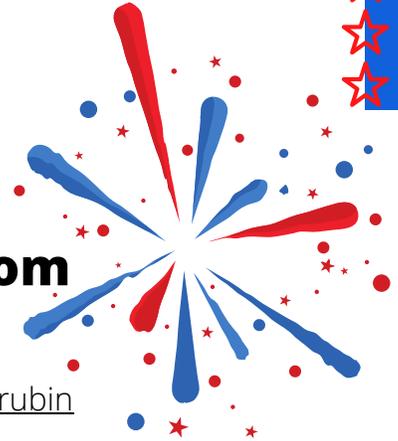# IEEE FOOTHILL

Monthly Newsletter

(https://www.ieee-foothill.org)

What's Inside:

July 2021 ExCom/OpCom Meeting

Prepared by: Max Cherubin

The July ExCom/OpCom meeting was held via Bluejeans. Networking started at around 6:30 pm and due to some technical errors, the meeting started at around 7:15 pm. It started with minutes and treasurer reports followed by the chairman's remarks. An October face-to-face meeting is possible but still in discussion because of some factors to consdder.

Section and Committees

Currently, we are at 890 members, and so that's an increase of about 25 over the last month, and we had one senior elevation.

We have 31 members on LinkedIn and 46 followers on Facebook. We highly encourage each section/ chapter to inform us of their activities so we can post them on our social media accounts because in that way we can gain more numbers of followers.

Technical Societies and Committees

On June 30th, MTT/APS held a meeting with their featured speaker who is a microwave distinguished lecturer, and they had 36 people who registered. Out of 36 who registered, they had 21 attendees. It was a very successful talk, it was broad and deep. It was Dr. Martens who talked about the recent challenge that is going up to 500 GHz with vector network analyzers, spectrum analyzers, real-time oscilloscopes, all the technology involved, and the challenges for giving accurate results.

They will have their next big event on September 18, 2021. It will be a joint meeting with the Buffalo New York Antennas of Propagation Chapter. It will be a talk about Silicon Base Millimeter-Wave Phased Arrays for 5G.

The Nanotechnology Student Team Challenge received 27 abstracts that met the format requirements and those applications will submit their poster which will be due on August 21st. However, all applicants are from the college level and they haven't received any from the high-school level and so they need to extend the submission hoping to have a high-school applicant. They figured out that one of the reasons why high-school students can't submit an application is because they don't have a teacher to sponsor them. What they plan is to provide them a mentor so that the students can attend to the competition next summer.

PES on the other hand is preparing for their upcoming expo which will be held virtually on July 26 to 29, that is from Monday to Thursday.

Educational Activities just successfully completed the Rialto Unified School District 4-day boot camp which was an introduction to coding. There were students from 4 to 5 schools involved. During the last day of the boot camp, they had student presentation. Next time we want, them to think about projects with sensors. We've provided them all 5 different sensors like ultrasonic, humidity, temperature, simple sensors and we provided Amazon giftcards at the end of the boot camp.

WiE successfully had their joint meeting with the Consultant's Network. They had a guest speaker Masheika Allgood, maybe 10 or 12 attended. Masheika gave an outstanding presentation, she gave an overview of what AI is, where you see it, wherein the many areas of our life that it is present, talked about the concept of machine learning and in many ways where we have made use of it in ways that is intrusive to not just privacy but some aspects of it that have been particularly negative. So her presentation was centered around giving us some examples of where AI is used and where it had been misused.

YP are planning to start holding meetings in person again, maybe once a month they'll have an in-person meeting. They are actively discussing it these days and trying to recruit more people by having in-person events.

Inside Microwave Measurements with Dr. Jons Martens

By: Scott Wedge

On the evening of June 30th, the AP/MTT and ED/CAS Chapters of the IEEE Foothill Section hosted a presentation by Distinguished Microwave Lecturer Dr. Jon Martens. Dr. Martens is an Engineering Fellow at Anritsu , a prolific author and inventor, a past chair of the MTT-S measurements subcommittee and a past president of ARFTG. His presentation was titled "What is my Measurement Equipment actually doing?"
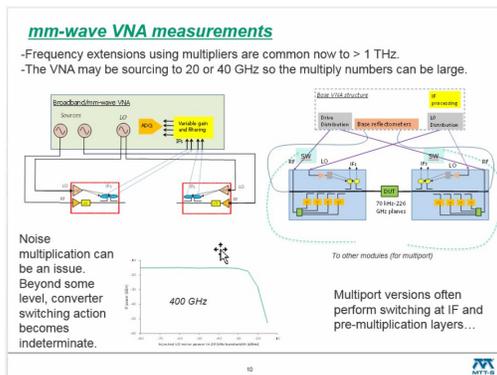
and involved many aspects of high-frequency instrumentation. With measurement needs advancing up to 500 GHz for 5G to 6G technologies, new challenges, and sensitivities arise in the design, processing algorithms, and calibration of microwave/millimeter-wave test equipment. The speaker delved deep into trending new challenges related to vector network analysis, spectrum signal analysis, and time-domain signal acquisition. For VNAs, signal purity used to be a secondary consideration. But above 100 GHz, harmonic content, phase noise, power level stability, and isolation issues become very important with frequency extensions that may involve 50x multipliers.

Measurement repeatability is also challenging and requires precision machining of mechanical components and careful calibrations. Signal analyzers must have low ADC intermodulation, low noise floors, and low noise sampling clocks. Real-time scopes must use interleaved ADC sampling, with high purity clocks and careful calibration of time-shifts. The speaker well described these issues by showing measurement system architectures and underlying technologies along with operating data that demonstrated the challenges. A nice surprise was a discussion on Over-The-Air (OTA) measurement and calibration issues, including measurement of phase-array antenna distortion.

Practical Quantum Computing with D-Wave

By: Frank Freyne

Our speaker was Dr. Victoria Horan Goliber from D-Wave, a company based in Vancouver, Canada.
Dr. Goliber has a PhD in Mathematics from Arizona State University and a MS in Computer Science from Geargia Tech. Now sheś a technical sales role explaining how quantum computing can be used.

The thrust of this presentation was to address the question, what are the current business uses of quantum computing : in particular, what is the state-of-the-art in D-Wave (commercial) quantum computing (QC)?

The current emphasis is on optimizing problems. Think here the classical annealing problems of such immense scale, say with a million variables, that will be prohibitive to attempt them on a present-day computer. The speaker referred to a number of such problems currently of interest that need to be solved. This would include traffic signals for a large city, trucking from large port through a city, truck routes for trash collection, designing bus routes for taking to multiple sites to a large convention center in a heavily congested waterfront region of downtown Lisbon, Portugal.

A number of companies have been and are actively working with D-Wave in developing QC applications to use the current capability for such indicated transportation industry problems. These include, among others, Volkswagen and Toyota.

The D-Wave Quantum Computer QC (5000 qubits, based on superconducting Josephson Junctions, 2.5 times that in a number of connectors required) can be coded through a browser. OCEAN, an open-source Phyton code would be used. To access the QC, coding will be translated in binary, functions are converted to binary quadratic form. It is claimed that this quadratic order (limit) for equations can be used for many problems. (Think in terms of differential equations to model various order derivatives, this demonstrates that this quadratic order is reasonable).


The newer D-Wave advantage QC can be accessed through a cloud server via the LEAP program. When the problem cant fit on an 8-qubit pattern for each node on a chip, then it can be run in a hybrid model.
Here it will be partitioned into a part classical CPU problem. the rest on a QPU (the quantum processing unit version of the CPU). It is designed for a million variables, in addition, there is not just a 0/1 choice for each variable.

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These techniques were illustrated when our speaker ran a 1985 era "Airline Hub Location" problem as a demonstration or a "toy" problem. Using just a fraction of a second clock time of actual QPU time, the solutions presented a number of ranked choices for three nationwide hub locations, out of some initial about 100 possible airport hub locations, that would satisfy the airline schedules after examining all the current flight destinations, flight frequencies, passengers selection, the expected load of passengers going from one location to the another, cost requirements, etc. This illustrated an important fact for these quantum optimization problems. The actual problem maybe run

1000 times in the spirit of an optimization problem and the results are given as probabilistic numbers. As with chemical annealing, one is looking for global minimums, as opposed to several strictly local minimums.
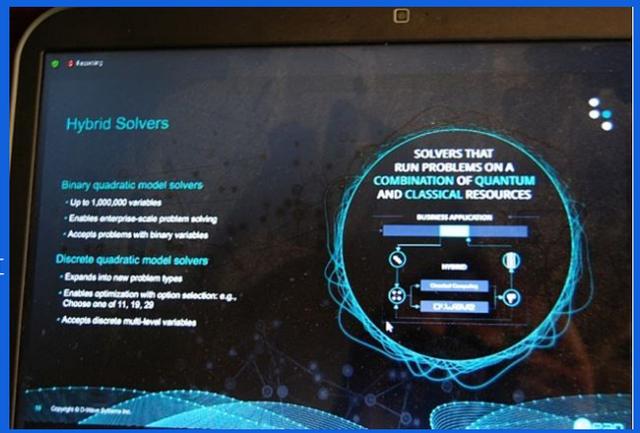
So what is the take of IEEE engineers from this commercial QC activity? Let this IEEE reviewer take a stab at this question, as it was not on the agenda of our speaker. Dr. Goliber, our speaker, noted that NASA is using this D-Wave system for some of their QC problem (machine learning). Their use cases and case histories are posted as technical reports on the D-Wave website for reference. What would be the optimization problems that would arise in 5G communications with the dense proposed IOT (Internet of Things) censored fields? How does one design, then optimize against the system parameters on the system latency and quality of service, the location of structure of MIMO antenna towers for the 5G system? What would be the optimization needed to make a large-scale system to cybersecurity threats, such as the recent Colonial Pipeline hacking? Note all the potential (and necessary) input/output data locations along the route of a pipeline system.

We should note that from the start that this talk would not cover the design of the superconducting Josephs junctions that are the functioning part of the qubits. That is another different technical area of our IEEE members to delve into.

We thank our presenter Dr. Goliber for her excellent introduction to D-Wave quantum computing for optimization problems. We expect rapid progress in this field in the next few years and a large number of applications, as well as we, anticipate a return virtual talk to the AIAA-Los Angeles-Las Vegas Section and the larger Southern Section IEEE membership area by Dr. Goliber for the newest result.

The Role of AI Literacy in Ethical AI

By: Kimberly Mosley

On June 30, 2021, the Foothill Section Women in Engineering and Consultantś Network Affinity Groups held a joint virtual meeting presenting a talk by guest speaker Masheika Allgood of AllAI Consultin, LLC. In the presentation titled "The Role of AI Literacy in Ethical AI", Masheika shared with us the importance of general societal understanding of artificial intelligence and how her company promotes education and awareness in this very relevant and burgeoning field.

Twelve in attendance were formed and enlightened with a rich discussion on AI decision-making in our daily lives.

Examples shared: Law enforcement with predictive policing and generalized surveillance, Social Services with child welfare and unemployment insurance fraud, Employment Management with empathy tracking and hiring practices. Ethical concerns centered on the coded bias in algorithms and specifically designed for decision-making that drive social and financial outcomes.

Central to Mashieka's talk was the lack of oversight of AI in the commercial and governmental enterprise, think the prevalence of dis and misinformation on social media, and inaccurate facial recognition software used in…

policing, and the reality that there are no real consequences for failures to follow or even enact in ethical standards and policies for responsible AI.

Finally, Masheika is a rather sobering statistic. Of the 300,000 AI engineers worldwide, only about 22,000 are AI specialists. Her talk was a clarion call to engineering to step up our game and put ethical guardrails in the design of AI systems.

WiE and CN Technical Presentation:
"NUCLEAR RENAISSANCE"

July 28, 2021

Speaker: **Dr. Deb Luchsinger**

The new *"Nuclear Renaissance"* will involve the deployment of small modular and microreactors. The reality is pollution is a problem, and the demand for energy is increasing (electric vehicles, smartphones, smart homes, etc.) In addition, outside of the U.S. there are millions of people living without clean water and electricity to provide refrigeration or power to medical equipment in medical clinics. NuScale Power is developing a new modular light water reactor nuclear power plant. This groundbreaking technology features a full factory-fabricated small modular reactor (SMR) capable of generating 77 MW of electricity using a safer, smaller, and scalable version of pressurized water reactor technology.

NuScale's scalable design - a power plant that can house up to 12 individual power modules - offers the benefits of carbon-free nuclear power and reduces the financial commitments associated with gigawatt-sized nuclear facilities. NuScale's technology is also ideally suited to supply energy for district heating, desalination, and other process heat applications.

About the Speaker:

Dr. Deb Luchsimger has more than 30 years of experience in the development of energy resources. She is a specialist in projects and program management, nuclear licensing, and NEPA, and holds advanced degrees in geology, biogeochemistry, and climatology, with extensive experience in Nuclear Regulatory Compliance. She had been focused recently on the site analysis, licensing, and permitting of energy resource development sites for new nuclear, and license renewal, subsequent license renewal, and other nuclear, licensing actions for existing plants.

Upcoming Events:

WiE and CN: Nuclear Renaissance
July 28, 2021

IEEE ExCom/OpCom Monthly Meeting
August 10, 2021

IEEE Foothill Consultant's Network Monthly Meeting
August 25 , 2021

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