Wind Turbine for PBL Group C

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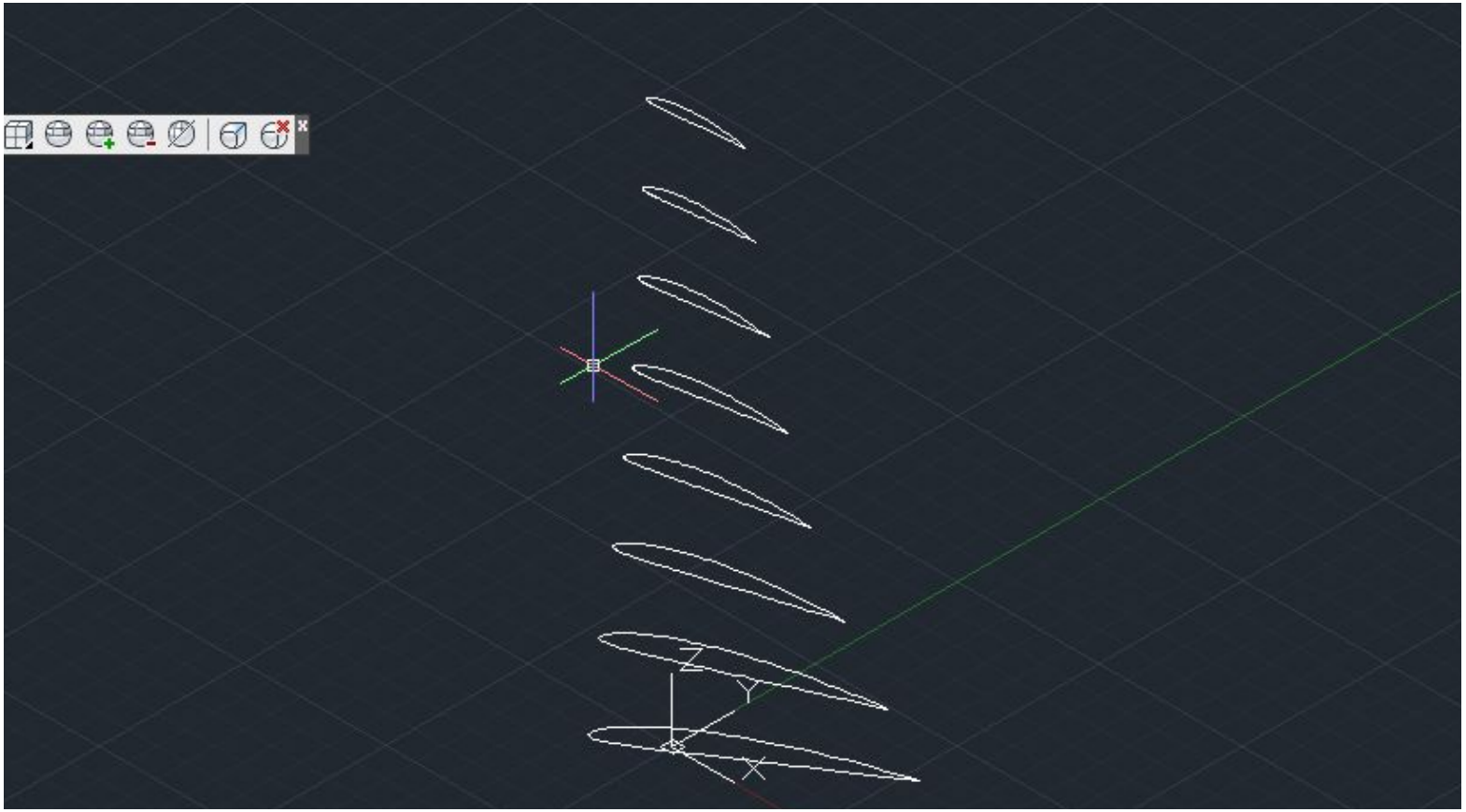
Outline

- Blade design
- Completed blades
- Wind lens design
- Completed wind lens
- Supporting design
- Supporting structure
- Assembly
- Wind turbine testing

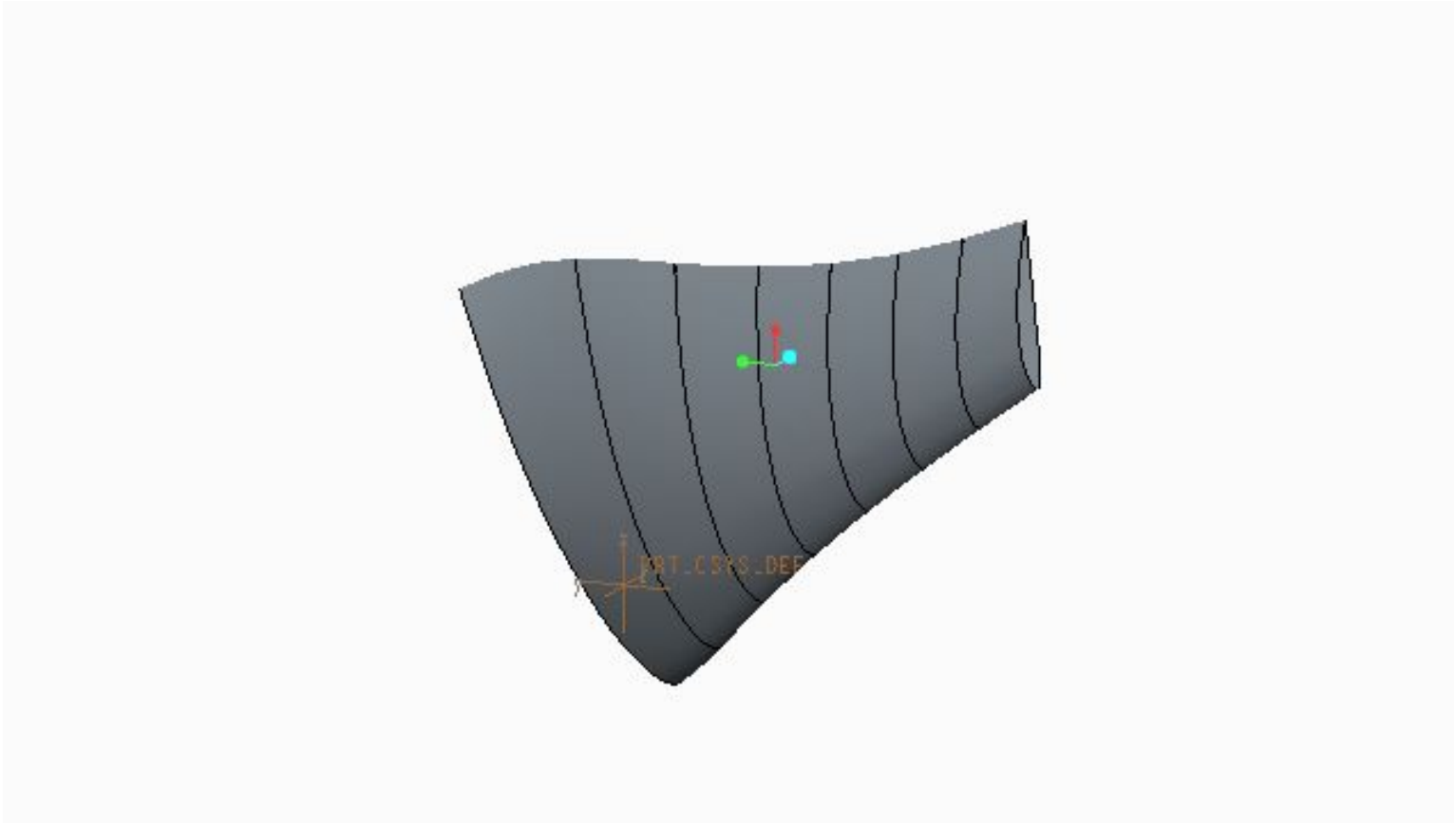
Blade design

	A	B	C	D	E	F	G
1	position	λ d	r	ϕ		β	cord
2	1	0.688468	40	0.645235	36.98797	33.48797	84.21197
3	2	1.16179	67.5	0.473798	27.16038	23.66038	77.86617
4	3	1.635112	95	0.365927	20.97669	17.47669	65.86562
5	4	2.108434	122.5	0.295244	16.92479	13.42479	55.50583
6	5	2.581756	150	0.24636	14.12252	10.62252	47.4276
7	6	3.055077	177.5	0.210888	12.08914	8.589136	41.1805
8	7	3.528399	205	0.184115	10.55435	7.054355	36.28298
9	8	4	232.4	0.163319	9.362242	5.862242	32.38495

Blade design



Blade design



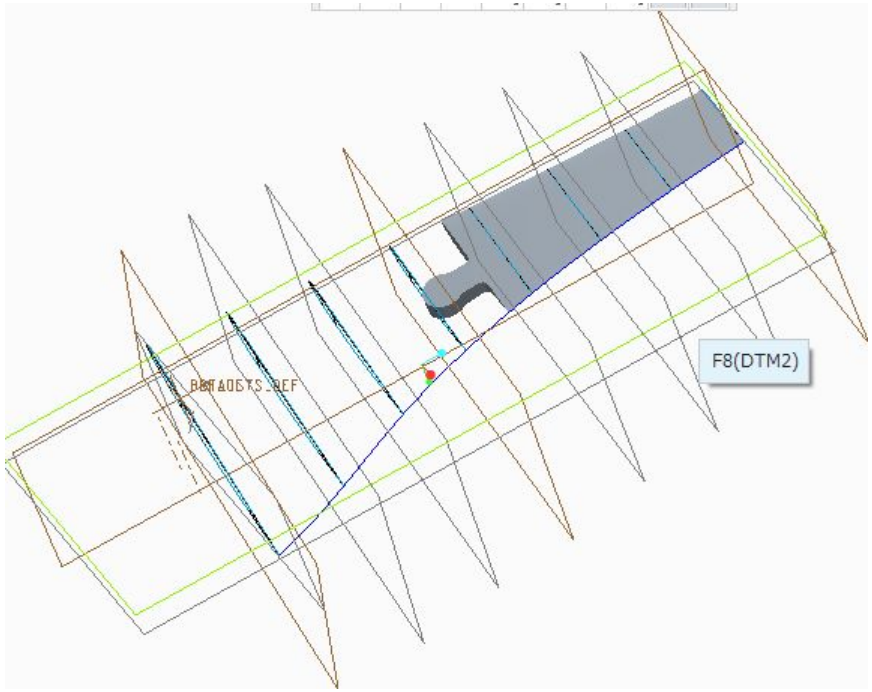
Blade design

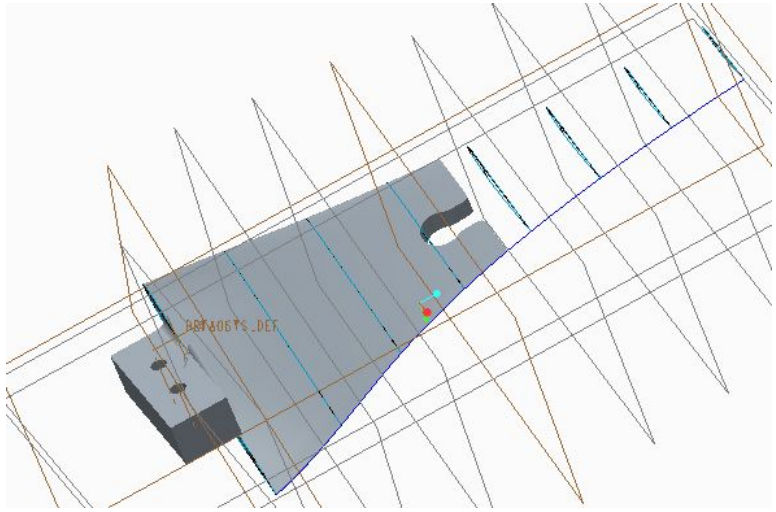
・Rotational radius
=232.4mm

・chord of blade tip
=34.2mm

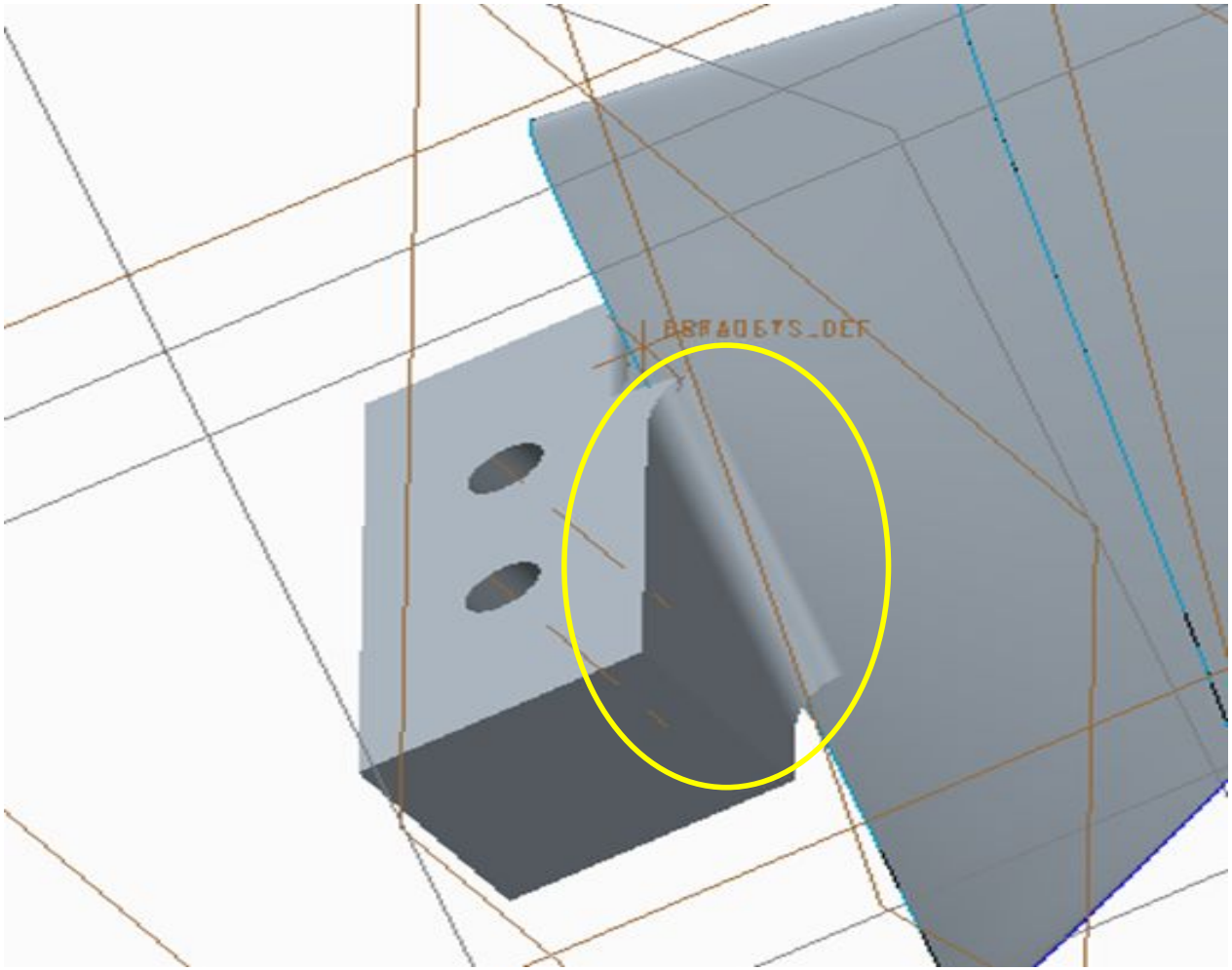
・chord of the root of blade
=84.2mm

・λd＝4





Blade design

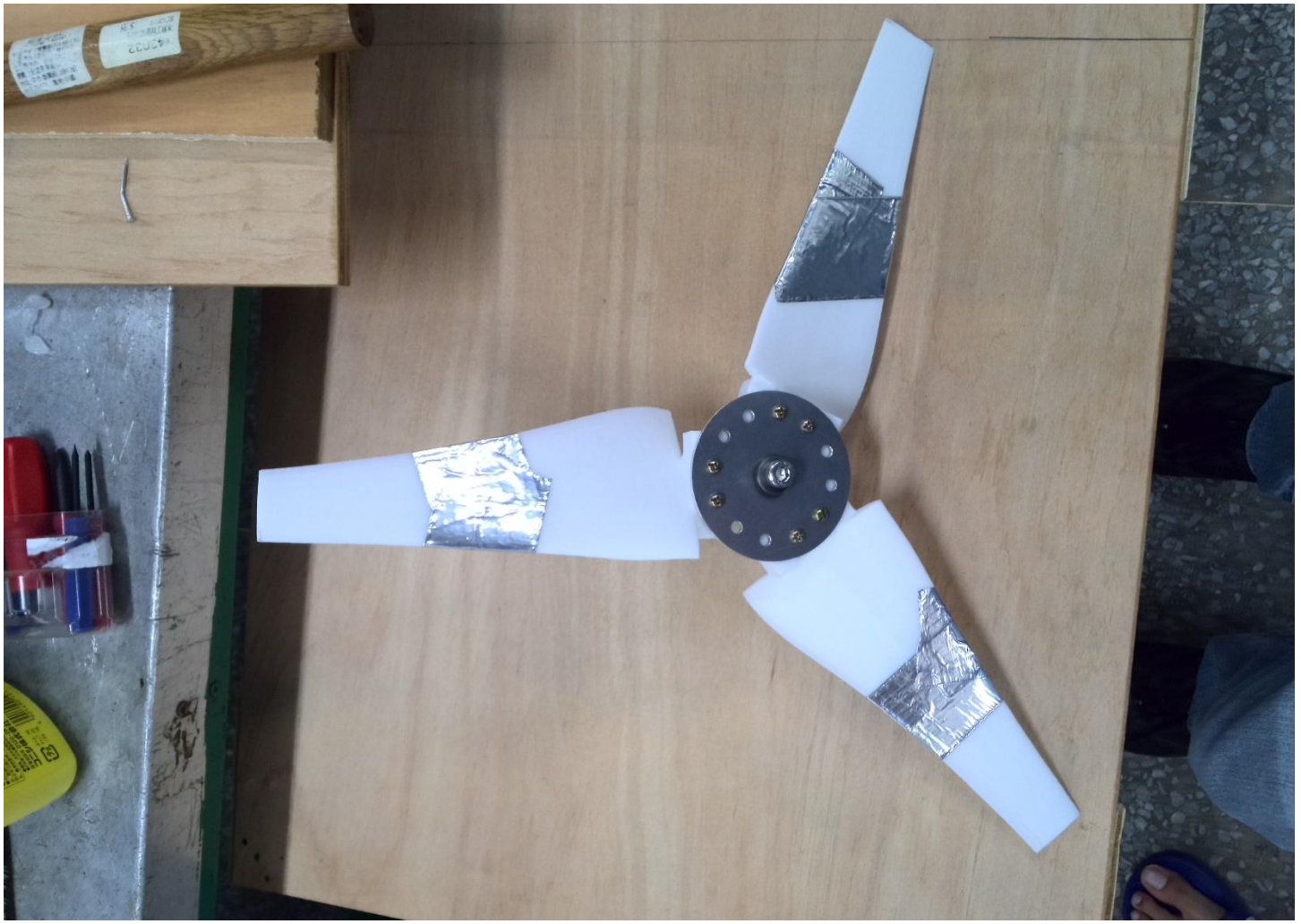


Completed blades

We divide blade into 2 pieces

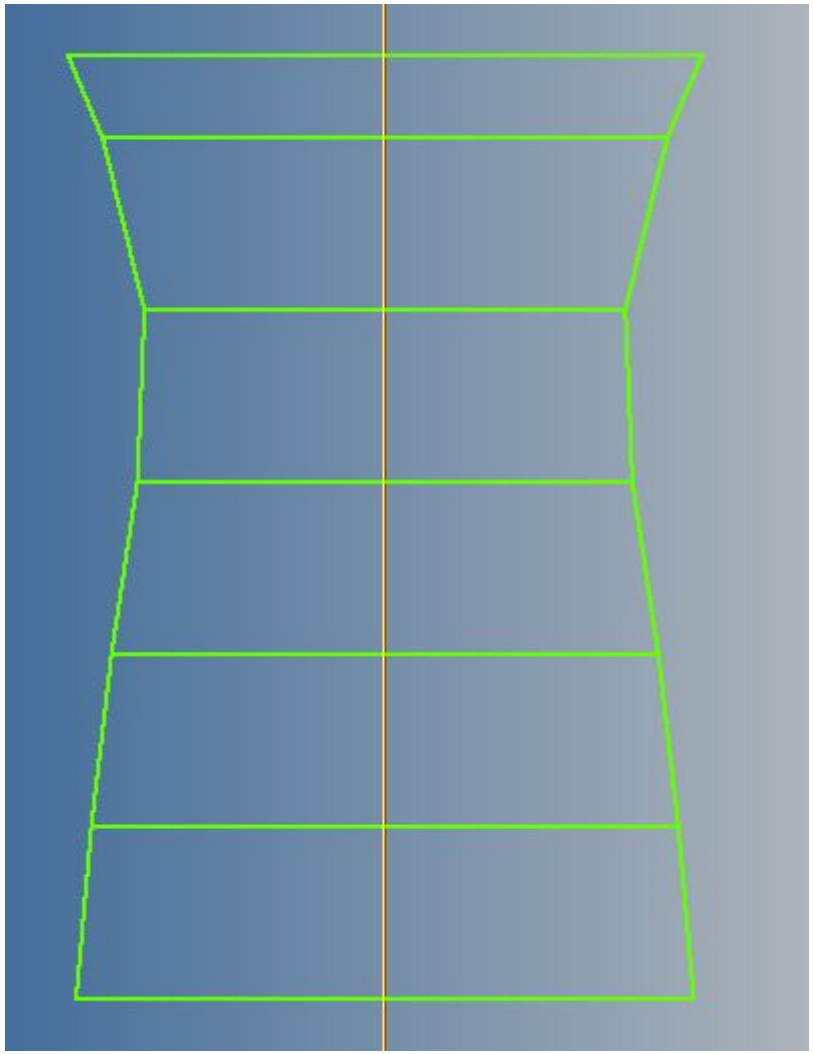
Completed blades

Use tape to fixed

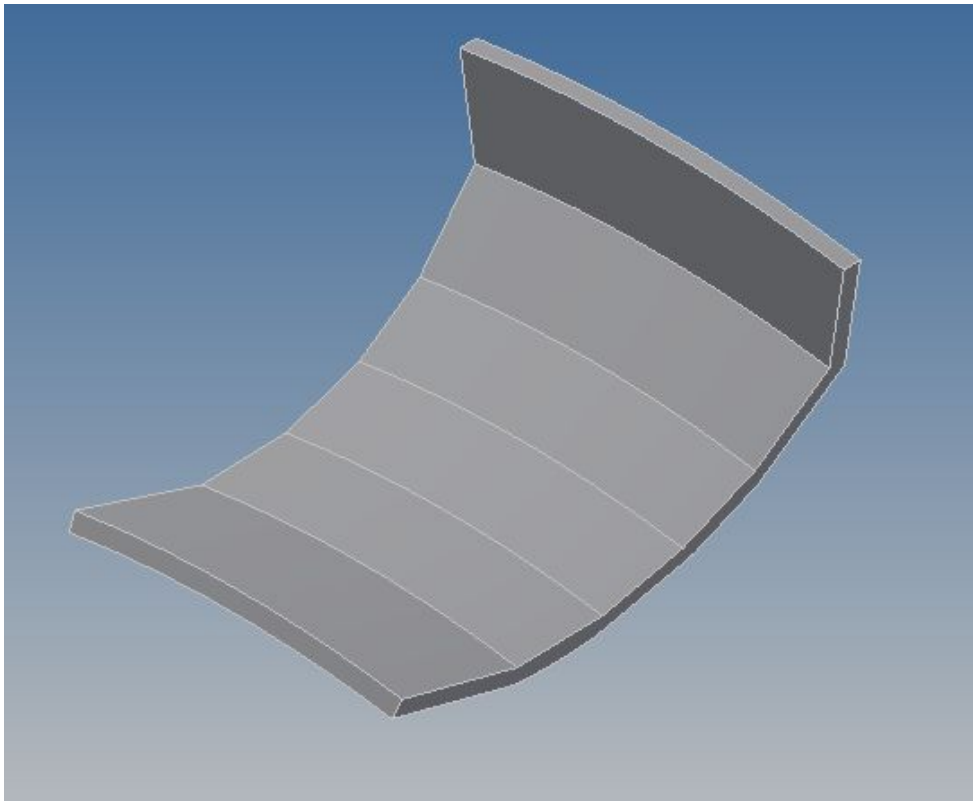


Wind lens design

Unfold drawing

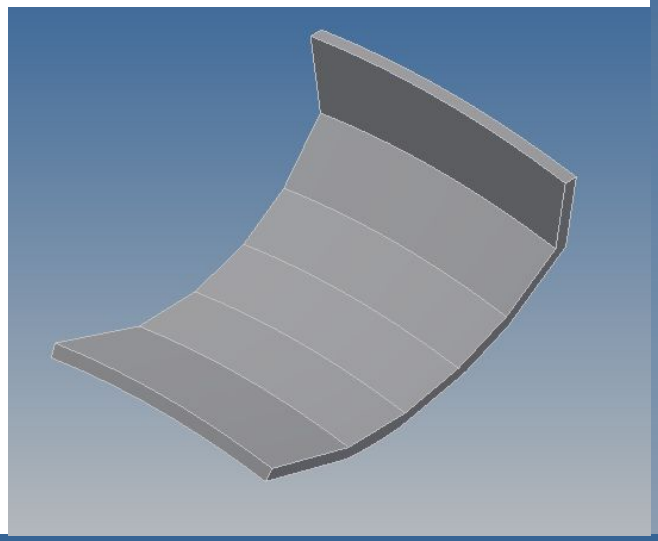


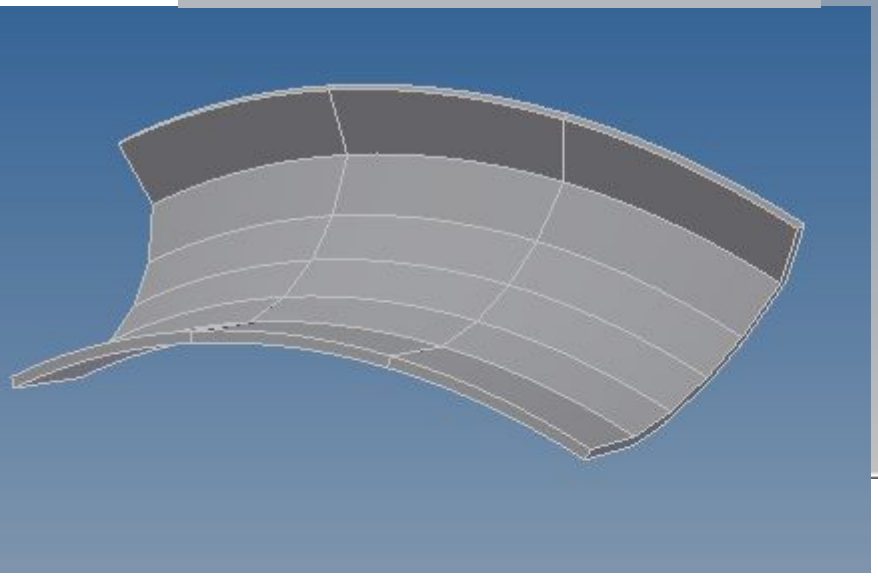
divide it into 20 pieces

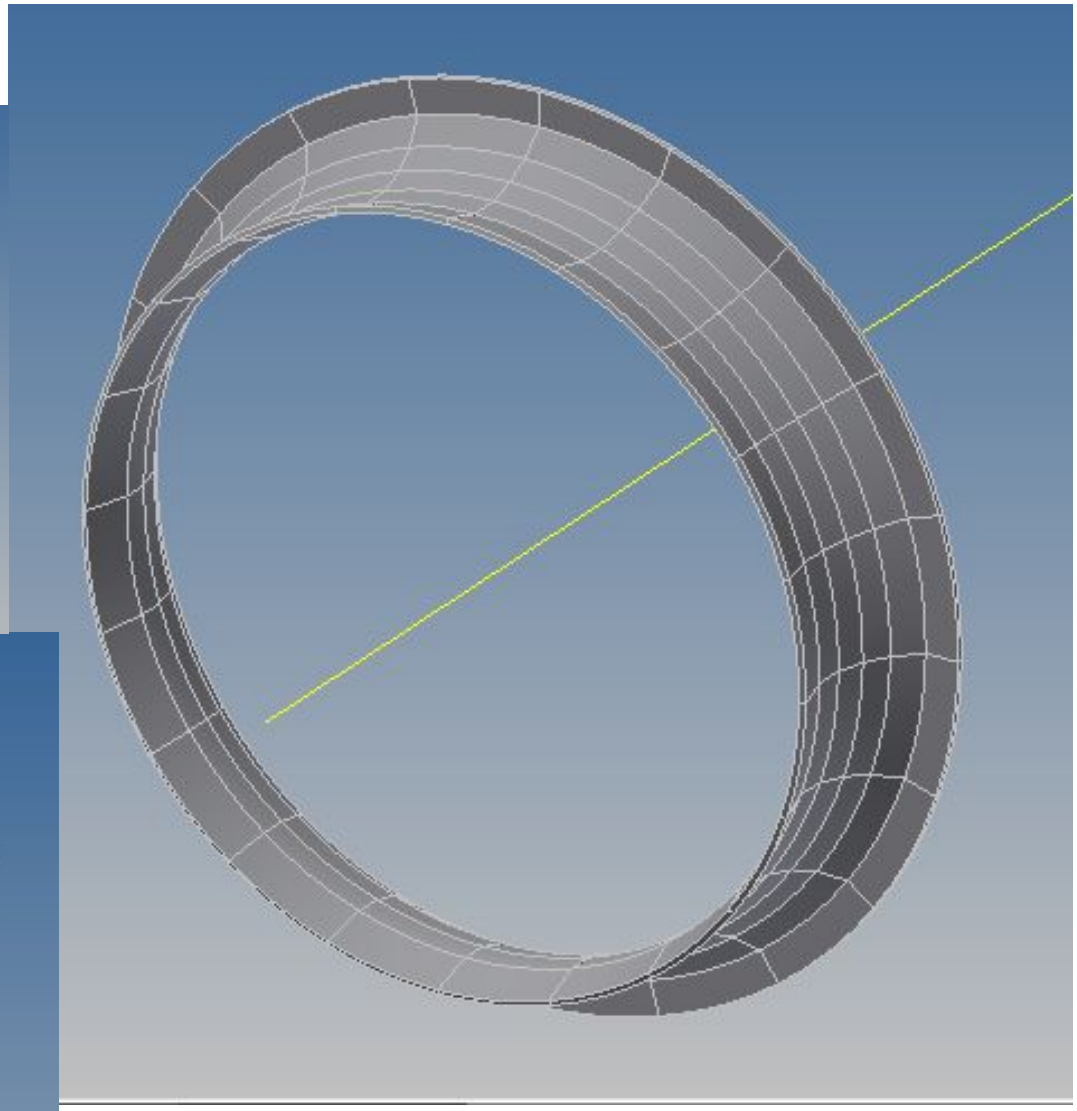


Use wire to link every pieces

Use tape to fixed

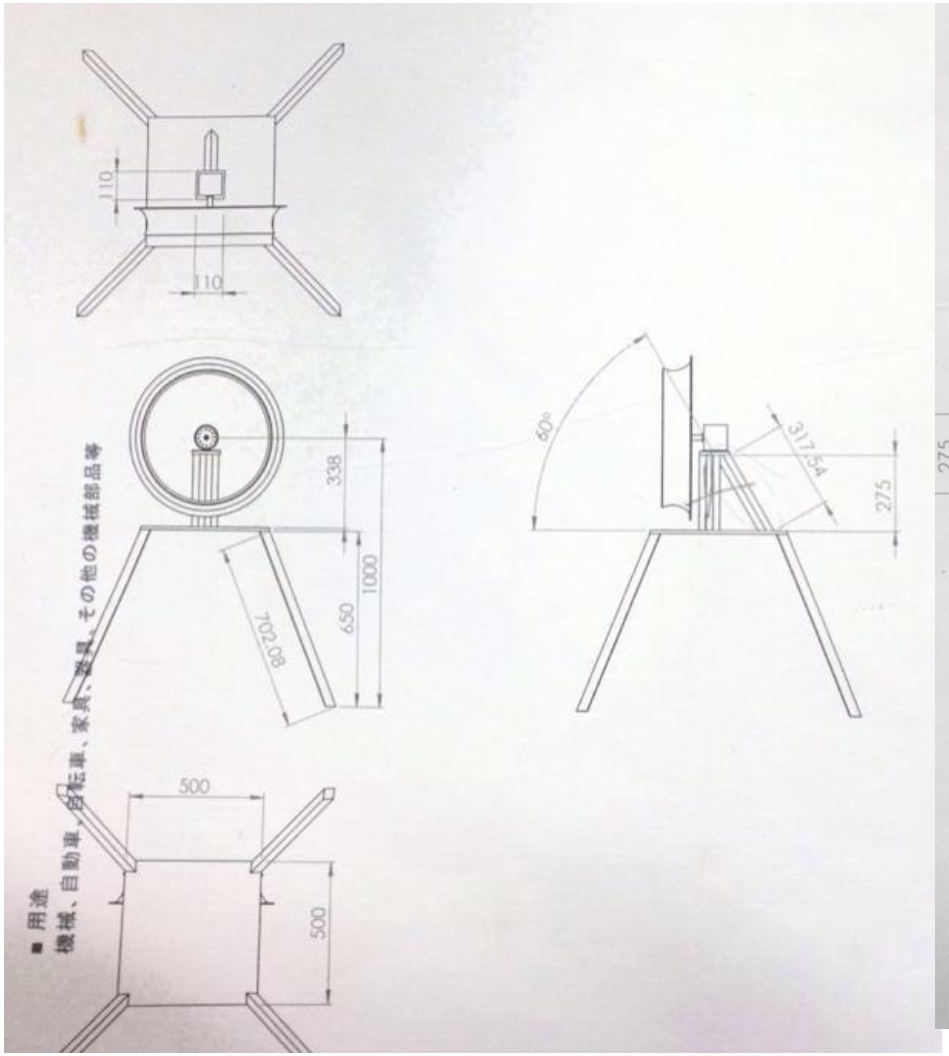


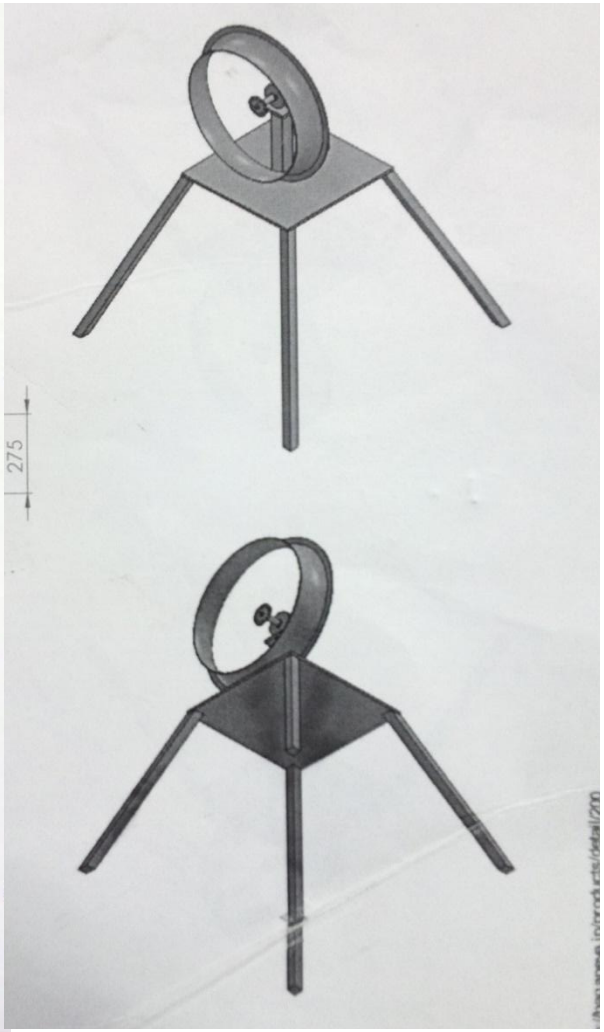




Completed wind lens

Supporting Design



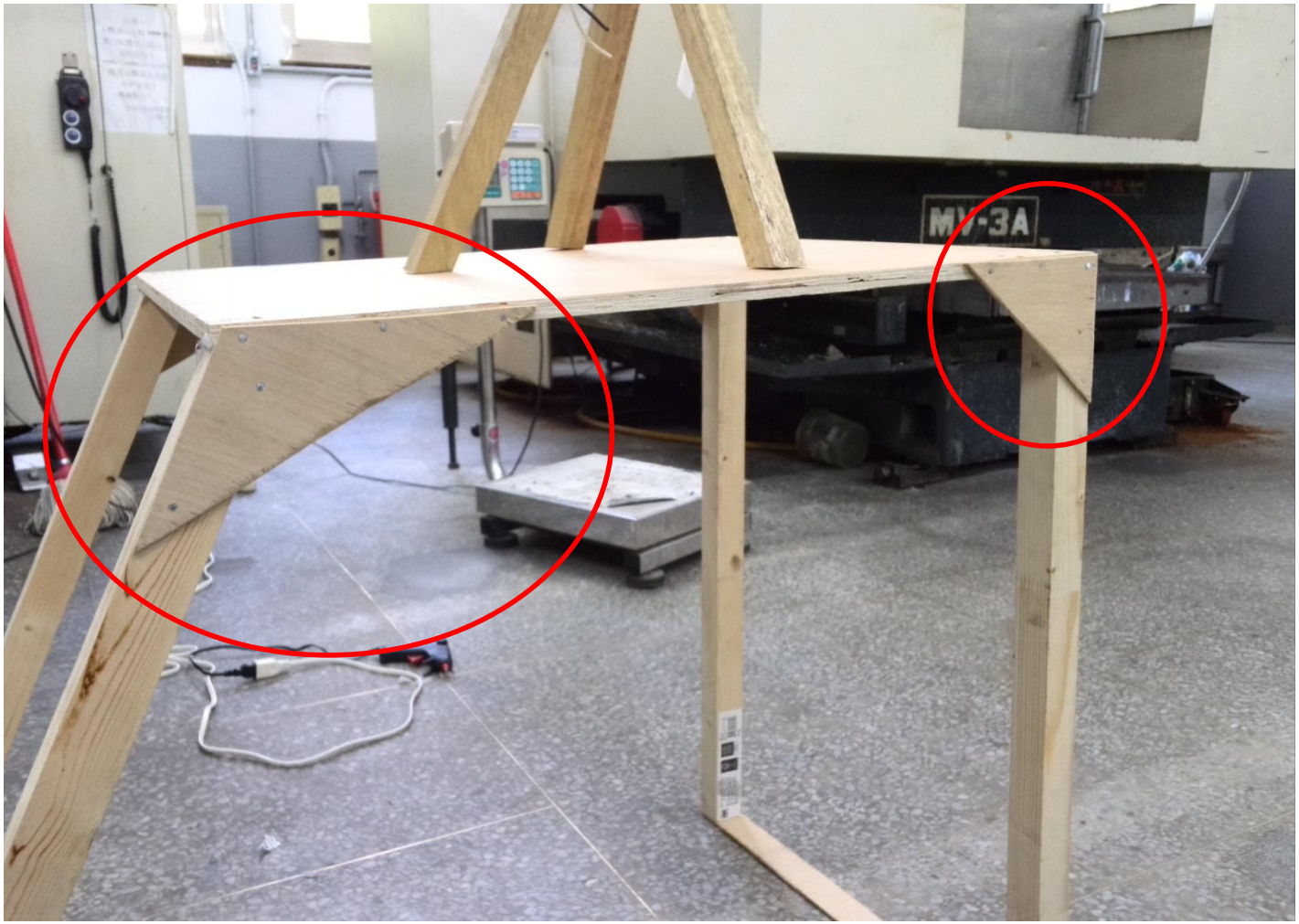


Supporting Structure

Support of the generator

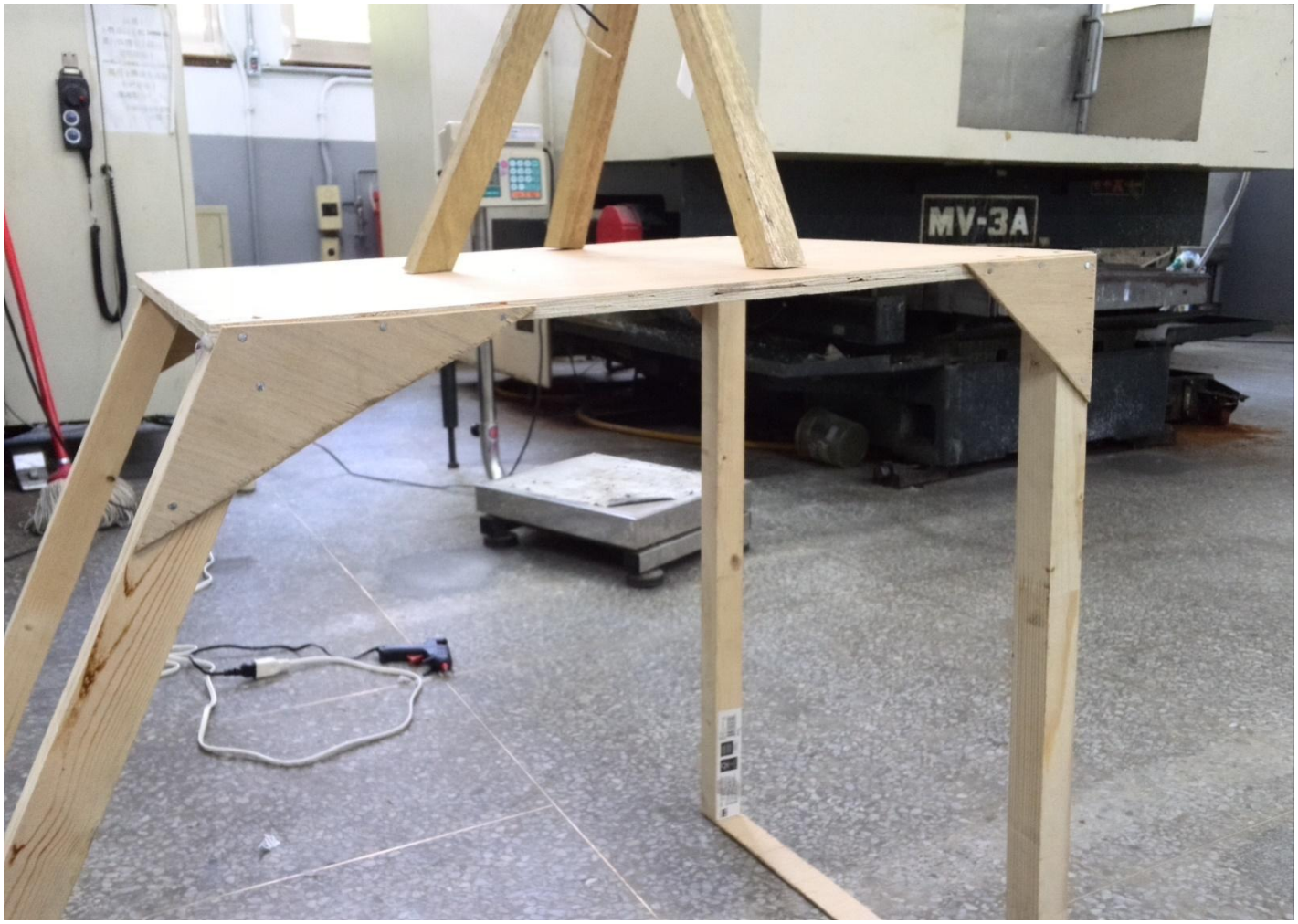
Base of the structure

On the outside
Fixed 4 legs and main plate by triangle wood plate



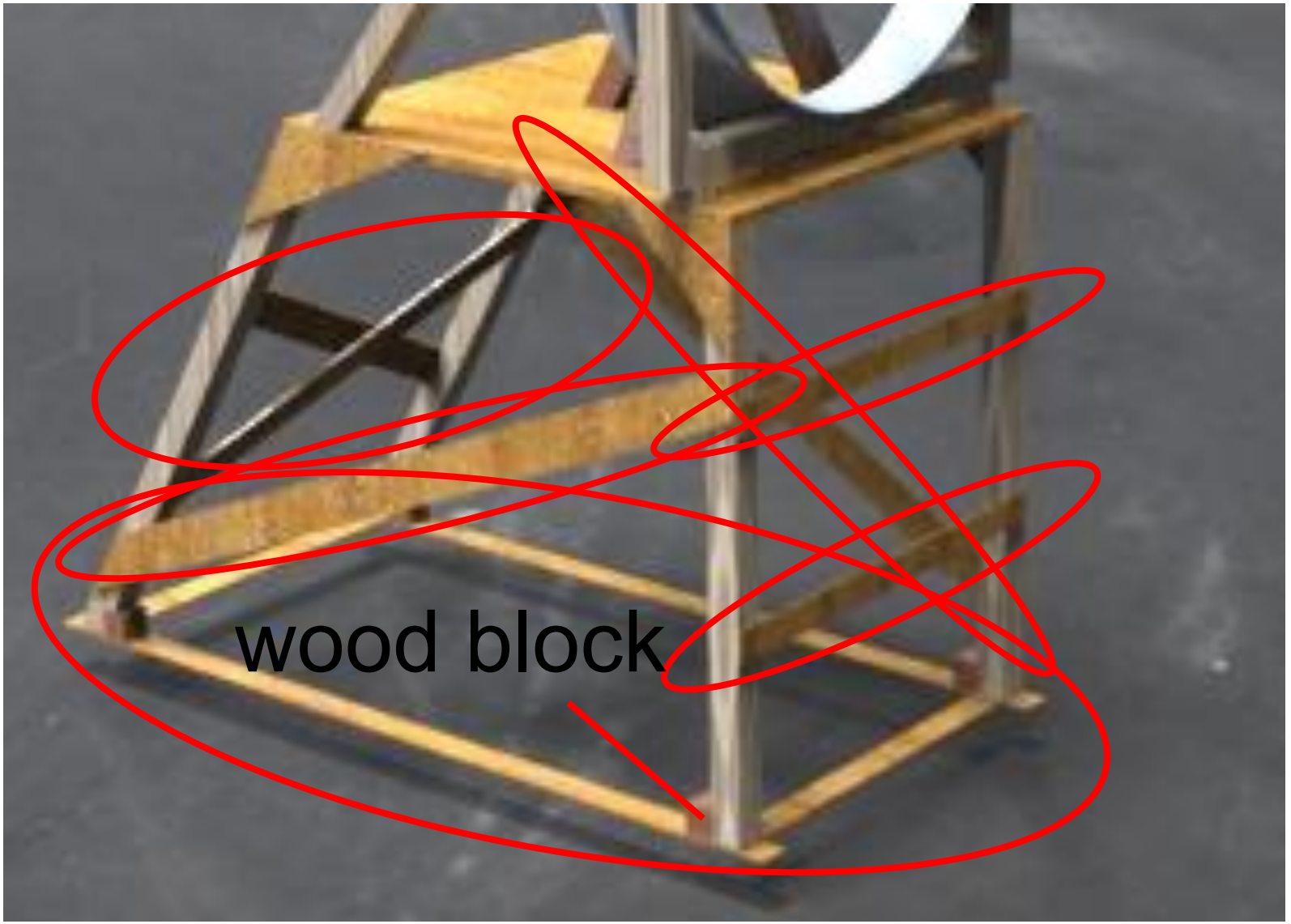
On the Inside
Fixed by L-shaped metal fitting

Only use triangle plate is not enough



Add more rectangle wood plate to fixed and make it stable

- Lighter is better
- So we use rectangle wood plate instead lumber

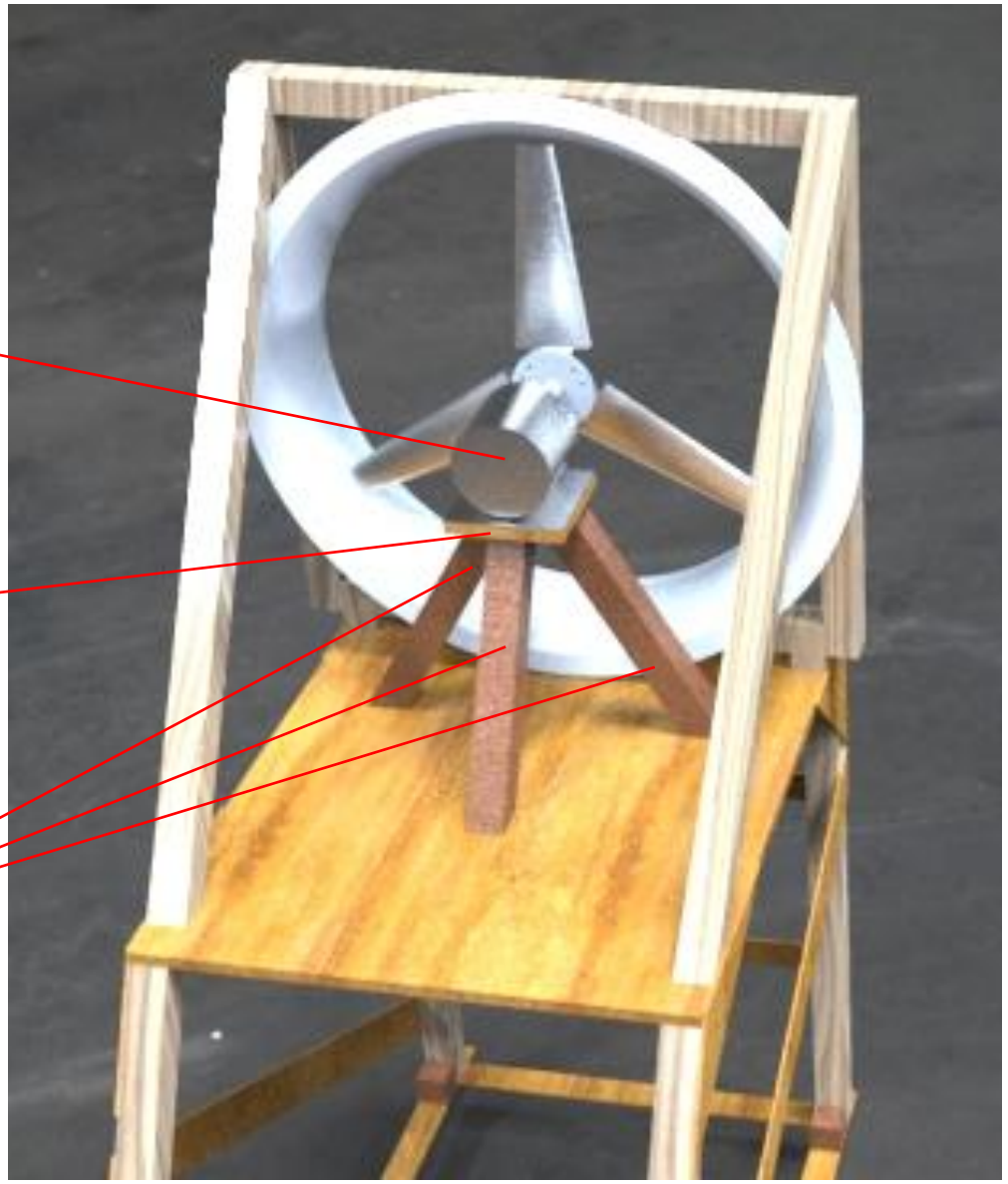


Support of the generator

generator

wood plate

3 oblique lumbers

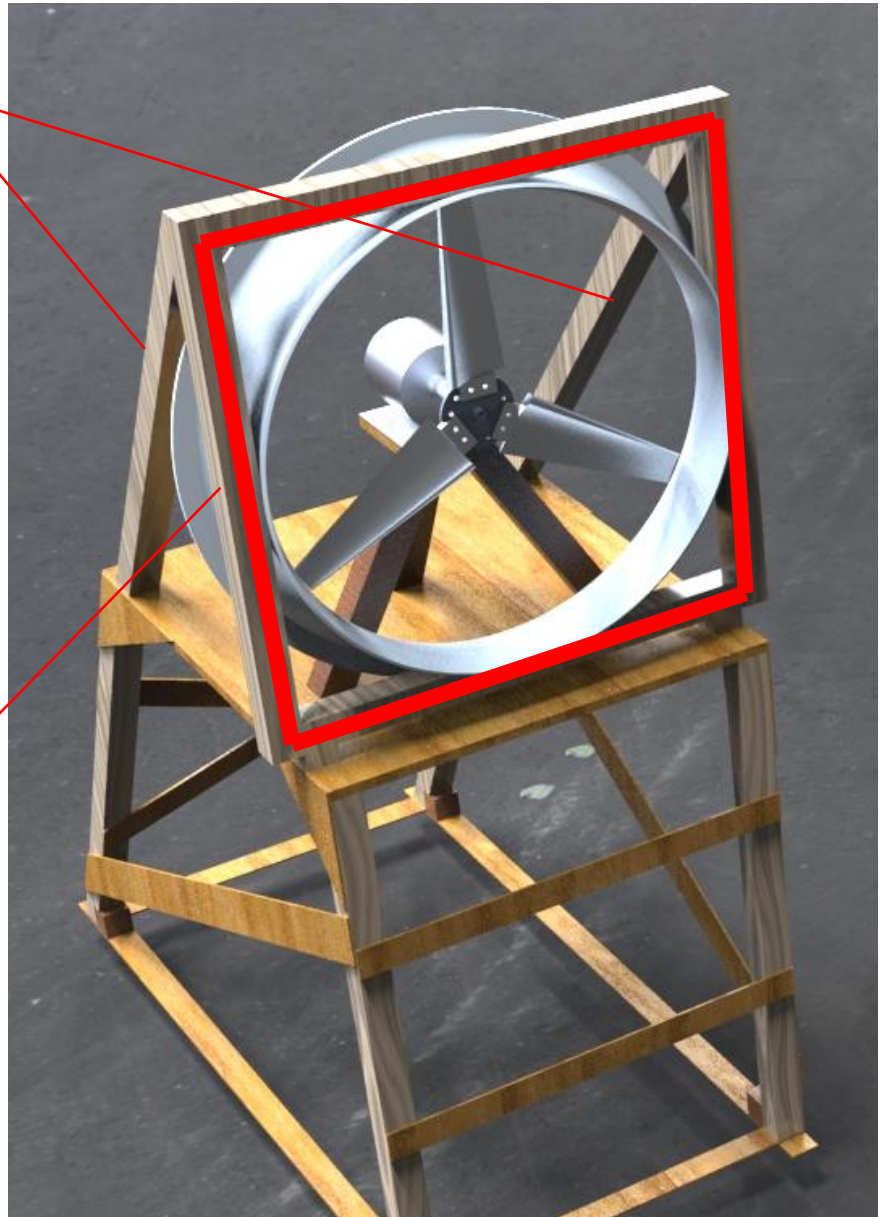


Wind lens fixed by lumber frame

2 oblique lumber

we use oblique lumber to fixed square lumber frame

Square lumber frame

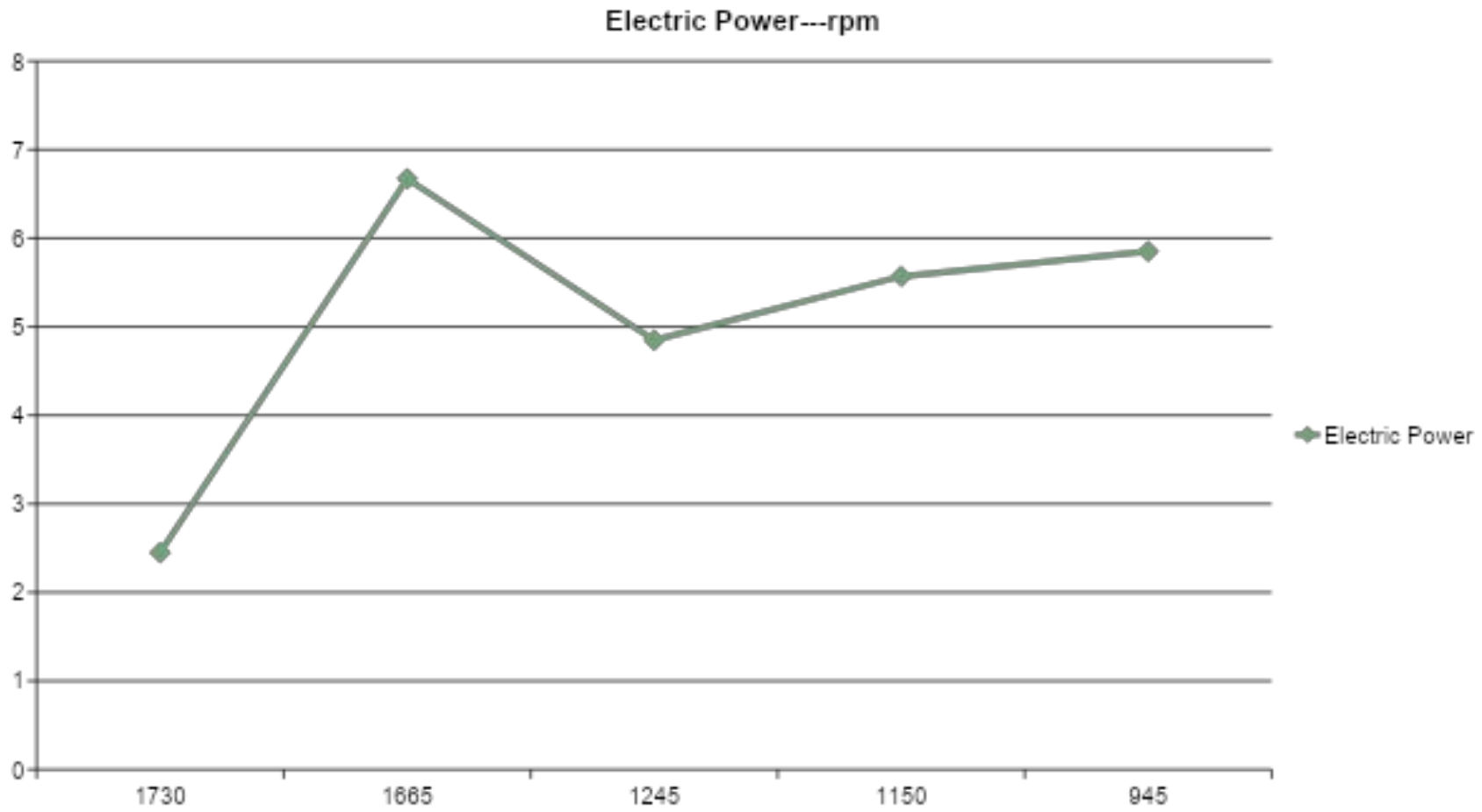


RESULTS

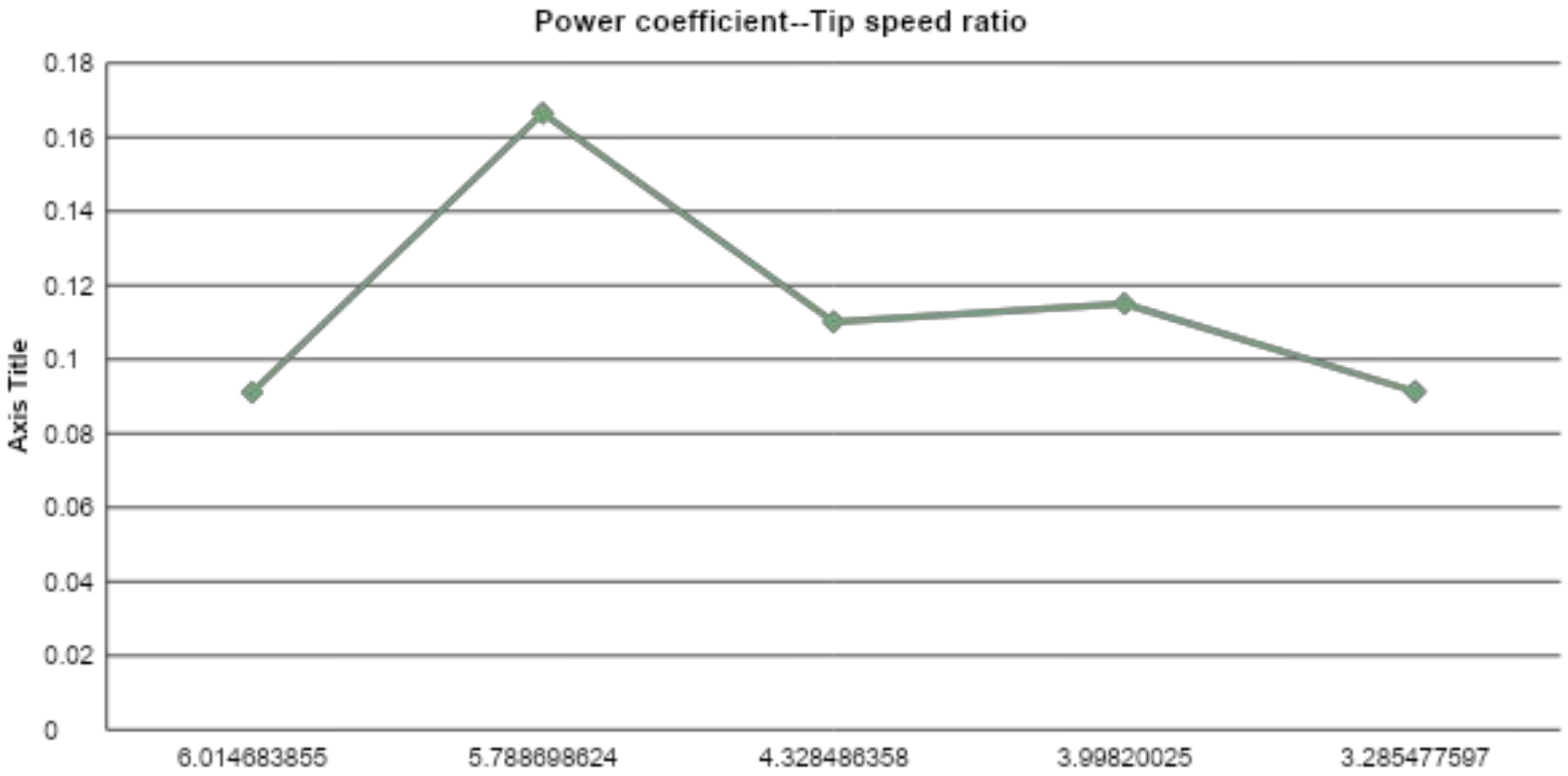
Wind turbine testing 1

Ohm	Voltage	Rotational Speed	Electric Power	Generator Efficiency	Mechanical Power	Power coefficient	Tip speed	Tip speed ratio
1000	49.5	1730	2.45025	0.135295	18.11042537	0.091093689	42.10279	6.014684
470	56	1665	6.672340426	0.201563	33.10300217	0.1665049	40.52089	5.788699
330	40	1245	4.848484848	0.221479	21.8913976	0.110111613	30.2994	4.328486
220	35	1150	5.568181818	0.243469	22.87018807	0.115034835	27.9874	3.9982
120	26.5	945	5.852083333	0.32245	18.1488086	0.091286752	22.99834	3.285478

Wind turbine testing 1



Wind turbine testing 1

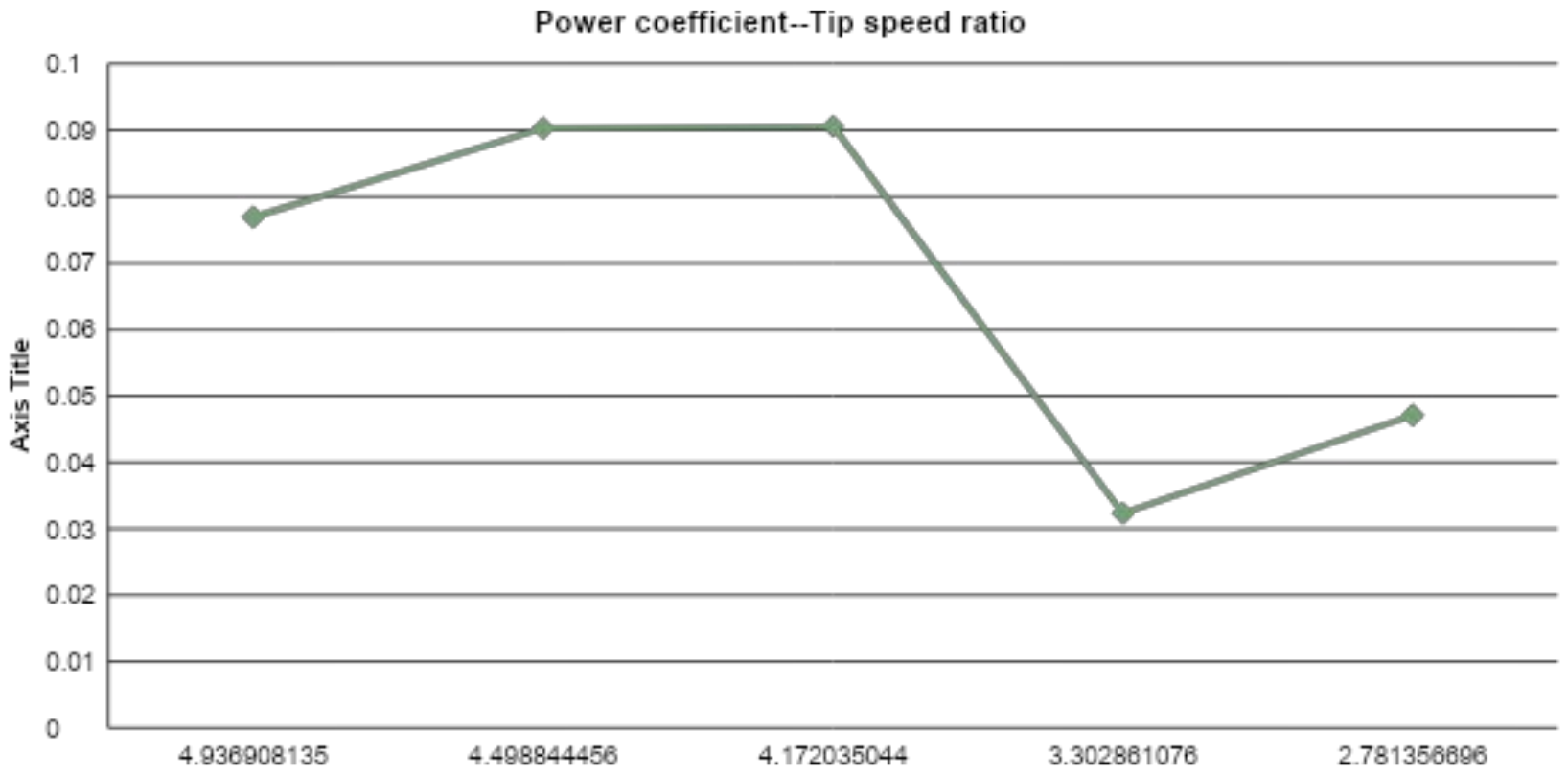


The break up

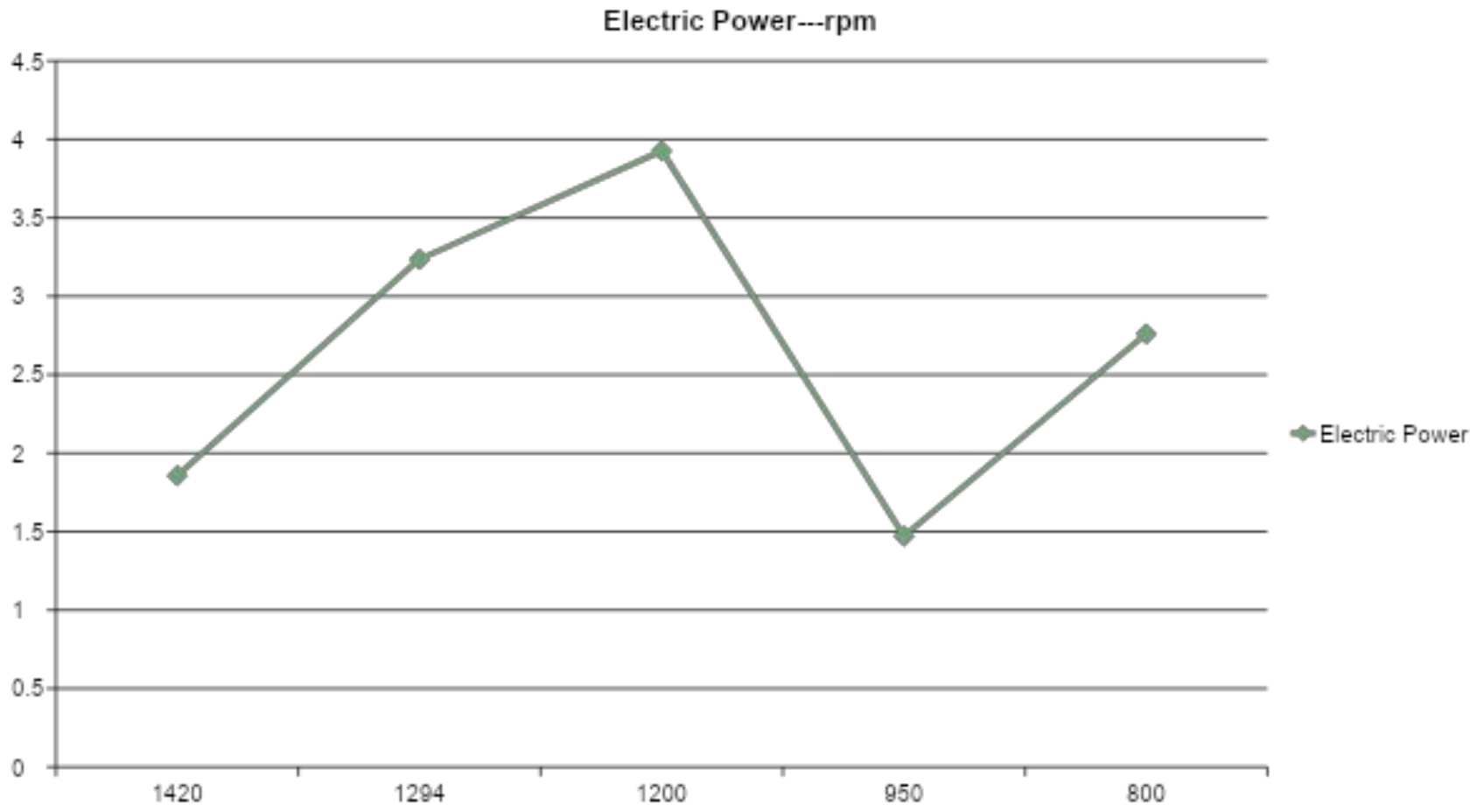
Wind turbine testing 2

Ohm	Voltage	Rotational Speed	Electric Power	Generator Efficiency	Mechanical Power	Power coefficient	Tip speed	Tip speed ratio
1000	43.1	1420	1.85761	0.121448	15.29551742	0.076934974	34.55836	4.936908
470	39	1294	3.236170213	0.180233	17.95548103	0.090314333	31.49191	4.498844
330	36	1200	3.927272727	0.218022	18.01319467	0.090604627	29.20425	4.172035
220	18	950	1.472727273	0.22933	6.42186924	0.032301381	23.12003	3.302861
120	18.2	800	2.760333333	0.294963	9.358235892	0.047071022	19.4695	2.781357

Wind turbine testing 2



Wind turbine testing 2



Conclusion:

- Good part
- Improved part

Thank you for listening