Environmental Safety and Occupational Health Concern in Battery Wireless Charging by Microwave

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***Abstract*—Environmental safety and occupational health management have an objective to analyze hazards prior to conduct "A battery wireless charging by microwave research". This management refers to military standard: System Safety (MIL-STD-882E) and Occupational Health and Safety Management (OHSAS 18001), which compose of Identify hazard, Assess risks, Reduce risks, Accept Risks and Manage Life Cycle Risks. Total hazard lists are 11 items which are in serious level 18% and medium level 82% and after reduced risk by setting of safety standard operational procedure, personal protective equipment and checklist etc. the medium level are 27% and low level 73%**

***Index Terms*—Wireless energy transfer, Battery wireless charging by microwave, Risk assessment, Environmental safety and occupational health management.**

I. INTRODUCTION

Electrical equipments are vital for every military field missions but in some circumstances, battery cannot be charged with conventional method when it runs out. Therefore, battery wireless charging method will play a major role to accomplish the important military missions.

Defence Energy and Fuel Department under Defence Technology Institute (Public Organisation) Thailand will research the feasibility to transmit power wireless via microwave which can be sent at long distance. At initial phase, we will use microwave generator from microwave oven (Magnetron gun) which is cheap and easy to buy to do a test. If test result is satisfied with our assumption, we will implement higher power of microwave generator for further development.

In this research, there are some potential hazards which might be affected to environment and users. So environmental safety and occupational health effectively management is mandatory to be conducted.

A. Wireless energy transfer

Wireless energy transfer or wireless power is the transmission of electrical energy from a power source to an electrical load without artificial interconnecting conductors. The most common form of wireless power transmission is carried out using direct induction followed by resonant magnetic induction. [1]

Microwave transmission refers to the technology of transmitting information or energy by the use of radio waves whose wavelengths are conveniently measured in small numbers of centimeters; these are called microwaves. [2]

Microwave Energy is an electromagnetic energy in high frequency radio wave range which has wave length range of 0.01 – 1 m. and frequency is 0.3 – 300 GHz.

Microwave Power Transmission (MPT) consists of Microwave generator (Magnetron gun), Transmitting antenna and Receiving antenna (Rectenna). Microwave is generated in electrical equipment called "Magnetron" which produce microwave range in frequency S band at 2,450 MHz and electrical power at 500 – 1,100 W. Mechanism of microwave generator start with supplying of low voltage and transform to high voltage (about 30 times) by electrical transformer and sent to capacitor and other devices for changing alternating current to direct current. Then, direct current is supplied to Magnetron for producing microwave power [3] as shown in Figure 1.

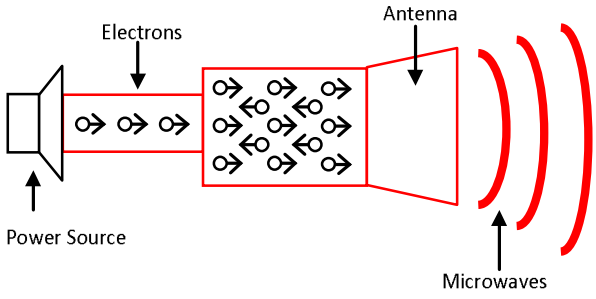

Figure 1. Microwave generator (Magnetron gun)

The electricity generation using microwaves is more friendly environments moreover it does not involve any emission of carbon gases. [3]

B. Battery

Battery is an energy storage device which consists of electrochemical cells to transform chemical energy into electricity by galvanic cell and electrolyte solution [4]. Battery in this research is Lithium Polymer Battery or well-known in Lithium – Ion Polymer Battery or LiPo, LiP, Li – Poly which is secondary battery or rechargeable battery.

This battery is an inflammable gel that means reduce explosion while charging, durable for overload charging,