Radio blackouts

The ionosphere is a dynamic part of the upper atmosphere which acts as a reflector for long range, high frequency communications (HF comms). During a solar flare the increase in x-ray radiation from the Sun causes the ionosphere to absorb rather than reflect signals, disrupting communications systems on the sun-lit side of the Earth. Even during periods of quiet solar activity turbulence in the ionosphere can result in a scattering of electromagnetic waves disrupting navigation systems, like Global Navigation System (GNSS - often known as GPS) and radio bands up to the GHz frequencies.
These are referred to as radio blackouts.

Category		UK Effect	US and Global Effect	Physical measure	Average Frequency (1 cycle = 11 years)
Scale	**Descriptor**	**Duration of event will influence severity of effects**			
Radio blackouts				**GOES X-ray peak brightness by class and by flux**	**Number of events when flux level was met; (number of storm days**
R5	**Extreme**	**HF Radio:** Complete HF (high frequency*) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector.	**HF Radio:** Complete HF (high frequency*) radio blackout on the entire sunlit side of the Earth lasting for a number of hours. This results in no HF radio contact with mariners and en route aviators in this sector. **Navigation:** Low-frequency navigation signals used by maritime and general aviation systems experience outages on the sunlit side of the Earth for many hours, causing loss in positioning. Increased satellite navigation errors in positioning for several hours on the sunlit side of Earth, which may spread into the night side.	X20 (2×10^{-3})	Less than 1 per cycle
R4	**Severe**	**HF Radio:** HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time.	**HF Radio:** HF radio communication blackout on most of the sunlit side of Earth for one to two hours. HF radio contact lost during this time. . **Navigation:** Outages of low-frequency navigation signals cause increased error in positioning for one to two hours. Minor disruptions of satellite navigation possible on the sunlit side of Earth.	X10 (10^{-3})	8 per cycle (8 days per cycle)
R3	**Strong**	**HF Radio:** Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth.	**HF Radio:** Wide area blackout of HF radio communication, loss of radio contact for about an hour on sunlit side of Earth. **Navigation:** Low-frequency navigation signals degraded for about an hour.	X1 (10^{-4})	175 per cycle (140 days per cycle)
R2	**Moderate**	**HF Radio:** Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes.	**HF Radio:** Limited blackout of HF radio communication on sunlit side, loss of radio contact for tens of minutes. **Navigation:** Degradation of low-frequency navigation signals for tens of minutes.	M5 (5×10^{-5})	350 per cycle (300 days per cycle)
R1	**Minor**	**HF Radio:** Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact.	**HF Radio:** Weak or minor degradation of HF radio communication on sunlit side, occasional loss of radio contact. **Navigation:** Low-frequency navigation signals degraded for brief intervals.	M1 (10^{-5})	2000 per cycle (950 days per cycle)

* Other frequencies may also be affected by these conditions.