

# ***Drift Tube Quality Control***

## ***CMS week – CERN – 23th Sept 2002***

- **Organization** of the QC Tests Results
- **Overview** of the QC Test Results
- **QC at Production Sites:**
  - **Aachen**
  - **Madrid Begona**
  - **Padova**
- **Status and decisions about HV Boards** **Marco**
- **Glue Quality Control - Results from rupture tests** **Hans**
- **Production Data Base at Madrid** **Pablo**
- **AoB**



# ***Drift Tube Quality Control***

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**Slthickness Slnum SLPos NumofMeas meas(1)...meas(numofmeas)**

# *Review of the Procedures and Conditions to perform Quality Tests*

<http://www.to.infn.it/activities/experiments/QUALITY/QCDB/Conditions.html>

## - Gas Tightness

Final SL enclosures

Manometer with  $< 0.5$  mbar res.

85% Ar – 15% CO<sub>2</sub>

Overpressure of 50 mbar

## - SL thickness - common conditions tbd

## - Chamber Planarity- common conditions tbd

## - Noise

85% Ar – 15% CO<sub>2</sub>

$< 500$  ppm O<sub>2</sub>

atmospheric pressure

HV cable connected but no voltage

Scaler or Cosmic Rate Hardware set up?

# *Review of the Procedures and Conditions to perform Quality Tests*

<http://www.to.infn.it/activities/experiments/QUALITY/QCDB/Conditions.html>

## - Efficiency

85% Ar – 15% CO<sub>2</sub>

< 500 ppm O<sub>2</sub>

atmospheric pressure

1200/1800/3600 V (Cern site)

threshold 15mV =  $V_{thr} - V_{ref}$  ( $V_{ref} = 1.5V$ )

At least 3 hits

Track-wire distance < 19 mm

## - Mean Timer

85% Ar – 15% CO<sub>2</sub>

< 500 ppm O<sub>2</sub>

at atmospheric pressure

1200/1800/3600 V (Cern site)

Threshold 15mV =  $V_{thr} - V_{ref}$  ( $V_{ref} = 1.5V$ )

Quantity to measure: MT123 and MT234 each column

4 hits tracks

angle limit?

# *Approved Format for QC Tests*

## Data Base Ascii File(s)

Data Source: Production Sites on a Local Web Page

Format:

<http://www.to.infn.it/activities/experiments/cms/QUALITY/QCDB/Update3db.txt>

**LayerWirePosTest** ID\_suplyr SL\_Position ID\_Layer SIDE NM pos(1)...pos(NM)

**LayerWireTensTest** ID\_suplyr SL\_Position ID\_Layer NM tens(1)...tens(NM) DATE

**SuperlayerRefBlock** ID\_suplyr SL\_Position Nref Nmeas pos(1)...pos(Nmeas)

**SuperlayerGasTight** ID\_suplyr SL\_Position Nmeas  
TimeConstant(1)...TimeConstant(Nmeas) DATE

**LayerNoise** ID\_suplyr SL\_position ID\_Layer HVSetup Ncell Noise(1)...Noise(Ncell) DATE

**LayerEffi** ID\_suplyr SL\_position ID\_Layer Ncell Effi(1)...Effi(Ncell) DATE

**SuperLayerMT1** ID\_suplyr SL\_Position NumColumn Nmeas AverageMT1(1) ...  
AverageMT1(NumColumn) WidthMT1(1) ...WidthMT1(NumColumn) ErrorMT1(1) ...  
ErrorMT1(NumColumn) DATE

**SuperLayerMT2** ID\_suplyr SL\_Position NumColumn Nmeas AverageMT1(1) ...  
AverageMT1(NumColumn) WidthMT1(1) ...WidthMT1(NumColumn) ErrorMT1(1) ...  
ErrorMT1(NumColumn) DATE

**LayerDiscCells** ID\_suplyr SL\_Position ID\_Layer ID\_Channel CAUSE DATE

# *Approved Format for QC Tests*

## Data Base Ascii File(s)

Data Source: Production Sites on a Local Web Page

<http://www.to.infn.it/activities/experiments/cms/QUALITY/QCDB/Update3db.txt>

### OPTIONAL CARDS:

**LayerNoiseStat** ID\_Suplyr SL\_Position ID\_Layer AVERAGE SIGMA N<THR1 CELLS(1)  
...CELLS(N<THR1) N>THR2 CELLS(1) ... CELLS(N>THR2)

**LayerEffiStat** ID\_Suplyr SL\_position ID\_Layer AVERAGE SIGMA N<THR1 CELLS(1) ...  
CELLS(N<THR1)

----- AVERAGE and SIGMA are calculated for the good cells. (e.g. THR1 < noise < THR2)

**LayerAfterP** ID\_suplyr SL\_Position ID\_Layer Ncell Prob(1)...Prob(Ncell) DATE

# *Approved Format for QC Tests*

## Summary QC Test Results

### Ascii File(s)

Data Source: Production Sites Output of the QC Test Analysis on a Local Web Page

<http://www.to.infn.it/activities/experiments/cms/QUALITY/QCDB/Update3s.txt>

**WirePosition** ID\_Layer SIDE AveragePos AverageSigma

**WireTension** ID\_Layer AverageT AverageSigma

**RefBlockPos** ResidualPos1 ResidualPos2 ResidualPos3 ResidualPos4

**GasTightness** TimeConstant

**Noise** ID\_Layer HVSetup AverageNoise AverageSigma Nover Nout NoutCell(1) ... NoutCell(Nout)

**CosmEffi** ID\_Layer AverageEffi AverageSigma Nunder Nout NumCell(1) ... NumCell(Nout)

**SuperLayerMT1** ID\_suplyr SL\_Position NumColumn Nmeas AverageMT1(1) ...  
AverageMT1(NumColumn) WidthMT1(1) ...WidthMT1(NumColumn) ErrorMT1(1) ...  
ErrorMT1(NumColumn) DATE

**SuperLayerMT2** ID\_suplyr SL\_Position NumColumn Nmeas AverageMT1(1) ...  
AverageMT1(NumColumn) WidthMT1(1) ...WidthMT1(NumColumn) ErrorMT1(1) ...  
ErrorMT1(NumColumn) DATE

**DiscCells** ID\_Layer NCause Ndisc NumCell(1) ... NumCell(Ndisc)

# Format for Crucial QC Tests

## Summary QC Test Results

### Data Table

On the Central Web QC page in Excel Format

<http://www.to.infn.it/activities/experiments/cms/QUALITY/QCDB/QCST.xls>

A software to fill this table starting from the Ascii file(s) is ready

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	SI_nr	ph3	ph5	th2	ph7	ph8	th5	ph4	ph6	th3	ph9	ph10	th6	ph11	ph12
2	Av_L1HVWireF	12.28	100.1	-8.43	-95.96	20.1	39.02	-36.16	-4.45		-1.06	11.62	13.96	33.95	-35.47
3	Av_L2HVWireF	-15.75	-60.35	13.93	9.47	13.31	71.8	57	-20.1		4.03	-0.58	11.02	36.08	22.47
4	Av_L3HVWireF	-28.18	74.18	-39.41	-16	13.25	27.07	-60.85	9.3		-25.62	12.93	31.79	45.34	-27.44
5	Av_L4HVWireF	46.9	-46.45	80.87	-0.39	-0.88	42.55	-53.35	3.7	57.79	32.15	-3.16	-16.55	24.19	48.61
6	Av_L1FEWireP	24.23	76.15	36.09	111.4	-39.59	52	-112.1	17.94		-0.58	-9.76	2.53	11.27	18.24
7	Av_L2FEWireP	-137.2	-27.47	-56.69	58.05	-16.26	51.19	-125.2	-2.79		-12.83	16.63	-10.02	21.5	-23.62
8	Av_L3FEWireP	-7.63	53.08	-27.81	90.57	-48.76	17.98	0.79	-1.18		26.66	-25.01	-59.22	-24.27	5.36
9	Av_L4FEWireP	-9.52	-7.86	24	45.55	-16.05	39.96	-88.19	21.71	-45.55	38.59	66.78	27.13	34.45	5.36
10	Sig_L1HVWireI	36.17	36.1	39.04	67.86	39.52	38.3	55.45	57.92		43.01	42.43	42.86	47.0	46
11	Sig_L2HVWireI	37.07	62.42	40.83	45.39	37.76	56.06	37.1	41.27		41.87	43.69	26.42	34.4	0.04
12	Sig_L3HVWireI	31.98	49.65	53.6	59.04	37.3	45.82	57.97	54.75		33.3	40.3	35.73	37	3.05
13	Sig_L4HVWireI	28.19	70.61	56.04	55.29	48.46	48.1	60.75	29.66	121.3	39.66	33.46	24.61	43.8	40.96
14	Sig_L1FEWireI	33.98	40.84	32.98	39.82	30.05	42.99	52.14	44.73		45.06	42.98	47.68	31.99	44.1
15	Sig_L2FEWireI	45.31	32.06	31.57	37.25	46.77	58.17	55.19	46.1		44.67	38.11	48.5	41.66	33.24
16	Sig_L3FEWireI	40.36	54.24	33.4	58.77	47.95	39.36	46.63	37.97		39.28	25.73	22.95	38.41	53.01
17	Sig_L4FEWireI	35.99	66.35	51.18	45.2	25.72	44.25	66.9	27.65	45.53	31.29	25.39	33.75	71.84	56.49
18	Av_L1T	2.75		2.8	2.84	2.92	2.98	2.79	2.66	2.82	2.99	2.84	2.94		
19	Av_L2T	2.75	2.7	2.8	2.88	2.86	3.01	2.86	2.7	2.73	3.08	2.9	2.95		
20	Av_L3T	2.75	2.68	2.78	2.87	2.8	2.98	2.86		2.79		2.89	3		
21	Av_L4T	2.74	2.65	2.76		2.83	2.94	2.83		2.82					
22	Sig_L1T	0.025		0.035	0.028	0.075	0.066	0.035	0.027	0.032	0.067	0.075	0.043		
23	Sig_L2T	0.034	0.025	0.023	0.036	0.047	0.048	0.022	0.032	0.028	0.057	0.063	0.066		
24	Sig_L3T	0.03	0.043	0.05	0.034	0.061	0.044	0.024		0.032		0.064	0.034		
25	Sig_L4T	0.021	0.05	0.023		0.044	0.045	0.033		0.033					
26	RefBlock1				-2	36	-58				-190	-192	-45	-183	-189
27	RefBlock2				-669	-703	-248				-876	-932	-399	-762	-800
28	RefBlock3				-483	-388	267				-526	-503	-31	-415	-464
29	RefBlock4				133	-17	-11				-60	-34	32	-24	-15
30	GasTight	51	69	363	635	125	277	40	25	50	592	192	76	115	800
31	DiscCellL1C1										1				
32	DiscCellL1C2	1					1								
33	DiscCellL1C3														
34	DiscCellL1C4													1	
35	DiscCellL1C5		1	2											

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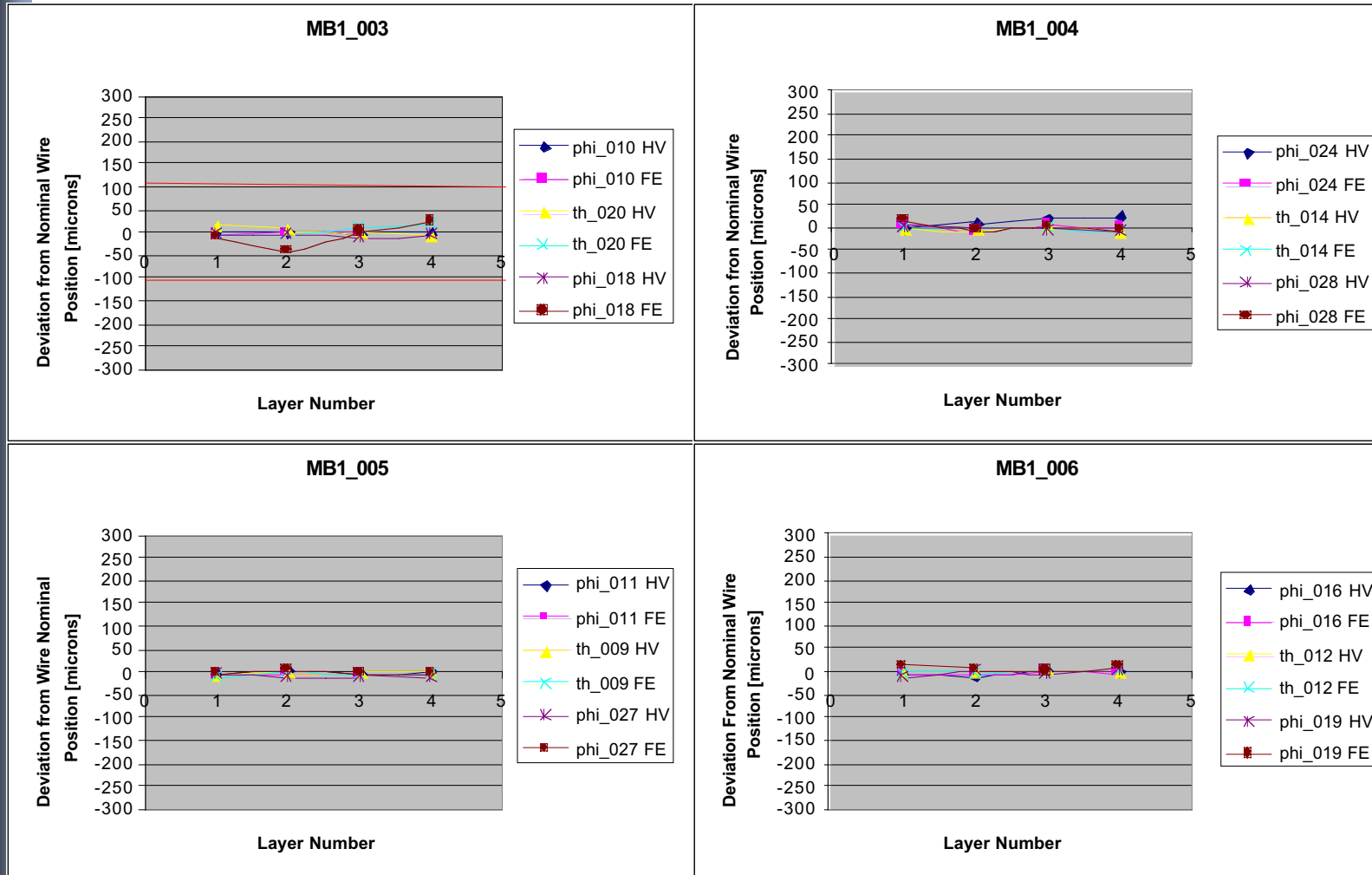




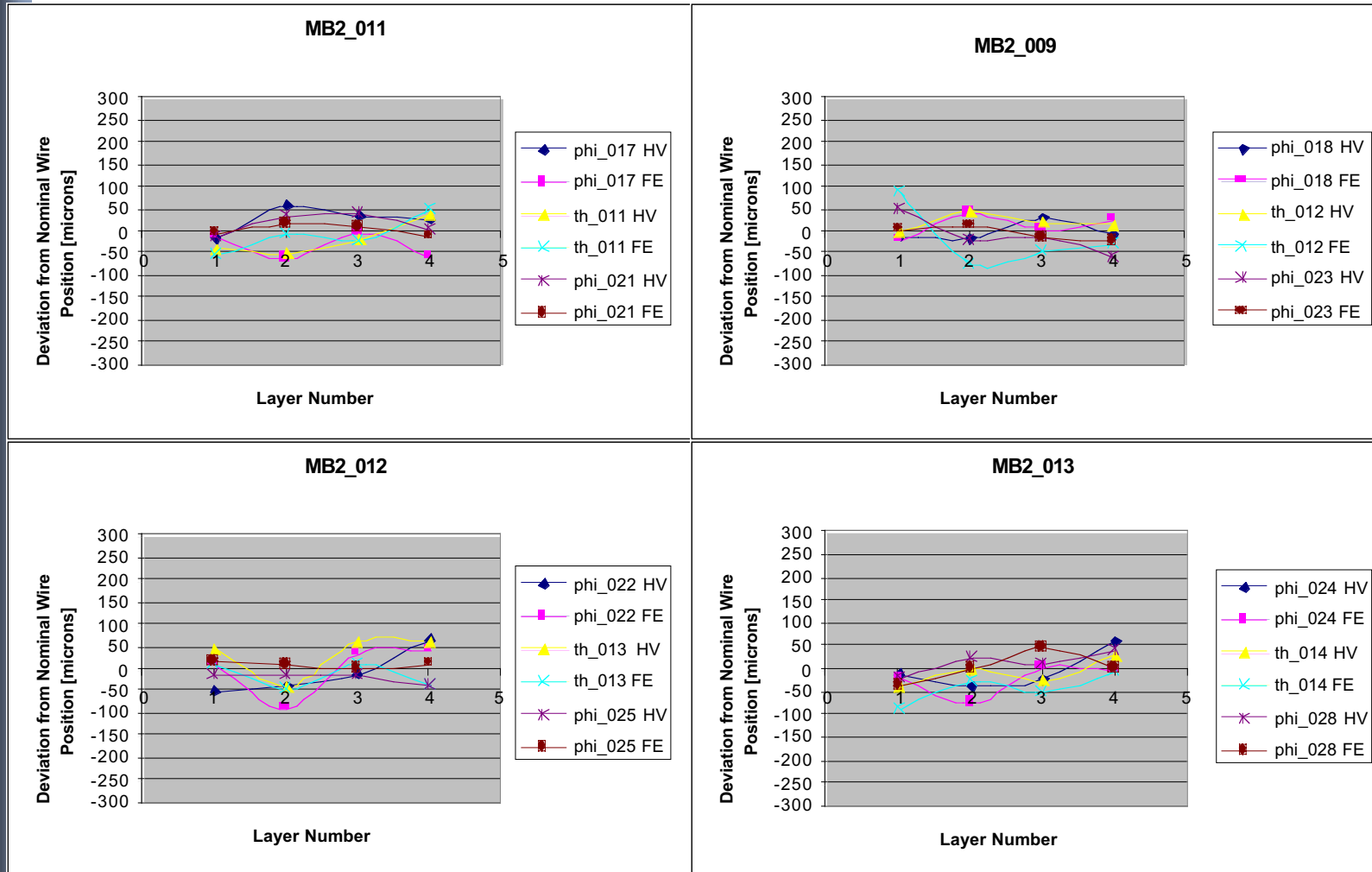
# *Summary QC Test Results*

<http://www.to.infn.it/activities/experiments/cms/QUALITY/QCDB/SLQC.html>

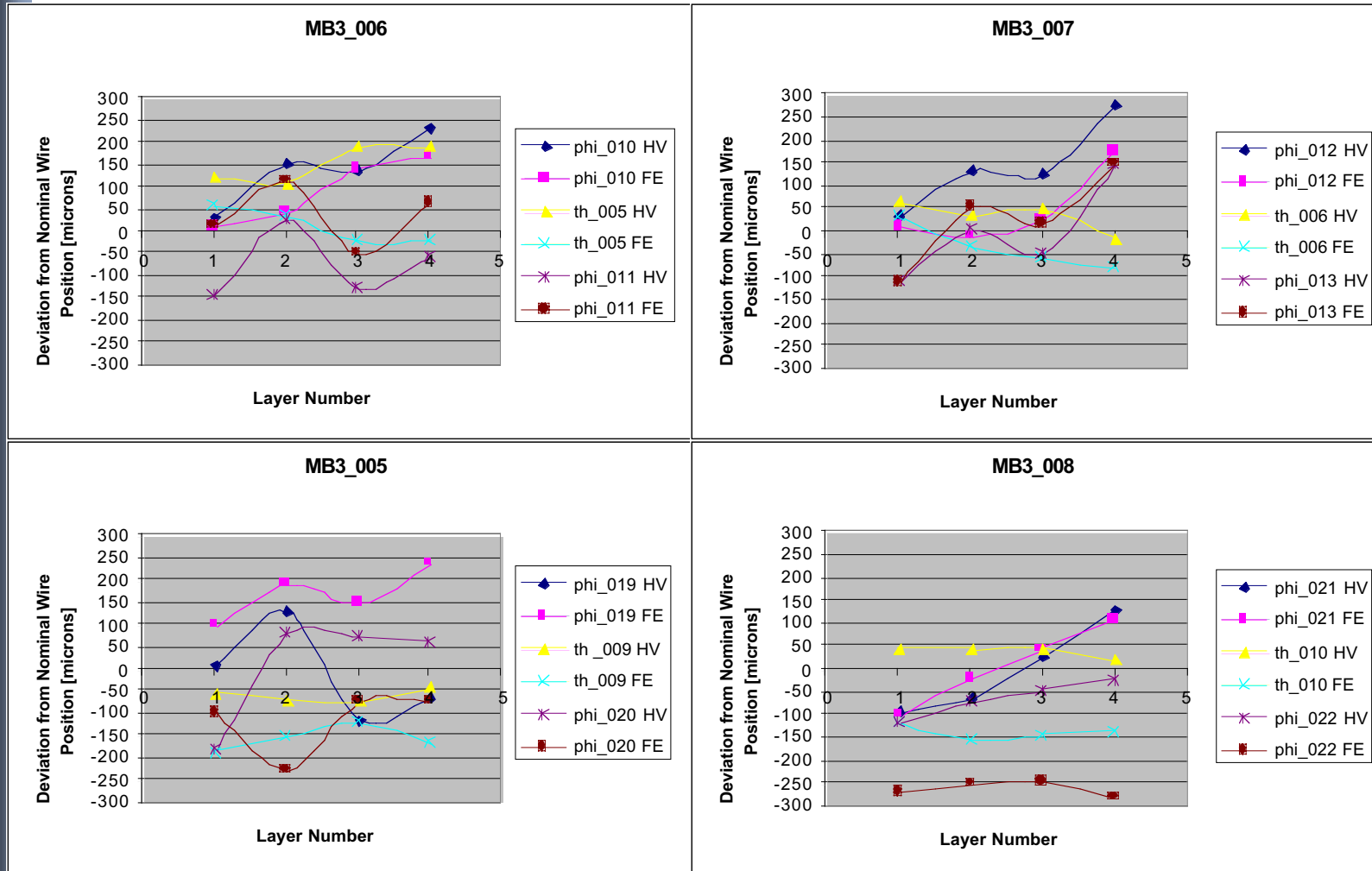
# Wire Position



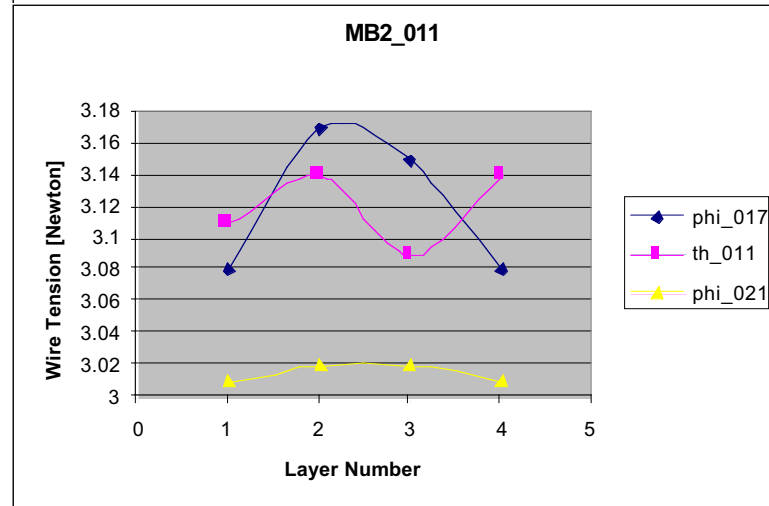
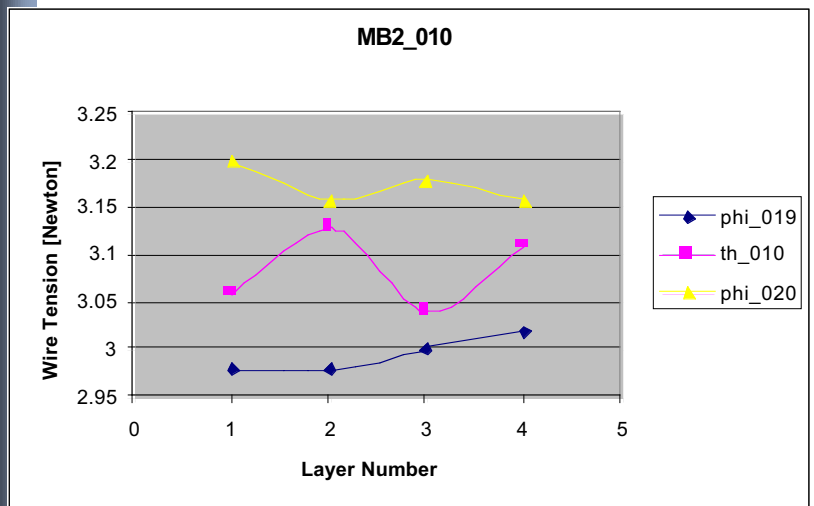
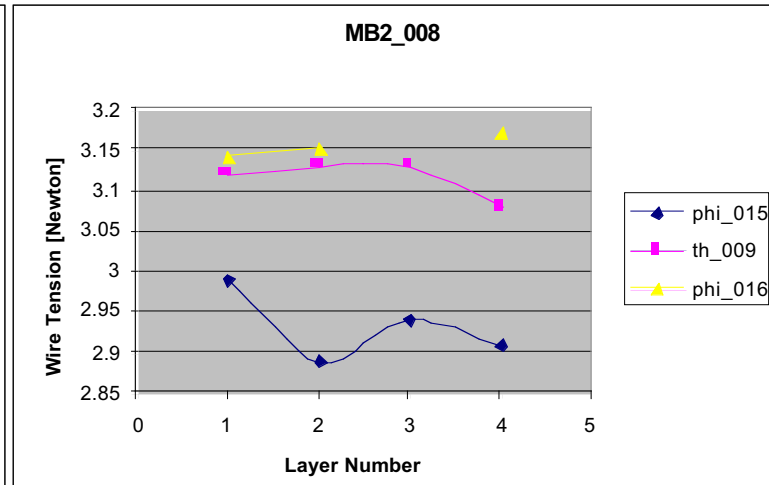
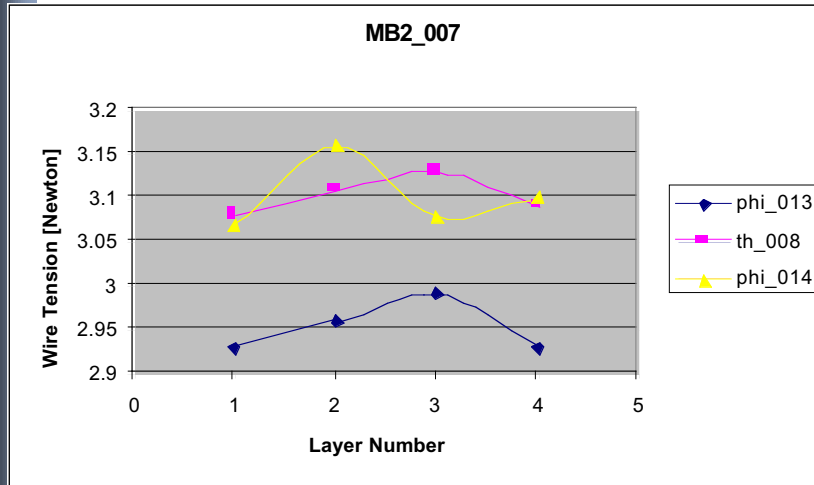
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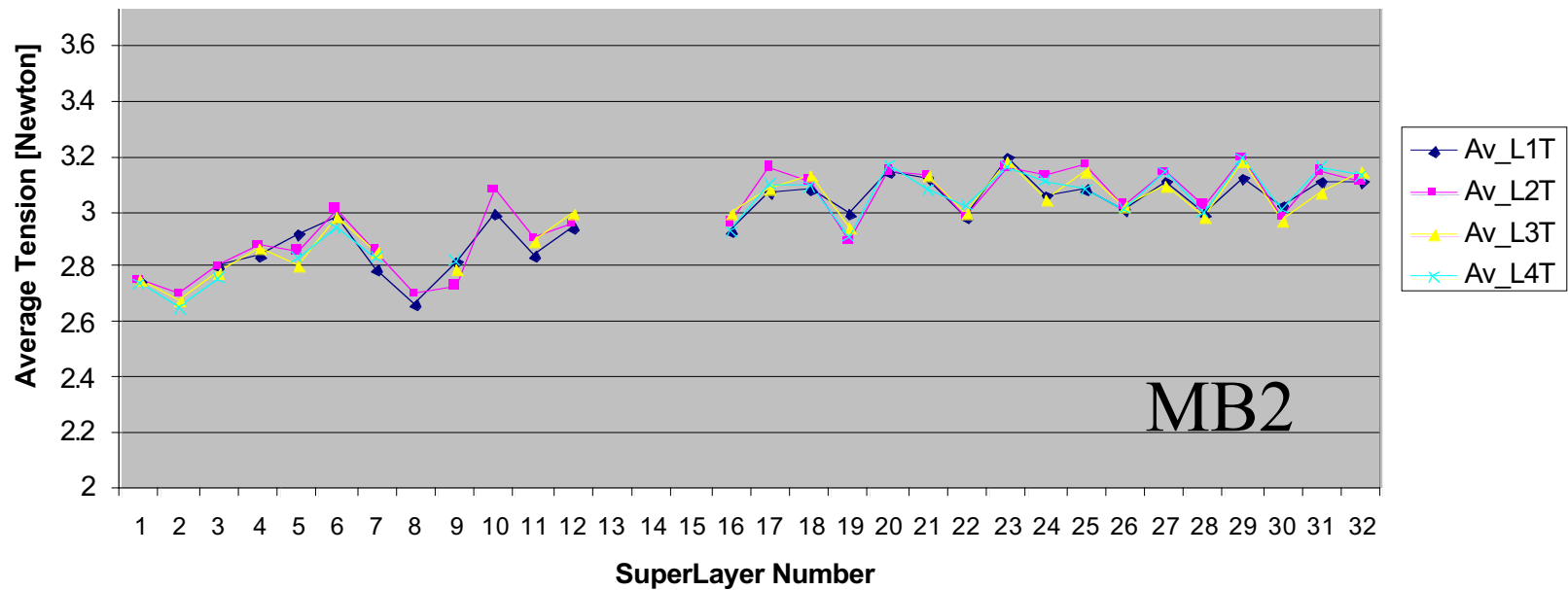
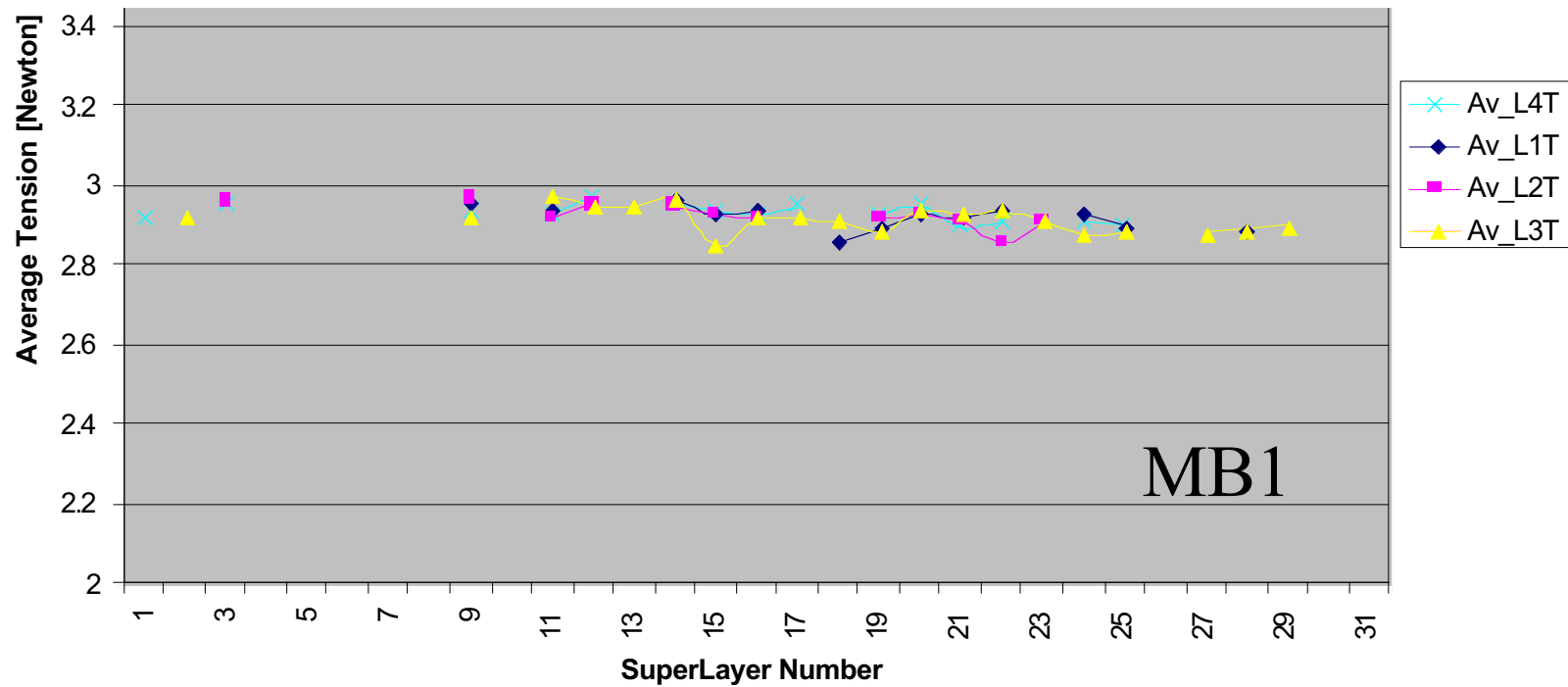
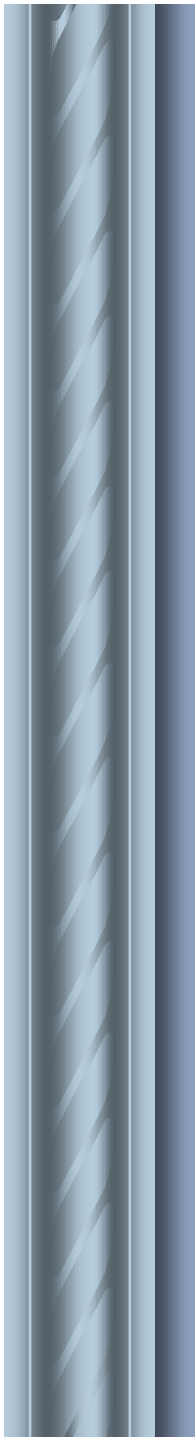


# Wire Position



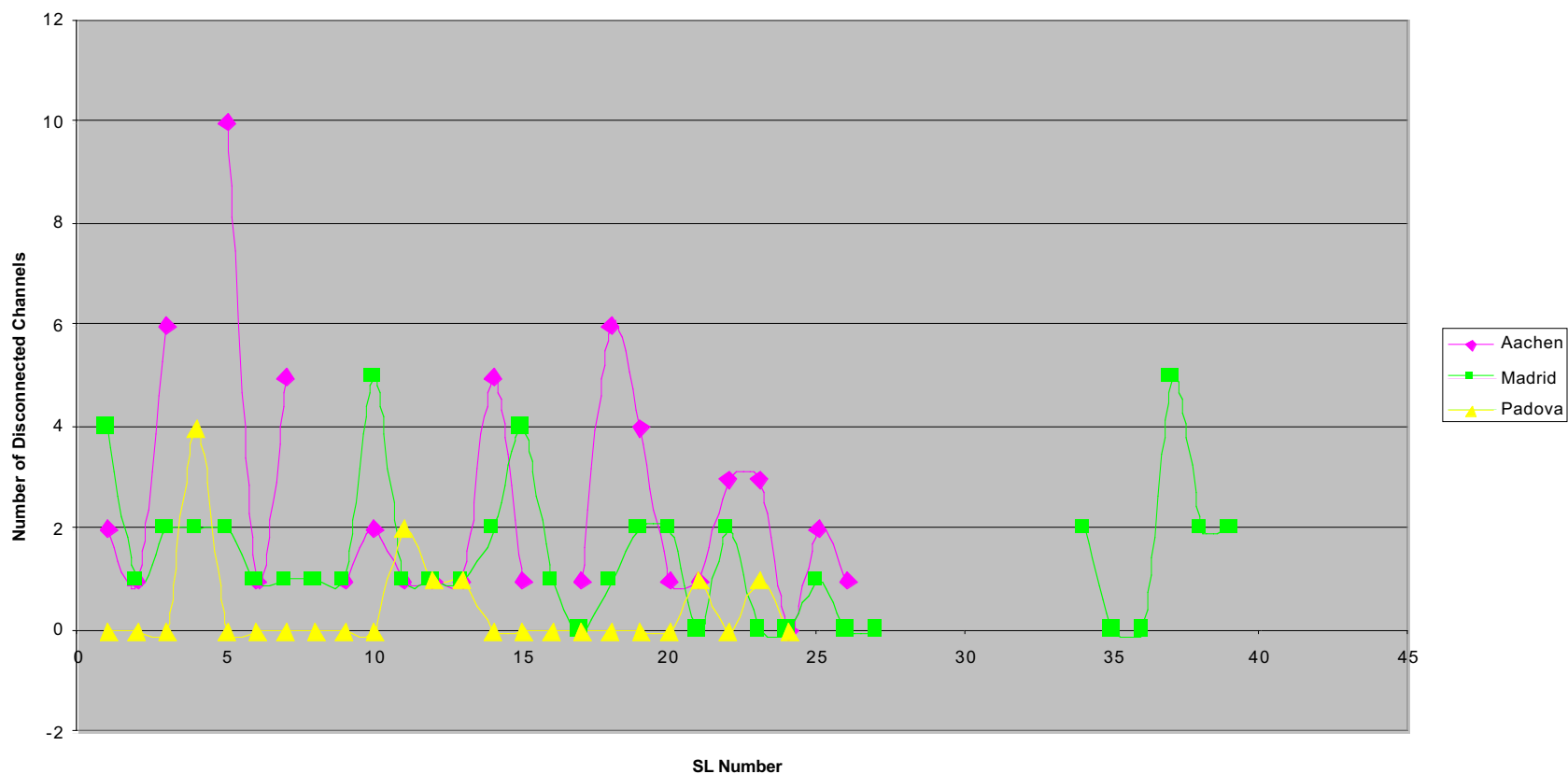
# Wire Tension





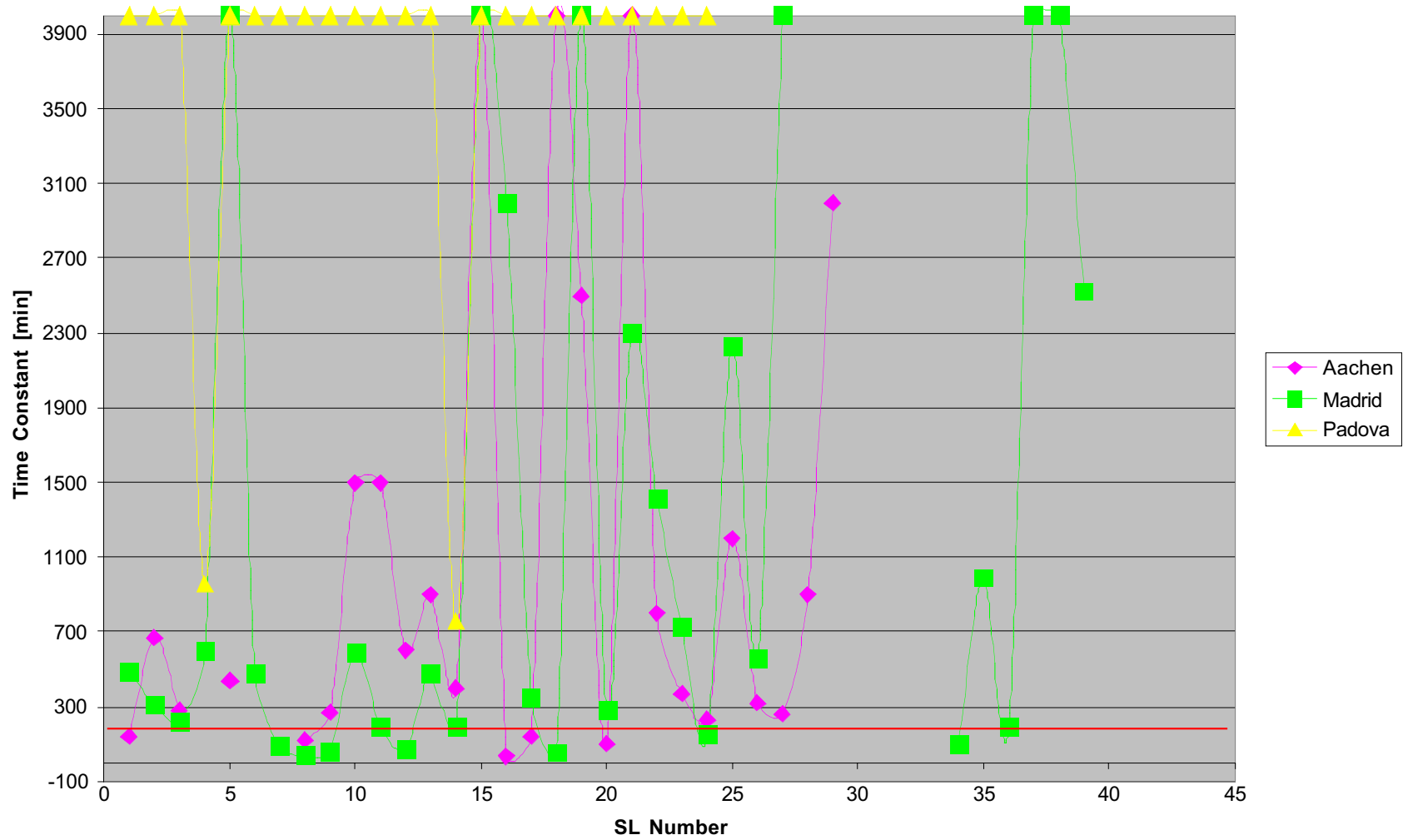
# Disconnected Channels

Disconnected Channels [from Chamber Traveler]



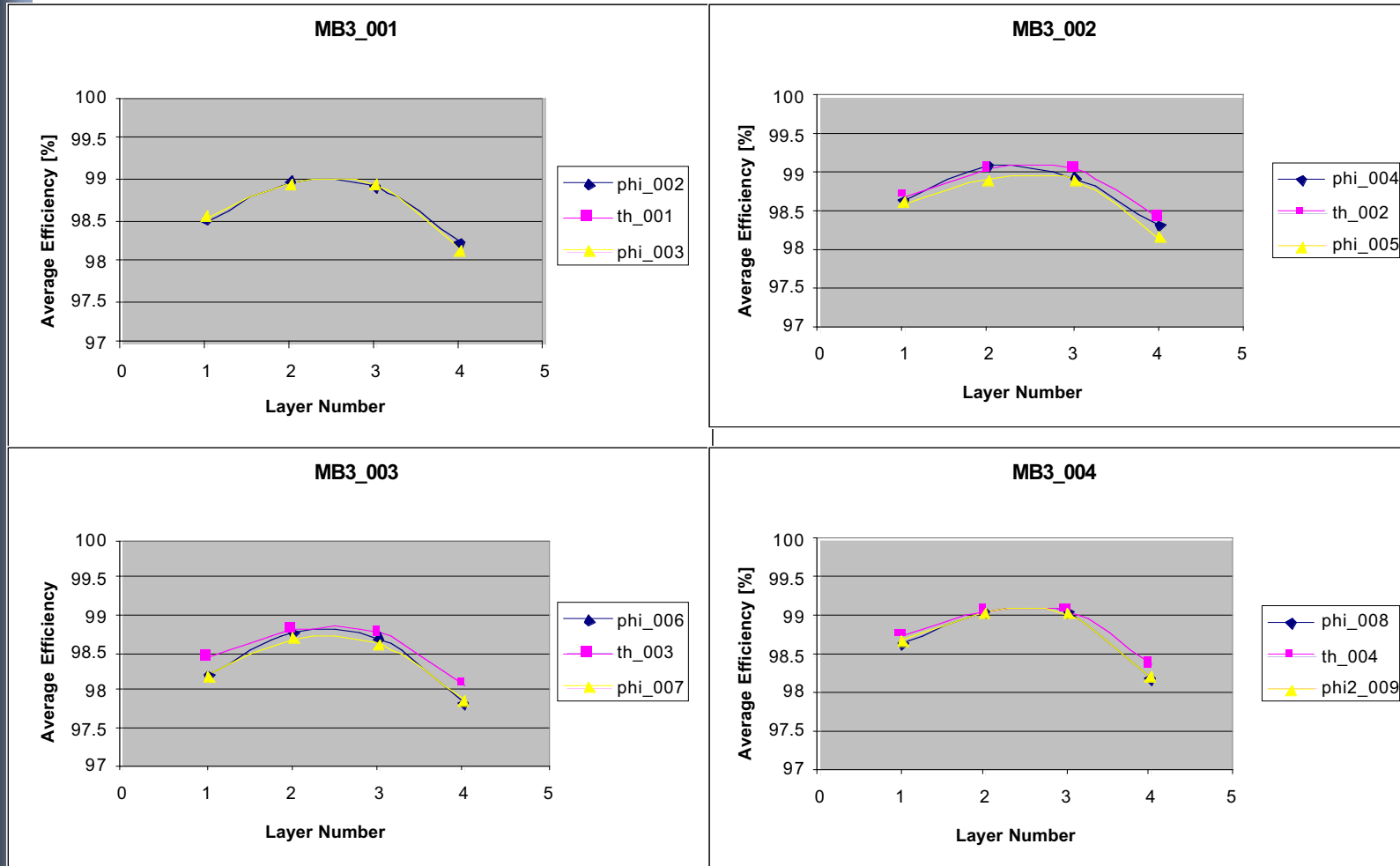
# Gas Tightness

Gas Tightness

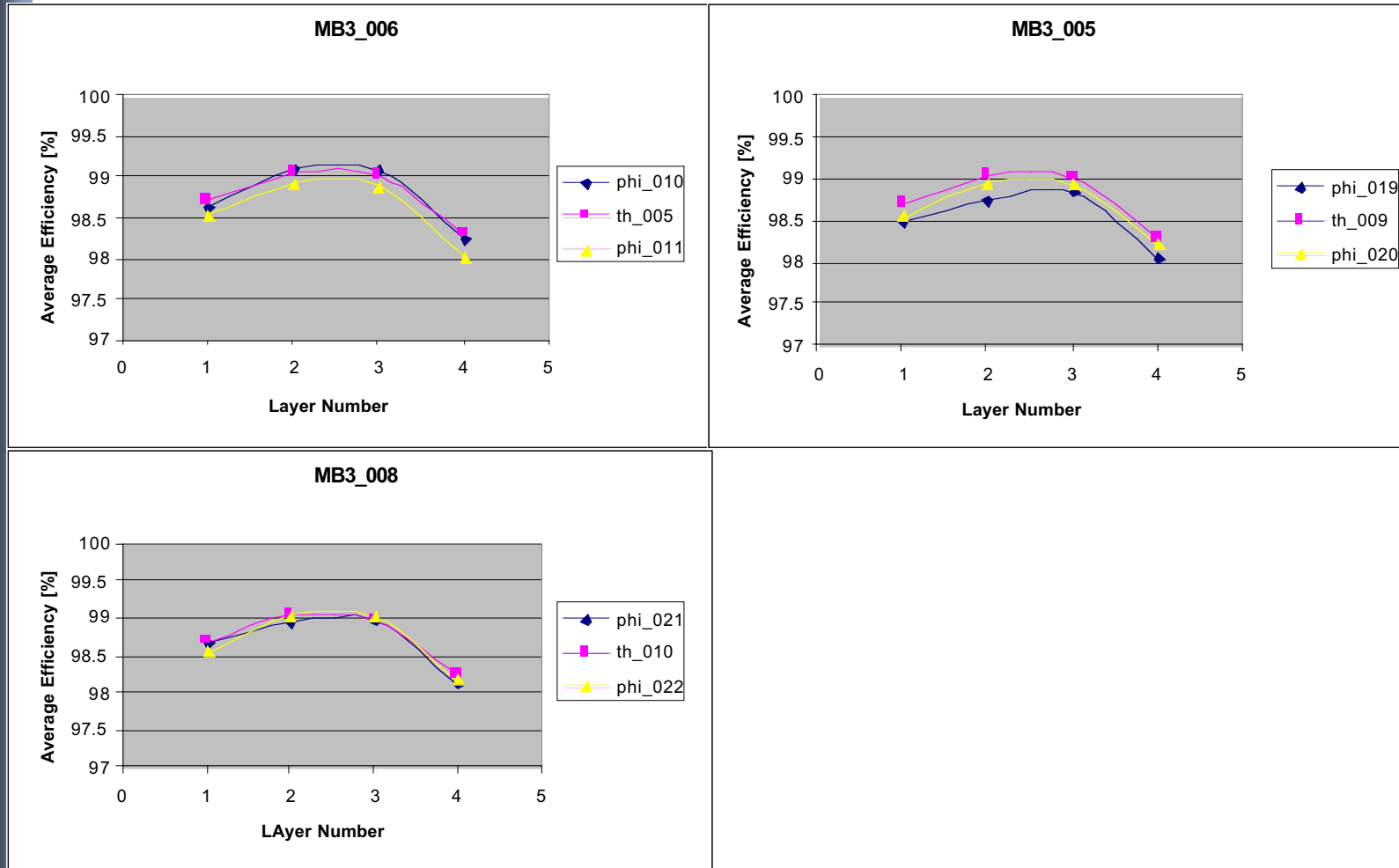




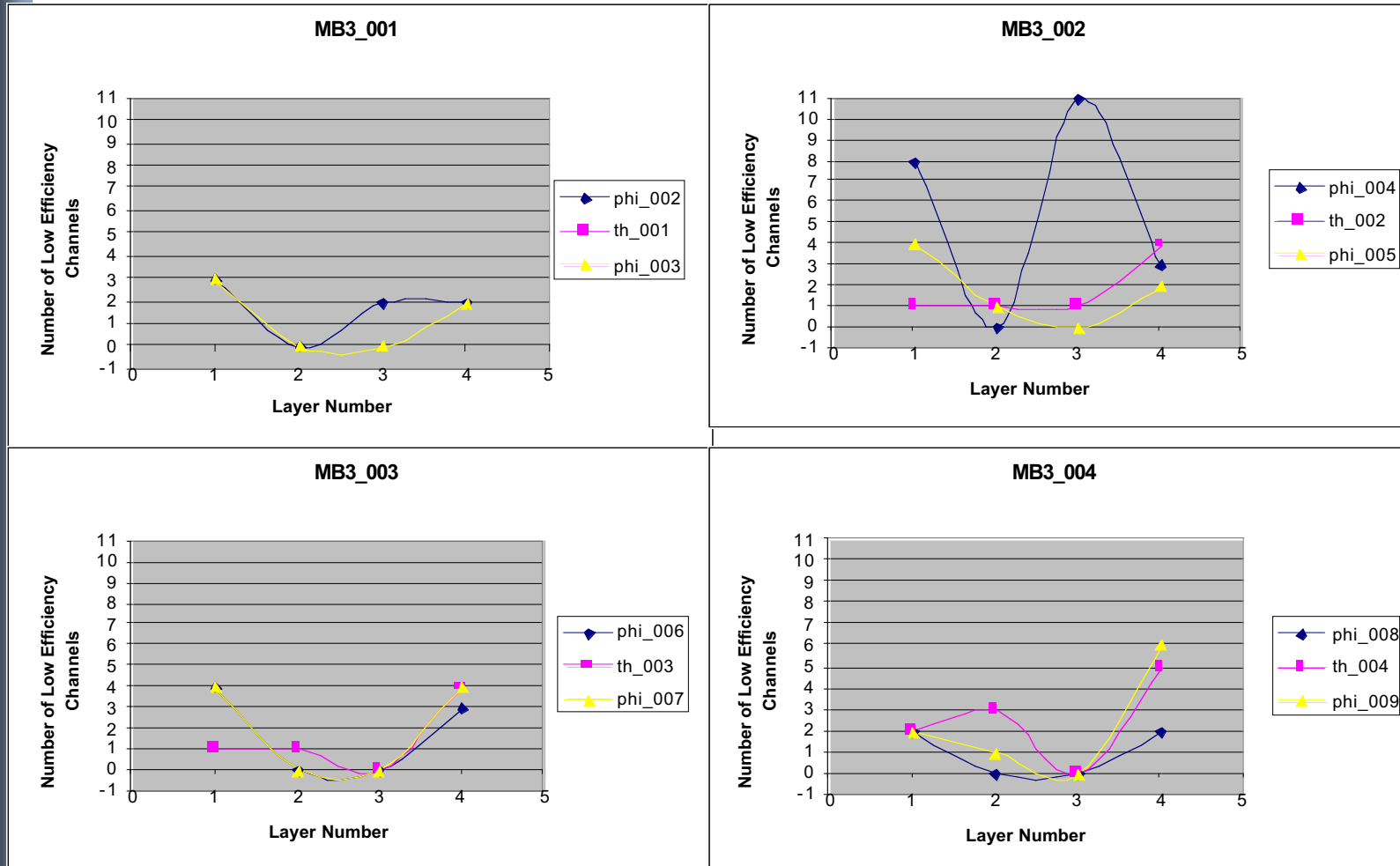
# Efficiency



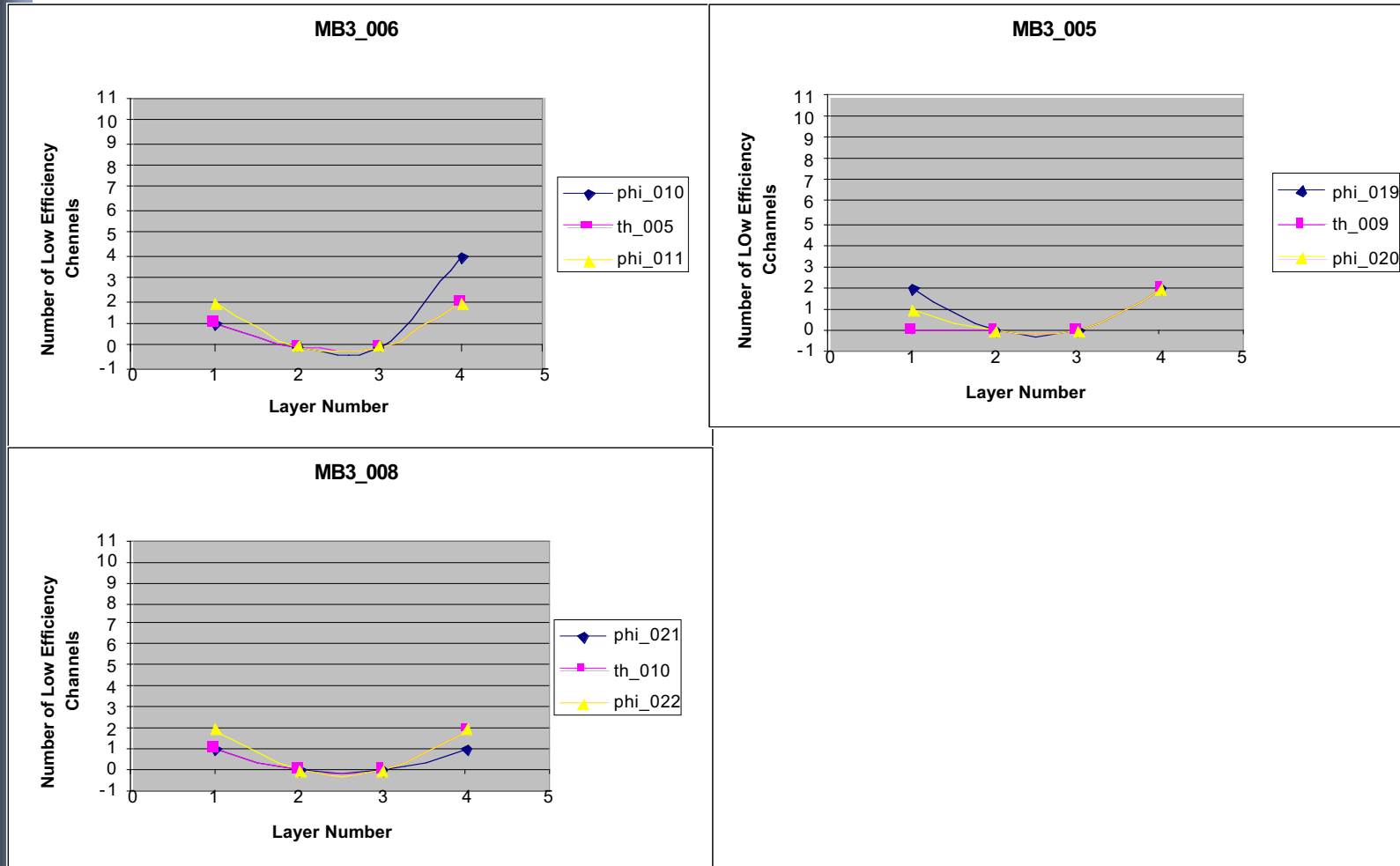
# Efficiency



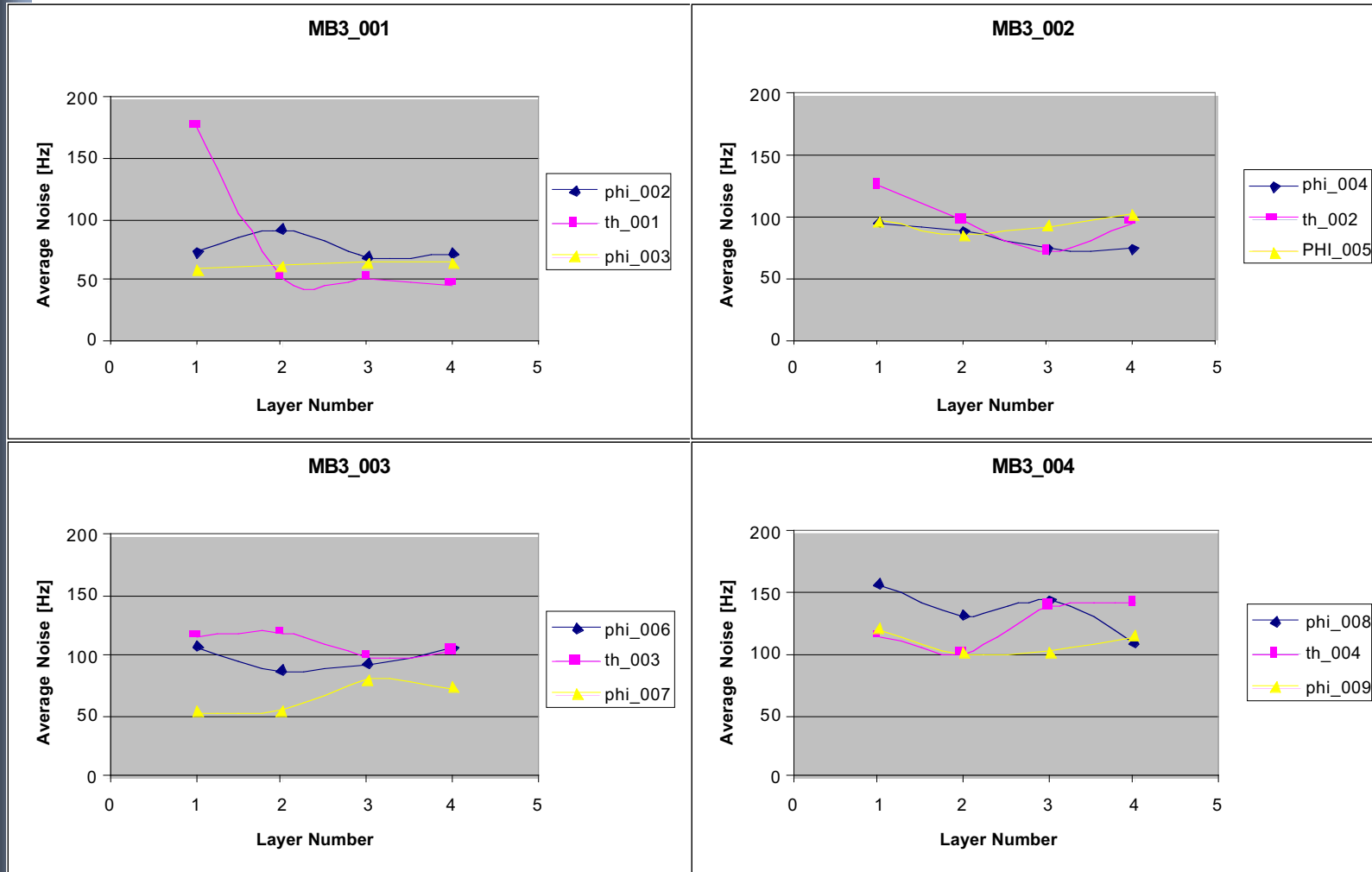
# Low Efficiency Channels



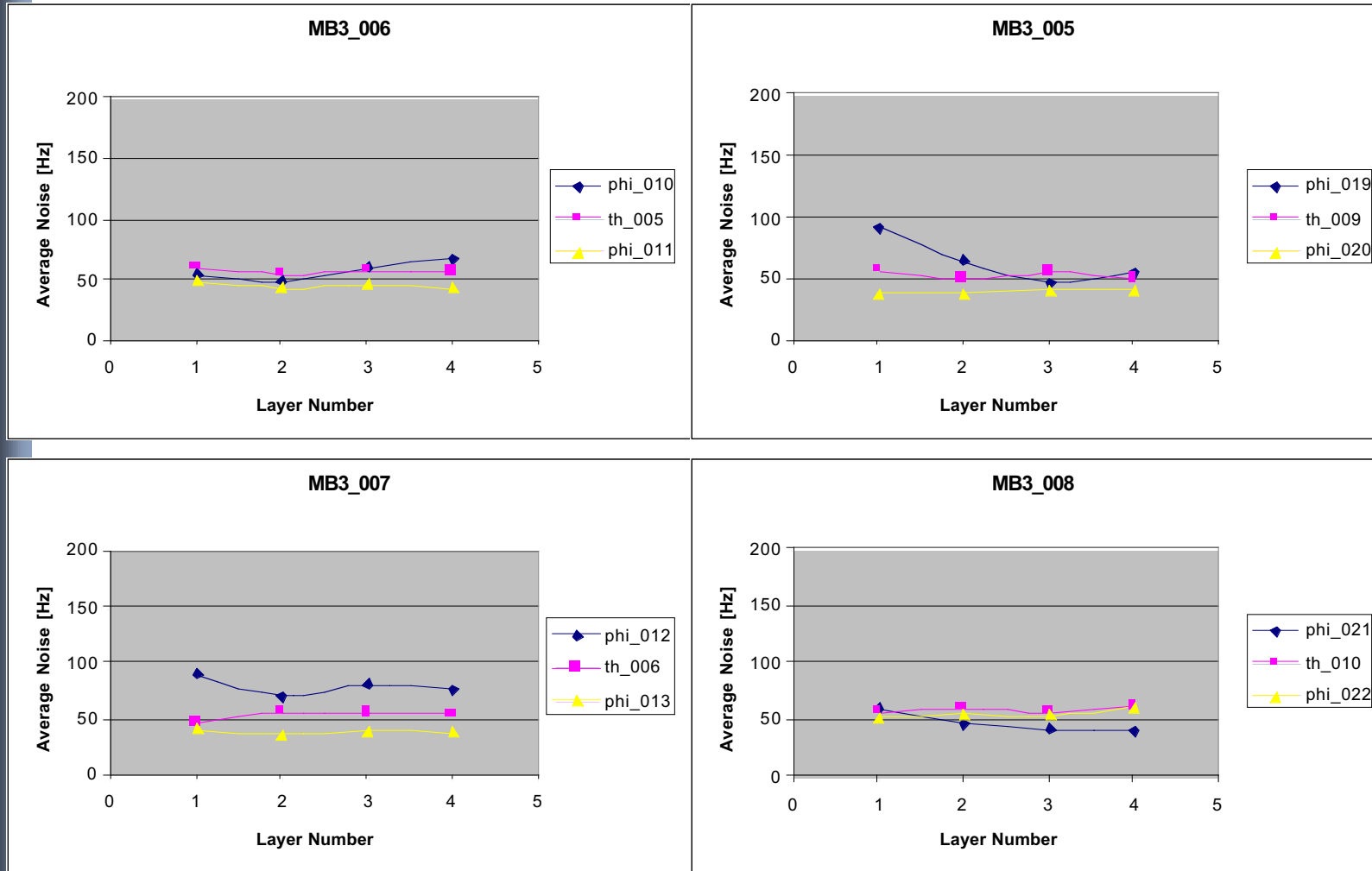
# Low Efficiency Channels



# Noise

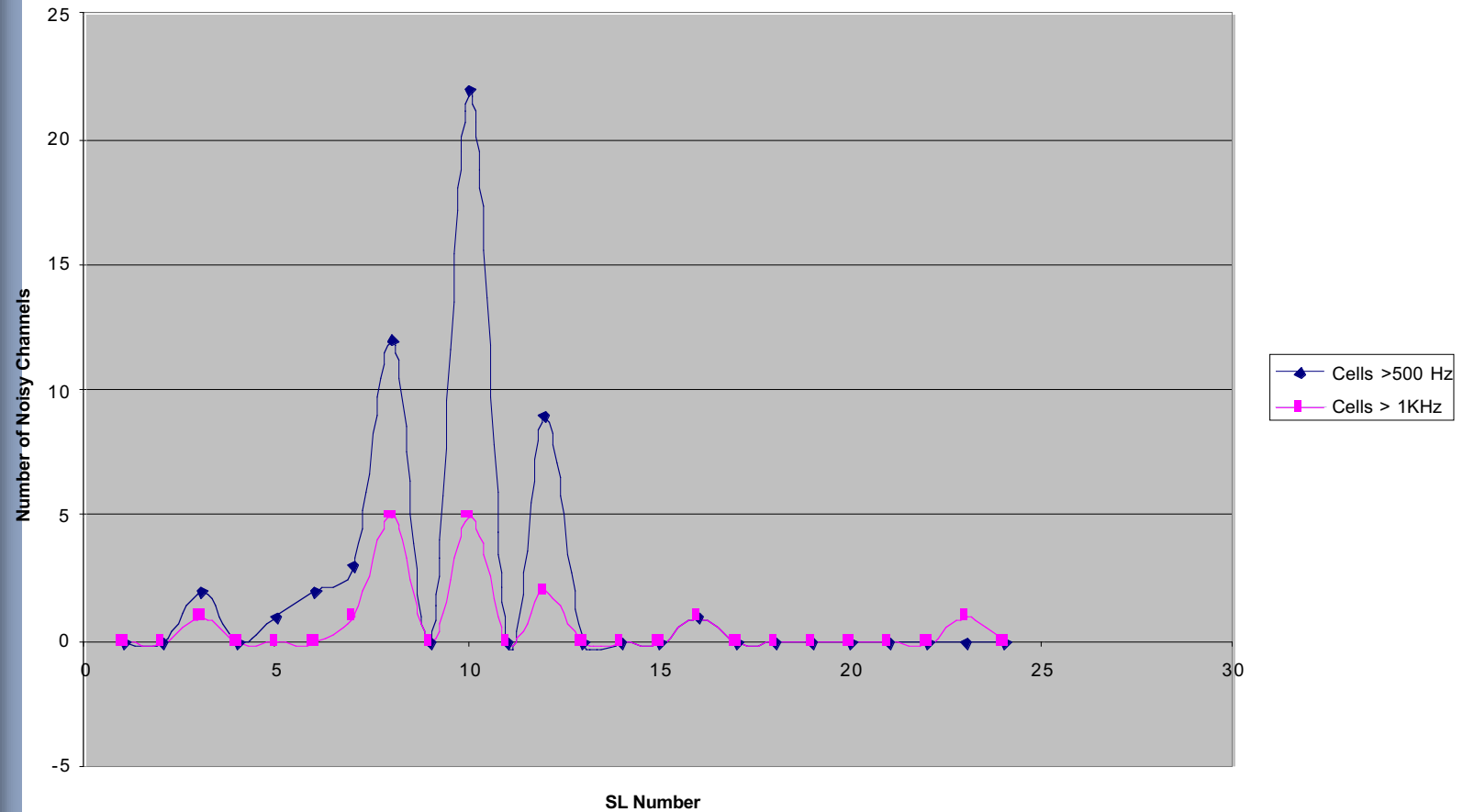


# Noise



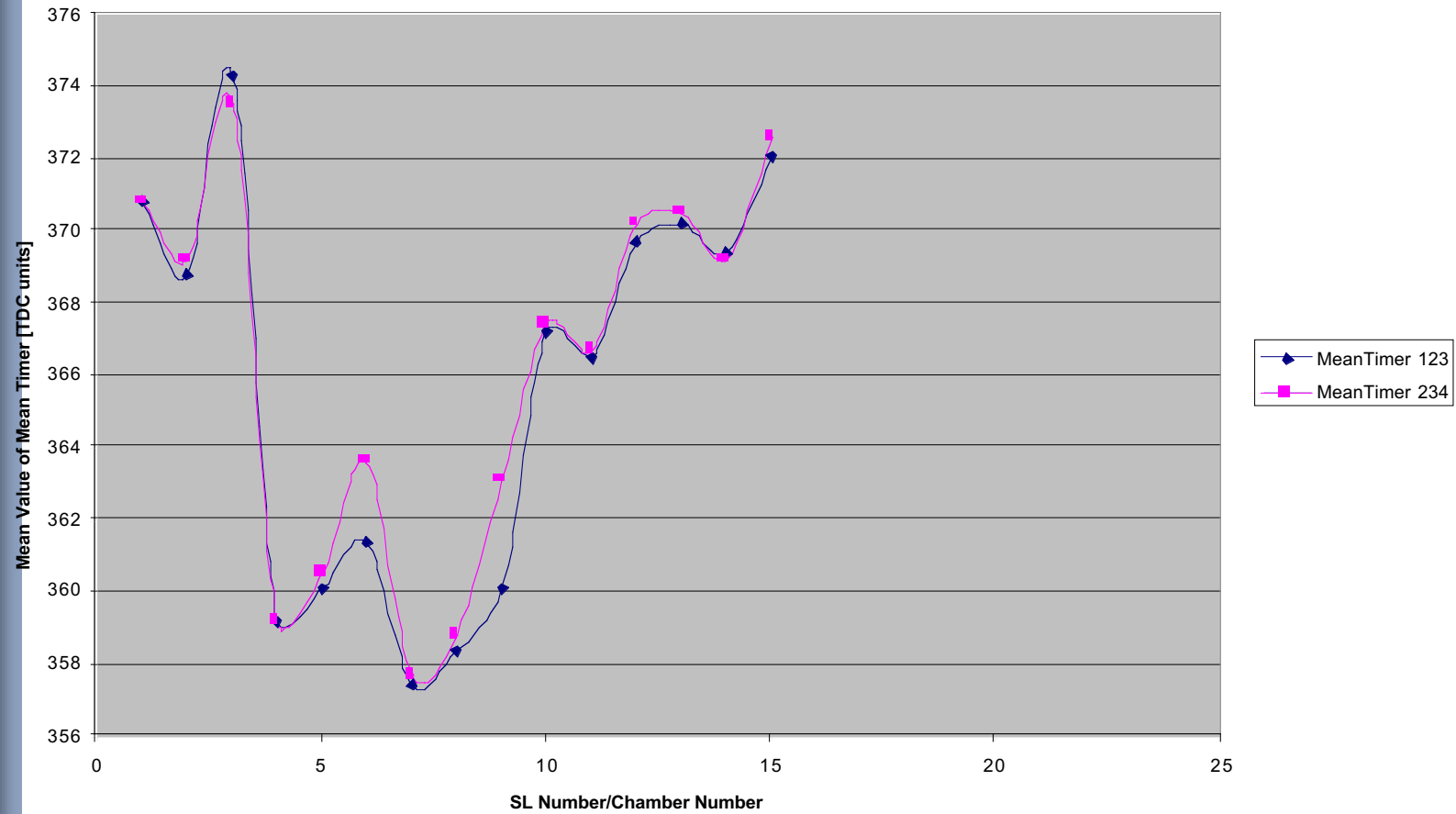
# Noisy Channels

Noisy Channels



# Mean Timer

MB3 Mean Timer





### MB2 Reference Blocks Positions

