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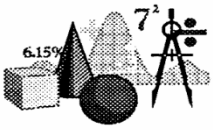


SPARKS

Daytona Section Newsletter
February 2023
https://r3.ieee.org/daytona/

UPCOMING EVENT

Engineering Week Keynote Address
Wednesday February 22, 2023
5:00 – 7:00 PM
Jim W. Henderson Administration and Welcome Center Atrium
Rooms: Duva 1, 2 and 3
600 S Clyde Morris Blvd
Embry-Riddle Aeronautical University
Daytona Beach

Building Capabilities in Cislunar Space

Professor Kathleen C. Howell
School of Aeronautics and Astronautics, Purdue University

Abstract

As evidenced by the Global Exploration Roadmap, international interest exists in a new era of exploration throughout the solar system. It is now apparent, however, that accomplishment of such a broad goal necessitates a multipurpose infrastructure in cislunar space as a prerequisite for ambitious long-term scenarios of space exploration and development. Simultaneously, the commercial sector also plays a role in support of further space exploration and any expansion likely depends upon building up a space economy. Thus, space infrastructure in the Earth-Moon neighborhood enables a multitude of missions that can leverage it to satisfy critical needs such as transportation, communications, energy, water, and waste management. All space sectors, i.e., civil, commercial, and national security, share common needs for space infrastructure, thus, such development should be designed for broad applicability, beyond a single mission, a single agency, or even a single country. Space infrastructure involves software as well as hardware capabilities, including a keen understanding of the pathways, that is a roadmap throughout cislunar space, i.e., an orbital infrastructure and ‘cislunar highway system’. NASA, for example, is currently focused on positioning and maintaining a future inhabited facility in a long-term and relatively stable orbit in the lunar vicinity that can serve as a hub for other activities. Various other types of orbits are proposed for a broad range of services, e.g., propellant storage, supplies for lunar missions, as well as locations for space-based facilities to support future crewed and robotic translunar missions to other destinations in the solar system. A view into the orbits and pathways in the cislunar region is introduced.

OUR SPEAKER

Professor Kathleen Connor Howell is presently the Hsu Lo Distinguished Professor of Aeronautics and Astronautics in the College of Engineering at Purdue University. She earned her BS degree in Aerospace Engineering from Iowa State University; her M.S. and Ph.D. degrees in Aeronautical and Astronautical Sciences are from Stanford University. Professor Howell's technical research interests and expertise are in astrodynamics, with particular applications in complex gravitational environments; such analysis includes mission and trajectory planning, station-keeping and maneuver design, as well as low-thrust applications and small satellites. She has successfully applied these methodologies to numerous NASA missions. She served for many years as the Editor-in-Chief for the AAS *Journal of the Astronautical Sciences*; she is also a current member of a number of other editorial and advisory boards. Professor Howell is an elected member of the National Academy of Engineering, the American Academy of Arts and Sciences, and the International Academy of Astronautics. She is also a Fellow of both AIAA and AAS. She is involved with various other organizations within the international aerospace and astrodynamics community.

WIE AFFINITY GROUP NEWS

WIE Affinity Group Chair Rebecca Demarco would like to do 4 - 5 events during the 2023 calendar year. At least 1 event will be organized to coincide with a Daytona Section regular program, preliminary target is either September or October of 2023. Here are further details about these planned events:

There will be a two-part Health and Wellness series. Content, potential speaker(s) and timeline subject to further discussion. There will also a Diversity and Inclusion event. The WIE EXCOM plans to solicit collaboration from several ERAU [Women in Aviation at ERAU; ERAU_BSA] and B-CU campus [B-CU SGA] student groups which will help to steer topics and content in alignment with IEEE WIE Mission & Vision. The event format discussed was to select a panel of students from diverse backgrounds, discussing their career plans along with their experiences, similar to the 10/26/2022 Expert Panel event.

The WIE EXCOM further discussed holding a summer event that could provide a forum of participation from area high schools to learn more about education and career opportunities for girls.

Our next meeting is on 2/16/2023 at 8:15 AM online via Microsoft Teams. If anyone would like to participate in the discussion and contribute to the efforts of the WIE Affinity Group, please Email rebeccademarco@ieee.org for the link.

LIFE MEMBER GROUP MEEETING/TOUR

The Life Member Affinity Group is planning an interesting tour for Life Members who are interested in airplanes and aerospace research on March 8th.

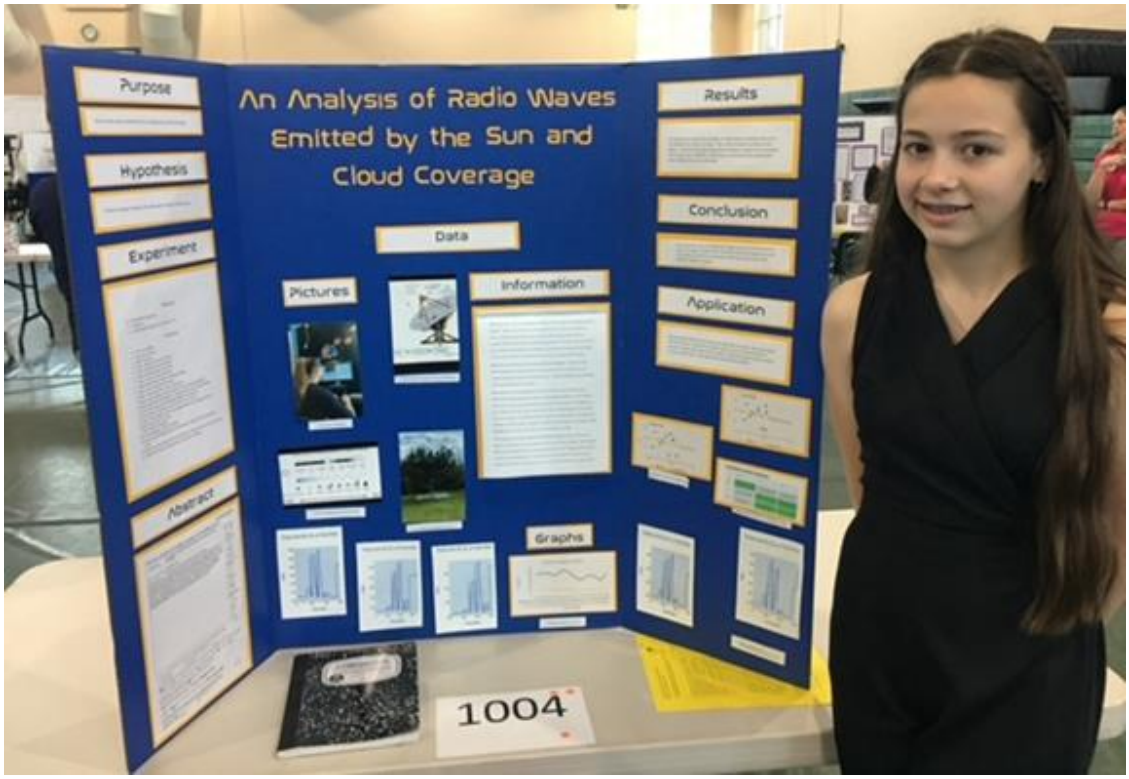
The Embry-Riddle Eagle Flight Research Center (EFRC) serves as the university's Aerospace Research & Design facility. The state-of-the-art center is equipped to conduct a variety of projects, including: experimental flight testing, aircraft modifications for FAA certification, design and testing of unmanned aerial systems (UAS), development and verification of high-fidelity (up to Level D) flight-data models used in engineering and training simulators and prototype engineering solutions to advance eco-friendly alternatives in aviation.

The EFRC is affiliated with the College of Engineering's Department of Aerospace Engineering and supports the class and individual projects of the university's various undergraduate, graduate, and doctoral engineering students. The students' research and practical efforts are supported by a diverse and experienced faculty, with specialties in fixed- and rotary-wing flight dynamics and control, flight testing, aeroelasticity, electrical engineering, air-breathing propulsion, parameter identification, and aerodynamics. To aid in a variety of research projects, the EFRC maintains a dedicated experimental Cessna 182, which is equipped with an internal navigation system and flight-testing data acquisition and sensor package.

For information email: Marty Oksenhorn (moksenho@yahoo.com) or Ron Gedney (rgedney@aol.com)

STUDENT USE OF THE SRT AT THE BURNS SCI TECH SCHOOL

We are happy to report the Small Radio Telescope our Section installed at the Burns Charter Science and Technology School in Oak Hill has resulted in a project being entered in the 2023 Tomoka Science and Engineering Fair held in late January at Stetson University. The student, Amanda King from the Burns School, presented her project in the Mathematics and Computational Sciences category. Her project was titled "An Analysis of Radio Waves Emitted by the Sun and Cloud Coverage". She used the school's SRT and its data in her project. Below is a photo of Amanda and her presentation display at the Science and Engineering Fair.



ANOTHER TALE FROM THE OLD PROFESSOR

BANDWIDTH

This is the story of how bandwidth became a household name. In the middle of the 20th century, after WWII, electrical engineers, particularly those involved in communications, were very familiar with the concept of bandwidth. But outside of engineering circles, only a few people had any idea of what bandwidth was all about.

Let's go back to the very early days of cable TV or CATV. CATV started out as "community antenna TV". In the history of television, say before 1970, many people had no access to TV signals. My grandmother, as an example, lived in a rural farm community in a Central Pennsylvania valley and didn't have access to TV signals until the late 1960's. This was of no concern to approximately half of the community who were Amish. Although her community was well within the signal contour of several TV stations, they stations were on the other side of the mountains. Towns in this situation placed TV antennas on the mountain tops where signals were strong. The signals were completely demodulated and then remodulated on a lower frequency such as the "low band" TV channels which were from 54 MHz to 88 MHz or channels 2 through 6. The use of low band channels would minimize the loss in the coaxial cable that would distribute the TV signals to subscribers. This was most important for UHF channels. If not converted to a lower frequency, the loss in the cable for the UHF channels would be enormous.

The early community antenna systems were run by local companies and even municipalities. Large communications companies caught on to how profitable these CATV systems could be and started buying local cable companies. These large telecoms, having infinitely more cash than a local CATV organization, expanded the number of channels handled by the cable system by adding satellite dishes and local access channels. In addition, since the subscriber signals were not broadcast, the cable systems were not limited to the assigned broadcast channels. Cable systems started adding more channels. These non-standard channels required a "set-top" converter which the cable company would provide for a nominal monthly fee.

Enter the MBA's. Some of these new regional CATV companies were attractive takeover targets by the giant telecoms. The telecom MBAs were appalled at the asking prices for these cable systems. They compared the history of their purchase of local telephone companies by such giants as AT&T and found the price of a cable system as unacceptable. They argued that a cable system was no different than a telephone company in that they had wires that were strung between utility poles parallel to the standard twisted-pair telephone line and provided communications services. In addition, the market penetration for telephone was nearly 100%; much more than the typical cable system. How could the regional cable companies expect so much money for their systems?

I doubt the MBAs of that time ever heard the term "bandwidth" in their business school courses. It wasn't the market penetration that made cable companies expensive. It was what they could do with their wires. The bandwidth of a telephone company's twisted pair is about 4 kHz, enough for voice communications.

The cable companies of the time had grown from just the low VHF channels, topping out at 88 MHz to 300 MHz with the addition of non-broadcast channels. In addition, like the twisted pair, the coaxial cable used by the cable systems was bi-directional and could provide more than just TV services.

The value of bandwidth is not limited to wired systems but also wireless. Radio spectrum is a very valuable asset and billions of dollars have been spent for the acquisition of radio spectrum by the wireless carriers. This has gone to such extreme as existing users of a part of the radio frequency spectrum have been moved to a different part of the spectrum so the giant telecom companies could expand their bandwidth. The cost of new equipment, its installation and checkout was borne by the new occupants of the vacated spectrum. It was a small price to pay relative to value of their new spectrum.

At the beginning of this Tale, I mentioned that bandwidth has become a household name. Here is one of three definitions found in the Cambridge English Dictionary which you can see has nothing to do with electronic communications systems.

"the ability or time to deal with a situation, especially one that involves a large amount of information or a number of problems:

I don't have the bandwidth to read stuff I know isn't going to lead to productive discussion.
If people misreport or misrepresent my arguments, I am using more of my bandwidth to correct the misreporting."

Hopefully I will continue to have the bandwidth to provide more Tales in the future.

Dr. Al Helfrick, a.k.a The Old Professor

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