TEST REPORT

TRE19939

boom mic sensitivity measurements

Author(s): AKU
Version: 1D
Document status: APPROVAL
Approved by: AKU
Approve date:

CHANGELOG

Version	Approver(s)	Change Note

1 Purpose:

Measurements of different boom mic sensitivities and frequency responses.

2 Device Under Test (DUT)

Boom mics: All microphones with +1.5V power supply.

PELTOR electrec:

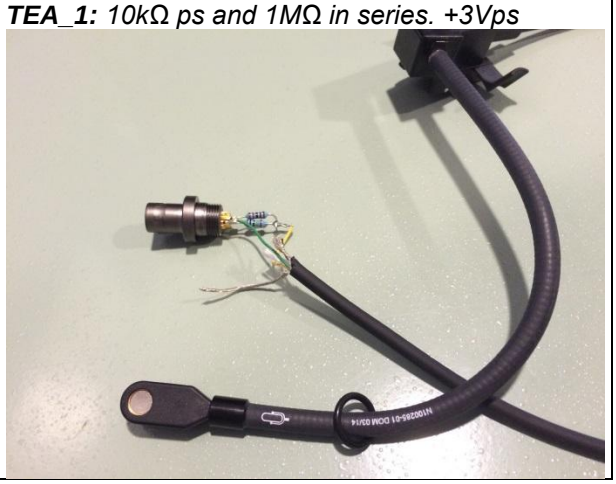
PELTOR dynamic:

MSA:

SELEX_1:

SELEX_2:

TEA_1: *10kΩ ps and 1MΩ in series. +3Vps*



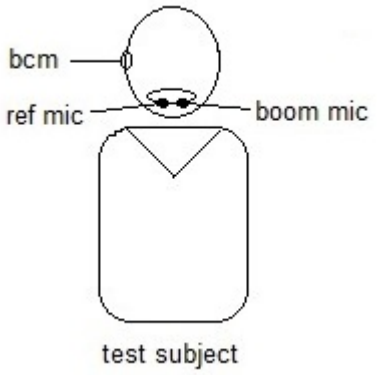
TEA_2:	***Knowles FB-EI-31552: 300Ω parallel.***
	

3 Equipment:

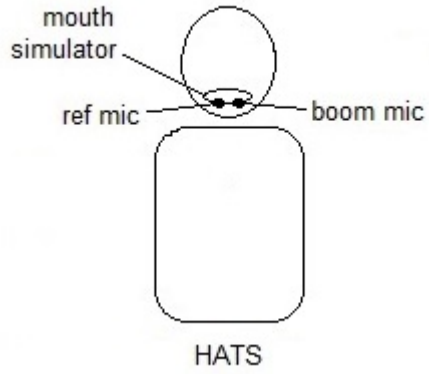
Akustik Lab equipment

4 How to perform it:

1st part:
The bcm output, reference microphone and boom mic (Peltor electrec) were recorded with 12 test subjects. Each test subject read a text for 60 seconds in his/her mother tongue. The wave file was recorded and the Frequency Response and Coherence are displayed.
Power supply for bcm and boom mic is +1.5V.



2nd part:
It is used a Pink Noise of 150mV rms with a frequency spam of 12.8kHz and playback it back in the mouth simulator of HATS. Then, the Frequency Response and Coherence of the reference microphone and different boom mics are displayed.

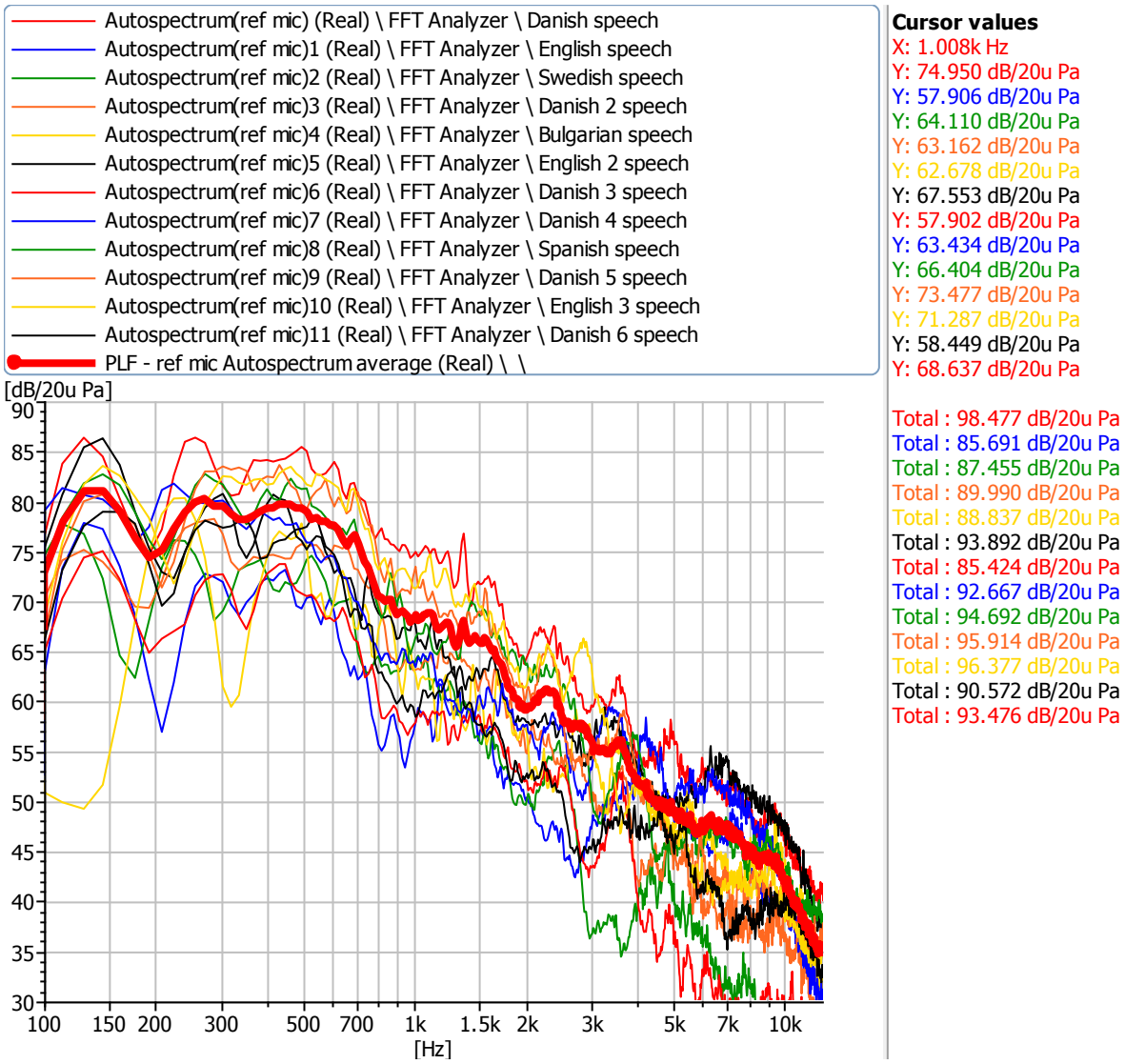

mouth
simulator
ref mic
boom mic
HATS

5 Result:

1st part: Speech of 12 Test subject:

- **Autospectrum**

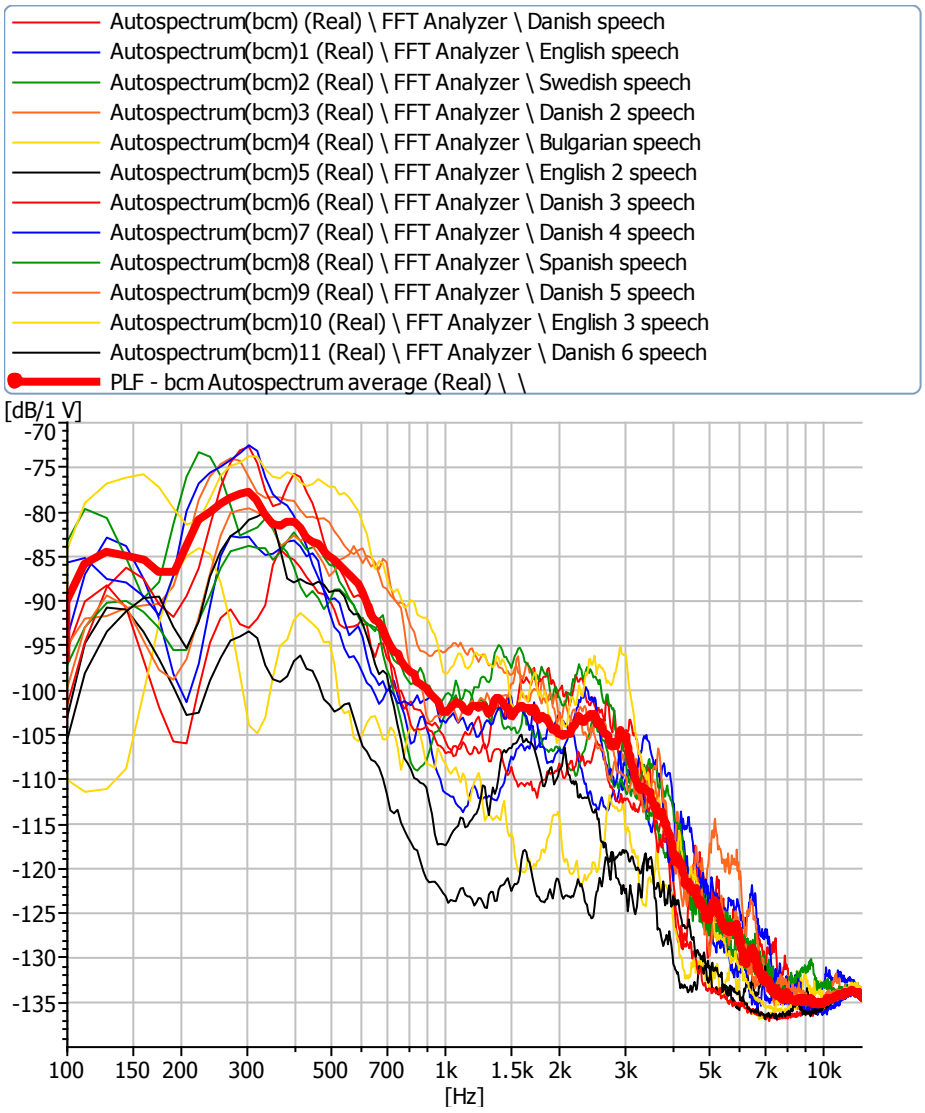
Ref Mic



Cursor values
X: 1.008k Hz
Y: 74.950 dB/20u Pa
Y: 57.906 dB/20u Pa
Y: 64.110 dB/20u Pa
Y: 63.162 dB/20u Pa
Y: 62.678 dB/20u Pa
Y: 67.553 dB/20u Pa
Y: 57.902 dB/20u Pa
Y: 63.434 dB/20u Pa
Y: 66.404 dB/20u Pa
Y: 73.477 dB/20u Pa
Y: 71.287 dB/20u Pa
Y: 58.449 dB/20u Pa
Y: 68.637 dB/20u Pa

Total : 98.477 dB/20u Pa
Total : 85.691 dB/20u Pa
Total : 87.455 dB/20u Pa
Total : 89.990 dB/20u Pa
Total : 88.837 dB/20u Pa
Total : 93.892 dB/20u Pa
Total : 85.424 dB/20u Pa
Total : 92.667 dB/20u Pa
Total : 94.692 dB/20u Pa
Total : 95.914 dB/20u Pa
Total : 96.377 dB/20u Pa
Total : 90.572 dB/20u Pa
Total : 93.476 dB/20u Pa

BCM response

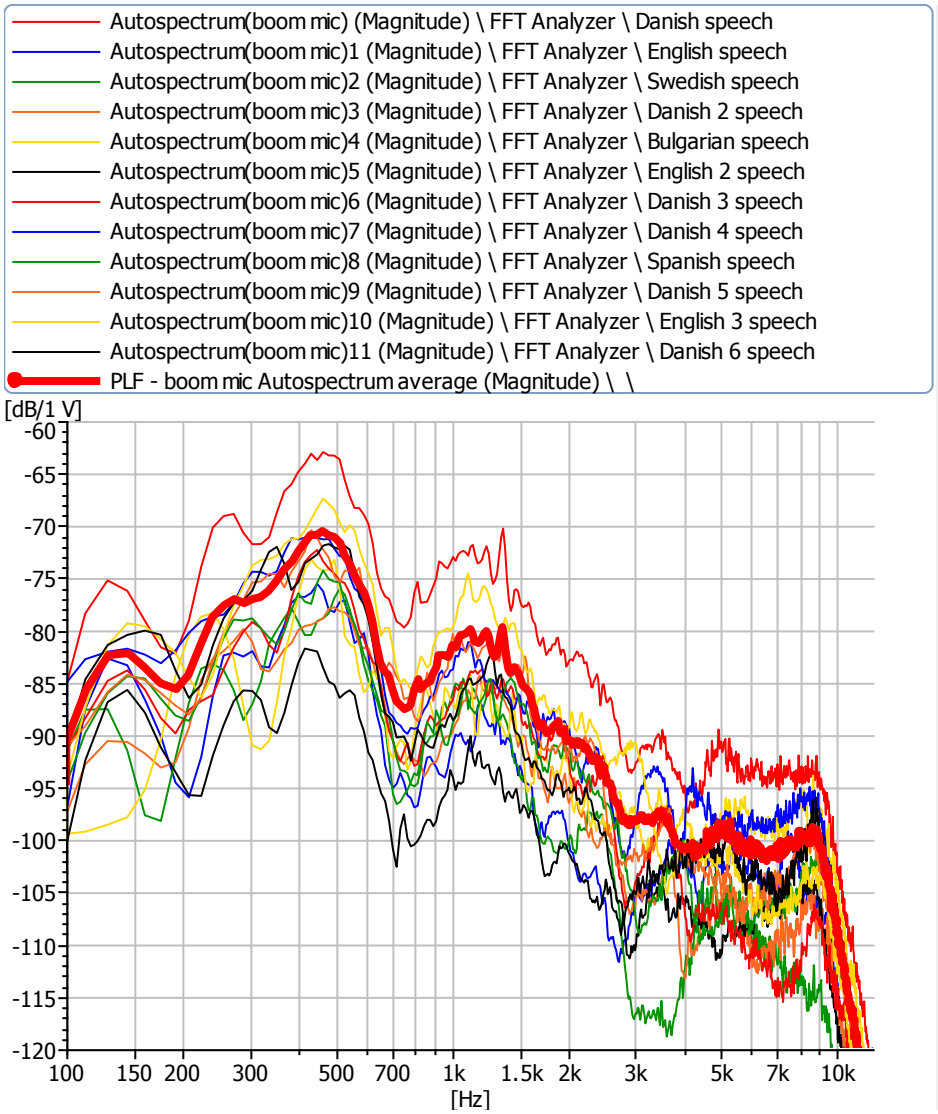


Cursor values

X: 1.008k Hz
Y: -105.870 dB/1 V
Y: -111.639 dB/1 V
Y: -102.705 dB/1 V
Y: -95.749 dB/1 V
Y: -108.343 dB/1 V
Y: -123.181 dB/1 V
Y: -107.174 dB/1 V
Y: -103.758 dB/1 V
Y: -100.594 dB/1 V
Y: -102.180 dB/1 V
Y: -98.308 dB/1 V
Y: -117.492 dB/1 V
Y: -102.560 dB/1 V

Total : -74.917 dB/1 V
Total : -71.571 dB/1 V
Total : -66.856 dB/1 V
Total : -65.304 dB/1 V
Total : -78.098 dB/1 V
Total : -81.930 dB/1 V
Total : -65.327 dB/1 V
Total : -65.347 dB/1 V
Total : -71.524 dB/1 V
Total : -69.087 dB/1 V
Total : -61.285 dB/1 V
Total : -72.327 dB/1 V
Total : -67.605 dB/1 V

PELTOR Boom Mic



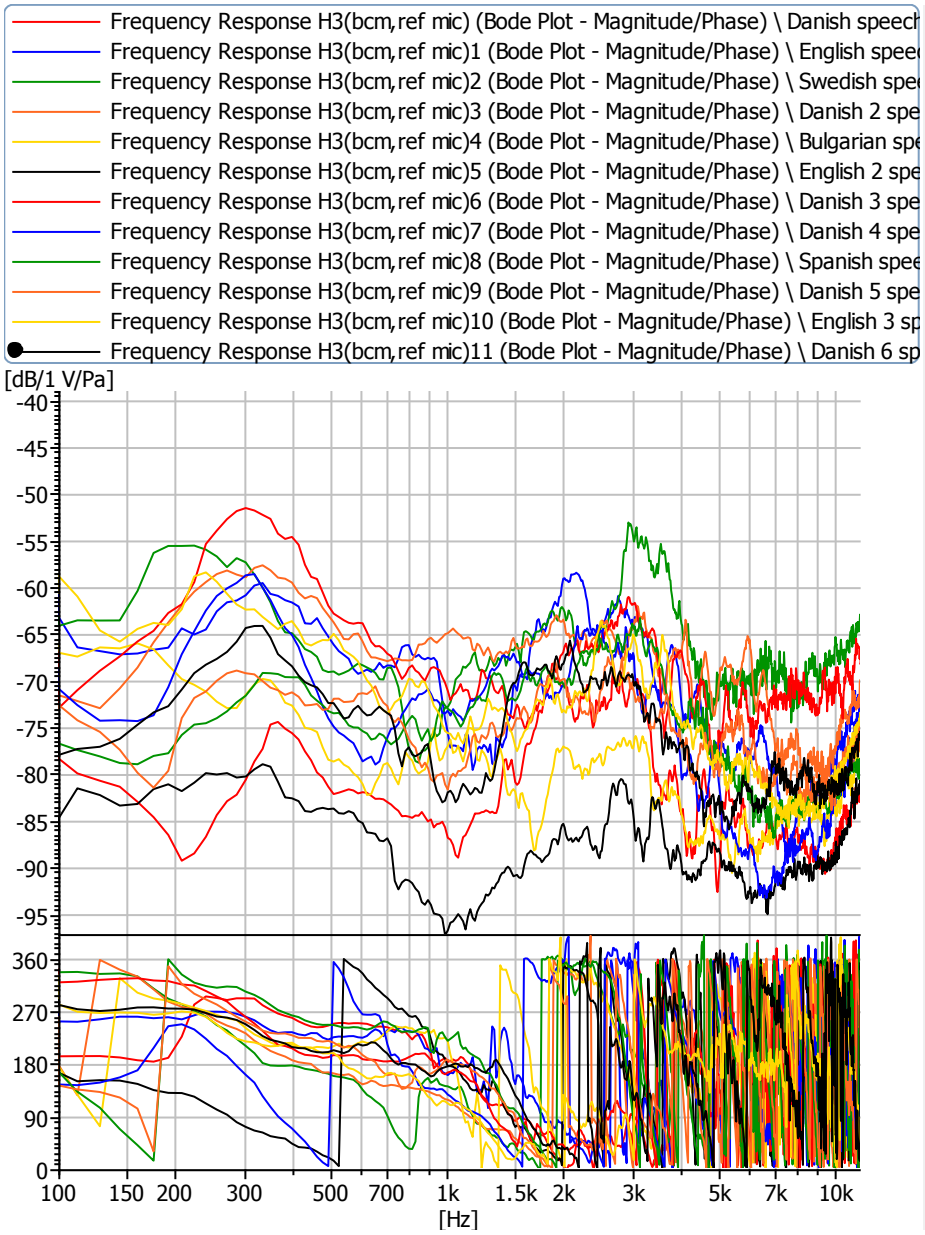
Cursor values

X: 1.008k Hz
Y: -72.981 dB/1 V
Y: -90.778 dB/1 V
Y: -85.843 dB/1 V
Y: -89.530 dB/1 V
Y: -86.789 dB/1 V
Y: -94.033 dB/1 V
Y: -86.614 dB/1 V
Y: -83.736 dB/1 V
Y: -88.802 dB/1 V
Y: -80.328 dB/1 V
Y: -79.624 dB/1 V
Y: -88.571 dB/1 V
Y: -81.413 dB/1 V

Total : -52.395 dB/1 V
Total : -65.812 dB/1 V
Total : -66.243 dB/1 V
Total : -66.147 dB/1 V
Total : -63.911 dB/1 V
Total : -71.439 dB/1 V
Total : -63.142 dB/1 V
Total : -60.042 dB/1 V
Total : -64.304 dB/1 V
Total : -60.703 dB/1 V
Total : -57.352 dB/1 V
Total : -61.060 dB/1 V
Total : -59.892 dB/1 V

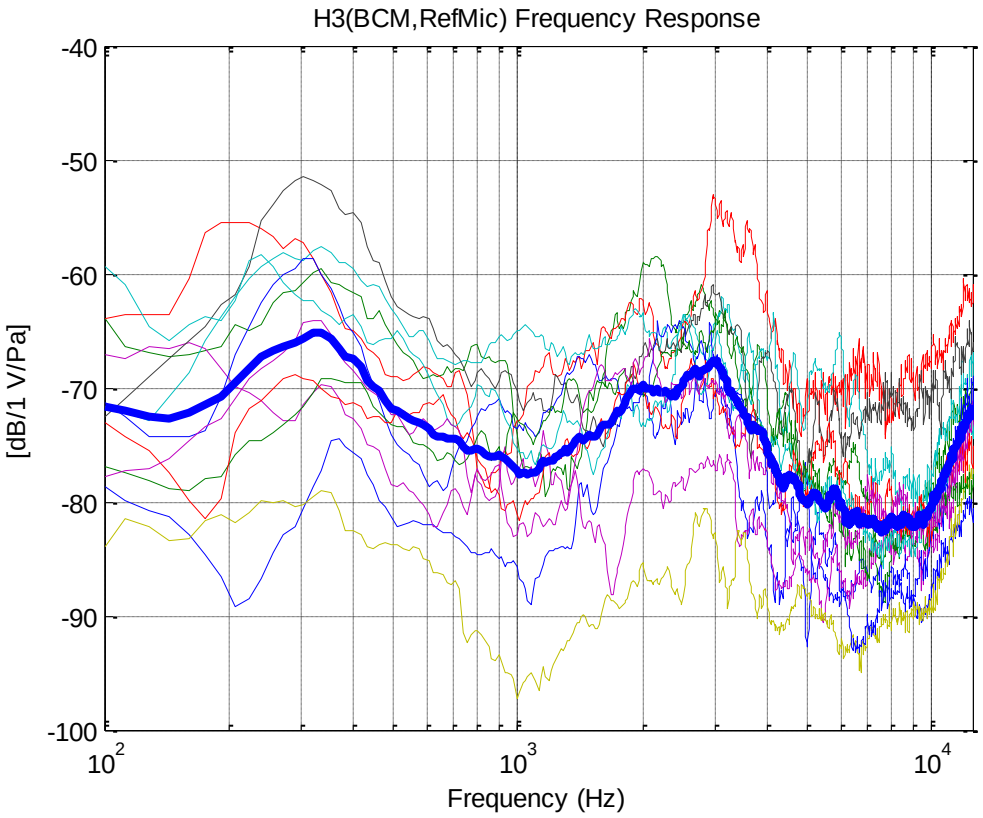
- **Frequency Response & Coherence**

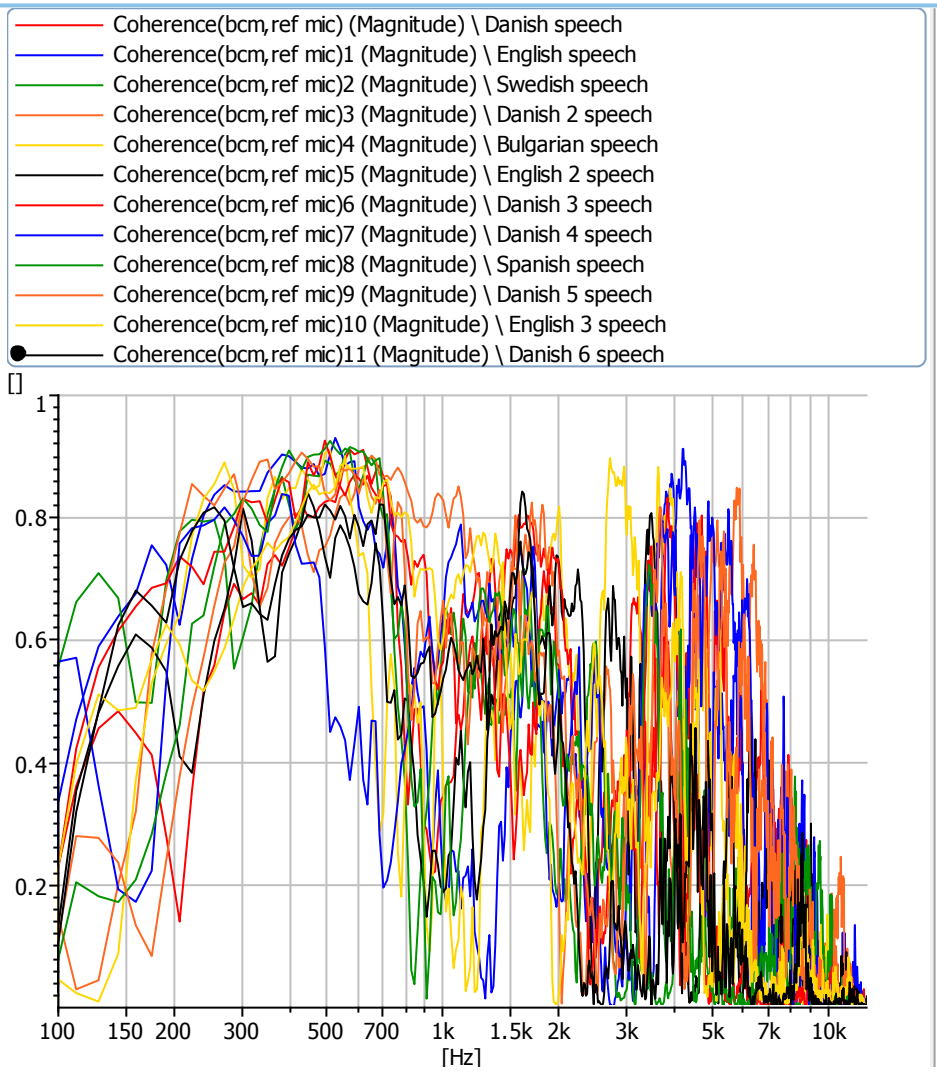
BCM and Ref Mic



Cursor values
X: 1.008k Hz
Y(Mg):-86.841 dB/1 V/Pa
Y(Mg):-75.565 dB/1 V/Pa
Y(Mg):-72.836 dB/1 V/Pa
Y(Mg):-64.932 dB/1 V/Pa
Y(Mg):-77.042 dB/1 V/Pa
Y(Mg):-96.754 dB/1 V/Pa
Y(Mg):-71.097 dB/1 V/Pa
Y(Mg):-73.213 dB/1 V/Pa
Y(Mg):-73.019 dB/1 V/Pa
Y(Mg):-81.677 dB/1 V/Pa
Y(Mg):-75.616 dB/1 V/Pa
Y(Mg):-81.962 dB/1 V/Pa
y(Ph):183.279 degrees
y(Ph):160.803 degrees
y(Ph):141.559 degrees
y(Ph):118.628 degrees
y(Ph):218.252 degrees
y(Ph):176.097 degrees
y(Ph):165.410 degrees
y(Ph):127.502 degrees
y(Ph):219.424 degrees
y(Ph):187.020 degrees
y(Ph):112.508 degrees
y(Ph):175.866 degrees

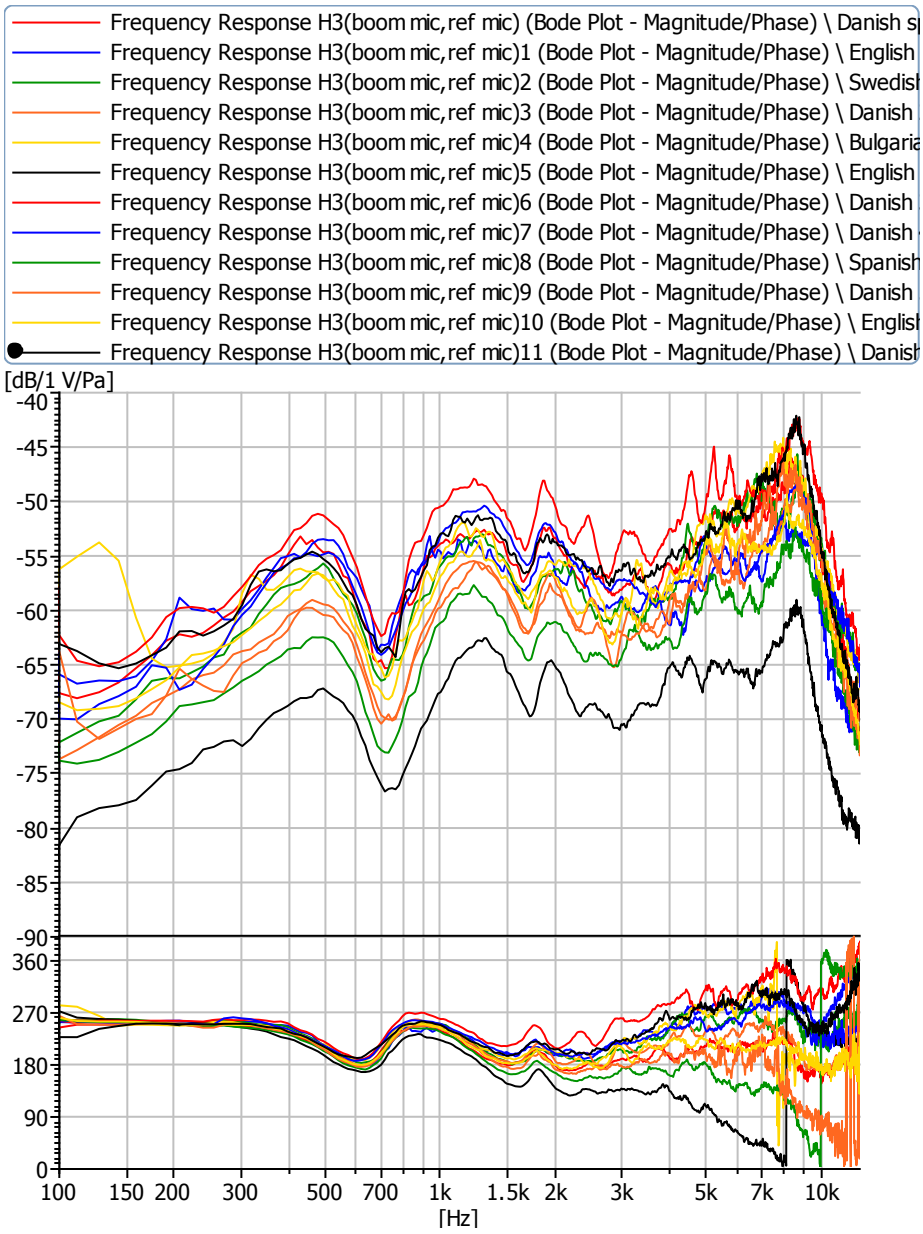
The following graph display the same frequency response H3 (bcm, refmic) with the mean value.





Cursor values
X: 1.008k Hz
Y: 0.344
Y: 0.199
Y: 0.618
Y: 0.827
Y: 0.367
Y: 0.187
Y: 0.564
Y: 0.642
Y: 0.230
Y: 0.663
Y: 0.602
Y: 0.536

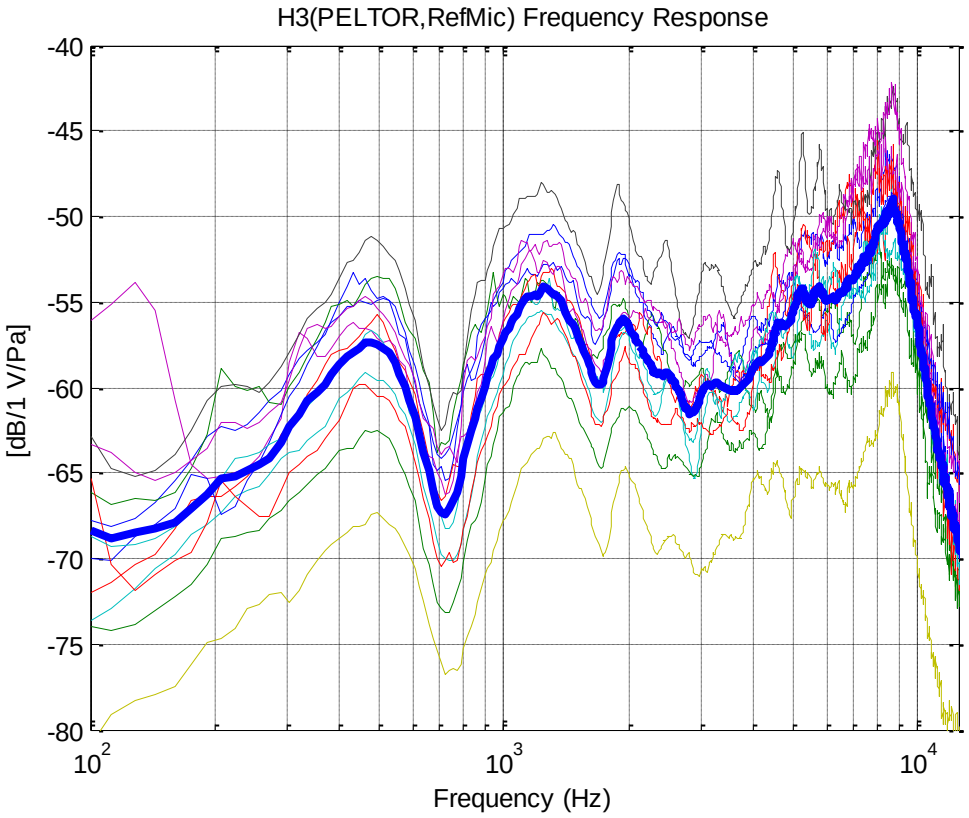
PELTOR Boom Mic and Ref Mic

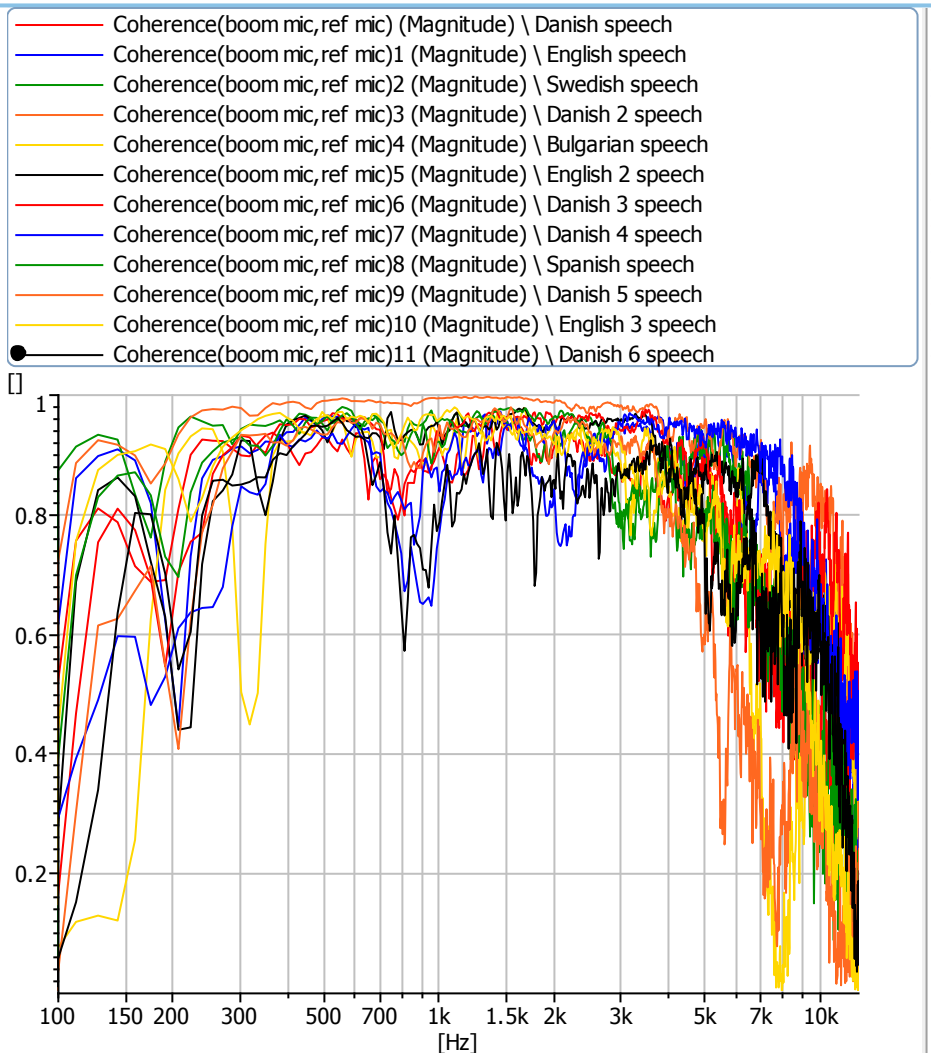


Cursor values

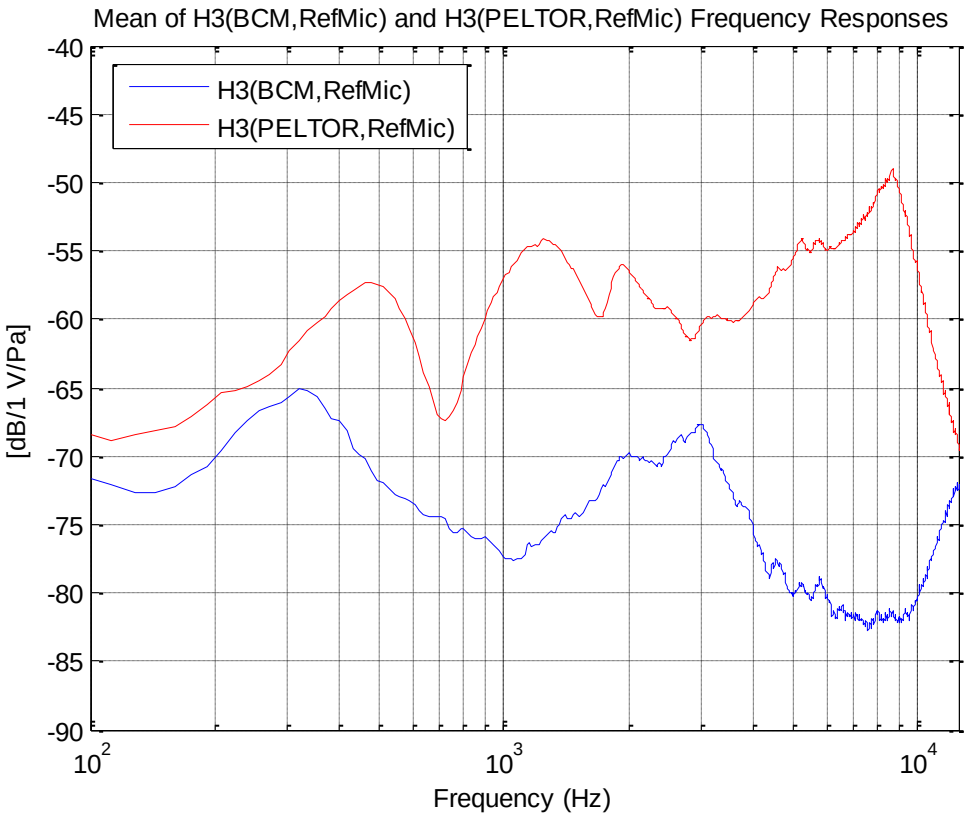
X: 1.008k Hz
Y(Mg):-53.952 dB/1 V/Pa
Y(Mg):-54.705 dB/1 V/Pa
Y(Mg):-55.973 dB/1 V/Pa
Y(Mg):-58.713 dB/1 V/Pa
Y(Mg):-55.488 dB/1 V/Pa
Y(Mg):-67.607 dB/1 V/Pa
Y(Mg):-50.537 dB/1 V/Pa
Y(Mg):-53.190 dB/1 V/Pa
Y(Mg):-61.227 dB/1 V/Pa
Y(Mg):-59.825 dB/1 V/Pa
Y(Mg):-56.931 dB/1 V/Pa
Y(Mg):-53.040 dB/1 V/Pa
y(Ph):236.126 degrees
y(Ph):242.732 degrees
y(Ph):248.081 degrees
y(Ph):246.257 degrees
y(Ph):243.294 degrees
y(Ph):220.248 degrees
y(Ph):256.737 degrees
y(Ph):248.476 degrees
y(Ph):234.385 degrees
y(Ph):239.692 degrees
y(Ph):240.763 degrees
y(Ph):246.265 degrees

The following graph display the same frequency response H3 (boom mic, refmic) with the mean value.




Coherence(boom mic,ref mic) (Magnitude) \ Danish speech
Coherence(boom mic,ref mic)1 (Magnitude) \ English speech
Coherence(boom mic,ref mic)2 (Magnitude) \ Swedish speech
Coherence(boom mic,ref mic)3 (Magnitude) \ Danish 2 speech
Coherence(boom mic,ref mic)4 (Magnitude) \ Bulgarian speech
Coherence(boom mic,ref mic)5 (Magnitude) \ English 2 speech
Coherence(boom mic,ref mic)6 (Magnitude) \ Danish 3 speech
Coherence(boom mic,ref mic)7 (Magnitude) \ Danish 4 speech
Coherence(boom mic,ref mic)8 (Magnitude) \ Spanish speech
Coherence(boom mic,ref mic)9 (Magnitude) \ Danish 5 speech
Coherence(boom mic,ref mic)10 (Magnitude) \ English 3 speech
Coherence(boom mic,ref mic)11 (Magnitude) \ Danish 6 speech
[]
1
0.8
0.6
0.4
0.2
100
150
200
300
500
700
1k
1.5k
2k
3k
5k
7k
10k
[Hz]
Cursor values
X: 1.008k Hz
Y: 0.911
Y: 0.770
Y: 0.955
Y: 0.993
Y: 0.919
Y: 0.940
Y: 0.930
Y: 0.837
Y: 0.920
Y: 0.948
Y: 0.959
Y: 0.786

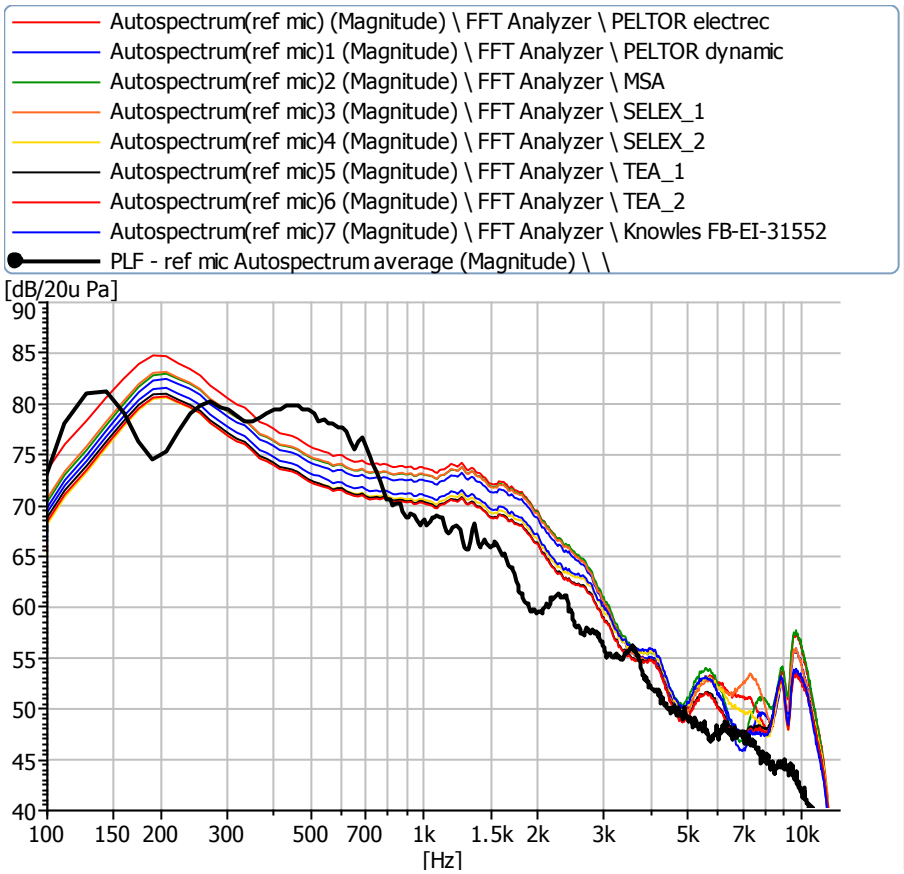
Comparison of mean value of BCM and PELTOR frequency responses



2nd part: Pink Noise through mouth simulator of HATS

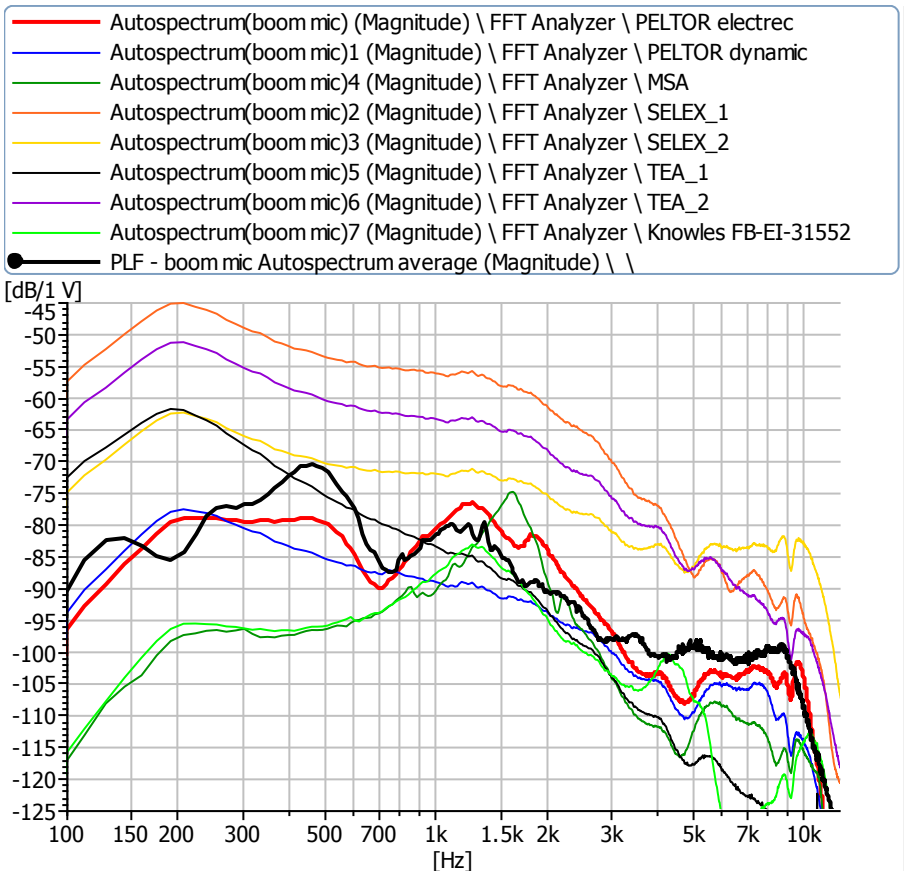
- **Autospectrum**

Ref Mic



The total energy of the average ref mic of 12 test subjects is *93.476 dBspl* (black curve) and the ref mic using Pink Noise of 150m Vrms through the mouth simulator of HATS is in average *93.352 dBspl*, which gives almost the same value.
There is a spread of the curves measured due to proximity effect of boom mic and ref mic.

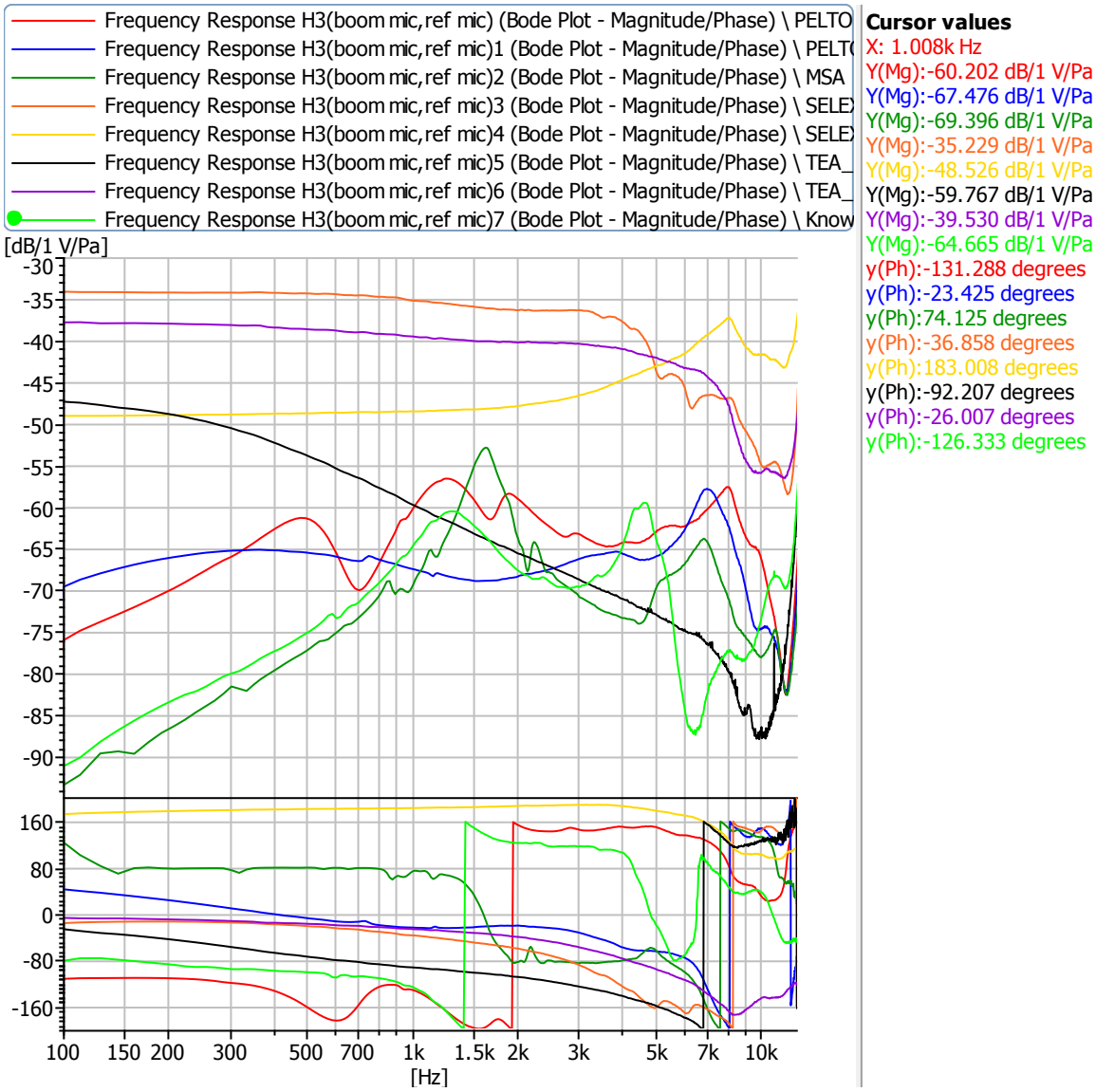
Boom mics

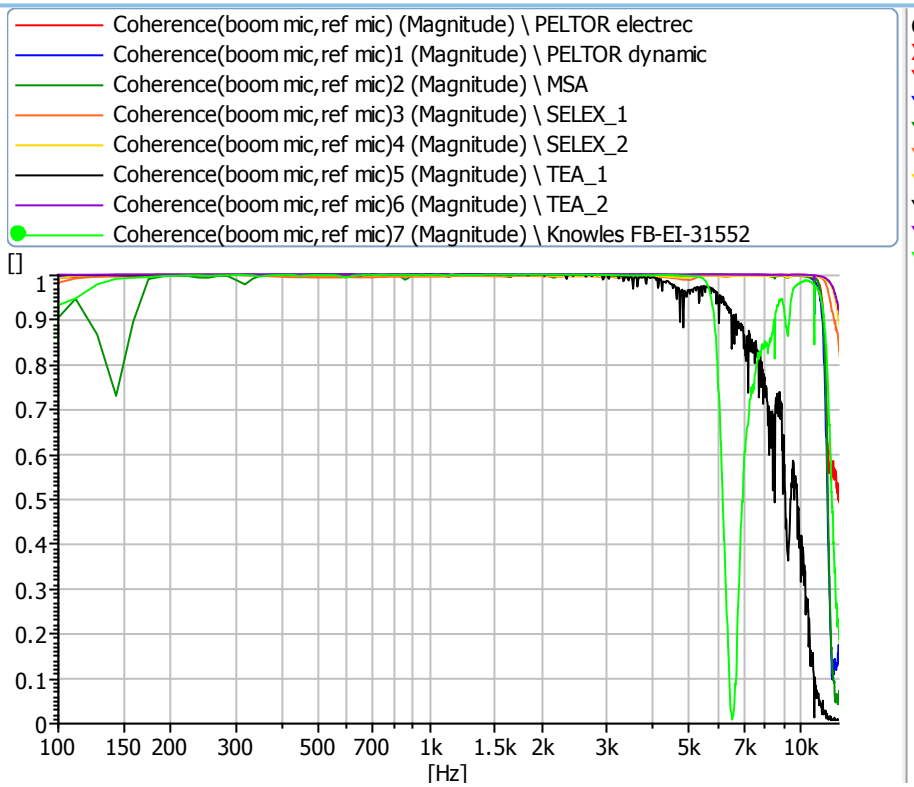


The total energy of the average PELTOR boom mic of 12 test subjects is *-59.892 dBV* (black curve) and the Pink Noise at 180m Vrms throught the mouth simulator of HATS using the same PELTOR boom mic is *-61.233 dBV* (red curve), given as a result a difference of *-1.3 dB*.

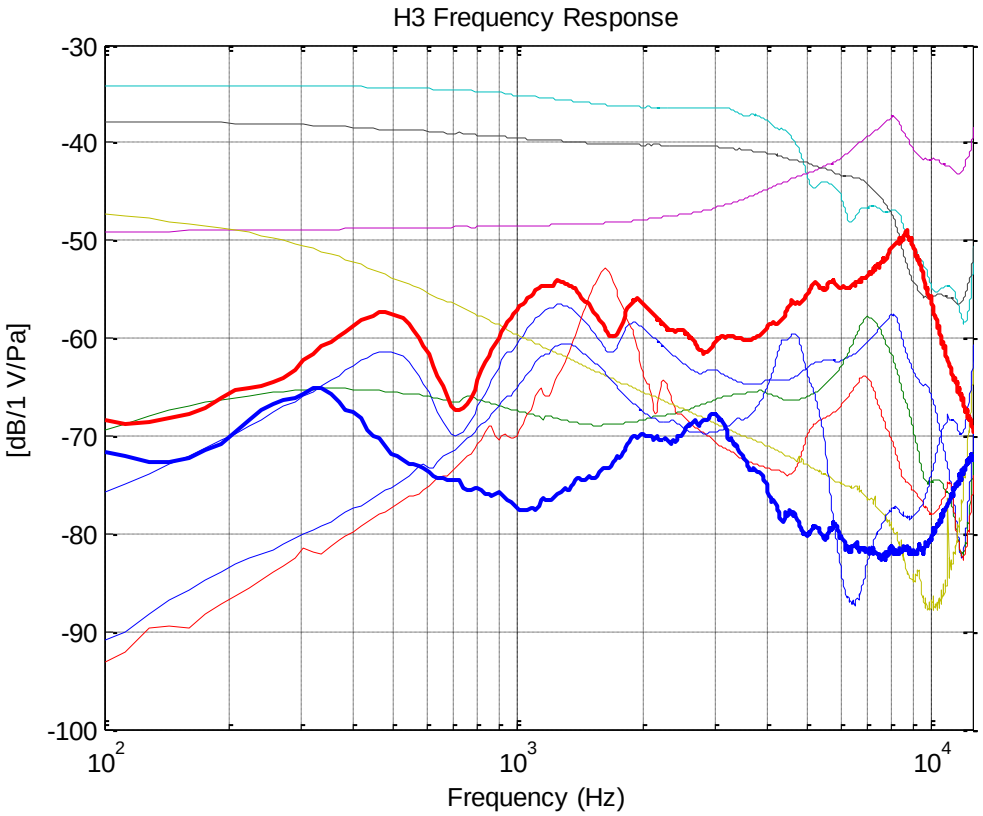
- **Frequency Response & Coherence**

Boom mics





Comparison of mean value of BCM and PELTOR frequency responses with test subjects and Boom mics using HATS.



blue curve is H3(BCM,RefMic), and red curve is H3(PELTOR,RefMic).

***note*: Data of the above curves is in the Test Report folder.**

6 Conclusion:

The best way to measure the sensitivity of unknown microphones and compared to the BCM is to use speech and measure the bcm and the boom mic at the same time. However, it cannot be always be used test subject for this type of measurements.
A very close approximation is to use Pink Noise at 150m Vrms through the mouth simulator of HATS. The total energy in the frequency range of 12.8kHz gives almost the same value than using speech. This gives as a result a well-known and ready available way to measure the sensitivity of unknown boom mics.