



Effect of FOD on Solderability

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1. Purpose:

This document explains the different types of FOD (Foreign Object Debris) and how it can impact the solderability in a PCB Assembly.

2. Scope:

This document is to enhance awareness and sensitize, the effect of various type of FOD (Foreign Object Debris) which can impact the solderability and later leads to Latent Failure.

2. Reference:

- IPC A 610 G-Acceptability of electronic assemblies.
- Defect simulation study from Kaynes technology India Private limited.
- AS 9146 – Foreign Object Damage (FOD) Prevention Program - Requirements for Aviation, Space, and Defense Organizations

3. Details:

3.1. What is FOD as per IPC A 610?

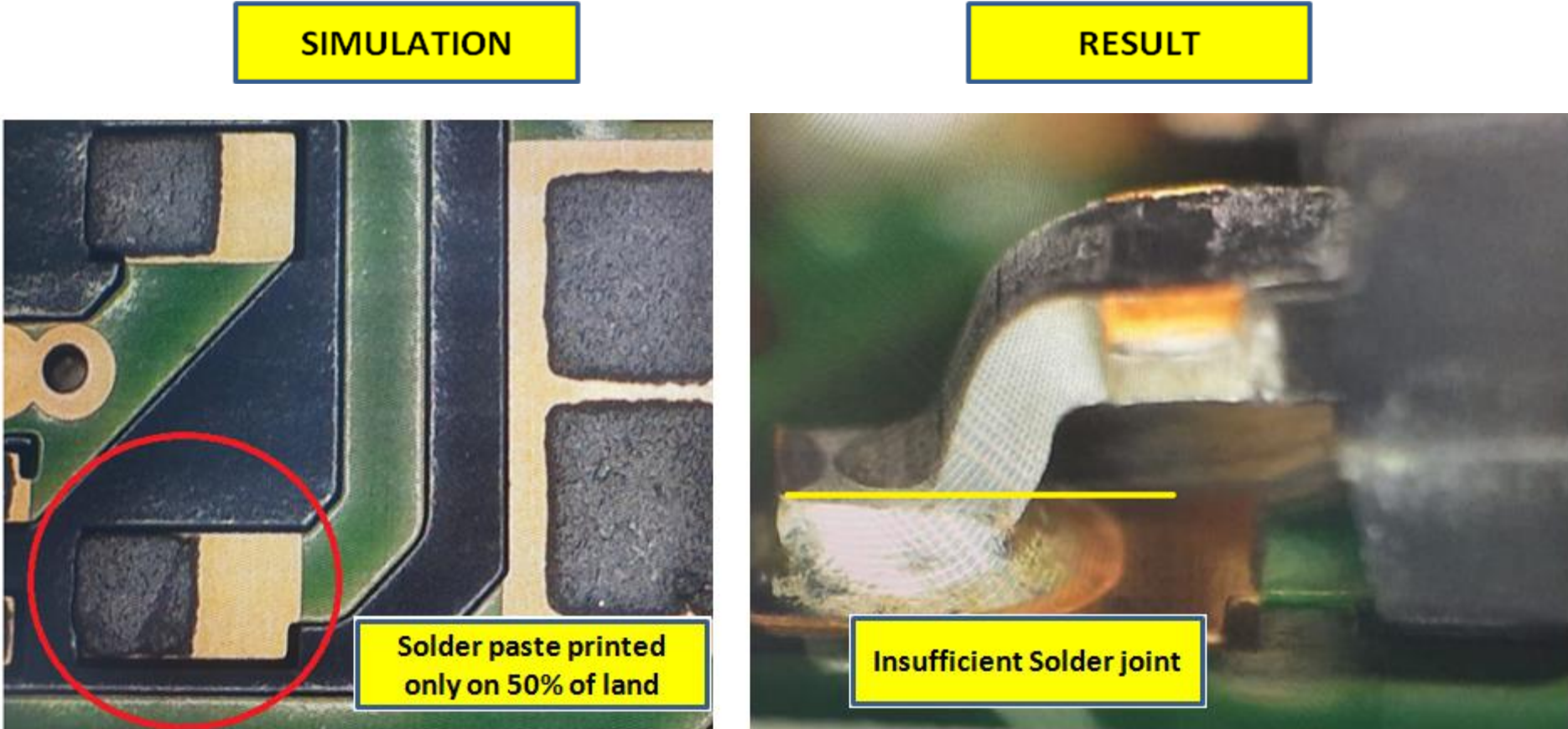
FOD (Foreign Object Debris) is a generic term for a substance, debris, particulate matter or article alien to the assembly or system.

3.2. Sources of FOD (Foreign Object Debris)

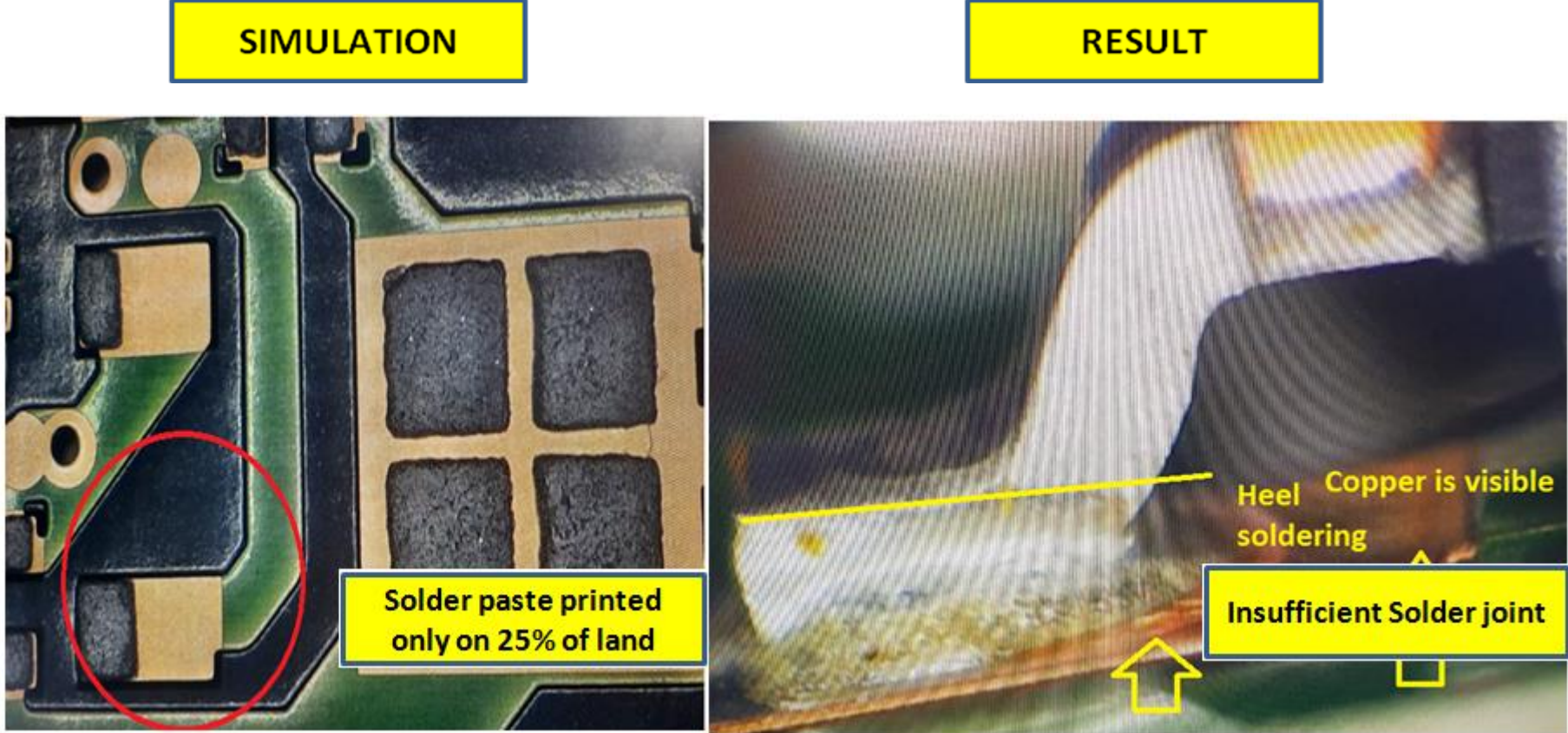
- Nature
- Work environment
- Bare Printed circuit board manufacturing process
- Solder Paste manufacturing process
- Raw material manufacturing process
- Contamination from Humans -Handling

4. Simulation and the effect of various FOD in soldering

4.1. Assume there is a FOD on the stencil aperture. The FOD blocked 50% of the solder pad and it's resulted in partial solder paste print over the solder pad.



4.2. Assume there is a FOD on the stencil aperture. The FOD blocked 75% of the solder pad and it's resulted in partial solder paste print over the solder pad.

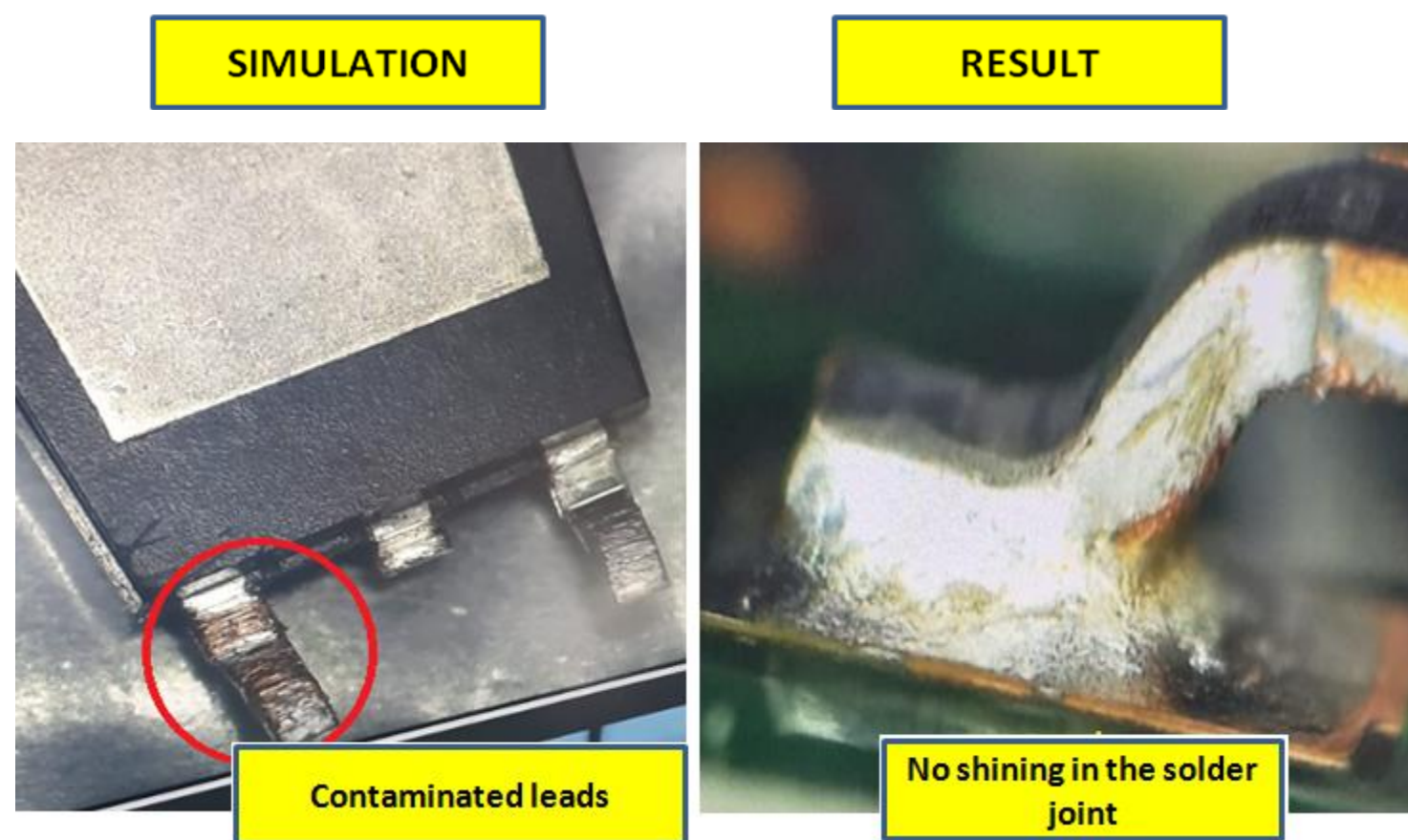


4.3. Below simulation explains the effect of ink mark from a marker pen over the solder paste.

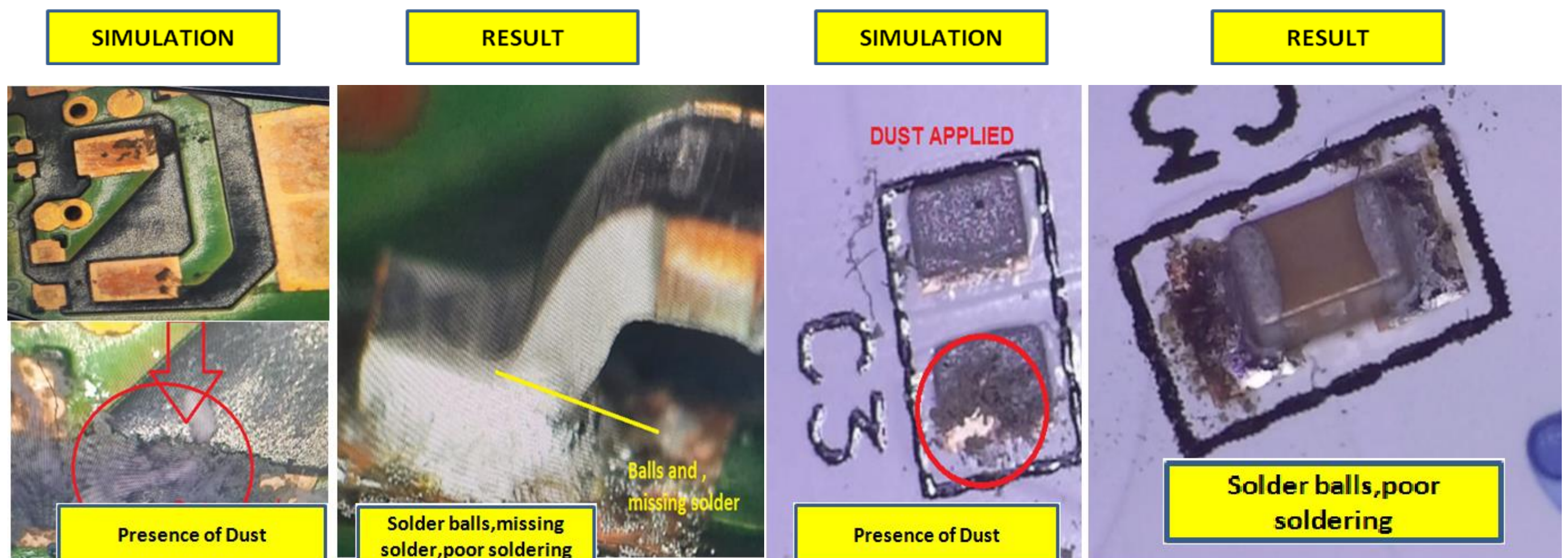




4.4. Below simulation explains the effect of contaminated component lead.

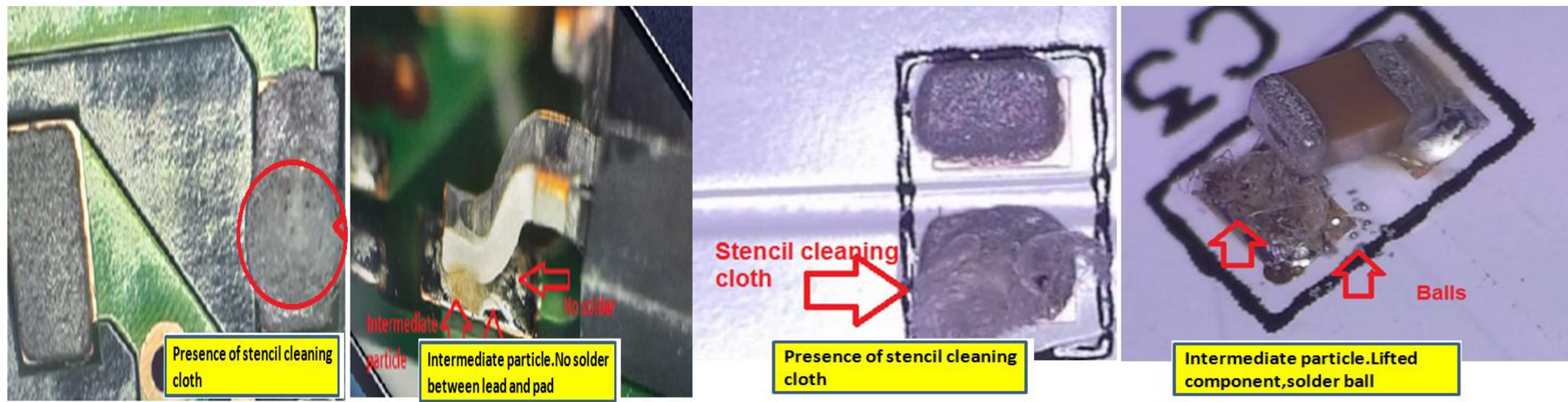


4.5. Below simulation explains the effect of dust over land or solder paste.

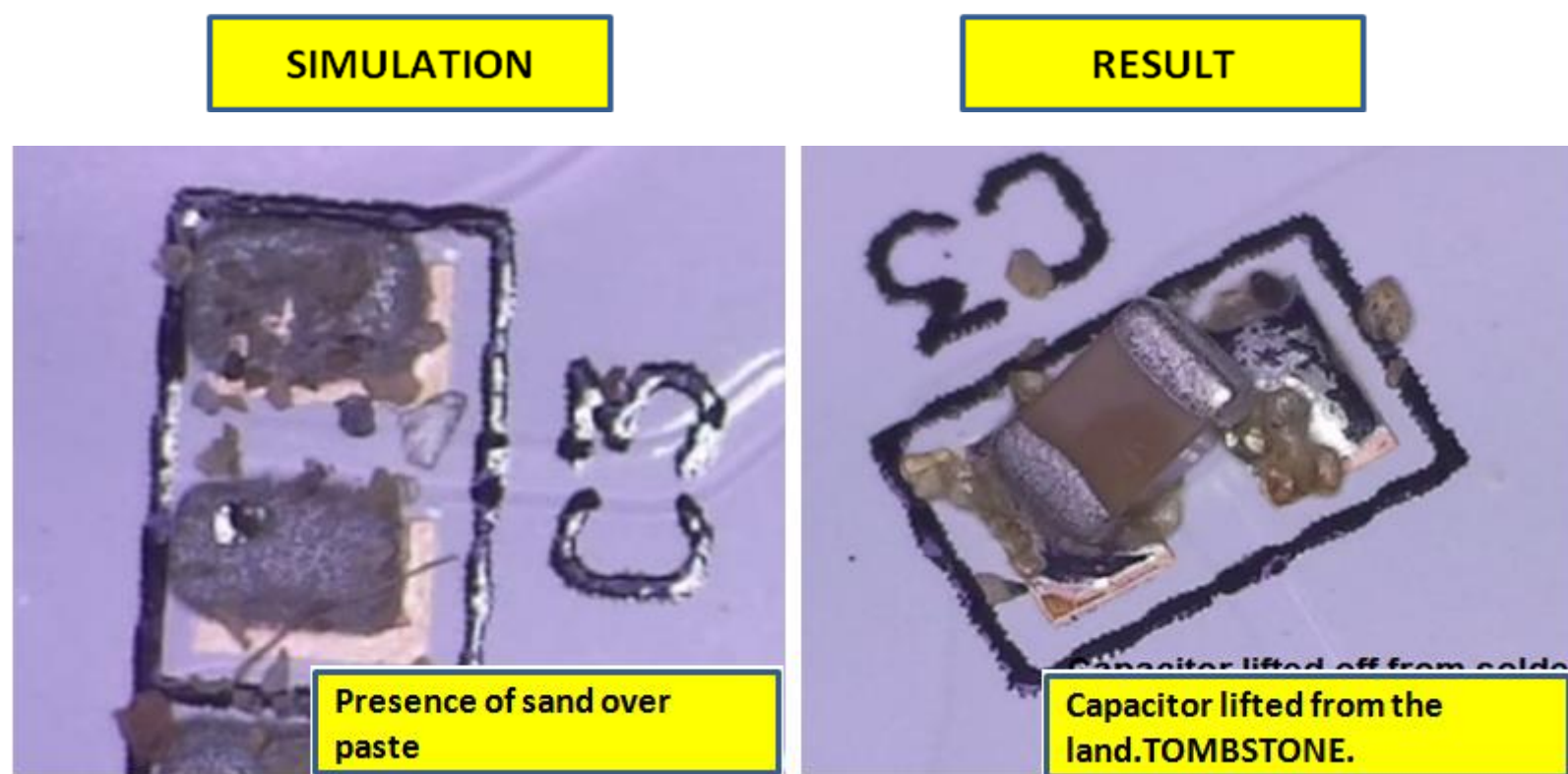


4.6. Below simulation explains the effect of stencil cleaning cloth over solder paste.

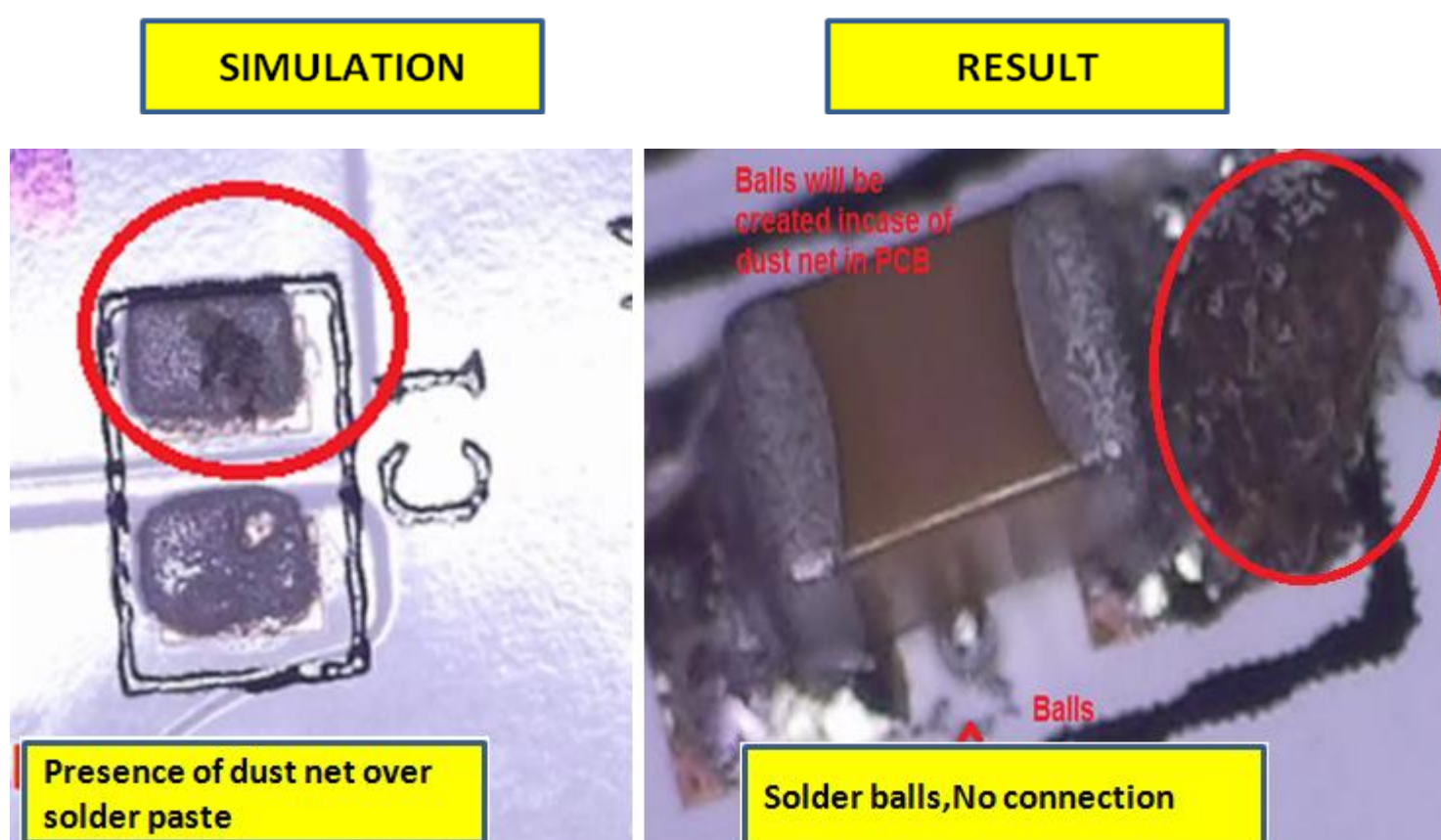




4.7. Below simulation explains the effect of sand over solder paste.



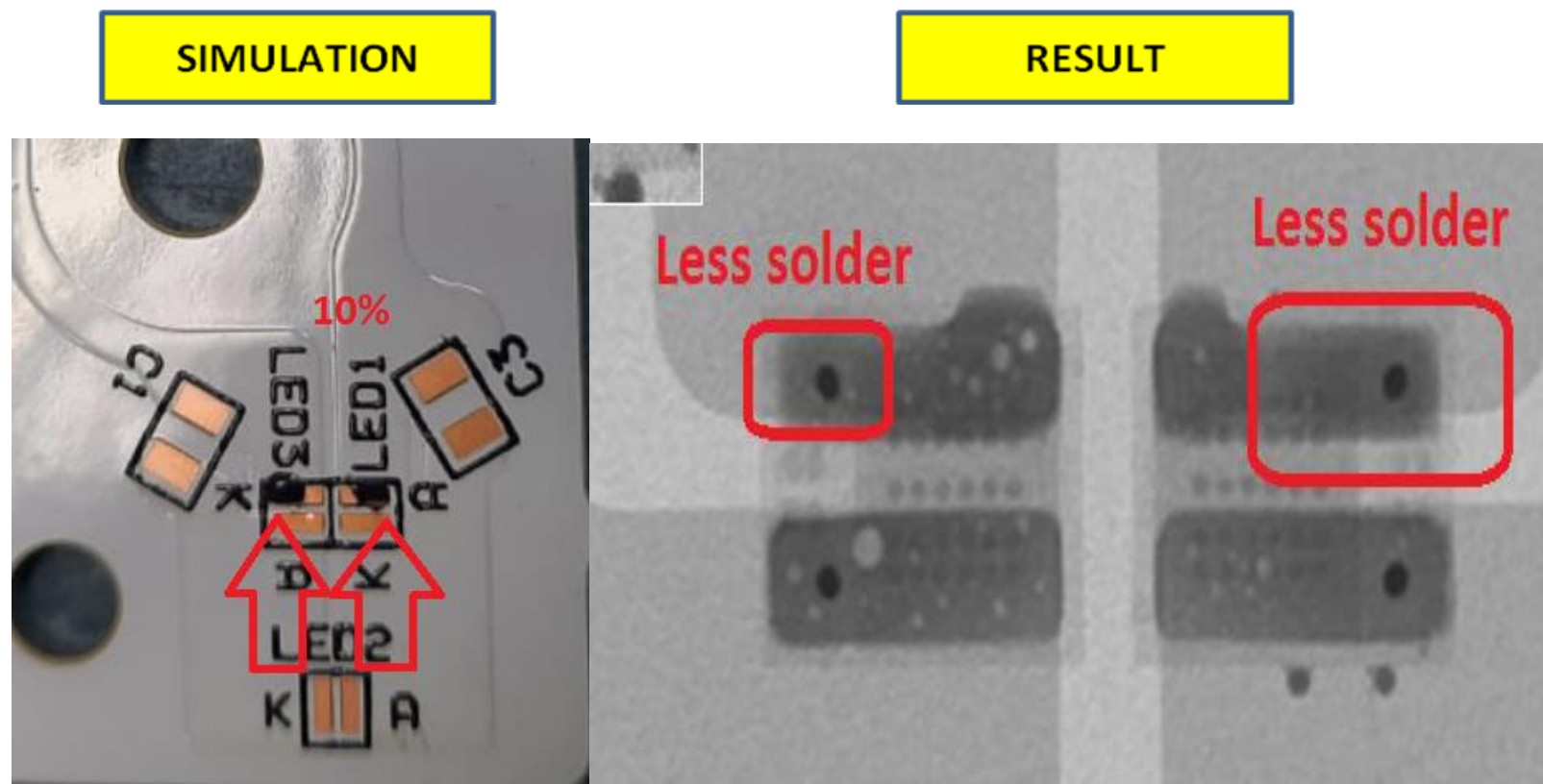
4.8. Below simulation explains the effect of dust net over solder paste.



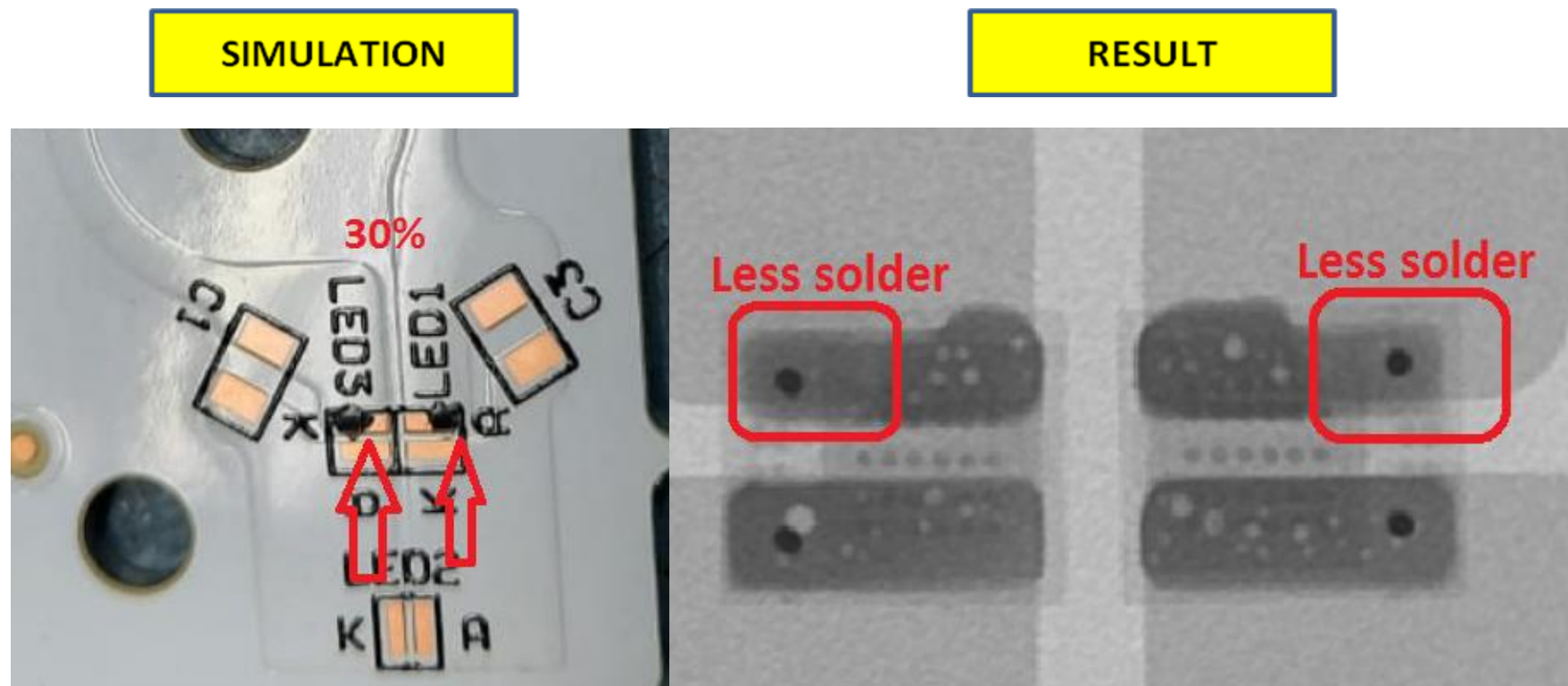
5. Presence of Silk screen ink over the solder pad- This also comes in FOD.

- Let us see how this presence of silk screen ink will affect the solderability of a bottom leaded component.
- Solderability of a bottom leaded component can be inspected only through X-Ray Inspection.

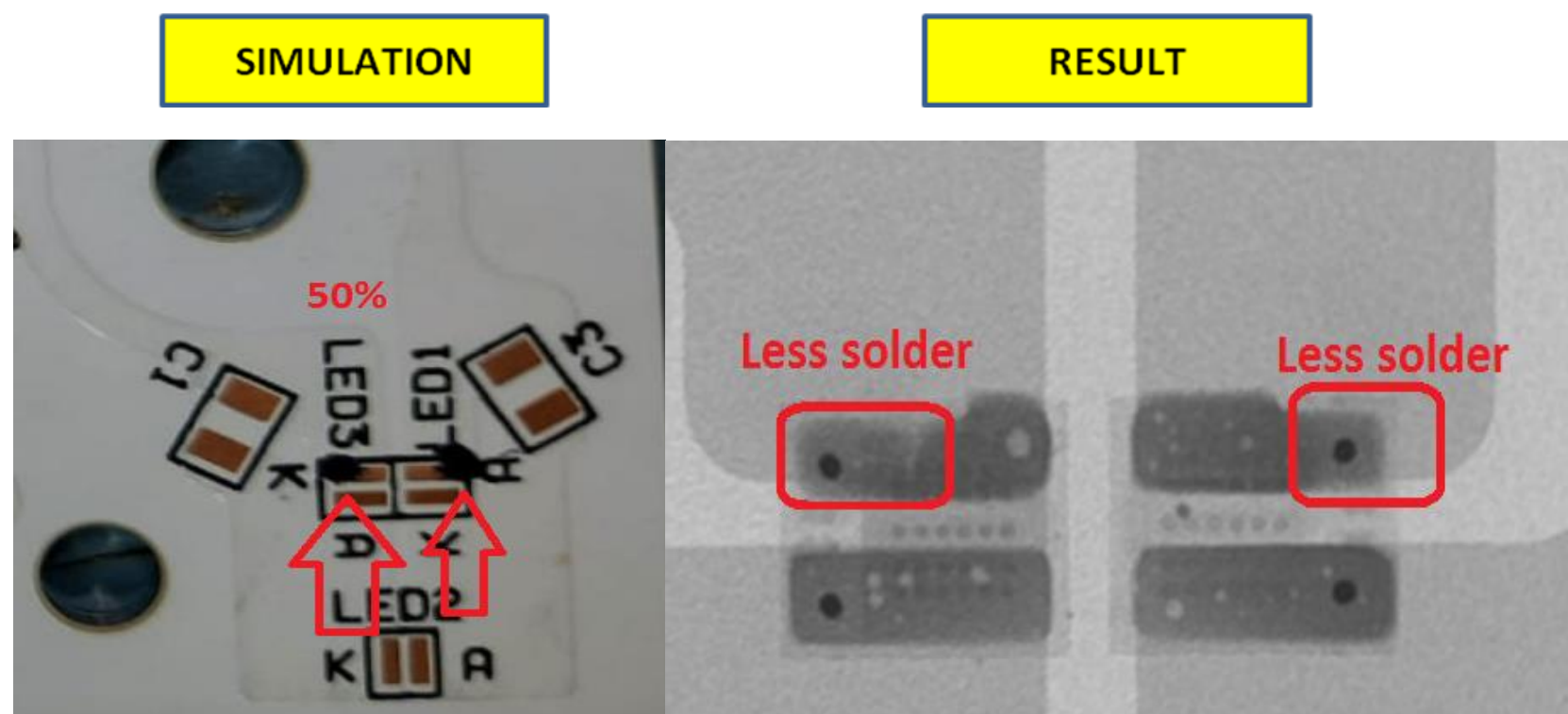
5. 1) Assume 10% of solder pad is ok and 90% of solder pad is covered with silk screen ink



5.2) Assume 30% of solder pad is ok and 70% of solder pad is covered with silk screen ink.

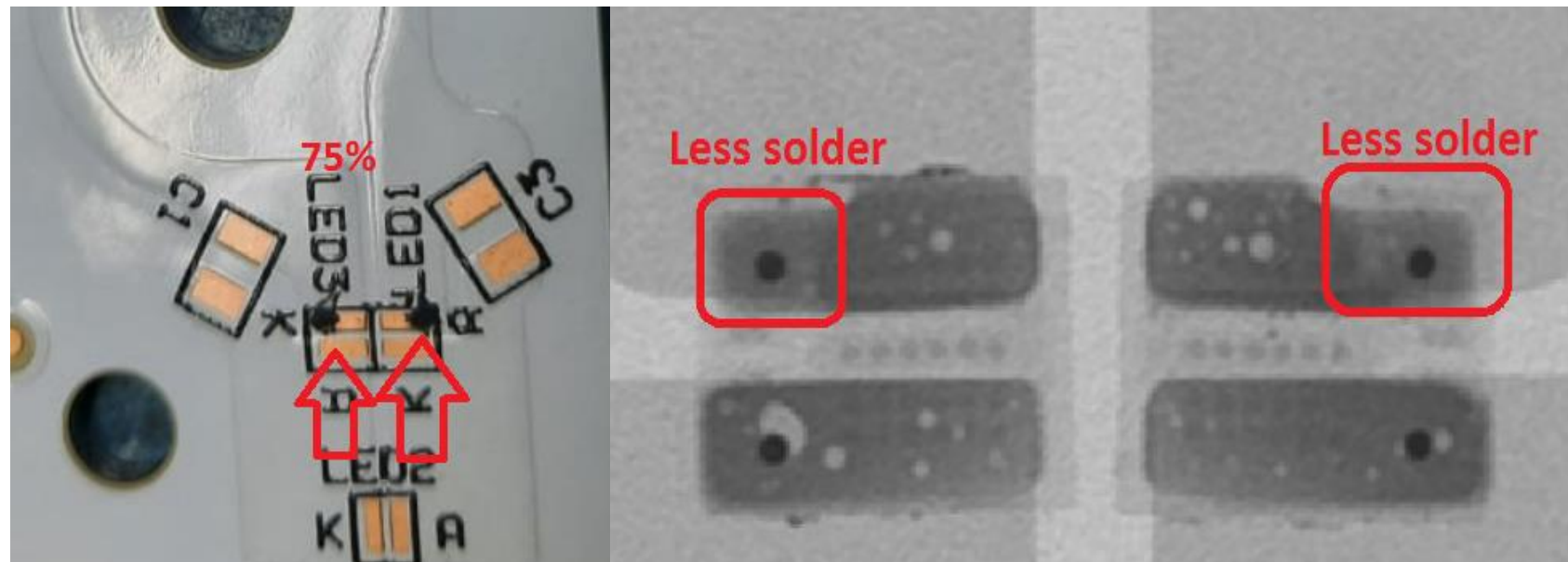


5.3) Assume 50% of solder pad is ok and 50% of solder pad is covered with silk screen ink .

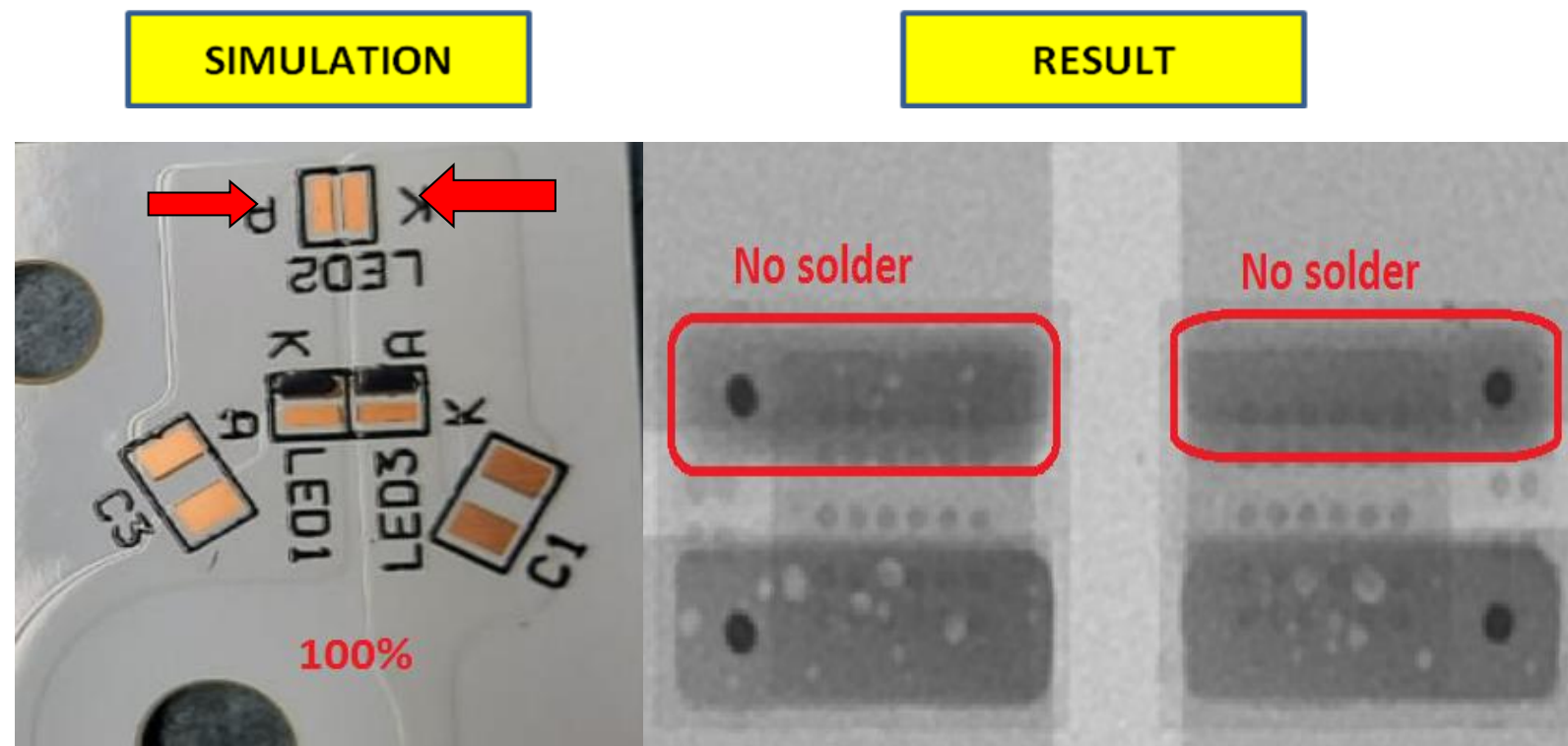


5.4) Assume 75% of solder pad is ok and 25% of solder pad is covered with silk screen ink.





5.5) Assume 100% of Solder pad is covered with silk screen ink .



6. Conclusion from the study of FOD (Foreign object Debris) :

Foreign object debris (FOD) is anything which can affect the electronic assembly. Especially it is very critical in Soldering application. FOD in solder paste, component lead, Solder pad/land & Stencil aperture is dangerous and to be eliminated.

Any damage attributed to FOD which could potentially degrade the product or system's required safety and/or performance characteristics.

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