



# 2015 IEEE AP-S Student Design Contest: Antenna for Body Area Network

Travel to the 2015 IEEE Antennas and Propagation Symposium  
Win US\$1500, \$750, \$250

Join the 6<sup>th</sup> IEEE Antennas and Propagation Society (AP-S) Antenna Design Contest! Design and build an antenna that is optimized for body area networks (BANs). The top 3 teams will receive up to US\$2,500 in travel funds to attend the IEEE Antennas and Propagation Symposium in Vancouver, Canada, July 19-25, 2015 to demonstrate their working systems. From these 3 teams, 1st, 2nd and 3rd place winners will be announced at the 2015 IEEE AP-S Awards Banquet at the conference and will receive cash awards of US\$1500, \$750 and \$250, respectively. Moreover, final reports will have the opportunity to be considered for publication in the IEEE AP Magazine.

Important deadlines are **November 3, 2014** and **March 23, 2015**. See below for details.

## Goal:

- Design and build an antenna that is optimized for on-body placement in a BAN application of your choice, such as fall detection or monitoring of vital signs.

## Specifications:

- Apart from the antenna, the BAN antenna system should include a data-collecting sensor, connected to a Bluetooth transceiver. The transceiver is connected to the antenna to transfer the data to a custom-built app on an Android smartphone. The sensor and transceiver can be purchased off-the-shelf.
- The transceiver must comply with the Bluetooth standard and able to operate at Class 3 power rating ( $\leq 1$  mW). The system should be battery-powered.
- The antenna system must be safe and durable, easily reproducible and lightweight. The antenna structure (excluding sensor, transceiver and battery) should be no larger than 30 mm  $\times$  30 mm  $\times$  5 mm.
- Apart from application-specific data, the Android app must be able to display and log the power received from the system, for comparison of link performance in terms of received power (in dBm).
- Test scenarios should include the antenna system being skin-mounted on the upper front part of the torso and the smartphone positioned at each of these three locations: 1 m in front of the torso, front and back pocket of pants. There should be no other objects within 2 m of the system, except for the smartphone operator.
- Existing licensed software at the university (e.g., electromagnetic simulation software) or free software may be used. Any other commercial software used for the project should be included in the budget. The total production cost for the entire system must be **less than US\$1,500**.

## Eligibility:

The team should consist of 2 to 5 students, with at least 50% being undergraduate students. For a 5-year Bachelor-cum-Master degree program, students in years 1 to 3 are considered undergraduates. Each team should be advised by a professional mentor who is a member of the IEEE AP-S, but the work needs to be done primarily by the students. No student or mentor should be involved in more than one team.

## The Application and Review Process:

1. All applicants must submit a preliminary design by **November 3, 2014**. It must include:
  - a. A proposal limited to two pages and in 12-pt Times New Roman font that includes
    - i) A detailed description of the system to be built.
    - ii) The steps that will be taken to ensure the accuracy of the system.
    - iii) A bill of materials (up to US\$1,500).
  - b. A letter from a professional mentor such as a professor or engineer in industry indicating agreement to supervise the project (the students being mainly responsible for doing the work). The mentor must be an AP-S member (please provide IEEE membership number) and must verify that all team members are graduate or undergraduate students at a university, college, or technical school. The proposal and letter must be integrated into a single pdf file named TeamName.pdf. The proposal should precede the letter.
2. The AP-S Education Committee will assess each preliminary design based on likelihood of achieving the design goal and specifications, creativity, and quality of written materials. Six semi-finalist teams will be selected by **November 17, 2014** and will receive US\$1,500 each to build and test their designs.
3. Each of the six semi-finalist teams must submit their final design by **March 23, 2015** in the form of a video demonstration of the working system ( $\leq 5$  minutes), and a final report ( $\leq 8$  pages) in pdf format ( $\leq 5$  MB file size). Submission instructions for the video demonstration will be provided later (some videos from previous contests are available on Youtube – search for “AP-S Student Design Contest”). The report should follow the standard two-column format of the IEEE Transactions on Antennas and Propagation and include:
  - i) A detailed description of the system (including schematic and other diagrams).
  - ii) A list of parts and materials required, including where to obtain them and costs.
  - iii) Photos of the final system (including a scale to show how large it is).
  - iv) Assembly and operating instructions for the system.
  - v) Received power measurements (in dBm) obtained using the system for the specified test scenarios.
  - vi) Biographies (100 words or less each) and photos of all design team members.All software necessary to build and/or operate the system are to be provided in a separate file(s).
4. Several Design Contest Judges will be appointed to assess each semi-finalist’s design based on achieved link performance, creativity, completeness of the description, functionality of the system as determined by the video, and quality of written materials. Three finalist teams will be selected by **April 15, 2015** to receive stipends of up to US\$2,500 per team to travel to and attend the IEEE AP-S Symposium. The stipend is intended to cover equipment shipping costs and all expenses for one team representative; however, it may be divided among multiple team members.
5. The finalists will be expected to demonstrate their working systems during the Symposium and attend the Awards Banquet. Two banquet tickets will be reimbursed per team, for one team member and the team mentor. Each team should bring all necessary equipment for the demonstration. The received power will be measured for the test scenarios using the same test person and the same Android smartphone installed with the apps. The Design Contest Judges will assess the final demonstrations and take into account the final reports to select the 1st, 2nd, and 3rd prize winners, who will receive certificates and cash prizes of US\$1,500, \$750 and \$250, respectively. The prize winners will be announced at the Awards Banquet.
7. After the Symposium, the finalists may revise their final reports for possible publication in the IEEE AP Magazine under the Education Column (the reports will be reviewed and must meet Magazine standards). Team mentors may either be listed as a co-author or acknowledged in the paper.

## How to Submit Materials:

Send all materials to [designcontest@ieeeaps.org](mailto:designcontest@ieeeaps.org) with the subject line “2015 IEEE AP-S Design Contest Submission.” Questions may be sent to the same address. All submitted materials must be in pdf format according to the guidelines above.