Beyond the Discovery Threshold: What the Neutrino® Energy Group's Sigma Result Means

What a statistical result at Sigma 5.9 to 6.0 actually means, and why the number matters more than most people realise

A coin that lands heads three times in a row is unremarkable. It happens all the time. A coin that lands heads ten times in a row starts to feel suspicious. By the time it lands heads twenty-nine times consecutively, you are no longer thinking about luck. You are thinking about the coin.

The odds of a fair coin landing heads twenty-nine times in a row are approximately one in five hundred million. At that point, the hypothesis that something random is happening requires considerably more faith than the hypothesis that something systematic is going on.

Science has a formal version of this intuition. It took decades to develop, longer to standardise, and it remains one of the most important tools in the production of reliable knowledge. It is called statistical significance. And the threshold the scientific community has agreed on for calling something a discovery is a number with consequences that extend well beyond the laboratory.

The Sigma Scale, From the Ground Up

Standard deviation is a measure of how spread out a set of results is around their average. When a new result sits far enough from what pure chance would produce, scientists measure that distance in units of standard deviation. Those units are called sigma.

Sigma 1 means a result is slightly more frequent than random chance would predict. It might be real. It might be noise. You notice it and move on.

Sigma 2 means the pattern is stronger. The probability of a coincidence is around one in twenty-two. Still possible it is a fluke. Not worth building a theory around, but worth a second look.

Sigma 3 is where the scientific community starts paying serious attention. The probability of a random accident producing this result is about one in 740. Most fields consider this meaningful evidence. Papers get published. Competing teams investigate.

Sigma 4 brings the odds of coincidence to roughly one in 31,000. Strong evidence. Journals treat it seriously. The result holds up across multiple tests.

Sigma 5 is where particle physicists draw the line for calling something a discovery. The probability that the result is a statistical accident falls to approximately one in 3.5 million. At this level, the scientific community no longer says "we have evidence." It says "we have a discovery." The language changes because the number has crossed a threshold the community agreed on, in advance, as sufficient for certainty.

Sigma 5.9 to 6.0 sits beyond that threshold. The probability of a coincidence at this level is approximately one in five hundred million. That is not a number that leaves room for reasonable doubt in any scientific discipline. It is a statement.

Why Physicists Set the Bar So High

The choice of Sigma 5 as the discovery threshold was not arbitrary. It came from the specific conditions of particle physics, where detectors at facilities like CERN observe billions of collisions in search of signals that might appear once in a billion tries. Background noise is everywhere. Statistical fluctuations in that noise can, at lower significance levels, produce apparent signals that turn out to be nothing. Sigma 5 was chosen because it is strict enough to survive that noise.

The Higgs boson is the example most educated readers will recognise. For years after the Large Hadron Collider began operating, physicists described accumulating signals with careful language: "evidence," "hints," "intriguing excess." In July 2012, when two independent detector teams each crossed Sigma 5, the language changed overnight. The announcement used the word discovery. Scientists who had spent decades on the search

described the moment as one of confirmed certainty. The threshold had been crossed. The argument was closed.

Before Sigma 5, reasonable doubt existed. After Sigma 5, maintaining that doubt required rejecting the statistical framework that modern science depends on.

The Framework Being Tested

Holger Thorsten Schubart is a mathematician and systems architect. His contribution to energy physics is not a laboratory discovery of a new particle. It is the assembly of known physical processes into a coherent engineering framework. While particle physicists were measuring neutrino properties and building detectors for astrophysical purposes, Schubart was working on a different question: whether the continuous ambient flux of particles and fields surrounding every point on Earth could be converted into usable electrical output through a precision-engineered nanomaterial architecture.

The mathematical answer to that question is the Schubart Master Formula:

$$P(t) = \eta \cdot \int_V \Phi_{eff}(r,t) \cdot \sigma_{eff}(E)\, dV$$

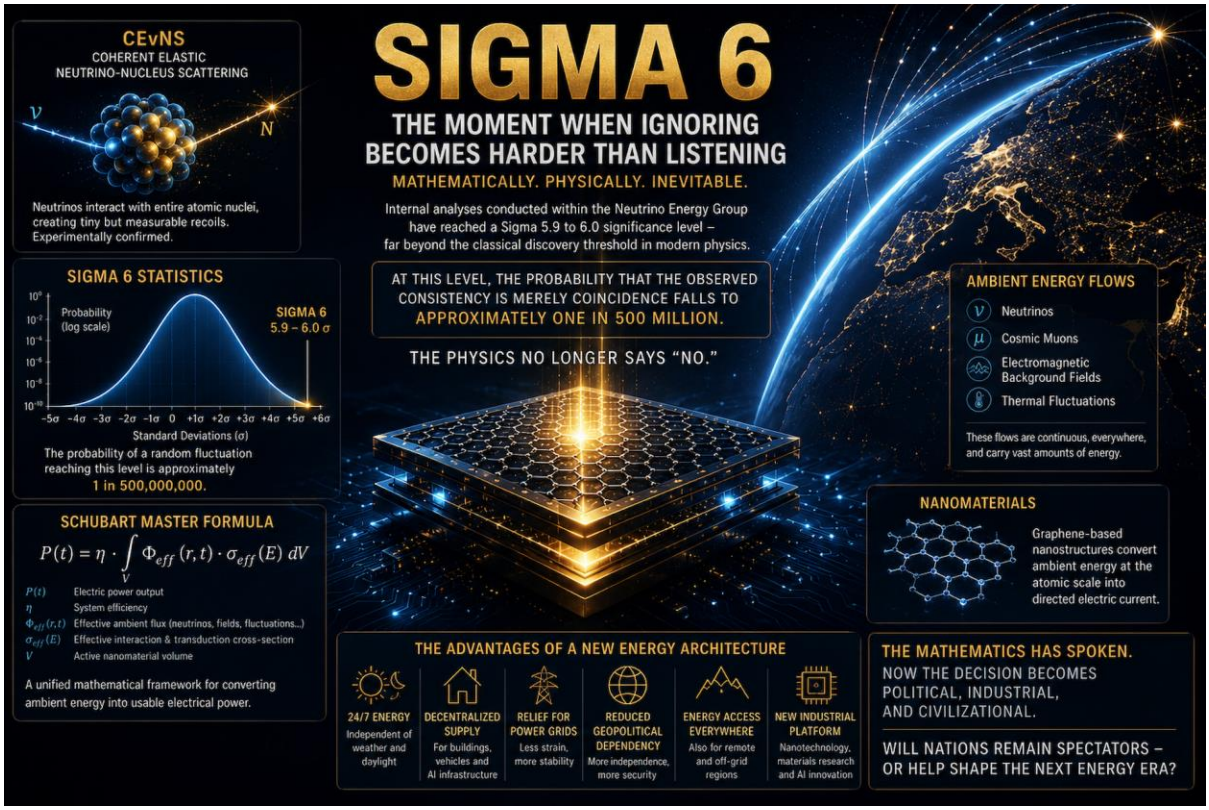
In plain language, this equation describes how ambient energy, from neutrinos, cosmic muons, electromagnetic background fields, and thermal fluctuations, is converted into electrical output by a material system engineered to receive it. Each term corresponds to something measurable or engineerable. The efficiency term η captures how well the material converts what it receives. The flux term Φ_eff(r,t) describes the multi-channel ambient environment at a given location and moment. The cross-section term σ_eff(E) encodes the probability of interaction and the transduction chain from particle interaction to electrical current. The volume integral sums all of this across the active material.

The Neutrino® Energy Group, the globally distributed innovation ecosystem that Schubart coordinates, ran simulations and mathematical reproductions to test the physical and mathematical consistency of this framework against established physics. What was being tested was not whether a commercial device has been deployed at scale. What was being tested was whether the architecture, the relationships between physical inputs and predicted outputs, holds together under rigorous statistical scrutiny when evaluated against the body of independently established experimental physics that bears on each of the framework's assumptions.

Experiments conducted by independent institutions over decades provided the physical data those simulations drew from. The COHERENT experiment at Oak Ridge confirmed that coherent elastic neutrino-nucleus scattering is real and measurable. CONUS+ extended that confirmation to solar-relevant energies. Professor Paul Thibado's peer-reviewed work at the University of Arkansas demonstrated that graphene membranes convert ambient thermal

fluctuations into measurable electrical output. None of these researchers were working on neutrinovoltaic technology. Their results independently confirmed physical processes the framework depends on. The simulations tested whether, when those confirmed processes are assembled according to the Master Formula's logic, the predicted output is consistent with what the physics permits.

The result of those simulations was Sigma 5.9 to 6.0.



What That Result Actually Establishes

This distinction matters and must be stated with precision.

The Sigma 5.9 to 6.0 result is a statement about the internal consistency of the theoretical and mathematical framework evaluated against established experimental physics. It says that the physical logic of the system, the chain from ambient flux through coherent elastic scattering, through phonon generation in the graphene-silicon lattice, through asymmetric transduction at the engineered interface, to directed electrical output, holds together under mathematical scrutiny to a degree of statistical confidence that excludes reasonable doubt.

When the simulation parameters behind that result are published in full, any researcher with access to the same established physics data can follow the same steps and reach the same conclusion. The result is reproducible not because the Neutrino® Energy Group asserts it, but because the mathematics and the underlying experimental physics compel it.

This is different from a claim that a commercial device has been independently verified at industrial scale. That is the next phase, and it is substantial engineering work. What the Sigma result establishes is the precondition for that work: that the physical and mathematical foundation is what it was claimed to be. In science, this matters enormously. Many technologies have been built before their theoretical framework was mathematically verified. Here, the verification precedes the scaling. That sequence is the right order.

A professor at a European institution who studied the framework carefully and arrived initially with scepticism concluded that the logic was consistent, and noted that the next phase belongs to the engineers. That is the correct framing. The physical foundation is established. The engineering follows.

What Five Hundred Million to One Feels Like

Numbers at this scale are difficult to hold intuitively. Two analogies may help.

If a fair coin lands heads twenty-nine consecutive times, the odds of that happening by chance are roughly one in five hundred million. If you witnessed it, you would not conclude the coin was fair. You would conclude something else was happening.

If a weather model predicted the exact temperature, wind speed, and rainfall for every major city in a country, correct to one decimal place, and did so correctly for twenty-nine consecutive days, you would not attribute that to luck. You would conclude the model was capturing something real about how weather works.

That is the level of confidence a Sigma 5.9 to 6.0 result represents. Not proof that every engineering challenge has been solved. Proof that the underlying framework is describing something real.

What Comes Next

The Sigma result closes the question of whether the physical and mathematical architecture is coherent. It does not close the engineering questions, which are real and demanding.

Manufacturing at the precision neutrinovoltaic conversion requires, atomic-level control of graphene-silicon layer interfaces, consistent doping concentrations, nanometre-scale geometric tolerances across large active areas, is the current frontier. Work underway through the Neutrino® Energy Group's materials development partnerships addresses exactly this challenge. The path from mathematical consistency to manufactured devices at scale has always been the hard part of any energy technology. It was true for photovoltaics, for fuel cells, and for every energy system that moved from laboratory to deployment.

The Sigma result does not announce that the work is done. It announces that the foundation is what it was claimed to be.

In physics, that is where every real thing begins.

Independent Scientific Commentary

Prepared by an interdisciplinary working group of specialists in:

- particle physics,
- condensed matter physics,
- graphene and nanomaterials engineering,
- advanced statistical modeling,
- and non-equilibrium energy conversion systems,

based on publicly documented experimental physics, peer-reviewed scientific literature, and internal mathematical consistency analysis related to the Schubart Master Formula and neutrinovoltaic conversion architectures.

Coordinated under the framework of the Neutrino® Energy Group Scientific Advisory Board

Geneva, Switzerland — May 2026