

### Low cost packaging performance

I see that more and more microwave circuits are being offered in plastic packages and in low cost packages that do not have microwave type connections (e.g. SO-8). It seems like the inductance of the leads and the lack of a ground plane would reduce the performance of the transistors or ICs inside, yet the products are specified up to 4 GHz or more. Is this right?

### Performance may be “good enough”

Basically, you are correct—such low cost packages do not allow the maximum performance of microwave circuits. However, their low cost and automated assembly advantages may outweigh the performance loss. With modern electromagnetic (EM) analysis software, the effects of the package can be determined, and at least partially compensated for in the design and mounting of the semiconductor die inside. Some versions have been modified to include a ground plane, although this is done primarily for heat transfer rather than RF performance.

Use of these SOIC style packages is already declining. New plastic packages that combine far better microwave performance with low cost are rapidly being adopted by RFIC and MMIC manufacturers, which have cooperated with packaging makers and automated assembly equipment providers in the development process.

### Laboratory measurement problems

I am having difficulty getting repeatable measurements of two-tone third order intermodulation products on a small-signal amplifier. The circuit operates in L-band (800 to 1900 MHz) and I have checked for everything from interfering signals to bad cables. Can I get some more suggestions to help find the problem?

### A few more troubleshooting ideas

Be sure to check basic factors like proper torquing of connectors and constant output from the signal generator(s). Double-check that temperature, operating voltage and bias current remain constant for the DUT, especially if you are making measurements before-and-after modifications to the circuit.

Any factors that can change the amplitude of the test signals are likely suspects. If you are combining the outputs of two signal generators, the amplitudes should be balanced and the combiner should not introduce any nonlinearities of its own. Attenuation between the combiner and the DUT will reduce the effects of any mismatch.

Also, look at the bandpass characteristics of the spectrum or network analyzer used as the detector. Some IMD measurements use wide spacing between

test frequencies, and distortion products will be attenuated if they fall outside the flattest part of the detector's signal passband.

### More on EDA tools and antenna modeling

I just read the article on EDA Tools in the September 2002 issue of *High Frequency Electronics*. It is a well written article. One thing that needs to be added to the capability of existing EDA tools is modeling of antennas and their interaction with the nearby environment (mounted on an aircraft, tank etc.). I noticed that under the “Ask the Experts” section you mentioned NEC-4 for such simulations.

I am glad to inform you that a more sophisticated CEM tool, FEKO, is available commercially to efficiently analyze antenna patterns along with their interaction with the nearby environment. FEKO uses a very advanced hybrid approach combining Method of Moments, Physical Optics and Uniform Theory of Diffraction techniques. Using the hybrid approach, very large problems can be easily solved, even on a PC. FEKO also comes with other capabilities such as planar Green's function for microstrip structure analysis and design.

EM Software & Systems (USA) Inc. is established to market and distribute FEKO in North and Central American region. More information can be found at [www.feko.info](http://www.feko.info).

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### How do I submit a question to the “Ask the Experts” column?

The best way to submit questions is by e-mail to: [editor@highfrequencyelectronics.com](mailto:editor@highfrequencyelectronics.com). We will locate the right person among our many volunteer experts to provide the answer you need.

All questions will receive a reply. We will pick the most interesting questions and answers for publication in our print and online editions.

### Are you an expert?

It seems that all experienced engineers have fielded many questions from colleagues. The readers of *High Frequency Electronics* would enjoy reading about the ones you hear most often, and the most interesting ones. Send a note with a brief description of the question and your answer by e-mail to: [editor@highfrequencyelectronics.com](mailto:editor@highfrequencyelectronics.com) or by mail to the Editorial office address on page 6.