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Non stationary tire-road noise analysis using large array beam forming in the time and frequency domains

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In the framework of the REBECA Project founded by the ADEME, one seeks to provide a description of the tire-road noise source from the exterior of the vehicle perspective. Far field acoustic imaging techniques were proposed to identify the sources. Therefore an optimised array of 120 microphones, 4 m in diameter, was modelled and built. Measurements of the noise produced by a car mounted on a roll were performed in a semi anechoic room. The front car axle was driven at various constant speeds and to rising speeds as well. Beam formed images and point signals have been post-processed with a 125 kHz sampling rate in order to derive space and time analysis of the pressure field in the vicinity of the tire-roll contact point. The high rate movies processed clearly exhibit periodic phenomena generated around the contact point, while the tire structure borne source appears to be insignificant. Results of frequency and order analysis are also presented in this attempt to provide an interpretation of the tire/road contact noise in terms of source models.