## IEEE AESS RADAR CHALLENGE 2024

For the Radar Challenge 2024 we have partnered with Analog Devices and MathWorks to provide participants with an exciting opportunity to practice and showcase their skills with state-of-the-art radar hardware, specifically the Phaser 10 GHz Phased Array Radar platform from Analog Devices. This is a low cost, simplified phased array radar which allows real beamforming hardware to be used for education, project proposals, and even software development. More information available at **https://www.analog.com/cn0566**.

The official IEEE AES Radar Challenge page can be found below, which will contain up to date information regarding the challenge. Information on the Challenge will be also posted on the website of the IEEE Radar Conference 2024.

**ieee-aess.org/radar-challenge**
**2024.ieee-radarconf.org**

**For the 2024 Radar Challenge please follow the below steps:**

1.  Form your team to take part to the challenge. The team can consist of undergraduate, graduate, and PhD students or industry engineers; there is a recommended maximum of 5 people.

    a.  Please note that at least one team member should be planning on attending the IEEE Radar 2024 conference in Denver, CO, USA.

**Register** your team via this Google Form link: **https://forms.gle/cB29VN7sRycvydn28**. Proposals should include:

    b.  Team name and Github site (or similar)

    c.  Your institute name and location

    d.  Names of team members along with a short biography of each member

    e.  A full postal address and contact email address

    f.  Description of a radar project that your team will be building. Keep it attainable, but the more creative the better! Consider for example how you can use the different parameters of the FMCW signals, the phase array element of the device for angular positions measurements, different beamforming algorithms to an illuminator, MTI processing, or even SAR by combining the device with a moving platform. Possible example projects might be:

        i.    Radar SAR imaging

        ii.   Object tracking

        iii.  Clutter suppression techniques

        iv.   Experimenting with different transmit and receive antennas.

        v.    Exploring virtual arrays

        vi.   Multiple Beam radars

        vii.  Calibration techniques and comparisons

    g.  All projects must be demonstrated on the Phaser hardware. But modifications to the Phaser kit are allowed, if necessary.

    h.  All project proposals are tentatively due by Oct 31, 2023.

2.  Project **Selection**:

    a.  There are a limited number of Phaser kits available. Therefore, the project proposals will be reviewed, and a limited number of teams will be selected to participate.

    b.  All teams will be notified as to acceptance status, within about one month from the project submission deadline.

    c.  The selected teams will be loaned a complete Phaser (**CN0566**) kit. If the project is completed successfully, and presented at the 2024 IEEE Radar conference, then that team may keep the kit to continue their project or education.

    d.  Phaser kits are expected to be shipped by around mid-November.

3. The following tasks must be performed by the dates indicated:

   a. December 2023: Setup and follow the online tutorial **here**.

   b. January 2024: Create a test environment where you sense a 10cm x 10cm metal or foil plate at 1m – 5m in 0.5m steps, showing the accuracy of your range estimations.

4. At least one team member needs to attend the 2024 Radar Conference in Denver, where you will demonstrate that you have implemented the tasks and any additional capabilities your team was able to implement. Specifically, we ask you to bring the following deliverables to the challenge event which will take place during the conference: at the live event we will ask you to present max 5 slides and a video showing your results with the Phaser; where possible, a live demonstration of your creative concept developed with the sensor can also be presented. Please include in the slides some measure of performance to evaluate your results, for instance accuracy in estimation or tracking, just to name an example.

5. By attending and providing your slides and videos, your team will compete for the Radar Challenge Prize. The team will be ranked by a selected jury from members of the IEEE AESS Radar System Panel, looking at criteria such as technical quality and performance metrics, as well as creativity of the proposed solution.

**Terms and conditions.**

   A. Phaser hardware may not be sent, or used by, any ITAR prohibited or sanctioned countries.

   B. Phaser kit may not be resold.

   C. All teams agree to return the Phaser kits if the above deadlines are not met, or if the team is unable to present or demonstrate their project at the conference.

   D. This is an open source project. Therefore, the team's presentation and example code will be expected to be made available in some form.

   E. Please note that by agreeing to participate photographs and video footage will be taken throughout the 2024 IEEE Radar Conference. These may be used for marketing and publicity in IEEE/Analog Devices/Mathworks blogs, websites, and in social media or third-party publications.

   F. The organizers reserve the right to cancel the event, should circumstances prevent the event from taking place.

**Possible Resources and Ideas for Projects:**

   I. MIT Cantenna labs: **https://ocw.mit.edu/courses/res-ll-003-build-a-small-radar-system-capable-of-sensing-range-doppler-and-synthetic-aperture-radar-imaging-january-iap-2011**

   II. Small and Short-Range Radar Systems: **https://a.co/d/h8UzIRr**

   III. Introduction to Radar With Python and MATLAB: **https://a.co/d/j8LHwoB**

**For help with setup: https://wiki.analog.com/phaser_matlab**

**Resources for radar modeling in MATLAB**

**https://www.mathworks.com/help/radar/examples.html?s_tid=CRUX_topnav**

**https://www.mathworks.com/help/phased/examples.html?s_tid=CRUX_topnav**