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SMALLSATS: A VIABLE TECHNOLOGY FOR EARTH OBSERVATION AND INTERPLANETARY MISSIONS

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# SMALLSATS AND CUBESATS

## Recent Innovations Involving Antenna Systems

IEEE

# 2016 FEKO Student Competition Winner Announced

Daniel Ung, a master's student at Curtin University, Perth, Australia (Figure 1), won the 2016 FEKO Student Competition, an annual international contest organized in support of engineering education and academic excellence. In the competition, students interested in antennas, microwave devices, bioelectromagnetics, electromagnetic compatibility, and other electromagnetics-related fields are given the opportunity to showcase their work with FEKO, the electromagnetic solver developed by Altair HyperWorks. The 2016 competition generated global interest, attracting entries from Germany, the United States, and India, as well as Australia.

Ung's winning entry, "Embedded Element Pattern Beam Model for Murchison Widefield Array," addressed the need for an accurate yet accessible beam pattern of the Murchison widefield array (MWA) for astronomers. "The judges were very pleased to see the complexity and accuracy of the results achieved using FEKO versus real-world results," commented Matthias Goelke, senior director of business development for academic markets at Altair.

In his work with the International Center for Radio Astronomy Research (ICRAR), Ung realized that knowledge of the beam pattern of a radio telescope is vital for calibration and image correction. The solution employed was to perform beam modeling using the full embedded element pattern method with spherical harmonics representation. The results showed that the simulated beam pattern using FEKO was superior to the analytical beam model, which assumes a Hertzian dipole response.

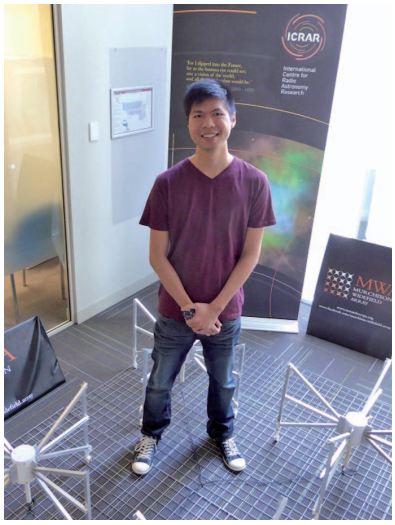


**FIGURE 1.** Daniel Ung, winner of the 2016 FEKO Student Competition.

**Ung realized that knowledge of the beam pattern of a radio telescope is vital for calibration and image correction.**

"Working on this project was challenging and rewarding at the same time," said Ung on hearing the news of his win. "I have developed an appreciation of the amount of 'behind the scenes' work that enables radio astronomy to deliver groundbreaking science. I hope the next generation of low-frequency telescopes, such as the Square Kilometre Array, will benefit from my project."

The ICRAR is an equal joint venture between Curtin University and the University of Western Australia, Perth. The MWA is a precursor to the Square Kilometre Array, the multibillion-dollar international project to build the world's largest radio telescope. This new beam model is currently being used by the MWA community to achieve its science goal. Ung's academic advisor, Dr. Adrian Sutinjo, will receive this year's supervisor award (Figure 2).

The 2017 FEKO Student Competition topics are scheduled to be announced in March on the Altair University website; see http://www.altairuniversity.com. The project will also be presented as a webinar in the upcoming FEKO 2017 Webinar Series.

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conductor plane, and the two half loop of electric current introduced at step c) are now flowing in the same direction and can thus be reduced to a single ideal current source, $I_2$.

8) Finally, a slot antenna with an ideal current generator as a feed is obtained.

In actuality, the duality implies that the input impedance of the dipole $Z_d$ and the input impedance of the complementary slot $Z_s$ are such that $Z_d Z_s = \zeta_0/4$, a characteristic that is very important in self-complementary antennas [10], [13]. Furthermore, it is possible to extend Babinet's principle to other kinds of screens, either absorbing or resistive [14].

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# AWARDS

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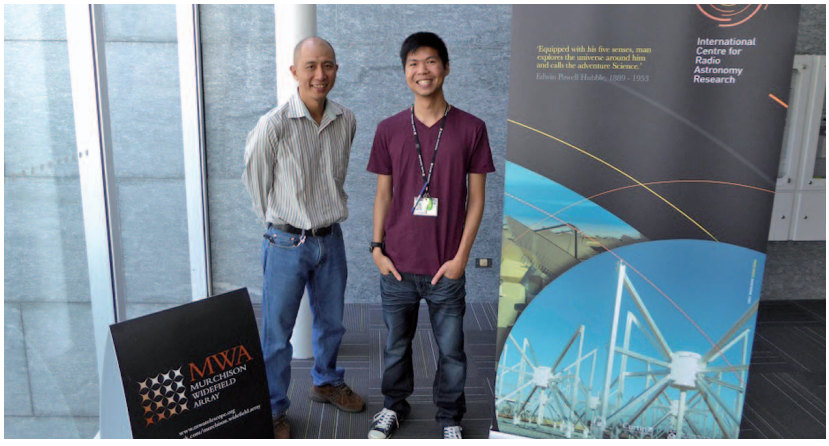


**FIGURE 2.** Daniel Ung (right) with his advisor, Dr. Adrian Sutinjo.

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