Radio Interaction between Small Wind Turbines and Base Station Antennas

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hybrid-powered radio cellular base stations
- Increase of demands in the power consumption of mobile broadband networks (e.g. 4G/LTE, 5G) => strong request to reduce environmental impact (CO₂ emissions)
- Effective and attractive solution: use of hybrid energy (solar and wind in addition to fuel) to supply BTSs located far from supply network

MW wind turbines can disturb radio systems
- Disturbance of megawatt WTs or wind farms on radars (air traffic, military, weather), TVs, GPSs, various radio systems: blade flashes and Doppler shifts (frequency spreads) reported in literature. Many wind farm projects suspended all over the world.

Because of proximity, can small wind turbine impact radio on the BTS it supplies?

Small Wind Turbine Models
- Power, shape, material
  - Nominal power of SWTs for most BTSs: 1.5 – 7.5 kW
  - Shape: much more diverse than megawatt WTs
  - Orientation vertical/horizontal
  - Material: fiberglass, carbon fiber, metallic parts (nacelle, assemblies)

Near Field SWT / Panel Antenna Coupling
- Worst case scenario
  - Metallic SWT model
  - All four dipoles of the panel antenna are obstructed by one blade straight down
  - Significant max gain reduction (7 dB)

Radar Cross Section (RCS) Measurements
- Doppler spread (SWT => 125 rpm)
- Back flash (>15 dB)

Conclusion
- Radio impact confirmed in worst case scenarios: RCS flashes, radiation pattern, Doppler spread
- RCS measurements validate modeling

Perspectives
- Effect of WT Materials / Installation recommendations?

References: