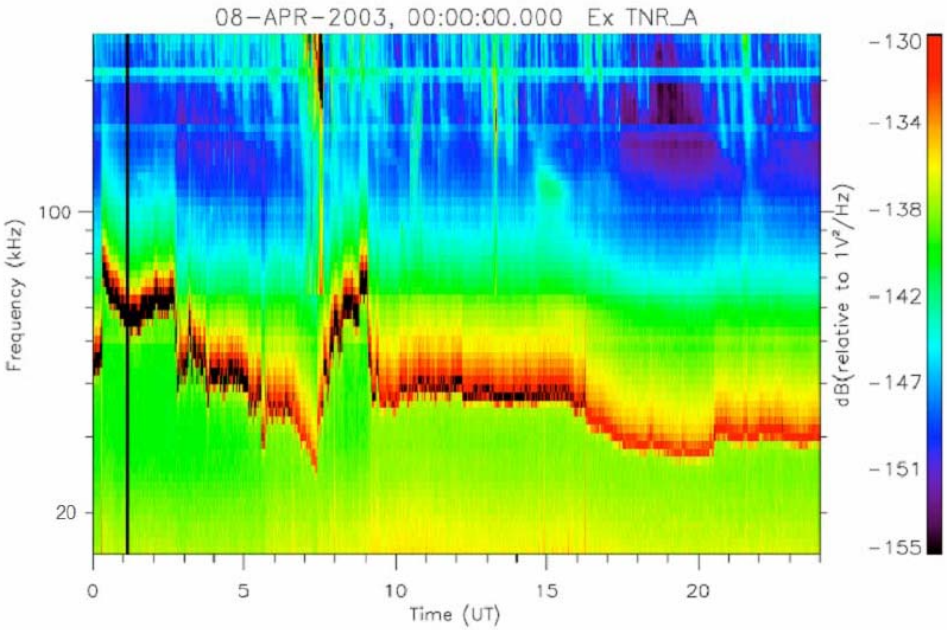
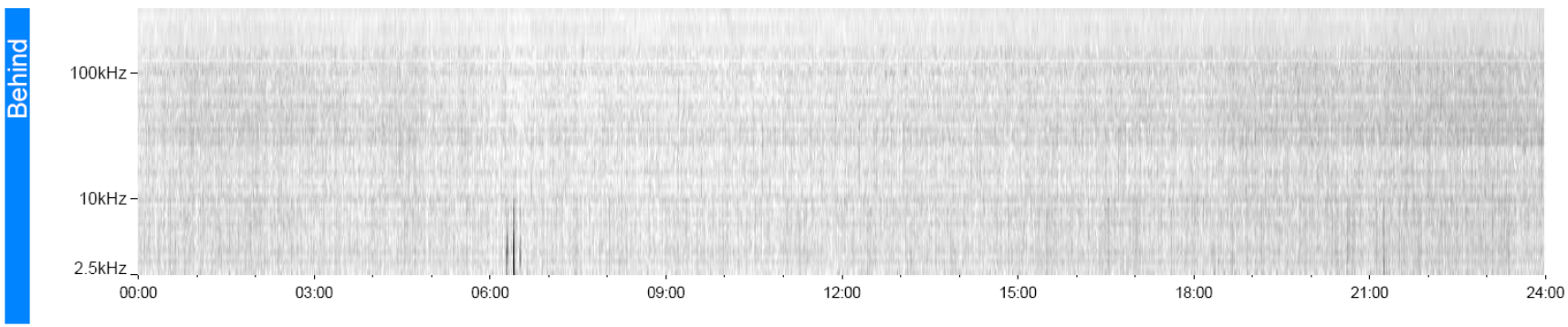
Electron density measurements from the Shot Noise collected on the S/Waves Antennas (Work done by Ioannis Zouganelis et al.)



WIND

STEREO

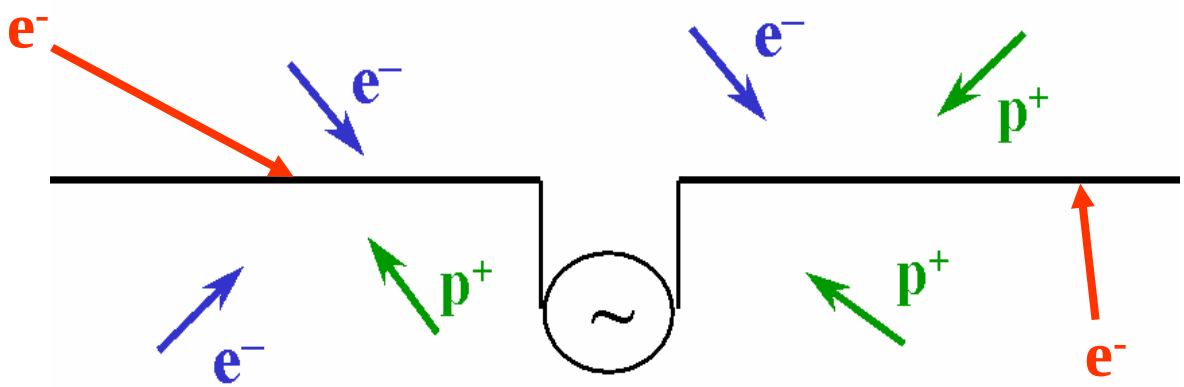


Behind PSE Angle = xxx.x
Behind source file = swaves_behind_2007_305_1_03.ptp

Time (UTC)

swaves_summary_20071101_g
Produced on 2007-11-04 at 06:45:18 with TMlib V932 and Dynspec V011

The thermal noise spectroscopy

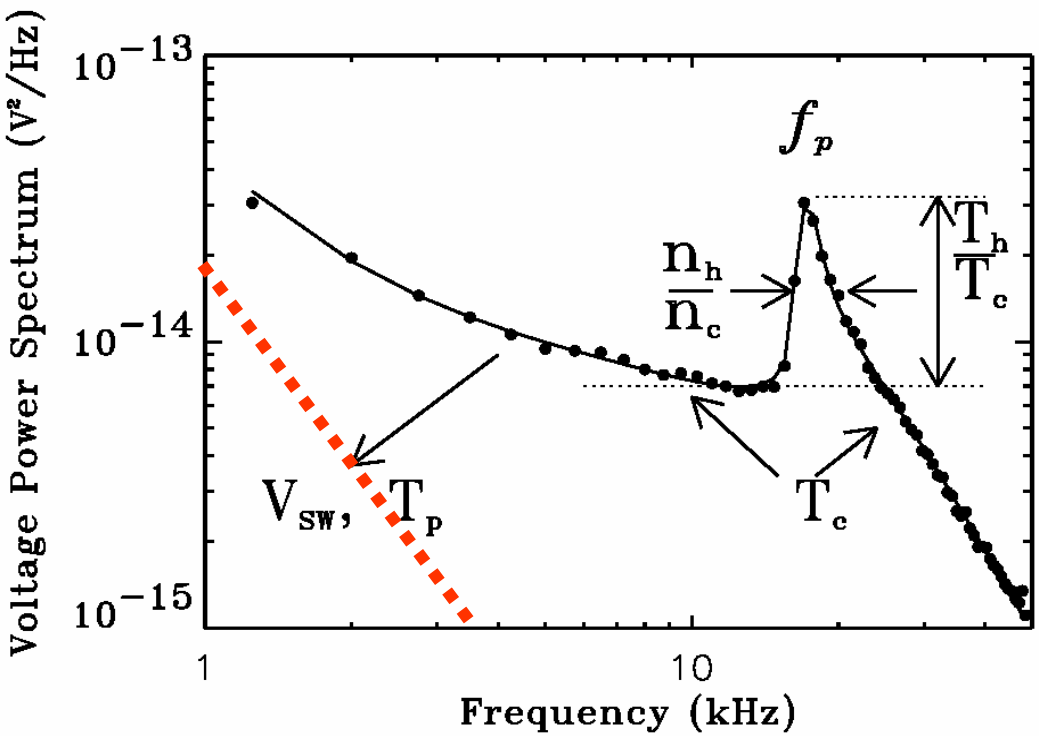


Shot Noise

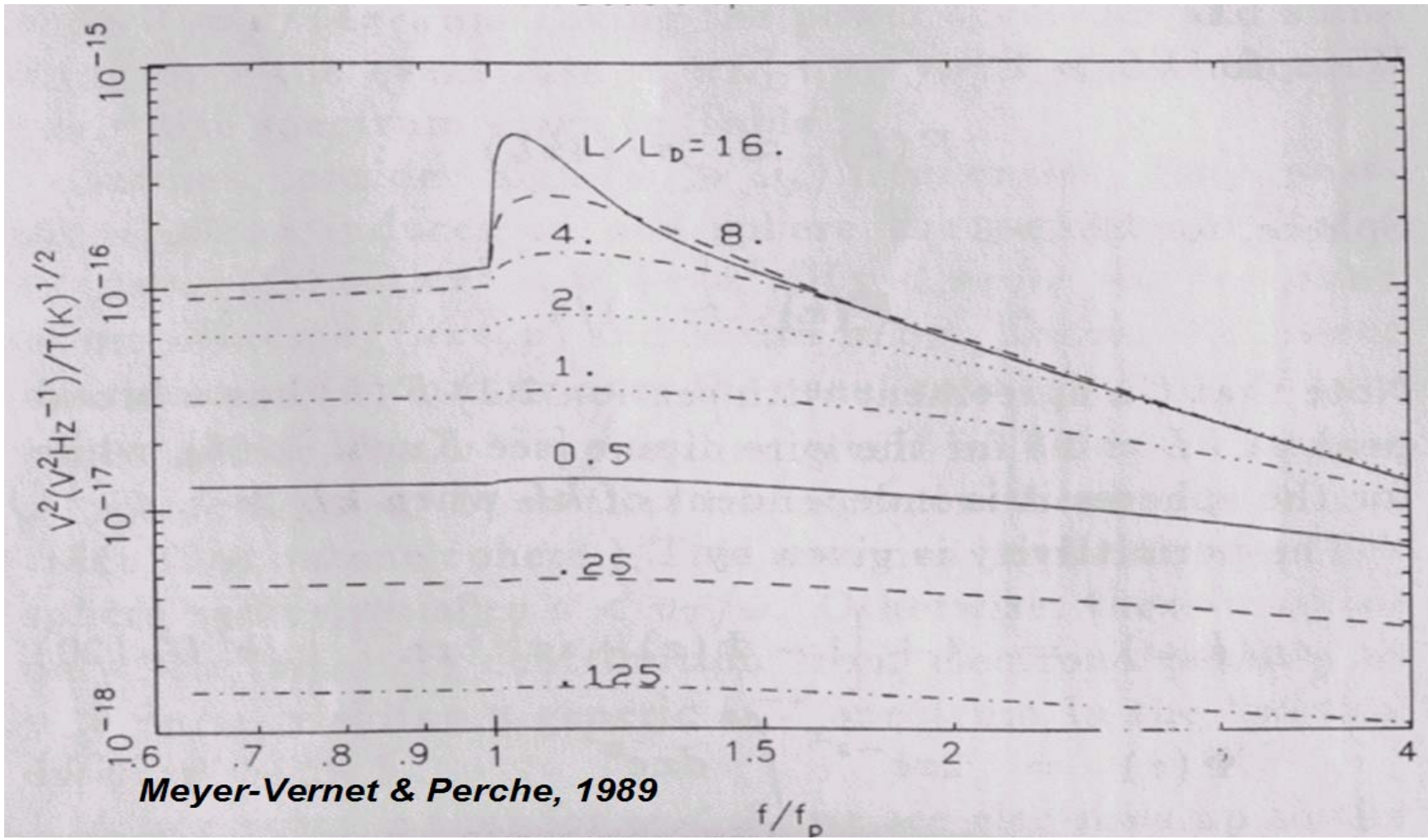
2 Maxwellians:

cold : n_c, T_c

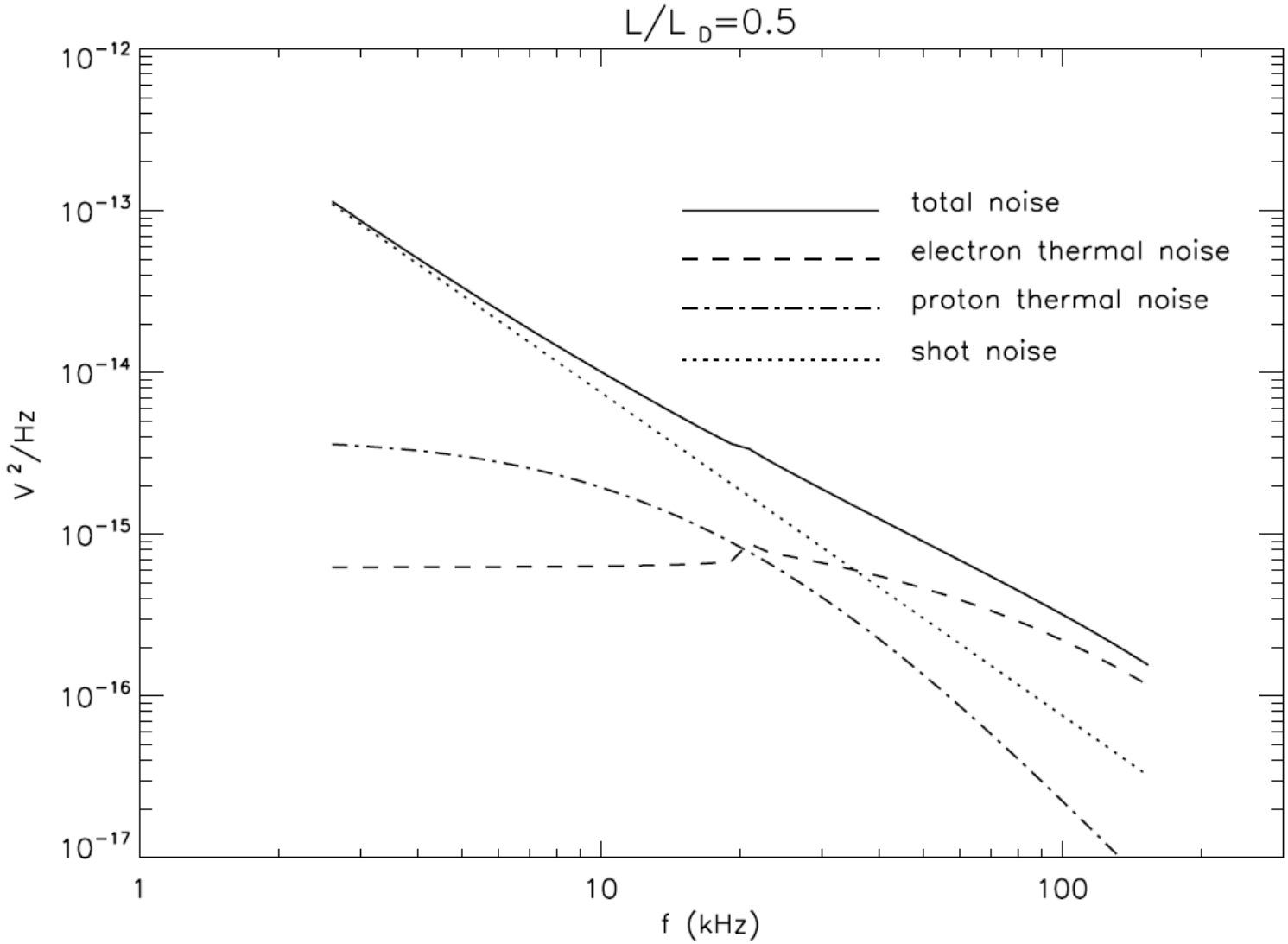
hot : n_h, T_h

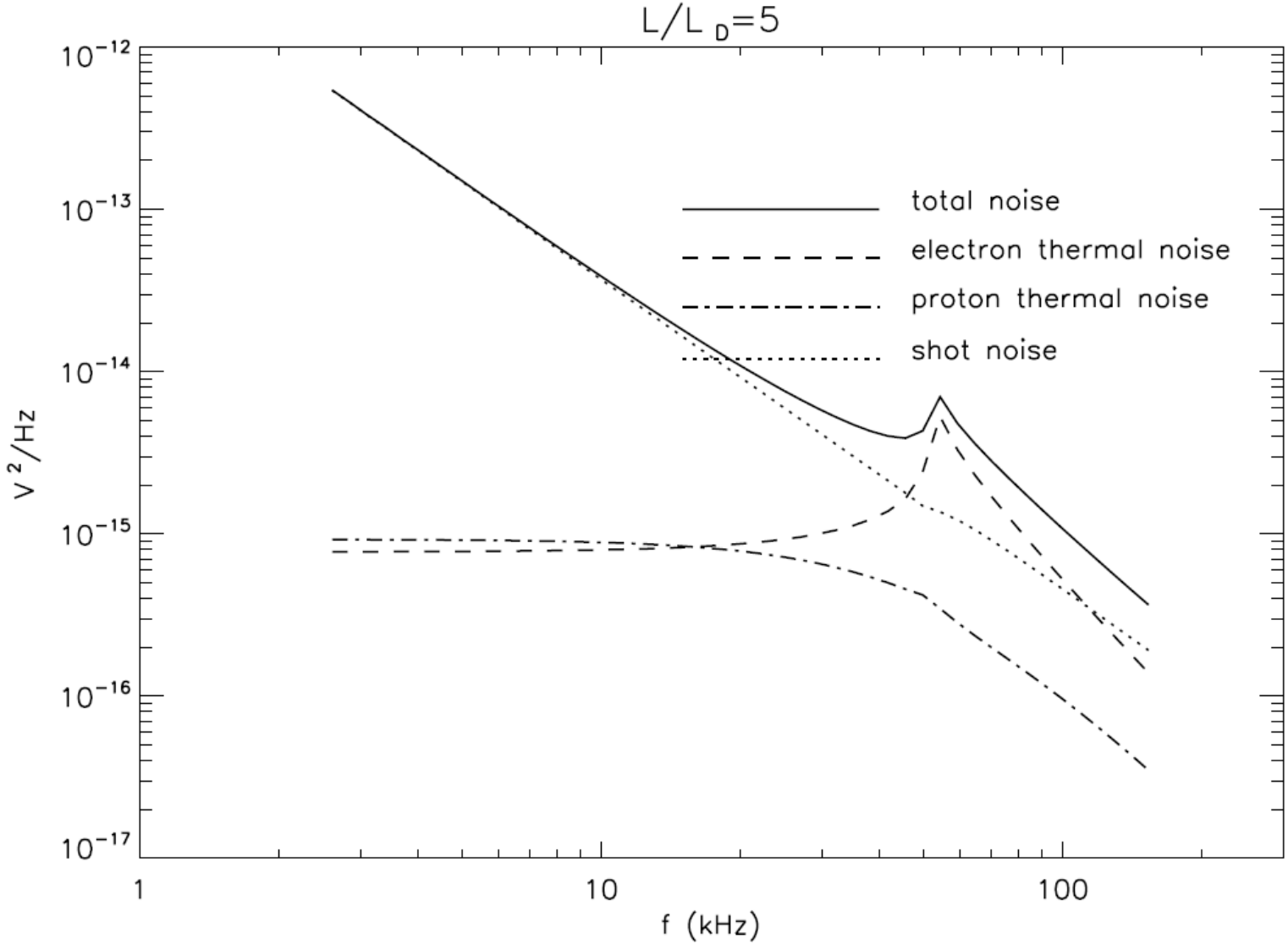


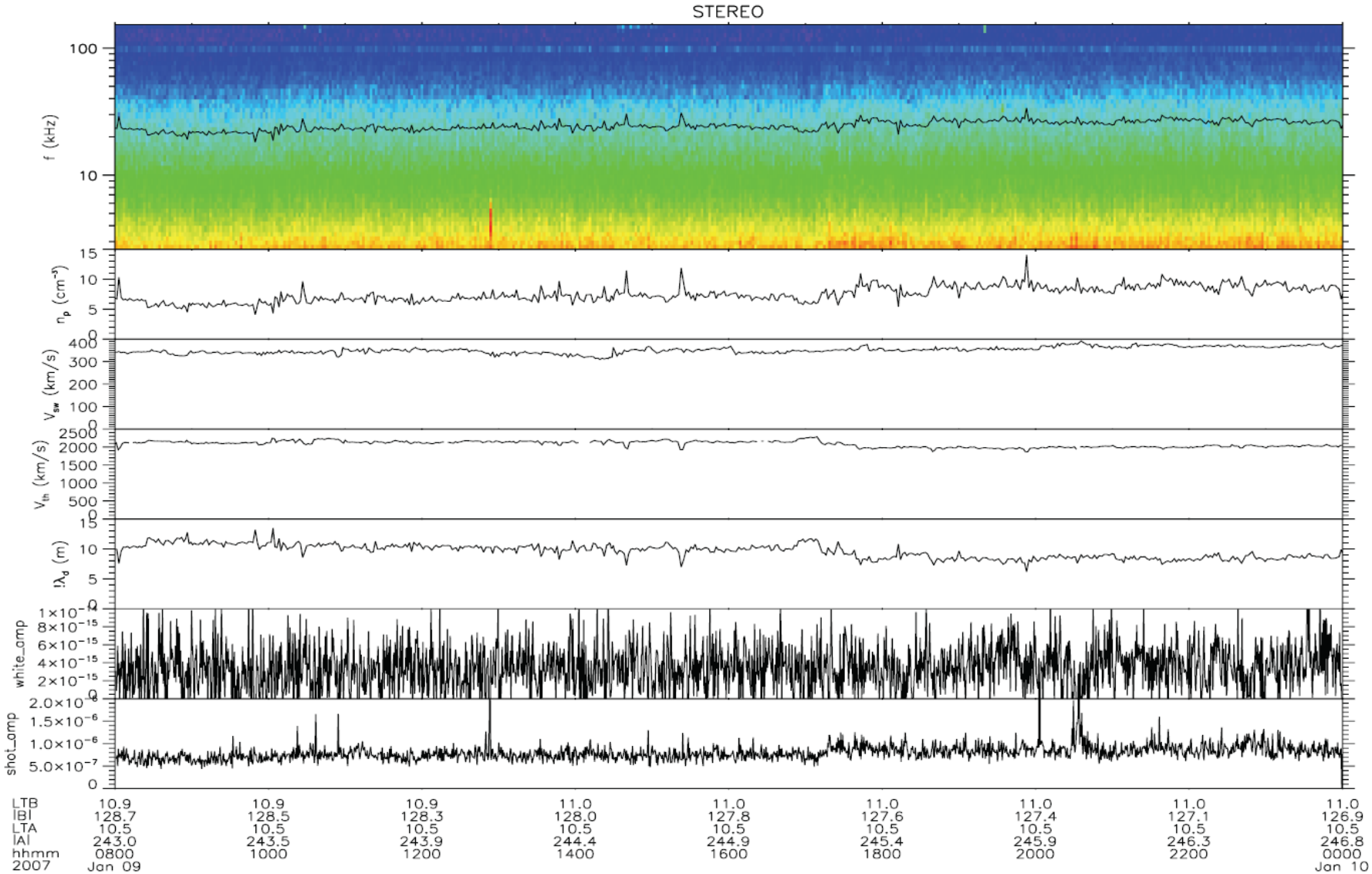
Need for antenna longer than the Debye length



The antenna is too short (we knew) but also too thick …




L/L D=5
total noise
electron thermal noise
proton thermal noise
shot noise
V 2/Hz
f (kHz)
10−12
10−13
10−14
10−15
10−16
10−17
1
10
100

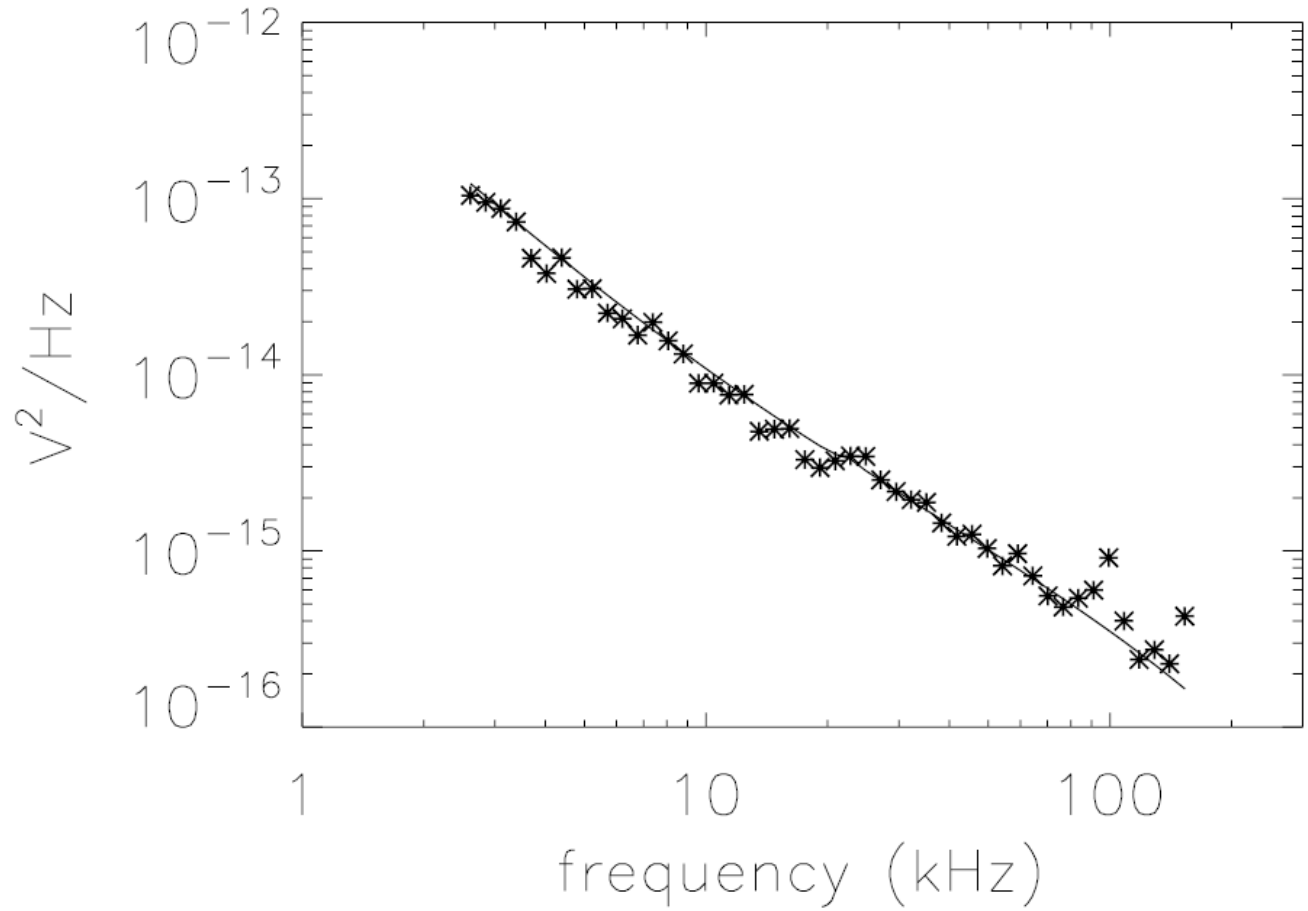

STEREO
f (kHz)
100
10
n_p (cm^{-3})
15
10
5
0
V_{sw} (km/s)
400
300
200
100
0
V_{th} (km/s)
2500
2000
1500
1000
500
0
λ_d (m)
15
10
5
0
white_amp
1×10^{-14}
8×10^{-15}
6×10^{-15}
4×10^{-15}
2×10^{-15}
0
shot_amp
2.0×10^{-6}
1.5×10^{-6}
1.0×10^{-6}
5.0×10^{-7}
0
LTB 10.9 10.9 10.9 11.0 11.0 11.0 11.0 11.0 11.0
|B| 128.7 128.5 128.3 128.0 127.8 127.6 127.4 127.1 126.9
LTA 10.5 10.5 10.5 10.5 10.5 10.5 10.5 10.5 10.5
|A| 243.0 243.5 243.9 244.4 244.9 245.4 245.9 246.3 246.8
hhmm 0800 1000 1200 1400 1600 1800 2000 2200 0000
2007 Jan 09 Jan 10

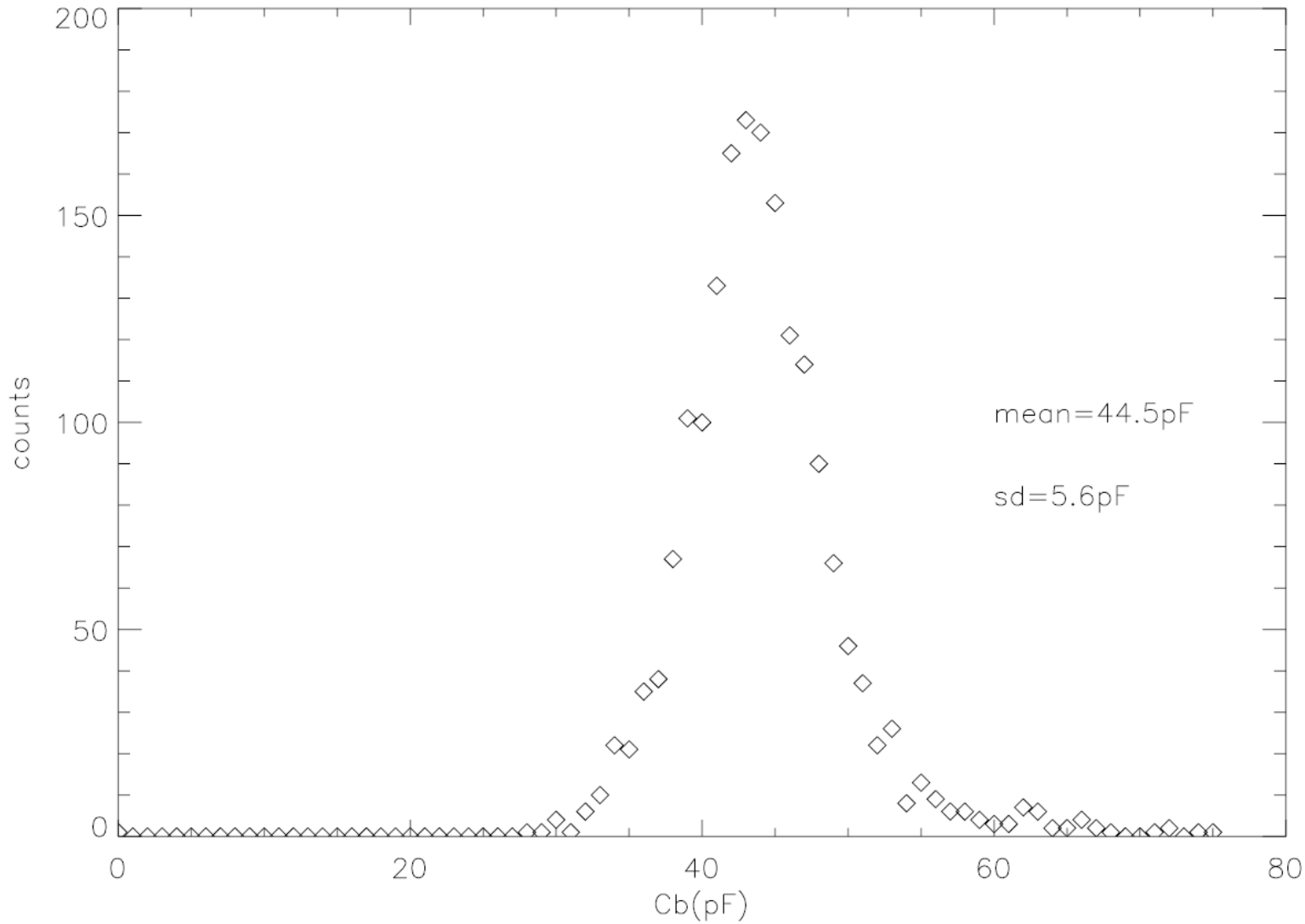
$$V_I^2 = 2e^2 N_e |Z|^2 \qquad N_e = (4\pi)^{-1/2} n_e v_{th} S$$

$$V_{obs}^2 = \frac{V_e^2 + V_p^2 + V_I^2}{\Gamma^2} \qquad \Gamma = \frac{Z_R + Z}{Z_R}$$

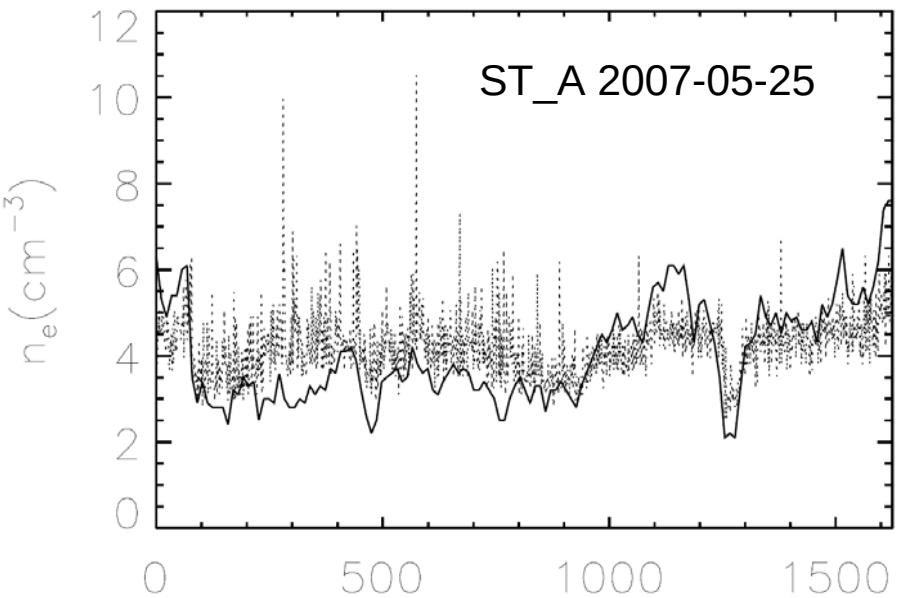
$$Z_R \approx \frac{1}{iC_b\omega} \qquad Z = R + \frac{1}{iC\omega}$$

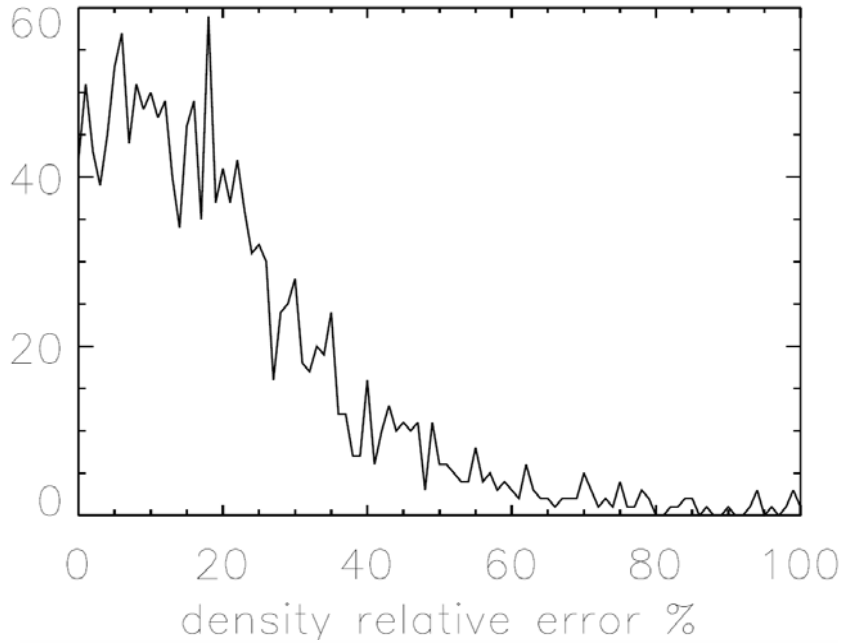
Determination of Cb, which is hard to model

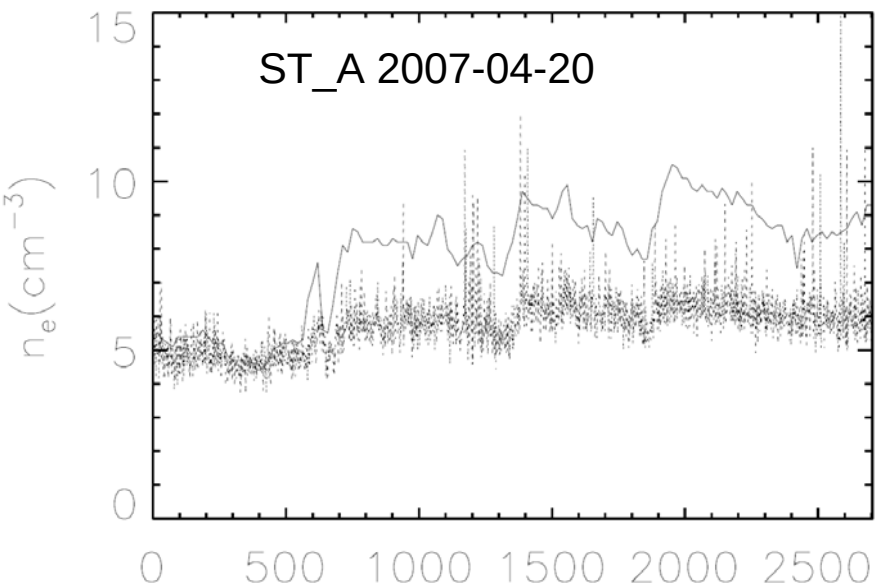

10^{-12}
10^{-13}
10^{-14}
10^{-15}
10^{-16}
V^2/Hz
1
10
100
frequency (kHz)

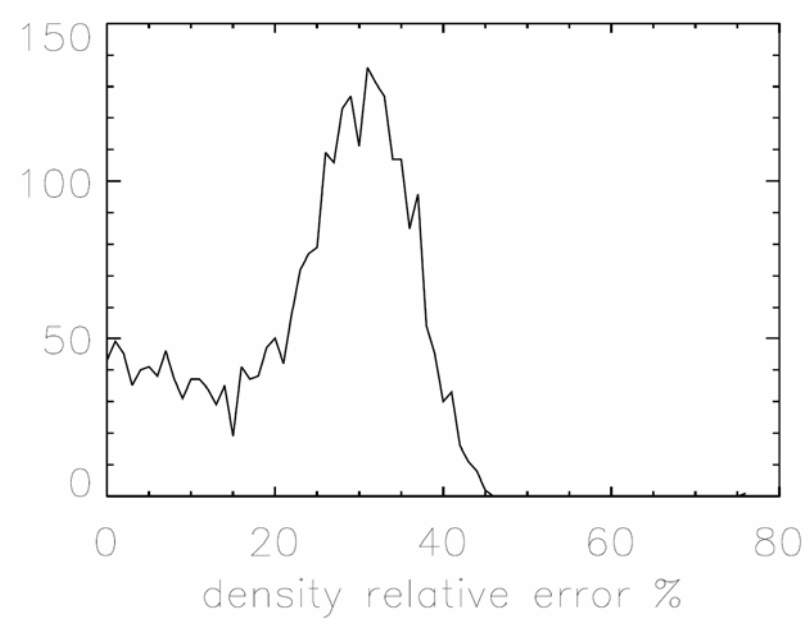

200
150
100
50
0
counts
0
20
40
60
80
Cb(pF)
mean=44.5pF
sd=5.6pF

Comparisons with Plastic Np









- Should remove the background
- Should compare with the antenna potential monitor
- Basically LFR could probably measure Ne with about 30 to 40 % accuracy and give a rough estimate of Te
- Tcore determination probably not possible with thermal noise because of shot noise