

Module final acceptance status

- 1. Status report and modules quality**
- 2. Problems seen on the 4 last modules of type 3**
- 3. Plans**

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(on behalf of the crew in building 154)**

1. Module testing status: 36 of each type

Type	Received	Tension & dimensions	HV checks	Rework & final HV	MGM	HV cond	leak test	QC + SR
	2%	10%	20%	30%	10%	20%	5%	3%
1 (100%)	36	36	36	36	36	36	35	35
2 (100%)	35	35	35	35	35	35	35	34
3 (95.8%)	36	36	36	36	36	32	32	32

Total: 98%

Successfully replaced wires

problem found by gain mapping in the US	352	33%
HV problem found during early HV checks	300	28%
straw left unstrung at production site	194	18%
tension too low or too high, slippage, F/B	142	13%
removed temporarily to fish out pieces of wires	80	8%
broken wires	10	1%
removed temporarily to fix a straw leak	2	0.2%
Total: 111 modules with 58592 wires	1055	1.8%

Dead channels for TRT barrel

	type 1		type 2		type 3		TRT barrel	
	wires	%	wires	%	wires	%	wires	%
bent	9	7.3%	54	44.6%	286	53.7%	349	44.9%
gain mapping	13	10.5%	4	3.3%	20	3.8%	37	4.8%
HV problem	31	25.1%	37	30.6%	154	28.9%	222	28.6%
broken socket	1.5	1.2%	7.0	5.8%	5.5	1.0%	14.0	1.8%
unstrung	68	55.1%	18	14.9%	67	12.6%	153	19.7%
tension	1	0.8%	1	0.8%	0	0.0%	2	0.3%
total	123.5	1.17%	121.0	0.73%	532.5	2.10%	777.0	1.48%

Replaced wires

	dead wires		replaced wires	
	total	fraction	replaced	fraction
type 1	123.5	1.17%	212	2.01%
type 2	121	0.73%	197	1.18%
type 3	529	2.08%	527	2.08%
total	773.5	1.48%	936	1.78%

1.48%: better than the projected number of 1.9% in September

of dead straws in type 3 modules

M3.02	2	M3.18	9.5	M3.01	18	M3.17	30
M3.28	2	M3.32	10	M3.15	18.5	M3.36	32.5
M3.10	4	M3.04	11	M3.25	18.5	M3.27	35
M3.14	5	M3.21	14	M3.23	19	M3.29	36.5
M3.22	6	M3.07	14.5	M3.37	19	M3.19	38
M3.20	7	M3.08	15	M3.03	20.5	M3.13	45
M3.12	8	M3.05	16	M3.11	21	M3.31	51
M3.16	8	M3.09	17	M3.33	23	M3.34	54
M3.06	9	M3.24	17.5	M3.26	28.5	M3.35	69

Modules shown in red still have to pass our QC

Module quality from Quality Circle reviews

Module type	***	**	*
32 type 1	20	7	5
32 type 2	23	9	0
29 type 3	10	12	7

Loose one star per flaw: HV pads are connected, more than 1% dead wires, broken traces or other special problem

External causes of HV trips in conditioning

1. Correlation found between humidity level and number of trips seen
Now humidity limited to 45% instead of 55%
2. Fuseboxes versus clamps: 3 σ effect
Clamps had a 100 Kohm resistor
Fuseboxes had a 1 Mohm resistor
Twice as many trips for modules with clamps
Now all have a 1 Mohm resistor
3. RC filters on HV distribution line:
Were in place for HV test stations but not for HV conditioning cabinet
HV cabinet now equipped with RC filters
4. “Self-quenching” trips: very small voltage drops with low current draw. Could be induced by touching the module. These trips were ignored.

Pieces of loose wires found between HV and tension plates

M1.35	Fishing wire + ball of lead wire
M3.05	Long piece of wire
M3.13	Long piece of wire + 3 tiny pieces
M3.17	Long piece of wire + second smaller piece
M3.24	4 pieces at front + piece of solder at back
M3.26	2 small pieces, one with wirejoint
M3.32	Piece of lead wire
M3.23	5 mm piece stuck in front twister
And many pieces removed from inside straws	

Ongoing work on type 3 modules

- 🔦 **4 modules of type 3 are still in building 154:**
 - We need 3 of these for the detector
 - HV conditioning and repairs still in progress
 - 3.13 and 3.26 can be improved now that many pieces of wires were retrieved from behind the tension plate
 - Might be worth it to inspect 3.24 with endoscope to make sure all loose pieces of wires have been found
 - These will need a rescan
 - 3.37 need more time to complete HV conditioning

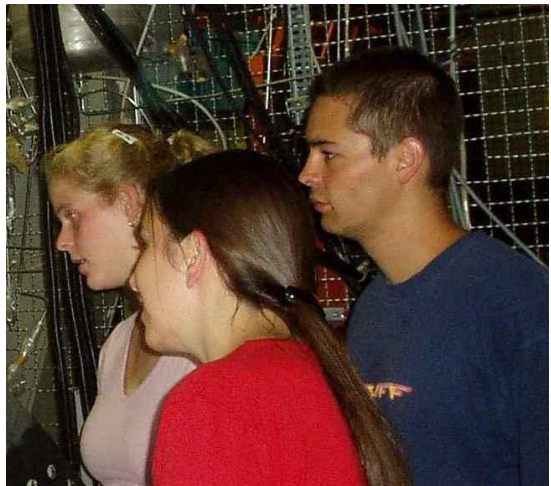
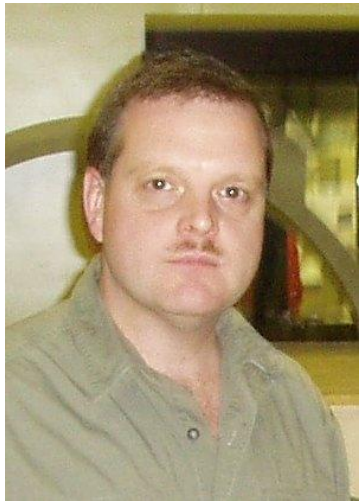
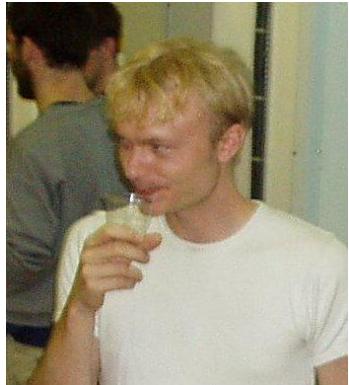
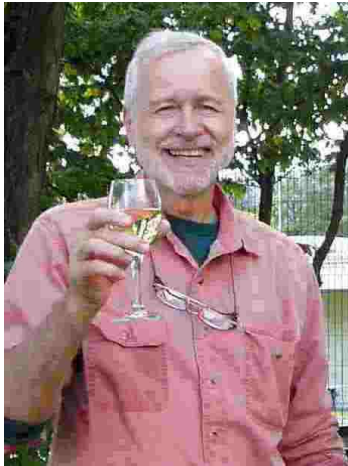
Preparing spare modules

- 🐛 **In 2005, we will try to prepare 2 modules of each type, fully certified and functioning**
 - **Type 1: 1.30 or 1.28; 1.26 ready but could be improved**
 - **Type 2: 2.05, 2.13 or 2.36: all need inspection**
 - **Type 3: 3.13 (in progress) and 3.31 ready**
- 🐛 **These could be used in case of a major problem later on**
- 🐛 **These modules will be kept stored in packing cylinders somewhere once all prepared with capacitors etc. ready for installation**

Module status

- 🚫 **All but 6 modules have been approved for installation**
 - 1.30 and 2.36 did not satisfied QC
 - 3.13, 3.24, 3.26 and 3.37 still being worked on
- 🚫 **In addition, 6 modules were used for test beam**
 - Only 1.28, 2.05, 2.13 could be reworked
 - 1.01 not a production module, used in nuclear reactor
 - 3.34 and 3.35 have too many bent straws

Thanks to many people but mostly...



And all those who helped at crucial times



What have I learned?

**You can't teach a pig to sing.
It wastes your time and
annoys the pig...**