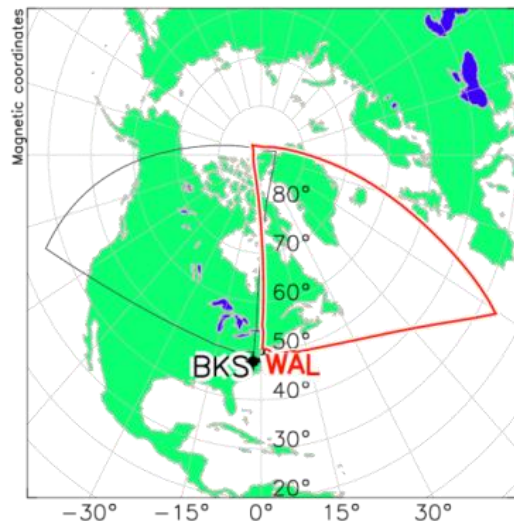


# SuperDARN

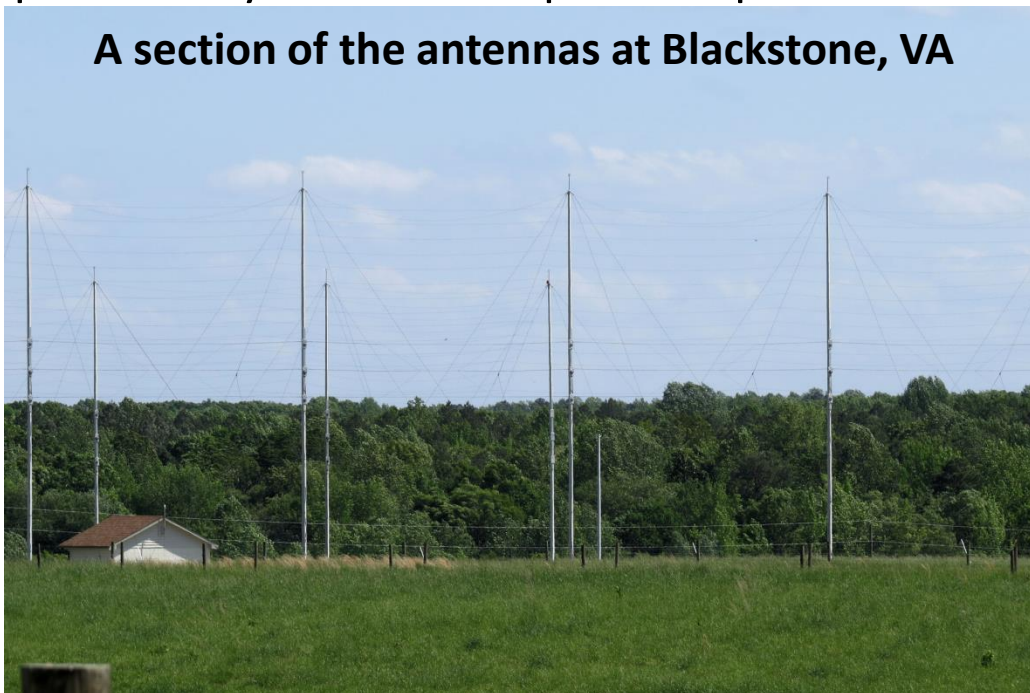
- “SuperDARN” stands for “Super Dual Auroral Radar Network”.
- SuperDARN is used to study plasma convection in the upper atmosphere.
- The radars use frequencies is 8-20 MHz with directional transmissions.
- SuperDARNs “BKS” is at Blackstone operated by Virginia Tech and “WAL” is at NASA Wallops Mainland (Temperanceville), VA operated by JHU APL.
- There are roughly 30 SuperDARN sites throughout the world. There are SuperDARN transmitters in Alaska, Kansas, Oregon, and Canada.
- Transmissions consists of a periodically transmitted pulse sequence.

Coverage of BKS and WAL



(Source: <http://vt.superdarn.org/tiki-index.php?page=Wallops+Island+Info>)

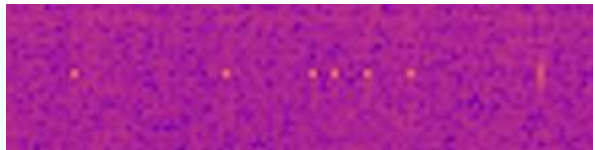
A section of the antennas at Blackstone, VA



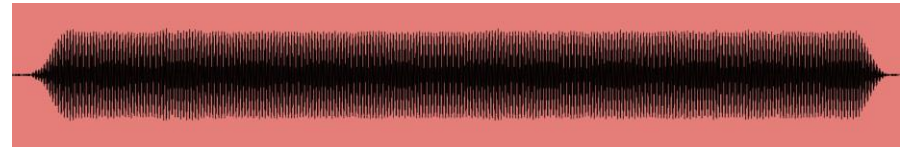
(Photograph by David L. Wilson)

# Example of Blackstone (“BKS”) SuperDARN Pulse Sequence

Spectrogram (time vs. frequency) showing a pulse sequence of eight 300 us pulses (the “blurred” pulse being actually 2 pulses) on 14.5 MHz



One of the 300 us (microsecond) pulses



Successive transmission of two of the 8-pulse sequences ( $T = 1.5$  ms) on 14.5 MHz



[0, 14, 22, 24, 27, 31, 42, 43] gives all time lags from 1 to 43 except 6, 23, 25, 26, 30, and 32-41.

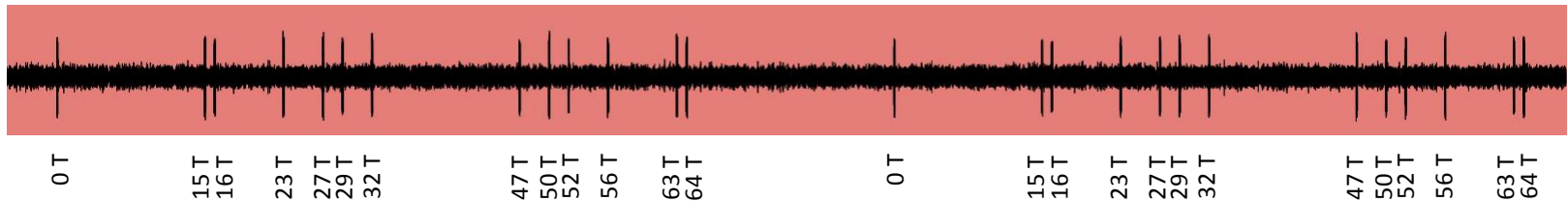
This sequence “reversed” is [0, 1, 12, 16, 19, 21, 29, 43]. Both sequences are known as the “8-pulse katscan 1500”.

(Plots produced with a HackRF One receiver using Universal Radio Hacker software.)



# Example of Wallops (“WAL”) SuperDARN Pulse Sequence

Successive transmission of two of the 13-pulse sequences ( $T = 2.4$  ms) on 11.0 MHz



This sequence [0, 15, 16, 23, 27, 29, 32, 47, 50, 52, 56, 63, 64] is different than the sequence used by Blackstone. It can be thought of as concatenating sequences [0,15], [0, 1, 8, 12, 14, 17], [0, 15], and [0, 3, 5, 9, 16, 17], where the last sequence [0, 3, 5, 9, 16, 17] is the “reverse” of the earlier [0, 1, 8, 12, 14, 17].



**Wallops SuperDARN antenna (at Wallops Mainland near Temperanceville)**  
**16 transmitters with an average power of 18 W**

(Plots produced with a HackRF One receiver using Universal Radio Hacker software. Photograph by David L. Wilson)