New Instrumentation for the Scientific Study of Rail Defects

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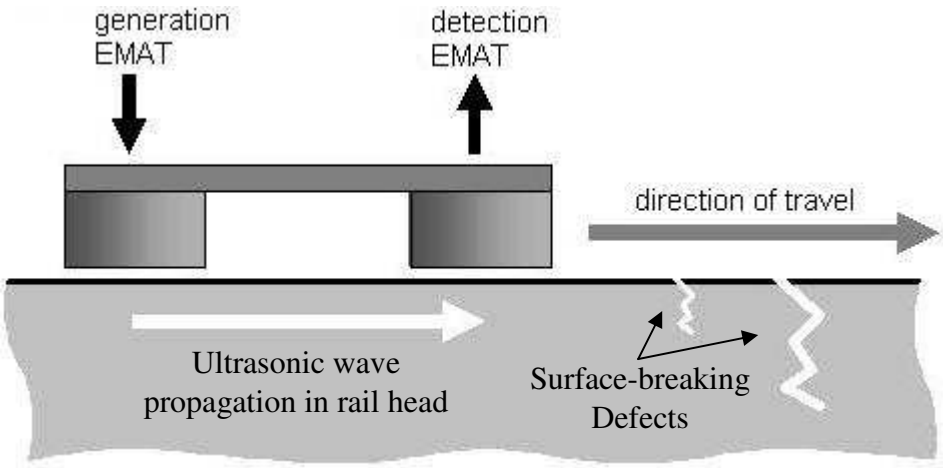
Advanced piezoelectric array technology implemented into state of the art wheel probes (University of Bristol) and non-contact ultrasonic technology using Electromagnetic Acoustic Transducers (EMATs) (University of Warwick) will be designed and constructed to perform both surface and bulk wave inspections that can operate at high speeds, as it will not have the same speed limitations as the conventional techniques. Pitch-catch Rayleigh-like surface wave techniques will be developed in collaboration with the University of Warwick to interrogate the top 15mm or so of the surface of the rail head. By selecting the frequency characteristics of the generation source it is possible to measure defects much shallower than the existing ultrasonic techniques. There is so much common ground between the contact and non-contact approaches, that it is more efficient to develop them within one coherent project. There are also instances where combining contact wheel probe and EMATs offer a viable and unique solution to the high speed bulk wave inspection problem. Through these novel and unique experiments coupled with finite element modelling, a detailed understanding of the structure of the rail and defects and how the ultrasound interacts with these defects will be established.



Schematic diagram showing the concept of the EMAT pitch-catch technique.