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IMAGING TECHNIQUE FOR TROUBLESHOOTING OF INDUSTRIAL EQUIPMENT BY GAMMA-RAY ABSORPTION SCANS

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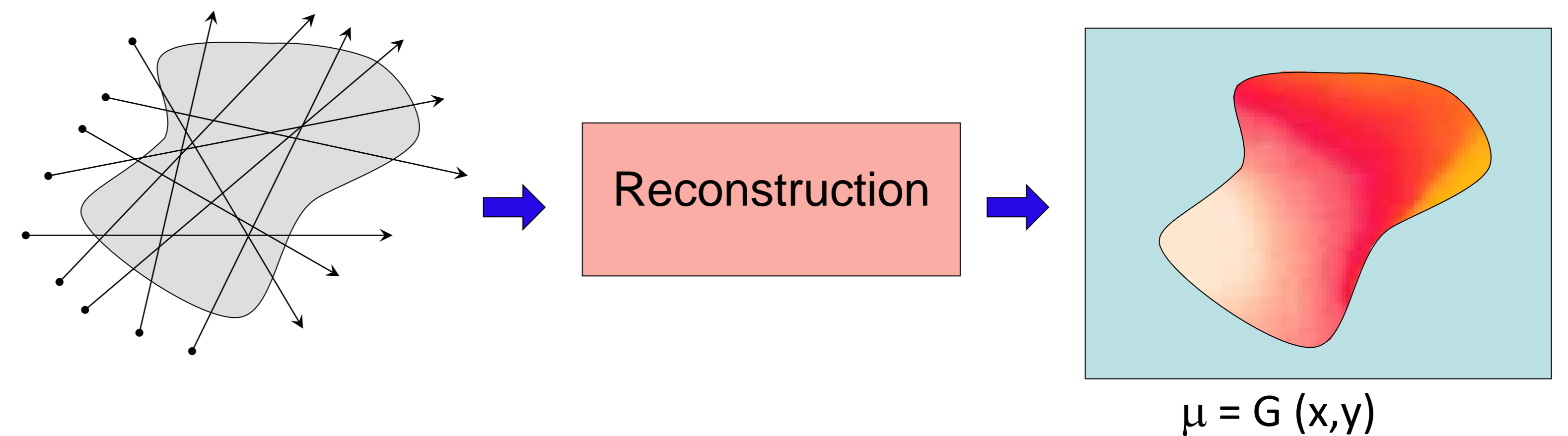
ABSTRACT

Gamma scanning is one of the most common nuclear techniques on troubleshooting industrial equipments like distillation columns and reactors. With a very simple concept, the technique is easy to implement.

Searching for a competitive edge the industry has been long developing solutions to achieve better results. On the last decades, significant development has been done with the advent of new equipments, electronics, portable computers and software. Continuous scanning and wireless detection systems are examples of successful field solutions, while new software aid on reporting and data presentation. However the type and quality of the results itself has not dramatically changed since its beginning.

A scan profile is simple to understand, although the process to build it can be very complex as it requires a specific blend of knowledge and abilities. Correct data gathering, interpretation and reporting are abilities often difficult to match or requires a long time of training. The industry faces a similar difficult on the customer side, as it is always necessary to train end users to understand a report and how to use its best.

This work describes our effort on developing a new approach on the gamma scan test using image reconstruction techniques that would result on a graphic image rather than a XY plot. Direct and easier to understand, a report with graphic images would be also be accessible to a wider audience, not limited to the customers experienced with gamma scan interpretation.



INDUSTRIAL EQUIPMENT IMAGING

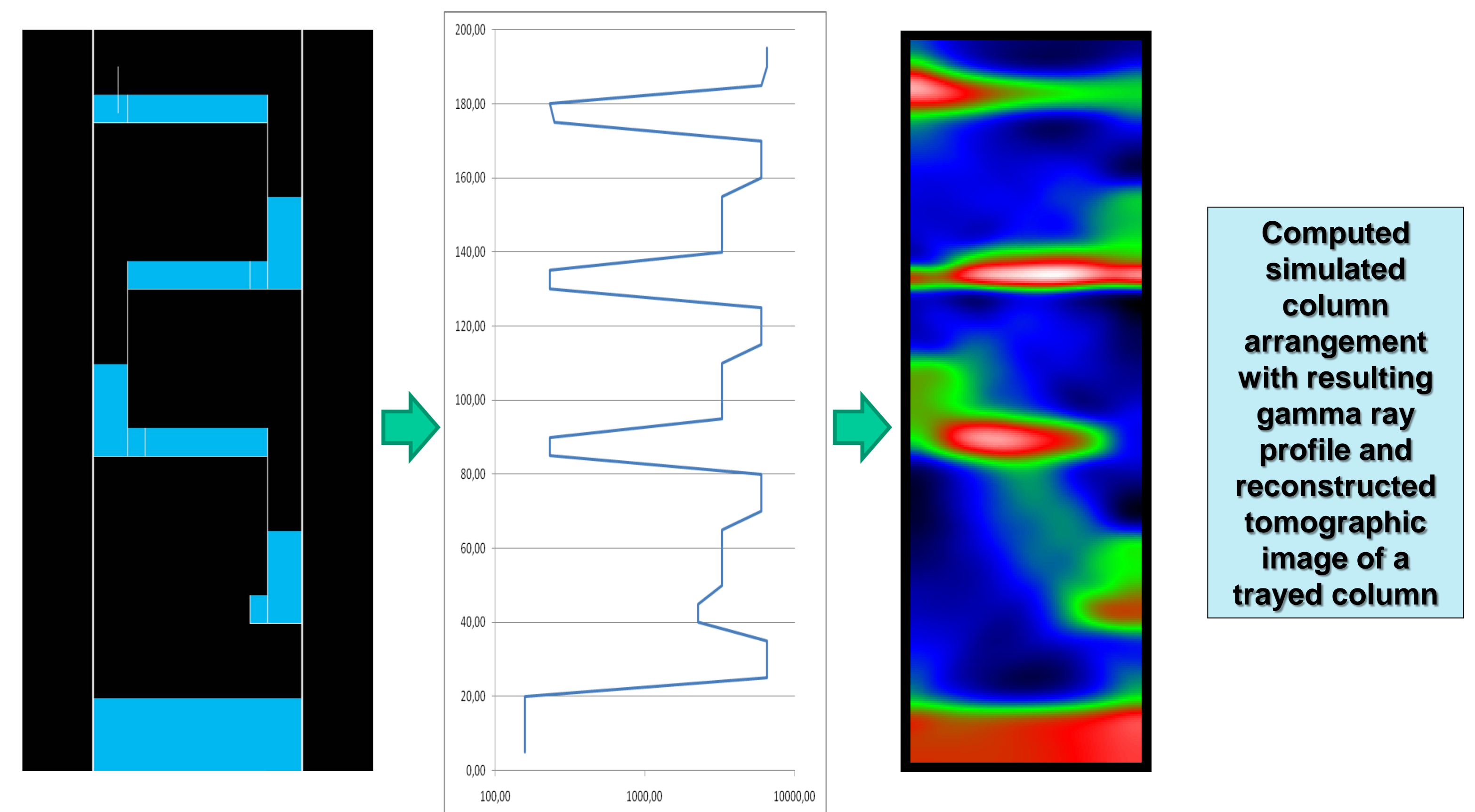
In this work, we propose to obtain a two dimensional longitudinal density profile of industrial equipments using the gamma ray profiling technique with the aid of tomographic image reconstruction tools. The process of image reconstruction calculates the property distribution within a region, with a limited number of crossing measurements using a mathematical or iterative algorithm and as long as the emission and detection coordinates are known, it is possible to obtain a tomographic image of any spatial arrangement.

GAMMA RAY PROFILING OR GAMMA SCAN

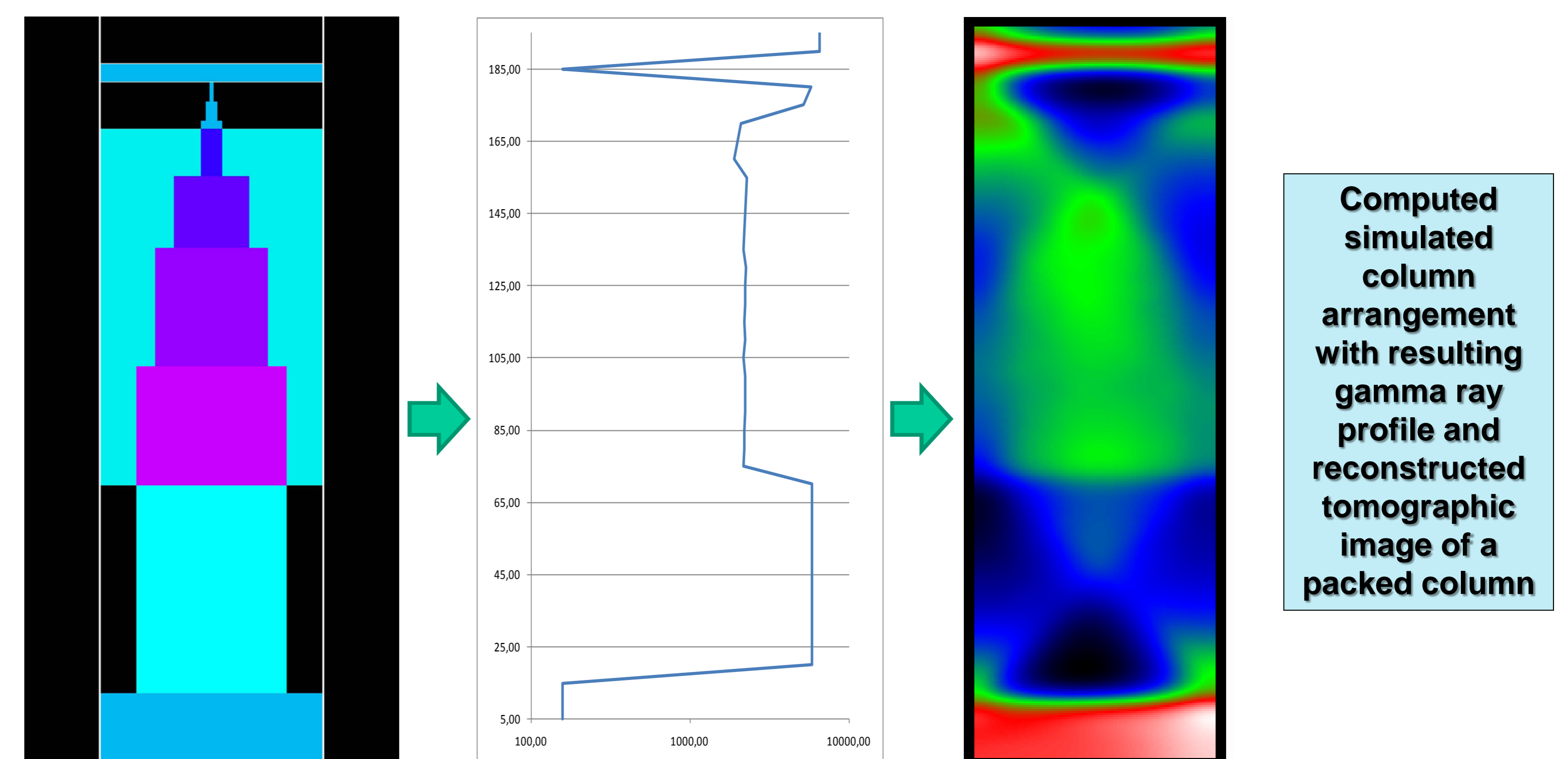
Industrial continuous process equipments are very complex equipments with difficult troubleshooting when the operational parameters escapes from the normal range. One single symptom can be caused by many different problems that might require a multimillionaire turn around or a simple instrument repair. With this scenario a correct problem identification is crucial for many engineering areas involved on plant operations.

Gamma ray column profiling or gamma scan is one of the most used NDT techniques to evaluate the on-line mechanical and operational behavior of process equipments. On this technique, a radioactive source and detector are positioned around the equipment and simultaneously moved along its length. The radiation attenuation values measured through the vessel results on a density longitudinal profile. The profile or scan plot is then analyzed and the results are present on a report.

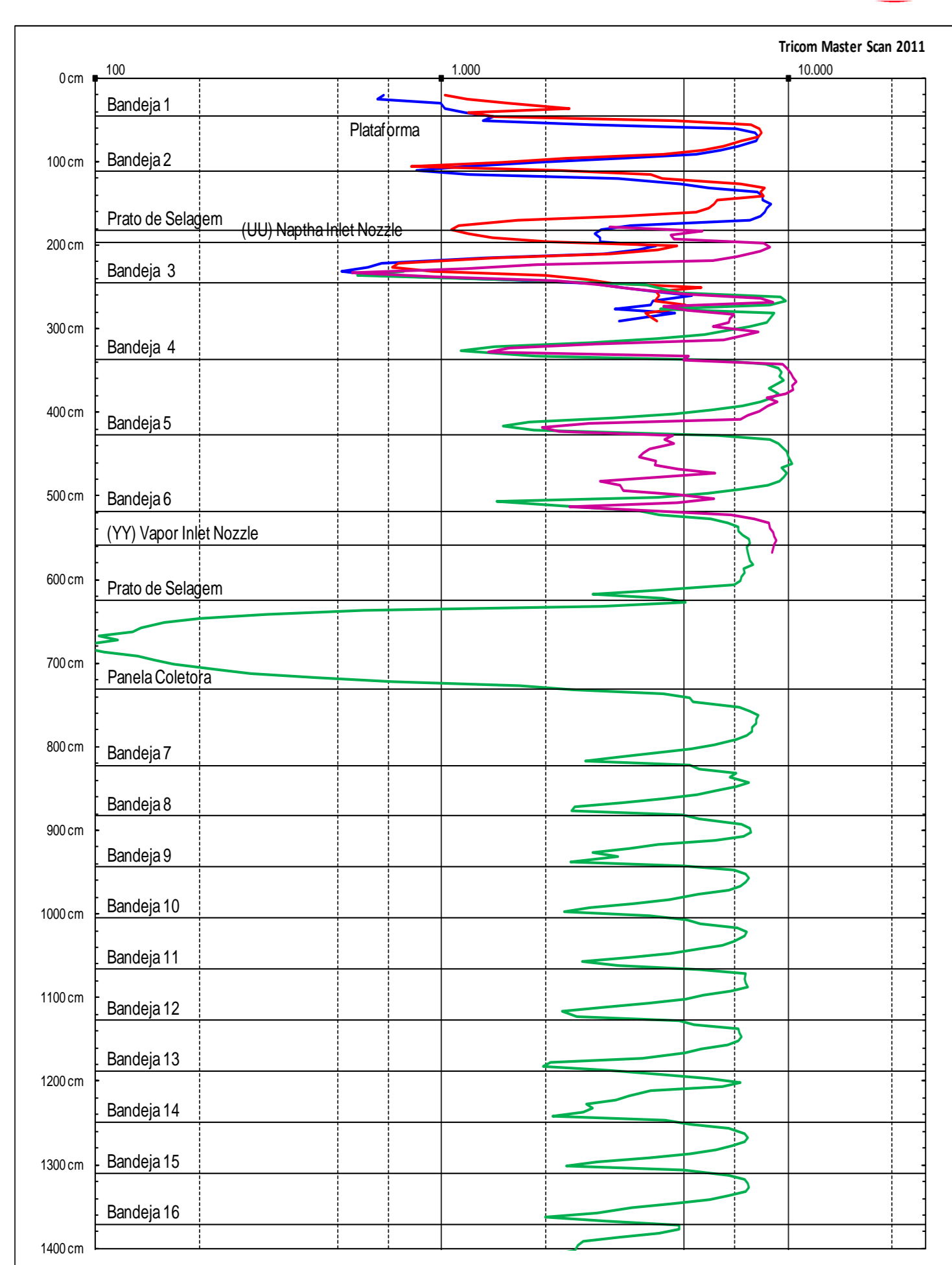
Although conceptually simple, the technique presents many technical difficulties and characteristics, ranging from difficult personal training, application, resulted information, that limited a broader use of this inspection.



Computed simulated column arrangement with resulting gamma ray profile and reconstructed tomographic image of a trayed column



Computed simulated column arrangement with resulting gamma ray profile and reconstructed tomographic image of a packed column



A typical gamma-ray profile plot

TECHNOLOGY INNOVATION

This new approach will be subject of a patent requirement as a partnership between Tricom Tecnologia, EPUSP (Polytechnic Scholl of Sao Paulo University) and CTR (Radiation Technology Center) at IPEN-CNEN/SP.

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