Contribution ID: **379** Type: **Poster**

# Injection of Multiple Shattered Pellets for Disruption Mitigation in DIII-D

*Thursday 25 October 2018 14:00 (20 minutes)*

Experiments on DIII-D have injected multiple shattered pellets at different toroidal locations for the first time, as is planned for the ITER disruption mitigation system. Systematically varying the relative timing of the two pellets suggests that simultaneously injected pellets may impact the assimilation of each other, altering the resulting disruption characteristics compared to that due to a single pellet injecting similar neon quantities. Thermal quench (TQ) radiation fractions measured near the injection are reduced with the dual pellets contrary to TQ radiation fractions measured away from the injection ports which do not have a clear difference between single or dual pellet injections. This asymmetric reduction in radiation fraction indicates an overall reduction in the global radiation fraction and that possible radiation asymmetries may be reduced with dual pellet injection. Global disruption mitigation properties, such as the current quench duration, is found to increase when the pellets enter the plasma simultaneously compared to single shattered pellet injections with similar neon quantities. The similar reduction in mitigation of current quench loads is consistent with the observed reduction in TQ mitigation. The time between initial pellet injection and thermal quench onset (plasma cooling duration) is shorter when both pellets are injected simultaneously compared to a single pellet. The faster shutdown with two pellets could be due to the "head start" in the toroidal and poloidal spreading of impurities due to injecting the pellets at different toroidal locations – effectively cooling multiple flux tubes simultaneously. The lower cooling duration may also limit the amount of the neon delivered by the shattered pellet into the plasma prior to the end of the TQ since the shattered pellet plume takes on the order of a few milliseconds to be completely in the plasma. These results suggest that changes in the spatial distribution of the initial impurity injection can impact the evolution of the fast shutdown, indicating that 0D treatments of disruption mitigation metrics are not fully sufficient. This asymmetric reduction in radiation fraction indicates an overall reduction in the global radiation fraction and that possible radiation asymmetries may be reduced with dual pellet injection.

## Country or International Organization

United States of America

## Paper Number

EX/P6-23

**Author:** Dr HERFINDAL, Jeffrey (Oak Ridge National Laboratory)

**Co-authors:** Dr LASNIER, Charlie (Lawrence Livermore National Laboratory); Mr SHIRAKI, Daisuke (Oak Ridge National Laboratory); Dr HOLLMANN, Eric M. (University of California San Diego); Dr BAYLOR, Larry R. (Oak Ridge National Laboratory); Dr EIDIETIS, Nicholas (General Atomics); Dr MOYER, Richard (University of California San Diego)

**Presenter:** Dr HERFINDAL, Jeffrey (Oak Ridge National Laboratory)

**Session Classification:** P6 Posters