Reviewer 1

In this paper, the influence of electrostatic effect on the main shaft bearing current of wind turbine is studied, and a laboratory device with charge generator and small wind turbine is established. The experimental results show that electrostatic discharge effect is a mode of bearing current of wind turbine, which is more harmful to bearings. The author needs to improve the article in the following aspects:

1 “Bearing current” is mentioned in the chapter title of Chapter 4, but the main body of this chapter only introduces the bearing impedance model and does not introduce the bearing current. Please make amendments to this problem.

Thanks for the reviewer's careful thoughts and comments, we have updated the title of Chapter 4 from “Bearing impedance model and bearing current “to” Bearing impedance model”

2 The titles of sections 5.2 and 5.3 are the same, please explain or modify them.

We apologize the type error in the manuscript, Title 5.3 updated from “simplified wind turbine configuration “to “5.3 Experimental setup ”

3 In Figure 17, why is the measured bearing voltage waveform not a square wave? In addition, please explain the voltage difference between bearing voltage and shaft voltage.

Thanks for the comments, ideally, if bearing is in conductive states (i.e. bearing's outer race and inner race is electrically connected via balls), the bearing voltage should be identical as the shaft voltage. However, due to lubrication grease is a dielectric material, and with bearing rotation, bearing could become an insulating state, i.e. becomes an dynamic capacitor as elaborated in section 4.
Consequently, the voltage at the bearing outer race (bearing voltage) will be dynamically different from the shaft voltage, if without grease, due to rotating of the bearing, the bearing voltage is trying to follow the shaft voltage. If with grease, the small bearing voltage is induced from capacitive polarization and depolarization current in the dynamic bearing capacitor.

4 In Figure 21, why didn't the bearing voltage drop directly to 0V as in Figure. 22, when discharge breakdown occurred?

The bearing voltage drop is a dynamic procedure and caused by electrical discharges within the bearing, once the lubrication grease film breakdown, discharge appeared and the accumulated charge dissipated to the ground causing the voltage drop. But with the rotating, the dielectric grease film quickly builds up again, the newly generated charges within the wind blades and shaft system is not enough to sustain the discharges / breakdown the new dielectric films. Thus, discharges stochastically appeared in Figure 21.

In figure 22, by increasing the needle voltage (discharging rate increases), more charges are supply to the wind blades and thereafter to the bearing, with increased the charge density , the supplied current flow is able to maintain the breakdown of the lubrication film, thus the voltage dropped closed to zero and keep at a lower level.

5 What is the purpose of PD discharge detection? Will the increased capacitance of PD detection unit affect the detection of bearing voltage and current?

The PD test is used to identify the bearing breakdown instead of the bearing dynamic conductive state. The PD test circuit is a high pass filter, which pick up only the high frequency signal. The PD phenomenon is an extreme high frequency procedure that can be picked up by the PD detection circuit. The bearing dynamic conductive state is an instantaneous state of bearing that the roller touched the race caused by mechanical rotation. Compared with the breakdown, the dynamic conductive state is a longer procedure, but it is hard for us to identify it from the current waveform. Thus, we use PD detection signal to confirm the bearing film breakdown in the test.
The capacitor used for PD detection will influence the amplitude of the bearing breakdown voltage/current. But from the bearing aspect, the partial discharge phenomenon remains the same and the coupling capacitor's influence is limited. As illustrated in following tests:
2 additional test groups with and without PD test circuit connected were performed as the same condition as elaborated in chapter 6.2. Results shows the similar shaft voltage and bearing current results.

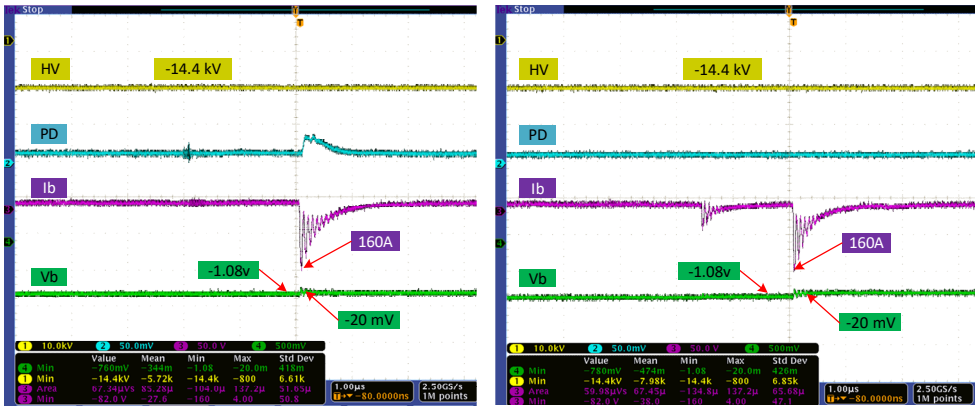

Figure 1 Lab test at 14,4kV needle voltage with and without PD detection system connected

Figure 2 Lab test at 13kV needle voltage with and without PD detection system connected