SPATIAL STRUCTURE OF RESONANCE CAVITIES IN SUNSPOTS

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We present a study of wave processes in sunspots from the active regions NOAA 11131 on 10 December 2010 and NOAA 12565 on 14 July 2016 observed by SDO/AIA in the 1600Å, 304Å and 171Å temperature channels. To study the spatial structure of the resonance cavities previously found by Jess et al., we applied spectral data processing techniques such as pixelized wavelet filtering and mode decomposition. For the first time, we found stable regions as waveguides of the oscillations in the sunspot umbra, occupying specific frequency ranges without spatial overlap. The sizes of these regions depend on the frequency of the oscillations, and the maximum frequency coincides with the values of the harmonics of the main oscillation mode. Frequency drifts were observed in the band occupied by these regions, with different spectral slopes depending on the location of the sources in the sunspot umbra. We suggest that the observed distribution of wave sources in the umbra is a set of resonant cavities where successive amplification of oscillations at selected multiple harmonics is observed. The distribution of sources at low frequencies indicates the influence of the atmospheric cut-off due to the inclinations of the magnetic field lines.