Engineering *Educator*

The latest news about teaching tools, measurement technologies and innovations in engineering education

Out of the Fishbowl

Eleanor Baum, Guest Editor

When I went to engineering school, I got very accustomed to being the only woman in my classes. I always felt incredibly conspicuous and that everyone was far too interested in what I was doing, what I was feeling, what I was thinking. In a way, I became "all women" in the eyes of everyone watching.

In the United States, it wasn't until 1972 that the number of women receiving undergraduate degrees in engineering surpassed one percent for the first time. At last count, the number still hadn't reached 20 percent, but we've definitely come a long way since the days when I studied in a proverbial fishbowl.

So what do we need to do to make sure those percentages continue to improve?

We need to increase the number of females choosing engineering school. If you're trying to convince high-school students that engineering is a possible career, you have to do a couple of things. First, you have to help them understand what engineers do. They need to know that engineers make life better for people and improve the condition of society. Next, you need to show them some successful female role models. When they see that you can be an engineer and still be a non-nerd, a regular person, a nice person, and there's nothing weird about you, they say, "Boy, look at that. I can relate to that person. I might want to be an engineer."

But it's not enough to simply get more females to enroll in engineering courses. We need to help them be successful in school. And if we want to improve the percentage of female engineering educators, we need to encourage women to go on to graduate school, to get the PhDs they need to become college professors. Of course we also need to create female-friendly environments in academia to allow those female educators to thrive.

If you exclude the creativity and the imagination of half of the population in solving major problems, you are wasting critical resources. It's time for all of us, regardless of gender, to do our part to stop the waste.

Eleanor Baum
Dean of Engineering
Cooper Union
New York, NY, USA

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Share Your Thoughts

Marsh Faber, Editor

In This Issue

This newsletter, as well as the Agilent Educator's Corner web site (***www.EducatorsCorner.com***), is intended to help you, the educators responsible for shaping students into competent engineers. But to do a good job of meeting your needs, we ask for your feedback. Please e-mail your comments, questions and concerns to *marsh_faber@agilent.com.*

New Look

Dear Readers,

Did you notice the newsletter's new look? The redesign was prompted by our transition from being part of HP to becoming a separate company, Agilent Technologies. In the past, many of you have mentioned how much you liked the design of the Engineering Educator newsletter. Please let us know what you think of its new look.

Marsh

Virtual Instruments

Dear Colleagues,

We propose a practical course in using advanced measurement instruments via the web. We seek partners who would be interested in using our module in a university course.

For more information please contact us or consult our web site. (For a link to the Remote Worldwide Instrumentation Network web site, go to **www.EducatorsCorner.com/links.**)

Kind regards,

Didier Geoffroy
Remote Worldwide Instrumentation Network
University of Bordeaux
Bordeaux, France
geoffroy@cre.u-bordeaux.fr

Navigating the Web Site

Marsh,

I thought that under Agilent there was an education package on the Internet called, "Wave Transmission Along a Line," or something to that effect. But I cannot find it under the new Educator's Corner. Does it exist? Where do I look?

Thanks,

Tim Healy
Santa Clara University
Santa Clara, CA, USA

Professor Healy,

If you look under "Experiments/ Spectral Animations", you'll find the Transmission Line animation.

We realize the site's experiment navigation needs help. To improve access to the labs, we have added a Java applet "Navigator". I know it's a pain to wait the minute or two that it takes to download, but I think you'll find it very useful once you get it. It not only lists the labs by type, but also by school and by author. That way you can see which schools have placed an entire lab series on the site. It also gives a brief description of each lab. It's a better way to get labs that have more continuity.

Marsh

ActiveX

Here's a follow-on note from Agilent's Werner Haussmann regarding the ActiveX article in a previous issue of the Engineering Educator:

You can read more about the use of Visual Basic and ActiveX to drive instruments in the following issues of Test & Measurement World: January '98, June '99 and October '99.

To see if your version of Microsoft® Excel®, Word®, etc. has Visual Basic, just hit (Alt-F11). To download the free ActiveX software to run an Agilent 54600-series scope from a Windows package like Excel, go to **www.EducatorsCorner.com/links**.

A Global Look at Female Engineering Educators

Mardi Hastings
Associate Professor of Mechanical Engineering and Biomedical Engineering
Ohio State University, USA

Years Teaching: 10

Specialties: Dynamic systems modeling, vibrations, acoustics, bio-instrumentation, and biomedical ultrasound

Denise Consonni
Senior Lecturer
Department of Electronic System Engineering
Escola Politécnica
University of São Paulo
São Paulo, Brazil

Years Teaching: 20

Specialty: Microwave measurements

Monika Ivantysynova
Universitätsprofessor
Dr.-Ing
Mechanical Engineering
Technical University of Hamburg-Harburg
Harburg, Germany

Years Teaching: 4

Specialty: Fluid power and control (mechantronics)

Raja Mannai
Assistant Professor
Telecommunications Engineering School
Tunisian University
Tunisia

Years Teaching: 2

Specialty: Signal and image processing

Xu Mingzhen
Professor
Peking University
Beijing, P.R. China

Years Teaching: 20

Specialties: Integrated circuits (ICs) and device reliability

Judy Raper
Dean
Faculty of Engineering
University of Sydney
Sydney, Australia

Years Teaching: 17

Specialty: Chemical engineering

What are the special challenges involved in being female in a profession dominated by men? What do female engineering educators from different countries have in common? How are they different?

To answers these questions, we sent a short survey to women educators from engineering schools on six different continents. This was not intended to be a scientific survey, but rather a sampler of experiences and opinions that will help us all communicate and understand each other better.

Tell us what you think

Does it surprise you that the lowest percentage of female faculty occurred at a university in a highly developed industrialized nation (Germany), while the university with the highest percentage of women faculty members is located in an emerging African nation (Tunisia)? Or that gender bias seemed to be a bigger issue for our U.S. respondent than for the others?

We encourage you to share your thoughts about gender issues in engineering education and/or to tell us about the situation at your university. Please send e-mail to marsh_faber@agilent.com.

What do you love about your job?

Denise Consonni: I love learning new things, and it makes me happy to be able to communicate what I learn and understand to my students. It is very rewarding to feel that, as an educator, I can collaborate in other peoples' evolution. I also feel that I am very fortunate to work with some really bright students, so that sometimes I learn more from them, than they do from me.

Raja Mannai: I love the kind of impact a good educator can have with engineering students, in particular:

- Give them solid foundations in the fundamentals of engineering
- Show them the excitement they can have in creating/engineering a host of ideas and products that can change the world around them
- Instill in them the spirit of cooperation and a level of awareness needed of the world around them, through projects

It is very rewarding to have a job that allows me to do this.

Judy Raper: I love the diversity–the opportunity to do a range of things, including mentoring students and seeing them develop, as well as research.

Mardi Hastings: Teaching, and the freedom to pursue research and development that is exciting to me.

Monika Ivantysynova: I have a lot of freedom and the possibility to do research in areas I like.

Xu Mingzhen: I enjoy researching academic problems and solving engineering questions together with my doctoral students. I feel happy when I discuss engineering questions together with my students.

What are the biggest challenges you face in general as an engineering educator, and specifically as a female engineering educator?

Denise Consonni: At the University, I rarely feel that I am different from my male colleagues. Therefore, I believe that the challenges we face are the same:

- To be continuously in pace with technological progress (an engineer can never afford to be uninformed)
- To keep a good balance in the content we want to transfer to our students, in terms of technical knowledge of theory and practice, and also with relation to human and professional issues such as ethics and effects of engineering projects over environment
- To search and properly apply all the available resources we have now, especially those related to multimedia, for the benefit of our students, helping them in understanding concepts, and also in developing their creativity.

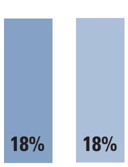
Judy Raper: One of the biggest challenges is to increase the community appreciation of the profession. This includes attracting good students into the profession. At times it has been difficult to be taken seriously as a female, but in general I think I have coped well.

Mardi Hastings: Gender bias at all levels of the university (including students).

Raja Mannai: The educational system for engineers is deficient in my opinion, due to the vague and weak connection between the university and industry needs. As an educator, you feel the responsibility to prepare students for the professional world, but you know that you cannot do a good job in that respect.

The challenges I face specifically as a female engineering educator are basically the same as I have seen in the U.S. They have to do with the society's perception and treatment of women. At the Tunisian University, all rights of women teachers are protected and there's a big effort towards equal treatment.

Xu Mingzhen: My challenge is always to become a better teacher, and also to become a better old student.

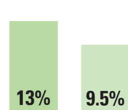


Ohio State University
Columbus, Ohio, USA

Engineering School Facts:

- Student Population: 18% female
- Faculty Population: 18% female

Compared to 10 years ago: about 12% of faculty and students were women.

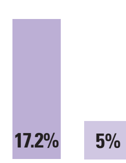


University of São Paulo
São Paulo, Brazil

Engineering School Facts:

- Student Population: 13% female, of 4,376 undergrads
- Faculty Population: 9.5% female, of 500 professors

Compared to 10 years ago: no significant change



Technical University of Hamburg-Harburg
Harburg, Germany

Engineering School Facts:

- Student Population: 17.2% female, of 4,396 students
- Faculty Population: 5% female, of 101 professors

Compared to 10 years ago: small increase in females

What can/should universities do to increase the number of women serving as engineering faculty and administrators?

Denise Consonni: Maybe they should do better marketing, showing to students in the secondary school the various interesting activities of engineering as a profession, the important role of engineers in society, and mainly, breaking some prejudices that still keep girls from even considering taking a career in engineering.

Mardi Hastings: Activities to increase the number of women must be generated at the top management level. Department heads must be not only given incentives to recruit more women faculty, but also to provide a nondiscriminatory working environment. Many times women are recruited, but they end up in a bad situation. It is not enough to just recruit; the upper administrative levels also need to be proactive to minimize prejudices in the working environment.

Monika Ivantysynova: They should describe the job of today's engineers in a better and more realistic way.

Raja Mannai: In Tunisia, many women with advanced degrees (PhDs and equivalents) tend to seek university teaching positions, and most of them are successful in that. Meeting the need for more women serving as engineering faculty begins by increasing the number of female undergraduate students who go on to graduate schools to obtain advanced degrees. This requires, from my experience, lots of support and encouragement, and lots of mentoring.

Did you have a mentor when you were in engineering school? If so, how did this person help you? Do male and female engineering students have different mentoring needs?

Raja Mannai: While in school, I did not have an official mentor. I had female friends in the same field and it was mostly a sense of challenge and competition that kept us moving along. I am constantly aware of the need and importance of mentoring young women engineering students. I strongly believe in guiding, offering advice, being available to all these aspiring young women. There is no question in my mind that male and female engineering students have different needs. The need for mentors is urgent for females.

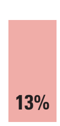
Mardi Hastings: I had several mentors in graduate school, both male and female. My PhD advisor is still a mentor. He has given me good advice on how to work effectively in the academic arena, and he is still there to both applaud my accomplishments and to let me know when something may be going wrong.

Male and female students do have different mentoring needs, primarily because they usually face different issues going into the engineering workplace. Many women students need help in learning how to respond to prejudices while maintaining good working relationships with their management and co-workers. These are very delicate issues. Although things have improved during the last 30 years, responses to gender bias situations can still make or break a woman's career.

Tunisian University
Tunisia

Engineering School Facts:
- Student Population: 34% female, of 1,500 students
- Faculty Population: 20% female, of 40 professors

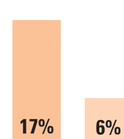
Compared to 10 years ago: about 5% female faculty and 20% female students



Peking University
Beijing, P.R. China

Engineering School Facts:
- Student Population: 13% female, of 5,000 students

Faculty Population: (not available)
Compared to 10 years ago: Percentage of women has increased



University of Sydney
Sydney, Australia

Engineering School Facts:
- Student Population: 17% female, of 2,200 students
- Faculty Population: 6% female, of 80 educators

Compared to 10 years ago: Slight improvement – students were about 13% female, staff was less than 1%

Helping Female Students Succeed in Engineering School

Sponsor Professor Lee Lynd gives advice to first-year intern Christy Dowding in setting up an environmental engineering experiment on fuel ethanol production from cellulose biomass.

Photo: © John Douglas, Flying Squirrel Graphics

Even at the most progressive American universities, male engineering students typically outnumber their female counterparts by a ratio of five to one.

Why the disparity? In the United States, despite the good intentions of well-meaning parents, girls and boys are raised with different expectations. According to Mary Pavone, director of Dartmouth College's Women in Science Project (WISP), many girls are still encouraged to be polite, stay clean, stay out of trouble, and ask for help solving problems. Boys, on the other hand, are encouraged to tinker, investigate how things work and take more intellectual risks. These early environmental influences can set a pattern for a child's development and aspirations.

"When girls are little, parents and teachers need to encourage them to take apart telephones and toys and figure out how they work," said Pavone. "We give a lot of encouragement to a little boy who has taken something apart. We get even more excited if he can put it back together. It's not that there's no one doing this with girls, but not to the same extent. As a society, we are still grappling with equity between males and females, even at the earliest stages of development."

By the time girls get to junior high and high school, they're bombarded with mixed, often negative, messages from their peers, parents, teachers and mass media that tell them that studying engineering is too hard, too unfeminine or too "nerdy" for girls.

So just getting girls to consider a career in engineering in the first place is an uphill battle. Once they've expressed an interest in the field, how do you nurture that interest and give them the extra help they need to overcome their negative conditioning?

The Dartmouth Solution

Dartmouth's 10-year-old WISP program aims to retain more female students in science, math, and engineering by creating a welcoming environment that supports women all through their undergraduate years.

WISP uses five strategies to encourage female students, particularly those in their first year, to pursue their interests

WISP interns Jewel Jones (L) and Melanie Luna work on developing a multimedia course for computer science freshmen.

Photo: ©Diane Fitzgerald

"Wow, this isn't what I thought science was about. It's different, it's more, it's cool."

in technical fields and to help them be successful in science, math and engineering programs. These strategies include:

1. Mentoring

WISP provides several mentoring options for female students, each with a slightly different focus.

Peer mentors: The peer mentoring program matches first-year women interested in math, science or engineering with a second-, third- or fourth-year student who has already selected a technical major. A slightly older peer has high credibility and influence for first-year students, helping them understand the educational system and its opportunities.

Faculty mentors: Formal faculty mentoring takes place in the context of WISP's internship program (see 3). However, Pavone and her team encourage students to make connections with faculty throughout their academic careers for informal mentoring.

Industry mentors: WISP's membership in MentorNet, the National Electronic Industrial Mentoring Network for Women in Engineering and Sciences, allows female students to connect with mentors in the industry via e-mail. Students can explore career options and learn what it's like to be an engineer in the workplace as they build relationships with their industry mentors. These mentors share their wisdom and act as a reality check for students in doubt about their abilities. They help students see what it means to be an engineer, a computer scientist, or a physicist and explore their suitability for a particular field.

2. Role Modeling

WISP attempts to provide role models by inviting prominent women scientists and engineers to visit for a day. While on campus, they might give a technical seminar or a traditional lecture, but they also meet with female students in a small, informal setting. "It gives students an opportunity to ask them about things that they would never talk about in a public lecture," explained Pavone. "They ask things like, 'What made you choose engineering? What was your career path? What obstacles have you faced? How do you balance your personal life and your professional life?' Students are usually relieved to discover that most women in technical fields advocate staying flexible and taking advantage of opportunities as they arise, rather than carefully planning and adhering to a specified career path.

3. Early Hands-On Research Experience

WISP's internship program gives first-year female students a closer look at what scientists and engineers actually do, and how they do it, through participating in a hands-on research experience under the close supervision of a faculty mentor. According to Pavone, the experience usually helps dispel the notion that studying engineering is about memorizing facts. Through the internship program, students begin to see science and engineering as inquiry-based. Many participants are surprised that asking questions and making mistakes are part of the process. Their reaction, says Pavone, is typically, "Wow, this isn't what I thought science was about. It's different, it's more, it's cool."

Program participants frequently cite the relationships they develop with their faculty sponsors as the biggest benefit of their involvement. "Even if a student doesn't feel she was particularly successful in her project results, often times she'll say afterwards, 'I thought the best part of this was going to be doing the hands-on work, and while that was wonderful, it was even more wonderful to develop a relationship with my faculty sponsor.' It gives them the feeling that someone cares about them and it helps them build self-confidence," said Pavone.

Continued on page 11

Amplitude Modulation Lab

Dr. Ben-Dau Tseng
Professor of Electrical and Computer Engineering Department
California State University
Chico, California, USA

Objective:

Amplitude modulation is one of the more common modulation techniques used in the industry. The following lab will give the students an opportunity to generate an amplitude modulated carrier utilizing the capabilities of the ESG signal generator. The ESA spectrum analyzer will be used to observe the waveform in both the time and frequency domain.

There are several variations of amplitude modulation (AM). The most common AM is the commercial amplitude modulation used in AM radio broadcasting. Mathematically, this AM is represented as

Equation (1) $$s(t) = A\,[1+m(t)]\cos(2\pi f_c t),$$

where s(t) is the modulated (or carrier) signal, m(t) is the modulating (message) signal, A is the amplitude of the unmodulated carrier signal, and f_c is the carrier frequency. The modulation index is defined as

Equation (2) $$\mu = \frac{A_{max} - A_{min}}{2A}$$

where A_{max} is the maximum value of A[1+m(t)] and A_{min} is the minimum value.

An AM waveform can be demodulated, i.e. m(t) can be recovered, by an envelope detector if $\mu \leq 1$. When $\mu > 1$, the carrier signal is overmodulated, and the envelope is distorted.

If we assume $m(t) = B\cos(2\pi f_m t)$ with $B > 0$, equation (1) becomes

Equation (3) $$s(t) = A\cos(2\pi f_c t) + 0.5\,\mu A\cos[2\pi(f_c+f_m)t] + 0.5\mu A\cos[2\pi(f_c-f_m)t]$$

where the modulation index, $\mu = B$. From equation (3), it is clear that the modulated signal, s(t), contains the carrier frequency, and two sidebands, $f_c \pm f_m$. Hence, the commercial AM is also called double-sideband with transmitted carrier (DSB-TC) or double-sideband with large carrier (DSB-LC). The ratio between the amplitudes of the carrier component and either sideband is 0.5μ. For example, this ratio gives a 0.5 value or -6 dB for a 100% modulation index, and a 0.25 value or -12 dB for a 50% modulation index.

In general, the Fourier spectrum of s(t) can be shown to be

Equation (4) $$S(f) = 0.5A[\delta(f-f_c) + \delta(f+f_c)] + 0.5A\,[M(f-f_c) + M(f+f_c)],$$

where M(f) is the Fourier transform of the modulating signal, m(t).

Double-Sideband Suppressed Carrier

Since the carrier component does not provide any information about the modulating signal, it is not necessary to be transmitted. This leads to a double-sideband suppressed carrier (DSB-SC) AM, which has a better efficiency in power required for transmission, but needs a more complex demodulation scheme. A DSB-SC waveform has the form as

Equation (5) $$s(t) = A\,m(t)\cos(2\pi f_c t)$$

Similar to equation (3), a DSB-SC for a single tone modulation is represented as

Equation (6) $$s(t) = 0.5\,A\cos[2\pi(f_c+f_m)t] + 0.5\,A\cos[2\pi(f_c-f_m)t]$$

If a four-quadrant multiplier is used to generate the product of A(1+m(t)) and the carrier waveform $\cos(2\pi f_c t)$ in equation (1), then the DSB-SC waveform can be easily generated with a 1 V negative dc offset added to the desired message signal. If, however, a two-quadrant multiplier is used, then $s(t) = 0$ for $m(t) < -1$.

Equipment:

The Agilent ESG-D series signal generator can be easily set up to produce AM waveforms, DSB-TC or DSB-SC. Several keys and connectors associated with this AM experiment are briefly explained below.

Hard Keys:

- Frequency: Adjust the RF (carrier) frequency.
- Amplitude: Control the amplitude of the unmodulated RF (carrier) signal.
- Mod On/Off: Toggles all modulating signals ON and OFF.
- RF On/Off: Toggles the RF signal ON and OFF at the RF OUTPUT.
- I/Q: Select an externally connected source for generate DSB-SC.

Output Connectors:

- RF output: RF (modulated or unmodulated) output with a source impedance 50 Ohms.
- LF output: RF output for the internal modulating signal.

Input Connectors:

- EXT 1 Input: Input for an external modulating signal.
- EXT 2 Input: Input for an external modulating signal.
- I Input: Input for an externally connected in-phase signal.
- Q Input: Input for an externally connected quadrature-phase signal.

Menu Keys:

- AM: Press this key to adjust the following parameters associated with AM.
  - AM Depth: Modulation index.
  - AM Off/On: Select a particular configuration.
  - AM Rate: Modulation frequency when *internal* AM source is used.
  - AM Source: Internal or external AM source.

Generating Amplitude Modulated Signals with the Agilent ESG Signal Generator

The ESG-D series signal generator can produce AM waveform in three different ways.

1. Use an internal modulating source. The range of the modulation index allowed is 0.1% to 100%.

2. Connect a desired modulating signal to the External 1 DC-coupled connector and select the corresponding AM source. Modulation index can be varied by adjusting the amplitude of the external signal. It can be shown that the AM transmitter is a two-quadrant multiplier, as mentioned previously.

3. Press the I/Q hardkey in the menu and select EXT I/Q. Connect a desired modulating signal to the I Input or Q Input, but not both. Leave the other input connector open. This arrangement allows a full range variation of the modulation index by adjusting the amplitude of the externally connected modulating signal. A DSB-SC AM can be generated, as well.

In addition to using an Agilent ESG-D series signal generator to output AM waveforms, an Agilent ESA spectrum analyzer is used to display the magnitude spectrum of the modulated waveform and the modulating signal.

Conclusion:

1. The ESG signal generator can be used to generate an amplitude modulated signal. The spectrum of this signal, when observed with the ESA spectrum analyzer, can be used to determine the modulating frequency and percent AM.

2. The ESA spectrum analyzer can be used to observe the amplitude modulated signal in the time domain. The time domain signal observed is the envelope detected modulating signal.

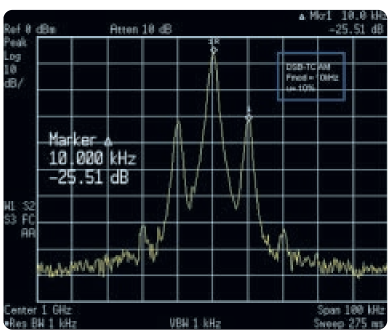


Fig 1. DSB-TC AM

Fig. 1 shows the magnitude spectrum of a DSB-TC AM with a 10% modulation index. The carrier frequency is 1 GHz, and the modulating frequency is 10 kHz. The relative level of the sideband magnitude compared to the carrier magnitude is -26 dB, which is the expected value.

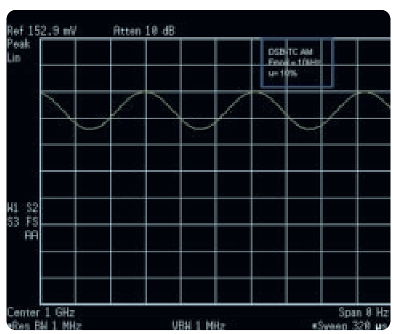


Fig 2. DSB-TC AM Spectrum Analyzer Time Domain Analysis

Using the zero frequency span mode along with a proper selection of the bandwidth and sweep time, the modulating signal, a 10 kHz sine wave, is plotted in Fig. 2. Since the bandwidth of an AM waveform is twice the bandwidth of the modulating signal, the resolution bandwidth must be several times larger than the signal bandwidth. It was set to 1 MHz for the 10 kHz signal in Fig. 2. In order to properly display the modulating signal in time domain, the sweep time must be longer than at least one period of the modulating signal. More important, linear amplitude scale must be used to avoid distortion caused by the Log scale.

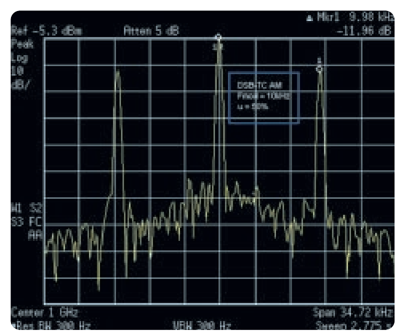


Fig 3. DSB-TC AM Frequency Domain

Fig. 3 shows the magnitude of a DSB-TC AM waveform with a 50% modulation index. The relative level of the sidebands to the carrier is -12 dB.

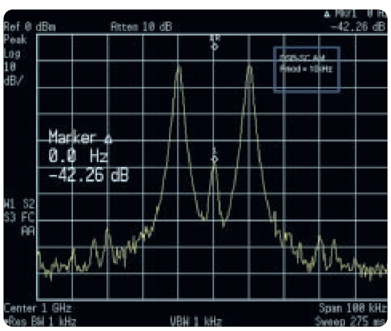


Fig 4. DSB-SC Frequency Domain

Fig. 4 shows the magnitude spectrum of a DSB-SC waveform. The magnitude of the carrier frequency is -42 dB with respect to the sideband magnitude. The zero frequency span mode cannot be used to demodulate a DSB-SC waveform.

Helping Female Students Succeed in Engineering School

Continued from page 7

4. Access to Information

WISP attempts to give students access to information that can help them make informed choices about technical courses, majors, out-of-classroom opportunities, and eventually a career path. Pavone says many students arrive at the college with a traditional career path in mind, totally unaware of the myriad opportunities in related fields. “Typically, someone has planted a seed in their mind, and they choose that direction without realizing that there are other paths,” she observed. “We give them the tools to make an informed decision.”

5. Building a Sense of Community

The last strategy WISP uses, creating a sense of community among the women in the program, is the most intangible — but according to Pavone, it’s one of the most important. “We attempt to create a sense of belonging, a connection to other women in science and engineering. We want students to realize that they’re not isolated.” WISP uses a bi-weekly electronic newsletter to help students feel connected. “It reminds students there’s a whole community here of women on campus, and they’re part of that. There’s a great sense of assurance from knowing that.”

Program Results

Over the last few years, Dartmouth has seen a steady rise in the percentage of women majoring in technical fields, with the current level at around 27 percent of all women students. However, Pavone is not ready to rest on her laurels. “WISP has made some nice strides, as have other science/engineering retention programs in the U.S. But when you look at individual departments, we still have some where women are greatly under-represented. Engineering is still one of those areas, along with computer science and physics. Those are the three areas where we need to focus. We still have work to do.”

For links to more information about Dartmouth’s WISP program, as well as other resources about mentoring and gender issues in education, visit ***www.EducatorsCorner.com/links.***

What's New on the Web?

A New Way to Get in Touch

No matter where you're located, you've long been able to communicate with us through the traditional channels: you could pick up the phone and give us a call, or send us a fax or e-mail message. Now, if you're in the United States, Canada or Puerto Rico, there's a new way to get in touch. Visit the Educator's Corner web site (**www.EducatorsCorner.com**) and click on the Agilent 'Contact Me Now' button. Fill out the short form that appears and someone will call you back within 15 minutes. It's a great way to get your questions answered without spending time on hold. If you prefer to communicate by e-mail or fax, just click on the 'E-mail Me' or 'Fax Me' links. It's that easy.

Complete Logic Labs Course Online

If you haven't already checked it out, be sure to take a look at the Digital Logic Design course that's now available on Educator's Corner (**www.EducatorsCorner.com**). You'll find a complete course, including a syllabus and 12 experiments you can use to teach your students how to analyze and design basic logic circuits.

The course helps your students:

- Become familiar with the lab environment and basic test & measurement instrumentation
- Develop skills in analyzing and testing the behavior of sequential and combinational logic circuits
- Gain experience in creating logic circuit representation of logic functions
- Get hands-on experience with various SSI and MSI circuits.

For a direct link to the logic course, go to **www.EducatorsCorner/links**. From the Educator's Corner home-page, you'll find it in the 'Experiments' section under 'Digital Electronics'.

Future Engineers Site Helps Students Prepare Winning Resumes

Your students may be whizzes at designing digital circuits, but if they don't have decent resumes, they may have trouble landing an interview. Give them a helping hand by sending them to the new resume writing tutorial on the Resources for Engineering Students web site (**www.FutureEngineers.com**). There they will learn how to tailor their resumes to help hiring managers see how their skills correspond with specific job requirements. The tutorial also helps students learn to evaluate advertised positions to make sure they're the kind of job they want.

Web Sites Win Multiple Awards

Both the Educator's Corner and the Future Engineers web sites have been winning awards since their inception. The latest round of kudos include: NewMedia Magazine's INVISION '99 Award, International EMMA Award, and Web Marketing Association's 1999 WebAward.

We are delighted to receive these awards. But even more important to us is your judgement of our web sites. Do you and your students find them useful? What could we add that would be useful to you? What do we need to improve? Please send an e-mail message to marsh_faber@agilent.com with your comments and suggestions.

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