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### Characterization Improvement Through Signal Processing — Application to Radiography Inspection: 3D Reconstruction

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During in-service inspections, experts are faced with the delicate task of establishing a complete diagnosis of defects from radiographs. Should a defect be detected, one must be able to demonstrate that the component still meets regulatory requirements. Thus, it is essential to be able to characterize precisely the defect, especially when the demonstration relies on mechanical calculus. However the characterization of the defect by only g or X-ray is sometimes very difficult, and the justification process can thus be jeopardized. In such cases, signal processing can be very helpful for the interpretation of the data and for the characterization (positioning and sizing) of the defect. This paper presents a 3-D reconstruction processing in hard conditions representatives of pipe inspections : the incidence angle is very reduced and thus the radiographs contain very little information along the vertical direction. The reconstruction process relies on the estimation of the attenuation. It is called inversion because it restores the attenuation from both data and prior information. The method has been tested on radiographs of a block with real defects and the performances were evaluated from a mock-up with several electro-drilled cylindrical defects. Even in the case of limited incidence, the method provides very useful 3D results. Moreover this process can be applied whatever the nature of the source. When a larger source is used in order to inspect thick components, signal processing allows to reduce the inevitable blur which leads to improved accuracy. In conclusion, signal processing and especially 3D reconstruction in the case of radiography can turn out to be a key step for in-service inspection of major NPP components.