

# Impact of windmill covenant

Radio Observatory  
ASTRON, Dwingeloo, The Netherlands

LOFAR status meeting 2016-10-26

## Assumes

- wind turbines radiate at EN55011 class-A industrial equipment level
- wind turbines do not occupy more than about 10% of time/frequency space radiating fully at norm.
- bi-static radar cross section of 2000 m<sup>2</sup>
- radiation starts to limit observations if effects are larger than 10% of thermal noise after integration
- beam forming suppression at horizon  $\sim$  35 dB

## Finds

- For 1000 h imaging integration, potential radiation can be 57 dB brighter than is necessary to prevent detectable damage to observation.
- Reflected signals  $\sim$  15 dB brighter than required for 10 h pulsar obs with superterp only

Improvement in dB $\mu$ V/m/Hz	Max integration
0	0.014 ms
10	1.4 ms
20	0.14 s
30	14 s
35	2 m
40	23 m
45	4 h
50	39 h
57	1000 h

EM interference reduction	Consequence
$< 35$ dB	No permission to build
$35$ dB $\leq$ improvement $< 40$ dB	56–62× 12 h idle
$40$ dB $\leq$ improvement $< 50$ dB	Reduced idle time to be negotiated
improvement $\geq 50$ dB	No restrictions

- Astron must find 7 dB additional improvement in signal processing.
- Agentschap Telecom establishes method to measure improvement in cooperation with Astron and wind farm developers.
- Measurement protocol must be available at 16th of May 2017 at the latest.
- In case of conflict: binding arbitration.
- Neither party will claim damage due to wind farm or lack thereof.

[https://www.rijksoverheid.nl/ministeries/  
ministerie-van-economische-zaken/documenten/kamerstukken/2016/  
09/19/  
ruimtelijke-inpassing-windpark-de-drentse-monden-en-oostermoer](https://www.rijksoverheid.nl/ministeries/ministerie-van-economische-zaken/documenten/kamerstukken/2016/09/19/ruimtelijke-inpassing-windpark-de-drentse-monden-en-oostermoer)