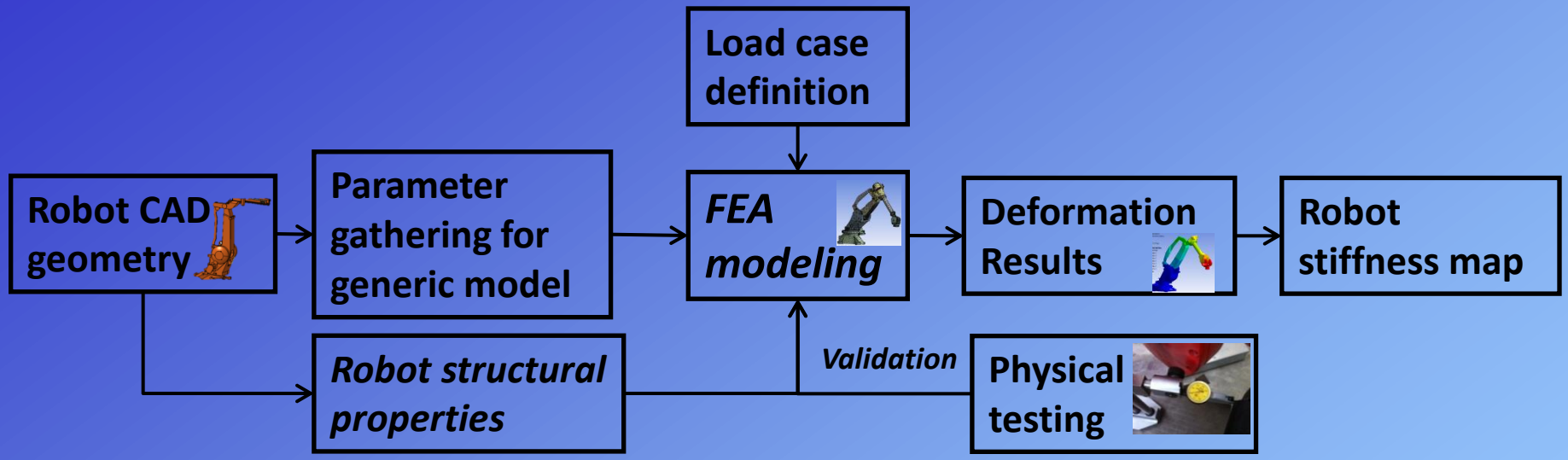
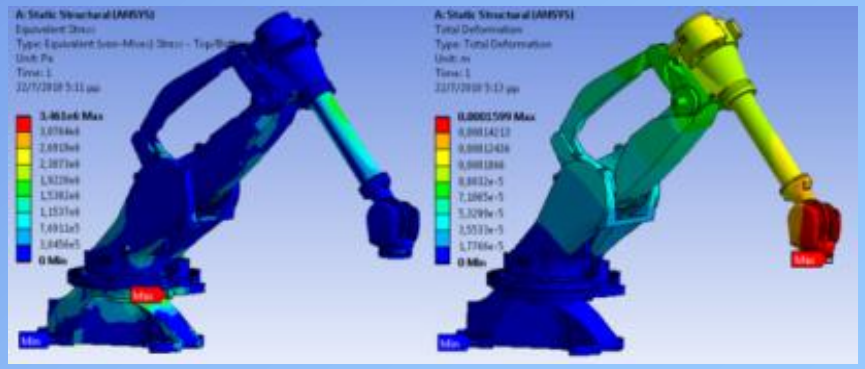
# Manufacturing Processes Modelling and Energy Efficiency

## Robot Structural integrity calculation using finite element modelling




- **Experimental validation** and model adjustment for optimal results
- **Static** and **dynamic** modeling.
- **Generic model** development for case that detailed CAD files are not available



**REF**: Doukas C., Pandremenos J., Stavropoulos P., Fotinopoulos P., Chryssolouris G. (2012) "On an Empirical Investigation of the Structural Behavior of Robots", Submitted to the *45th CIRP Conference on Manufacturing Systems (CIRP CMS)*

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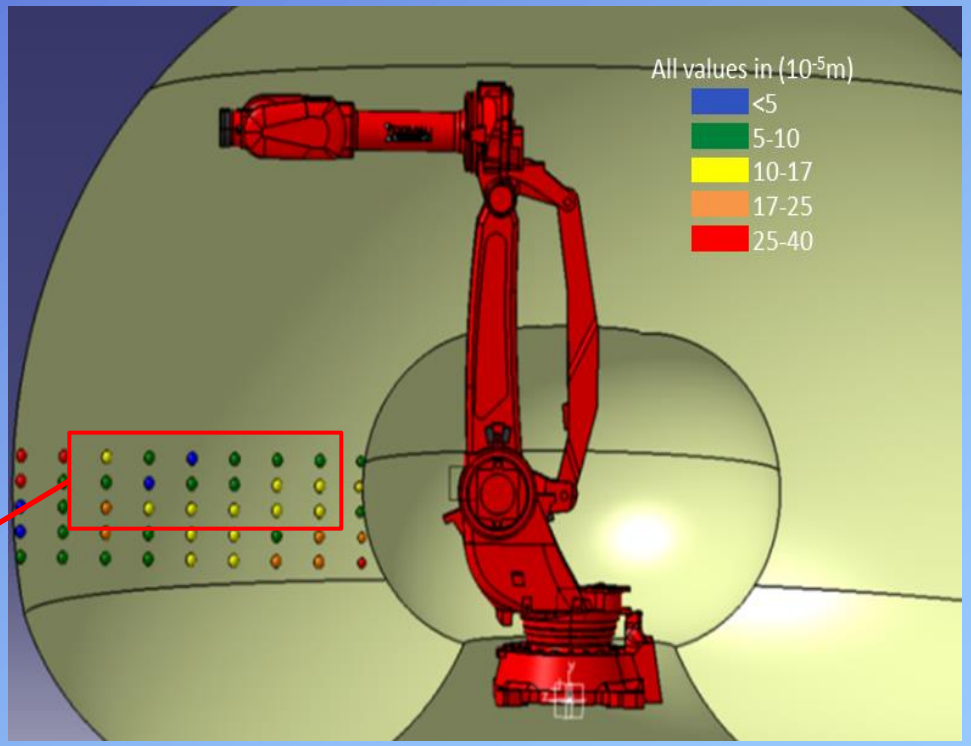
## Static response calculation of industrial robots under external loading conditions

### Horizontal and vertical deflection maps

- horizontal/vertical loading, opposed to end-effect movement
- Visual representation of the robot accuracy by separate maps
- Color coded to 5 accuracy classes




***Typical machining task:***

**0,5m long, 0,3m width, 0.15m height**

- Typical area for machining tasks
- Calculated accuracy level: 0,1-0,2mm
- Easy selection of most appropriate workspace to be used

**REF**: Pandremenos J., Doukas C., Stavropoulos P., Chryssolouris G., "Machining with Robots: A Critical Review" (2011), *7th International Conference on Digital Enterprise Technology*, Athens, Greece, pp. 614-621