

## Exhibit Information:

The National Wind Institute (NWI) has pioneered using radar technology to document complex wind flows through wind plants. Using the existing TTUKa radars, the development team has historically mapped the winds across a large wind plant, documenting turbine wakes, and turbine-to-turbine interaction. This historical effort provides the framework to make intelligent decisions about how to proactively control turbines to optimize the wind plant, but the radars were never optimized for this purpose.

Now, with funds from the US Department of Energy Project DE-EE0006804: The Incubation of Next Generation Radar Technologies to Lower the Cost of Wind Energy, the next generation of X-Band radar technology is being developed at NWI to specifically support wind energy applications. The original TTUKa radars were developed for a wide range of weather driven applications (including severe storms research), while the new X-Band radar is being developed to expand measurement success in a wider variety of atmospheric conditions (including non-precipitating environments), enhance the maximum range of data collection, provide semi-autonomous operation, and streamline more user friendly data output. All of these attributes are specifically geared towards the wind energy application.

The new radar will be deployed at Reese Technology Center in early 2016, and is expected to be online by the end of March.

Faculty and students also submit scientific works for peer review and publication in scientific journals and attend international conferences, etc. as a result of this research to advance the science.

### Modulating Signal Description:

Nonlinear frequency modulated chirp with 14 MHz maximum modulation bandwidth.

### Bandwidth of Modulation Description:

Variable between 5 MHz to 14MHz depending upon pulse width of compressed pulse. Typically we utilize 10MHz bandwidth for a 20 micro-second compressed pulse.