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# Study on porosity defects of EBMed Ti64 components by tomographic analysis

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The electron beam melting (EBM) is one of the most promising ALM technologies, which utilizes a high-energy electron beam, as a moving heat source, in order to melt and fuse (by rapid self-cooling) metal powder and produce parts in a layer-building fashion. Anyway many technical aspects concerning the quality of EBM produced components are still industrial open items and studies need to be carried out. The objective of this study is to evaluate the distribution and the features of porosity defects generated during the EBM process by using tomographic analysis, at this aim a simple test case, consisting in rectangular parallelepiped (50x10x10 mm) samples manufactured in Ti6Al4V, was chosen. A suitable DOE was developed in order to investigate the effect of the following intra-build process parameters on porosity: Samples orientation: samples were built according to n.4 different orientations: x, y, z (90°) and 45°. The x and y oriented samples were built horizontally and they were, respectively, parallel and perpendicular to the rake movement direction and the 90° oriented samples were built vertically. Height in the build chamber: the group of samples shown in 2b was built at n.3 different levels in the build chamber which are named hereafter: h1, h2 and h3. More in detail, h1 level starts at z=40 mm, h2 level starts at z=170 mm and h3 level starts at z=300 mm.

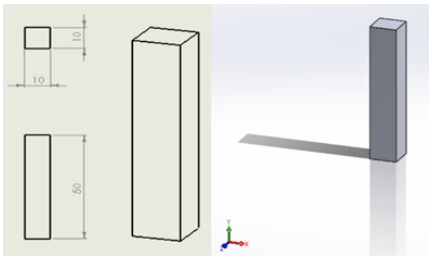

**Figure 1:** *Sample: rectangular parallelepiped (50x10x10 mm) component manufactured by EBM in Ti6Al4V.*

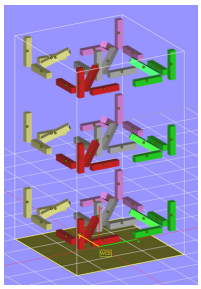

**Figure 2:** *Design of the build run: samples height, orientation and locations*

## Recent Publications

1. A Uriondo, M Esperon Miguez and S Perinpanayagam (2015) The present and future of additive manufacturing in the aerospace sector: a review of important aspects. Proc. IMechE Part G: J. Aerosp. Eng., DOI: 10.1177/0954410014568797.
2. D X Gong, T Anderson and K Chou (2014) Review on powder-based electron beam additive manufacturing technology. Manufacturing Rev. 1(2):1-12.
3. C Koerner (2016) Additive manufacturing of metallic components by selective electron beam melting – a review. Internat. Mat. Rev. 61(5):361-377.
4. W Van Grunsven, E Hernandez Nava, G C Reilly and R Goodall (2014) Fabrication and mechanical characterization of titanium lattices with graded porosity. Metals 4(3):401-409.

## Biography

Carmine Pirozzi graduated with Honors in Industrial Engineering in 2004 with a PhD in Systems and Technology of Production. He is a Researcher in additive manufacturing since 2011, involved in projects as HYPROB, TIMA-RITAM, ANGELA, SAT-AM as material science and additive manufacturing engineer specialist. He does cooperate with several research centers, universities and firms being authors of more than 10 scientific articles on specialized journals and conferences.

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