ALCPG07

Stray magnetic fields.

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Previous work 1

- Sensitivity to Nano-Tesla Scale Stray Magnetic Fields, by **J. Frisch, T. O. Raubenheimer, P. Tenenbaum,** SLAC, LCC-Note-0140 (June 7, 2004)
  - Analysis for NLC
  - Data from SLC (End station B)
  - Conclusion: *we are mostly OK.*

Previous work 2

- Rough estimation of effects of fast changing stray field in long transport of RTML - Emittance dilution in Turnaround, **K. Kubo,** KEK, ILC-Asia-2006-05 October 12, 2006
  - Requirement estimation: rms B < 2 nano-Tesla (ILC RDR)

Magnetic fields

- Commercial superconducting solenoid – **10 Tesla (1 e+1)**
- Earth magnetic field -- **50 micro-Tesla (5 e-5)**
- Cell phone – **100 nano-Tesla (1 e-7)**
- ILC-RDR requirement – **2 nano-Tesla (2 e-9)**
- Beating human heart -- **~ 10 pico-Tesla (1 e-11)**

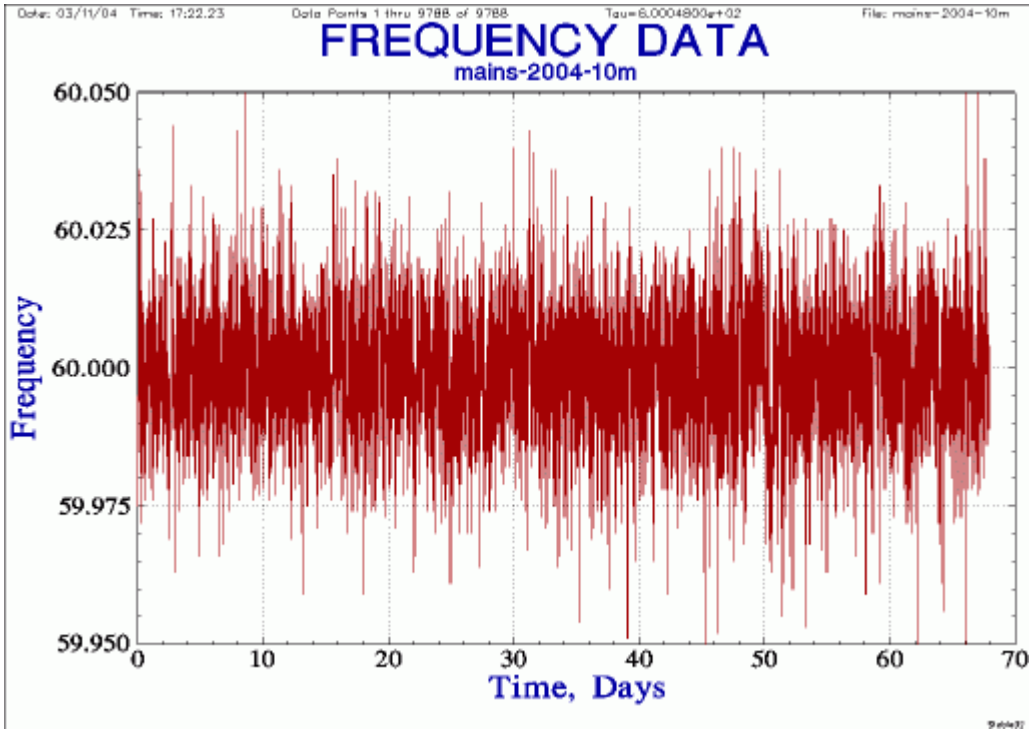
Frequency dependence

- <1 Hz (can be compensated by feed-forward system)
- > 100 kHz (attenuated in the structure)

Classification (following F.R.T.)

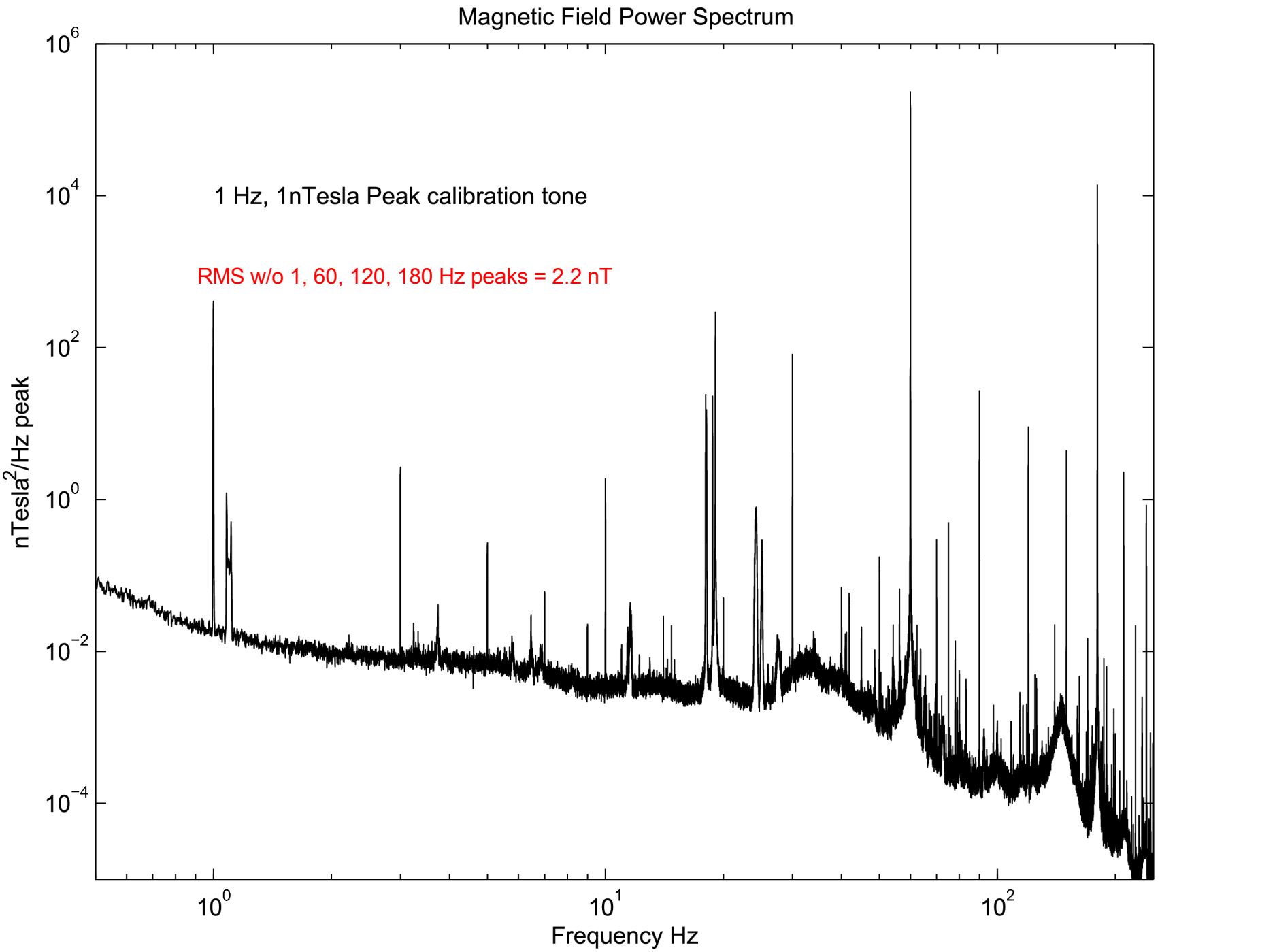
- 60 Hz and its harmonics
- Fields from RF systems
- Others (non-RF technical sources)

60 Hz

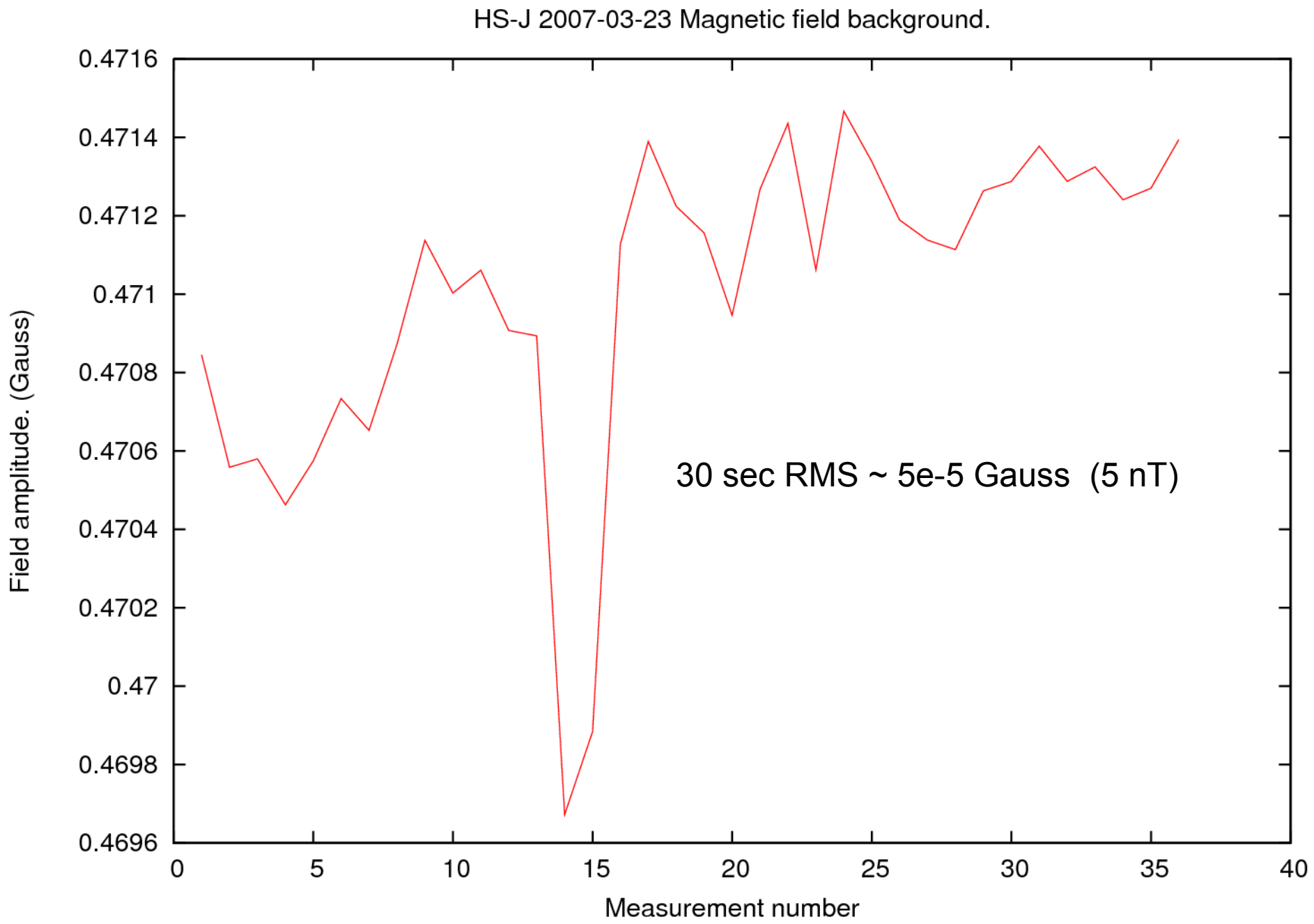


A 1 second frequency sample was taken every 10 minutes.

Tom Van Baak: http://www.leapsecond.com



Frish,Raubenheimer,Tenenbaum, LCC-Note-0140


HS-J 2007-03-23 Magnetic field background.
Field amplitude. (Gauss)
0.4716
0.4714
0.4712
0.471
0.4708
0.4706
0.4704
0.4702
0.47
0.4698
0.4696
0
5
10
15
20
25
30
35
40
Measurement number
30 sec RMS ~ 5e-5 Gauss (5 nT)

Future work

- We need more data!
  - Different sites; different locations on the same site.
  - Consistent measurement techniques.
- Defensive design:
  - Consider some (extra) shielding?