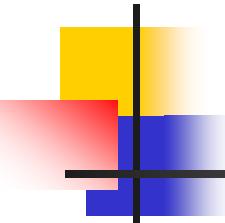


AGATA PROJECT

EMC STATUS SINCE JULY 2009

By : N. Karkour



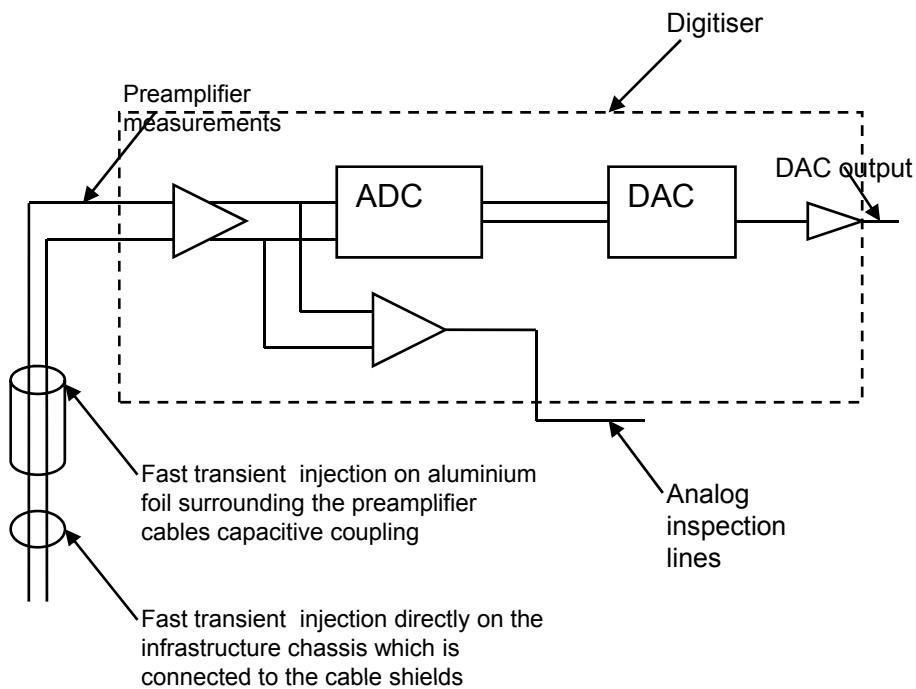
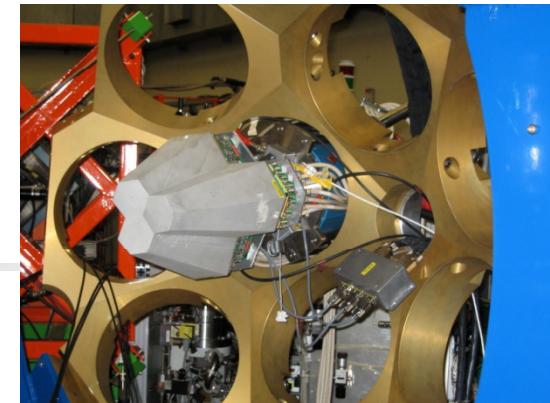
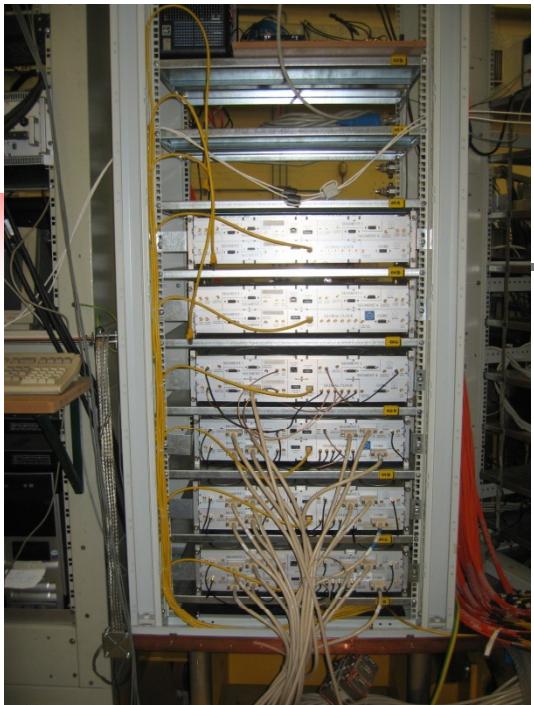
outline

- Agata Specifications for EMC
- Few Remindings from the Expertise day
- Raw qualification results
- Recommendations
- Infrastructure Setup for the Cable Qualification
- Conclusion



Agata Specifications for EMC

- AGATA signal resolution is severe (10^{-4} or .1 keV)
- AGATA construction is Highly Expensive
- Insure proper signal integrity from detector to DAQ
- Immunity to High Frequency noise above 100 MHz. 2 mV @ 1 KV fast transient pulse



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AGATA WEEK January 2010

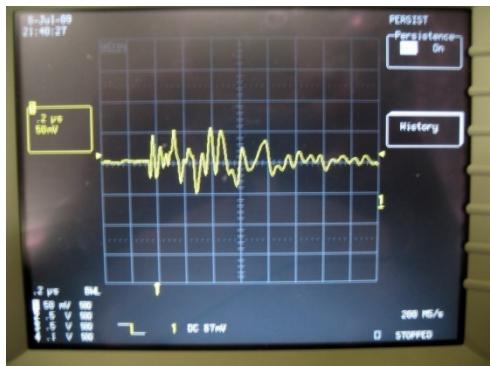
Raw qualification results

- Green crystal output using green crystal cable: 250 mV p-p equivalent to 1 MeV noise



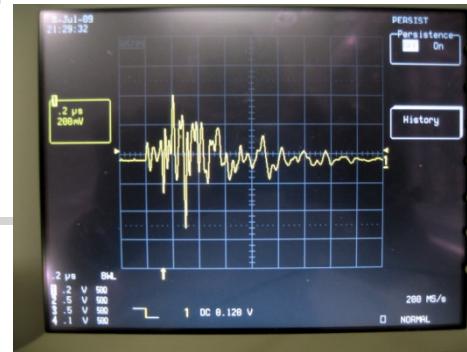
1.Spiques shown on the green crystal core preamplifier signal

- Blue crystal output using blue crystal cable: 120 mV p-p equivalent to 500 keV noise



1.Spiques shown on the blue crystal core preamplifier

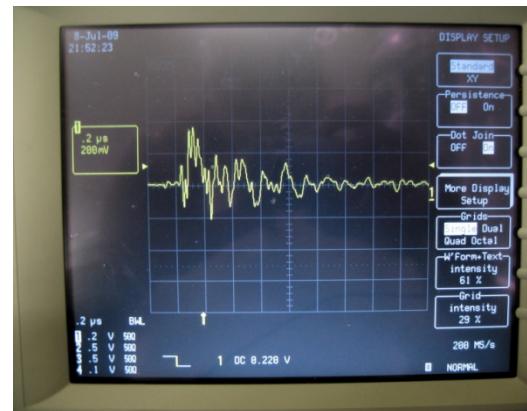
- Red crystal output using red crystal cable: 1 V p-p equivalent to 4 MeV noise



1.Spiques shown on the red crystal core preamplifier

Since the blue crystal is the best in shield (but out of spec), and the red crystal is the worst. The red crystal preamplifier output was put into the blue cable in order to distinguish the noise pickup if it was from the cable or the preamplifier motherboard.

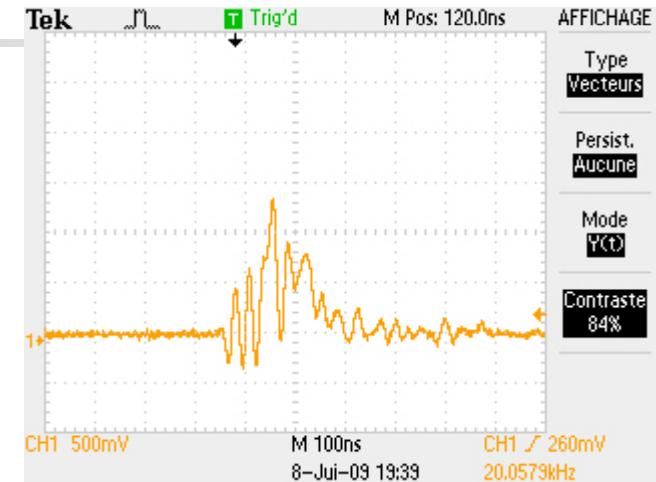
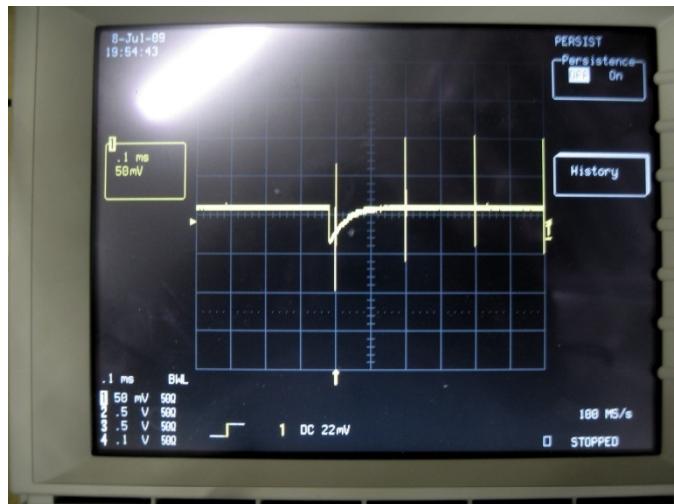
- Red crystal output using blue crystal cable: 600 mV p-p equivalent to 2 MeV noise.



1.Spiques shown on the red crystal core preamplifier using blue cable

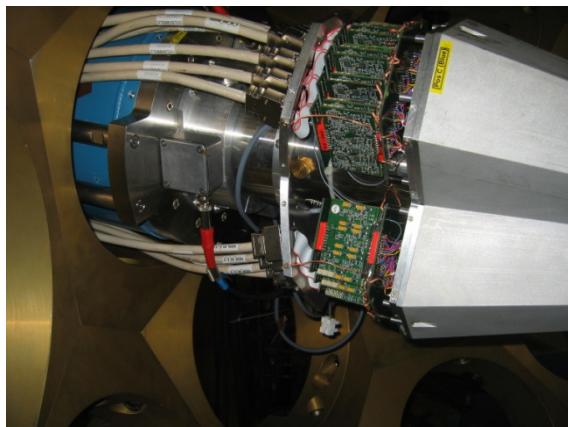
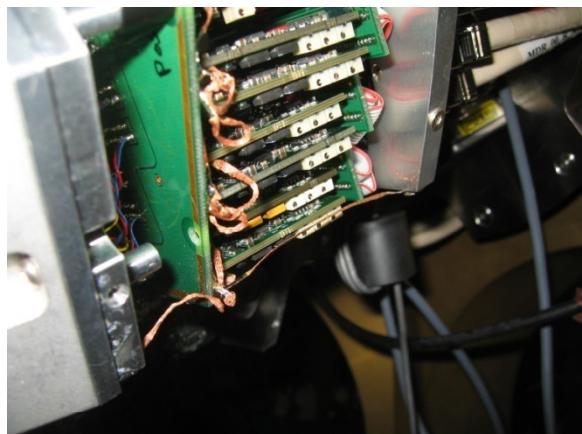
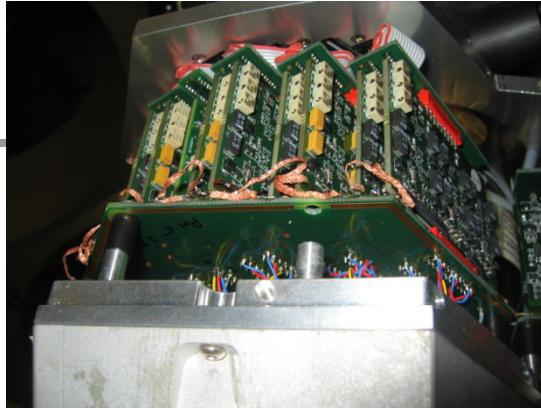
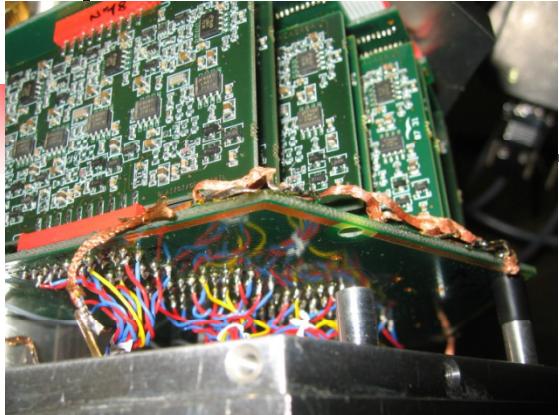
Raw qualification results

1. Spikes shown on the preamplifier signal by sending spikes on the Digitisers bay mechanics Direct injections



- Results on the noise injected into the detector mechanics chassis
- The fast transient noise generator output has been directly connected to the The fast transient noise output is 500 V signal because @ 1 kV the preamplifier output was saturating.
- Connection of the fast transient in burst generator
- The following measurements were made at the Analog inspection lines of the digitisers. They concern the core preamplifier signal for the 3 crystals

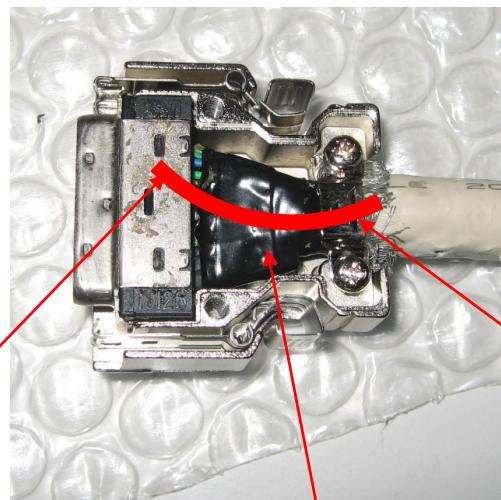
Preliminary conclusion



We can conclude that the preamplifier motherboard is susceptible to EMC noise. The photos below show the ground connections between the preamplifiers which are too long to act as low impedance bonds above 10 MHz frequencies. The improvement of the noise susceptibility is shown in the next test measurements on the preamplifier output.

Preliminary conclusion

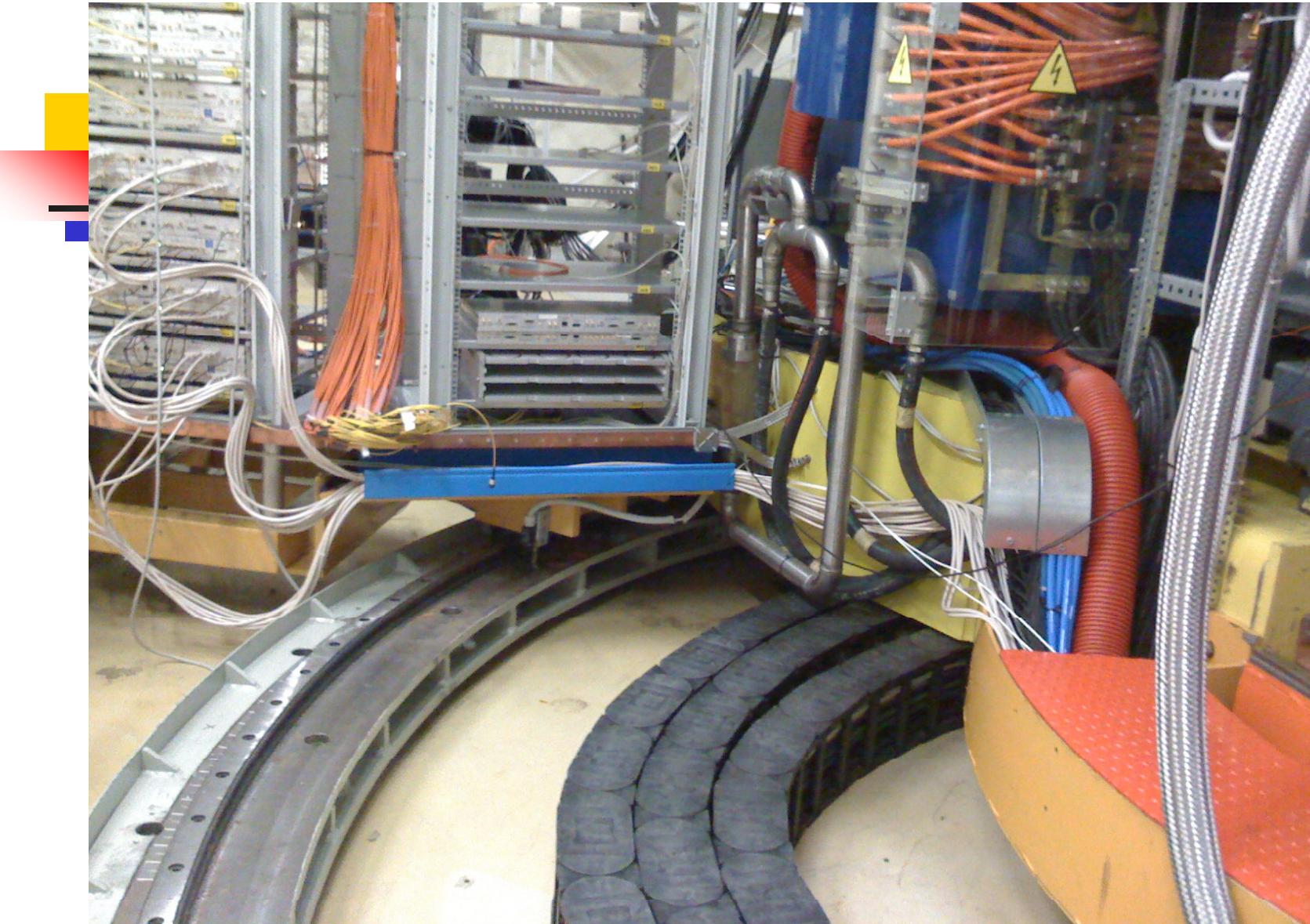
Moreover the MDC cable shield does not have a good connection to the connector core. The photo below shows that the connector core is not well connected to the external shielding of the cable. There is $100\text{ m}\Omega$ resistance between the connector shell and the cable shield.



Connector Core not tightly connected to the shield

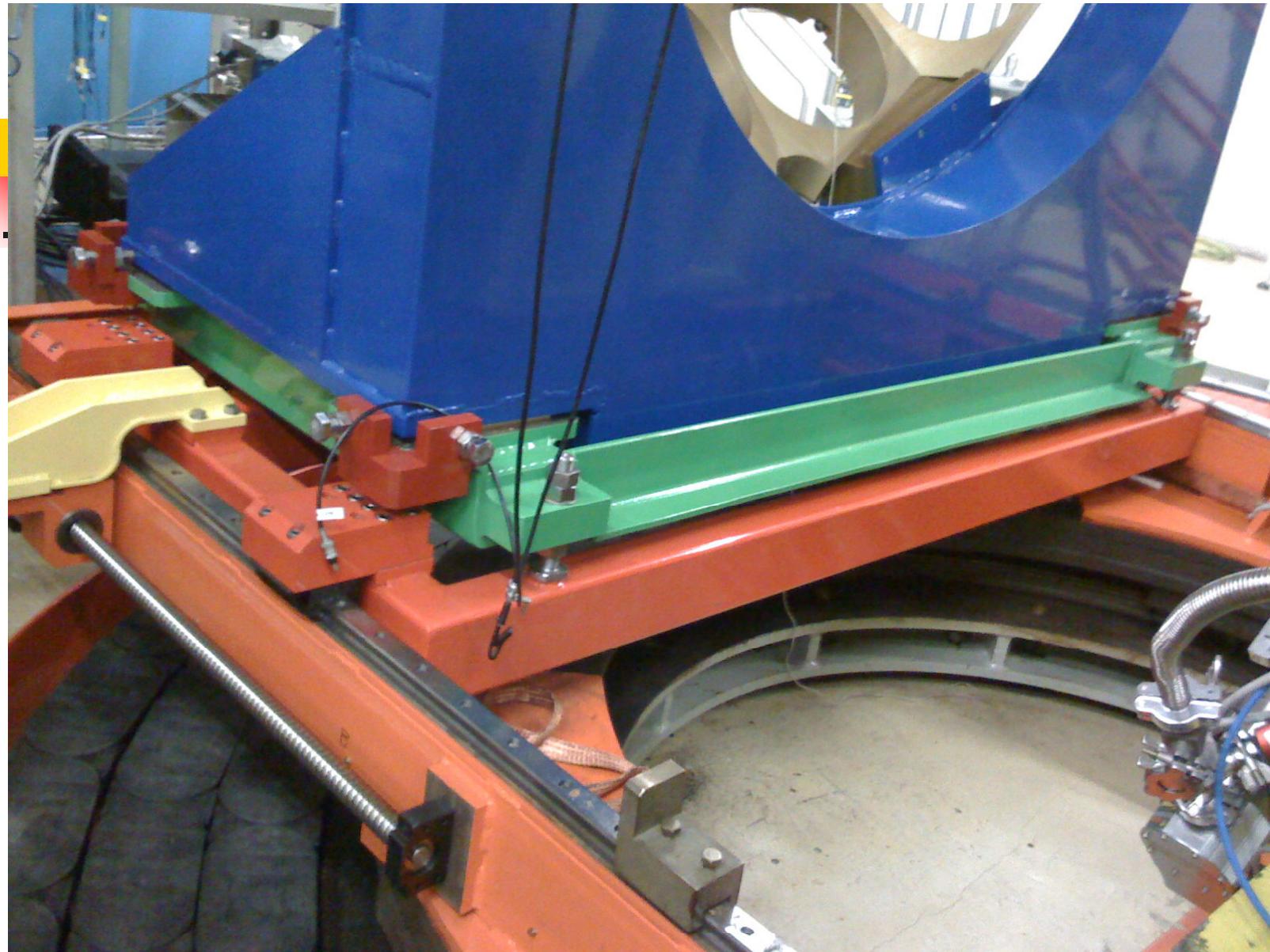
Cable shield tightly connected to the connector hoods but not core

There should be large and short connection between the cable shields connected to the connector core



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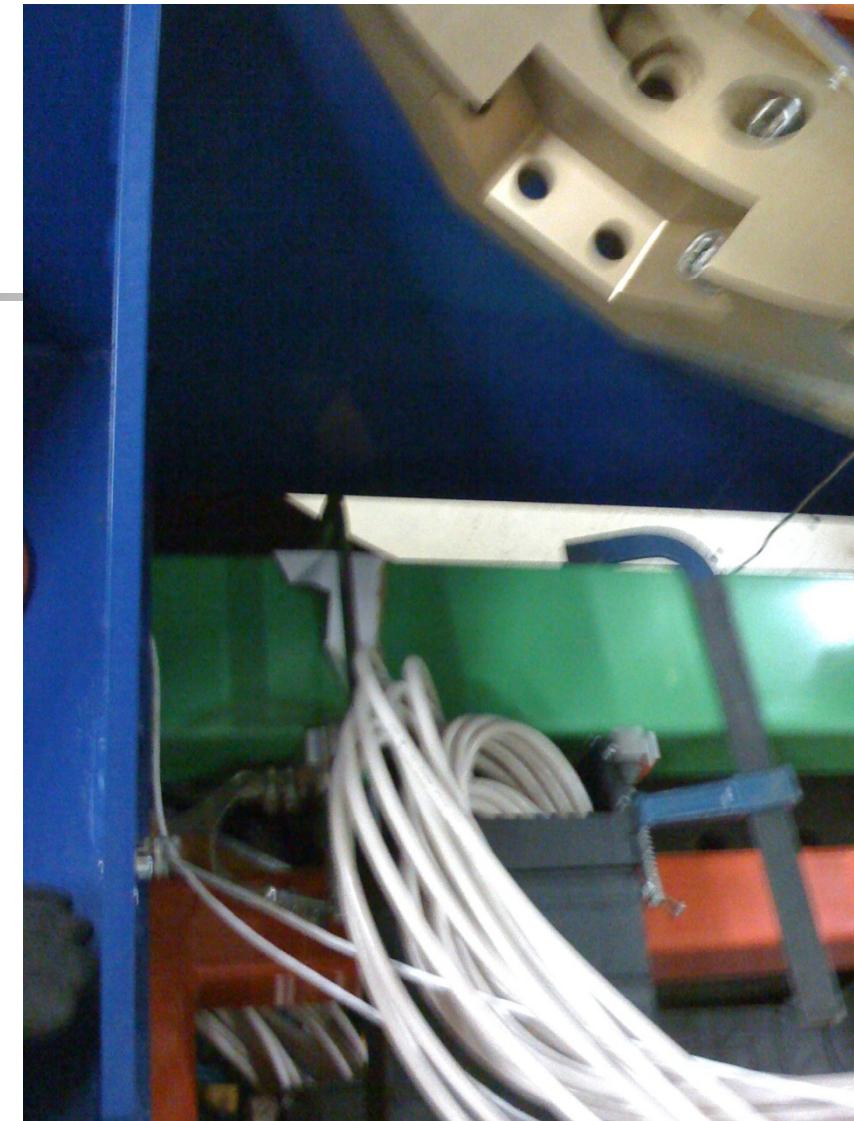
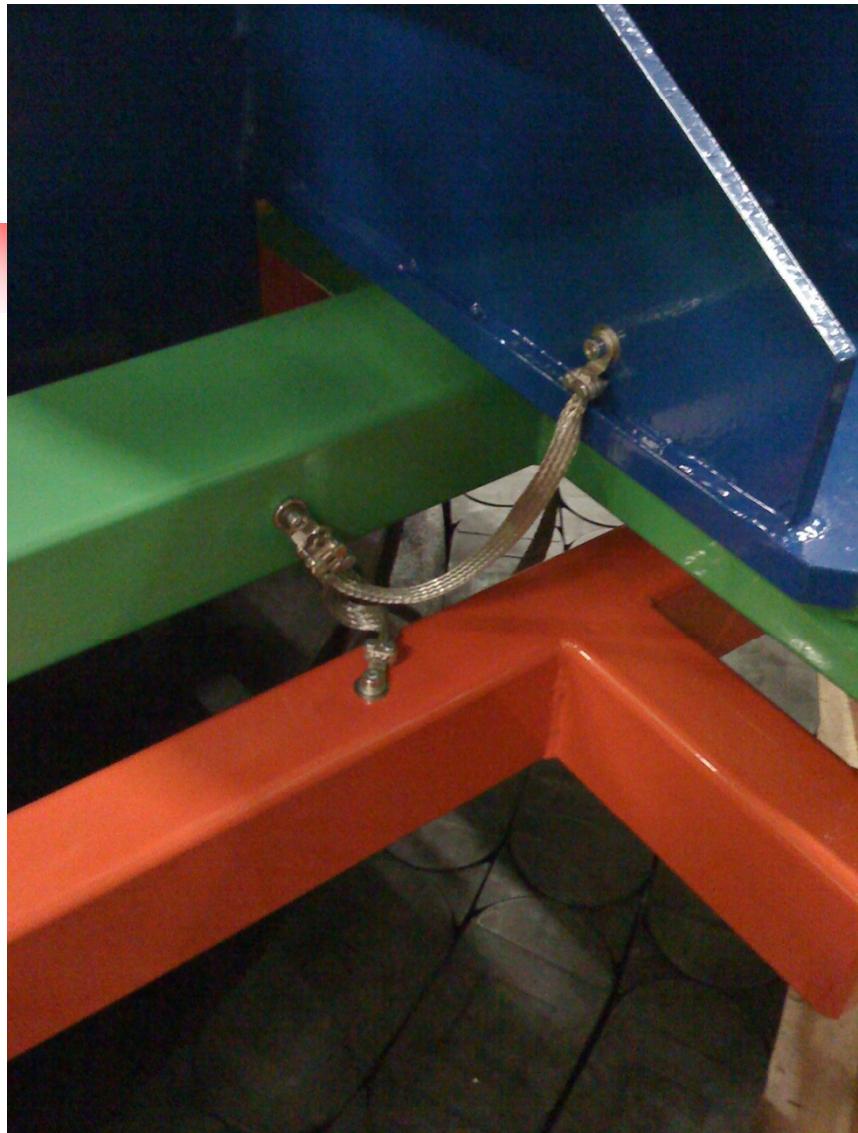
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Infrastructure Setup for the Cable Qualification



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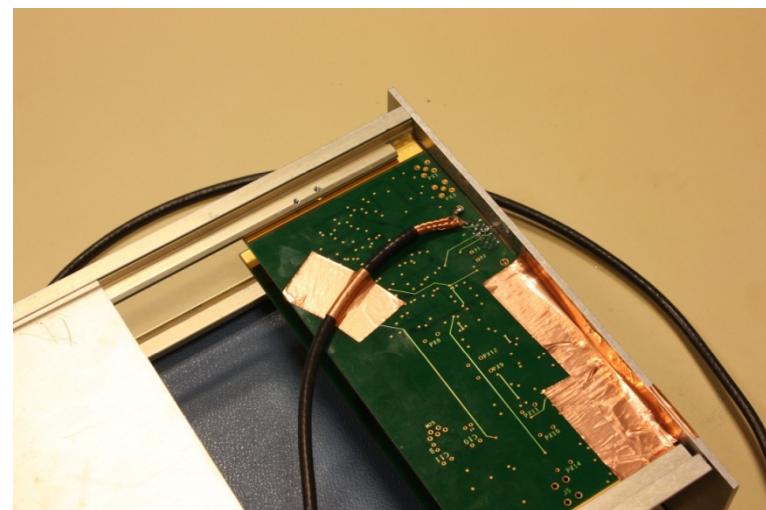
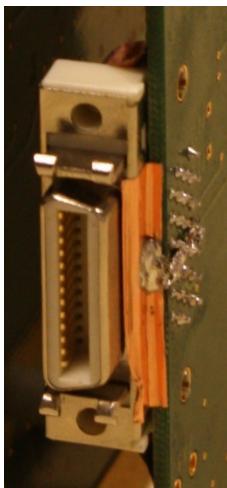
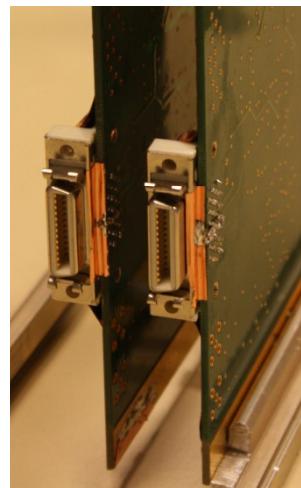
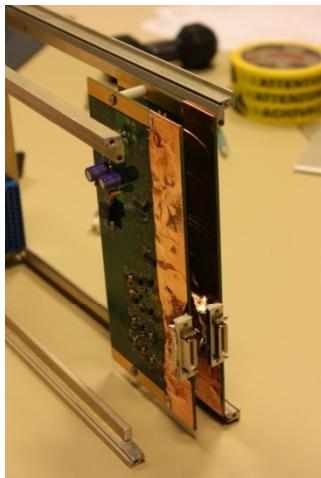
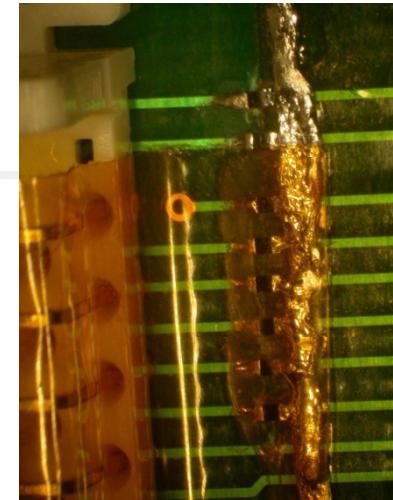
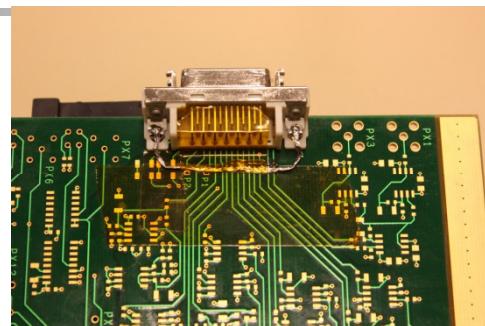
Infrastructure Setup for the Cable Qualification



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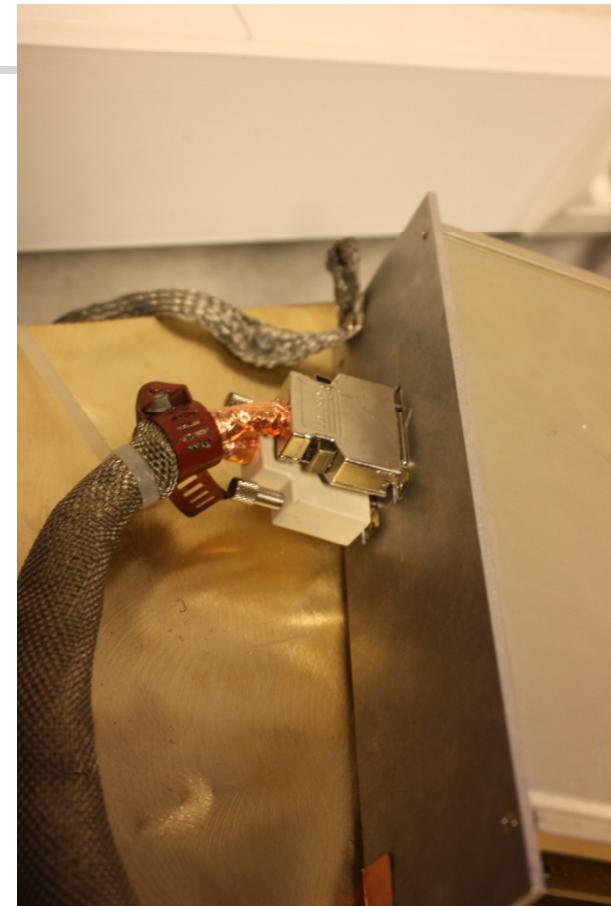
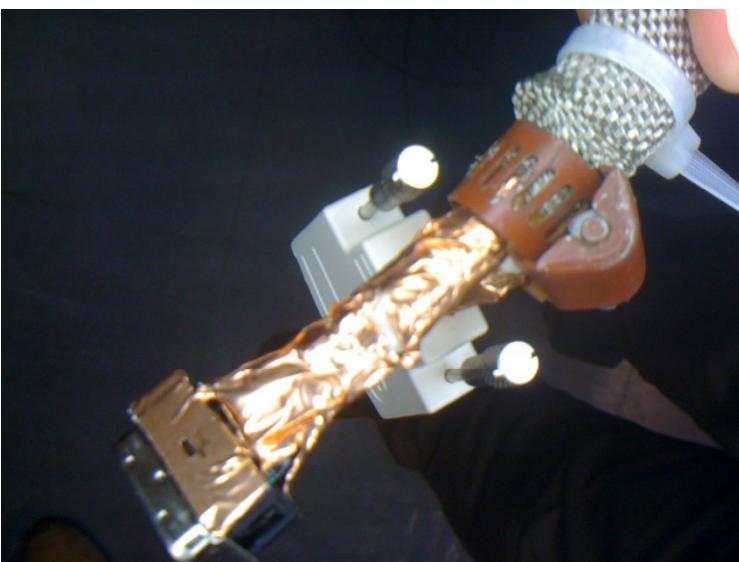
Infrastructure Setup for the Cable Qualification



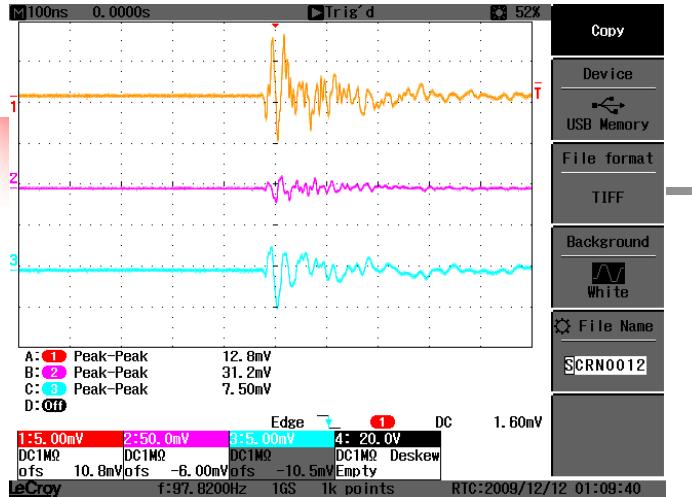
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AGATA WEEK January 2010

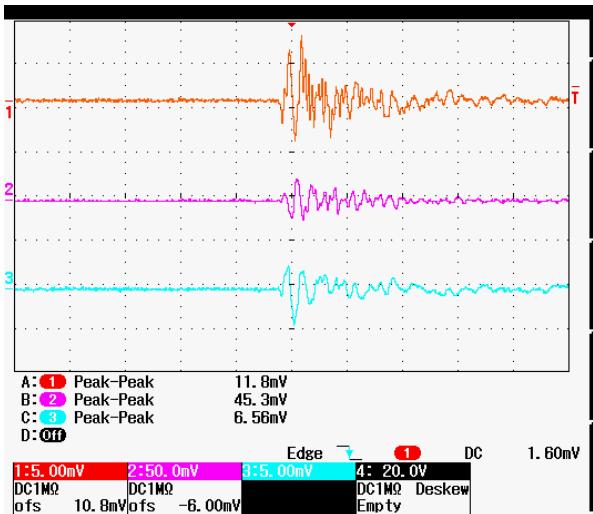
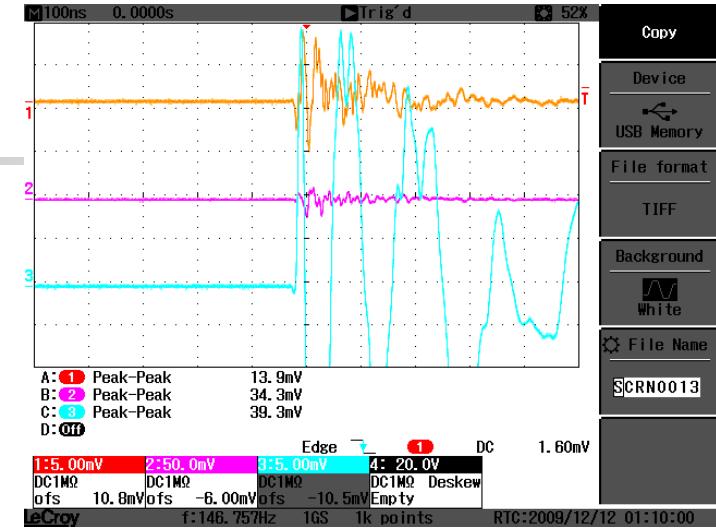
MDR Cable Qualification compared to normal coaxial cable



MDR Cable Qualification results

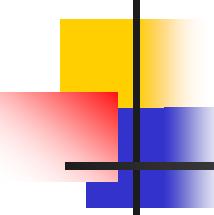


COAXIAL CABLE
SCOPE FREE
INPUT



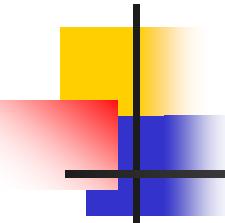
MDR CABLE V_{pp} ~13 mV
V_{pp} < 6 mV if scope intrinsic noise is deduced

COAXIAL CABLE ~ 45 mV
SCOPE FREE INPUT
V_{pp} between 6.56 mV and 7.5 mV



Conclusions on the MDR cable qualifications

- MDR cable connector shield must be modified to improve grounding
- MDR cable must be surrounded by metallic sleeve from beginning to the end.
- Spiral thin foils around the twisted pair is not enough
- Connector shielding on TC and Digitisers should be investigated to insure proper grounding connections
- Immunity to High Frequency noise above 100 MHz. 2 mV @ 1 KV can be achieved after cable modifications.



Conclusions from the Sit Down Meeting @ Legnaro on December 2009

- MDR cable must be surrounded by metallic sleeve from beginning to the end.
- Meeting to be held with GSI and DCDC manufacturer ISEG to improve HV Filter grounding
- Meeting with the cologne and CTT company to improve preamplifier mother board grounding
- Propositions to improve grounding connections to the digitisers bay from Legnaro people will be done somewhere in 2010.
- Grounding Meeting tomorrow Friday morning to plan the milestones for the actions defined.
- Finish creating the grounding group in order information circulate to all the interested persons.