

Dust detection by monopole and dipole electric field instruments onboard MAVEN Spacecraft

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EGU General Assembly 2022, Vienna, Austria

May 23–27 2022



CHARLES UNIVERSITY
Faculty of mathematics
and physics



Measurement Technique

- The instrument includes two, 7.1 m stacer booms which support preamplifiers and sensors.
- Sensors are 40cm long titanium rods with a TiN surface.
- The booms are 110.9° from each other. The separation between the sensors, centre-to-centre, is 12.68 m.
- We use burst mode (middle frequency, 4096 points over 62.5 milliseconds) of Langmuir Probe and Waves (LPW) instrument (dipole or monopole configuration).

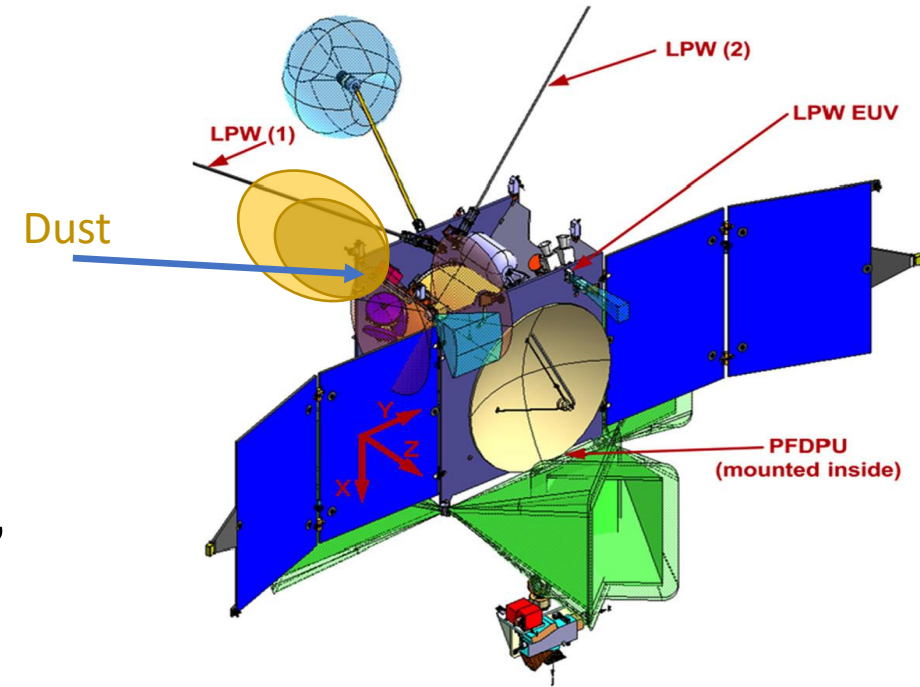
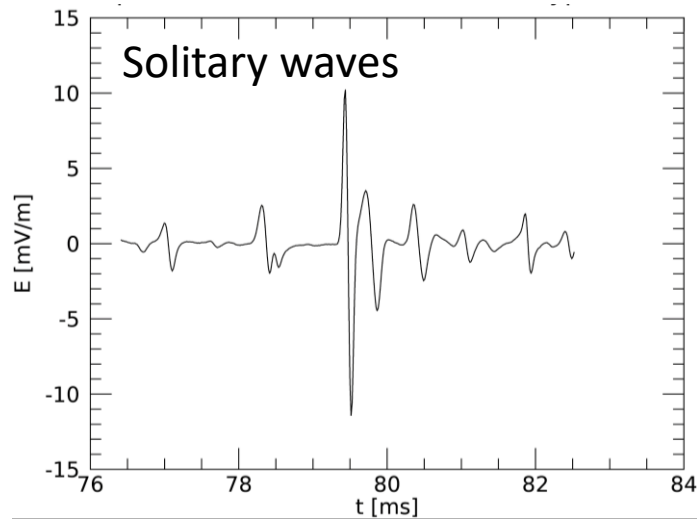


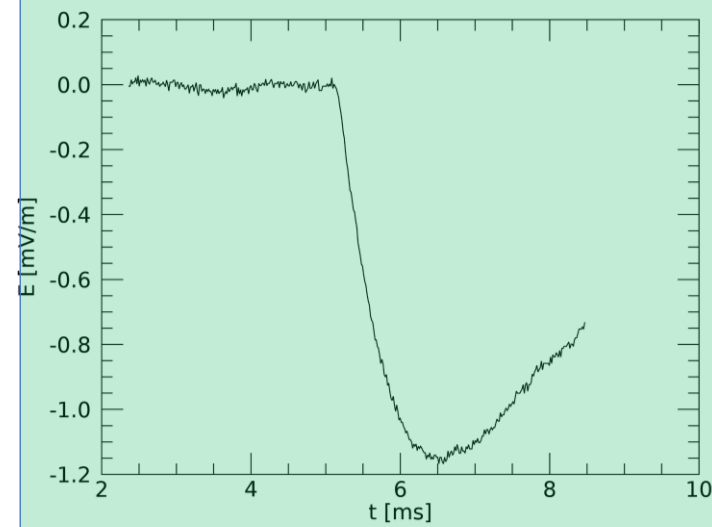
Figure 1: The location of the LPW sensors on MAVEN¹.

¹Andersson, L. et al. "The Langmuir Probe And Waves (LPW) Instrument For MAVEN". *Space Science Reviews*, vol 195, no. 1-4, 2015, pp. 173-198. Springer Science And Business Media LLC, <https://doi.org/10.1007/s11214-015-0194-3>.

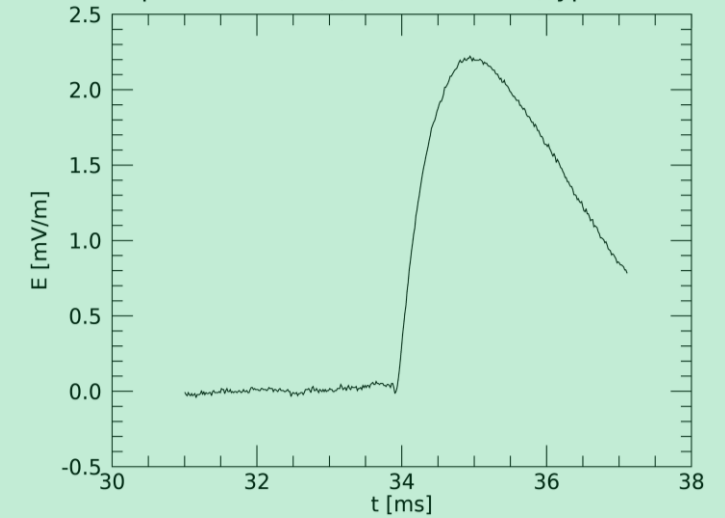
Categorization of Events



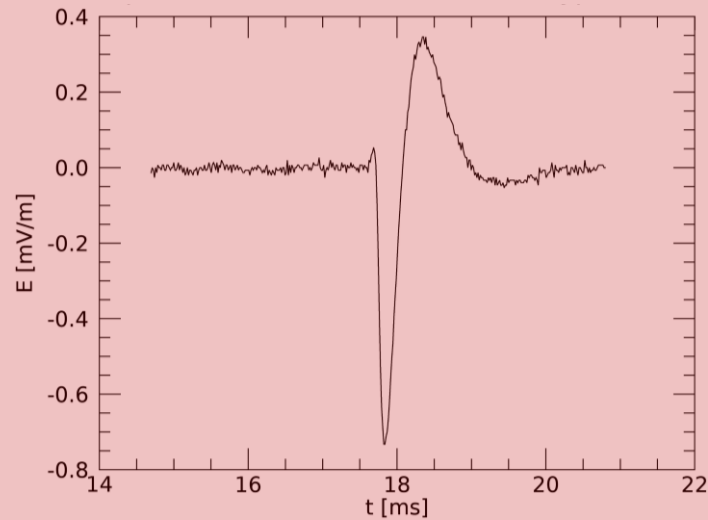
2613 events



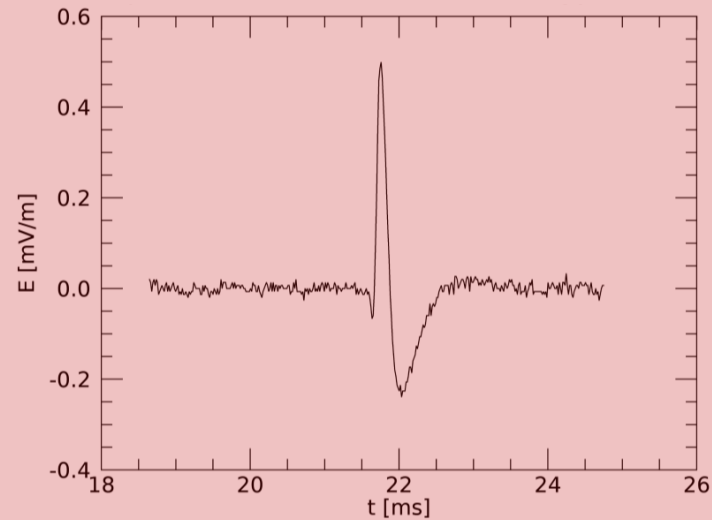
3253 events



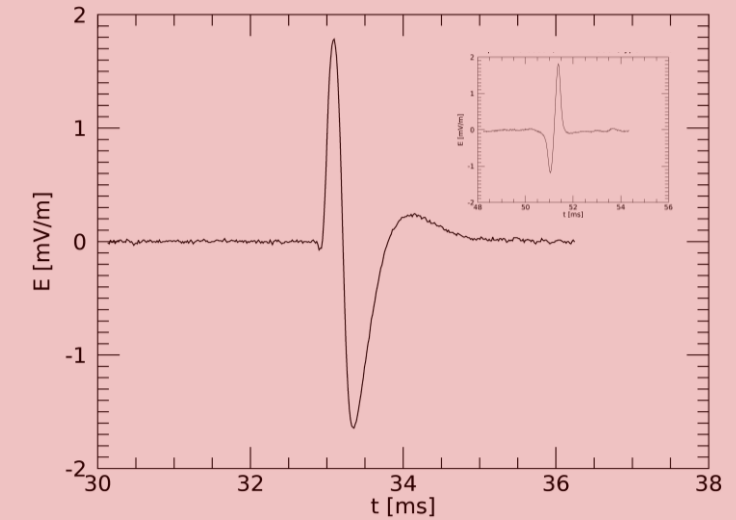
757 events



2633 events

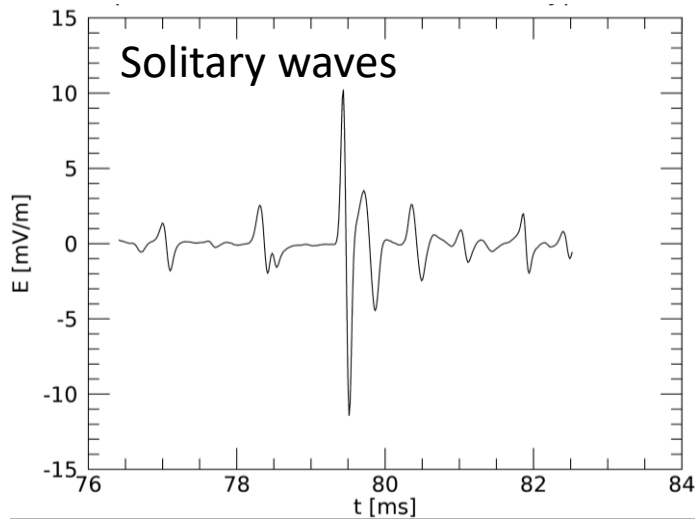


5359 events

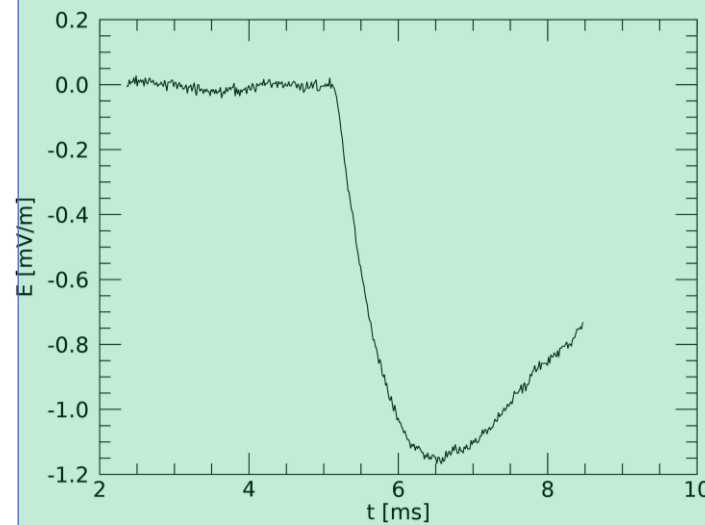


1856 events

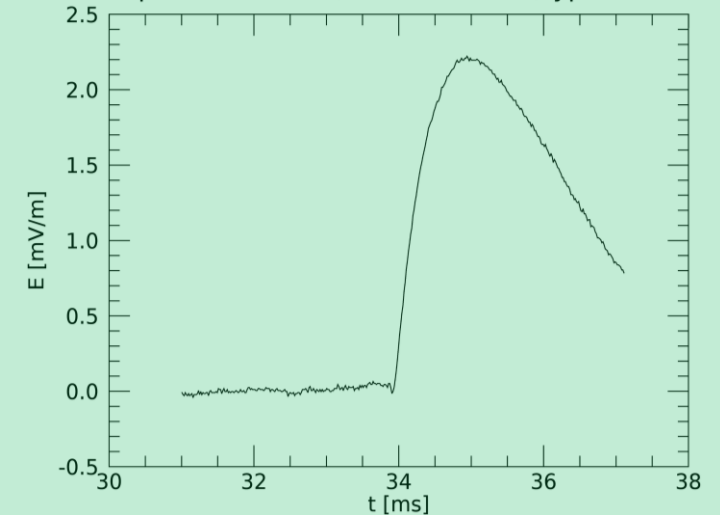
Categorization of Events



2613 events

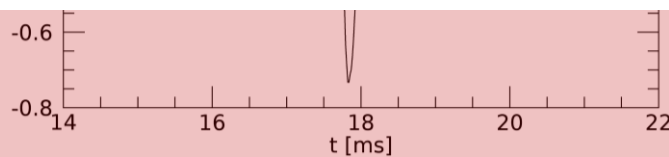


3253 events

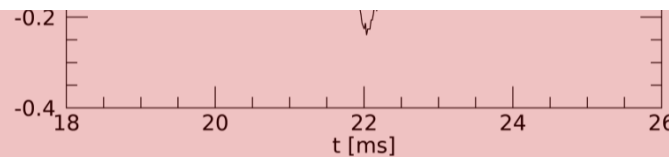


757 events

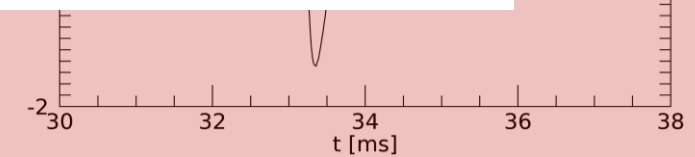
➤ In the data analysis it is very challenging to distinguish dust impact signals from the solitary waves as few pulses can be misinterpreted as dust impacts.



2633 events

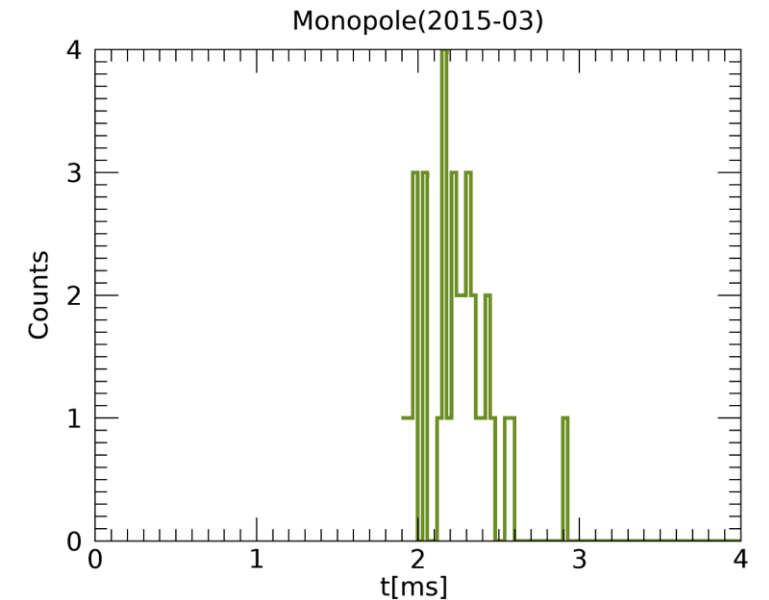
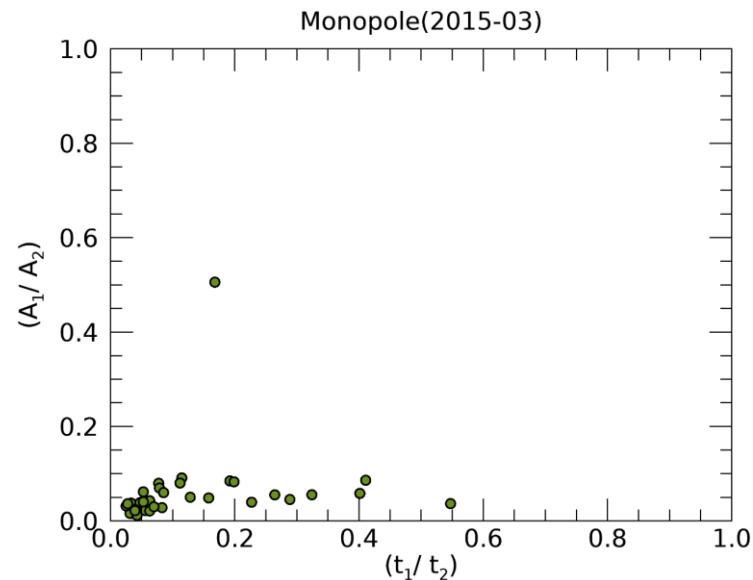
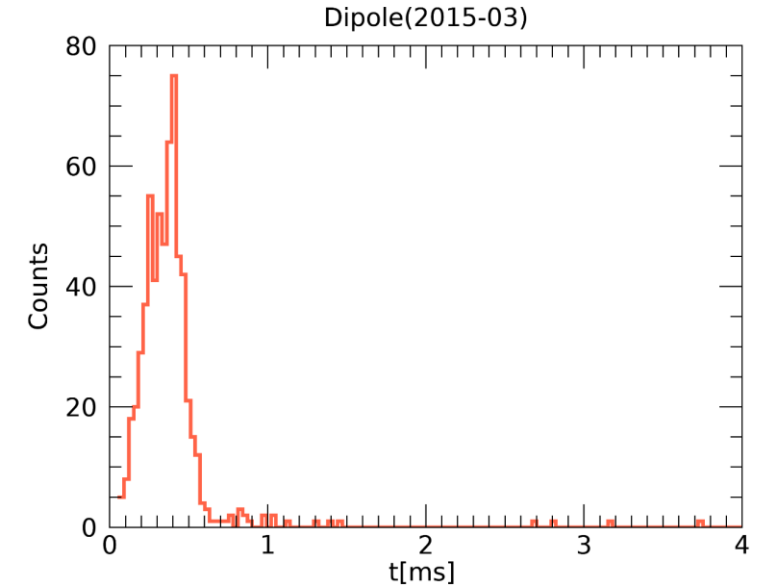
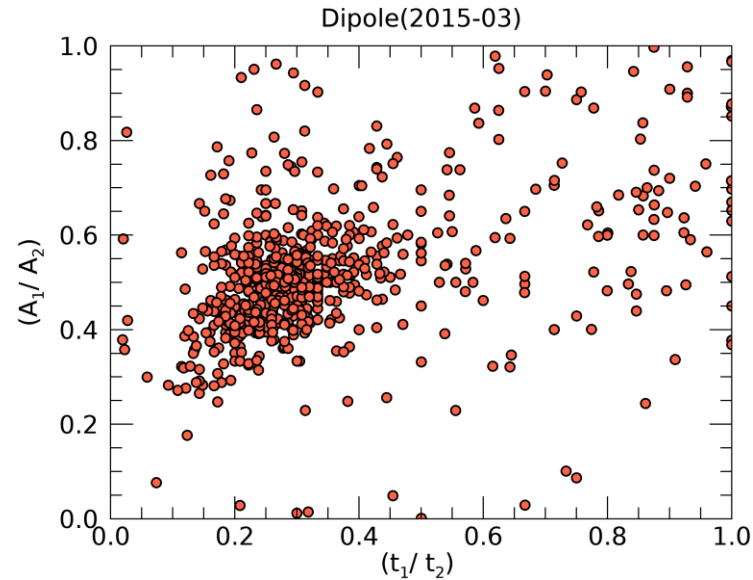
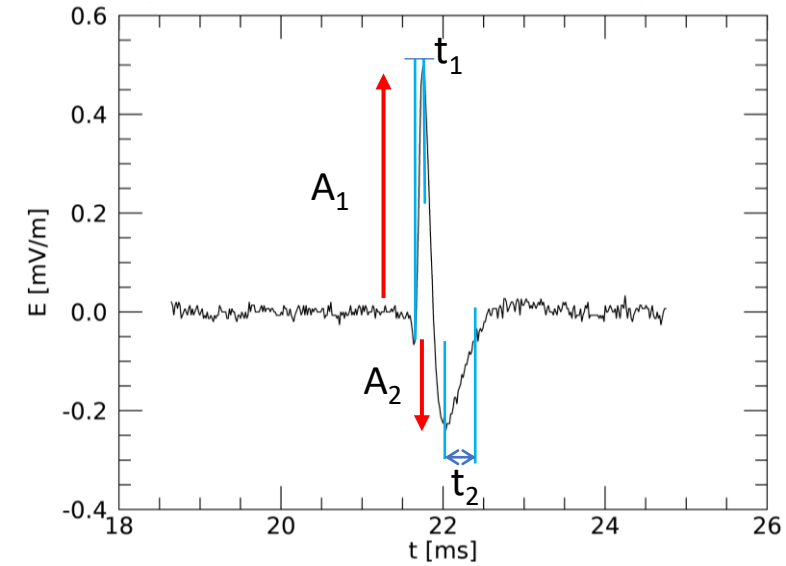


5359 events



1856 events

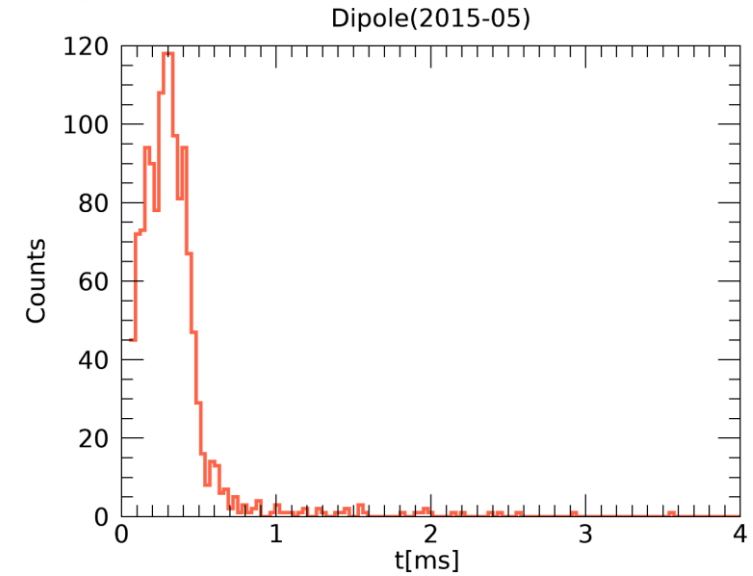
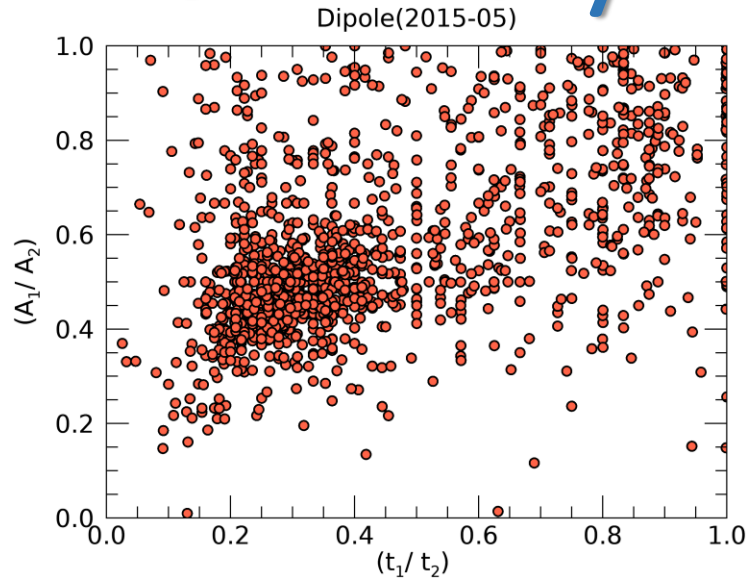
Preliminary Results



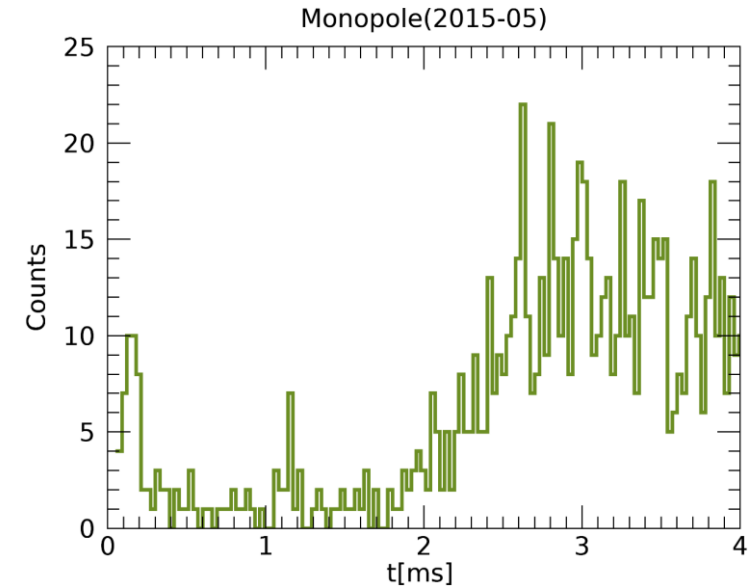
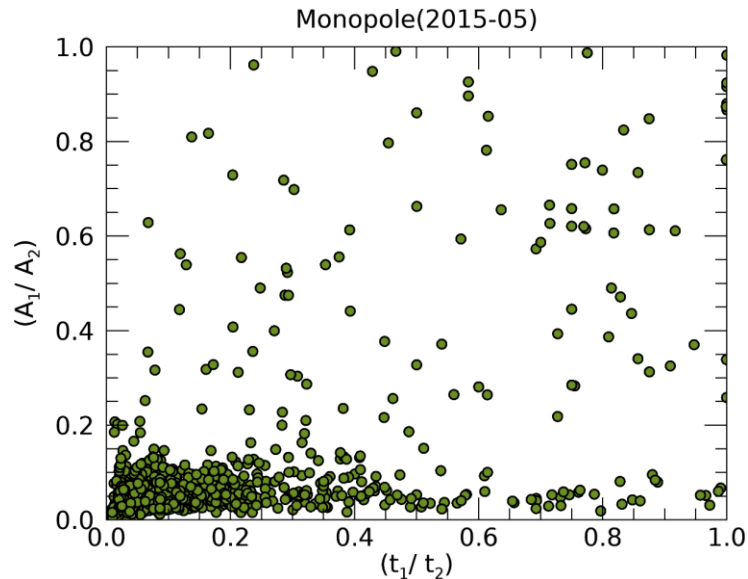
- t_1/t_2 is the ratio of rising and decay time.
- A_1/A_2 is the ratio of amplitudes.

Preliminary Results

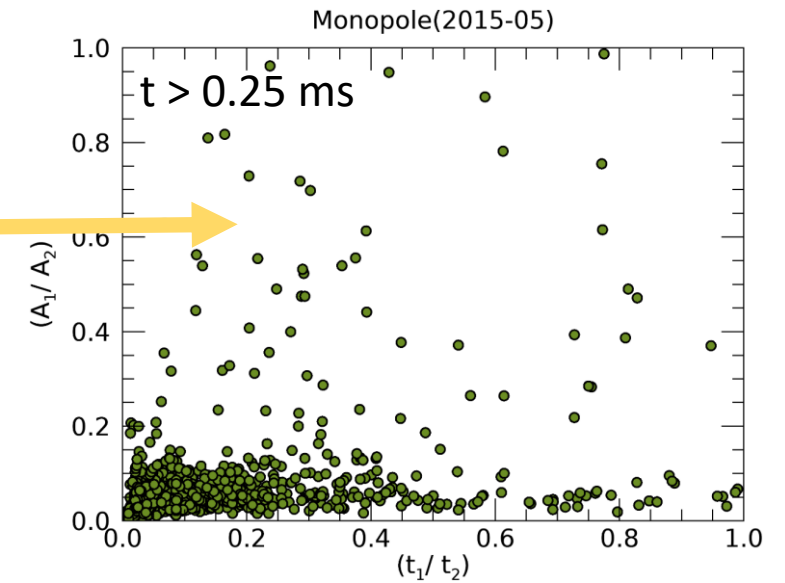
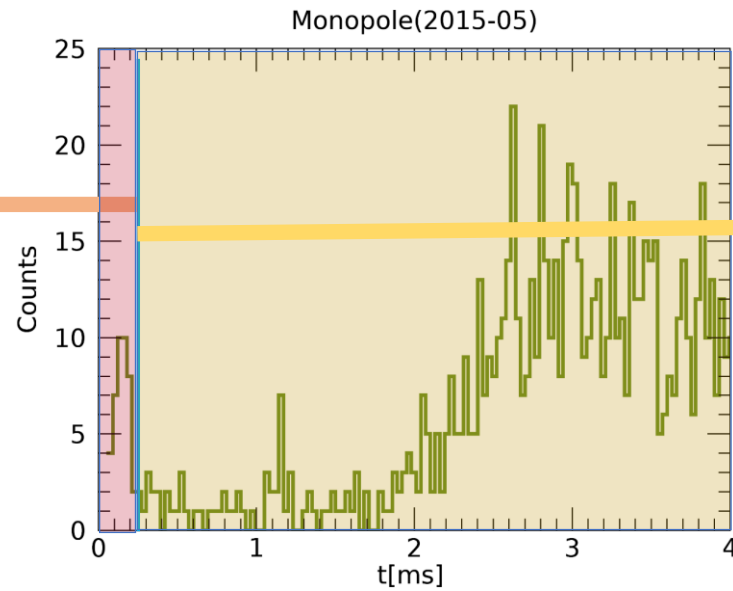
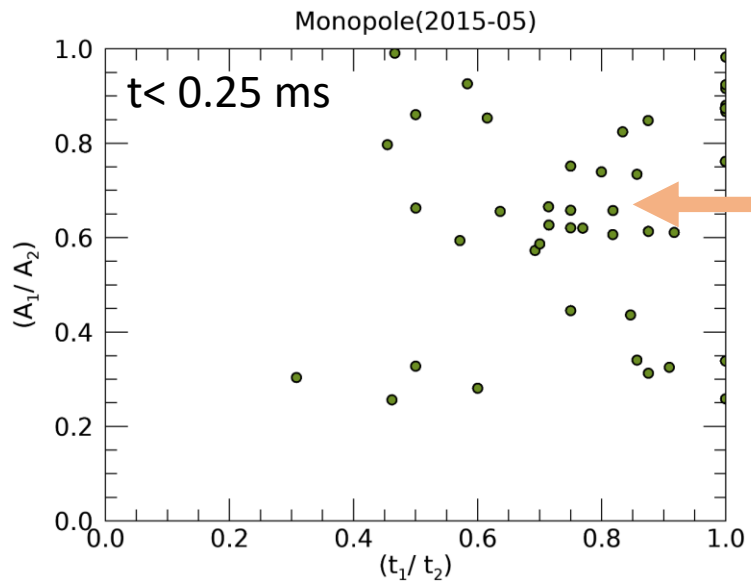
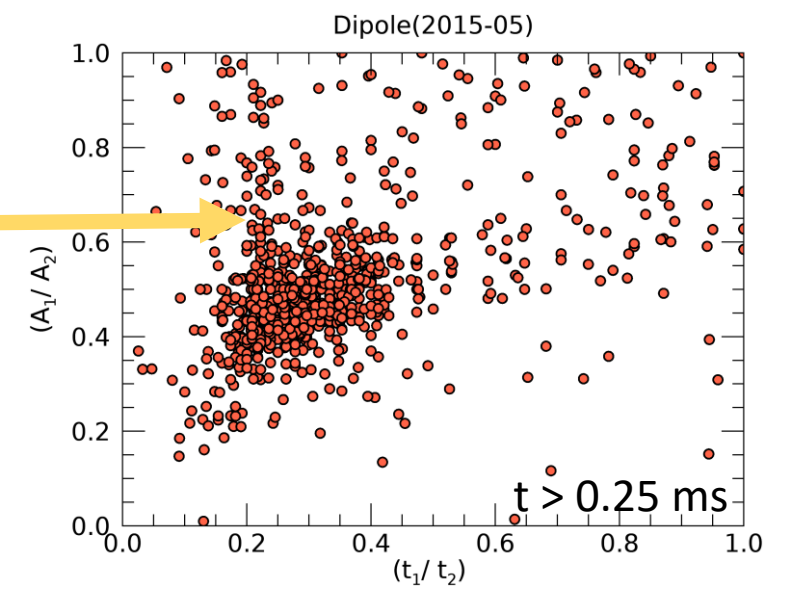
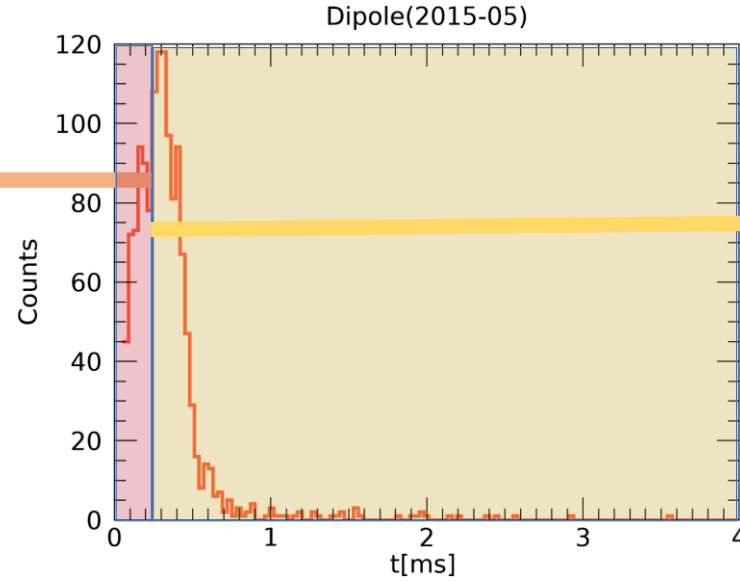
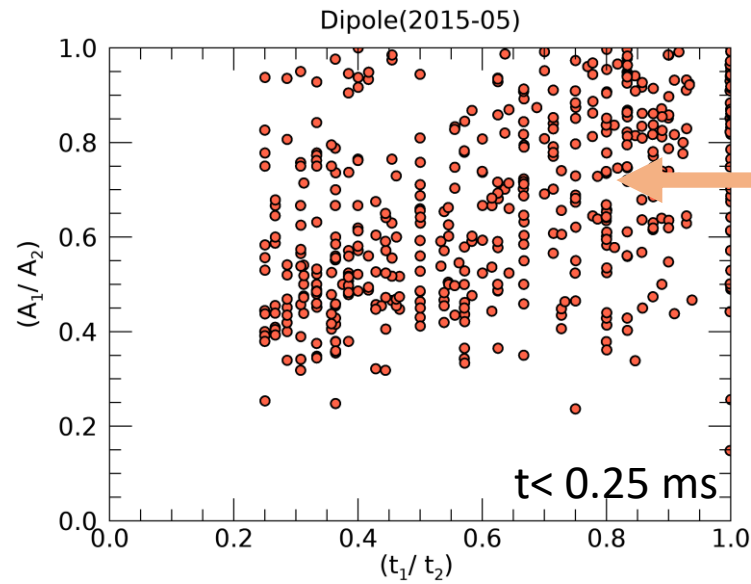
➤ Dust events in the monopole and dipole configuration behave differently.



➤ Solitary waves are randomly distributed independent of the instrument configuration.



Preliminary Results



Summary

- Dust events look different in monopole and dipole mode of the LPW instrument.
- The behaviour of solitary waves is independent of the configuration of the instrument.

Thank you.