

Protection of communication systems from solar flares

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ABSTRACT

A solar flare is a violent explosion in the Sun's atmosphere releasing up to a total energy of 6×10^{25} J. The electromagnetic radiation produced by solar flares result in long distance radio signals disruption by changing the Earth's ionosphere. Shortwave broadcast and amateur radio are also frequently disrupted. A satellite's orbit around the Earth get disturbed by the enhanced drag on the satellite from the expanded atmosphere and satellites' electronic components can be damaged.

We would like to prefer to have a proactive action rather than a reactionary plan. We should have *early warning systems* that continuously monitors solar-geophysical activity. We can develop a small *high resolution optical telescope* suitable for satellite use with the capability of sending electro-optical, digitized pictures of the Sun's atmosphere. The satellites and other communication systems can be shielded by some *diamagnetic gas layers* which would nullify the catastrophic effects of the solar flares. We can have the "*radiation belt remediation*" system that can temporarily change the upper atmosphere from a mirror bouncing high frequency radio waves around the earth to a sponge that absorbs them instead. In addition, satellite operators can power down equipment or send corrective signals to their spacecraft that are in the path of incoming energy waves. The development of a satellite-based, multispectral sensor package to monitor the entire solar electromagnetic spectrum will be required.

An important special case of this problem concerns precise timekeeping among orbiting communications satellites, where the loss of synchronization can mean the loss of communications.