

## **OBJECTION**

Simulation is not the real thing. There are discretion errors and there are singularities in it.

## **RESPONSE**

Simulation is a fair estimation of the real thing if you use the expensive simulators costing thousands of dollars, such as Micro-Cap from Spectrum Soft (a variety of Berkeley SPICE).

As for “matrix is singular” errors...

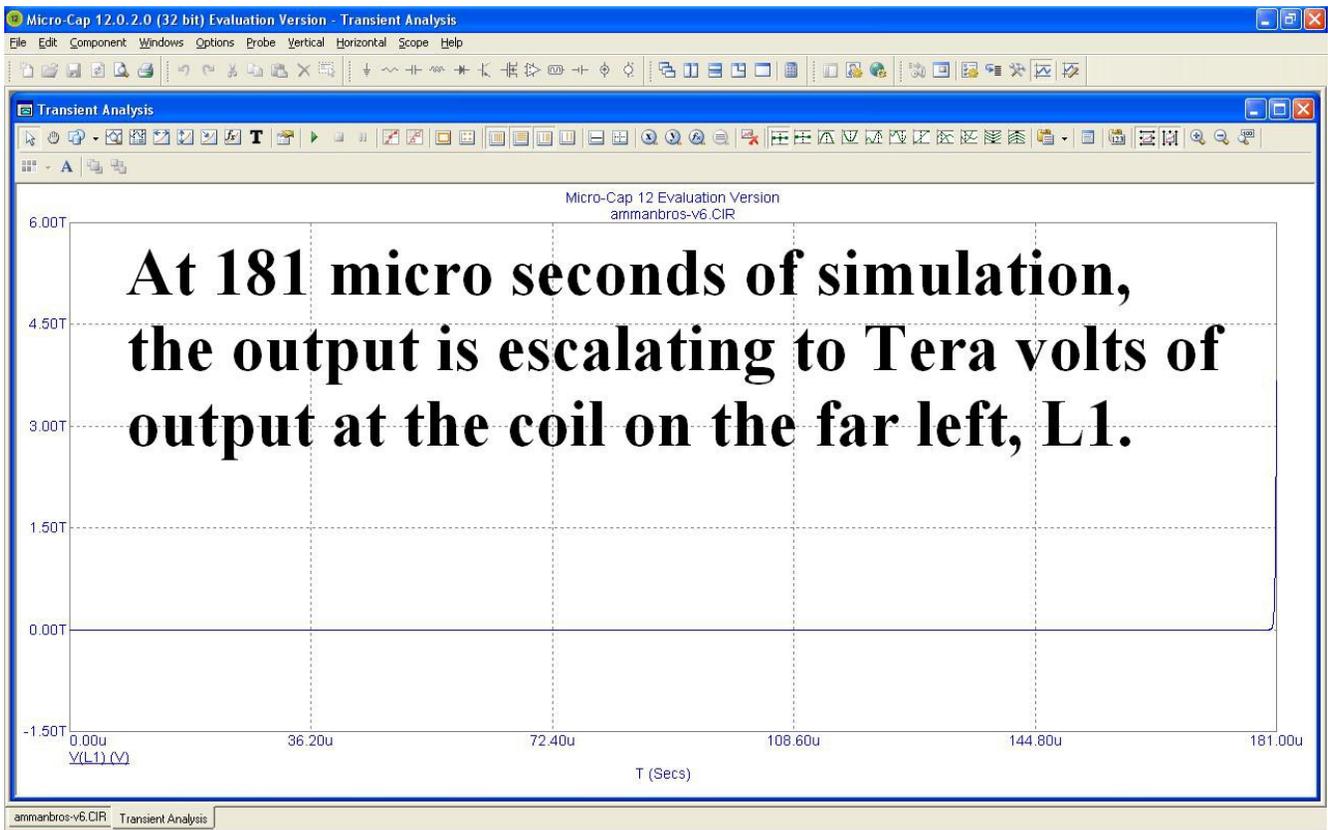
They are not always an error of the circuit. They are an error of the imperfection of simulating a circuit. It is important to make this distinction to clarify the problem.

One circumstance generating this error is due to extreme symmetry of the layout of the circuit making it impossible for the simulator to approximate a solution. In other words, a capacitor flanking either side of an inductor is graphically symmetrical down the vertical middle of the inductor (in terms of layout) and may produce this type of error when the simulator performs its mathematical calculations. This has happened to me many time making my work difficult unless I somehow figure out how to imbalance the simulator’s approximation of what is happening by modifying the circuit in such a way that does not also make whatever goal which I am seeking impossible to achieve.

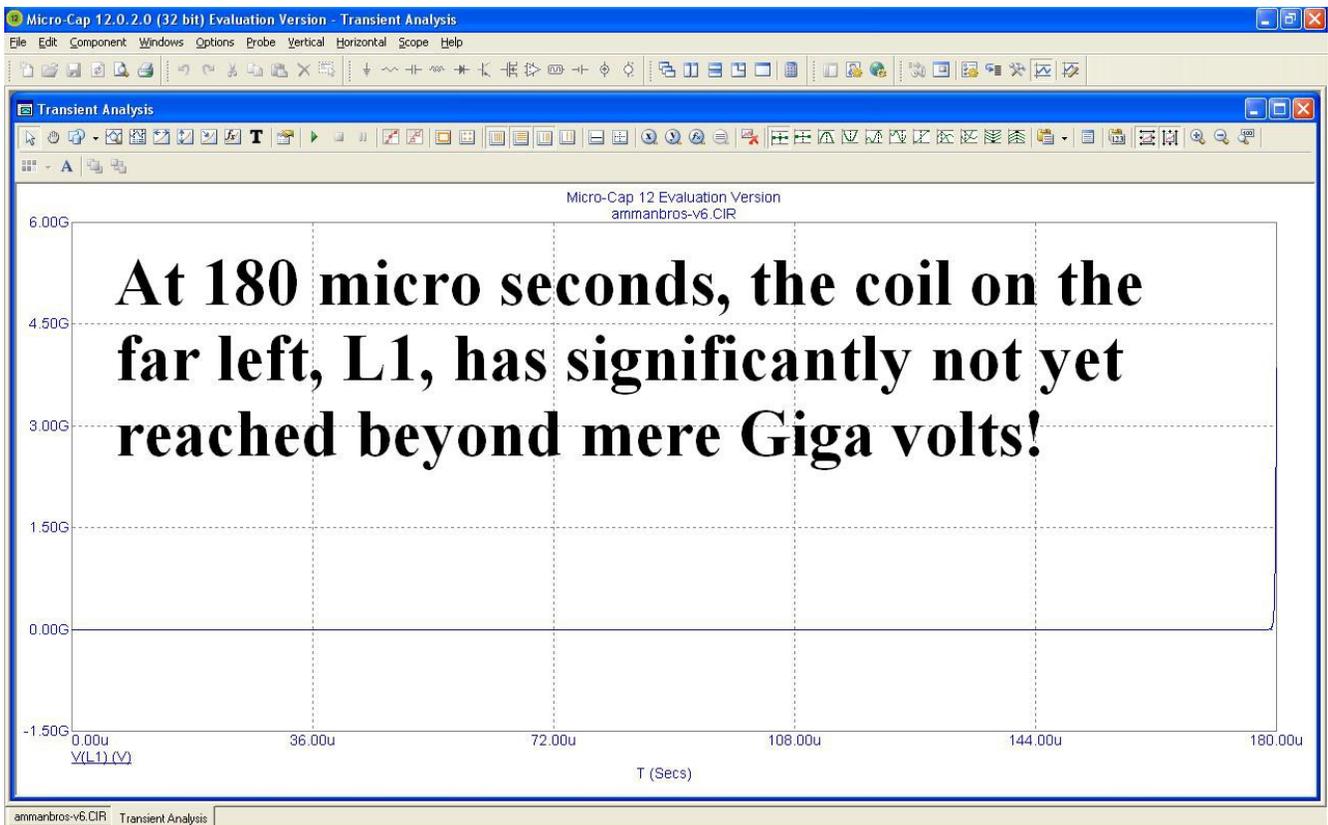
Another circumstance is not an error since it’s simply the circuit is outputting an extreme amplitude of power far in excess of the simulator’s capability to measure it. The way to test this hypothesis is to perform many simulations at various durations to see when does it produce this error and (most significantly) view what was happening immediately prior to the moment when this error is produced to see if there is a pattern which could emerge indicating a rapid escalation of power. At these magnitudes, it would be like trying to measure the voltage of Creation with a simple multimeter purchased from the hardware store. This, obviously, cannot be done, because it’s “off the charts” or “out of range” for the little multimeter’s capability!

At 182 micro seconds, the output of the coil at the far left, L1, has exceeded the simulator’s scale of magnitude...

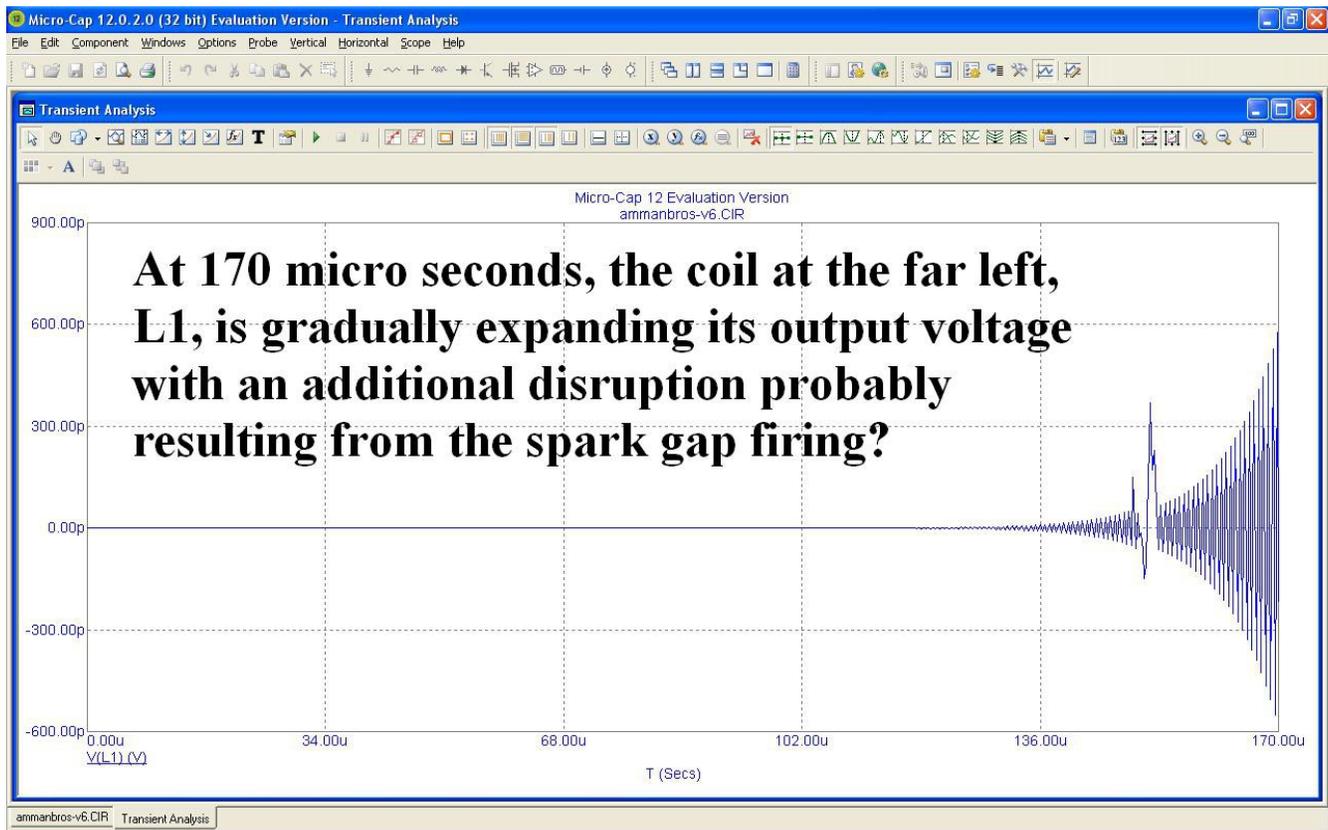




At 180 micro seconds, the output at L1 is merely in the Giga volt range...

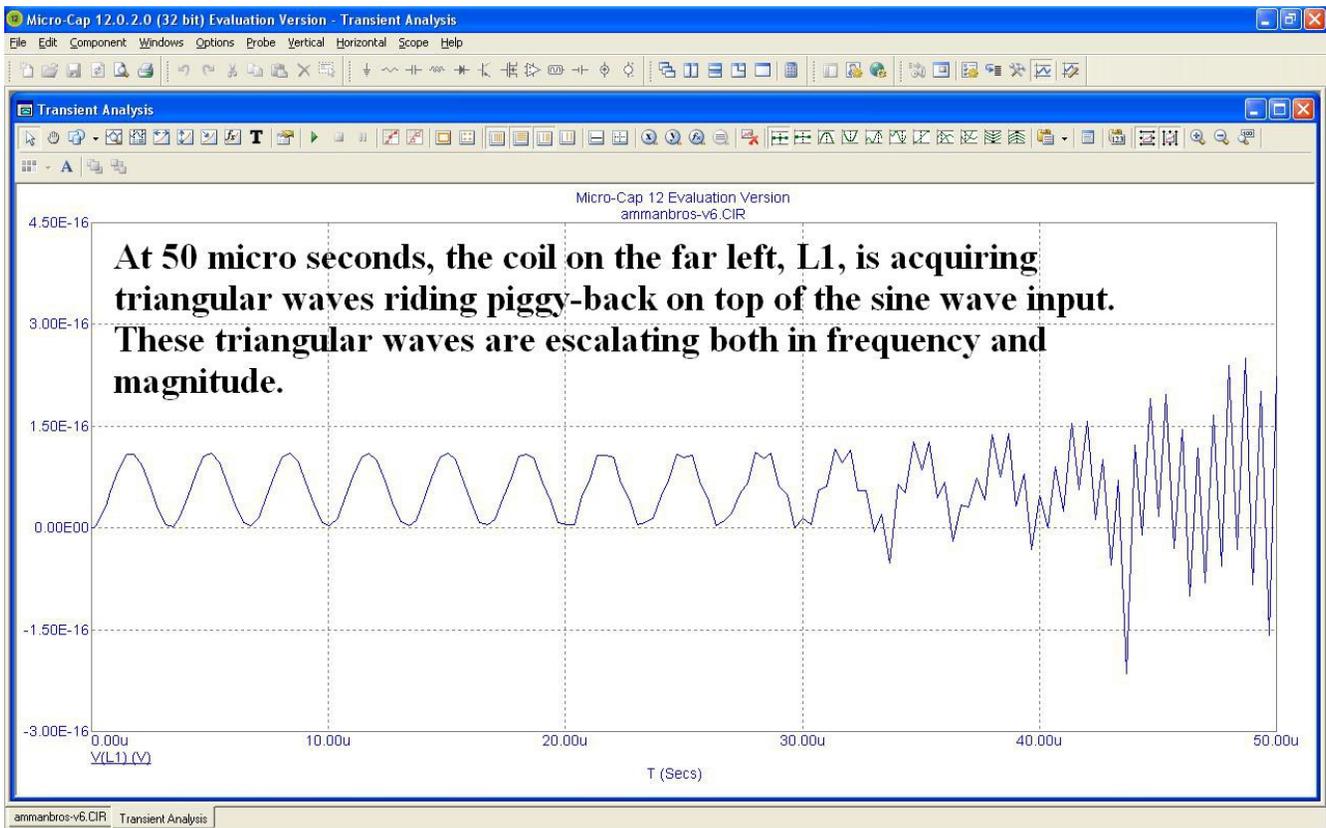


At 170 micro seconds, L1 is expanding its voltage at a far slower rate and exhibiting a bit of a disruption probably due to the neon bulb firing. The inclusion of this spark gap (in the form of a neon bulb) is probably why this particular example wants to suddenly escalate and rapidly accelerate its escalation...



By the way, this shape (above) is what's called: "[Gabriel's Horn](#)" (look it up on Wikipedia) signifying a mathematical peculiarity called: Pure Resonance...

<https://www.quora.com/q/electricalscience/Impedance-of-Same-Magnitude>



It's generally not a good idea to discredit the value of simulators without careful consideration of their intrinsic worth. They have their faults - same as we, but these faults do not make them worthless.

Any shortcoming requires interpretation which, in turn, requires familiarity with both the simulator's shortcomings and compare this to reality plus the ability of the user to translate between both worlds.

This is no different than speaking in French versus speaking in English. There are always words missing in both cultural languages making an exact translation frequently impossible. Yet, these imperfections do not invalidate either cultural experience.

Far from it!

Each culture adds to the perspective of the other.

This is why I simulate: to broaden my perspective beyond what the teacher will profess to his students of electrical engineering.

Simulators do not have any agenda which is generally in evidence. Yet, schools often possess agendas for the benefit of the donors funding those schools to produce workers who will fit into the corporate motto of: "don't do too good a job, for that will make everyone else look really bad"!