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Amplitude and frequency modulation in a turbulent jet at high Reynolds number DANIELE FISCALETTI, Delft Univ of Tech, BHARATHRAM GANAPATHISUBRAMANI, University of Southampton, GERRIT ELSINGA, Delft Univ of Tech — In this work, the amplitude and frequency modulation of the small scales of turbulence is investigated experimentally in a jet at high Reynolds number. Hot-wire anemometry (HWA) and long-range μPIV measurements are performed in the fully developed region of the jet. From HWA, time series are converted into space series by applying the Taylor hypothesis. Using spectral filters, two signals representative of the large, and the small scales are constructed. It was found that for positive large-scale fluctuations, the associated small-scale signal is stronger in amplitude (amplitude modulation), and presents locally a higher number of local maxima and minima (frequency modulation). Moreover, the local standard deviation of the small-scale signal (representative of the amplitude of the small-scale signal) increases with the local strength of the large-scale fluctuations. A further investigation with PIV allowed to resolve the small scales of turbulence, without the need for Taylor hypothesis. From this analysis, the amount of amplitude modulation was found to be only 25% of the value obtained with HWA. This difference can be explained considering that the structures of intense vorticity travel, on average, at velocities higher than the mean velocity of the flow.

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