

Pseudoscience in audio (September 2022)

Humans are uncomfortable with uncertainty and the unknown, and yearn for explanations and understanding. This is what drives scientific research. Unfortunately, instead of pursuing the tedious route of formal science, some people join the cult of a self proclaimed guru. An interesting case study of this gullibility is provided by the Youtube channel [Audio Science Review](#) hosted by [Mr. Amir Majidimehr](#), in particular his video [“Scientific Proof of Measurable Difference in Audio Cables? Paper Review”](#) about some papers written by me. Based on an entertaining cocktail of circular reasoning, irrelevant measurements, and plain dishonesty, Mr. Majidimehr has cultivated some loyal followers who are unable or unwilling to digest original sources of scientific information¹, and are indifferent to their cult leader’s qualifications, or lack thereof. From Mr. Majidimehr’s own LinkedIn page and Google scholar record, [he has zero journal publications](#) and [has never been invited to speak at international conferences on audio](#). Yet we have a “critical assessment” of journal papers from someone who never published a single research paper himself! Mr. Majidimehr [has no clue about how scientific research works](#). He does not know the difference between correlation and causation. This cult leader is stuck in a twilight zone of limited and faulty knowledge.

My paper published in JAES², which he claims is wrong (“*I...pointed out all these problems*”; “*but it is sad that AES published this*”) was rigorously reviewed with a fine-tooth comb by 4 independent reviewers plus editors. This was all to ensure that every scientific detail was thoroughly scrutinized. JAES then hosted a Zoom roundtable open to all AES members and guests and also hosted an official online forum in which the paper was discussed. At the end of this scrupulous process, no questions remained unanswered and not a single thing was found wrong with the paper. Long after the paper was published, it has been read carefully by many members of the AES community (including AES officers) who praised the work. It is an unfortunate state of society when followers believe their cult leader rather than the entire professional research community. Contrary to his implication (“*author starts his newest paper by acknowledging that this problem exists*”), the subsequent paper in IOSR³ did not admit and fix problems in the JAES paper. It is simply a natural extension of the previous work. Professional research proceeds in stages. Apollo 11 was not an admission of “mistakes” by the first 10 missions because they didn’t land people on the moon. The earlier missions set the stage. Having never published any research at all, Mr. Majidimehr would not know this. And his followers appear unwilling to do their own fact checking.

Mr. Majidimehr has serious deficits in his understanding of key concepts:

(1) Signal analysis for evaluating audio fidelity has 2 broad domains: Frequency (spectral) and time (temporal). To focus on only one of these is like approaching audio assessment with only half a brain. A spectrum analyzer focuses on only the first and is not best suited for studying impulse response and transients⁴, which are influential in defining instrumental timbre. Also Fourier representations cannot properly describe transfer functions of non-linear and non-time-invariant systems. Mr. Majidimehr’s instrumentation and basis of analyzing audio fidelity is fundamentally flawed.

(2) The temporal (time) resolution of the auditory system has no direct connection with 1/f (reciprocal of frequency). Mr. Majidimehr mixes the two. Humans can detect a time difference between left and right ears of 10 microseconds at a frequency of 900 Hz. This time is 100 times shorter than 1/f ~1 millisecond. This has been known for over half a century^{5,6}.

¹ YouTube provides a wonderful and valuable platform where one can listen to many different viewpoints and experiences. Most hosts are civil and have the humility to acknowledge what they do or do not know, and are not intent on spreading misinformation.

² M. N. Kunchur, “Cable Pathways Between Audio Components Can Affect Perceived Sound Quality,” J. Audio Eng. Soc., vol. 69, pp. 398–409 (2021). DOI: <https://doi.org/10.17743/jaes.2021.0012>. [Free download through my homepage.](#)

³ M. N. Kunchur, “An electrical study of single-ended analog interconnect cables”, IOSR J. Electr. Comm. Eng. vol. 16, pp. 40–53 (2021) DOI: 10.9790/2834-1606014053. [Free download through my homepage.](#)

⁴ See pg. 32 of the user manual of the [Audio Precision analyzer](#).

⁵ R. B. Klumpp, and H. R. Eady, “Some measurements of interaural time difference thresholds,” J.

(3) Mr. Majidimehr seems to have a nonsensical notion that digital temporal resolution equals $\sim T/2^{n-1}$ (T =sample period, n =bit depth). That corresponds to the shortest shift in a waveform's edge that can be detected. It does not represent the fineness of features in a waveform that can be resolved, which is in fact limited by approximately the sampling period T (not $T/2^{n-1}$!). For further explanation, see the review paper⁷ (which can be downloaded for free) written by the current President of the Audio Engineering Society that explains time smearing in digital audio due to convolution with the impulse response.

(4) From his statement (“4 nanoseconds is 250 megahertz...why would I care about a 4 nanosecond pulse to go through anything”), Mr. Majidimehr seems to not understand one of the most fundamental concepts in electromagnetism, which is the connection between low-frequency properties such as the dielectric constant and signal propagation speed. This is analogous to relating the density and pressure (low-frequency properties) of a gas to its speed of sound⁸.

(5) Mr. Majidimehr seems to have a juvenile understanding of oscilloscope measurements, thinking that they are limited to 8-bits of vertical resolution. For repetitive signals, the resolution can be expanded through triggered measurements at multiple ranges, as was done for the IOSR paper's Fig. 6(b) and (c). This is similar to shooting a static scene with a camera on a tripod at multiple exposure settings, a technique known as HDR (high dynamic range) photography.

Pretty much every word that came out of Mr. Majidimehr's mouth in that video is nonsense—out of a combination of ignorance and the desire for entertaining his followers with shock humor. I hope his viewers don't just echo his words like a parrot without thinking. Attend AES conferences and read papers in their entirety including footnotes, references, and other details. If you do this, you will easily catch his lie (“At a minimum he should tell us what these cables are so that we can replicate this testing. He doesn't even tell us what the brands are...”). If you look carefully, all the information is there: In the JAES paper, look at the clause on page 3 starting with “(A) a Straight-Wire Virtuoso ...” and footnotes 8 and 11; in the IOSR paper⁹, look at footnote g and its reference 1. The IOSR paper provides the most complete measured specs anyone has ever published on audio cables. This detailed documentation allows anyone to repeat the experiments if they want to. There is a wealth of other valuable new information in the paper (e.g., the psychology underlying listening tests), which seems to have been missed because of the superficiality with which the papers were skimmed over.

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Further information about my background, qualifications, and experience can be found at: <http://boson.physics.sc.edu/~kunchur/>. I have been invited to speak all over the world on audio, acoustics, and measurements involving fast signals at professional society conferences and research institutions. I have had discussions of my work with presidents of the Audio Engineering Society, the Acoustical Society of America, and the Association of Research in Otolaryngology. All of my work is thoroughly vetted before I submit it to a journal, where it is further scrutinized to the last detail before it gets published. I have a track record of going beyond the beaten path and developing fresh approaches and interpretations to get to the bottom of perplexing observations and claims. For this reason, my work is cited in textbooks and review articles. I may, at some point, provide tutorials for those who have a serious interest in the science behind audio and hearing.

Acoust. Soc. Am., vol. 28, pp. 859–860 (1956). DOI: 10.1121/1.1908493.

⁶ A. Brughera, L. Dunai, W. M. Hartmann, “Human interaural time difference thresholds for sine tones: the high-frequency limit”, J Acoust Soc Am. vol. 133, no. 5, pp.2839-2855 (2013 May). Their Fig. 1(c). DOI: 10.1121/1.4795778. PMID: 23654390; PMCID: PMC3663869.

⁷ J. D. Reiss, “A Meta-Analysis of High Resolution Audio Perceptual Evaluation,” J. Audio Eng. Soc., vol. 64, no. 6, pp. 364–379 (2016 Jun.). <http://dx.doi.org/10.17743/jaes.2016.0015>.

⁸ This is why breathing in helium makes the voice “squeaky” (formants shift up); sound speed = $\gamma \sqrt{P/\rho}$.

⁹ Some journals are sensitive about commercialization and don't like brands to be mentioned in the main text. So the information is presented in the footnote and its reference.