

I S I E C

INITIAL SAFETY INFORMATION ON EXPERIMENTS AT CERN

DATE: 9 May 2006 EXPERIMENT: RE1 (AMS)
 INSTALLATION START: May 2006 AREA/BEAM: 867 R-F54
 SPOKESMAN: Samuel C.C. Ting
 GLIMOS: Joseph Burger TEL: 75914
 FILLED IN BY: Joseph Burger TEL: 75914

(1) TEST BEAMS: TBD
 LABS AT CERN (BLDG/ROOM): 892 5-A

(2) GASES, LIQUIDS, CRYOLIQUIDS
 (used in detectors or kept in nearby containers)

Device Type	Fluid 1 + % Fluid 2 etc.	Volume	Abs. Press.	Max Flow
Cryomagnet	Liquid He	2455 l	4 bar	NA
Cryomagnet	Warm He for valves	~ 7 l	200 bar	
Cryomag GSE	Liquid He	3000 l	3 bar	
Cryomag GSE	Liquid N ₂	3500 l	3 bar	
Cryomag GSE	Warm He	720 l	200 bar	

SEE ATTACHED CONTINUATION SHEET

(3) OTHER CHEMICALS

Toxic/Corrosive/Flammable metals, solvents, additives etc:

Ammonia is toxic + flammable - located in factory sealed heat pipes
 (same item in (2) above) Propylene is flammable, located in
 factory sealed heat pipes (same item in (2) above) Xe and CO₂
 are heavy gases. located in the TRD ((2) above)

(4) ELECTRICITY

Magnet type	Power	Field	Gap Vol.	Max. water press.
MAGNETS: Superconducting	NA (460A)	0.86 T	5.15 MJ stored	NA (max liquid He pressure 4 bar)

Detector Type	Voltage	Current	Stored Energy	No of HV Channels	Remote Shut-off?
High Voltage (>1 KV) See table	HV and currents in in Flight safety Report		AMS 02 + TBD		
TRD	< 1800	13 x 100 μA		13	yes

SHORT-CIRCUIT current > 5 mA for >50 V possible anywhere? YES
 POWER dissipated by all electronics a) on detectors: 2500 W
 b) off detectors: check GSE (TBD)
 SPECIAL GROUNDING REQUIREMENTS? Yes Conductive Floor in 867 R-F54

(5) LIFTING AND HANDLING

Weight of heaviest single piece to install? 10 T TBC
 Specially designed handling equipment? YES
 For which max. weight? 10 T TBC

(6) VACUUM TANK, PRESSURE TANK, CRYO TANK

Tank	Abs. pressure	Volume	Weakest part(s) of wall
Cryosacuum	0	~225L	NOP 4bar (burst disc)
Cryo Hp	0.016 bar	24550	NOP 4bar (burst disc)
TRD Xe	107 bar	27.5L	NOP 207 bar Burst G41

SEE ATTACHED CONTINUATION SHEET

(7) IONIZING RADIATION

Beam intensity, radioact. Sources, depleted uranium, etc.
4 radioactive sources Fe⁵⁷ 0.0003 mCi each contained in steel monitor tubes in TRD gas system

(8) NON-IONIZING RADIATION

	DETAILS (e.g. class of laser, origin of UV light, average power of microwaves or RF, pulsed or CW, ...)
LASER	10 pulsed laser diodes 1082nm < 80mW
UV LIGHT	
MICROWAVES (300 MHz-30 GHz)	
RADIOFREQUENCY (1-300 MHz)	

(9) OTHER HAZARDS (or remarks):

battery for uninterruptible power supply for superconducting magnet monitor system

(10) RISK ANALYSIS

See AMS02 Phase II Flight Safety Data Package <http://ams-02project.jsc.nasa.gov/html/1SDP.htm>

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INSTALLATION START: May 2006 AREA/BEAM: 867 R-F54
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- (1) TEST BEAMS: TBD
LABS AT CERN (BLDG/ROOM): 892 S-A
- (2) GASES, LIQUIDS, CRYOLIQUIDS
- | Device Type | Volume | Abs. Press. | Max Flow |
|--------------------------|-----------------------|-----------------|----------|
| Cryomagnet | 2455 l | 4 bar (3 diff.) | NA |
| Warm he for valves | ~7 l | 200 bar | |
| Cryomagnet GSE | 3000 l | 3 bar | |
| Liquid N2 | 3 Dewars | | |
| Warm He | 3500 l | ~3bar | |
| | 1 Dewar | | |
| | 720 l | 200 bar | |
| | (24 standard bottles) | | |
| TCS Cooling | 2x2 l TBC | ~60 bar | 2 g/s |
| Ammonia Axial | <6 l tot. | 15 bar | NA |
| Groove | in 55 | | |
| heatpipes | heatpipes | | |
| Ammonia Loop | 2x0.18 l | 15 bar | TBD |
| Heatpipes | | | |
| Propylene Loop | 8x0.2 l | 4 bar | TBD |
| Heatpipes | | | |
| TRD Gas system | 230 l | 1.4 bar | 41 l/h |
| TRD Gas Tanks, see below | | | |
- (3) OTHER CHEMICALS
- Ammonia is toxic and flammable. Located in factory sealed heatpipes. Same item as in (2) above ~1.1kg total
- Propylene is flammable. Located in factory sealed heatpipes. Same item as in (2) above. 4 x 42 g
- Xenon and CO2 are heavy gases. Located in the TRD gas sytem. Same item as in (2) above. 49 kg Xe, 5 kg + 2 kg CO2
- (4) ELECTRICITY
- MAGNETS:
- | Magnet type | Power | Field | Gap Vol. | Max. water press. |
|-----------------|-----------|-------|----------------|-----------------------------------|
| Superconducting | NA (460A) | 0.86T | 5.15 MJ stored | NA (max liquid He pressure 4 bar) |
- High Voltage (>1kV)
- | Detector Type | Voltage | Current | Stored Energy | No. of HV Channels | Remote Shut-off? |
|-------------------------------------|----------------------|---------------|---------------|--------------------|------------------|
| See Table: HV and Currents in AMS02 | A8.8 to 10 in flight | safety report | | | |

TRD <1800V a3x<100uA TBD 13 YES

SHORT-CIRCUIT current > 5mA for >50 V possible anywhere? Yes
Power dissipated by all electronics a) on detectors: 2500W
b) off detectors: check GSE

See AMS-02 Hazard Report AMS-02-F17
SPECIAL GROUNDING REQUIREMENTS? Conducting floor in 867 R-F54

(5) LIFTING AND HANDLING

Weight of heaviest single piece to install? 10T TBC
Specially designed handling equipment? YES
For which max. weight: 10T TBC

(6) VACUUM TANK, PRESSURE TANK, CRYO TANK

Tank	Abs. pressure	Volume	Weakest part(s) of wall
Cryo Vacuum	0 bar	~2295 l	MDP 4 bar (burst discs) (3 diff.)
Cryo He tank	0.016 bar	2455 l	MDP 4 bar (burst discs) (3diff.)
TRD Xe tank	107 bar	27.5 l	composite overwrapped steel tank MDP 207 bar Burst Pressure 641 bar
TRD CO2 tank	65 bar	13.3 l	composite overwrapped steel tank MDP 207 bar Burst Pressure 441 bar
TRD Mixing Tank	13.8 bar	1 l	steel tank MDP 20.7 bar Burst Pressure 82.7 bar

TRD straws	1.4 bar	230 l	kapton straws MDP 2.0 bar Burst Pressure 4.1 bar
TTCS CO2 accumulator tank	~60 bar TBC	2x 1 l	A316LN steel tank MDP 160 bar Burst Pressure 615 bar

Warm He for cryomagnet valves	200 bar	7 l	Composite overwrapped Al2219 tank MDP 301 bar Burst Pressure 938 bar
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Cryocoolers	16 bar	4x0.26 l	MDP 20.3 bar, burst Pressure 124 bar
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LHP shutoff valves (Ar)	6 bar	<10x0.02 liters	Steel bellows, TBD
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TTCS Oscillating Heatpipe (3M FC-87 2.6 grams)	35-60bar	~0.11 TBC	Steel tubing, MDP 5.3 bar, Burst pressure 21.3 bar
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Weka warm Valves (He)	6 bar	TBD	Steel bellows, MDP 11 bar, Burst pressure > 27.5 bar
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Axial groove heatpipes (NH4)	15 bar	~55 pipes	MDP 25 bar Burst pressure 155 bar
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Propylene LHPs	4 bar	8x0.2 l	MDP 18 bar Burst pressure 123 or 64 bar (TBC)
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Ammonia LHPs	15 bar	2x0.35 l	MDP 20.3 bar Burst pressure 175 bar
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(7) IONIZING RADIATION

4 radioactive sources Fe55 0., 0003mCi each, contained in sealed steel monitor tubes in the TRD gas system

(8) NON-IONIZING RADIATION

	DETAILS
LASER	alignment laser inside magnet, 10 pulsed laser diodes 1082 nm max 80 mW
UV LIGHT	none
MICROWAVES	none
RADIOFREQUENCY	none

(9) OTHER HAZARDS
battery for uninterruptable power supply for superconducting magnet monitor system

(10) RISK ANALYSIS
See AMS02 Phase II Flight Safety Data Package
<http://ams-02project.jsc.nasa.gov/html/SDP.htm>