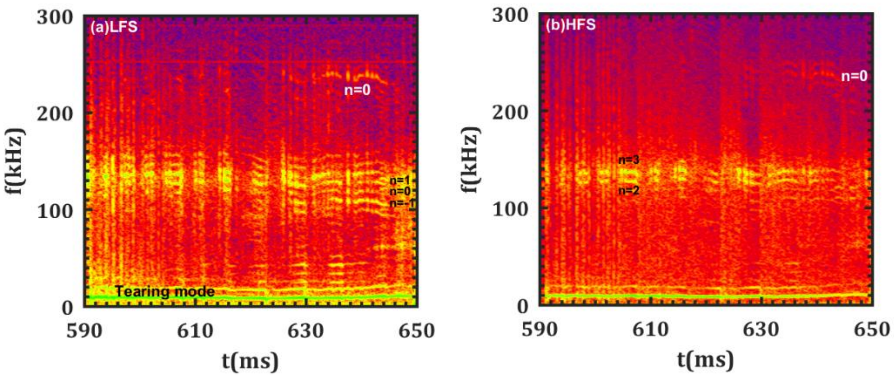

Fig.1 TAEs nonlinearly couple with tearing mode at the spectrogram of Mirnov coil signal in (a) low field side (LFS) and (b) high field side (HFS). Some modes are labeled with corresponding toroidal mode numbers.

The global Alfven eigenmode (GAE) driven by nonlinear coupling between toroidal Alfven eigenmode (TAE) and tearing mode is found for the first time on HL-2A. Series of MHD instabilities, which include Alfvenic modes (AMs) with frequency lying in TAE frequency region and high frequency modes (HFMs), are found in the presence of strong tearing mode at Fig.1. The MHD instability activity show different characteristics in LFS and HFS. Alfven sidebands with n_{AMs}= 0, ±1, ±2, ±3... and n = 0 HFM appear in LFS while only the n = 2-3 AMs and three HFMs can be observed in HFS. Frequency difference and mode number discrepancy of two adjacent AMs are comparable to the tearing mode frequency and toroidal mode number, i.e. $f_{AM}(i)-f_{AM}(i-1) = f_{TM}$ and $n_{AM}(i) - n_{AM}(i-1) = n_{TM}$, which indicates a nonlinear mode-mode coupling process. The result given by the squared bicoherence reveals that two AMs couple together and following matching conditions are satisfied among these AMs, i.e. $f_{AMa}+f_{AMb}=f_{HFM}\approx 240$kHz and $n_{AMa}+n_{AMb}=n_{HFM}=0$. In other words, the symmetrical HFM generate as a result of mode-mode coupling between two AMs. The symmetrical mode is identified as GAE by Alfven mode code (AMC) calculation. The frequency is around 240kHz, which agree with experimental observation. The mode structures display global feature and cover fully normalized radius of $\rho = 0-1$.