



Environmental noise tests for AdV Vacuum electronics

- Cooling fans
- Power supply
- PLC (preliminary)

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Cooling fans for racks

Indications for more acoustically silent fans:

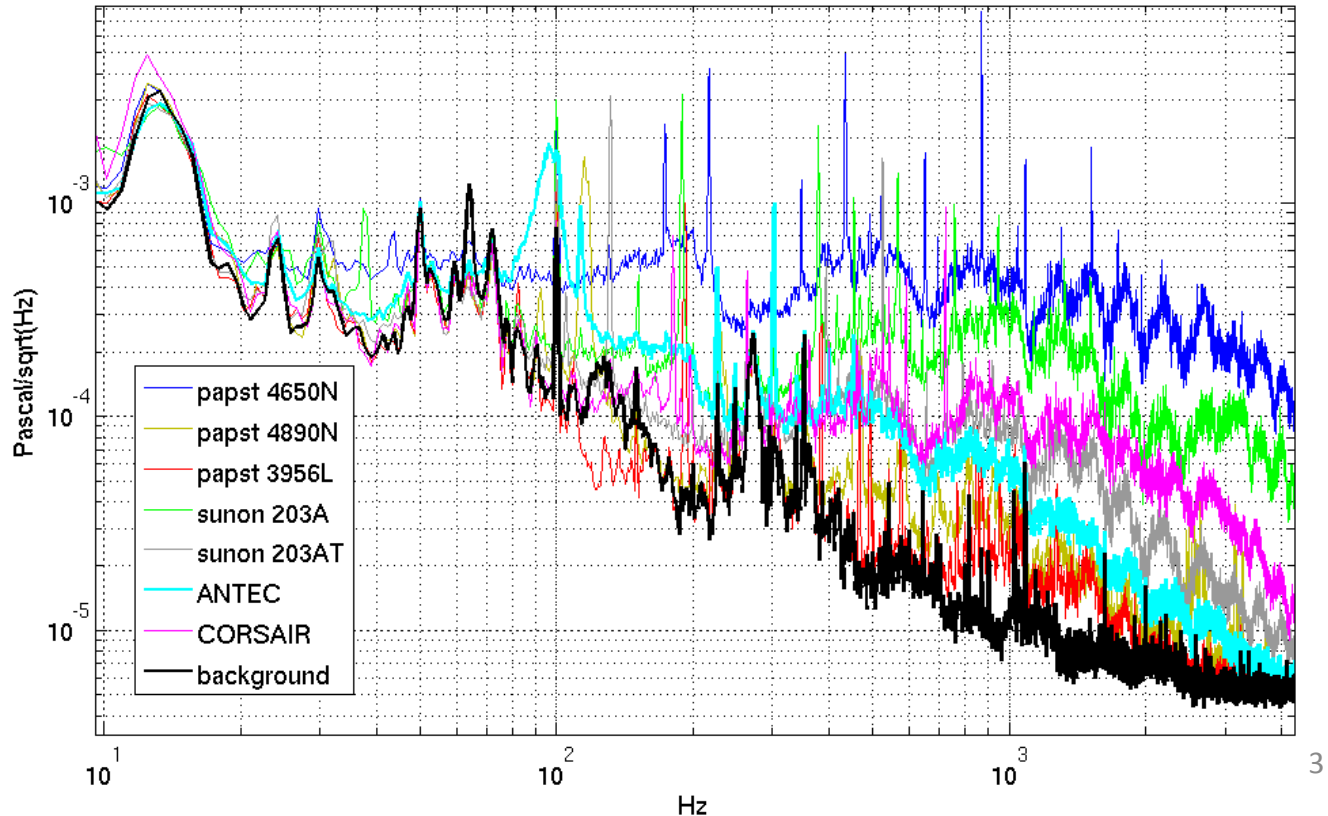
In recent years, lot of litterature/producs mostly directed to Personal Computer users (“quiet PC”)

- Reduce Speed, and (possibly) Larger size to guarantee sufficient air Flux
- Bearings, Sleeve vs Ball: Balls B. tend to have a bit longer life but to be a bit noisier (friction), yet both lifetime and noise seem to mostly depend on quality of materials and manufacturing, for example: lubricant sealing, alignment of rotor and shaft (no wobbling), material resistance to abrasion and fatigue...
- Input voltage: DC (models from $\pm 5V$ to $\pm 24V$) → 1) >10times lower power consumption; 2) allows reducing fan rotation speed if needed.
-yet, thermally-self-controlled speed, looks not good for us: unpredictable changes in noise features.
- Use of Rubber pins/screws to reduce vibration and rattling sounds

Sound emission comparative tests

- Old Virgo model: Papst 4650N, 230VAC, 120mm², 160m³/h
- New models: headed for fans with about half air flux, assuming old virgo one was a bit oversized in terms of flux
 - a few 120mm² size with declared lower sound emission (dBA)
 - two slower&larger ones (200mm², DC 12V)

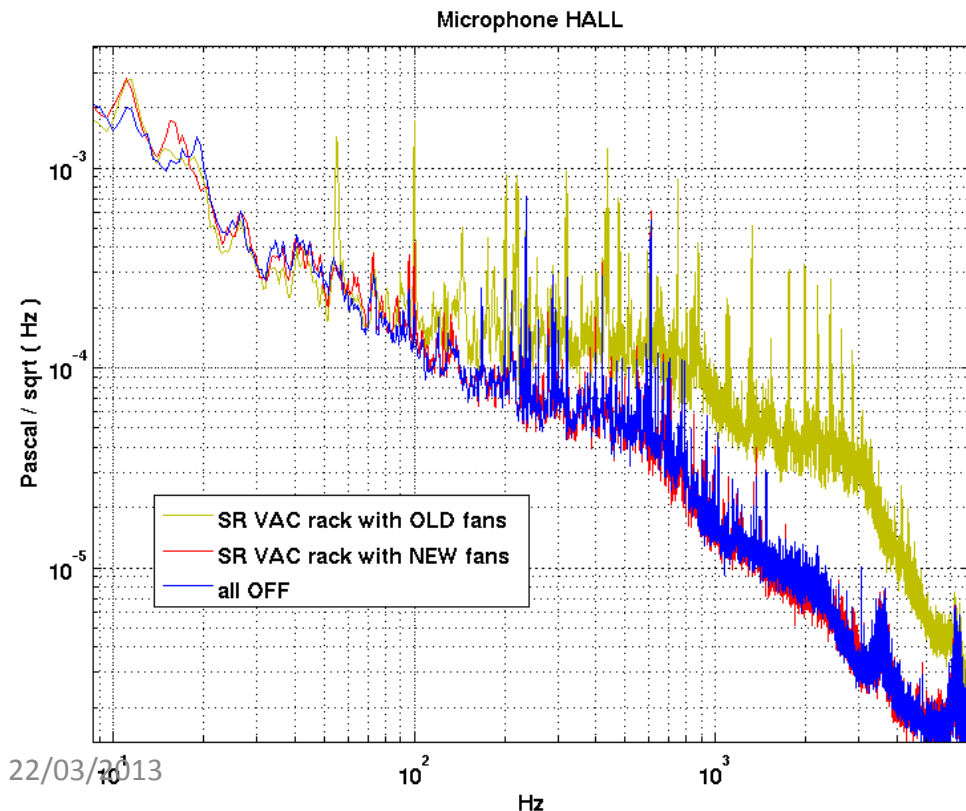
Winners: EbmPapst 4890N, Antec



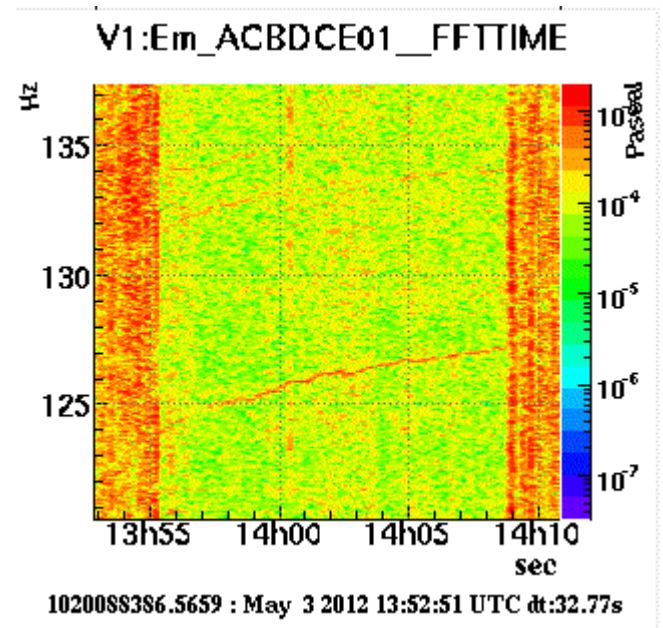
Suspended fan,
Mic. 30cm from fan

Test with SR rack (eLog 30755)

- Silence condition in the central hall (almost everything off) **BLUE**
- SR vacuum rack:
 - 1) 6 old fans (4 in the mid frame, 2 in the top frame)+OS9 fan (**YELLOW**)
 - 2) 4 new fans in the middle frame: 3 EbmPapst 4890N and 1 Antec (**RED**)



Some noise lines at blade-pass frequency, 130Hz:



Old fans:

Fan model	Air Flux (m ³ /h)	Size (mm ²)	V input	Noise (dBA)	Speed (rpm)	Lifetime (L10)	cost
Papst 4650N	160	120	AC	46	2650	37500h = 4yr	40 eu (Farnell)

Suggestion for new fans:

TESTED:

Fan model	Air Flux (m ³ /h)	Size (mm ²)	V input	Noise (dBA)	Speed (rpm)	Lifetime (L10)	cost
EbmPapst 4890N	80	120	AC	25	1550	55000h = 6yr	34 eu (Farnell)
Antec, BigBoy	228 (?)	200	DC 12V, 3- speed	30	800/700 /600	Not quoted	20 \$

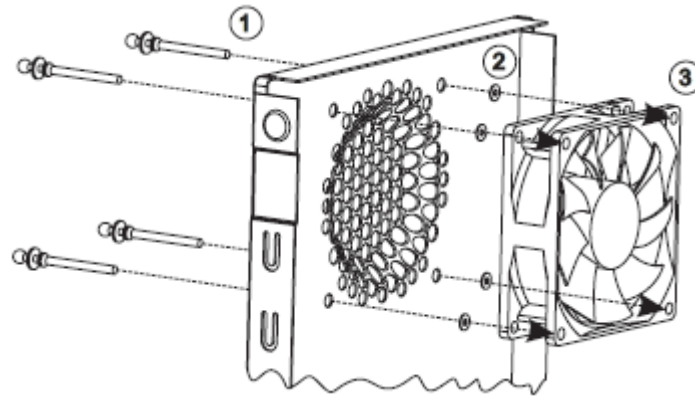
Not tested (...is there still time for tests?):

Yet, these other models look promising based on specs, in addition DC powering gives opportunity to reduce speed if needed. Noctua one sounds particularly interesting.

Fan model	Air Flux m ³ /h	Size mm ²	V input	Noise (dBA)	Speed (rpm)	Lifetime (L10)	cost
EbmPapst 4412 FG(L)	94	120	DC, 24V (12V)	26	1600	80000h = 9yr	19 (Farnell)
Noctua, NF-S12A-FLX 22/03/2013	107	120	DC, 12V	18	1200/900/700	6yr	20 eu

Rubber pins/screws

- Possibly, to reduce vibrations and rattling sound:



Home :: DIY :: Fan Screws - Rubber :: Deluxe



Fan Screws - Rubber

Rack Power Supply

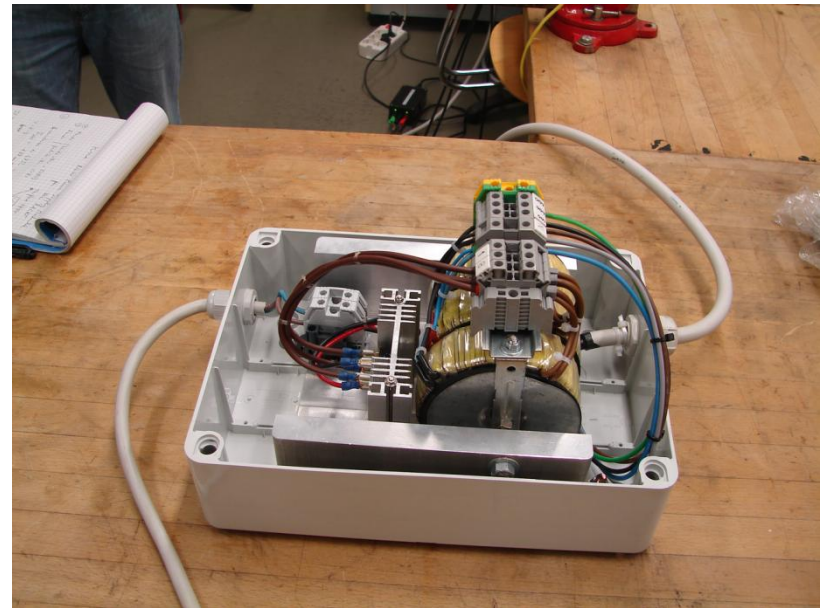
Compared Magnetic noise emission of:

- Old Legrand-46923 filtered rectifier power supply module
- New Custom Prototype from LAL (eLog 30903)

Old modules



New LAL module



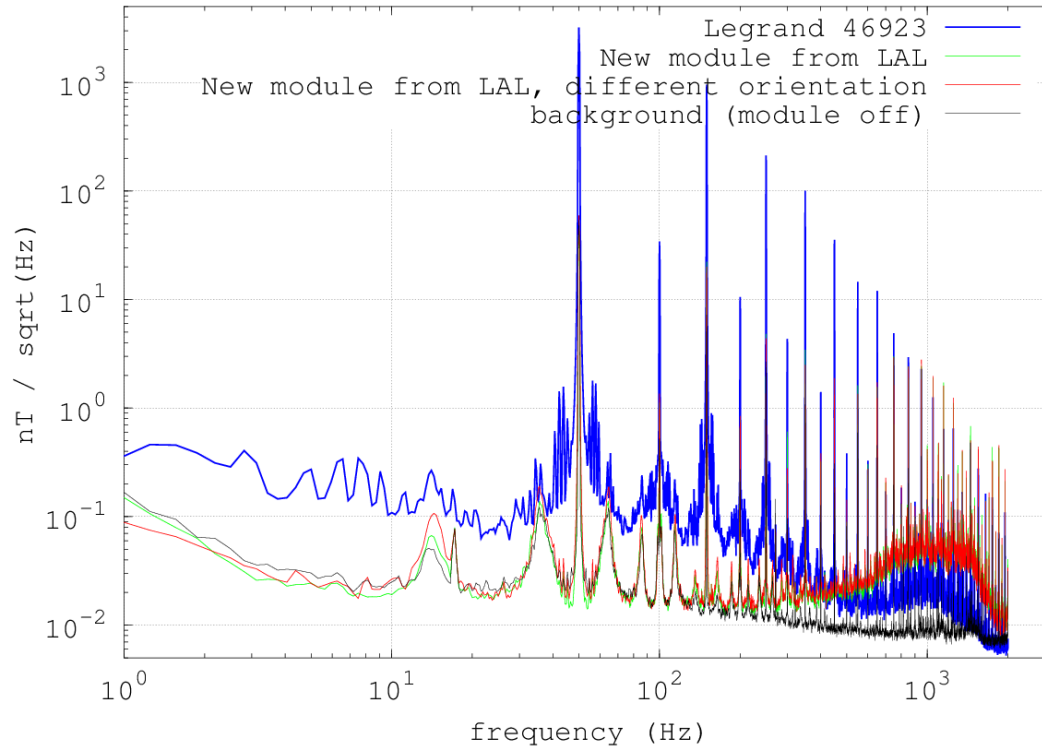
Adopts Toroidal voltage transformers

New module shall replace both L-46923 and Traco switching Power Supply, and in addition L-42468 (isolation transformer) will be eliminated.

22/03/2013

Rack Power Supply

Magnetic Noise at 0.5 meter

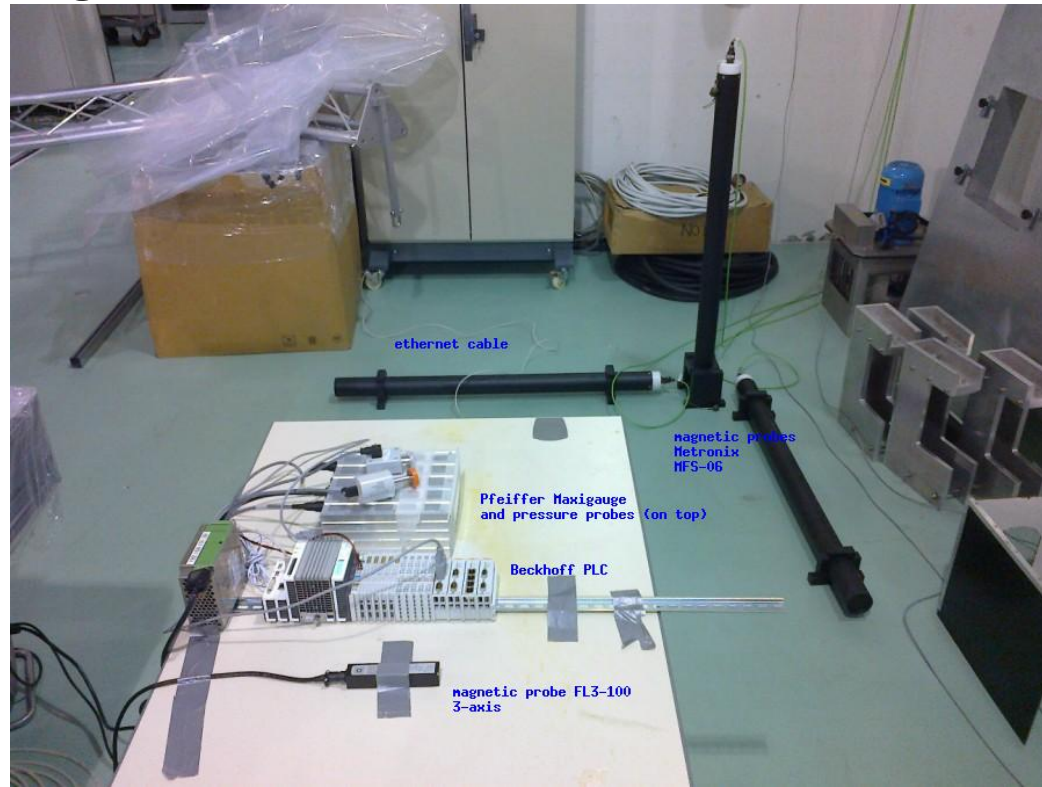


Powered on same inlet (IPS), No difference with changing output load (23, 47,94 Ω resistor), different module orientations (eLog 30903). Changes less than a factor of 2.

Indicative result is that new LAL module produces substantially less magnetic field at low frequency (below few hundred Hz), in particular, it does not generate nasty magnetic noise bumps around 50Hz and harmonics. For this reason, it seems substantially better than the old choice for the point of view of magnetic coupling to AdV payload magnets.

PLC, magnetic noise emission

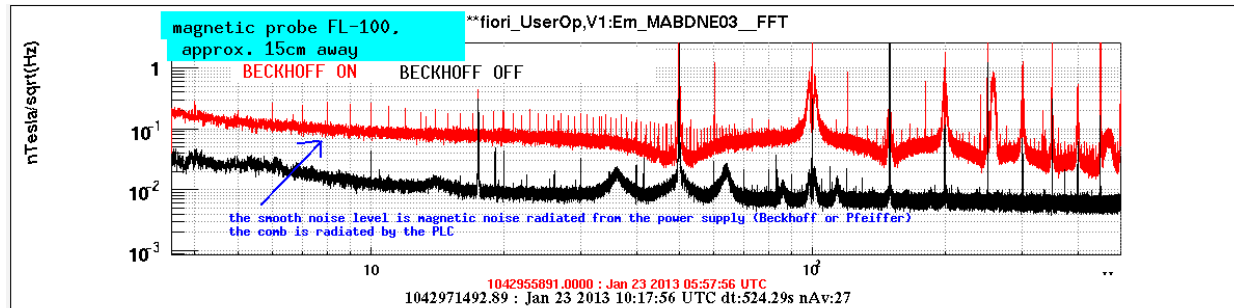
- eLog 30942 (with M.Moan, G.Ballardin)
Search for possible narrow magnetic “lines” emission associated to production of precisely timed digital data.
- Very Basic configuration:



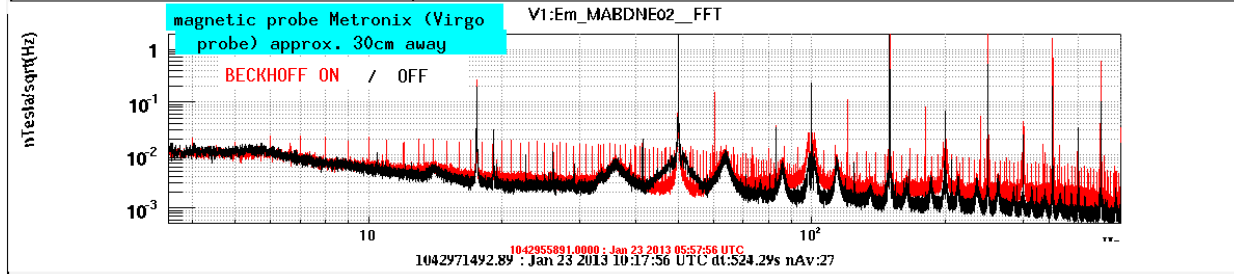
PLC, magnetic noise emission test

PLC device
ON vs **OFF**

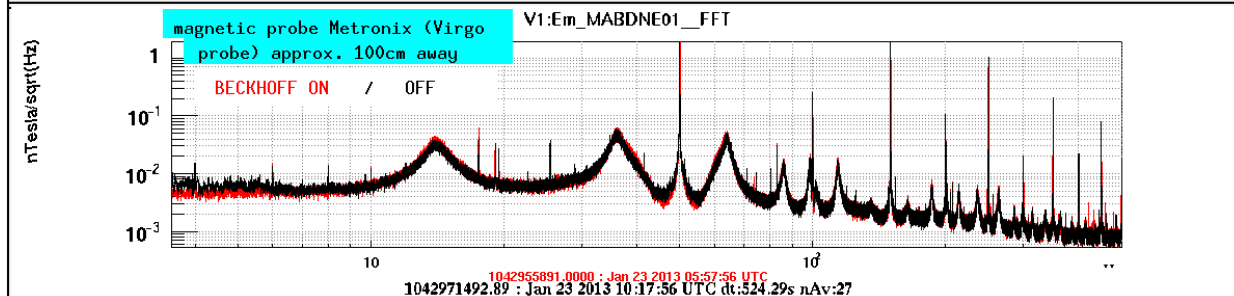
Magnetic probe:
15cm away



Magnetic probe:
30cm away



Magnetic probe:
1m away



We do measure combs of narrow lines associated with PLC polling period, yet their intensity reduces below the hall environmental magnetic noise floor at a distance of 2m from the PLC.

Our preliminary conclusion is that, for this basic PLC configuration, the measured radiated low frequency magnetic noise does not reveal peculiarities which could be critical for AdV. Tests to be repeated with a more realistic configuration.