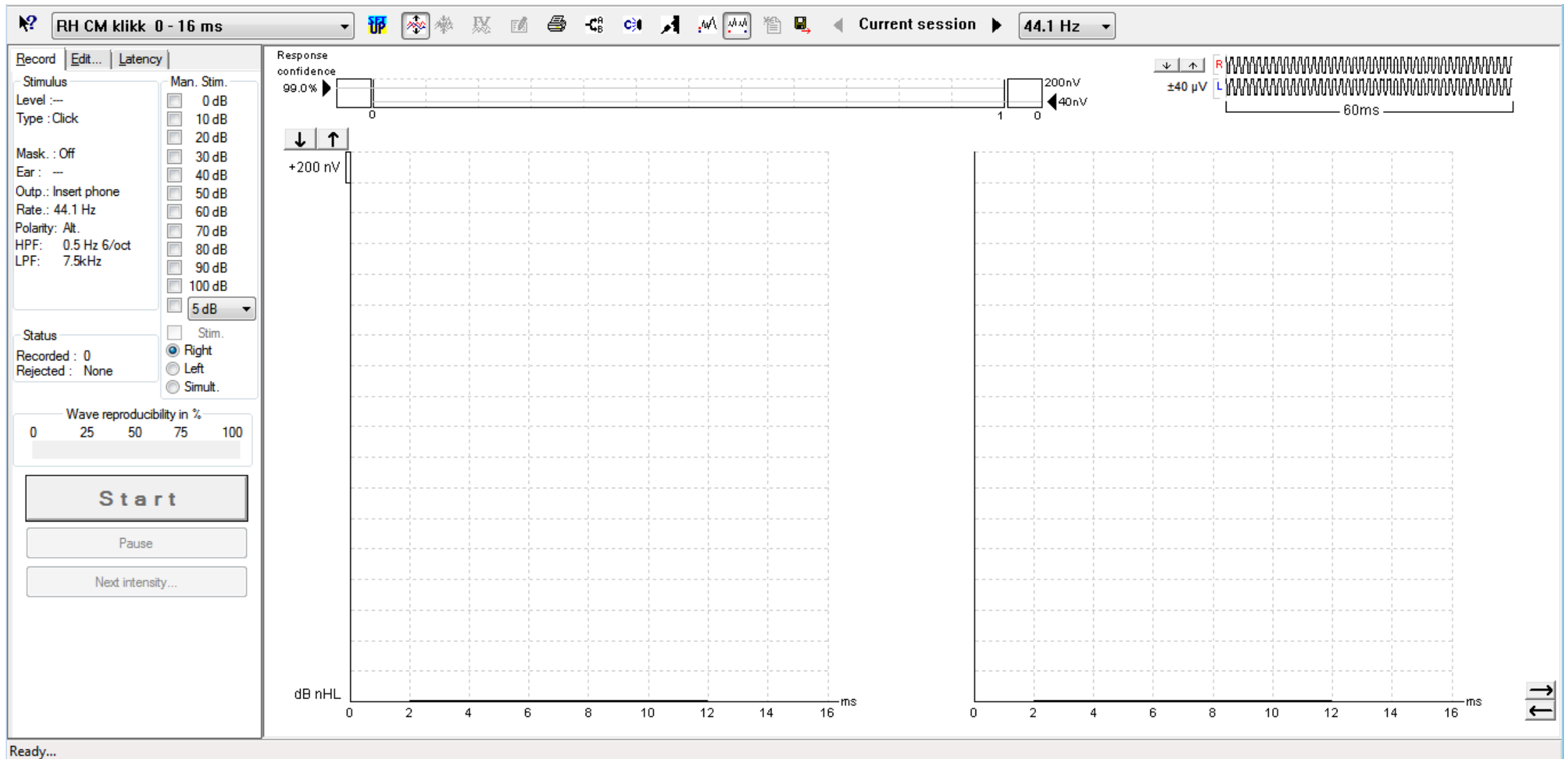


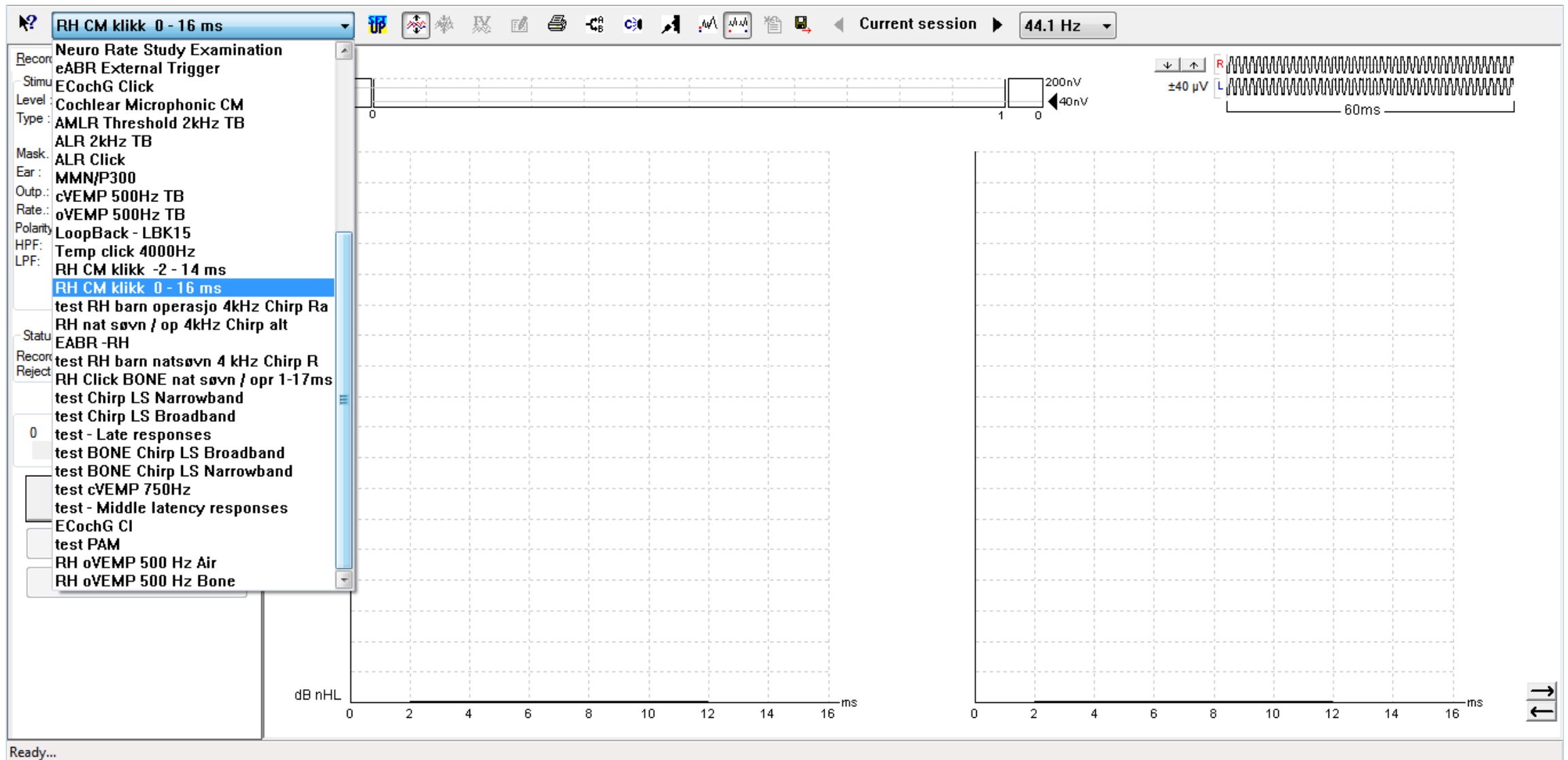
ABR-protokoller/innstillinger

Torquil Macdonald Sørensen
Audiofysiker ved OUS Rikshospitalet

Interacoustics Eclipse



Interacoustics Eclipse



Stimulustype

The image shows a screenshot of the 'Temporary Protocol Setup' dialog box in a software application. A red circle highlights the 'Stimulus properties' section. Within this section, the 'Stimulus type' dropdown menu is open, showing options: 'Click', 'Click', 'Tone Burst', 'NB CE-Chirp®', and 'CE-Chirp®'. The 'Click' option is selected. Other settings in the 'Stimulus properties' section include 'Burst' (Manual), 'Frequency' (1 kHz), 'Rise/Fall' (Sine waves), and 'Plateau'.

The dialog box is titled 'Temporary Protocol Setup' and contains several sections:

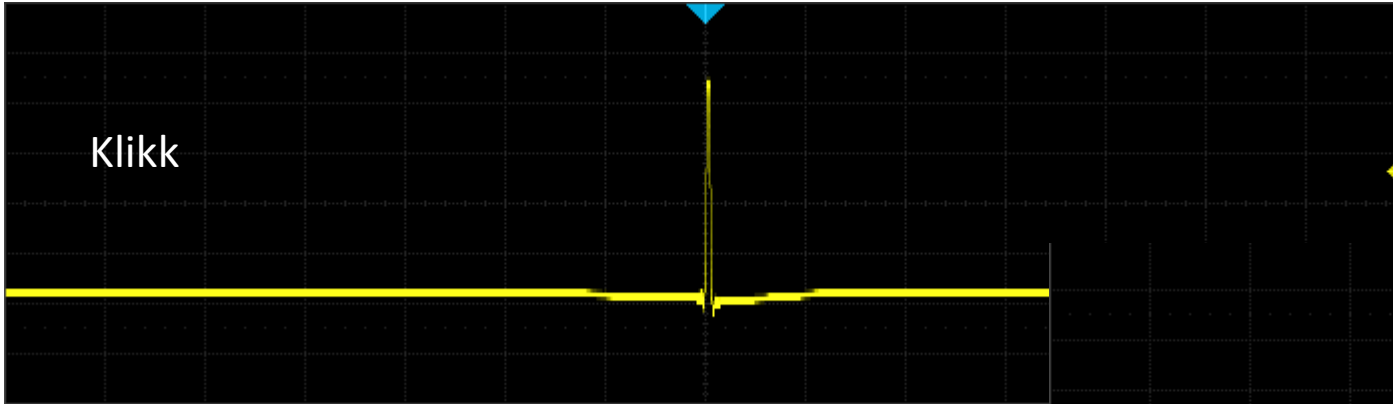
- Type of measurement:** ABR-30
- Printer wizard...** button
- Stimulus properties:** Stimulus type (Click), Burst (Manual), Frequency (1 kHz), Rise/Fall (Sine waves), Plateau.
- Intensity:** On: [checkboxes], Level (0, 10, 20, 30, 40, 50, 60, 70, 80, 90, 100 dB nHL), Times (1, 1, 1, 1, 1, 1, 1, 1, 1, 1), Ascend, Descend, Soft attenuator.
- Filter properties:** Filter settings for input amp (Low pass: 4000 Hz, High pass: 100 Hz 12/oct), Preliminary display settings (Low pass: 4000 Hz, High pass: None).
- Display properties:** Display (Auto arrange during test, Show stim rate, Show stim freq., Split screen, Show polarity), Single Curve (On, Latency Templates), Volt/div response curve (200nV), Gain info on raw EEG (Off), Baseline method (Original).
- Stimulus ear:** Insert phone, Left, Right, Binaural Stim., Masking (Masking level method: Relative, Masking offset: -40 dB), Stimulus type (WN), Masking in ipsi.
- Recording properties:** Stop criteria, Number of stimuli, Response confidence (Detection=99% (Fmp=), Residual Noise Target Level (40nV), Fmp range (Manual), Recording (Begin at: -0.0 ms), Rejection Level (±40 µV (92 dB)), Advanced... button.
- Optimize recording:** Bayesian weighting, Minimize interference.
- Wave Repro:** From: 2.0 ms, To: 12.0 ms.
- Research availability:** Destination (Application Data\Logs\), Log.

Buttons at the bottom: OK, Cancel.

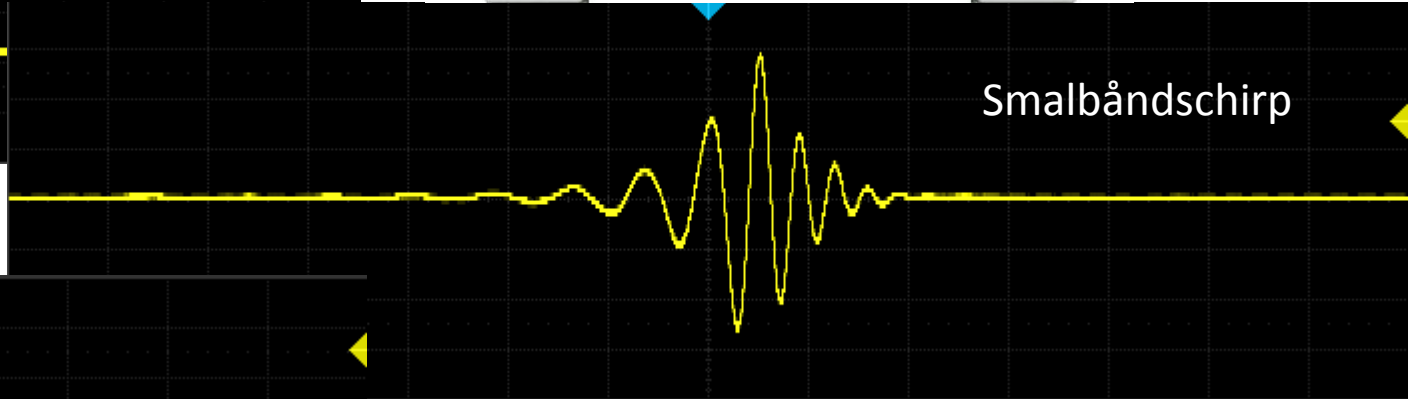
Stimulustype – elektriske målinger



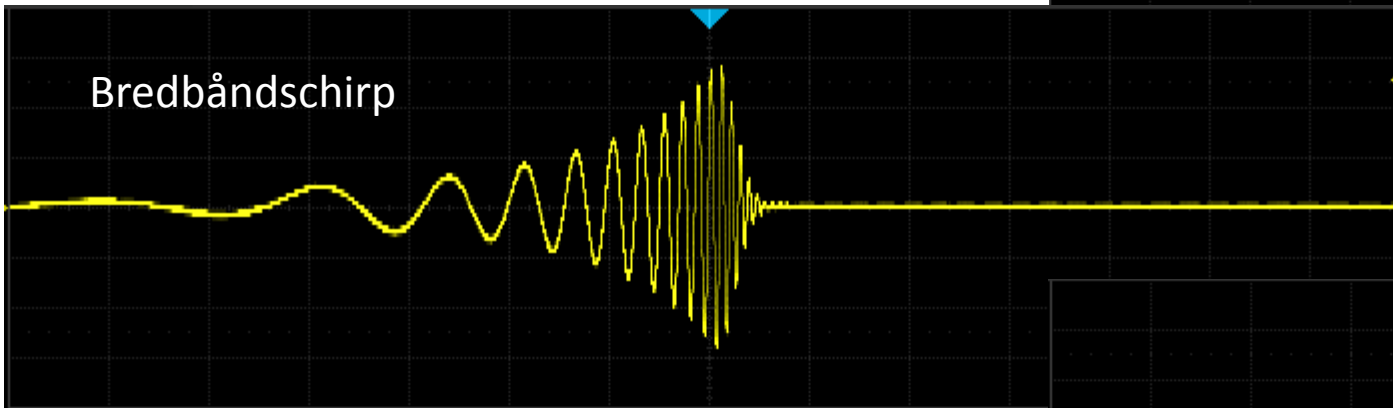
Klikk



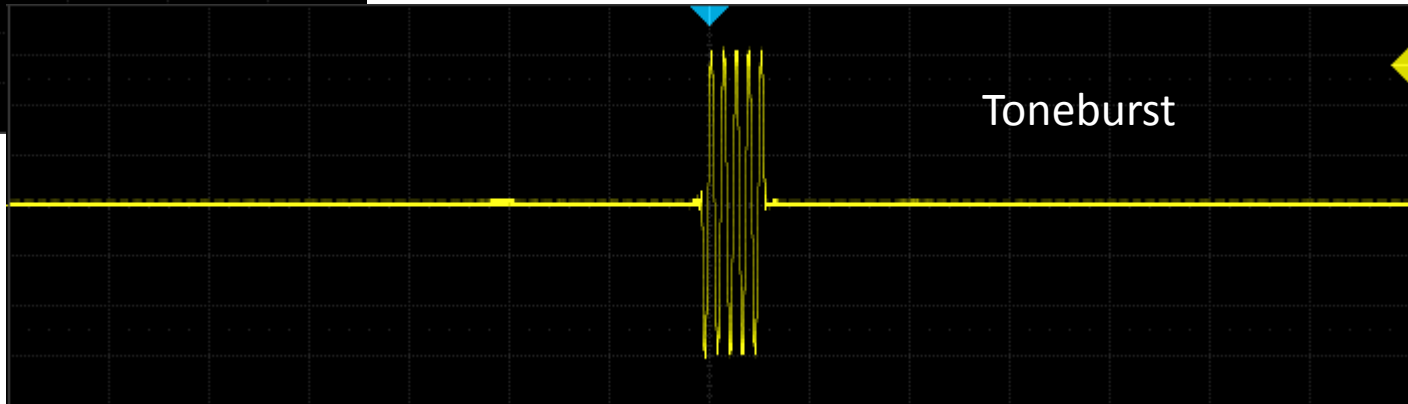
Smalbåndschirp



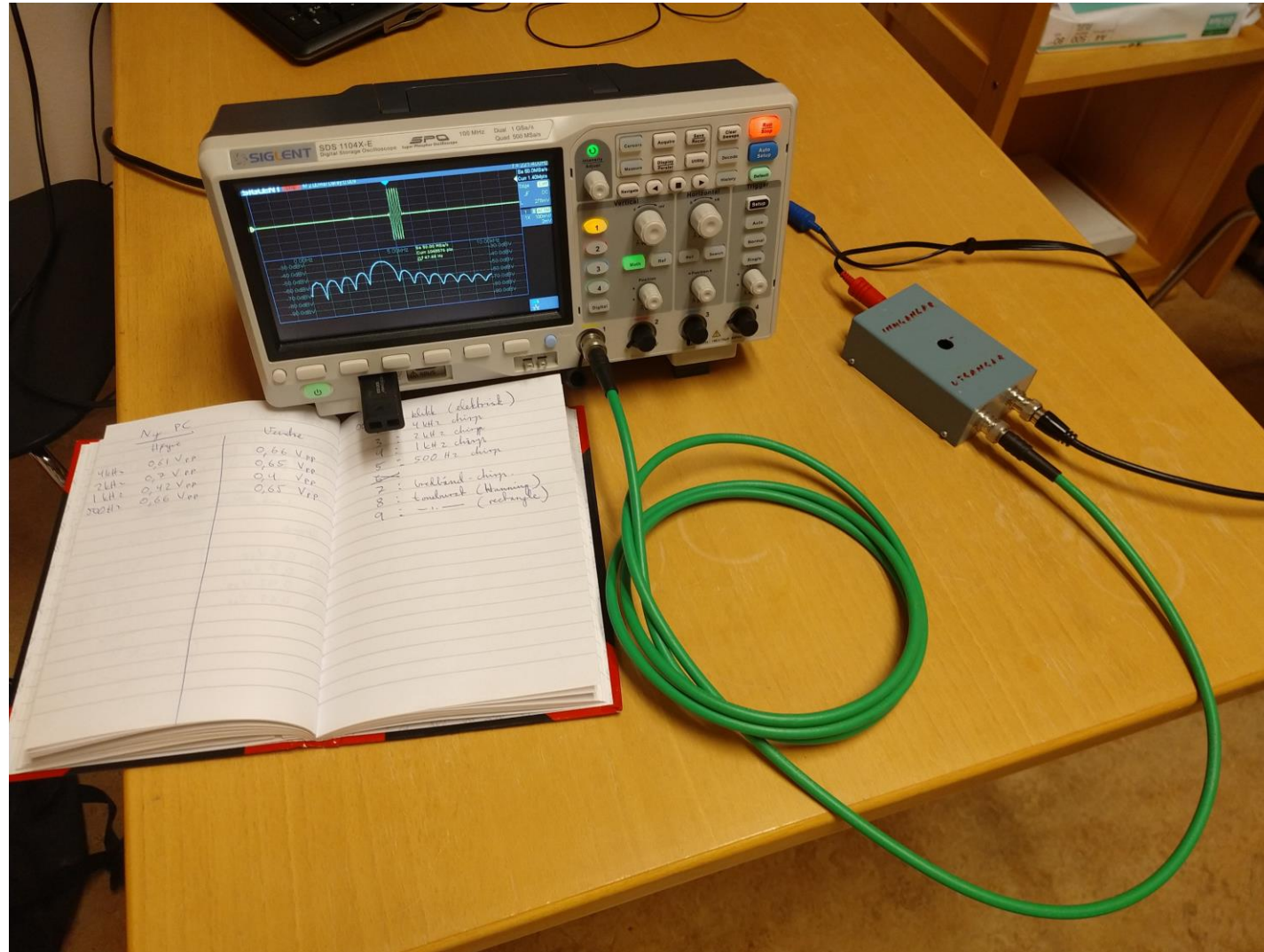
Bredbåndschirp



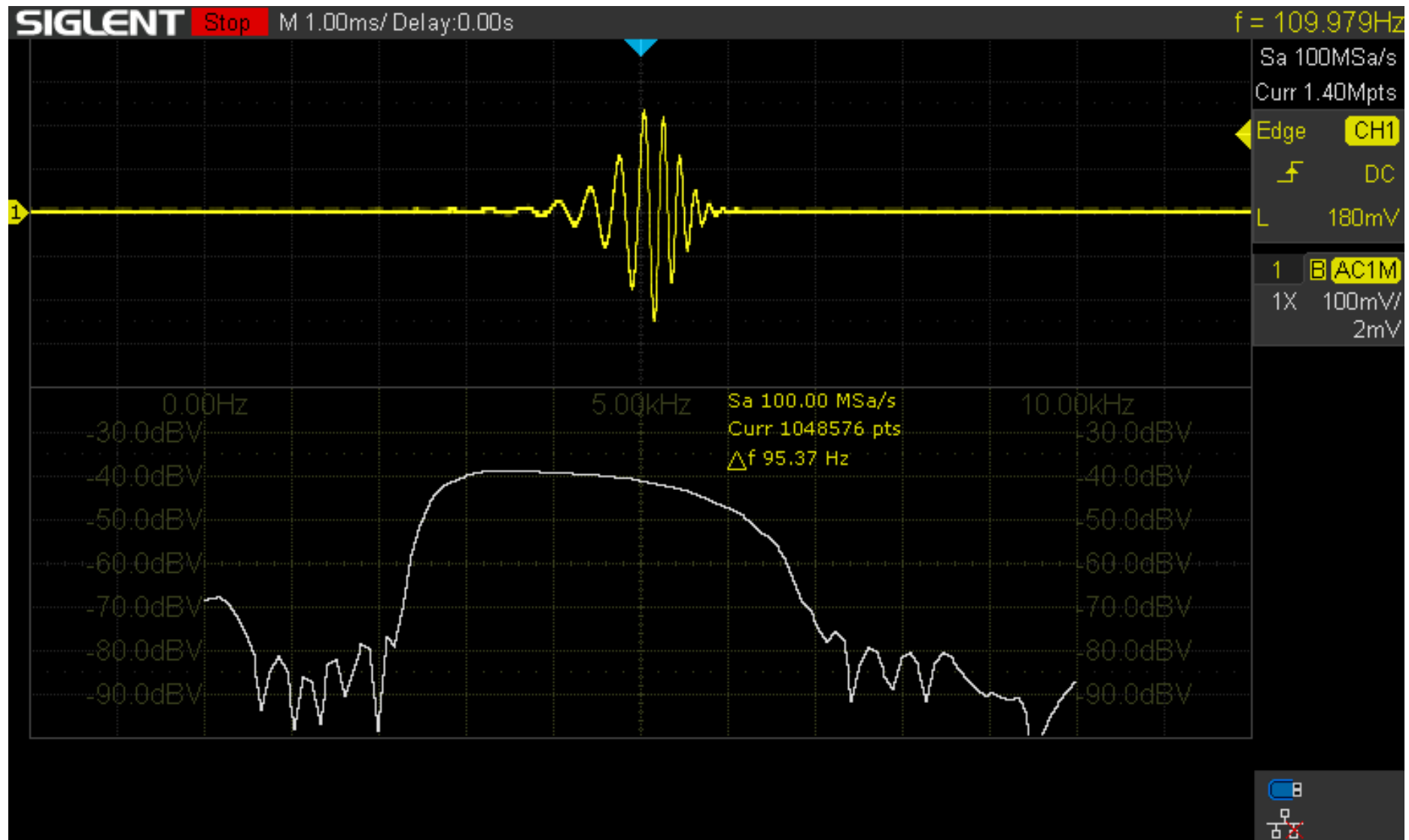
Toneburst



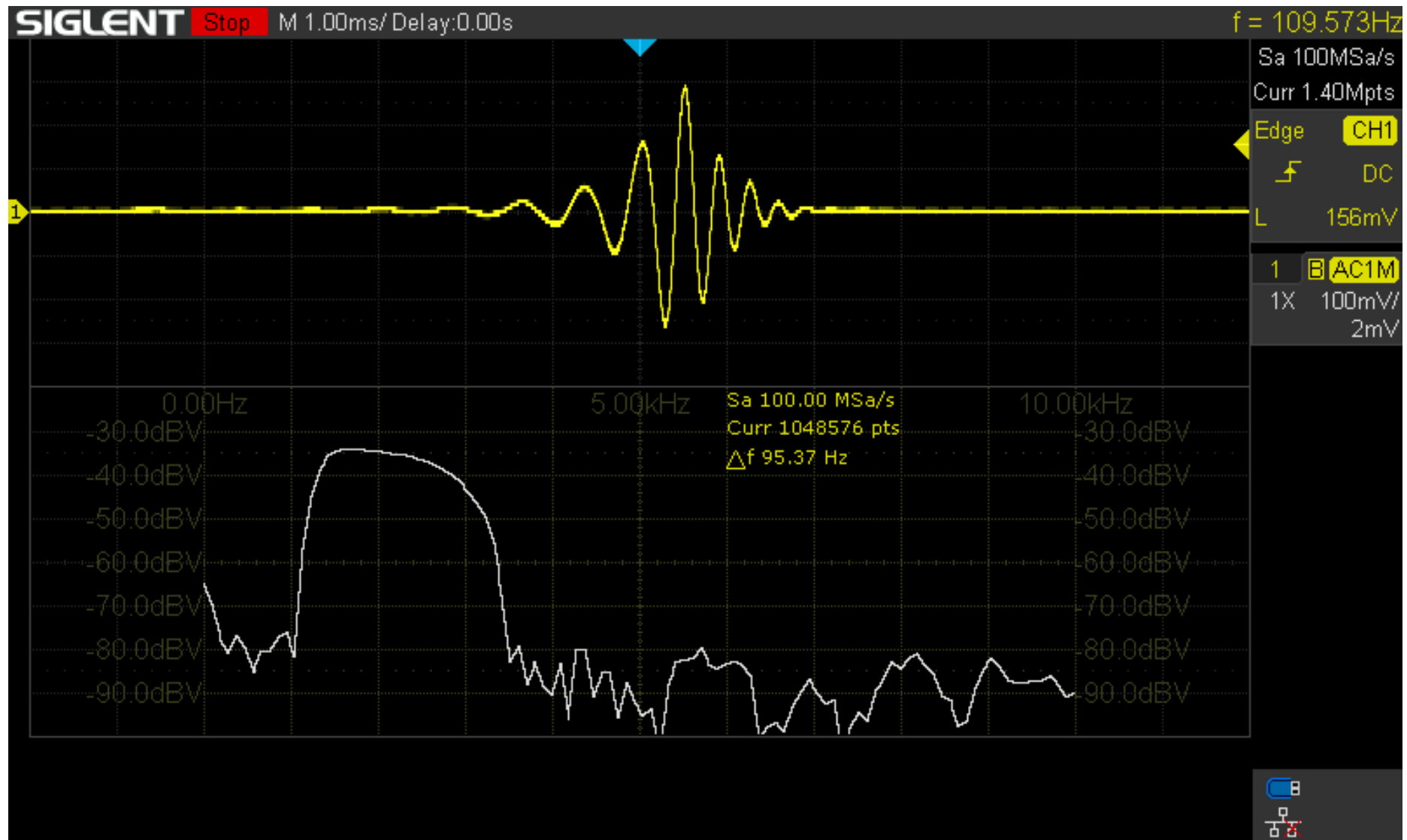
Måleoppsett for elektriske målinger



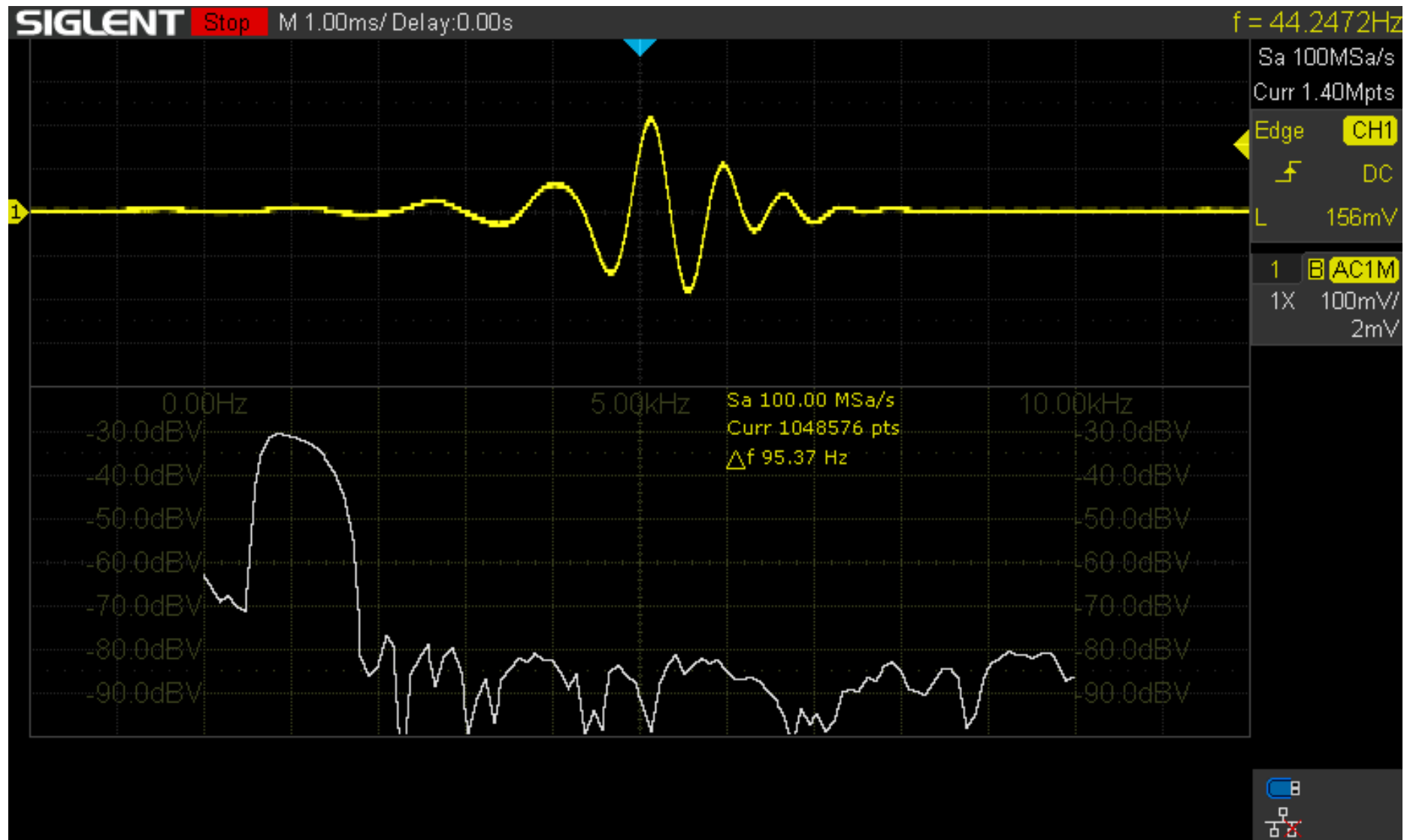
Elektrisk stimulusmåling – 4 kHz chirp



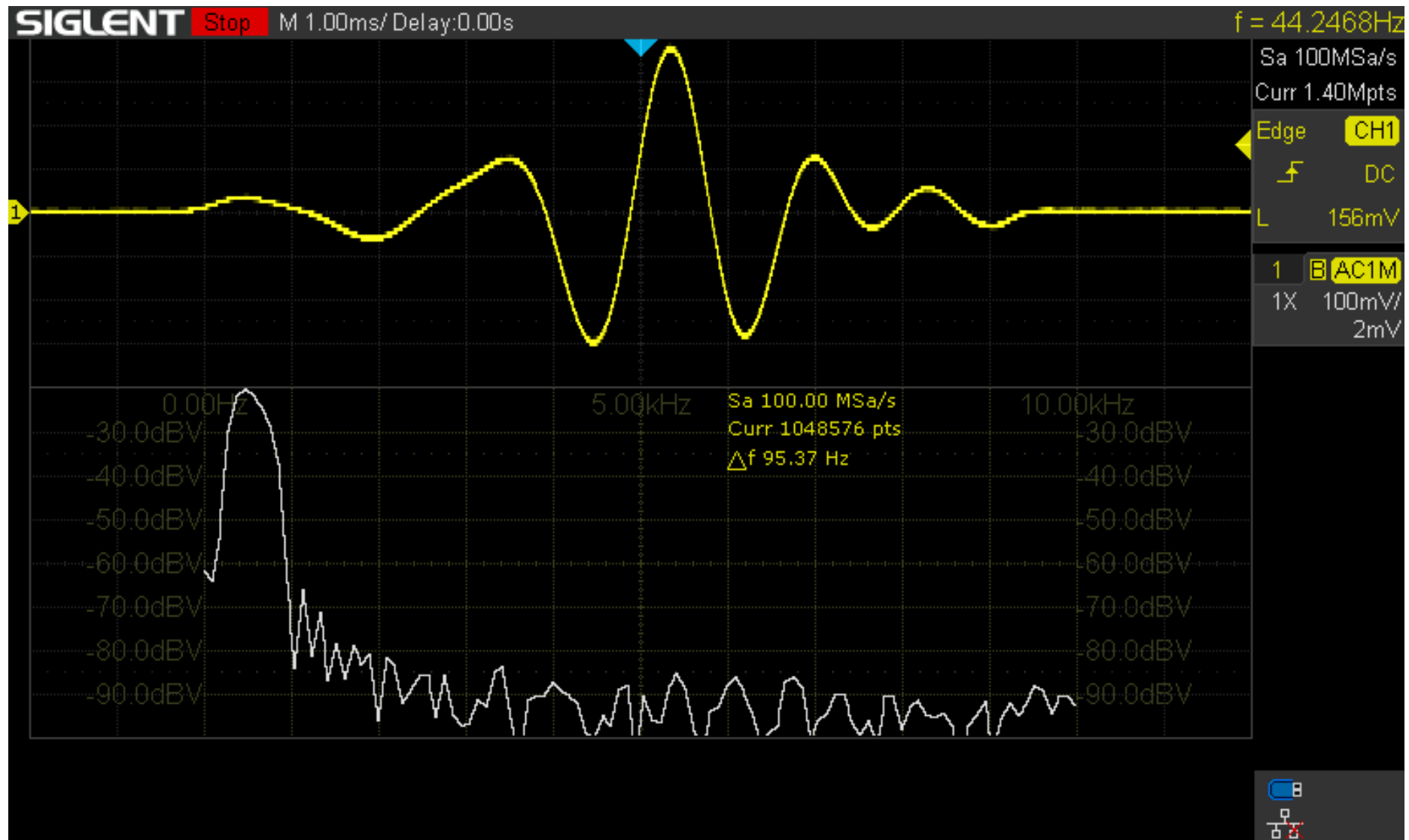
Elektrisk stimulusmåling – 2 kHz chirp



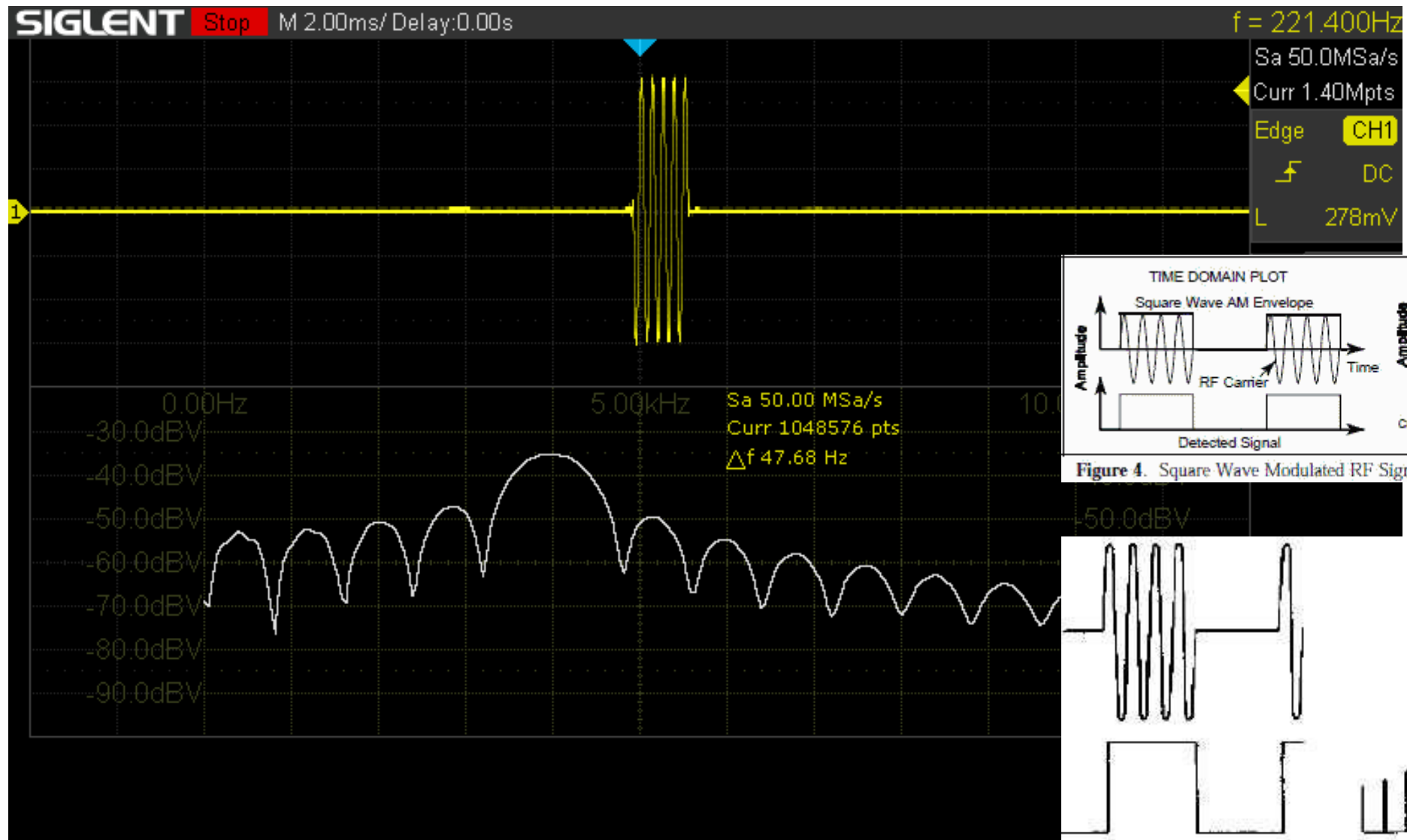
Elektrisk stimulusmåling – 1 kHz chirp



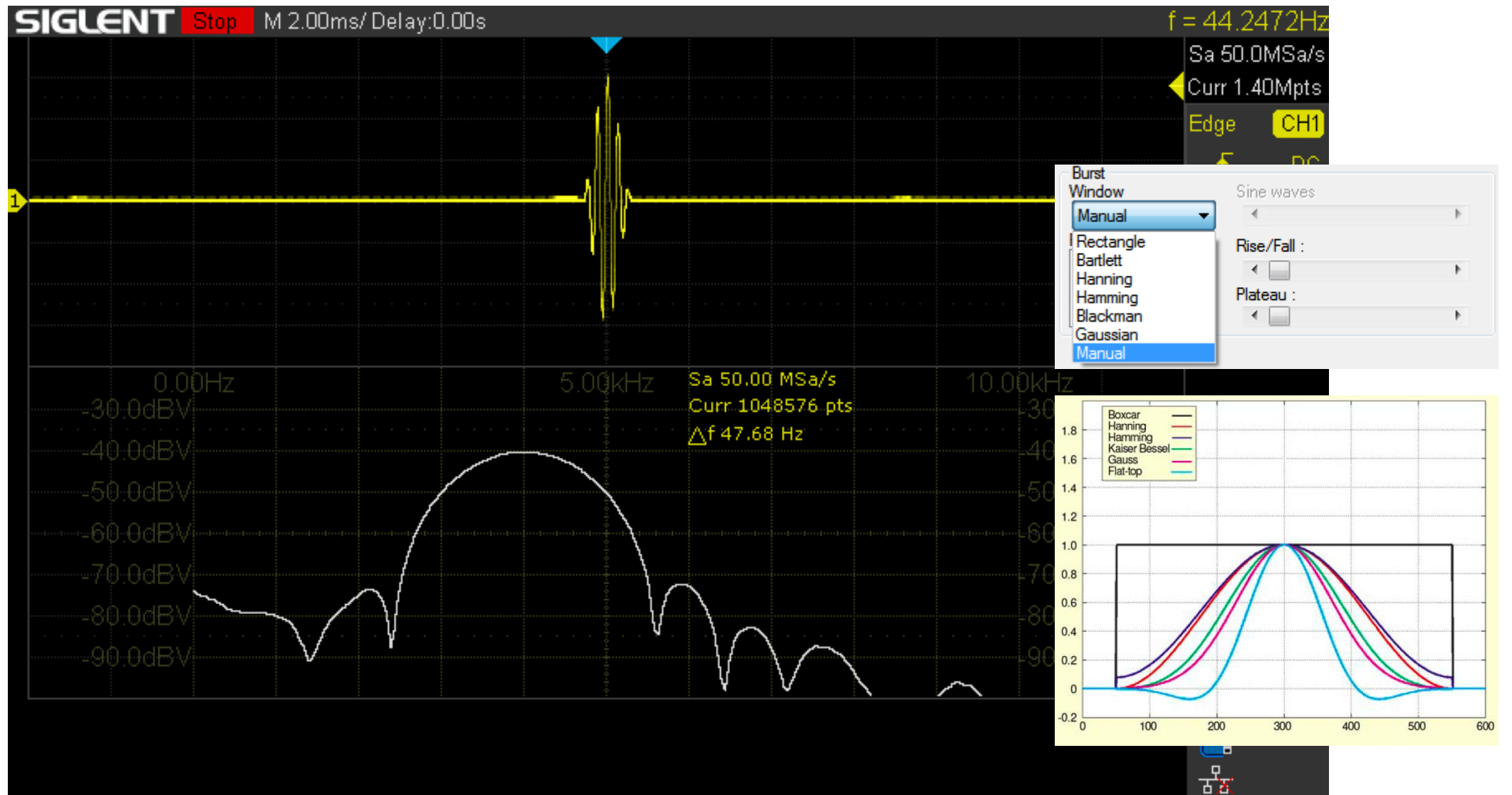
Elektrisk stimulusmåling – 500 Hz chirp



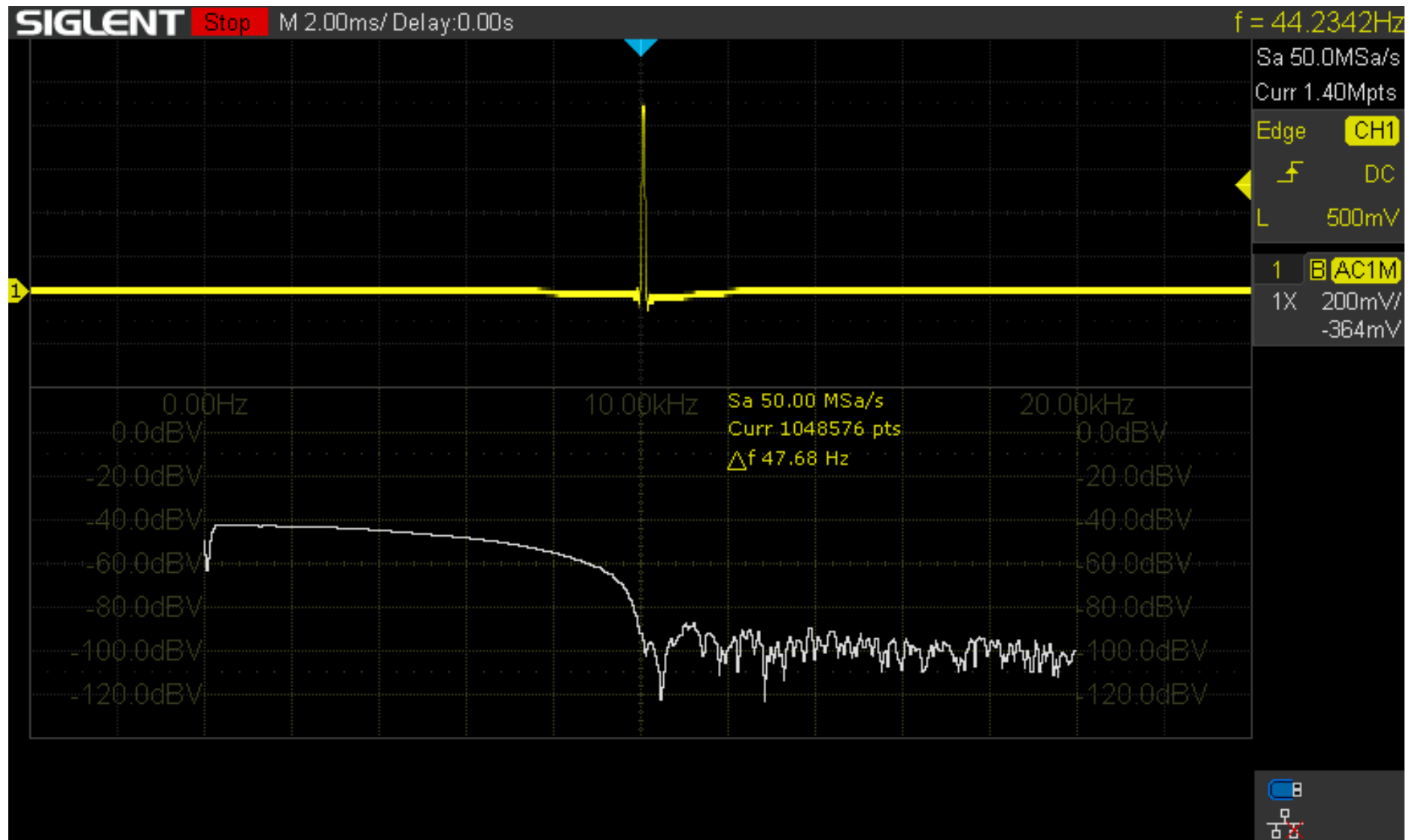
Elektrisk stimulusmåling – toneburst/rektangel



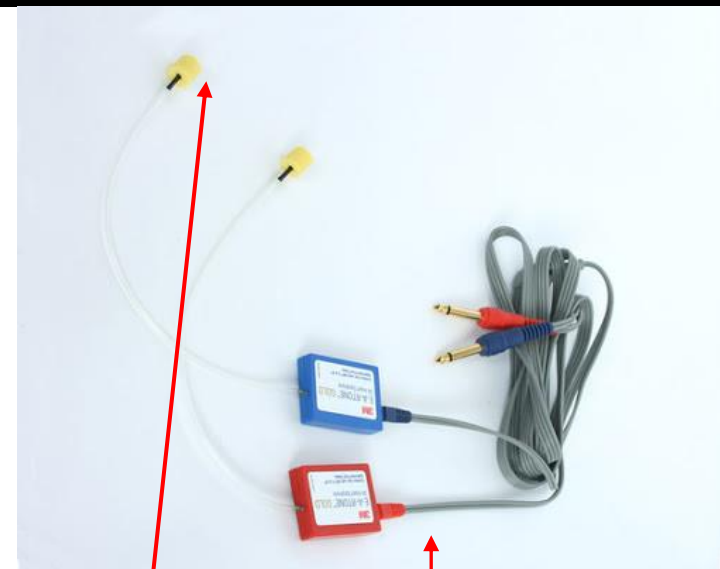
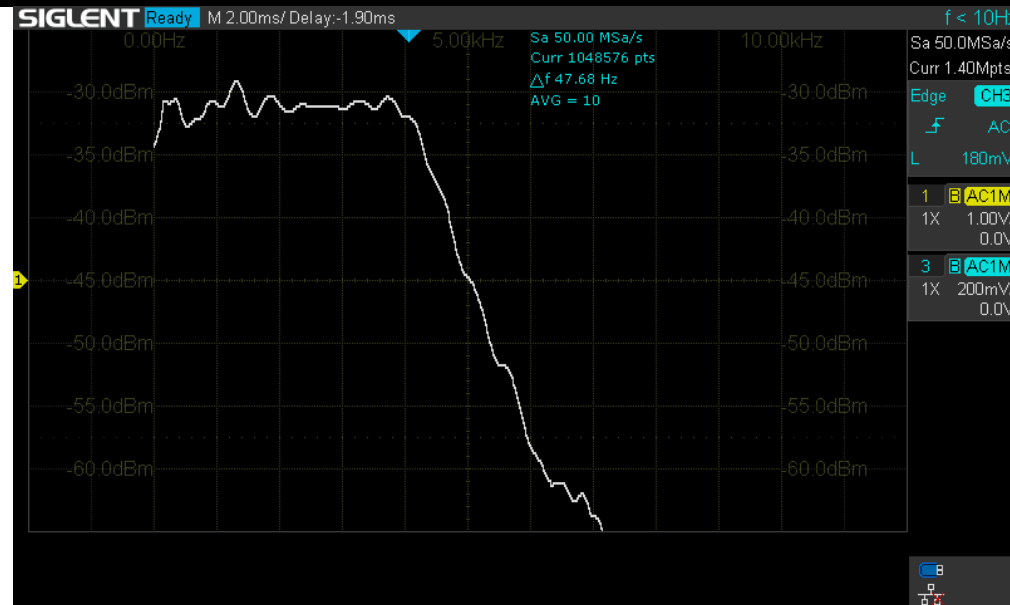
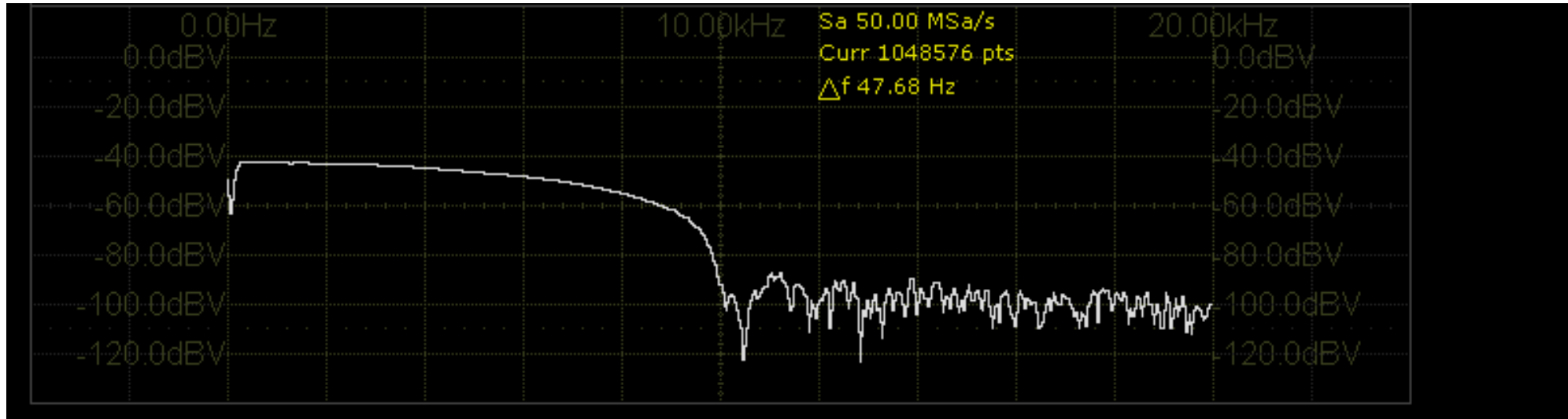
Elektrisk stimulusmåling – toneburst/Hanning



Elektrisk stimulusmåling - klikk

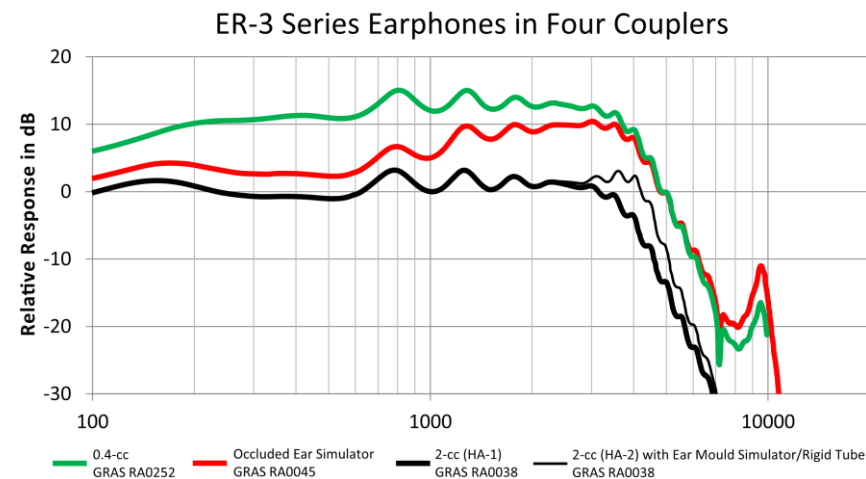


Klikk – elektrisk og akustisk inn i Brüel & Kjær 4157 kunstig øregang



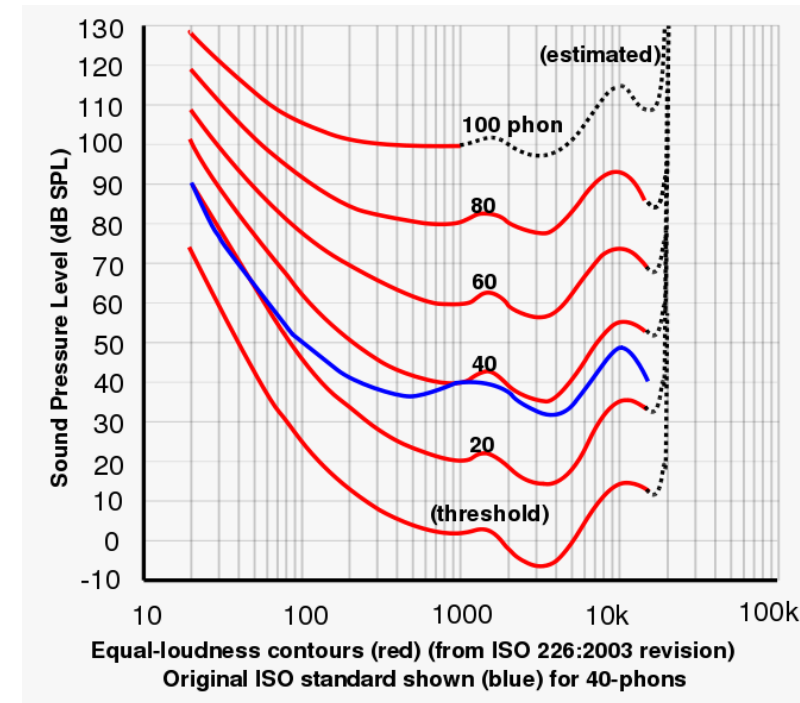
Akustisk - elektrisk

Klikk – akustisk måling i Brüel & Kjær 4157 kunstig øregang + ER-7c probe microphone/Rastronics TM-12 2cc coupler



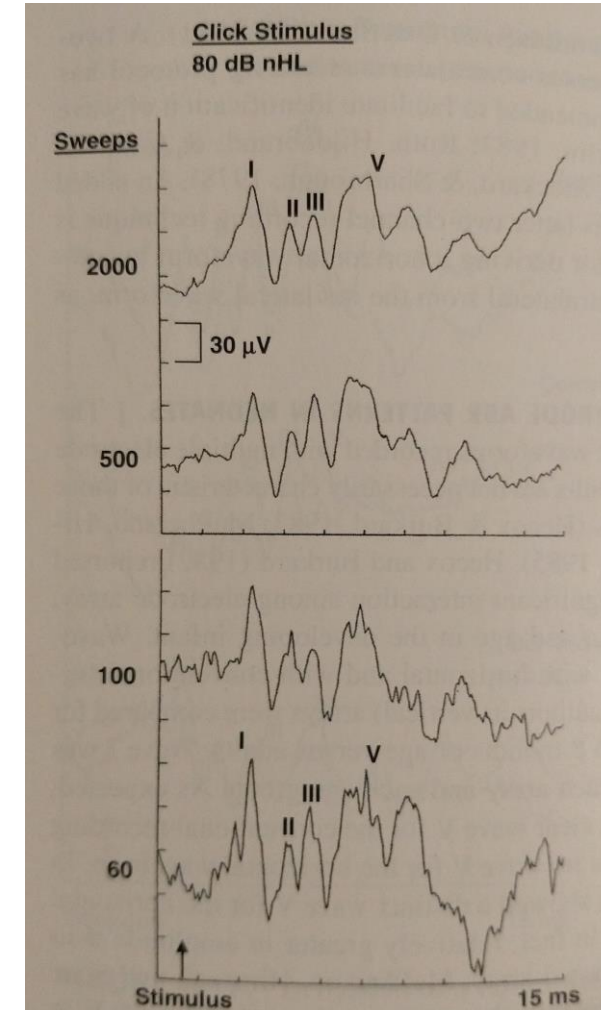
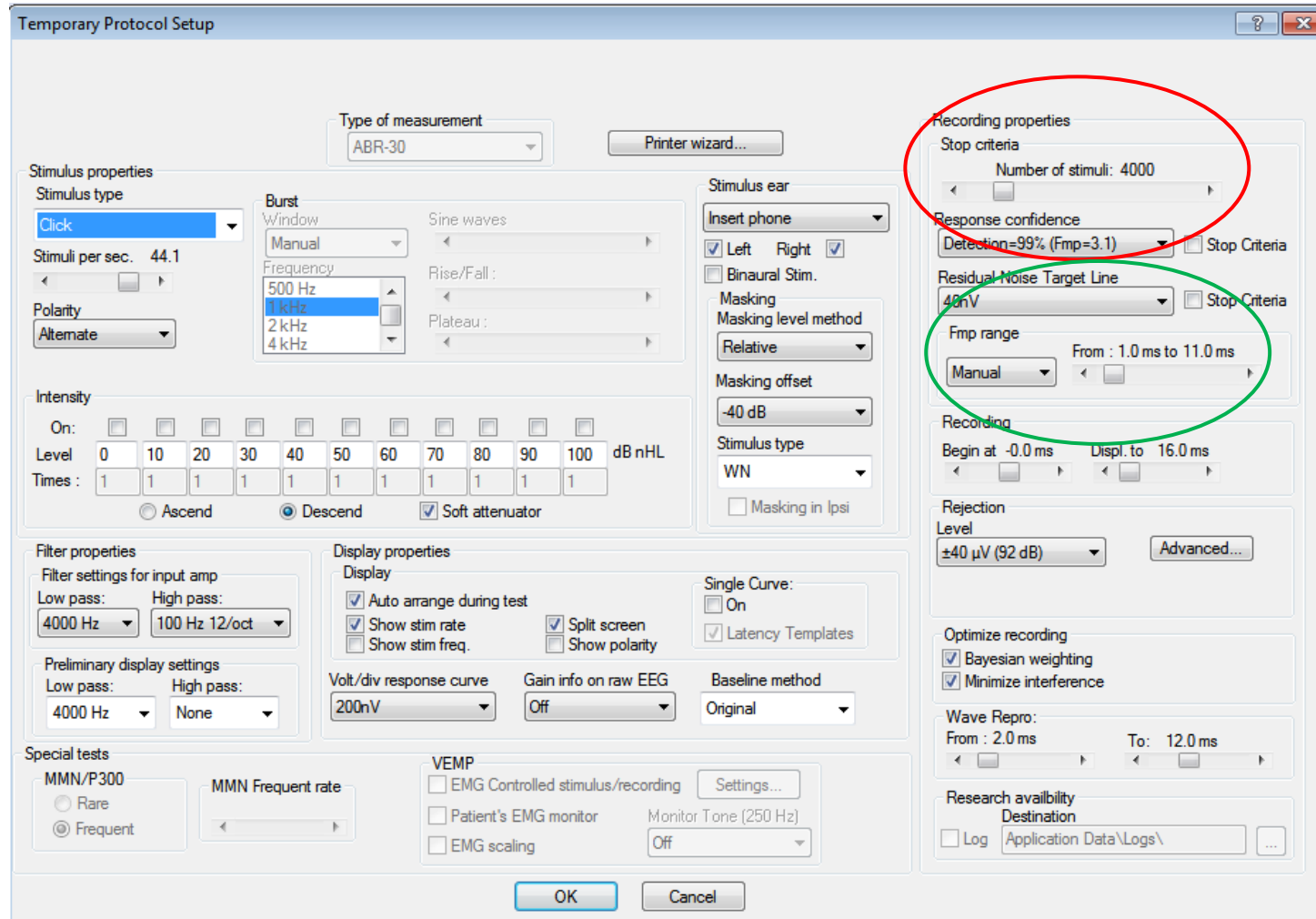
Klikk – akustisk måling

SPL-måling – dvs må korrigeres for å sammenliknes benyttes for å sammenlikne klikk-stimulus med audiogramterskler målt i db HL (hearing level)

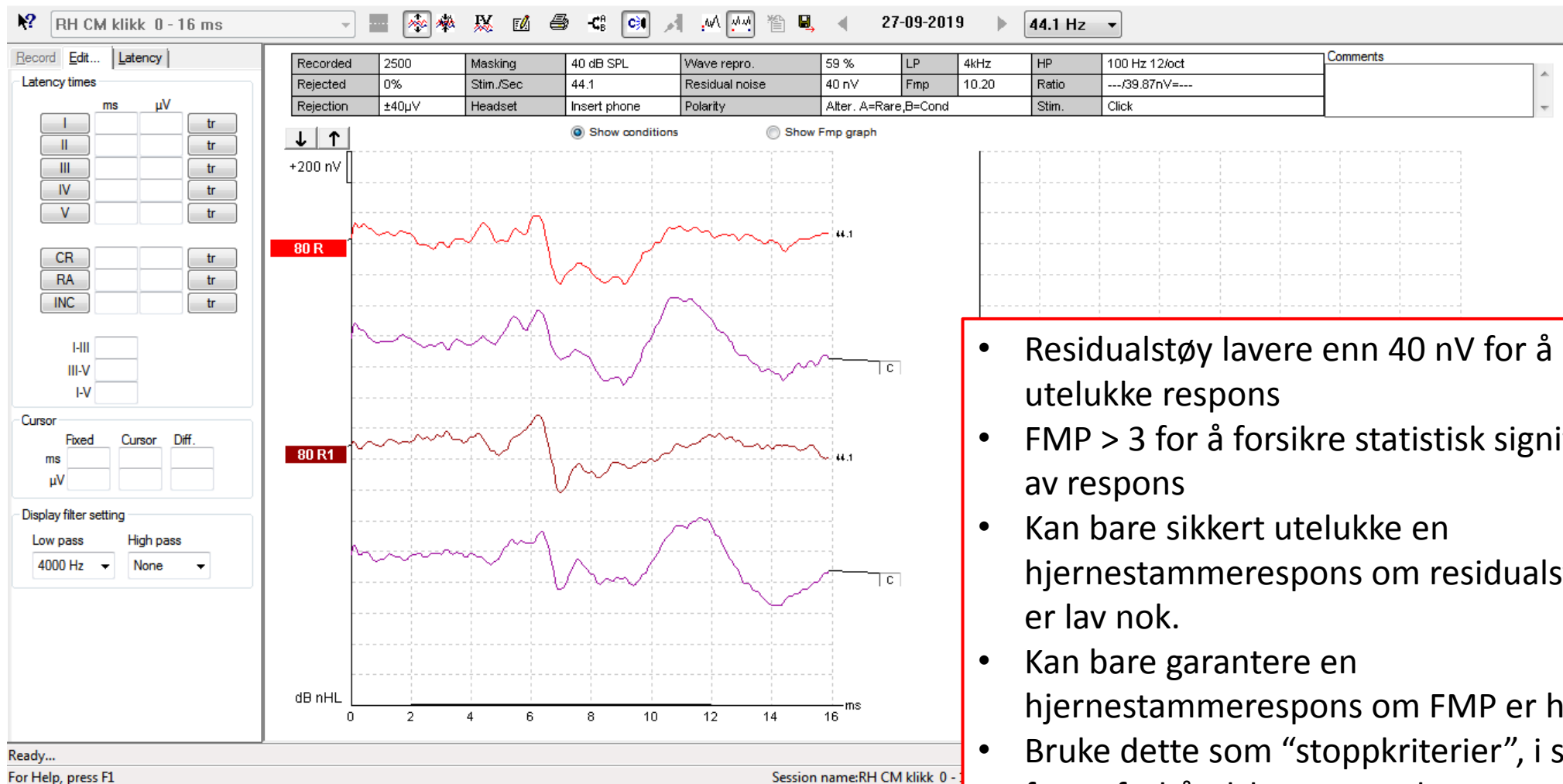


ABR – antall stimulering, residualstøy, signal-støy-forhold (FMP)

James Hall

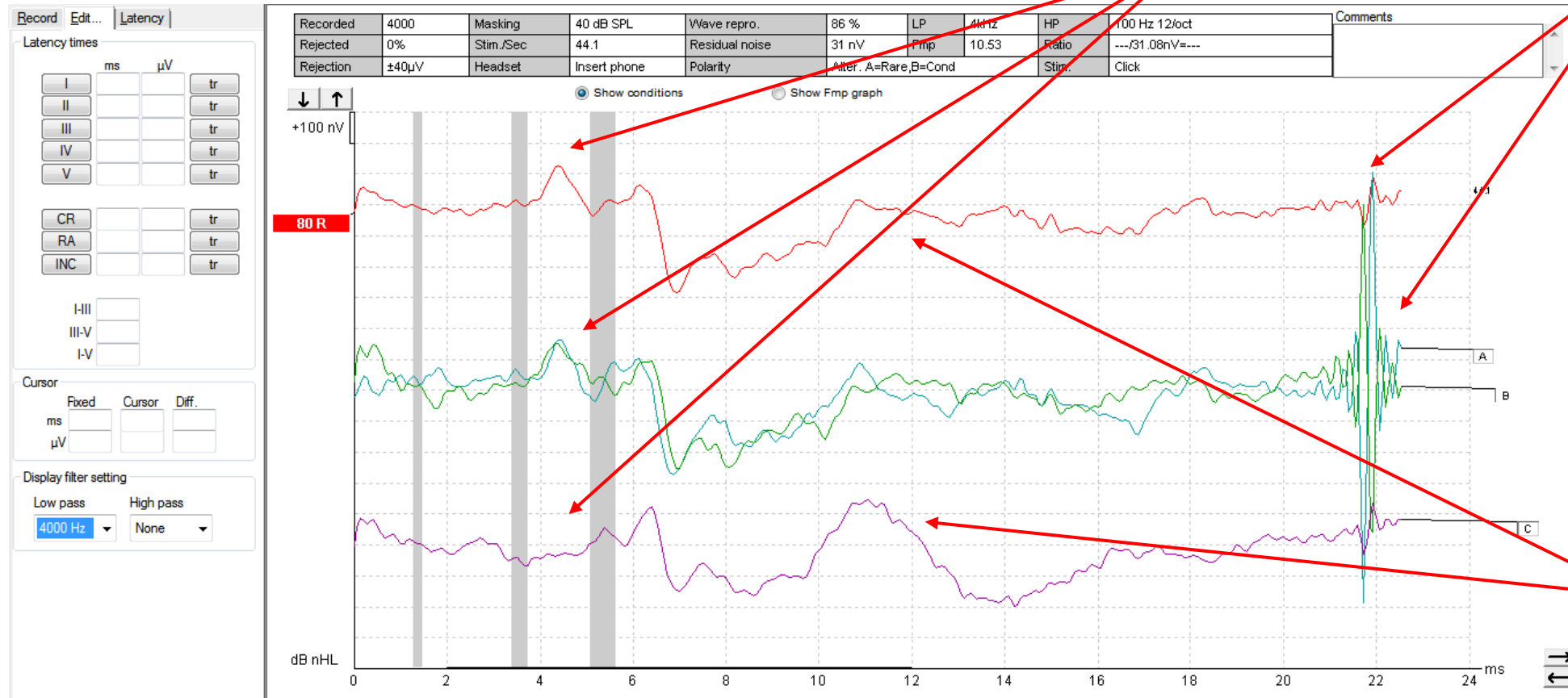
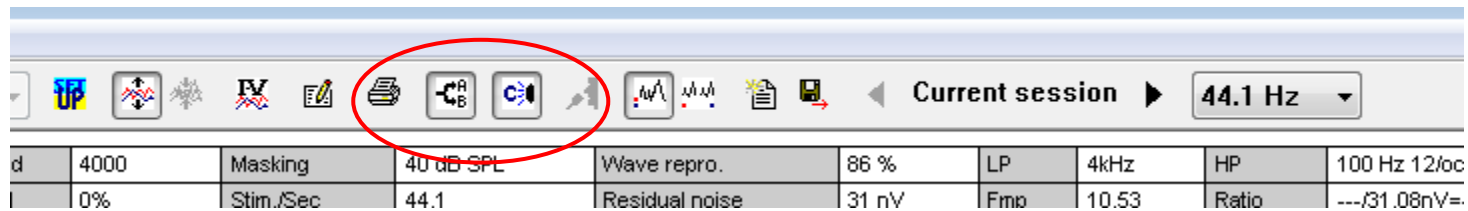


ABR – antall stimulering, residualstøy, signal-støy-forhold (FMP)



- Residualstøy lavere enn 40 nV for å utelukke respons
- FMP > 3 for å forsikre statistisk signifikans av respons
- Kan bare sikkert utelukke en hjernestammerespons om residualstøyen er lav nok.
- Kan bare garantere en hjernestammerespons om FMP er høy nok.
- Bruke dette som "stoppkriterier", i stedet for et forhåndsbestemt valg om antall stimuleringer

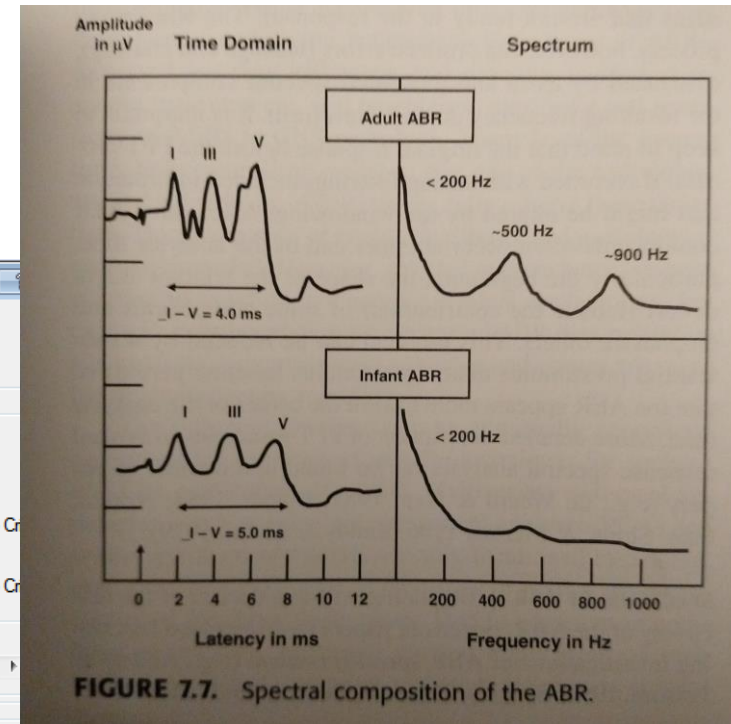
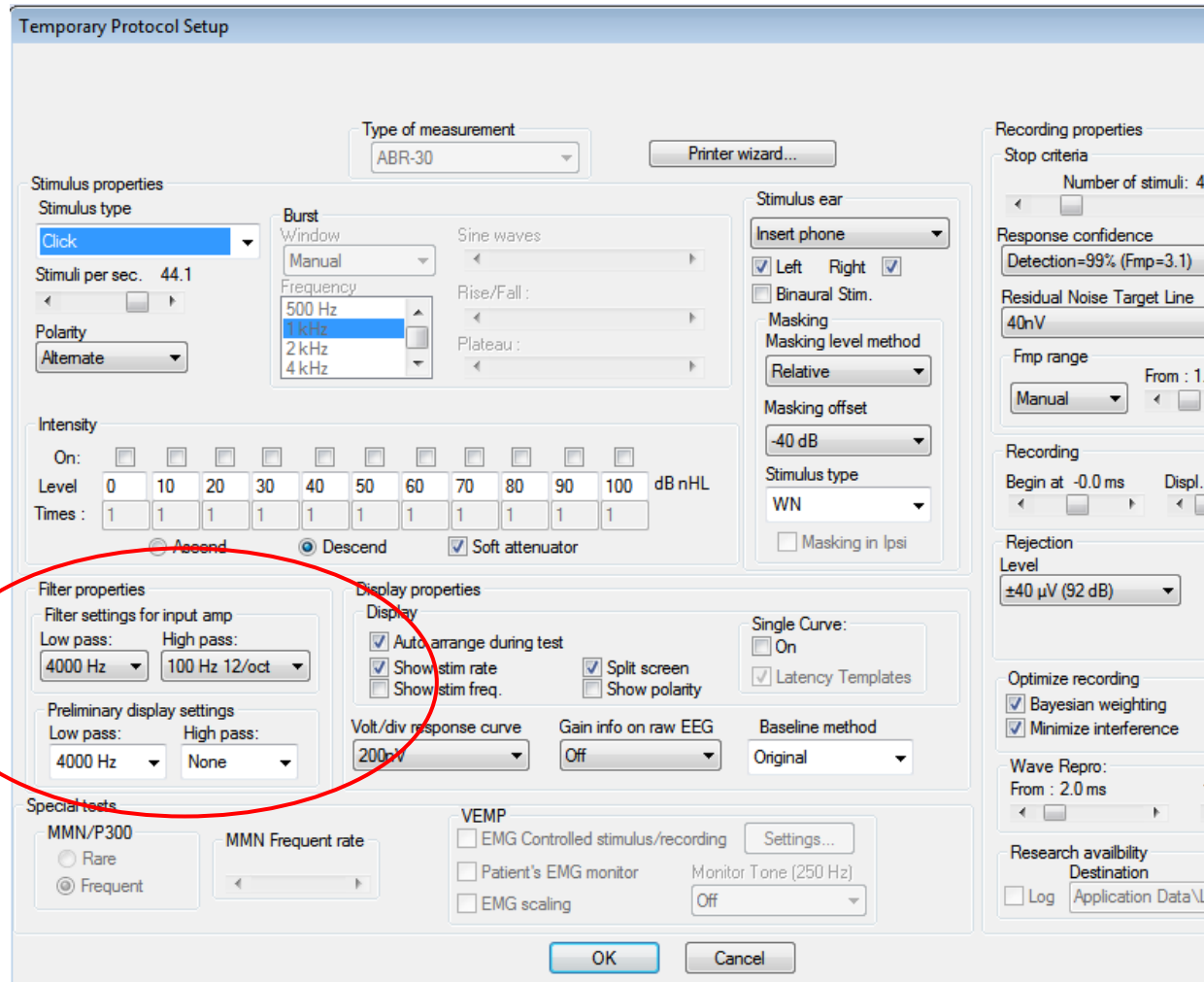
ABR – A/B og kontralateral elektrodemåling



ABR – A/B og kontralateral elektrodemåling

- A/B-kurvene kan brukes for å undersøke mikrofoni
- I noen tilfeller kan det skje at hver enkelt stimuleringspolaritet gir en forståelig respons, mens summen er vanskeligere å tolke, f.eks. pga latenstidforskjell mellom respons for hver polaritet.
- Kontrakurven kan brukes til å få mer info om hvilket øre som har plukket opp responsen, spesielt for benledningsmålinger hvor ipsilateral respons kan ha mye elektrisk artefaktforstyrrelse.
- Bølger I og III er ofte svakere eller borte ved den kontralateralt elektroden, mens bølge V er ofte tilstede.
- Mikrofoni påvirker ikke den kontralaterale elektroden.

ABR – filtrering av elektrodesignal



James Hall

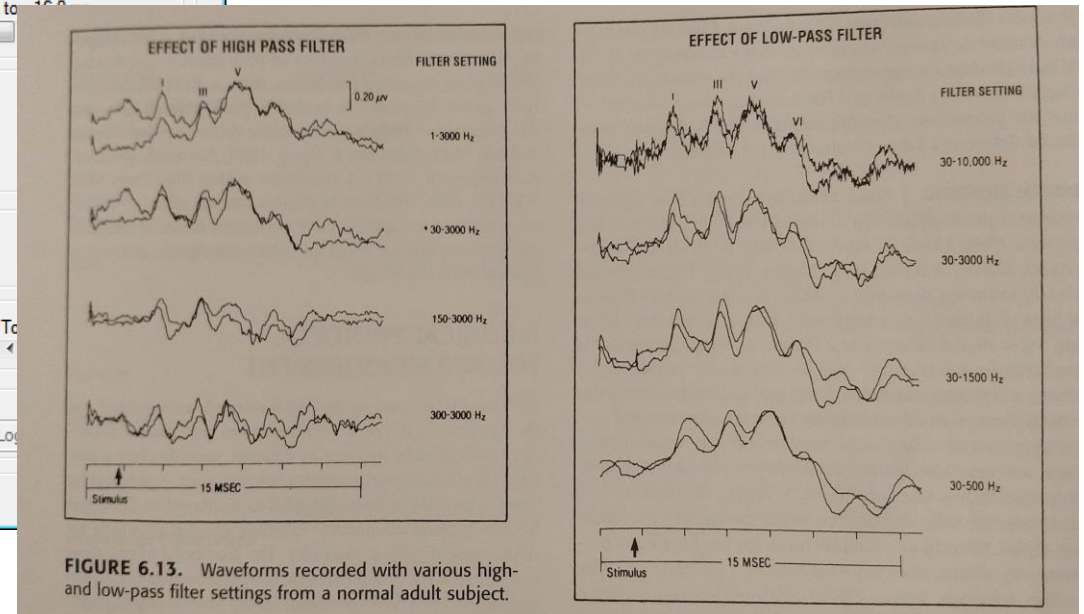


FIGURE 6.13. Waveforms recorded with various high and low-pass filter settings from a normal adult subject.

ABR – filtrering av elektrodesignal

RH CM klikk 0 - 16 ms

27-09-2019 44.1 Hz

Recorded	2500	Masking	40 dB SPL	Wave repro.	59 %	LP	4kHz	HP	100 Hz 12/oct	Comments
Rejected	0%	Stim./Sec	44.1	Residual noise	40 nV	Fmp	10.20	Ratio	---/39.87nV=---	
Rejection	±40µV	Headset	Insert phone	Polarity	Alter. A=Rare,B=Cond	Stim.	Click			

Latency times

I	ms	µV	tr
II			tr
III			tr
IV			tr
V			tr
CR			tr
RA			tr
INC			tr
I-III			
III-V			
I-V			

Cursor

Fixed	Cursor	Diff.
ms		
µV		

Display filter setting

Low pass	High pass
4000 Hz	None

200 nV

80 R

80 R1

dB nHL

ms

Ready...

For Help, press F1

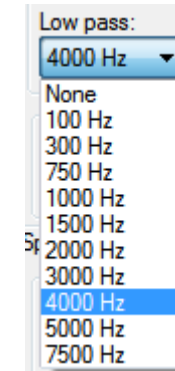
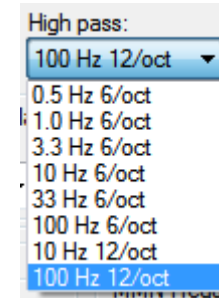
Session name:RH CM klikk 0 - 16 ms

Session date:27-09-2019 ABR30

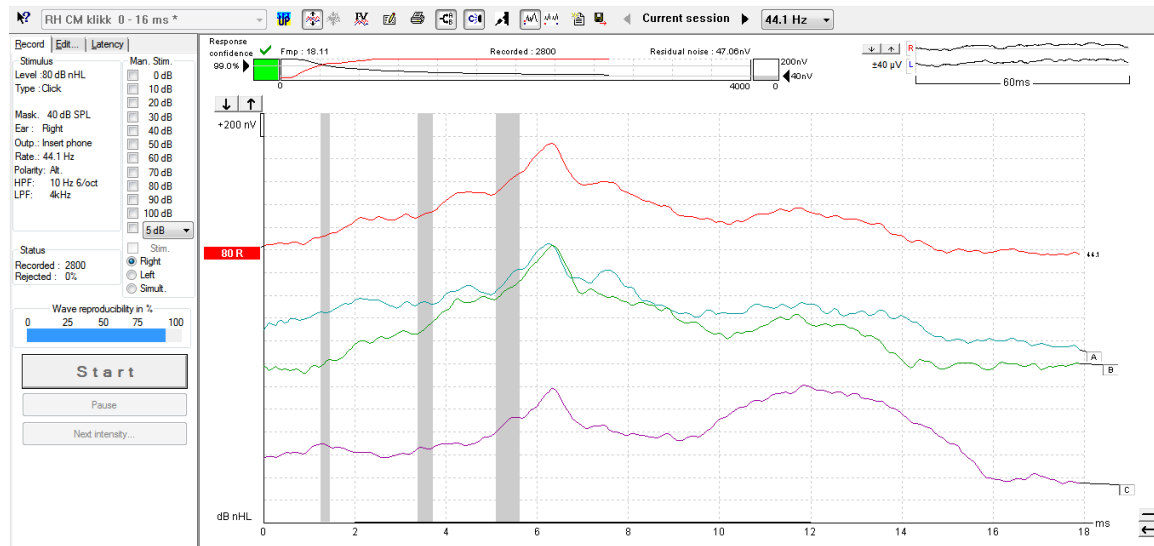
The screenshot displays the ABR software interface. On the left, there are control panels for 'Latency times' (I-V, CR, RA, INC) and 'Cursor' (Fixed, Cursor, Diff. in ms and µV). A red circle highlights the 'Display filter setting' panel, which shows 'Low pass' set to '4000 Hz' and 'High pass' set to 'None'. The main area contains two waveforms: a red one labeled '80 R' and a purple one labeled '80 R1'. The y-axis is labeled '200 nV' and 'dB nHL', and the x-axis is labeled 'ms' with values from 0 to 16. A table at the top right provides session parameters like 'Recorded: 2500', 'Masking: 40 dB SPL', 'Wave repro.: 59 %', 'LP: 4kHz', 'HP: 100 Hz 12/oct', 'Rejected: 0%', 'Stim./Sec: 44.1', 'Residual noise: 40 nV', 'Fmp: 10.20', 'Ratio: ---/39.87nV=---', 'Rejection: ±40µV', 'Headset: Insert phone', 'Polarity: Alter. A=Rare,B=Cond', 'Stim.: Click'. The bottom status bar shows 'Ready...', 'For Help, press F1', 'Session name:RH CM klikk 0 - 16 ms', and 'Session date:27-09-2019 ABR30'.

ABR – filtrering av elektrodesignal

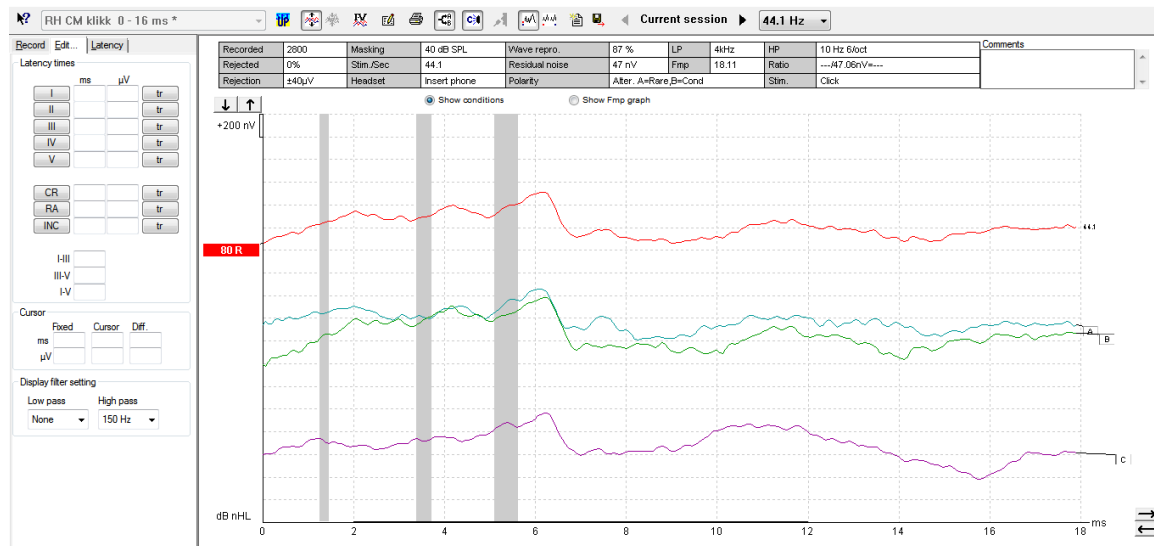
- Lavpassfilter:
 - På Riksen ser vi kun etter hjernestammerespons når vi bruker chirp-stimulus
 - Med klikkstimulus ser vi etter både hjernestammerespons og mikrofoni
 - Viktig å ikke ha filtreringsinnstillinger her som demper mikrofoni...
 - 4 kHz chirp: 1,5 kHz lavpassfilter
 - Klikk: 4 kHz lavpassfilter
 - For lav frekvens her kan forskyve latenstida til f.eks. bølge V.
 - Høypassfilter:
 - 100 Hz med 12 dB/oktav
 - For høy frekvens gjør bølge V mindre tydelig.
 - Kan også justeres i etterkant av malinger for å påvirke visninga
-
- Om man ikke vil bruke alternerende stimuleringspolaritet, så kan mikrofoni komme med i response om elektrodefiltreringa ikke undertrykker det, f.eks. med 4 kHz chirp/condensation og 4 kHz lavpassfilter.
 - Siden klikk også inkluderer lavere frekvenser, så blir det vanskelig å filtrere bort mikrofoni fra f.eks. condensation-klikk uten å potensielt forringe hjernestammeresponsen.
 - Det same gjelder lavfrekvent chirp.



ABR – filtrering av elektrodesignal - høypassfilter

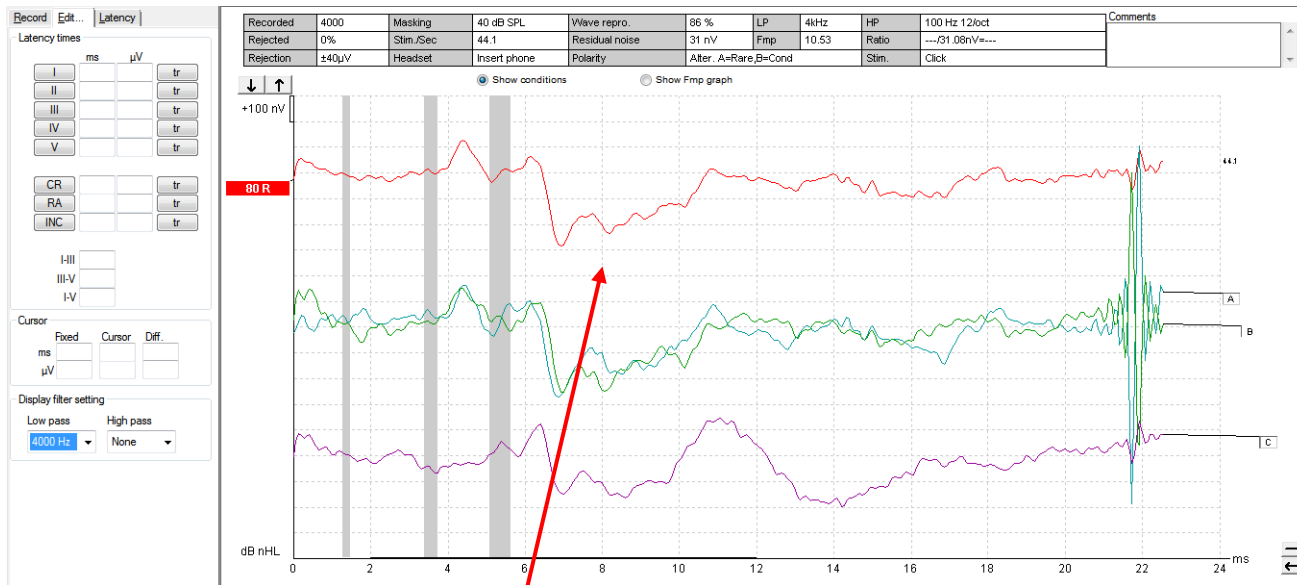


Høypassfilter: 10 Hz



Høypassfilter: 150 Hz

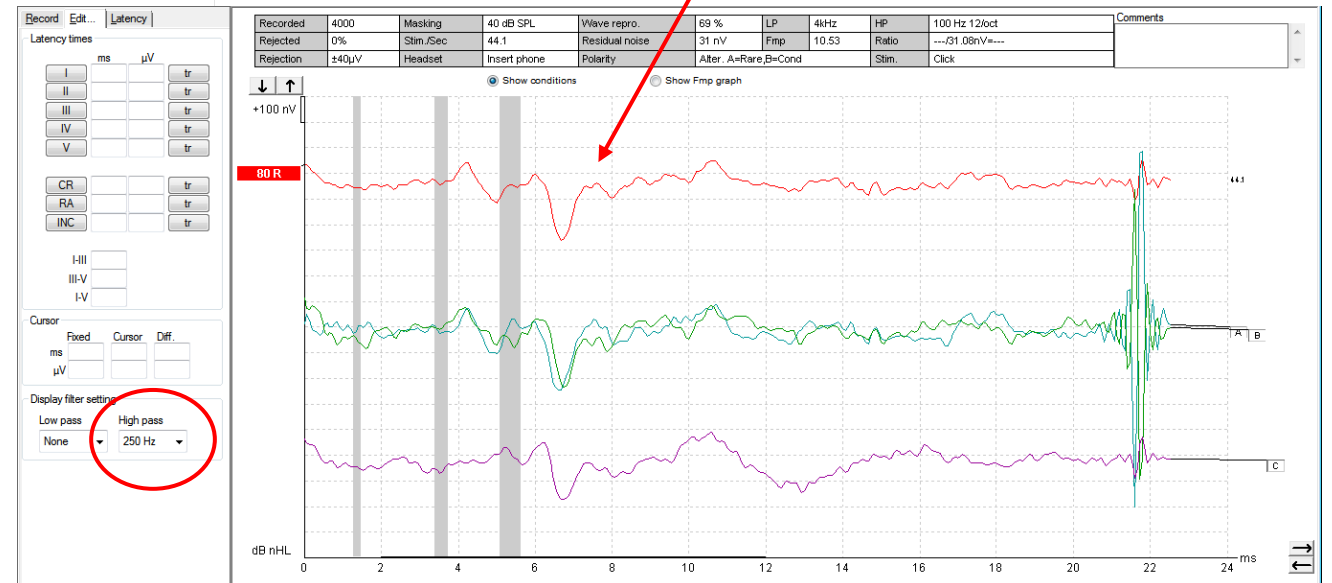
ABR – filtrering av elektrodesignal – klikkstimuli med synlig artefakt



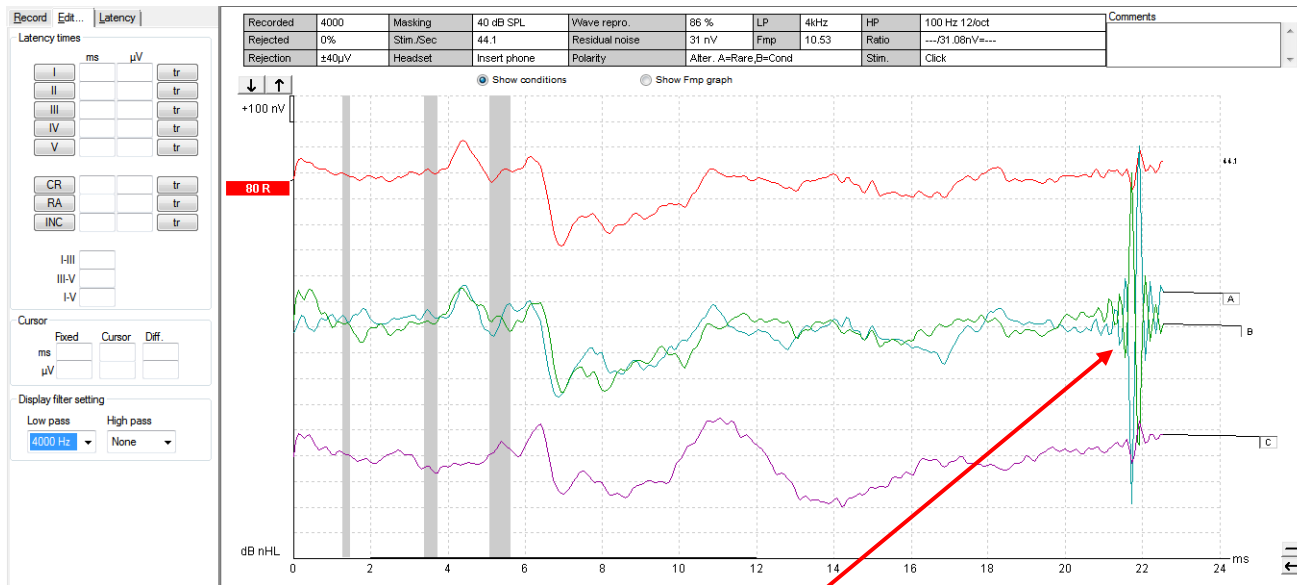
Standardverdier: 100 Hz høypass, 4 kHz lavpass

Dårlig SN10

Aktiverer 250 Hz høypass:

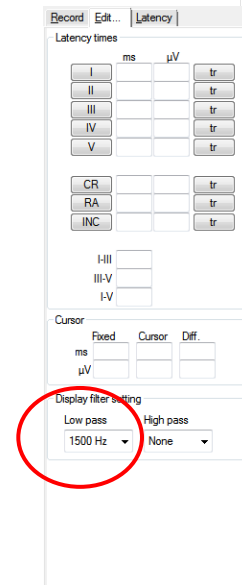


ABR – filtrering av elektrodesignal – klikkstimuli med synlig artefakt



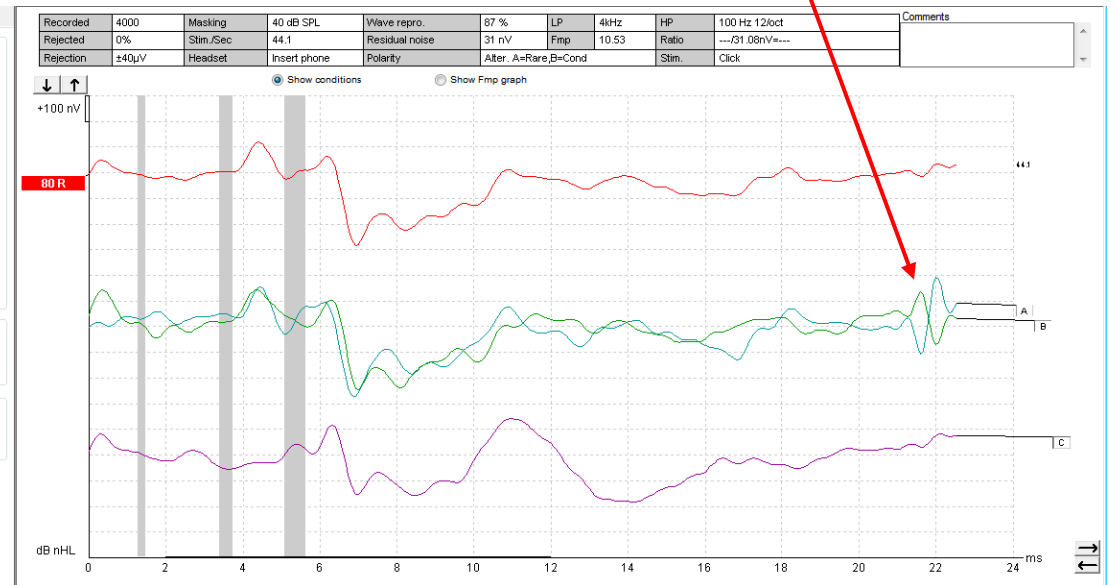
Kraftig artefakt

Aktiverer 1,5 kHz lavpass:

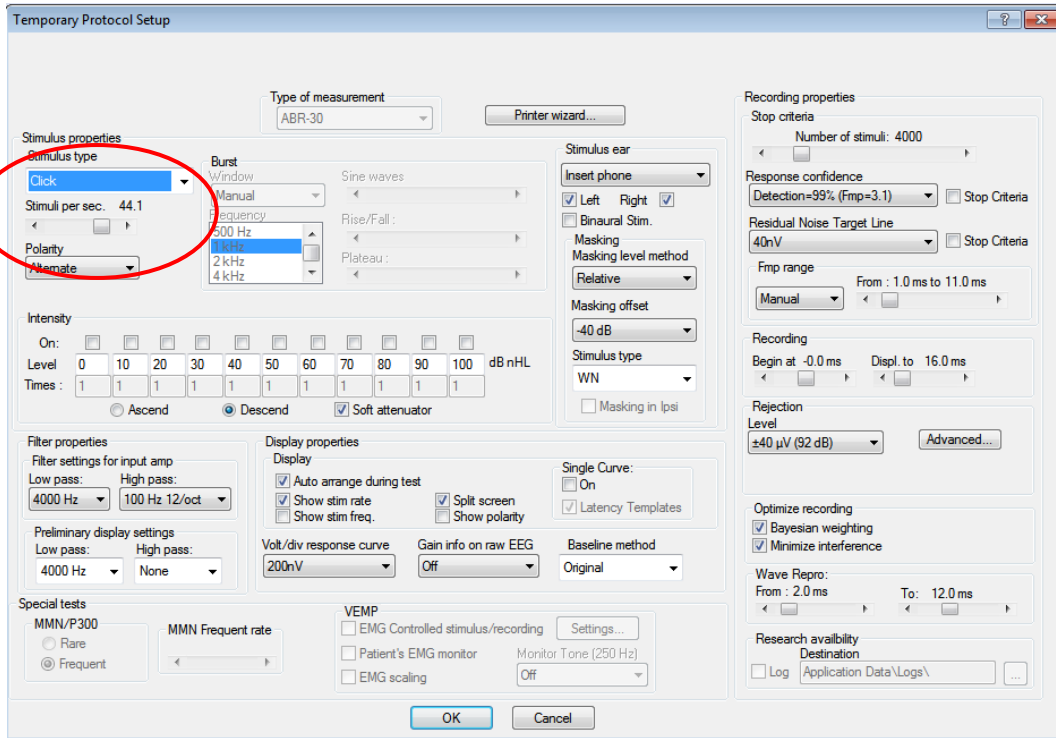


Standardverdier: 100 Hz høypass, 4 kHz lavpass

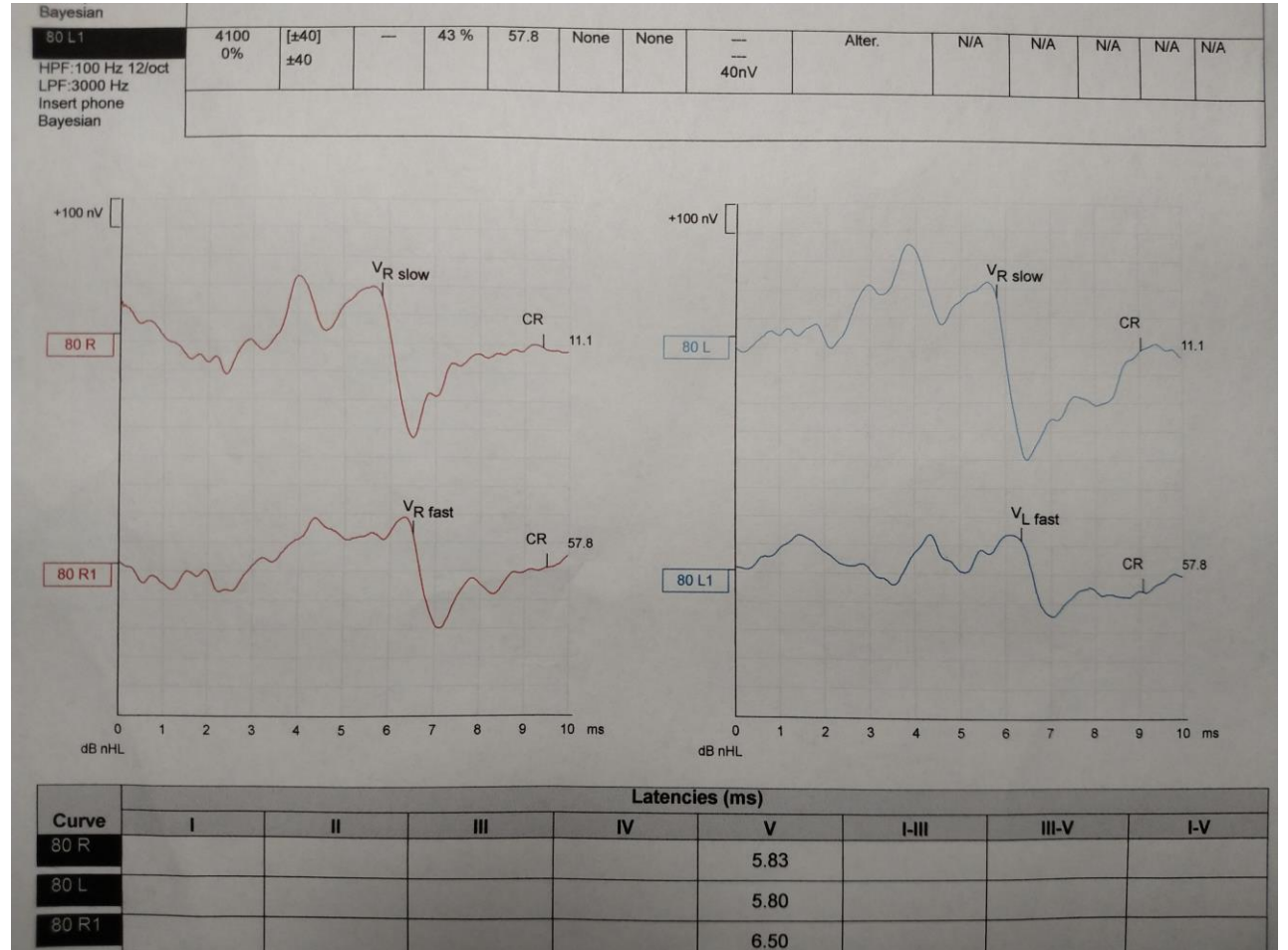
Dempet artefakt og glattere kurve



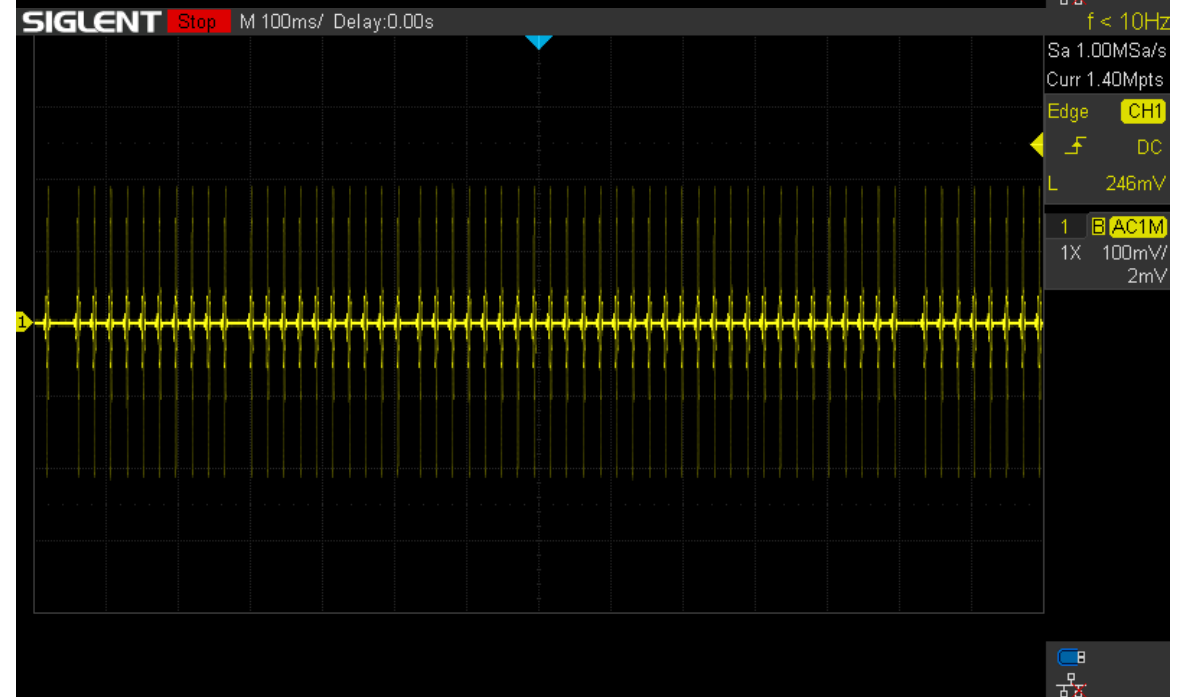
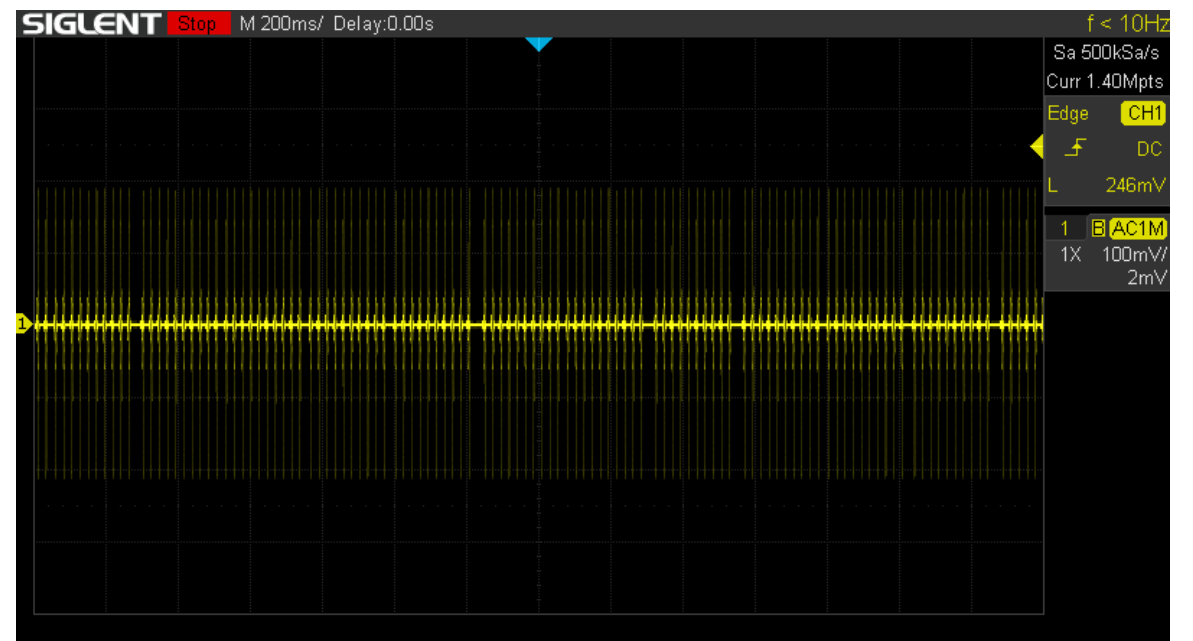
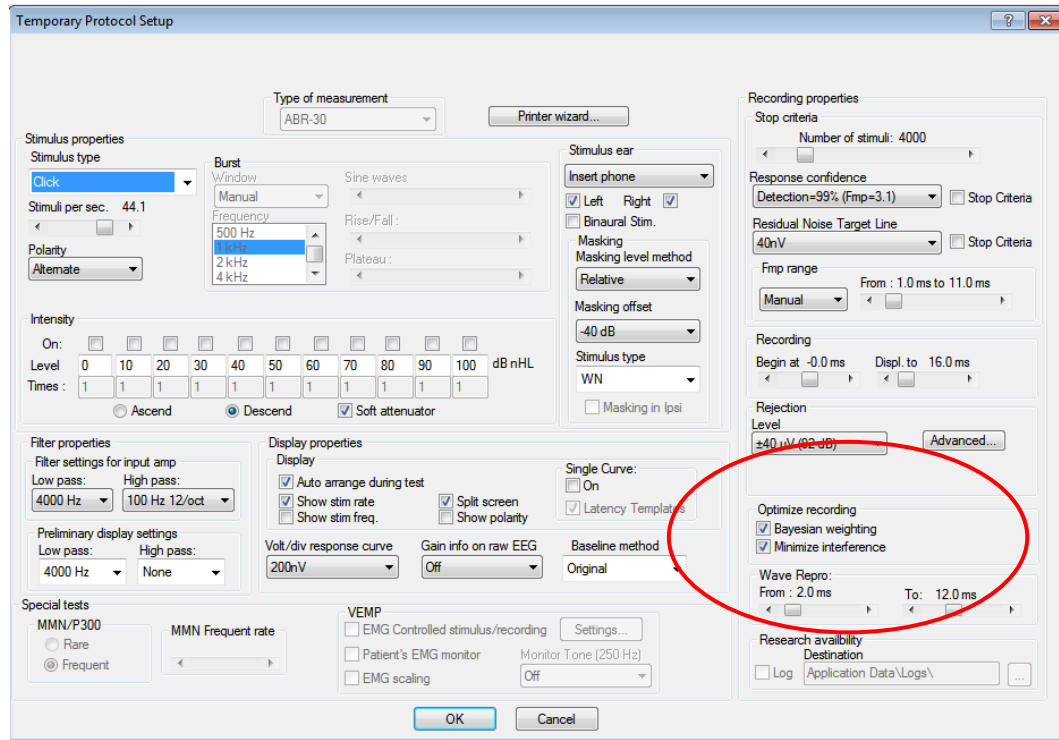
ABR – stimuleringsrate



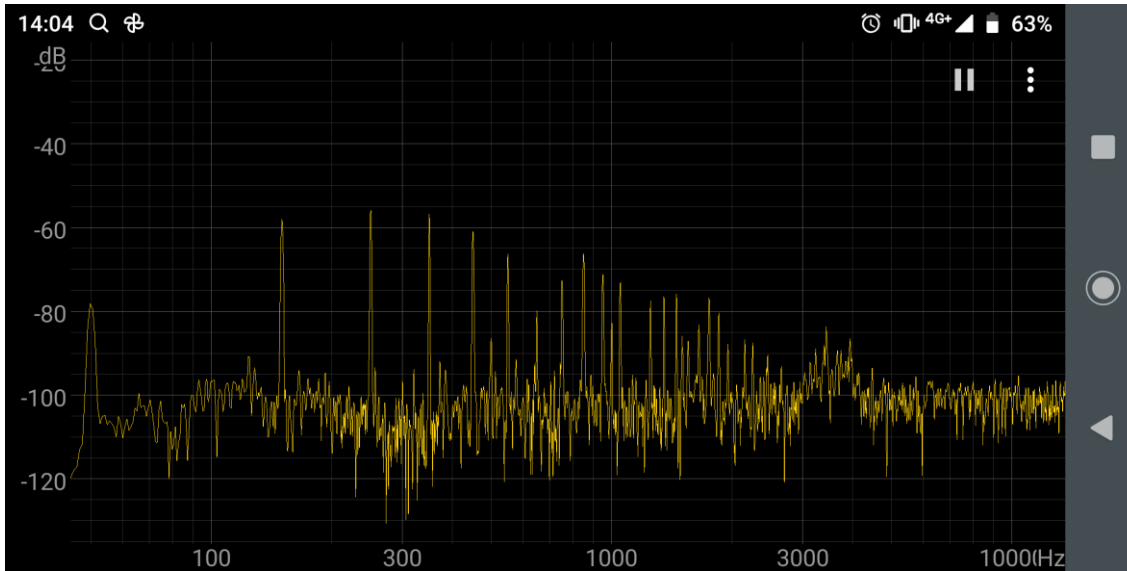
- Ikke velg 25 Hz eller 50 Hz...
- Kan være høy for raskere vurdering av mikrofoni, f.eks. 88 Hz.



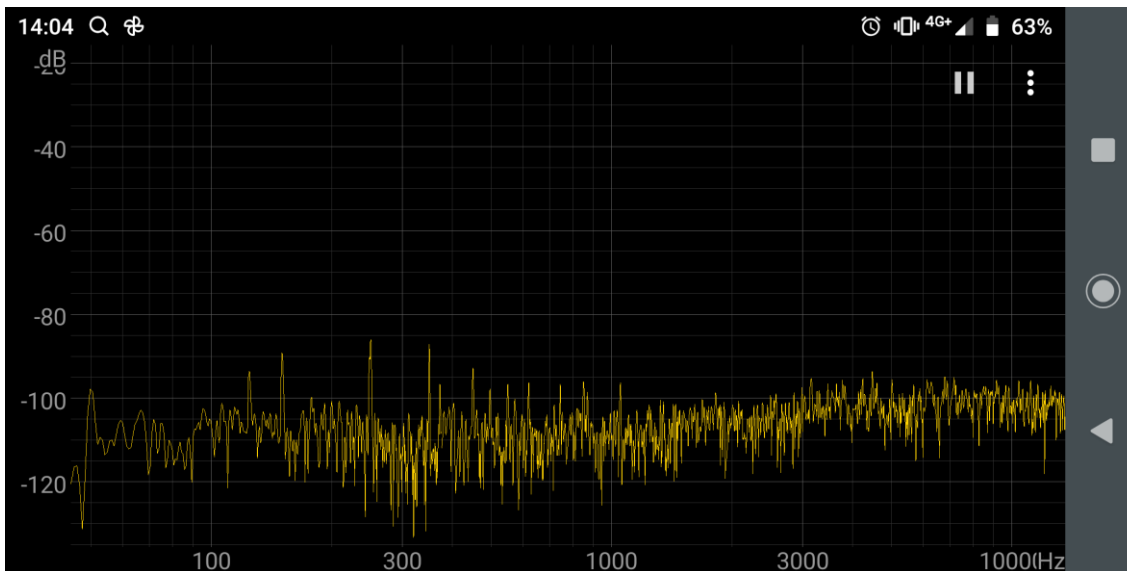
ABR – “minimize interference”



ABR – elektromagnetiske forstyrrelser

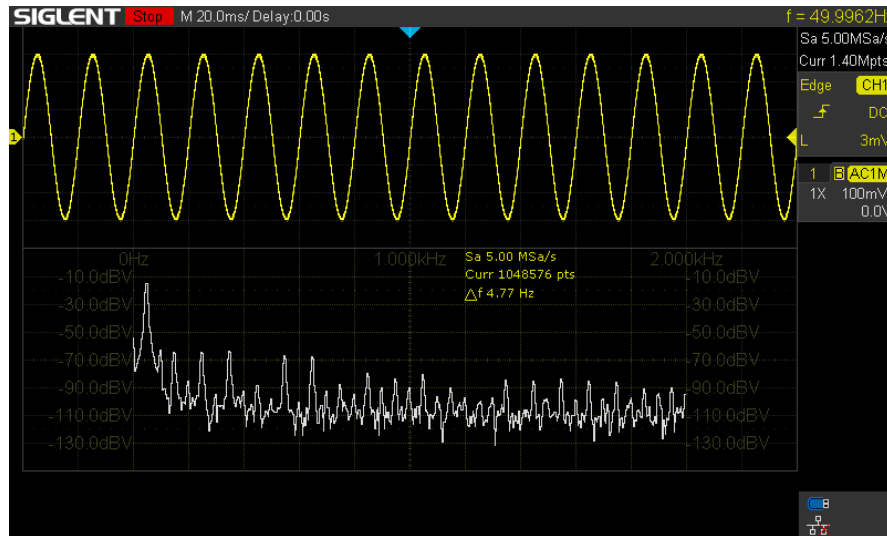


Inntil Eclipse-system

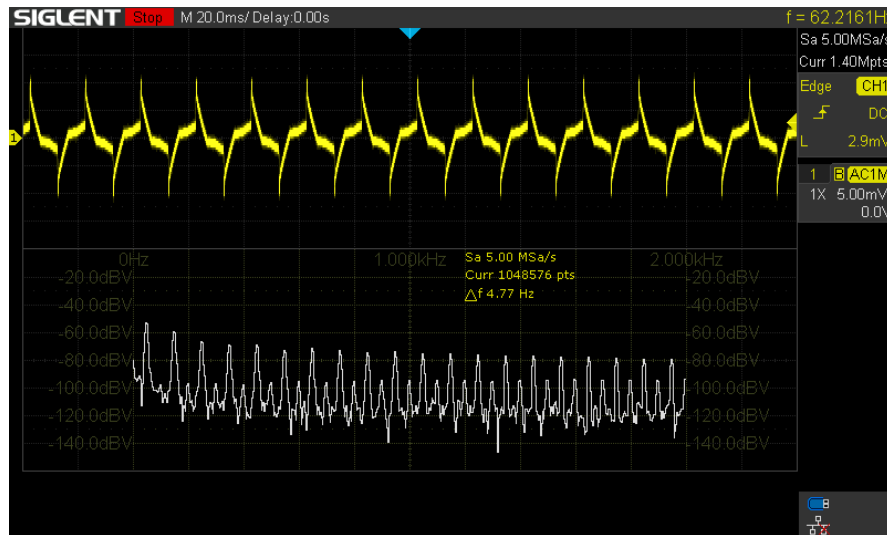


1m unna Eclipse-system

ABR – elektromagnetiske forstyrrelser

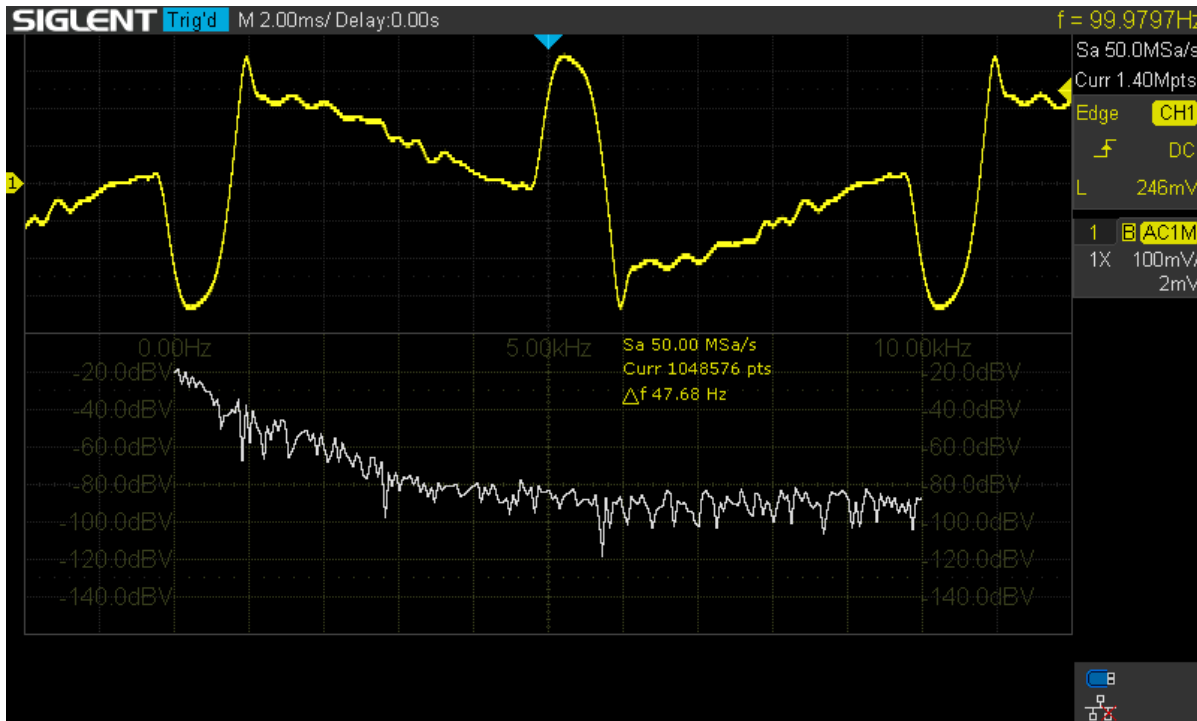


Magnetfelt nær varmeovn



Magnetfelt nær lysdimmer

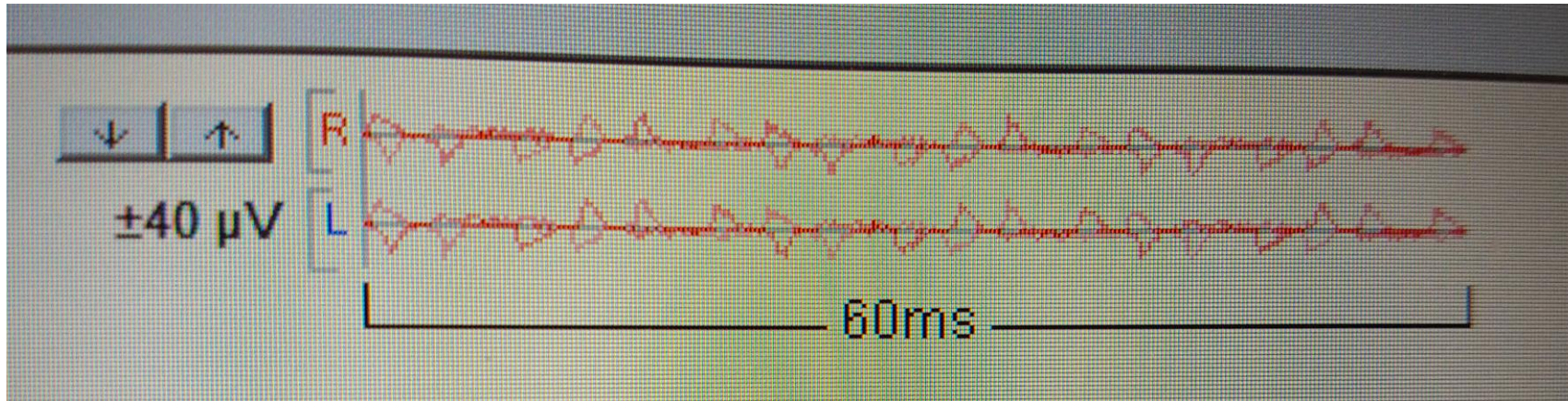
ABR – elektromagnetiske forstyrrelser



Magnetfelt nær skilletrafo på ABR-system

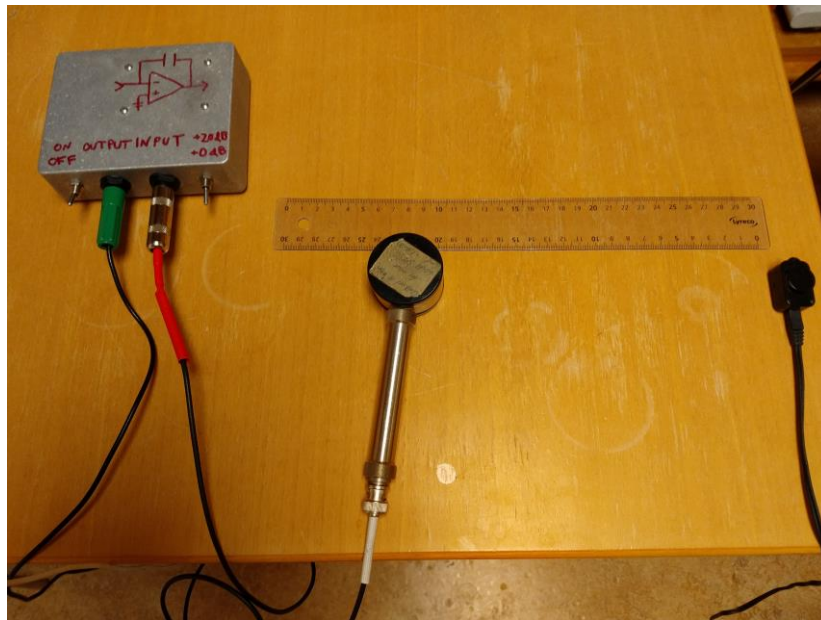
ABR – elektromagnetiske forstyrrelser

Støyproblem på operasjonsstua:

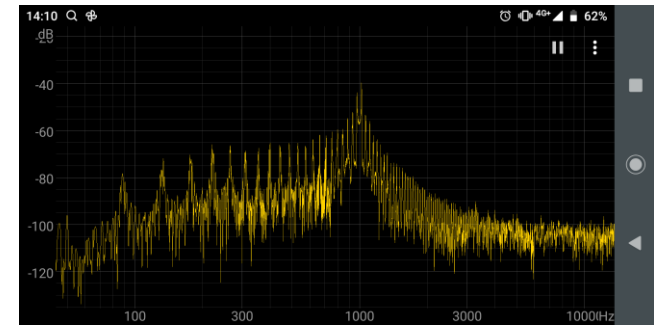


ABR – elektromagnetiske forstyrrelser

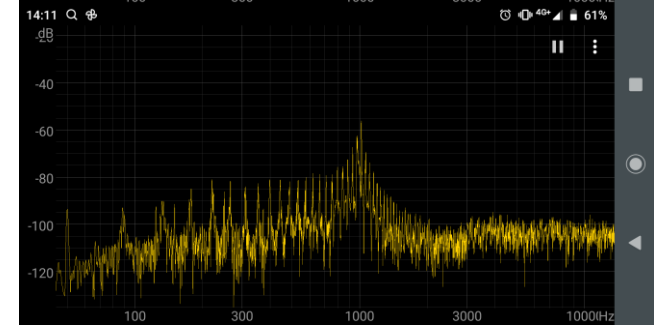
- Benleder med 1 kHz chirp @ 40 dB
- Målt med en Brüel & Kjær magnetfeltsensor gjennom hjemmelagd forforsterker



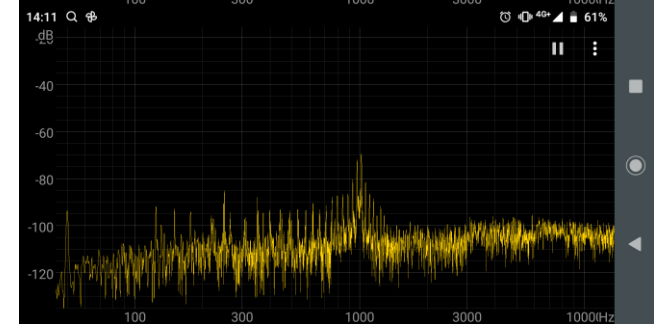
0 cm



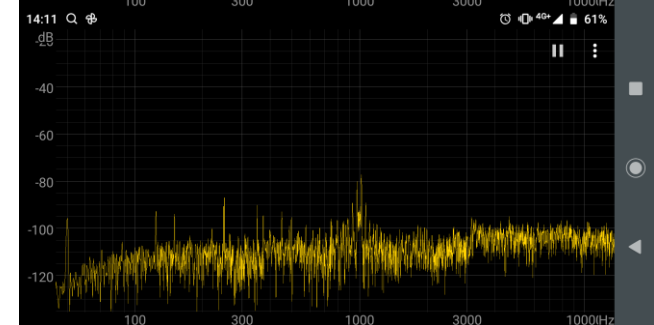
5 cm



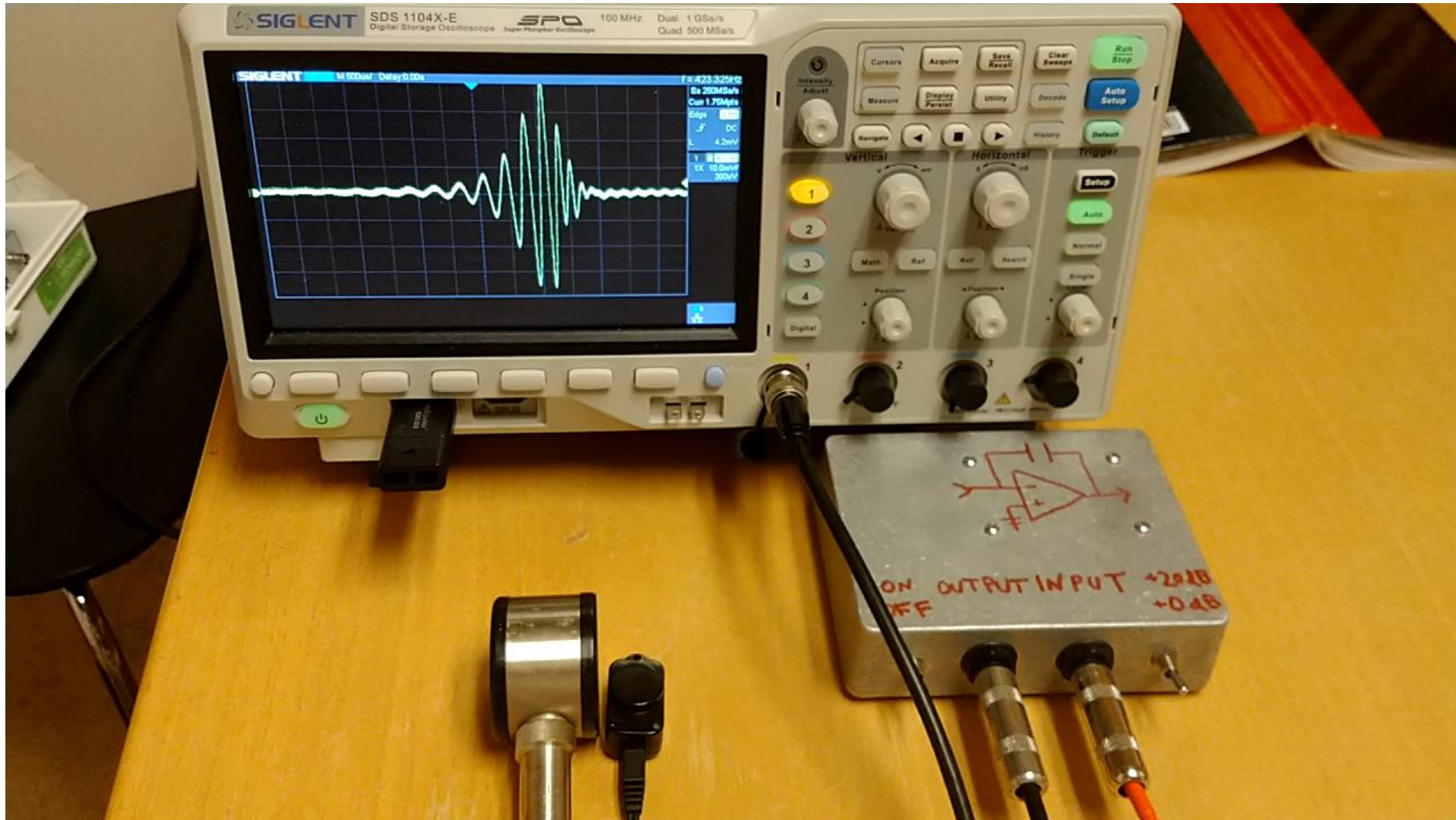
10 cm



15 cm

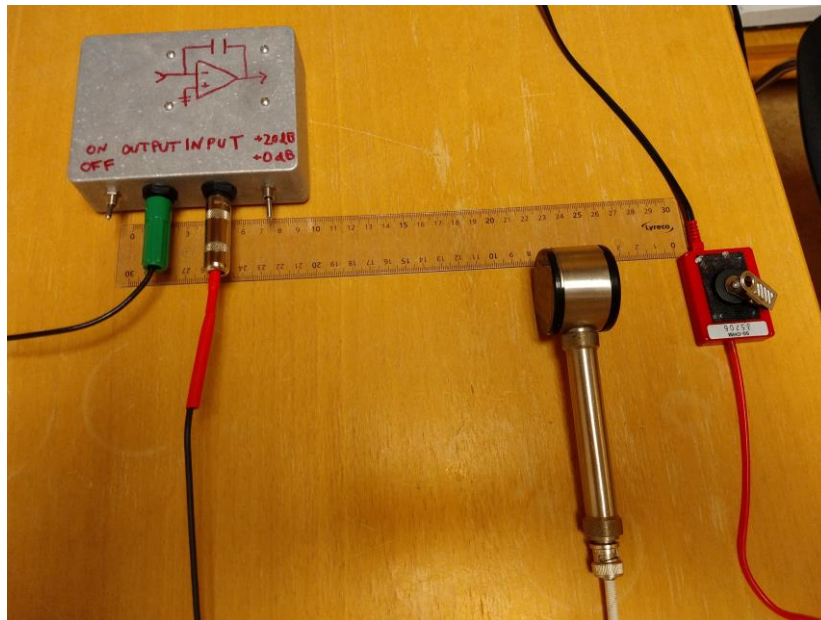


ABR – elektromagnetiske forstyrrelser



ABR – elektromagnetiske forstyrrelser

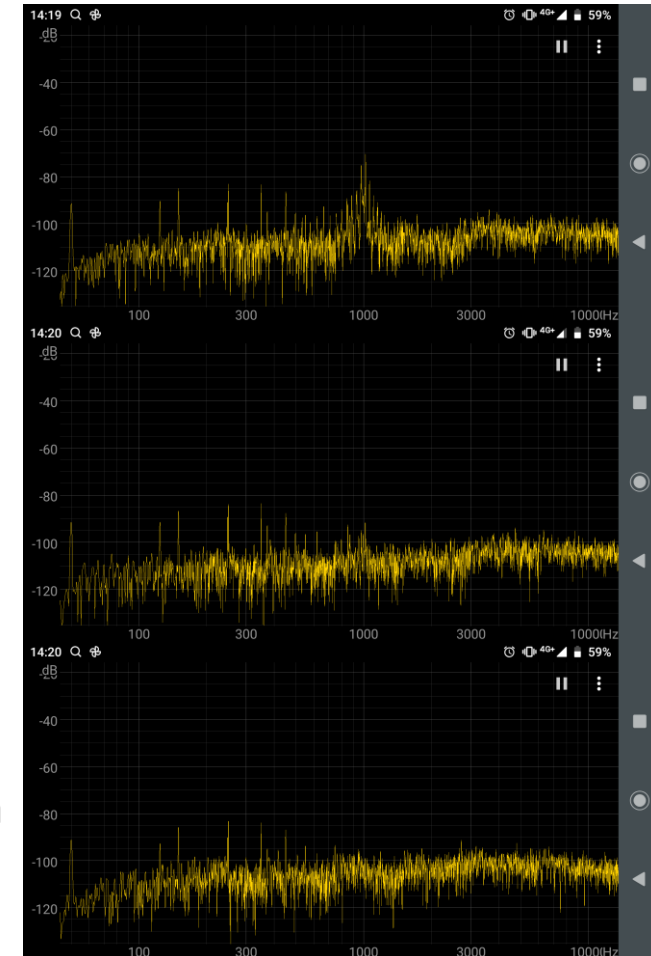
- ER-3C lyd giver med 1 kHz chirp @ 100 dB
- Målt med en Brüel & Kjær magnetfeltsensor gjennom hjemmelagd forforsterker



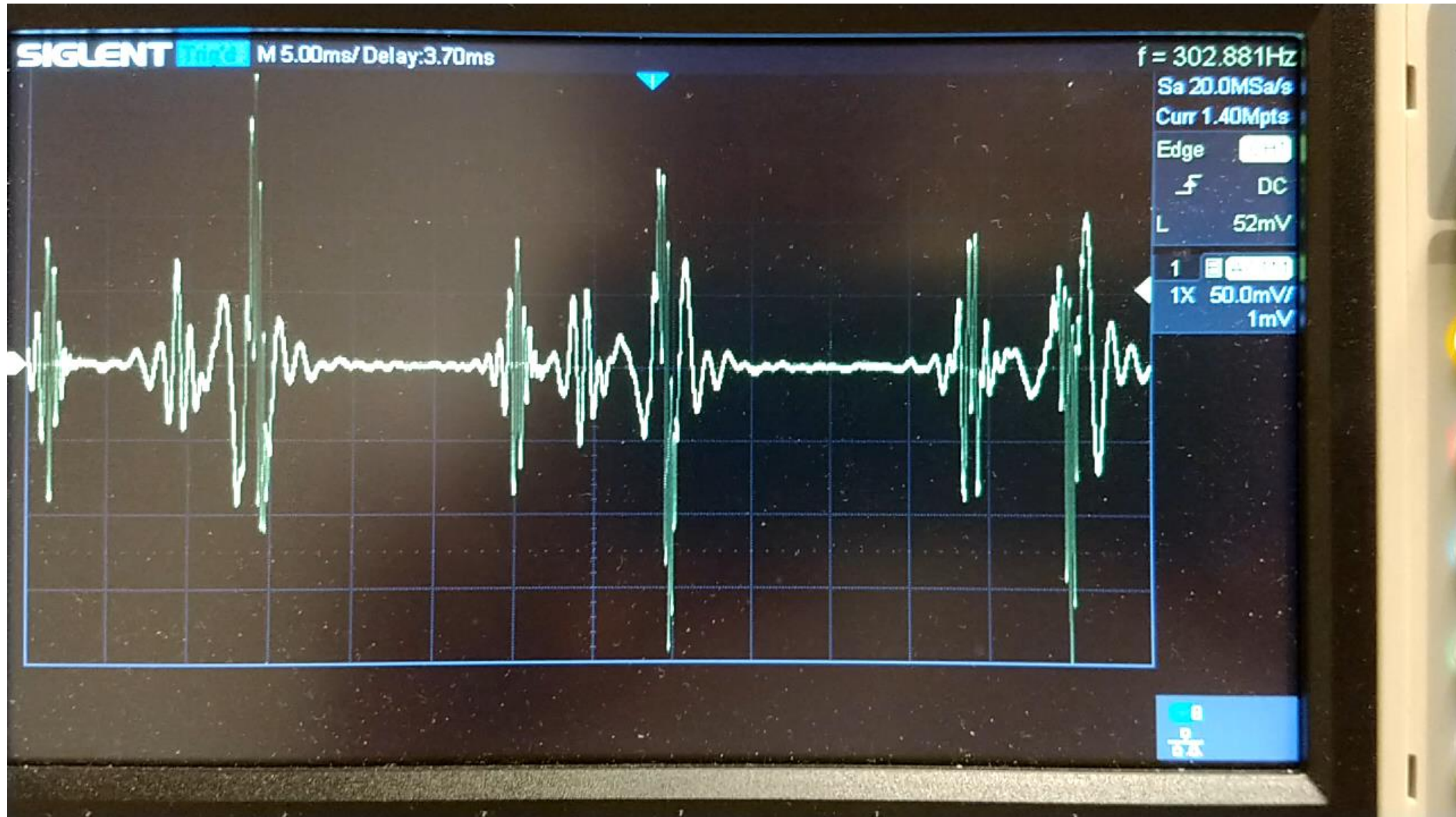
0 cm

5 cm

10 cm



ASSR



ASSR – øyeblikksbilde av alle frekvenser



ASSR – stimulus rate: 40 Hz eller 90 Hz

Interacoustics ASSR 1.2.7.51

File Help

L+R 65dB 4 freq. (Awake Adult) Actual Session

ASSR Audiogram

Stimulus

Right

Freq	Running	Waiting
500Hz		65dB nHL
1kHz		65dB nHL
2kHz		65dB nHL
4kHz		65dB nHL
WN		

Left

Freq	Running	Waiting
500Hz		65dB nHL
1kHz		65dB nHL
2kHz		65dB nHL
4kHz		65dB nHL
WN		

Total Session Status

Time elapsed

Headset: Insert phone

Stimulus rate

Adult Awake (*40Hz)

Start

Pause

Right

Left

500Hz

1000Hz

2000Hz

4000Hz

500Hz

1000Hz

2000Hz

4000Hz

dB nHL

500Hz 1kHz 2kHz 4kHz

dB nHL 500Hz 1kHz 2kHz 4kHz

Ready

100%

12:15

11.11.2020

ASSR – stimulus rate: 40 Hz eller 90 Hz

40 Hz, 1kHz alternerende



90 Hz, 1kHz alternerende



ASSR – masking og rejection level

The screenshot displays the Interacoustics ASSR 1.2.7.51 software interface. The main window shows a stimulus waveform (red) and a system setup dialog box (System setup) with several red circles highlighting specific settings.

System Setup Dialog - Stimuli selection:

Initial Level	500Hz	1kHz	2kHz	4kHz	White Noise Masking
Right: 65 dB nHL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Left: 65 dB nHL	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

System Setup Dialog - Rejection Level:

Rejection Level: 40 μ V

System Setup Dialog - Other Settings:

- Selected test: L+R 65dB 4 freq. (Awake Adult)
- Name of test: L+R 65dB 4 freq. (Awake Adult)
- Correction factor: Adult Awake (40Hz) Insert phone - v. 2.1
- Stimulus rate: Adult Awake (*40Hz)
- Headset: Insert phone

The background interface shows a stimulus waveform with a red circle around the amplitude control buttons (up and down arrows). The main window also displays a table of frequencies (500Hz, 1kHz, 2kHz, 4kHz) and their corresponding dB nHL values (65dB nHL) for both Right and Left ears.

ASSR - korreksjonsverdier

40 Hz

Voksen

System setup

Auto Tests | General Setup | Report Templates | Correction Factors

Predefined correction templates :

Selected correction: Adult Awake (40Hz) Insert phone - v. 2.1
Name of correction: Adult Awake (40Hz) Insert phone - v. 2.1

ASSR to Audiogram Correction Factors

	0/5	10/15	20/25	30/35	40/45	50/55	60/65	70/75	80/85	90/95	100	dB ASSR
500Hz	15	15	15	15	10	10	5	5	5	0	0	
1kHz	15	15	15	10	10	10	5	5	5	0	0	
2kHz	15	15	10	10	10	10	5	5	5	0	0	
4kHz	10	10	10	10	10	5	5	5	0	0	0	

OK Avbryt

90 Hz

Barn < 2 år

System setup

Auto Tests | General Setup | Report Templates | Correction Factors

Predefined correction templates :

Selected correction: Adult Sleeping (90Hz) Insert phone - v. 2.
Name of correction: Adult Sleeping (90Hz) Insert phone - v. 2.

ASSR to Audiogram Correction Factors

	0/5	10/15	20/25	30/35	40/45	50/55	60/65	70/75	80/85	90/95	100	dB ASSR
500Hz	25	25	25	25	20	20	15	10	5	5	0	
1kHz	15	15	15	15	10	10	5	5	5	0	0	
2kHz	5	5	5	5	5	5	0	0	0	0	0	
4kHz	5	5	5	5	5	0	0	0	0	0	0	

OK Avbryt

System setup

Auto Tests | General Setup | Report Templates | Correction Factors

Predefined correction templates :

Selected correction: Child (90Hz) Insert phone - v. 2.1
Name of correction: Child (90Hz) Insert phone - v. 2.1

ASSR to Audiogram Correction Factors

	0/5	10/15	20/25	30/35	40/45	50/55	60/65	70/75	80/85	90/95	100	dB ASSR
500Hz	25	25	25	25	20	15	15	10	5	5	0	
1kHz	15	15	15	15	10	10	5	5	5	0	0	
2kHz	5	5	5	5	5	5	0	0	0	0	0	
4kHz	5	5	5	5	5	5	0	0	0	0	0	

OK Avbryt