Acoustic Neuromodulation CR

In tinnitus reduction caused by hyperactivity of horizontal fibers in the auditory cortex.

In our clinic, we use acoustic neuromodulation CR in tinnitus reduction caused not only by two basic plasticity models, but also when it is generated and enhanced by hyperactivity of horizontal fibers in the auditory cortex.

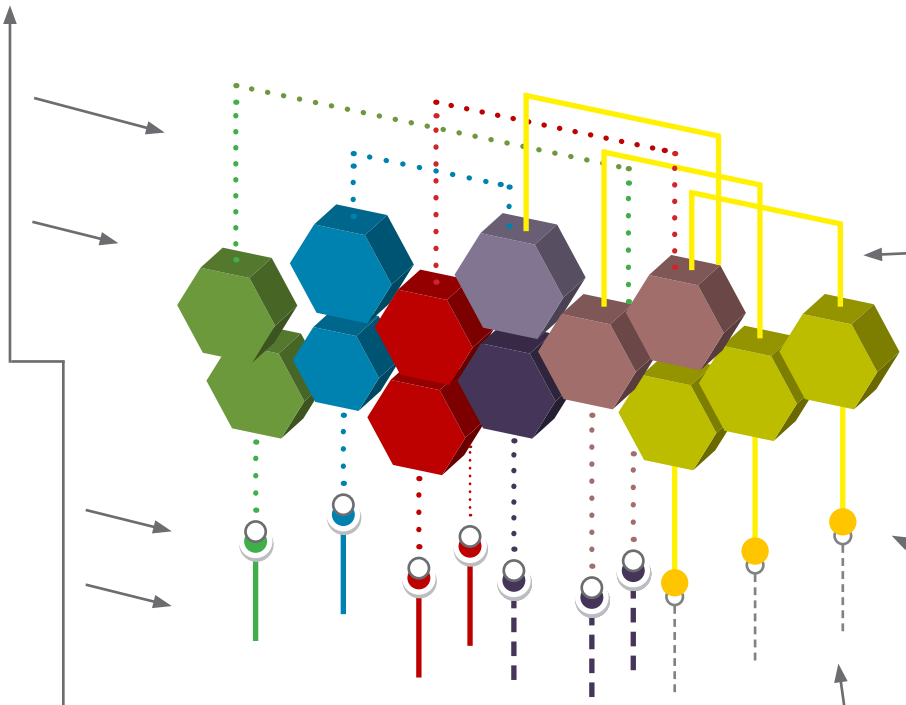
During patient's diagnosis and going through the process of qualification for a certain plasticity model, we always make sure if the structure of horizontal fibers, to which auditory cortex neurons are connected, does not take part in reinforcing the hyperactive structure of neurons. If a patient additionally has hyperactive structure of horizontal fibers, despite having spontaneous activity model or enhanced synchronization model, we use acoustic neuromodulation technology, and then technology with a very basic plasticity to reduce tinnitus.

Reduction of hyperactive structure of horizontal fibers with acoustic neuromodulation CR

Completed process of tinnitus reduction – a patient stopped hearing buzz or shriek

Reduction of the main cause generating tinnitus and one of two plasticity models (spontaneous activity, enhanced synchronization)

How hiperactive horizontal fibers tinnitus is generated?



Hiperactive horizontal fibers that increase activity of neurons that are close and connected with tinnitus neurons by fibers

Auditory cortex neurons that recive spontaneous activity from synapses that generate tinnitus

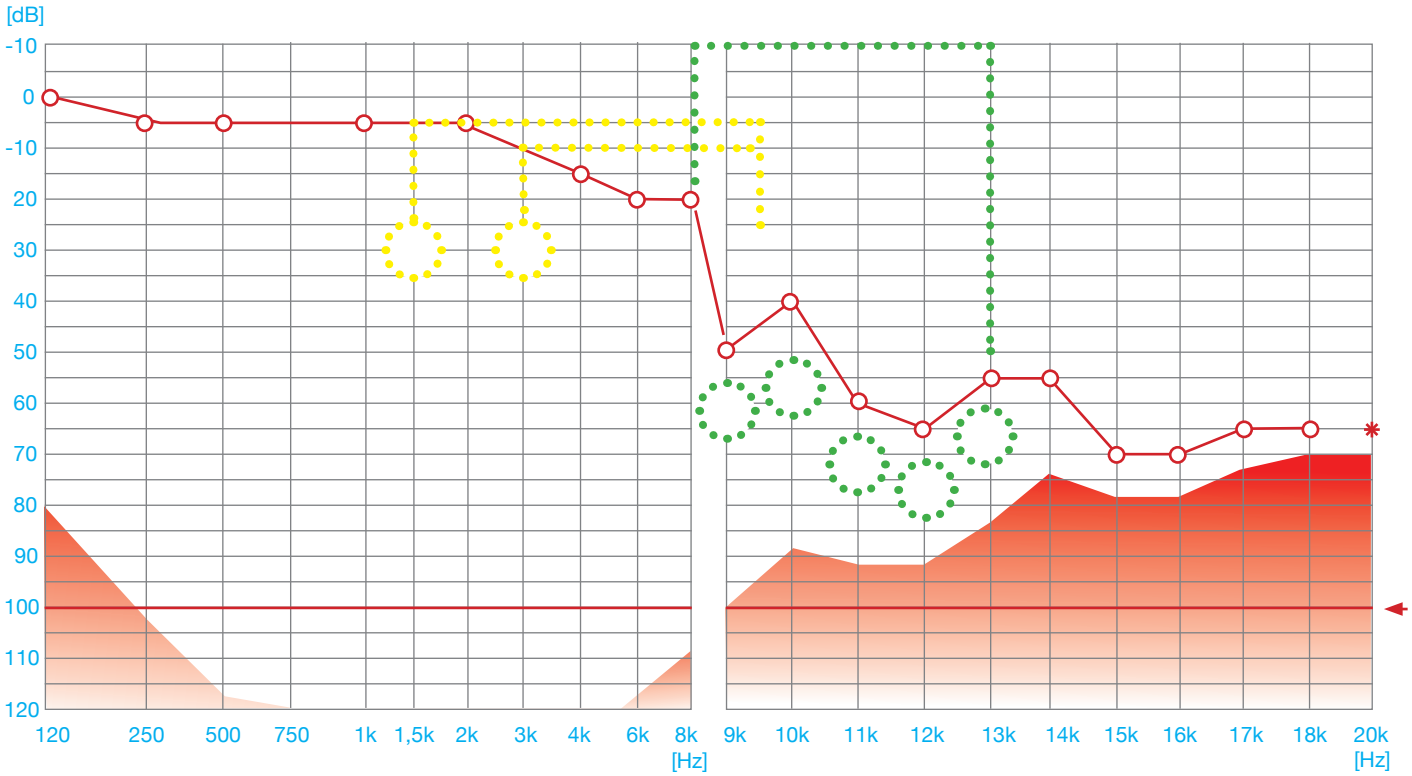
Hiperactive synapses of coachlear nucleus that release to much spontaneous activity to auditory cortex neurons

Horizontal fibers, synapses and neurons unaffected by tinnitus and sudden hearing loss

Decrease activity of auditory nerve fibers in sudden hearing loss range

The picture above presents simplified scheme of neurons from the auditory cortex (marked in different colors) and hyperactive horizontal fibers (marked in yellow). Those fibers join the structure of hyperactive neurons which receive spontaneous activity from synapses with neurons connected with this range and are engaged in generating hyperactivity.

Diagnosis and qualification process to reduce tinnitus caused by the basic model and hyperactivity of horizontal fibers



The picture above presents high frequency audiometry test results were sudden hearing loss was diagnosis and its marked as green. As yellow live were marked hyperactive horizontal fibers structure. Yellow dots meaning stimulation impact on tinnitus reduction during Tinnitus Tone Test. If after acoustic signal presentation in range were is none present sudden hearing loss patient feel that tinnitus is reduced this is our horizontal fibers hyperactivity area. Green marker dots are understood as area were sudden hearing loss appeared and this is our basic treatment goal after reducing hyperactivity of horizontal fibers.

In order to diagnose hyperactive structure of horizontal fibers, a following diagnosis must be conducted.

- High frequency tonal audtiometry
- Test of boundary frequencies and test of spontaneous activity of synapses
- Sudden hearing loss does not concern speech recognition from 125 Hz up to 10 kHz, which means it is above this range

After diagnosis, we select acoustic neuromodulation CR therapy for a patient. Its goal is to reduce tinnitus enhanced by hyperactive fibers. After the fibers are reduced, a patient moves on to the further protocol of stimulation, which task is to reduce the real symptom of tinnitus (one of two models: spontaneous activity or enhanced synchronization).

Qualification process to acoustic neuromodulation CR therapy.

- A patient hears shriek or buzz with additional high-pitched sounds
- Inatestforhyperactivityofhorizontalfiberapatientpointsoutafewfrequenciesplacedfar from the range of sudden hearing loss which reduce tinnitus
- ASSR test which measures oscillation (eurhythmics of neurons movement) shows hyperactive structure of horizontal fibers
- Sudden hearing loss does not concern speech recognition from 125 Hz up to 10 kHz, which means it is above this range

When a patient does not meet with the qualification requirements.

A person struggling with hearing loss stepping into the range of speech recognition is qualified for tinnitus reduction in this model with a broadband hearing aid up to 14 kHz. Such a wide range of reinforcement will stimulate auditory cells and then it will reconstruct neurons of the spiral ganglion which were deprived during hearing loss. Thanks to this process, an appropriate organizing of the auditory pathway will take place and neurons from the boundary frequencies will be joined to the restimulated ranges. As an outcome, we should get better hearing range, tinnitus reduction and auditory hypersensitivity reduction due to equaling the level of neurotransmission.

Tinnitus reduction caused by hyperactivity of horizontal fibers in the auditory cortex.

Patient received mobile acoustic neuromodulation CR device with CIC headphones. The device is programed by audiologist and need to be used during 2-month stimulation protocol, patient should use stimulation 6-7 hour at day. After successful reduction of hyperactivity of horizontal fibers patient can start tinnitus reduction in spontaneous activity model or enhauzed synchronization.

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We reduce tinnitus