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ANTENNA ROTATOR DESIGN BY 3D PRINTING

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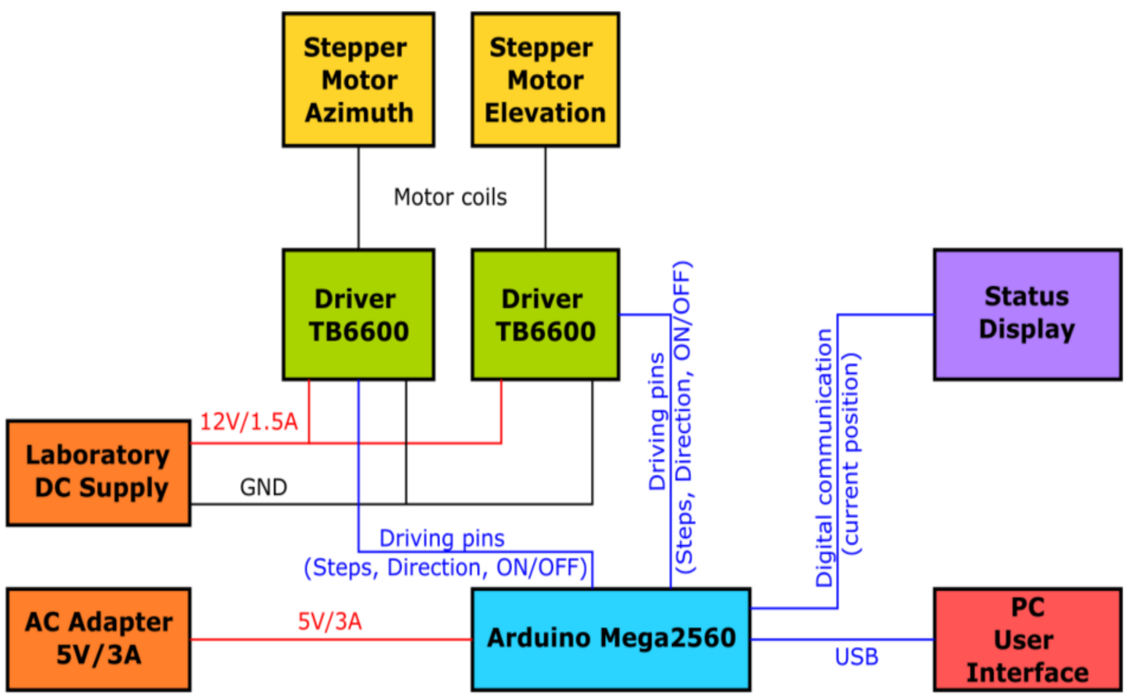
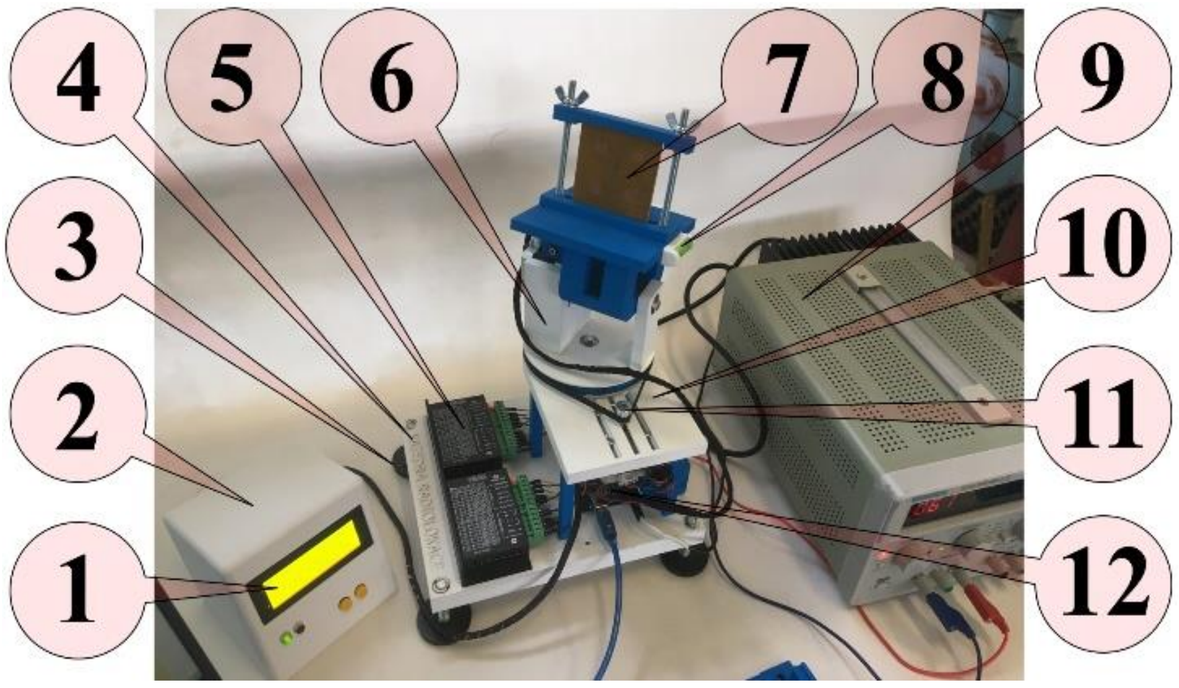
Due to the problematic availability or expensive purchasing costs of anechoic chamber for antenna parameter measurements, it would be worth considering a design of a low-cost alternative. This paper presents the design and implementation of an antenna platform that could be used for the measurement of basic radiation parameters of low power antennas. The antenna platform is manufactured by 3D printing. The aim of this paper is to describe the design and realization of the antenna rotator with focus on high accuracy of position control, variability of possible use (different types of antennas made of different materials) and low cost.

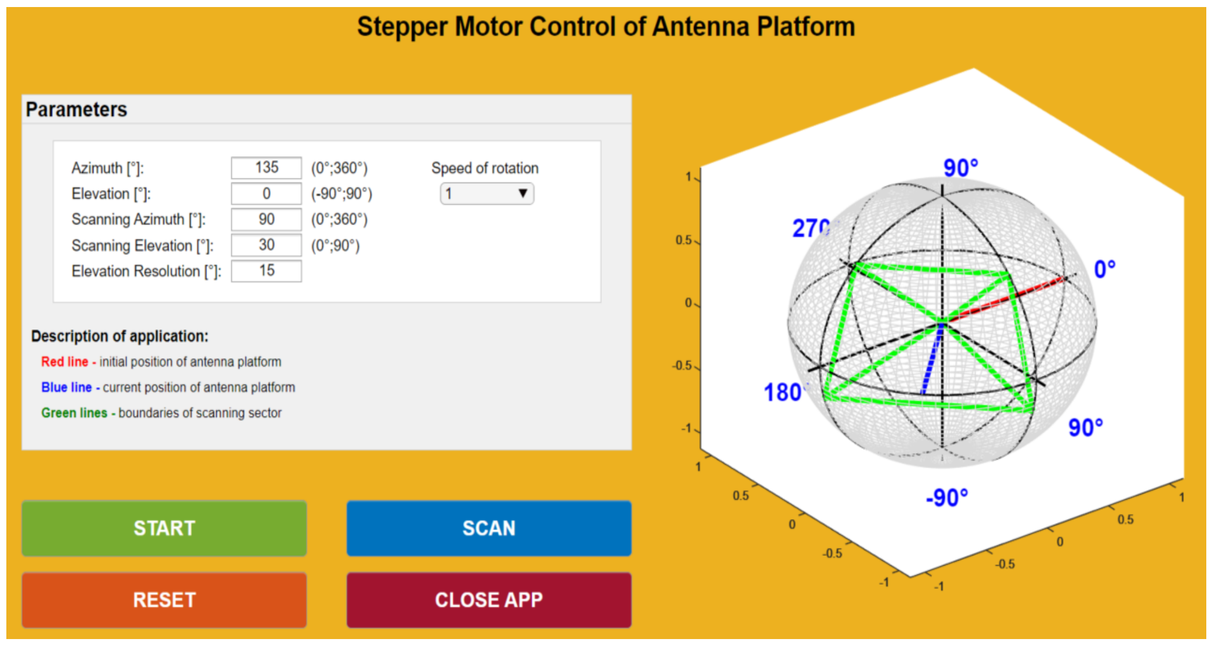


Block diagram of antenna platform control

- ❑ Supply
  - ❑ Laboratory DC Supply – supply for stepper motors
  - ❑ AC Adapter 5V/3A – supply for Arduino Mega2560 board and Status Display
- ❑ Movement of antenna rotator
  - ❑ Stepper motors NEMA 17 HS4401 – rotation in azimuth and elevation
  - ❑ Drivers TB6600 – drivers for bipolar stepper motors with wide range of microstepping modes and supply currents
- ❑ Control
  - ❑ PC – User interface in MATLAB for input of the parameters
  - ❑ Arduino Mega2560 board – software control of the rotator
- ❑ Additional information
  - ❑ Status display – information about current measurement progress



Assembled antenna platform control



User Interface in MATLAB

1. LCD display
2. Status display case
3. Levelling screws
4. Base for control circuits
5. Driver TB6600
6. Antenna rotator
7. Atachment for antenna
8. Bubble level
9. Laboratory DC supply
10. Rotatory base
11. Azimuth stepper motor
12. Arduino Mega2560

No.	Production cost	
	Material	Cost
1	3D printing (material, electricity,...)	41 EUR
2	2x Driver TB6600	22 EUR
3	2x Stepper motor NEMA 17 HS4401 + supp. comp.	35 EUR
4	1x Arduino Mega2560	40 EUR
5	1x AC adapter ANU-050300A	8 EUR
6	1x Bubble level	5 EUR
7	Other electronic components and fastening material	35 EUR
	Total cost:	**186 EUR**

Advantages of proposed solution

- ✓ High precision of stepper motors control (0.1° angular change)
- ✓ Variability in terms of measuring different types of antennas (horn, patch, etc.)
- ✓ Measurement of the antennas made of diffent materials (metal, coated plastic, etc.)
- ✓ The possibility of 3D scanning
- ✓ Variability of the overall solution (easy modification, exchange of control elements)
- ✓ Low manufacturing cost (186 EUR)
- ✓ Short manufacture time (approximately 7 days if one 3d printer is used)

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