

# Robots' Intellect 2023

## Laser Tag

### 1. The task

The goal of this match is to test the ability of autonomous robots to aim at the target as precisely as possible while moving. The robot must pass the track while aiming the laser at the center of the target. The robot's ability to adjust the laser beam as fast as possible is also tested. The winner is the robot that passes the track keeping the laser beam closest to the target's center during the run and passing it as fast as possible with the highest accuracy.

### 2. General rules

1. It is strictly forbidden for the robot to injure any participants or viewers.
2. It is forbidden for the robot to damage the course, obstacles or any other items of the organiser's inventory, unless it is explicitly a part of the competition.
3. The robot must be fully autonomous. Human input isn't allowed during the match, unless it's specifically allowed by the competition.
4. It is forbidden to intentionally cause any harm to other participants or robots.
5. The robot must be registered before the date specified by the organisers. One robot can participate in only one competition.
6. The robot must pass qualification before participation. Robots that are late for qualification must get the competition coordinator's permission to pass qualification after official qualification time.
7. During qualification, each robot will be assigned a unique number, which must be put on the robot in a clearly visible location.
8. Competition coordinator has final say on all questions and problems during the competition.
9. The organisers keep the right to alter/edit the rules, informing the participants about it accordingly.
10. Violation of the rules above will result in disqualification or criminal liability.

### 3. Requirements for the robot

1. Weight is not limited.
2. Maximum robot size: 1x1x1.5 m (length, width, height).
3. The robot isn't allowed to: change size; emit gases, liquids or dust; dazzle the participants with the laser beam
4. The laser in use must be in the visible spectrum range (380 - 740 nm wavelength) and no higher than class 2 (maximum power: 1mW).
5. The robot can only have 1 laser source that represents 1 point, no bigger than 5 mm in diameter.
6. The robot can have its own optical tracking system.

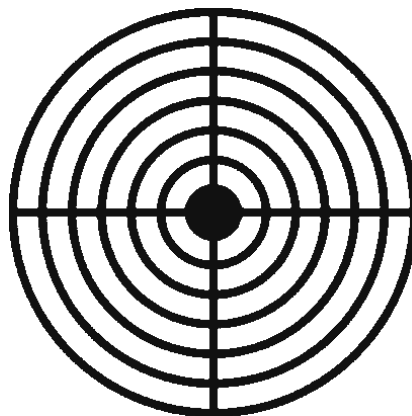
7. An additional stationary computer with no additional inputs (e.g. additional camera on computer, Internet connection, etc.) can be used for data processing.
8. The robot and the laser must have a START/STOP button or the ability to start/stop remotely.

#### **4. Team**

1. The team can't consist of more than 5 people.
2. The number of robots presented by a team is unlimited.

#### **5. Competition field**

1. The width of the track is 3 meters.
2. The length of the track is 1.5 meters.
3. The height of the target place might vary from 0.5 to 2 meters.
4. The target is 0.15 m in diameter and it will look as shown in Fig. 1.



*Figure 1 The target*

#### **6. Competition progress**

##### **6.1. General rules**

1. One robot gets 3 tries in the competition.
2. The robot has to go in a straight line from the start to the finish position, both specified by the judge and marked with tape.
3. The robot must pass the track in no more than 40 seconds.
4. When the robot passes the track, the participant must stop the robot and turn off the laser source. The judge then stops the timer and marks the time.

##### **6.2. The start**

1. After the qualification, the participants are invited according to the procedure established by the organisers.
2. The invited participant has to calibrate his robot equipment within 10 minutes and prepare it for the run.

3. With the permission from the judge, the robot is placed at the starting position and the laser source is turned on. When the judge gives a signal, the robot is started.

### **6.3. Deciding the winner**

1. The judge's program tracks the deviation of the laser beam position from the center of the target. The result will be judged by the RMS (root mean square) value - the longer and closer the laser beam is to the center of the target, the lower RMS value is. The winner will be the team with the lowest RMS value on their best attempt.
2. If there are several robots with the same RMS value, then the winner will be the robot that passed the track faster.

### **6.4. Comments**

1. During the run, the robot cannot use external assistance, otherwise the run gets stopped.
2. If the robot directs the laser beam from the target area to the side, the participant must immediately stop the robot and turn off the laser. In this case, the run is terminated.