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Automatic wing leading edge airplane aerodynamic diagnostics system in flight condition

A new approach of leading edge diagnosis based on optic fiber injection into the composite materials is proposed. The result of semi-natural modeling the system components is provided.

**Aerodynamic diagnostics system**

The use of composite materials is due to high strength and stiffness and low weight compared to metallic materials. However, a significant disadvantage of polymer composites is the possibility of hidden internal destructive micro shock due to various influences, which can cause accidents in the operation of the aircraft.

Fig. 1. Typical circuit of the LED

Calculate which resistor R in the above scheme should be used to obtain optimum power dissipation.

According to Ohm's law we find the values of resistance that will provide a fall:

 (1)

Find the power needed for resistor dissipating:

*PR=I*2*·R=*0.022*·*135=0.054 W

Photoresistor acts as a resistive sensor in a diagnostic system.

Consistently connected resistors divide the voltage supplied to them in a certain proportion, thus forming a voltage divider and replacing one of the resistors with resistive sensor, a resistive sensor is obtained.

Table 1

Results of semi natural experiment

|  |  |  |  |
| --- | --- | --- | --- |
| normal environment | dark environment without LED | dark environment with 50% of the voltage across the LED | full voltage for the LED |
| 950 | 949 | 188 | 190 | 220 | 214 | 549 | 549 |
| 949 | 949 | 190 | 190 | 221 | 221 | 550 | 550 |
| 950 | 950 | 187 | 189 | 220 | 219 | 549 | 550 |
| 949 | 949 | 189 | 188 | 219 | 219 | 549 | 549 |
| 950 | 950 | 190 | 191 | 219 | 221 | 549 | 550 |
| 949 | 949 | 188 | 190 | 220 | 219 | 549 | 550 |
| 950 | 950 | 190 | 191 | 222 | 220 | 550 | 549 |
| 950 | 950 | 189 | 190 | 220 | 220 | 549 | 549 |
| 949 | 950 | 190 | 190 | 222 | 220 | 548 | 548 |

**Conclusion**

While fiber fracture occurs subsidence signal, i.e. change in the amount of reflected light is 6-18%, so the error of the results obtained in different conditions should not exceed 75% of this value that should not be greater than 4% of the maximum value of the sample.

References

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