Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Influence of the burner swirl on the azimuthal instabilities in an annular combustor[1] MAREK MAZUR, HKON NYGRD, NICHOLAS WORTH, JAMES DAWSON, Energie- og Prosessteknikk, NTNU — Improving our fundamental understanding of thermoacoustic instabilities will aid the development of new low emission gas turbine combustors. In the present investigation the effects of swirl on the self-excited azimuthal combustion instabilities in a multi-burner annular annular combustor are investigated experimentally. Each of the burners features a bluff body and a swirler to stabilize the flame. The combustor is operated with an ethylene-air premixture at powers up to 100 kW. The swirl number of the burners is varied in these tests. For each case, dynamic pressure measurements at different azimuthal positions, as well as overhead imaging of OH* of the entire combustor are conducted simultaneously and at a high sampling frequency. The measurements are then used to determine the azimuthal acoustic and heat release rate modes in the chamber and to determine whether these modes are standing, spinning or mixed. Furthermore, the phase shift between the heat release rate and pressure and the shape of these two signals are analysed at different azimuthal positions. Based on the Rayleigh criterion, these investigations allow to obtain an insight about the effects of the swirl on the instability margins of the combustor.

[1]This project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n 677931 TAIAC)

Marek Mazur
Energie- og Prosessteknikk, NTNU

Date submitted: 31 Jul 2017 Electronic form version 1.4