1. Explanation

There are good reasons why modern electronics has not been implemented in space suits, even though technology on Earth is rapidly advancing. Cosmic radiation is very harmful to the circuitry on modern electronics, mostly because the density of the transistors is very big. This means that gadgets such as tablet computers cannot be used in space. One of the problems that arises is data inaccessibility for astronauts. While they work, they should receive a lot of crucial information for their well being. To address this issue, we have created a concept of a device which can display that crucial information directly to the astronauts using electronics that we’ve adapted to last in space environment.

1. Description

The primary focus in the design of the device was to protect all the electrical components from cosmic radiation, and to be very user friendly and it can be easily operated by the astronaut, despite his massive gloves.

The device is assembled from several layers of material. On the top, we have corning gorilla glass made in collaboration with Motorola used to protect the device from light physical damage with thickness of 1mm. Next we have a 2mm layer of polycarbonate in order to protect the screen from radiation. After this, there is a specially designed mirror to reflect sun rays away from the screen to avoid its burning. The mirror is combined with the screen, which is actually an oled screen that provides strong levels of brightness to be able to penetrate the mirror and display a clear image to the astronaut. The mirror and the screen together have a thickness of 2mm. Following the mirror, we have a 5mm thick layer of lead to protect all the electronic components from cosmic radiation. In fact, the electronics are completely surrounded by lead from all sides. After the electronics and the cooling system, we have the second layer od lead with equal thickness. Finally, the entire device is surrounded by a special protective plastic which is 1,5mm thick.

From all of these layers of protection, the most impressive is the mirror. It is a two-way mirror which means that it is partially reflective and partially transparent. That is why the brightness of the oled screen is able to penetrate it.

The electronics are also a very impressive part of our device. On the specially designed motherboard we have two SOC’s (Snapdragon 616), and the each of the CPU’s in the SOC’s have 8 cores. The SOC’s are developed using 28 nm process, which makes it better for space usage. If this SOC’s were developed using “Red Hard” process, the space between the transistors shouldn’t be much different. Other parts are the 2 ecc RAM memory chips, each having memory size of 512 MB. Then, we have 2 flash memory chips which also have memory of 512 MB. We also have two chips which are used to process the data from all the sensors gathering information.

To conclude, the device is powered by 2 lithium-ion batteries which provide 20,000

mAh. On full load, the system should consume ~500 mAh.

1. Functionality

As we mentioned previously, the purpose of this device is to display valuable information to the astronauts. The following measurements will be displayed:

* Radiation levels (α, β, γ, x, n)
* Temperature (inside and outside)
* Humidity level
* Timer (Manually controlled)
* Heart rate monitor
* Pressure
* Battery level
* Oxygen and CO2

Besides all of these features, the astronaut will be able to instantly see photos taken by the camera mounted in the suit.