

433 MHz LoRa Antenna

You have found the antenna made by the 2023-24 Year 10 CanSat team Athena. Here is some helpful stuff about this antenna:

Dimensions & Details

Component	Component Length (mm)	Distance from Reflector (mm)	Distance between previous component (mm)
Reflector (R)	339	0	N/A
Driven Element/Dipole (D)	319	138	138
Director 1	292	190	52
Director 2	288	315	125
Director 3	283	464	149
Director 4	279	637	173
Director 5	275	831	194
Director 6	272	1039	208

Boom Diameter: 20mm

Radiating Component Diameter: 12mm

Frequency f : 433 MHz

Wavelength λ : 692 mm

Element diameter d : 12 mm

Boom diameter D : 20 mm

Total number of elements: 8

Boom length: 1063mm

Gain: 12.7 dBi (approx.)

The antenna should be able to easily send signals for half a kilometre – we tested up to 350 and it worked with careful alignment (we ran out of space in the field to test further) – because the theoretical gain is 12.65 dBi, and a stronger gain means the signal can propagate further. The beamwidth (angle in which signal would be received) should be about 20-30 degrees. The antenna is made of hollow aluminium tubes.

A few tips:

- Use antenna simulation software such as Ansys HFSS – it's free for students.
- If the beamwidth is too narrow (loses signal if antenna is moved slightly), remove a director.

Parts & Assembly

If you need to print any spare parts, here is a link to them: <https://github.com/CanSat-Athena/Diagrams/tree/main/Antenna%20Docs/3D%20Models>

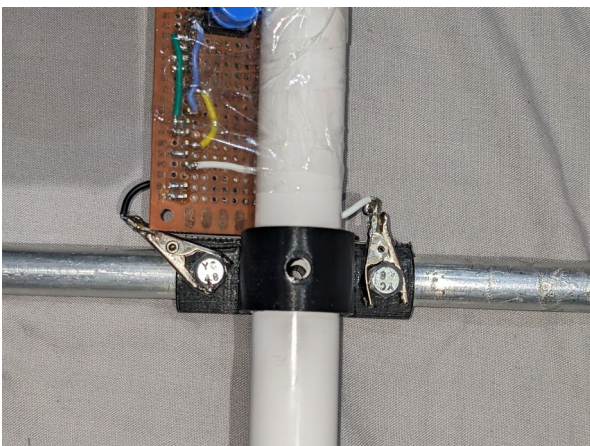
For the printed parts, black PLA was used.

The bolts and nuts used are standard M5.

The antenna boom is in two pieces to make it easier to carry, use the joiner part to connect the two. There is also a circular part and a matching hole on the boom with a flat bottom to mount the antenna to a tripod if necessary. When assembled, it should look like this (ignore the coaxial wire coming out of the dipole, the part connecting to the tripod should also have the tripod mounting part described above to mount it to the tripod securely):



After assembling the antenna, connect the radio to the dipole as such:



Links

You might find these useful:

Link to the 3D model for both the CanSat and antenna parts on Onshape:

<https://cad.onshape.com/documents/41446cc90593da251aa18a70/w/317e5d5472789b370bb6c815/e/380754f822a4cc7bc89015d7>

Links to our PDR, CDR and FDR: <https://github.com/CanSat-Athena/Diagrams/tree/main/Antenna%20Docs>

Our code (main code is in CanSat repository): <https://github.com/orgs/CanSat-Athena/repositories>

Our website (if it is still alive by the time you read this): <https://cansatathena.com>

Our YouTube channel: <https://www.youtube.com/@CanSatAthena>

Our Reddit: https://www.reddit.com/user/Project_Athena/

Our Instagram: https://www.instagram.com/athena_cansat/