

ECLIPSE RADIO

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Solar eclipse total over wide area of North America

Solar flux Interruption affects radio signal propagation

You have seen this listening to AM driving at night

WSM 650 Nashville; WOR 710 New York; WWL 870 New Orleans; WTAM 1100 Cleveland; ...

Previous studies: Grote Rieber (1919), Belgian radio amateurs (1999), M. Kelsch and JLR (2017).

Effects on different frequencies differ

Study AM broadcast band:

Many fixed-location stations acting as beacons

IONOSPHERIC RADIO

2/4

Solar UV radiation and cosmic rays create regions of ionization at various heights above Earth

D region: 50–90 km. Absorptive, disappears at night

E region: 90–150 km, weakens at night

F region: 150–>400 km, splits into regions F1 (lower), F2 (higher) during daytime. Responsible for long-distance radio communication

Index of refraction affected by electron density n_e

Dielectric const. $\epsilon = 1 - (f_p/f)^2$ where f_p is the plasma frequency ($\sim \sqrt{n_e}$) and f is the operating freq.

Signal a distance d diffracted from height $h = 200$ km can be $d = 2\sqrt{2R_{\oplus}h} > 3000$ km away

PREVIOUS EXPERIENCE

3/4

15 km ESE of Munich, 8/11/99, SONY SW7600G RX

Belgian beacons: 7012.5, 3522.5, 1831.5 kHz

Latter beacon appeared at 1012 UTC, maximum between 1030 and 1034 UTC (totality 1039–1041), disappeared 1102 UTC. Gap from 1046 to 1048 UTC during which the beacon was not audible.

Carbondale, IL, 8/21/2017, 3520-3540 kHz

Contacts 1400-2000 UTC, totality 18:20:05-18:22:42 UTC

1421,1429,1522,1559,1710,1713,1724,1726,1802,1833,1835,1836,1839,1844,1844,1849,1852,1922,1930,1936

CLuster of contacts around 1833-1852 UTC; 1710-1726?

PRESENT SETUP

4/4

Software defining radio (SDR) to inspect AM BC band

Frequency range 550-1550 kHz, in and out of totality

