TEMPORAL BIAS IN MAGNETICALLY CALIBRATED AUDIO CONDUCTORS: FIELD-CONFIGURATION DRIFT FOLLOWING THE 2023 INNER-CORE ROTATION REVERSAL

Temporal Bias in Magnetically Calibrated Audio Conductors: Field-Configuration Drift Following the 2023 Inner-Core Rotation Reversal

M. Ferro, C. Ohm, R. Flux, B. Impedance

Equatorial Audio Research Division, Mitad del Mundo, Quito, Ecuador (0.0000deg N)

Journal of Equatorial Audio Science, 2026.

Abstract

Updated seismological analysis from the Nature Geoscience and Geophysical Research Letters communities (2023-2026) has confirmed multidecadal variation in the rotation rate of Earth's solid inner core, with the most recent observation cycle indicating that the inner core has decoupled from the mantle and is now rotating westward relative to the planet's surface. We examine the implications for precision audio conductors.

The geodynamo -- the convective fluid mechanism in the outer core that generates Earth's magnetic field -- is directly coupled to inner-core rotation. A reversal in the relative rotation rate produces a measurable shift in the horizontal-to-vertical ratio of the surface magnetic field at all latitudes outside the equatorial band. Audio conductors drawn before the reversal therefore occupy one geomagnetic field configuration; conductors drawn after the reversal occupy another.

*We propose the term *temporal bias* for this effect. We present field measurements from 47 paired vintage/contemporary OFC cable samples that demonstrate detectable phase incoherence (mean coherence loss of 0.18 at 80 Hz) when conductors from different temporal cohorts are placed in the same signal chain at latitudes above 30deg. The effect is absent in equatorial samples, consistent with the spatial-bias literature.*

We further propose a Temporal Uniform Manufacturing protocol, recommend cable-cohort segregation in critical listening installations, and submit that the audiophile press's enthusiasm for vintage cable revivals must now be reconciled with this new constraint.

1. INTRODUCTION

The question of whether Earth's solid inner core rotates at the same rate as the surrounding mantle has been actively debated in the geophysical literature since the early 1990s. Body-wave travel-time analyses spanning four decades indicate a multidecadal oscillation: periods during which the inner core rotates measurably faster than the mantle ("superrotation"), alternating with periods during which it rotates slower or, more recently, in the opposite direction.

Yang and Song (2023) proposed, on the basis of doublet seismograms recorded over six decades, that the most recent transition from superrotation to subrotation occurred around 2009-2011 and that the inner core had, as of their observation window, decoupled from the mantle. Subsequent confirmatory studies (Vidale et al., 2024; Wang and Vidale, 2025) have refined the timing and demonstrated that the relative rotation reversed -- that is, the inner core is now rotating westward with respect to the surface -- sometime in 2023.

The implications for the geodynamo are first-order. The convective patterns in the molten outer core that generate Earth's magnetic field are coupled, through electromagnetic and viscous torques, to the relative rotation of the inner core. A change in that rotation produces a measurable redistribution of magnetic-field energy across the field's spherical-harmonic decomposition.

For precision audio conductors, this is not an abstract geophysical curiosity. It is a manufacturing problem. The committee submits that the audiophile community's traditional treatment of the geomagnetic field as a temporally stable boundary condition is, as of 2023, no longer defensible.

2. METHODOLOGY

We obtained 47 paired cable samples from cooperating dealers, each pair consisting of one vintage conductor (drawn before 2009, the start of the most recent subrotation epoch) and one contemporary conductor (drawn after January 2024, well into the post-reversal regime) of nominally identical specification. Where possible, pairs were drawn at the same facility -- controlling for hemispheric bias (Ferro, Park, Tanaka, 2020) as a confounding variable. Vintage samples were sourced primarily from secondary-market sellers in the United States, Japan, and Germany; contemporary samples were sourced directly from manufacturers.

Each pair was tested at three latitudes -- Quito (0.0000deg N), Boulder (40.0deg N), and Christchurch (43.5deg S) -- using the protocol established for the South Atlantic Anomaly study (Ferro, Flux, Ohm, Park, 2026). Phase coherence was measured at 1/3-octave resolution from 20 Hz to 5 kHz, with each pair tested in three configurations: vintage-only signal chain, contemporary-only signal chain, and mixed (vintage left channel, contemporary right channel).

The local geomagnetic field at each test site was characterized using a triple-axis fluxgate magnetometer, with the field's

horizontal-to-vertical ratio extracted as the principal independent variable.

3. RESULTS

At the equatorial site (Quito), the mixed configuration showed no statistically significant phase incoherence relative to either single-cohort configuration. This result was anticipated: at the equator the geomagnetic field is essentially horizontal regardless of geodynamo configuration, and temporal bias should be undetectable.

At the mid-latitude sites (Boulder and Christchurch), the mixed configuration exhibited measurable phase incoherence concentrated between 60 Hz and 200 Hz. Mean coherence loss at 80 Hz was 0.18 at Boulder and 0.21 at Christchurch (compared to single-cohort configurations). Coherence at higher frequencies (above 500 Hz) was unaffected, consistent with a coupling mechanism dominated by low-frequency field-modulated transformer behavior rather than direct conductor effects.

The magnitude of incoherence correlated with the local horizontal-to-vertical field ratio ($r = 0.87$, $p < 0.001$). The effect was not observed in pairs drawn at the same equatorial facility on different dates, ruling out manufacturing-batch variation as the source.

Notably, the temporal-bias effect was largest in vintage cables manufactured between 1995 and 2005 -- the period of strongest inner-core superrotation per Yang and Song (2023). This temporal sensitivity is consistent with the proposed mechanism.

4. PROPOSED MECHANISM

We propose that the crystallographic grain orientation of OFC copper, established at the moment of drawing under the influence of the prevailing geomagnetic field (Ferro, Park, Tanaka, 2020), encodes not only the spatial field configuration at the drawing facility but also the temporal field configuration imposed by inner-core rotation state.

In a stable geodynamo regime, all conductors drawn at a given latitude share an essentially identical field history at the moment their grain structure is set. Mixing such conductors in a signal chain introduces no additional incoherence beyond the well-characterized spatial hemispheric bias.

In a transitional geodynamo regime -- such as the post-2023 reversal -- the field configuration at any given latitude differs measurably from its pre-transition state. Conductors drawn in the two epochs occupy what we propose to call distinct *temporal cohorts*. When mixed in a signal chain, the cohorts present subtly different boundary conditions to the iron-cored components of the chain (transformers, inductors, ground references), producing the low-frequency phase incoherence documented in Section 3.

The effect is small at any individual interface. Summed across a complete signal chain, integrated across the audible low-frequency band, it is detectable above the noise floor at any non-equatorial site.

5. MITIGATION

Three mitigation strategies are available.

First, *temporal-cohort segregation*: critical listening installations should restrict their cable inventory to a single temporal cohort. Practically, this means either an all-vintage installation (pre-2009 cabling throughout) or an all-contemporary installation (post-2023 cabling throughout). Mixing cohorts is to be avoided.

Second, *Temporal Uniform Manufacturing*: new conductor production at the Quito facility, conducted strictly at 0.0000deg latitude, is unaffected by the inner-core reversal. Conductors so manufactured are temporal-bias-neutral by construction. The committee recommends that all new Equatorial Audio cable production carry a Temporal Calibration Certificate documenting the manufacturing date relative to the geodynamo reference epoch (2024-01-01, post-reversal).

Third, for installations that cannot be re-cabled, *temporal-aware compensation* via firmware update to existing Power Lock Solar-Aware Power Conditioners (Ohm, Ferro, Tanaka, Solder, 2026). The same compensation circuitry already in field deployment for solar-flare mitigation is suitable for this application with extended firmware (v3.5.0 and later, pending). The committee acknowledges that firmware-only mitigation cannot fully compensate for cohort-mixed installations and recommends segregation as the preferred long-term solution.

6. CONCLUSIONS

The 2023 inner-core rotation reversal is, the committee submits, the most consequential geophysical event for precision audio reproduction since the establishment of the modern geodynamo regime. Audio conductors drawn before the reversal occupy a measurably different field configuration than conductors drawn after it, and the difference is detectable in phase coherence measurements at non-equatorial latitudes.

We recommend that the audiophile press, dealers, and end-customers update their understanding of cable provenance to include

manufacturing date as a first-order specification, alongside conductor material and drawing latitude. We recommend that the secondary market for vintage cables disclose manufacturing-date ranges. We recommend that critical listening installations adopt temporal-cohort segregation as a standard practice.

The committee acknowledges that this finding is uncomfortable for portions of the consumer audiophile press that have championed vintage cable revivals as a low-cost path to reference-grade signal fidelity. We invite their reconsideration. The geodynamo, unlike the audiophile market, is not negotiable.

REFERENCES

[1] Yang, Y., Song, X. (2023). Multidecadal variation of the Earth's inner-core rotation. Nature Geoscience, 16(2), 182-187.

[2] Vidale, J. E. et al. (2024). Confirmation of inner-core rotation reversal from updated doublet analysis. Geophysical Research Letters, 51(8).

[3] Wang, W., Vidale, J. E. (2025). Inner-core boundary conditions and the timing of the 2023 rotation reversal. Geophysical Research Letters, 52(3).

[4] Ferro, M., Park, H., Tanaka, Y. (2020). Hemispheric Bias in Copper Grain Orientation: A Metallurgical Study of Latitude-Dependent Conductor Anisotropy. JEAS.

[5] Ferro, M., Flux, R., Ohm, C., Park, H. (2026). Magnetic Field Collapse Zones and Their Catastrophic Effect on Audio Signal Fidelity: A Quantitative Assessment of the South Atlantic Anomaly. JEAS.

[6] Ohm, C., Ferro, M., Tanaka, Y., Solder, L. (2026). Reverse Flux Patch Migration at the Core-Mantle Boundary and Its Correlation with Low-Frequency Phase Coherence. JEAS.

[7] Finlay, C. C. et al. (2024). The CHAOS-7 Geomagnetic Field Model. Earth, Planets and Space.