

High frequency treatment of tinnitus with potentially wearable technology

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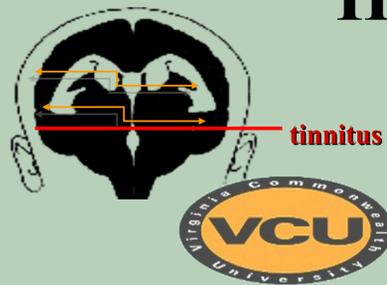
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www.tinnitus.vcu.edu

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tinnitus

UltraQuiet™

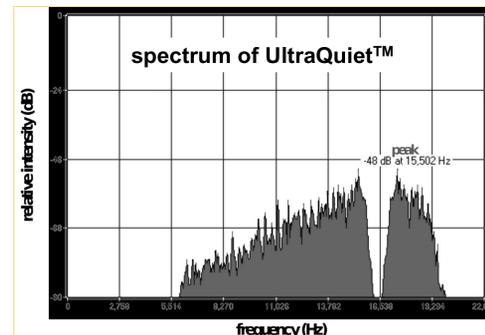
next generation UltraQuiet™

INTRODUCTION

- Tinnitus is a perception without a sensation.
- Tinnitus is chiefly neural and it can appear to be in either ear or both.
- Perception of tinnitus is interactive with external sound.
- Attention or top down processing is a factor in tinnitus perception.
- The lemniscal or tonotopic auditory pathway is involved in tinnitus as well as the multimodal non-lemniscal pathway.
- The limbic system is part of the tinnitus neural network and the amygdala plays a prominent role.
- Hearing loss is often associated with tinnitus.
- Spontaneous neural rate increase.
- Cortical neurons tuning response reprogram.
- An effective treatment for tinnitus would involve very high frequency stimulation at a level (~10 dB SL) covering the tinnitus pitch match and the tinnitus spectrum.
- The purpose is not to mask but to stimulate cortical reprogramming with high frequencies.



FDA pre-market approval



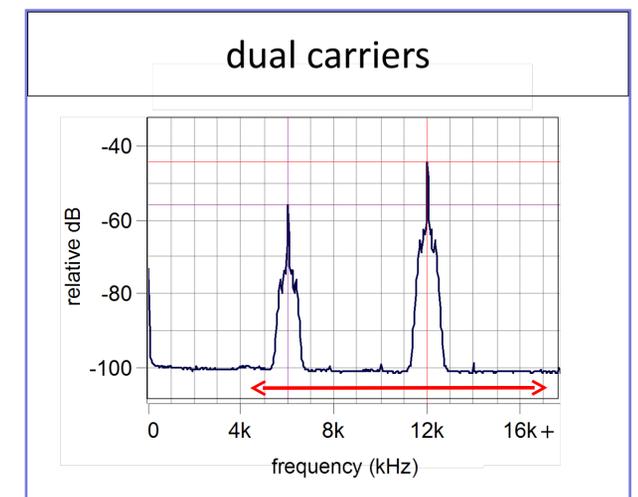
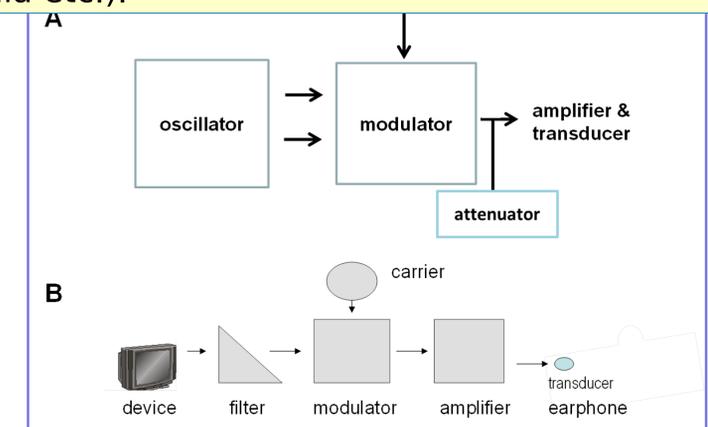
Patient ID	PET Category	MML Change in dB	Subjective Scale		Feldmann Masking Curve (1-4)
			1 Wk After	8 Wk After	
1	Hyper	5-10	5	5	1
2	Hyper	5-20	4	6	1
3	Hyper	5-15	5	4	4
4	Hypo	5-45	4	6	4
5	Hypo	10-35	7	6	4
6	Mixed	5-10	5	5	4

Note: Subjective scale (efficacy of fair; 4 = no change; 0-3 = poor. Hyper = hypermetabolic; hypo = MML = minimum masking level.

7 = very good; 6 = good; 5 = fair; 4 = no change; 0-3 = poor. Mixed = mixed metabolic;

Problem: Benefit is < 50% outside the lab. Increase compliance and discipline in therapy.

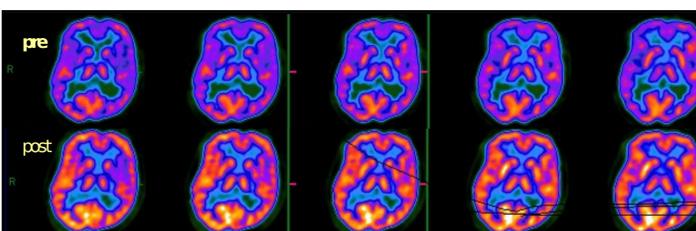
Solution: Incorporate therapy in a recreational format (TV, media etc.).



ARMY SBIR

New diagnostic test: 2011 Army SBIR award to Acentech Inc. and Ceres Biotechnology, LLC for tonal tracking procedures in the identification of tinnitus.

PET study



frontal cortex; parietal; aud. cortex; insula thalamus; medial temp lobe; cerebellum

PET verified UltraQuiet™ efficacy. (study details: www.tinnitus.vcu.edu)

