

Study of the CSC noise at the disks

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Outline



- 1. Results of CFEB noise measurement at P5**
- 2. Noise sources**
- 3. Grounding jumpers to reduce internal noise**
- 4. External pickup noise**
- 5. Proposed shield**
- 6. Effect of LV monitoring system**
- 7. Resume.**

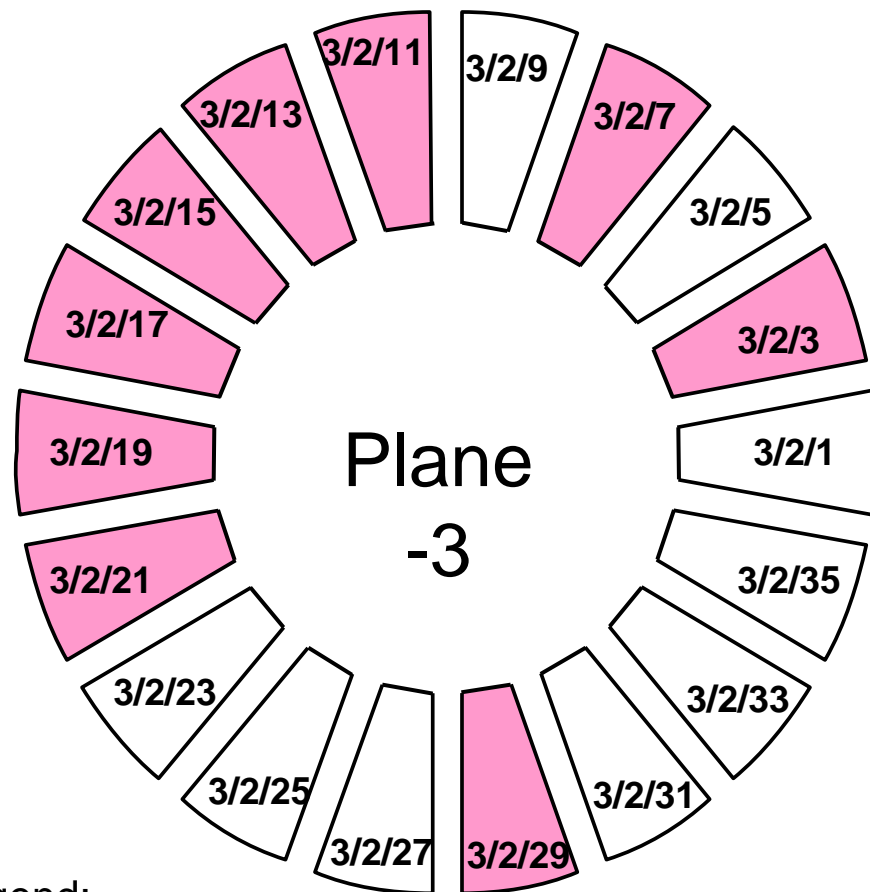
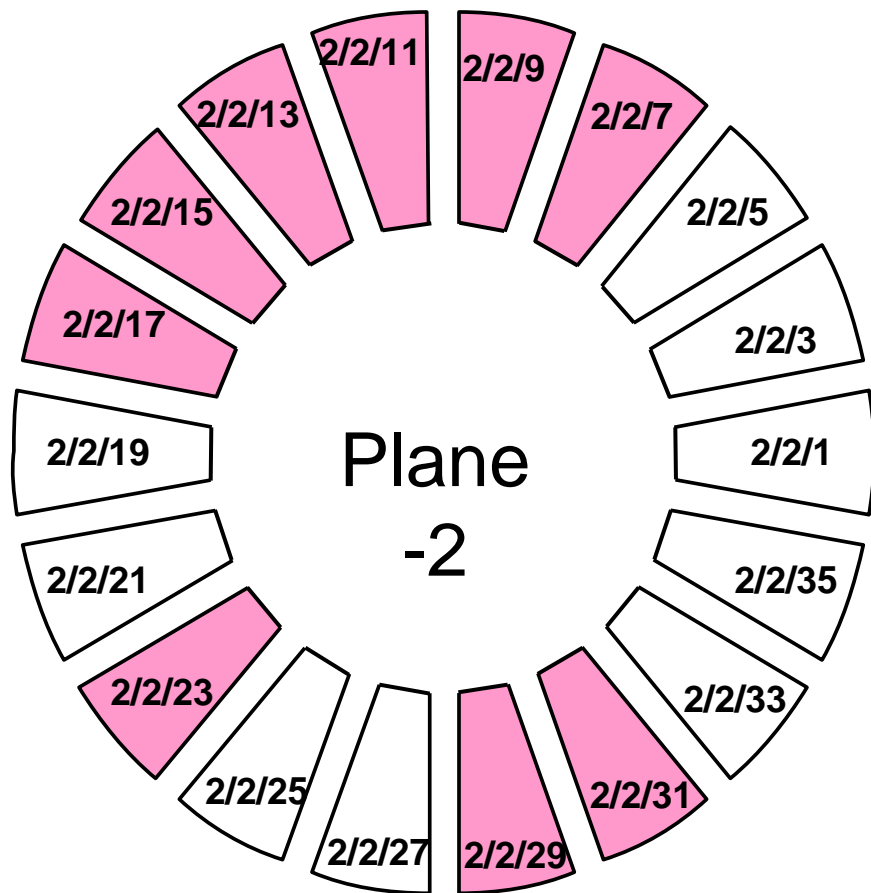


Results of CFEB noise measurement at P5

Chambers with excess noise at the planes -2, -3



Results of measurements by M. Ignatenko et al.
in January – March, 2005



Legend:

 - Chamber with excess noise

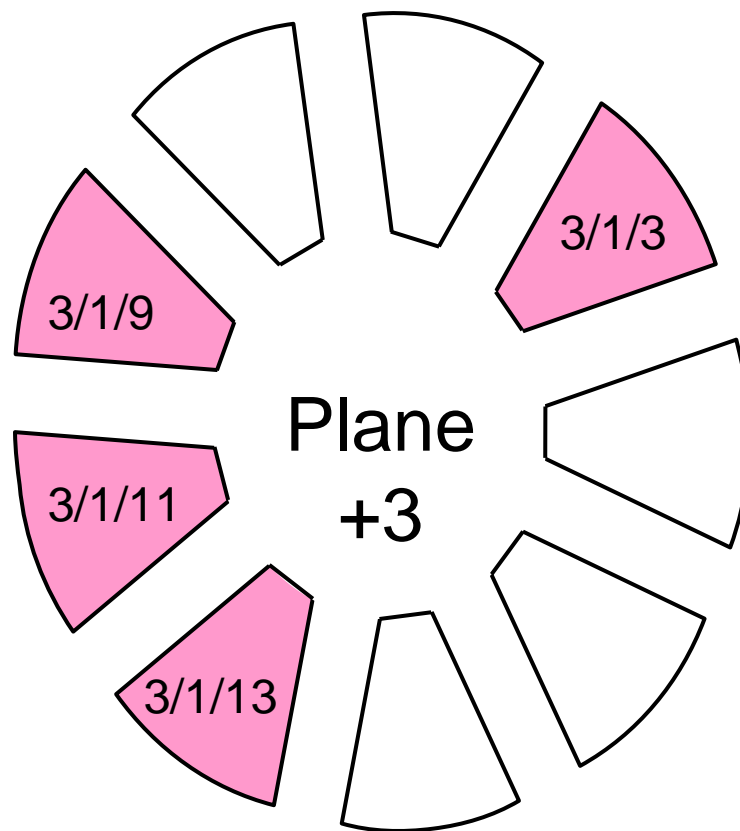
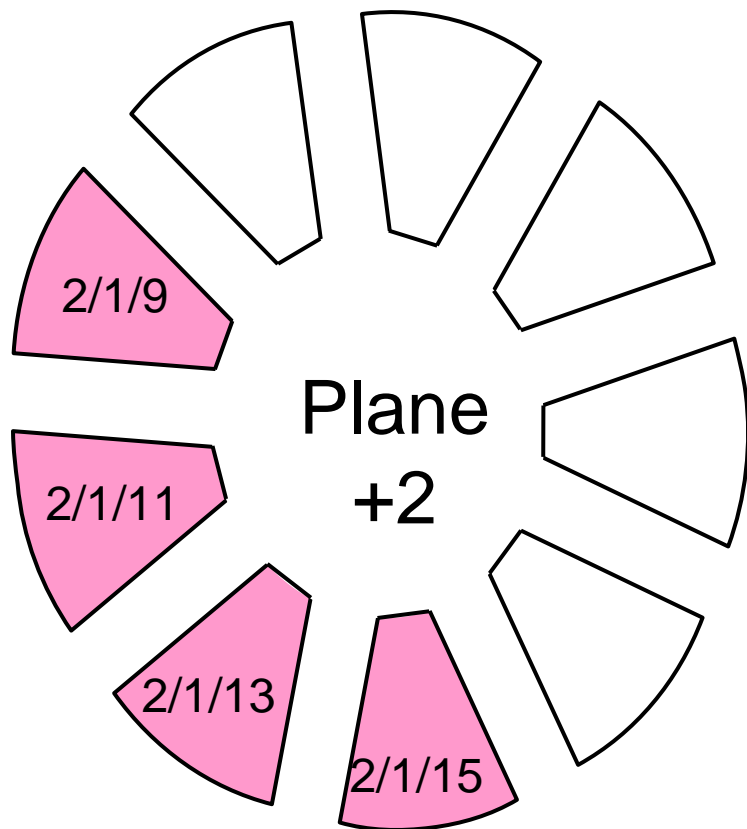


Results of CFEB noise measurement at P5

Chambers with excess noise at the planes +2, +3



Results of measurements by M. Ignatenko et al.
in January – March, 2005



Legend:

 - Chamber with excess noise

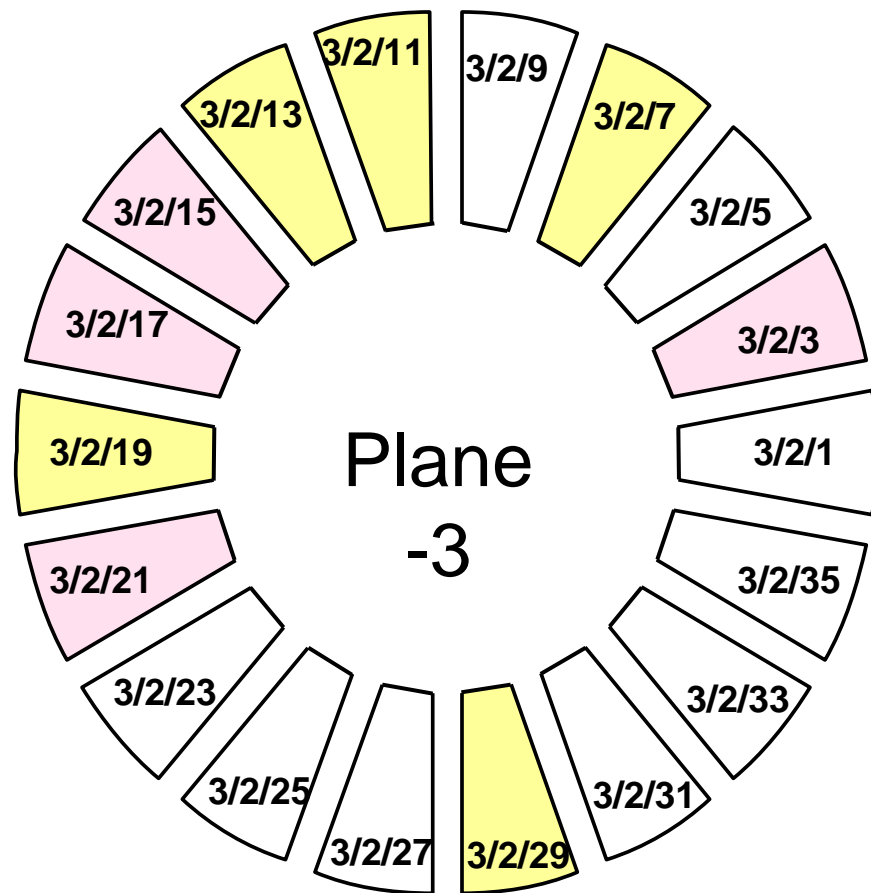
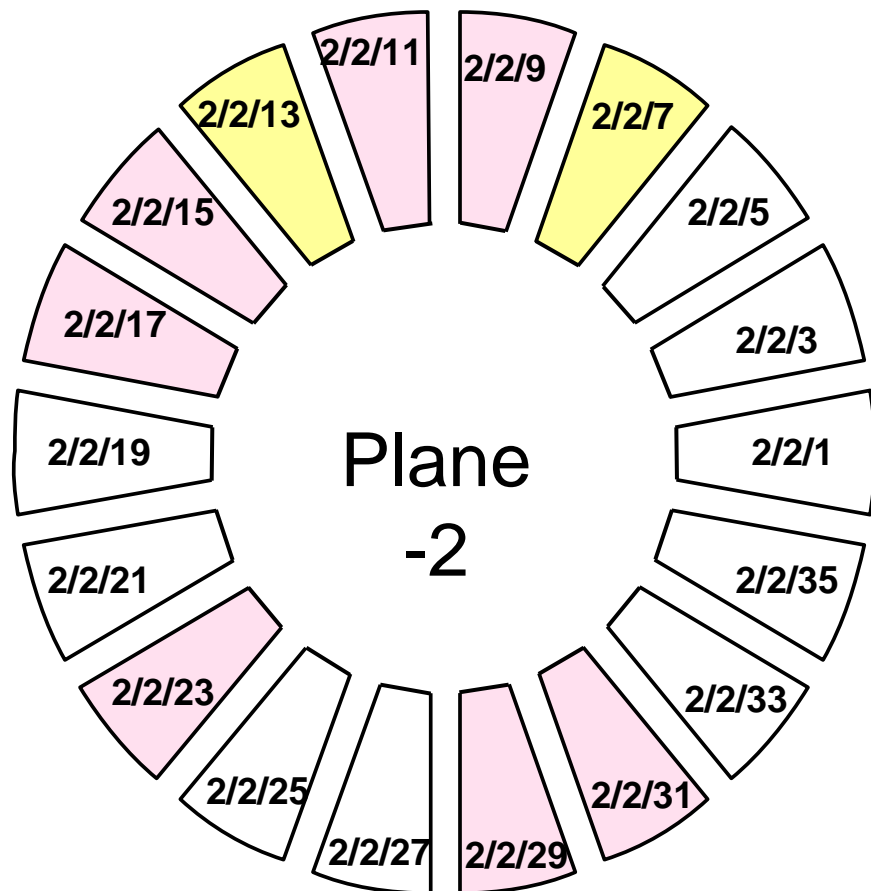


Results of CFEB noise measurement at P5

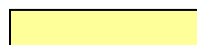
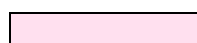
Chambers with excess noise at the planes -2, -3



New results were obtained during noise investigation with 2 different setups
February – March, 2005.



Legend:

-  - Excess noise disappeared after retesting
-  - Chamber was not retested

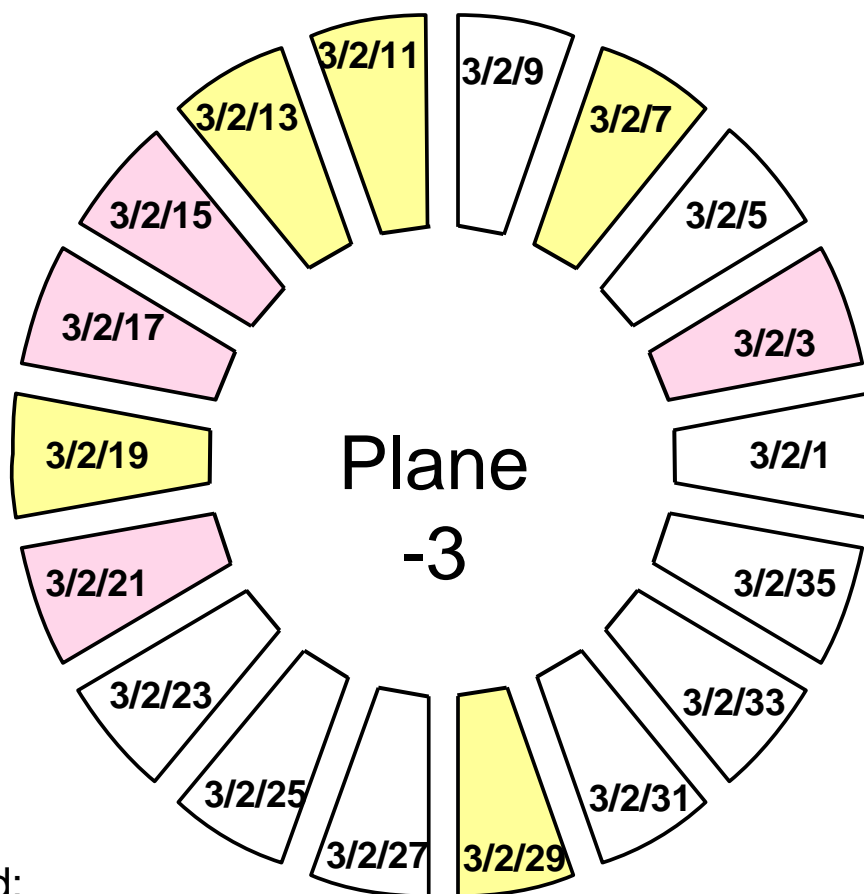
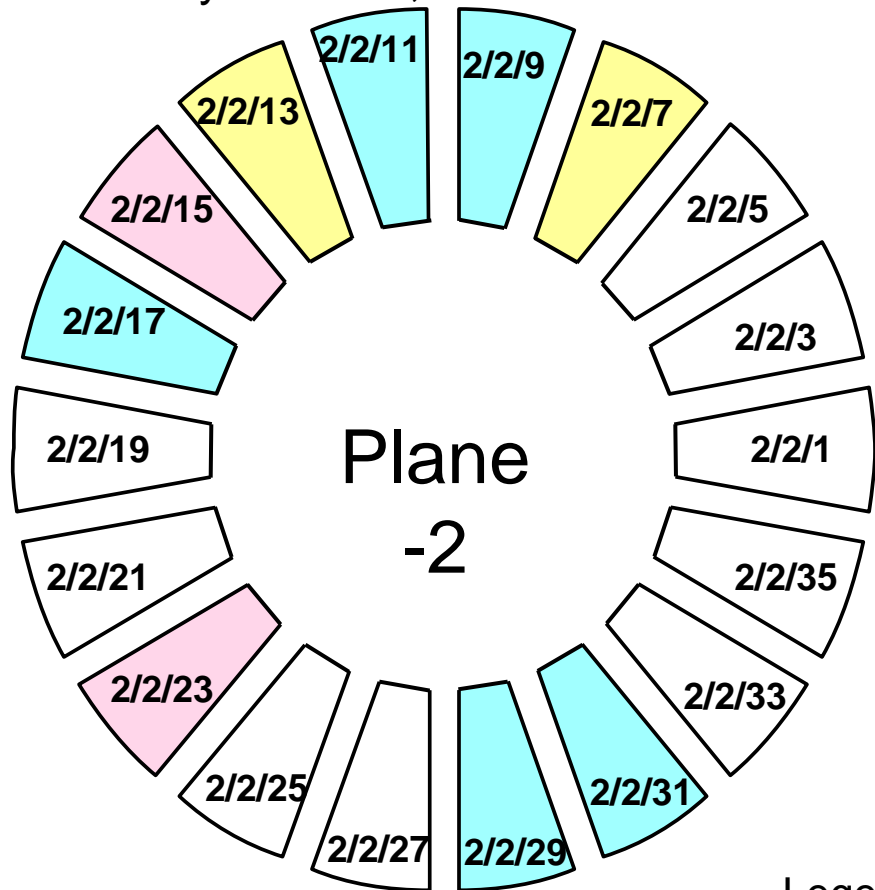


Results of CFEB noise measurement at P5

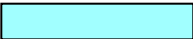
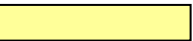

Chambers with excess noise at the planes -2, -3



New results were obtained during noise investigation with 2 different setups
February – March, 2005.



Legend:

-  - Chamber fixed with grounding jumpers
-  - Excess noise disappeared after retesting
-  - Chamber was not retested



Summary:

- Almost half of the tested chambers on the bottom layers showed a noise problems.
- There is a good coincidence of problematic chambers installed on one disk, and problems are gathered in sectors.
- There are 2 types of noise – first disappeared after additional jumpers. This noise presented mostly at planes 1, 2, 6.
Second – spontaneous disappeared after retesting and presented mostly at planes 3, 4, 5 at boards 5 and 4.
- First type of noise distributed randomly around the disk (unfortunately we have result only on one disk).
- Second type of noise is sectored

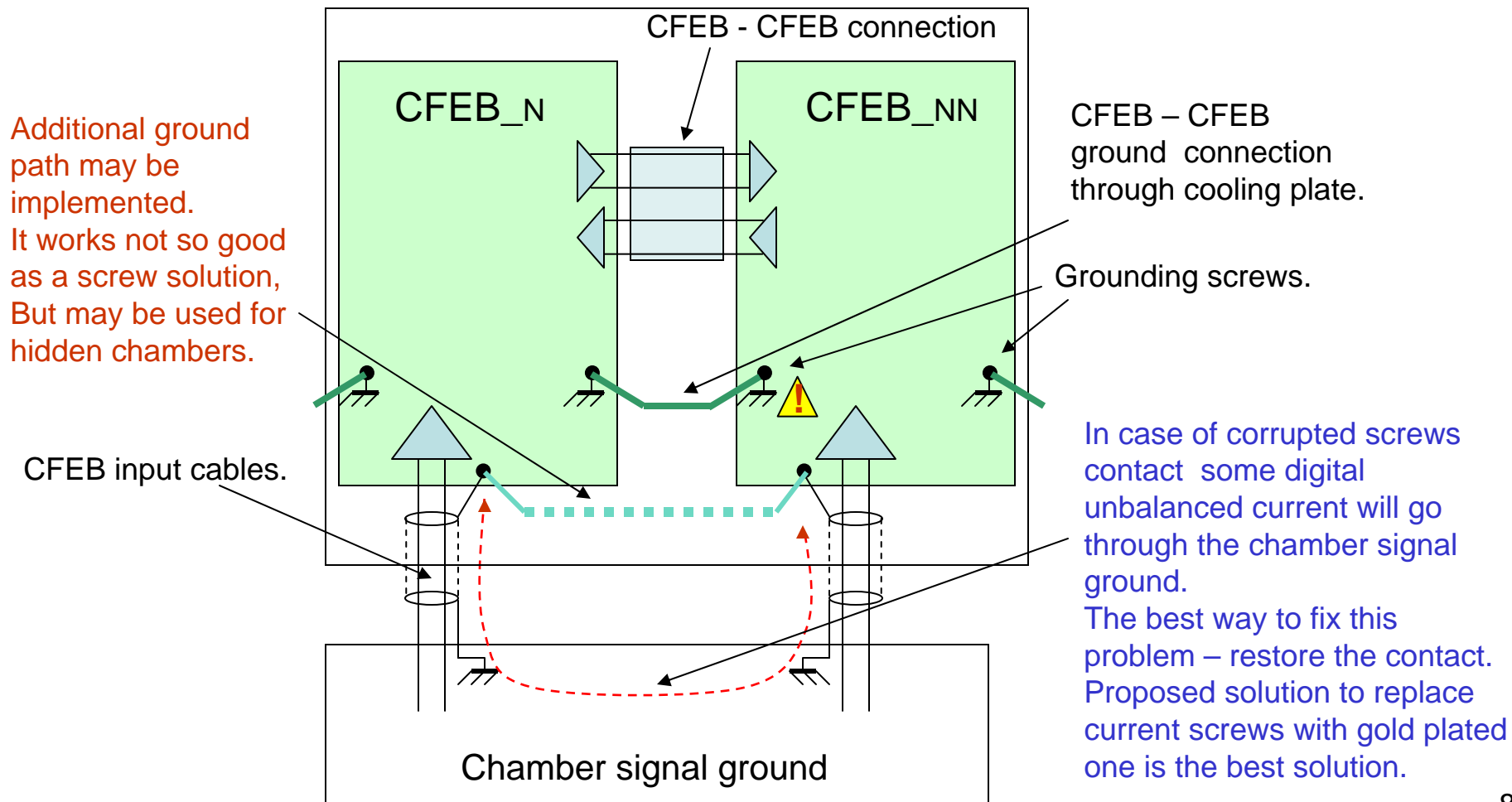


Noise sources



There are 2 noise sources:

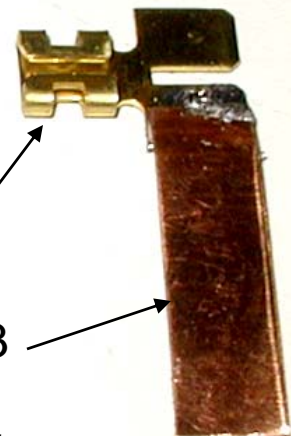
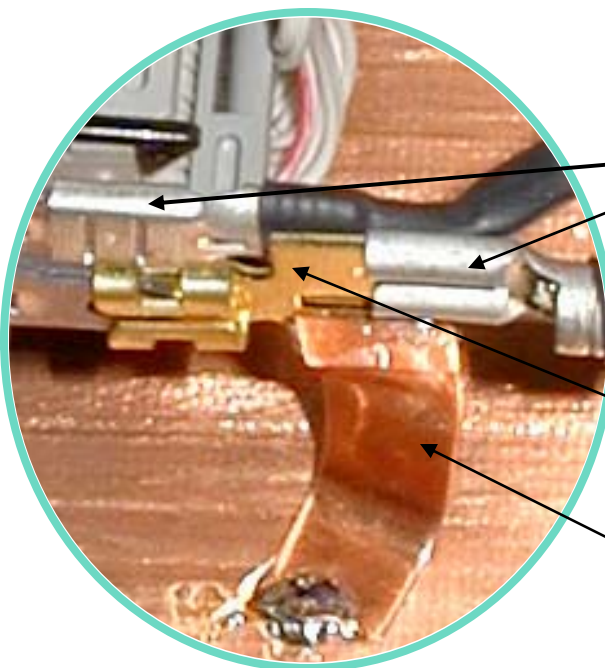
1. Internal pickup





- CFEB Input side
- CFEB Input cables
- CFEB Input cables grounding connection

Additional CFEB grounding



1. Cable grounding disconnect
2. Disconnect Adapter, Panduit D-250A-M;
3. Copper foil

Note: The disconnect conductivity does not degrade after 3 weeks in warm, wet atmosphere. Further investigated is needed



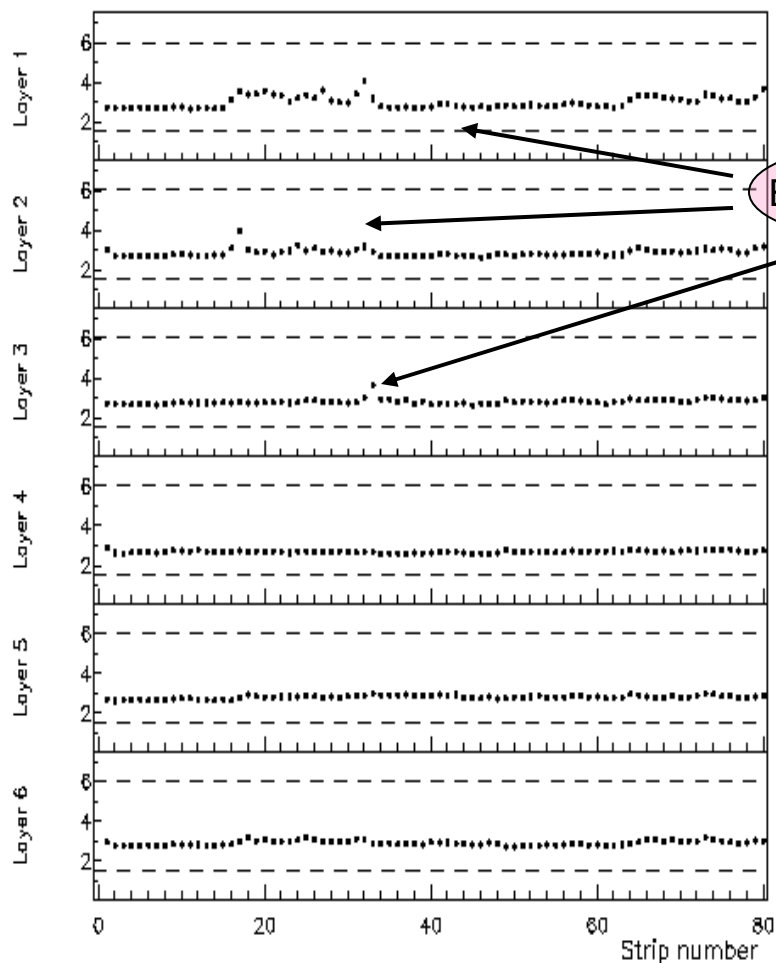
Grounding jumpers to reduce internal noise



Grounding jumpers effect (ME-2/2/09)

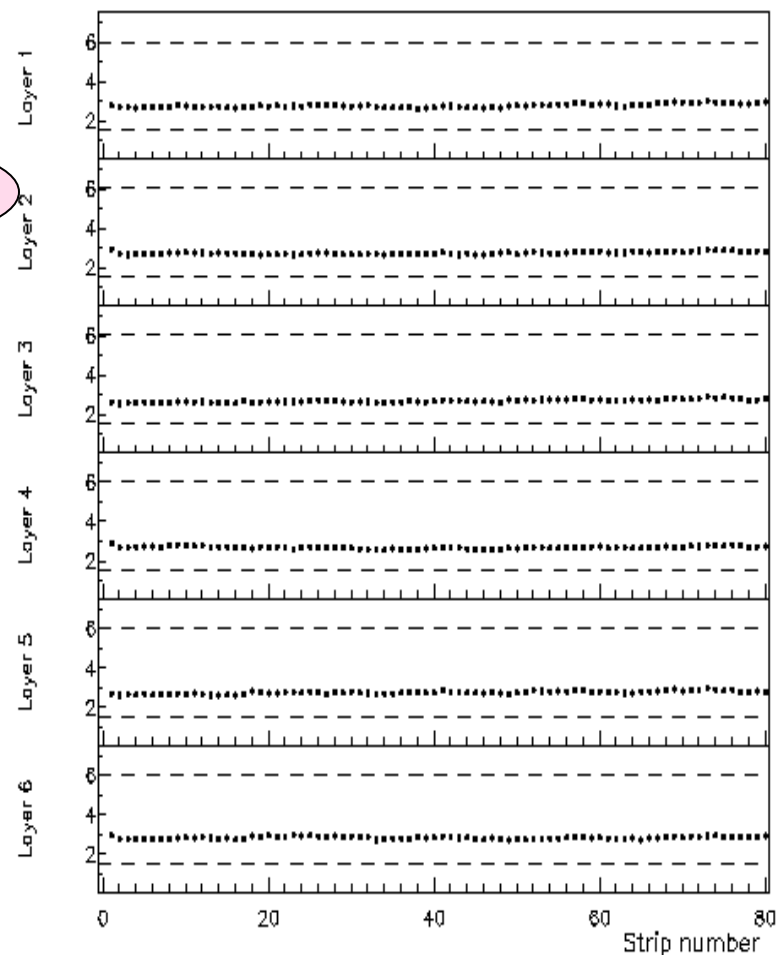
Before

ANA DATE: 02/28/2005 16:24:19
RUN DATE: 02/28/2005 16:20:36



After

ANA DATE: 03/14/2005 17:56:13
RUN DATE: 03/09/2005 19:36:01



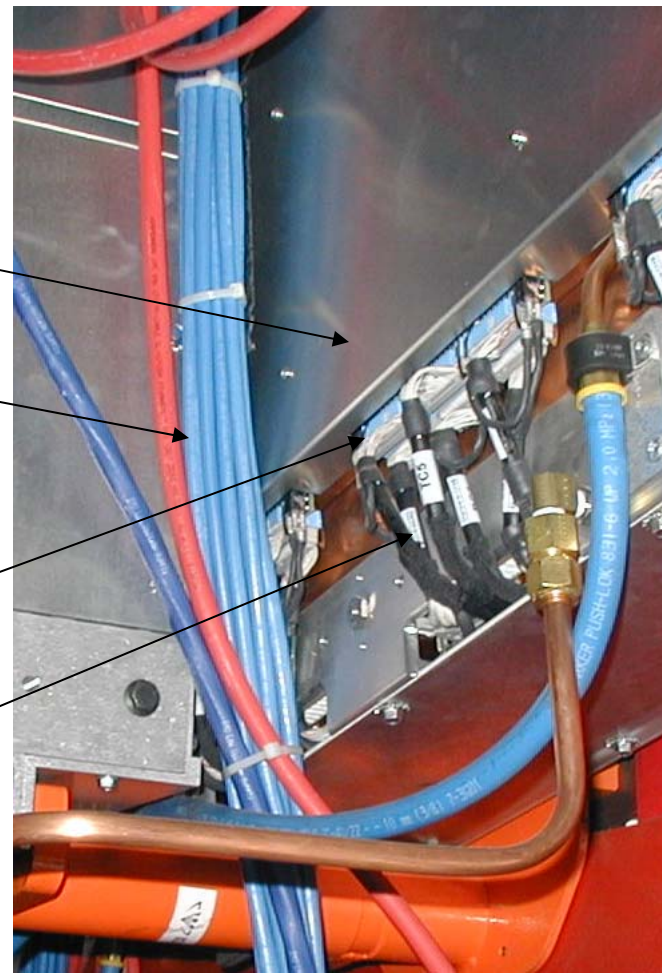
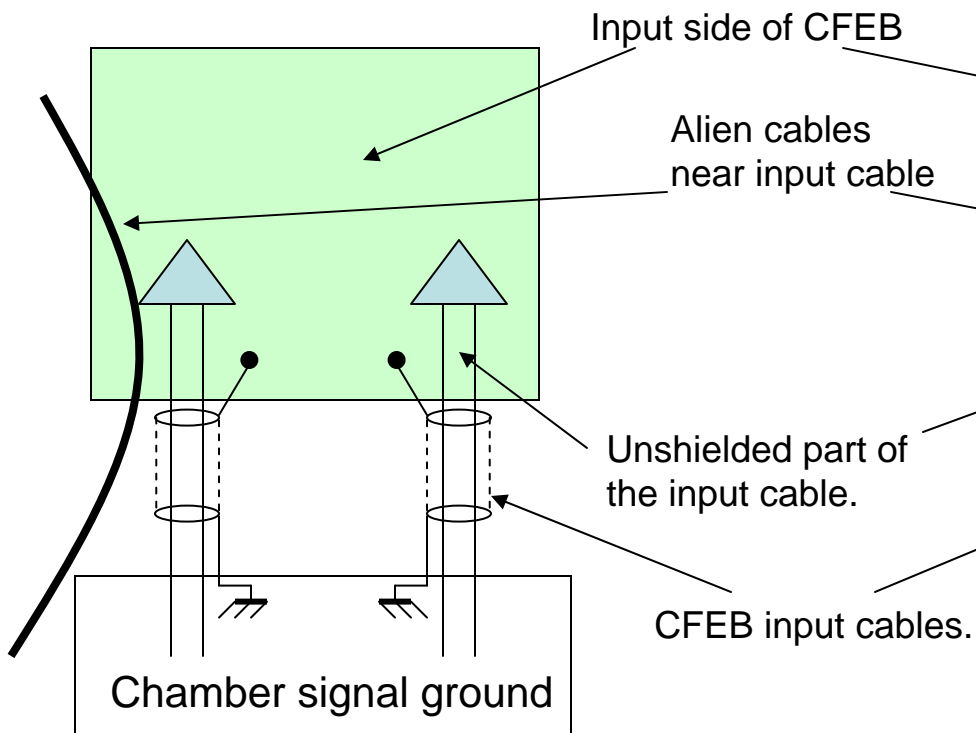
ME234.2.063
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003759.dat

ME234.2.063
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz002173.dat

There are 2 noise sources:

2. External pickup

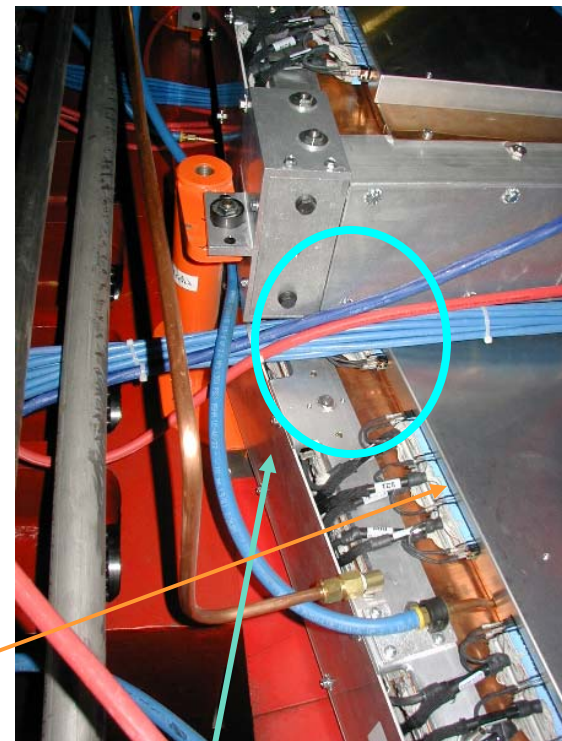
Outer shield of the alien signal cable works as an antenna and may retransmit disturbances to the CFEB input cable located nearby. The value of measured noise is a function of the noise source power and disk location relatively the noise transmitter.





External pickup noise

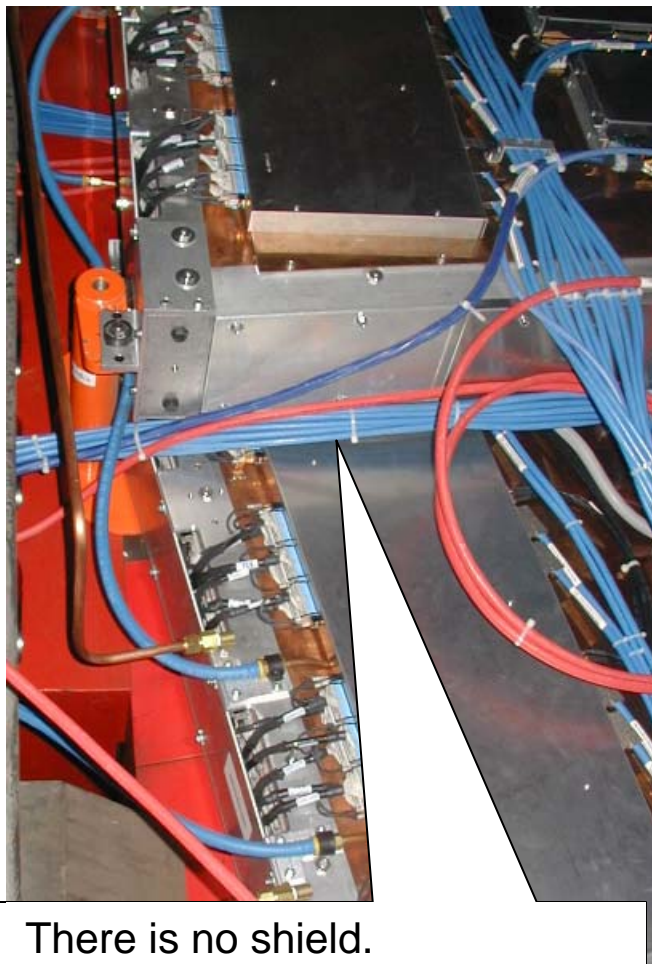
Possible noise pass



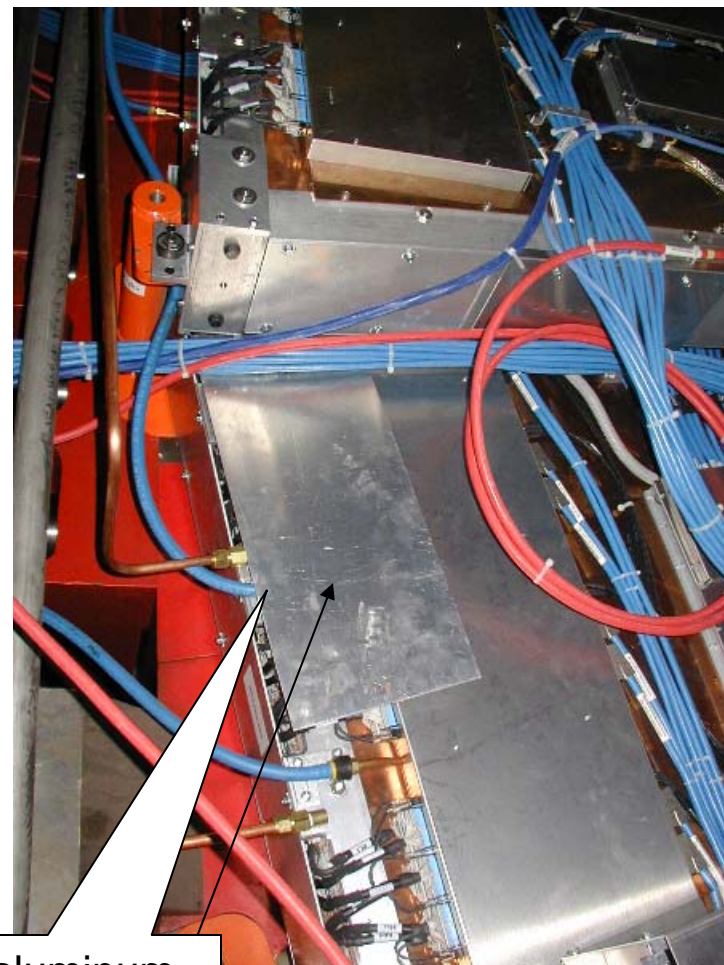
CFEB inputs

Alien cables go over CFEB input cables

External pickup noise shielding



There is no shield.
To reduce pickup noise the
cable bundle was moved out of
the input cables



Piece of aluminum
used as a shield



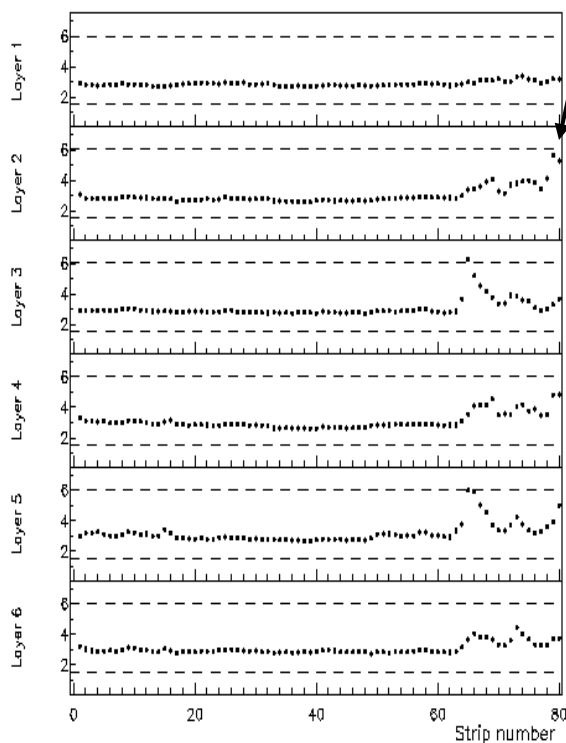
External pickup noise shielding effect



Excess noise reduced by two ways:

Initial result

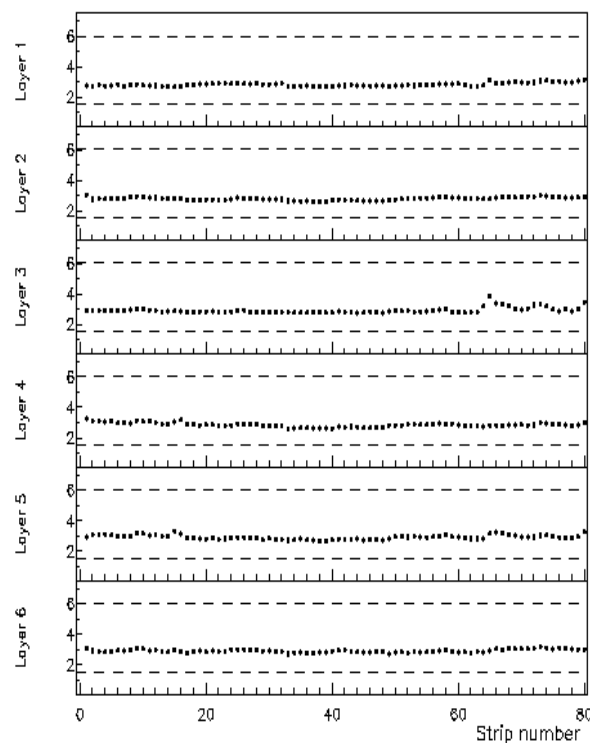
ANA DATE: 03/02/2005 13:55:32
RUN DATE: 03/02/2005 13:52:33



ME234.2.041
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003768.dat

1. Put on a screen

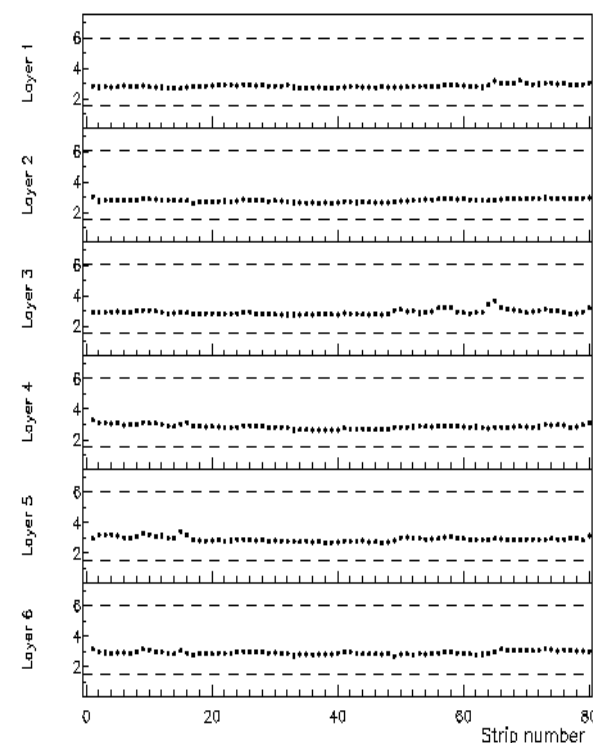
ANA DATE: 03/11/2005 17:25:08
RUN DATE: 03/03/2005 16:48:14



ME234.2.041
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003778.dat

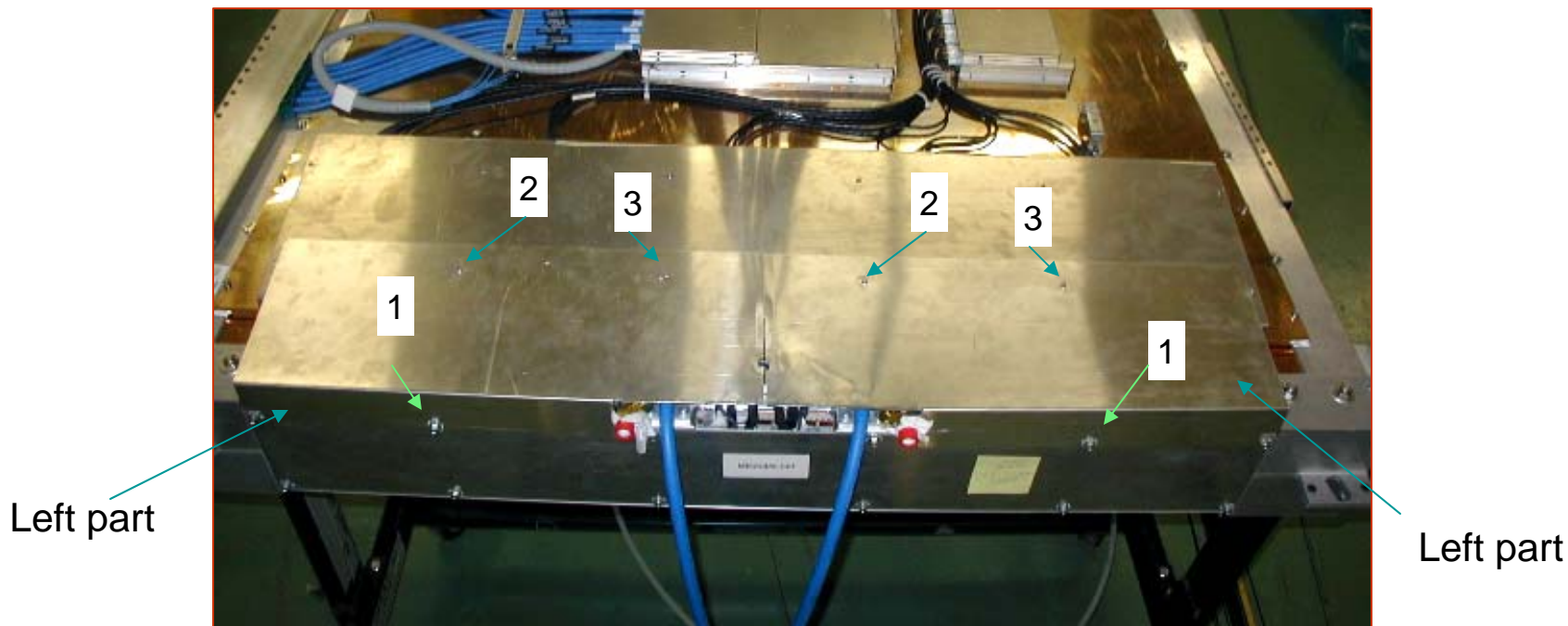
2. Move out the cables

ANA DATE: 03/11/2005 17:27:30
RUN DATE: 03/03/2005 16:03:24



ME234.2.041
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003782.dat

External pickup noise proposed shield



This is two parts shield.

Material - aluminum 1 mm.

Each part installed individually.

Each part fixed with 3 screws.

Screw 1 better to replace with longer screw

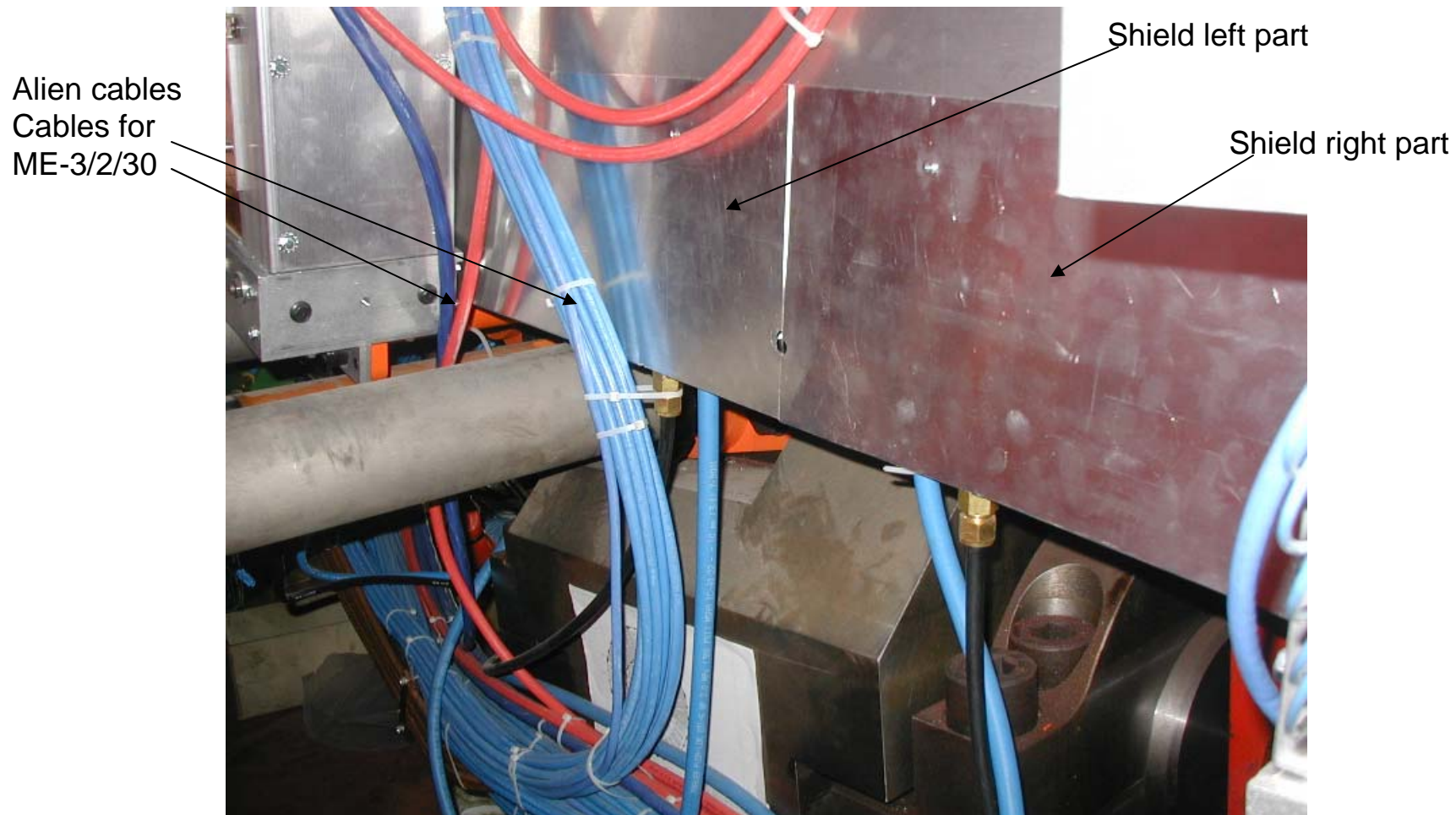
Screws 2 and 3 –CFEB cover screws.

Shield may be installed on the bottom chambers

Shield installation time ~ 15 – 20 min.

External pickup noise proposed shield

Shield installed on chamber ME-3/2/29





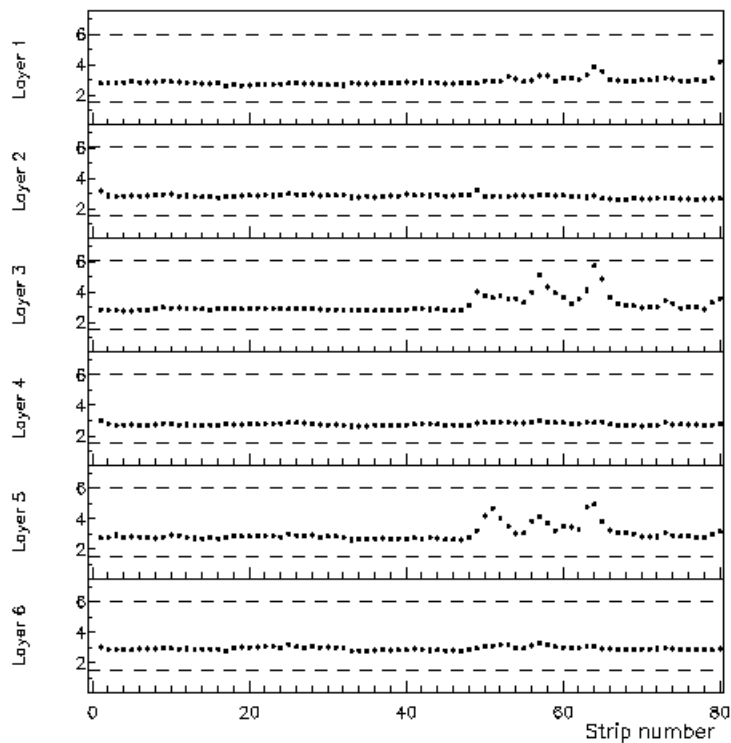
External pickup noise proposed shield



Shielding effect

Noise before shielding

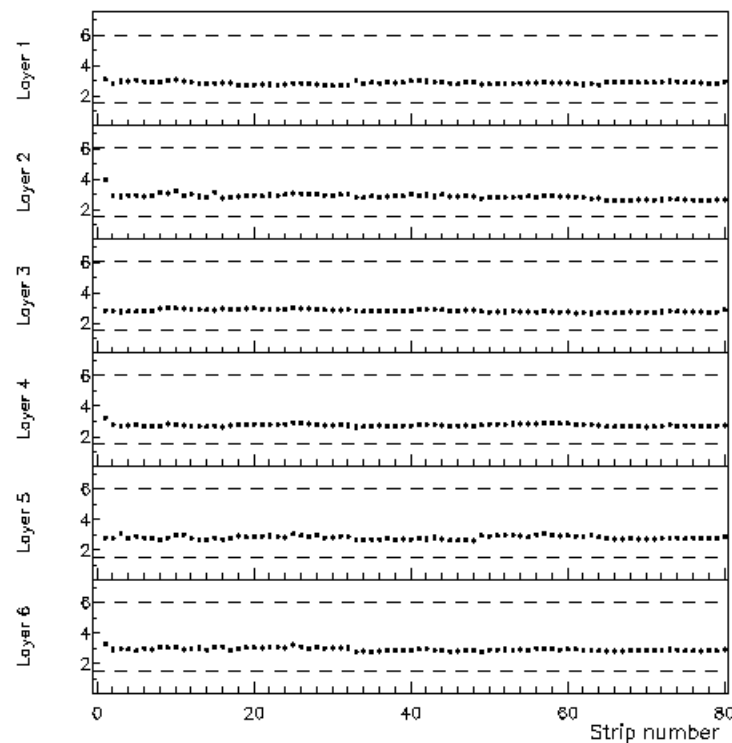
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RUN DATE: 03/16/2005 09:34:48



ME234.2.004
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003866.dat

Noise on shielded chamber

ANA DATE: 03/17/2005 09:18:16
RUN DATE: 03/17/2005 09:16:56



ME234.2.004
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003876.dat

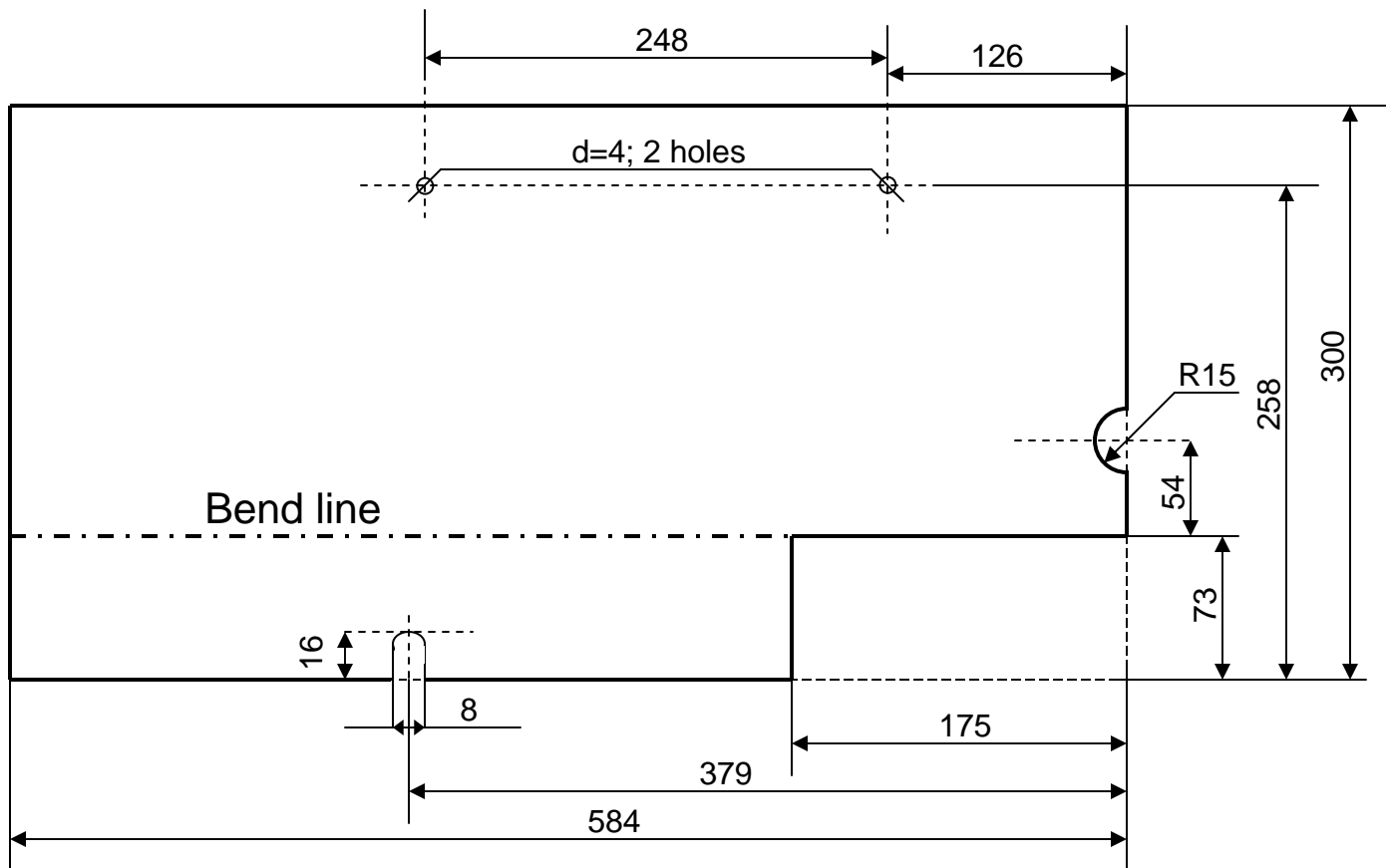


External pickup noise proposed shield



Proposed shield, left part.

Not in scale.



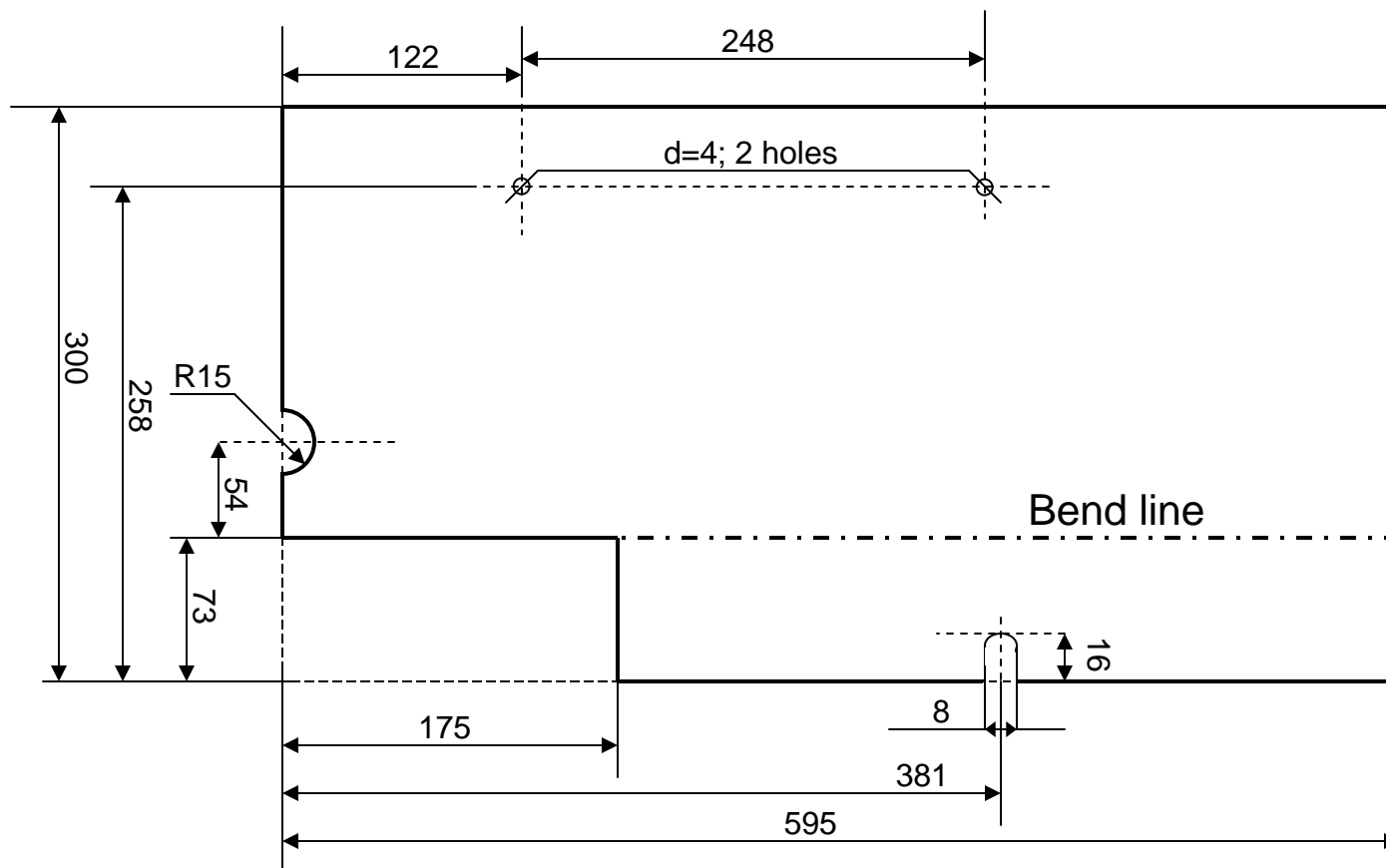


External pickup noise proposed shield



Proposed shield, right part.

Not in scale.





External pickup noise summary



The external pickup noise is an external disturbances coming through the unshielded part of CFEB input cables and alien cables worked as a reradiator. Measured noise value is a function of noise source power and disk location relatively the noise source.

Sectored distribution of this noise we can explain as a coincidence of measured time and noise transmitting time. (Usually one segment is measured during 2-3 days, then setup is moved to the next place).

There are two ways to reduce that noise: put shield between input CFEB cables and alien wires, or move the alien wire far away. We observed about the same noise suppression result. But this is true for current situation.

Generally speaking, the shielding is a good solution for reducing this kind of noise. And it may be recommended for installation on all chambers.



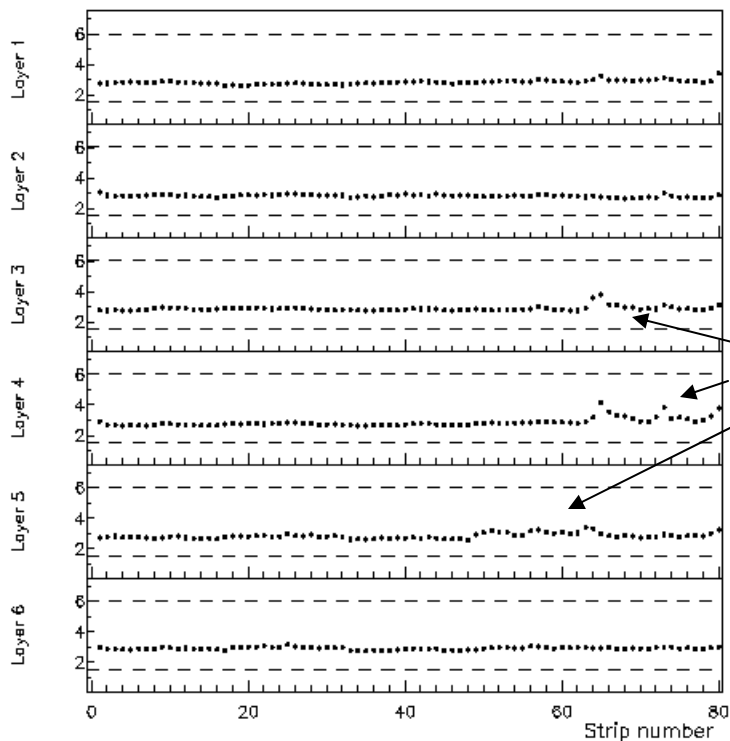
Effect of LV monitoring system



LV monitoring system on chamber ME3/2/31,
Noise measured on the adjacent chamber ME3/2/29

System working

ANA DATE: 01/11/2005 15:59:01
RUN DATE: 01/11/2005 15:54:19

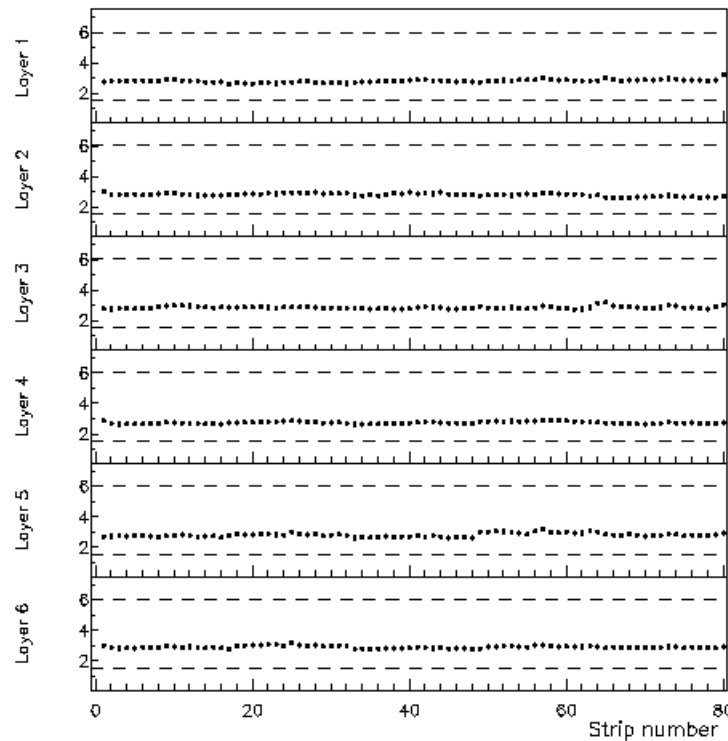


Excess noise

ME234.2.004
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003478.dat

System stopped, power on the chamber - off

ANA DATE: 03/12/2005 09:52:59
RUN DATE: 03/11/2005 16:51:06



ME234.2.004
Test 15
CFEB Noise test
CFEB Noise
/data/csczdata/cscdataz003856.dat



Resume.



1. The first signs of aging process just noted as a CFEB excess noise which can be removed with the gold plated screws.
2. Grounding jumper for hidden chambers is a cheap and quite reliable substitution of the gold plated screws
3. There is a visible way at CFEB input for pickup noise. The value of measured noise is a function of the noise source power and disk location relatively the noise transmitter. This question needs further investigation, moreover the real noise situation in the cave will be different.
Proposed shield significantly suppressed pickup noise and may be recommended for installation on all chambers.
4. We observed the influence of the LV monitoring system to the CFEB noise. Actually this is a relatively small effect, but it needs more attention.