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P1.1022 Intense and short bursts of whistler-frequency waves during the pedestal collapse in KSTAR H-mode plasmas

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A high-speed broad-band (0.1-5 GHz) RF spectroscopy system has been developed to study the wave phenomena associated with the collapse of edge confinement barrier (called pedestal) in the KSTAR tokamak. In the early measurements using the dipole-type antennas (<1 GHz), the collapse always coincided with intense and short (~100 μs) broadband (<800 MHz) RF bursts [1-2], which was conjectured as a result of fast localized magnetic reconnection (MRX). To better understand the origin of the RF emissions, higher frequency range (up to 5 GHz) has been measured in 2018 KSTAR campaign by resolving the modulation the electron cyclotron emission (ECE), which can provide local measurement unlike the dipole antennas. During the pedestal collapse, narrow-band intense emissions with rapid frequency up/down chirps in the whistler frequency range (~ 3 GHz) appeared for tens of s, suggesting collisionless fast MRX [3]. Bicoherence analysis shows that the GHz emissions have substantial nonlinear interaction with the sub-GHz ion cyclotron harmonic waves, implying that both waves are generated at the same spatial location. The local nature of the wave emissions is consistent with the existence of solitary filament and its localized burst at the pedestal collapse measured by ECE imaging diagnostics [4-5]. This work is supported by R&D program of "KSTAR Experimental Collaboration and Fusion plasma research" (NFRI-EN1801-9), the National Research Foundation of Korea under contract No. NRF-2017M1A7A1A03064231 and BK21+ program.

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