Cathode Production
Status Report

Muon Week
CERN, April 25th 2001

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Bologna:

MB2 θ cathode production was completed by April 13th.

The HV test lagged behind for lack of some HV modules under repair at CAEN. It was completed on April 21st.

~2020 cathodes were packed on April 23rd.

The dish has been modified to assemble MB3 θ cathodes and production has started albeit with reduced speed due to holidays in Italy.

Production Information

The Mylar distribution head was modified in the middle of March to cope with the tape manufacturing vagaries: the tapes being more tightly wound than in previous batches.

QC sheets were filled for most of the cathode production, i.e. starting with March 23rd.

Some observation based on a quick analysis of the QC sheets:

- 90% of the cathodes pass the visual QC inspection; 88% if one consider “Standard” dishes with only bare I-beams.

- The rate of good cathodes from March 23rd to April 10th was of 127/day. It reached 165/day in the period from April 2nd to April 10th.
- Only 3 operators did the cathode production from March 29th to April 13th.
- The I-beams were cleaned by hand, a rather time consuming operation.
- The fraction of QC failures are: 17% Mylar only, 48% Aluminum, 35% Mylar and Aluminum.
- 86% of the QC failures are due to problems with the tape quality, mostly dirt in the adhesive and scratches on the aluminum.
- The remaining 14% can be ascribed to the tape deposition procedures. Some improvements will be done to reduce this value.

$\Rightarrow$ The rate of 160 cathodes/day can be achieved without heroic efforts especially with clean I-beams.

MB2 Cathode Production Statistics

Date	#Dish	I-beams	Cathodes	Eff.	Seq
13/04	1	39	33	0.85	1
11/04	1	39	34	0.87	2
10/04	4	175	161	0.92	3
09/04	4	166	142	0.86	4
06/04	5	195	175	0.90	5
05/04	5	201	178	0.89	6
04/04	4	152	143	0.94	7
03/04	3	136	118	0.87	8
02/04	3	133	125	0.94	9
30/03	2	80	73	0.91	10
29/03	4	155	139	0.90	11
28/03	3	109	96	0.88	12
27/03	3	117	107	0.91	13
26/03	2	80	65	0.81	14
23/03	4	145	133	0.92	15
Total	48	1922	1722	0.90	

Dish Types:

Recover I-Probs	1
Standard	32
New + Recovers	13
Aluminium only	2

MB2 Cathode Production Statistics
Visual Inspection Rejects

Mylar		
Dirt	23	(0.64)
Air bubble	11	(0.31)
Entry/exit Prob	2	(0.06)
Crimped	0	(0.00)
Aluminium		
Dirt	37	(0.38)
Air bubble	3	(0.03)
Indentation	26	(0.27)
Bad Quality	27	(0.28)
Points	1	(0.01)
Glue	0	(0.00)
Crimped	3	(0.03)
Mylar+Al		
Dirt	61	(0.92)
Air bubble	0	(0.00)
Entry/exit Prob	5	(0.08)
Glue	0	(0.00)

Total Rejects:

Mylar	36
Aluminium	97
Mylar+Al	66

MB2 Cathode Production Statistics
Standard Dishes (bare I-beams)

Date	#Dish	I-beams	Cathodes	Eff.	Seq
11/04	1	39	34	0.87	1
10/04	2	78	69	0.88	2
09/04	2	78	61	0.78	3
06/04	5	195	175	0.90	4
05/04	4	156	137	0.88	5
04/04	2	72	68	0.94	6
03/04	2	78	66	0.85	7
02/04	1	38	33	0.87	8
30/03	1	39	37	0.95	9
29/03	4	155	139	0.90	10
28/03	1	39	33	0.85	11
27/03	3	117	107	0.91	12
26/03	1	39	30	0.77	13
23/03	3	117	107	0.91	14
Total	32	1240	1096	0.88	

MB2 Cathode Production Statistics
Standard Dishes (bare I-beams)
Visual Inspection Rejects

Mylar		
Dirt	13	(0.54)
Air bubble	9	(0.38)
Entry/exit Prob	2	(0.08)
Crimped	0	(0.00)

Aluminium		
Dirt	27	(0.39)
Air bubble	3	(0.04)
Indentations	18	(0.26)
Bad Quality	18	(0.26)
Points	0	(0.00)
Glue	0	(0.00)
Crimped	3	(0.04)

Mylar+Al		
Dirt	47	(0.94)
Air bubble	0	(0.00)
Entry/exit Prob	3	(0.06)
Glue	0	(0.00)

Total Rejects:

Mylar	24
Aluminium	69
Mylar+Al	50

HV Test

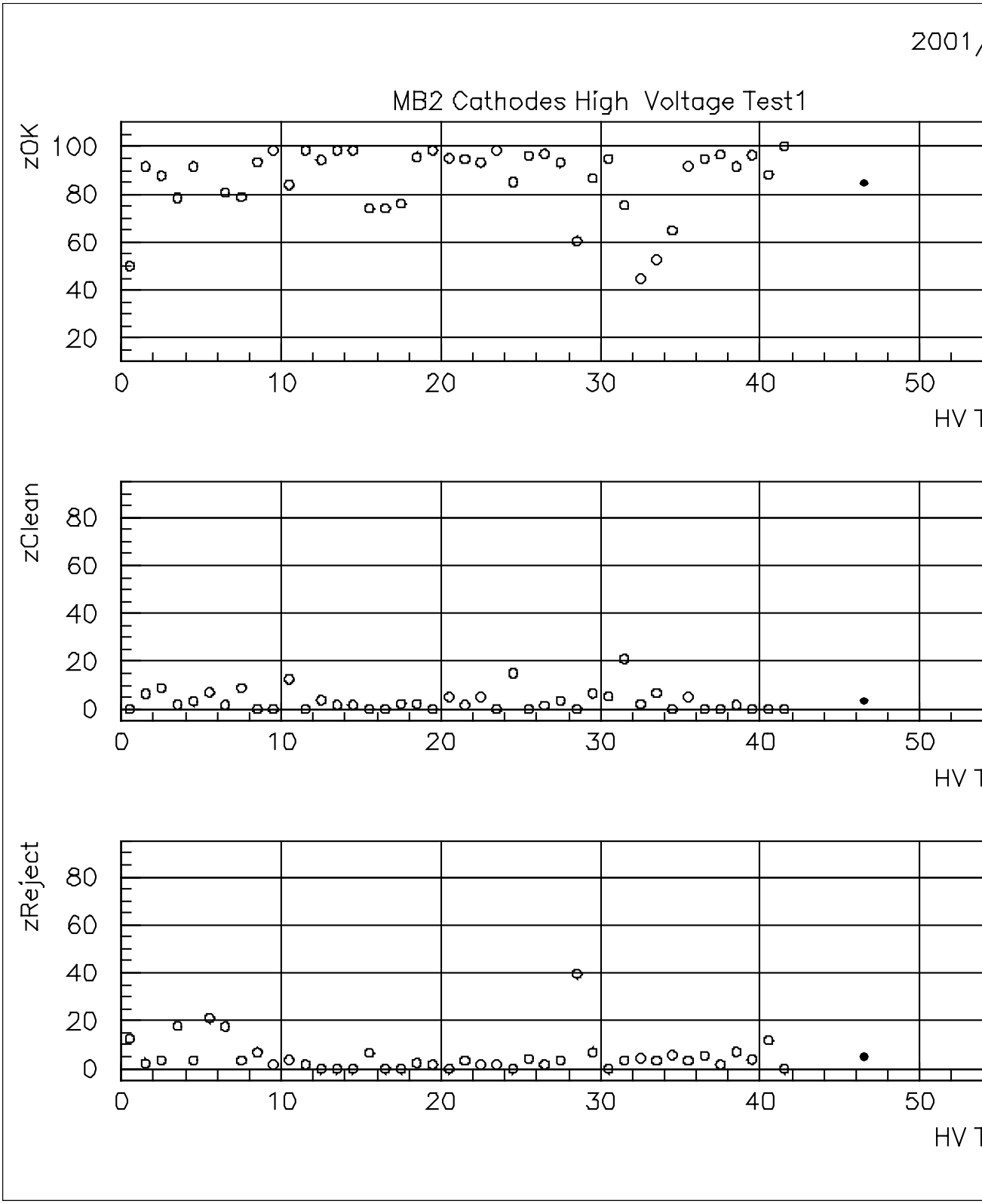
This task was done by physicists (Silvia Arcelli, Christian Montanari, Tiziano Rovelli +..) including cleaning with alcohol the cathodes which had high final current.

Typically two tests of 60 cathodes each were done each day.

The reject rate are at the few % level:

	New Cathodes			Cleaned		
Type	OK %	Clean %	Rjct. %	OK %	Clean %	Rjct. %
Phi	89.6	7.6	2.8	84.1		15.9
MB2	85.0	9.8	5.2	85.7		14.3

The higher reject rate for MB2 cathodes is due to the new batch of Mylar tapes before the tape head was changed and to a defective Mylar tape.



Sequential HV test Runs on the abscissa

Protvino

The optical bar and encoder boards brought from Protvino were tested and found to be OK.

The advice from the manufacturer was to make additional measurements in Protvino.

On April 1st measurements with aluminum bars precisely machined to reference lengths indicated that the plotter movement was correct.

The problem with the head positioning was caused by a deformation of the movable bridge. This was fixed by applying spacers under the rails.

With the plotter back in working order the plan was:

- Modify the Mylar distribution head as done to the one in Bologna,
- Commission the Mylar deposition cycle,
- Commission the Aluminum deposition cycle with an additional head which had been used in Bologna the previous week and bring back the head already in Protvino for tests on the XY-plotter
- Fix problems with the I-beam washing system
- Start cathode production.

Lufthansa foiled the crucial item of this plan since the aluminum tape deposition head arrived broken in two pieces, i.e. it was broken during transportation.

The old head was then equipped with pieces from the broken head and the entire operation of aligning the various pieces started again.

The commissioning of the aluminum cycle was more difficult than expected. The aluminum was centered on the I-beam but some times it would wander out of tolerance.

The problem was finally fixed by Thursday afternoon after the diameter of the first wheel was increased by 4mm and the bridge speed was reduced to the value used last year in Bologna.

799 cathodes were produced (680 were done in 4 days Friday to Monday).

The failure rate at the HV test was at the same level as in Bologna.

Three crates containing:
2463 Phi-type I-beams and 1111 Phi-type cathodes are ready for shipping.

$\Rightarrow$ The production line is ready.

Comments on Protvino Status

The cutting and de-burring of the I-beams went reasonably well although with more people than we used to.

The I-beam washing and drying system works but needs to be optimized. We could test it only the day before we left since the demineralised rinse water was missing $\Rightarrow$ The I-beams were cleaned by hand

The participation of Protvino technicians to the cathode production was very limited although four or five people were around most of the time.

The interactions with Obraztsov and his deputy Arsenteev were very limited probably because they were busy with a period of data taking.

My personal conclusions are:

- The team necessary to do the production of 170 000 cathodes is still not there.
- I don't see how it will be set-up unless some drastic changes take place.
- It is not feasible to have two cathode assembly sites hence either Protvino can do the job or we should pull out as fast as we can.