[Proposal Form for Venture Research Program for KAIST Ig-Nobel Prize]

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Light Shot to Paradise

1. Information on Research Team

Name	Student ID	Department	Career	Role
Phuong Le Hoang	20140811	Material Science and Engineering, KAIST	Bachelor	Model design, data analysis, numerical computation
Seung Pyo Chang	20148091	Physics, KAIST	Integrated Ph.D. and Master	Simulation, model design
Binh Xuan Cao	20146487	Mechatronics	Exchange Ph.D. candidate	Idea owner, budget justification

2. Project Summary

Objective	Wire-less transfer of energy using high power laser beam
Description	Recently, wireless energy holds several significant benefits in both science and industrialization including fuelling space, terrestrial, and aqua vehicles, alternating electric power wiring and transferring lines in challenging locations, and even powering the satellites from extremely far in outer space. In this project, we briefly propose the operation mechanism, novel analytical model, experimental design of laser beaming (our "light shot") fuelling flight object to the sky (Paradise). To simplify the whole system, we divided the objects into two groups. The first group is the transmitter which includes a high power laser source and a system of mirrors and convergent lens to transfer and direct the laser beam to the target. The second group is the receiver which includes a small, light flight object (can be a drone for the experiment) connected with a highly efficient solar panel for receiving and storing energy from the laser beam. The solar panel

	and system of mirrors can be actively rotated as long as the laser beam axis is perpendicular to the panel plane. Both of two groups are controlled simultaneously so that the flight object can obtain as high intensity as possible. We build up the analytical model to quantify the relative intensity and beam spot that flight object can obtain from laser beam source to optimize the setup of the optical system of the transmitter. Accordingly, we can figure out the best surface area of solar panel required for the receiver. Furthermore, the parameters of flight objects such as the flight velocity, altitude as well as the change in laser beam intensity caused by atmosphere refractive index variation will be meticulously investigated for exploring the limitations of the application. In practical, we conduct the experiment powering the drone which flies in a small height of approximately 1 meter and gradually increases the height. As a result, we can measure the required parameters as mentioned above as well as the capacitor of solar cells. The whole data and optimal model of the system can be withdrawn based on this experiment.
Novelty / unusualness	An analytical model of the optical setup for obtaining the best laser beam transmittance and optical modeling of laser transmittance in the atmosphere. Solar cell optimal design and composition for energy storing and receiving capacitor. Calculation of orbit and velocity of flight object for justifying the limitation of application (This points out that the system can even power a UAV in outer space).
Scholarly profundity	Study the dynamics of the laser beam in the atmosphere. Optimize the optical setup based on the Gaussian nature of laser beam. Study the optimal material composition and fabrication of photovoltaic cells (solar cell). Develop a new generation of energy transmittance which contributes

	an extremely significant role in both science and industrialization. This idea can apply to any vehicles or machines which must operate in the extreme environment where the fuel source is deficient. Additionally, the requirement for a green energy source could be obtained with this project.
Research plan	First of all, we carry on the experiment as mentioned in the Description and gain the data. After that, we build up the analytical model and set up the condition as well as the limitation of the model. Eventually, we combine the experimental data and analytical models for comparison and improvement. The final target is the ideal system of laser beaming