ESRF	**Experiment title:** Non destructive in situ and ex situ 3D study of electromigration and thermomigration induced void formation and propagation in solder bumps	**Experiment number**: MA-1608
Beamline: ID15A	**Date of experiment**: from: 28 Nov 2012 to: 04 Dec 2012	**Date of report**: 28/02/2013
Shifts: 18	**Local contact(s)**: Mario Scheel (email: mario.scheel@esrf.fr)	*Received at ESRF:*

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Report:

This experiment is a continuation of MA1113. In the former experiments, we did ex-situ and in-situ characterization of 3 types of flip chip Pb-free solder under two different electromigration (EM) testing conditions. Our aim is to follow the so-called “pancake” voids growth at the bump interface, which is induced by EM. The basic experiment scheme was as follows. Use defined current density, we power six chips at the same time. For an every 24 hours' interval, we stop the powering and scan the sample by white beam laminography. Figure 1 shows the sketch of the sample. The upper-right corner of bump A is our region of interest, which is the so-called current crowding region and where the voids happen to grow.

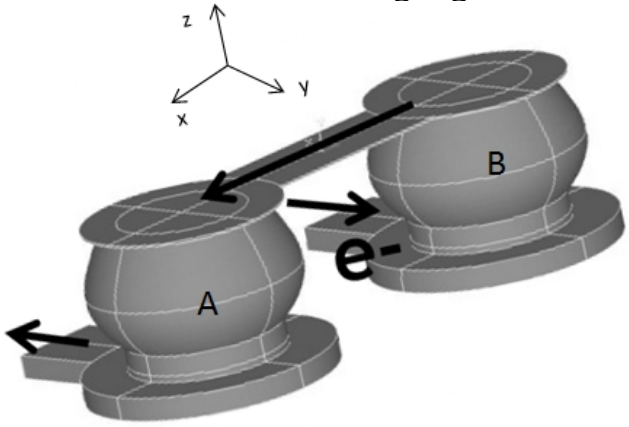

Figure 1

In the former experiment, we managed to power the sample up to 100 hours. We already observed dramatic changes (voids growth, coalesce etc.) in the bump. After we repower them again another 400 hours this time right before the experiment, we expected to observe more damages even failure of the sample.
Due to the high energy and high flux of ID15A, besides laminography scans, we were able to conduct tomographic scans on the same sample as well. Tomography will have higher out-of-plane resolutions and laminography will give better in-plane resolutions. We could combine the advantages of both and also compare them. Figure 2 shows two reconstructed slices. (a) is tomographic reconstruction and (b) is the reslice of laminographic reconstruction in Z direction (out-of-plane).

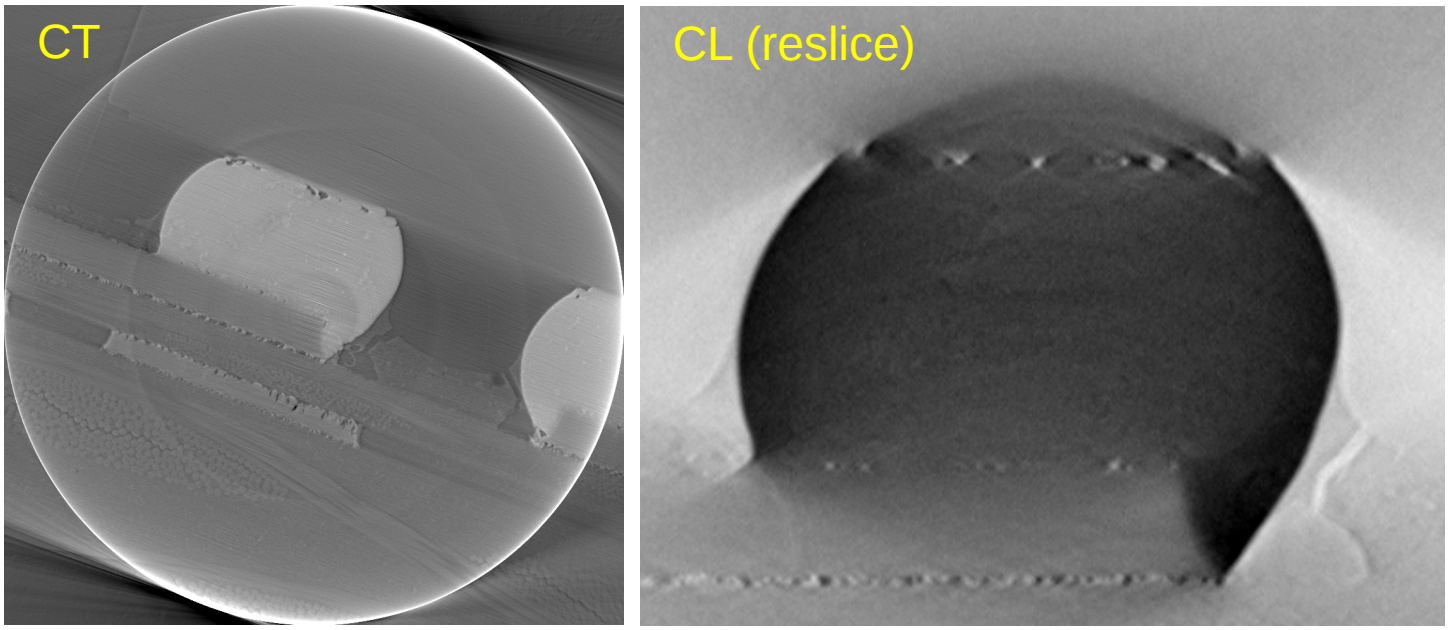

Figure 2. Reconstruction of CT and reslice CL respectively

More data are now being evaluated. We are about to summarize the results and prepare a manuscript mainly focus on ex-situ and in-situ quantitative EM evaluation by high resolution X-ray computed laminography.