling with SFHe	14 d
4	Top up AMS vessel with normal LHe at 4.2K	
5	Pumping of AMS vessel to 1.8K	
6	Pumping of LHe Dewars from 4.2->1.8K	
7	Top up of AMS with SFHe	
8		
9	Install Tower in Large Space Simulator (LSS)	5 dp
10		
11		
12		
13	Move AMS into LSS	2 d
14	Connect vent lines and cable	1 d
15	Test cables and lines	2 d
16		
17	Pre-Test	4 d
18	Close LSS and pump	(2 d)
19	Check operation	(2 d)
20		
21	SUBTOTAL Shipping, Setup, Cool down, Pre-test	37 d
22		
23	Thermal Vacuum Test	
24	Hot NON OP	20 h
25	Cold NON OP	20 h
26	Test	8 h
27	Thermal Cycle 1	
28	Hot OP	20 h
29	Test	8 h
30	Cold OP	20 h
31	Test	8 h
32	Thermal Cycle 2	
33	Hot OP	20 h
34	Test	8 h
35	Cold OP	20 h
36	Test	8 h
37	Thermal Cycle 3	
38	Hot OP	20 h
39	Test	8 h
40	Cold OP	20 h
41	Test	8 h
42	Thermal Cycle 4	
43	Hot OP	20 h
44	Test	8 h
45	Cold OP	20 h
46	Test	8 h

1	Thermal Balance	
2	Cold BALANCE	180 h
3	Test	24 h
4	Hot BALANCE	180 h
5	Test	24h
6	Contingency	288 h (12 d)
7	Return to air	24 h
8	SubTotal 41 d = 29 d + 12 d contingency	
9		
10	SUBTOTAL TVT	41 d
11		
12	Remove AMS from LSS	2 d
13	Prepare transport stand	2 d
14	Move to EMI test	1 d
15	Move CGSE	4 dp
16	Cable and attach CGSE	2 d
17	Move EGSE	2 dp
18	Cable and attach EGSE	2 dp
19		
20	EMI Test	5 d
21		
22	SUBTOTAL EMI	12 d
23		
24	Uncable and detach CGSE	2 d
25	Uncable and detach EGSE	2 dp
26	Move AMS back to assy area	2 d
27	Move CGSE back to assy area	2 dp
28	Re-setup CGSE	4 d
29	Move EGSE back to assy area	dp
30	Warm Cryomag to 2.5 K and 1 atmosphere	5 d
31	Magnet should be shipped to KSC at 2.5 K and 1 atm.	0d
32	Remove lower detectors	2 dp
33	Reconfigure stand (not in parallel with warm up)	1 d
34	Install in transport stand	1 d
35	Pack for shipping	4 d
36		
37	SUBTOTAL Warm up and Pack for KSC	27 d
38		
39	TOTAL ESTEC	117 d
40		
41	Note: Preparation at CERN for shipment to ESTEC not included	
42	<u>Shipping time from ESTEC to KSC not included</u>	
43		
44	Offline processing at MPPF	
45	Reconfigure PSS to High position (TBD – LMSO)	1
46	Connect Electronics GSE	1dp

1	Connect Cryomagnet GSE	7dp
2	Connect Tracker Thermal cold plates	2dp
3		
4	Install Lower USS to Upper USS with RICH & ECAL	
5		
6	Install Lower USS to Upper	1
7	Seal reflector and aerogel radiator	1
8	Install Lower TOF Z struts (TOF group)	2
9	Measure RICH Aerogel plane relative distance to PMT	
10	Structure using TOF fiducial marks.	1
11	Connect RICH to ERPDs	1/2
12	Connect RICH to JT crate (AMS Wire, trigger and fast trigger)	1/2p
13	Connect RICH to USCM (TBD)	1/2p
14	Connect ECAL to ERPDs	1/2
15	Connect ECAL to JT crate (AMS Wire, trigger and fast trigger)	1/2p
16	Connect ECAL to USCM (TBD)	1/2p
17	Test ECAL and RICH including light tightness	2
18	Install RICH Debris Shielding	1
19	Subtotal	9d
20		
21		
22		
23	Reinstall Lower USS MLI	
24	Cooldown Cryomag from 4.2 to 1.8 and top up helium.	2w
25	Refill TRD Gas	2dp
26	Refill warm helium system	2dp
27	Install PVGF (including cabling), FRGF, handrails, WIF, etc.	
28	(Keel and PAS installed later)	5dp
29	Test AMS with magnet	7d
30	Install Keel, PAS, BCS Camera, UMA, EVA Panel, Interface Panel A,	
31	ROEU Bracket and ROEU PDA, Cable	10d
32	Ready to ship to SSPF Subtotal	31d
33		
34		
35		
36		
37		
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39		
40		
41		
42		
43	SUMMARY TABLE	
44		
45	(arbitrarily working days and calendar days are considered the same to simplify counting)	
46		

Item Number	Item	Work Days	Calendar Days	Subtotal	
1	Magnet/USS	24			
2	ACC	14			
3	Tracker, TAS, AST, TTCS	57			
4	Lower TOF	8			
5	TRD / Upper TOF	26			
				139	
8	Cool Magnet	59	6w+1w+10=59		
6	U + L USS	10dp			
	Fin UTOF&TRD	14dp			
9	AMS Test No B	49 (35)			
10	AMS Testing B	20			
				218 (204)	
11	CERN Test Beam		36.5d		
				254.5 (240.5)	
13	Finalize Exp & Radiators	37.5			
14	Shipping Prep	3.5			
				295.5 (281.5)	
15	ESTEC Shipping, Setup, Cooldown,		37d		
	ESTEC TVT		41d		
	ESTEC EMI		12d		
	ESTEC Warm up & Pack for KSC		55d		
				440.5 (426.5)	