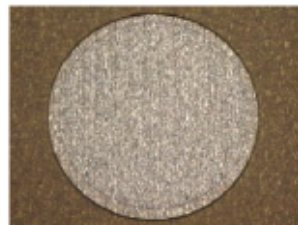
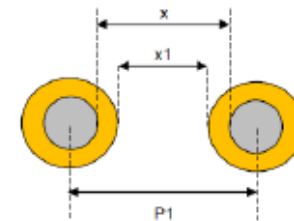
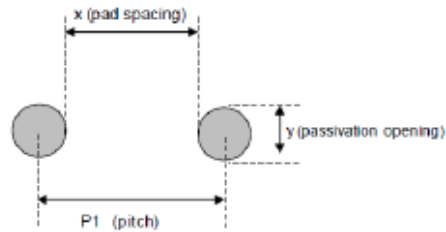
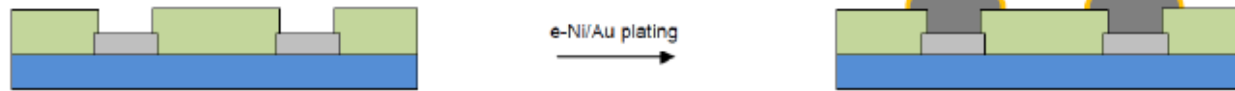


● Bumping at PacTech - UBM

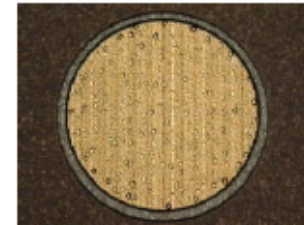
▷ UBM ENIG (Electroless Nickel Immersion Gold)

- ↳ Chips face up glued to tape, "re-assemble" wafer, no req. on placement accuracy
- ↳ Bath 1: "zincation", replace upper layer of Alu pad with reactive Zinc
- ↳ Bath 2: electroless deposition of Nickel on Alu pad with Zinc layer ($\sim 5 \mu\text{m}$)
- ↳ Electroless deposition of Gold, $\sim 50\text{nm}$
- ↳ Price tag: setup 4500 € per chip type, 20 .. 30 €/chip (depending on number of chips)



Aluminum Bond Pad

e-Ni/Au plating
→

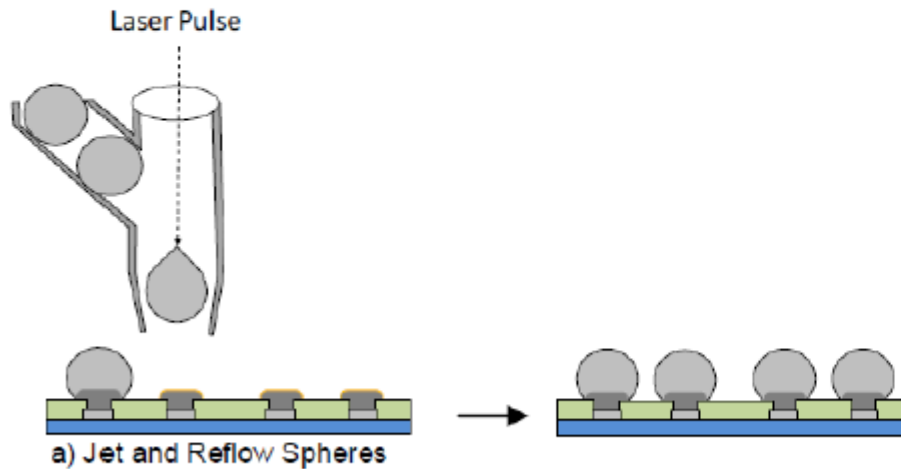


e-Ni/Au Plated Bond Pad

● Bumping at PacTech - balling

▷ Single Chip Solder Balling SB² (similar to Mannheim but now on ENIG, not Au Stud)

- ↳ **100 μm**
- ↳ ~~80 μm~~ SAC305 balls
- ↳ Already experience with PacTech service for HLL dummy ASIC production (DCD, SWB..)
- ↳ Still ball-by-ball single chip process but now out-sourced and on their own UBM
- ↳ Price tag: 2800 € setup per chip type, 16 .. 26 €/chip



Solder Placement with Laser Reflow (SB²-SM):

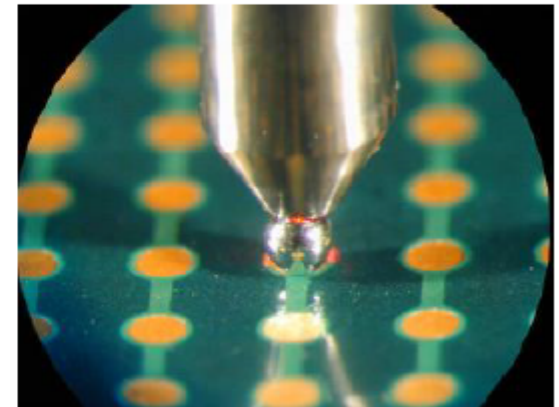
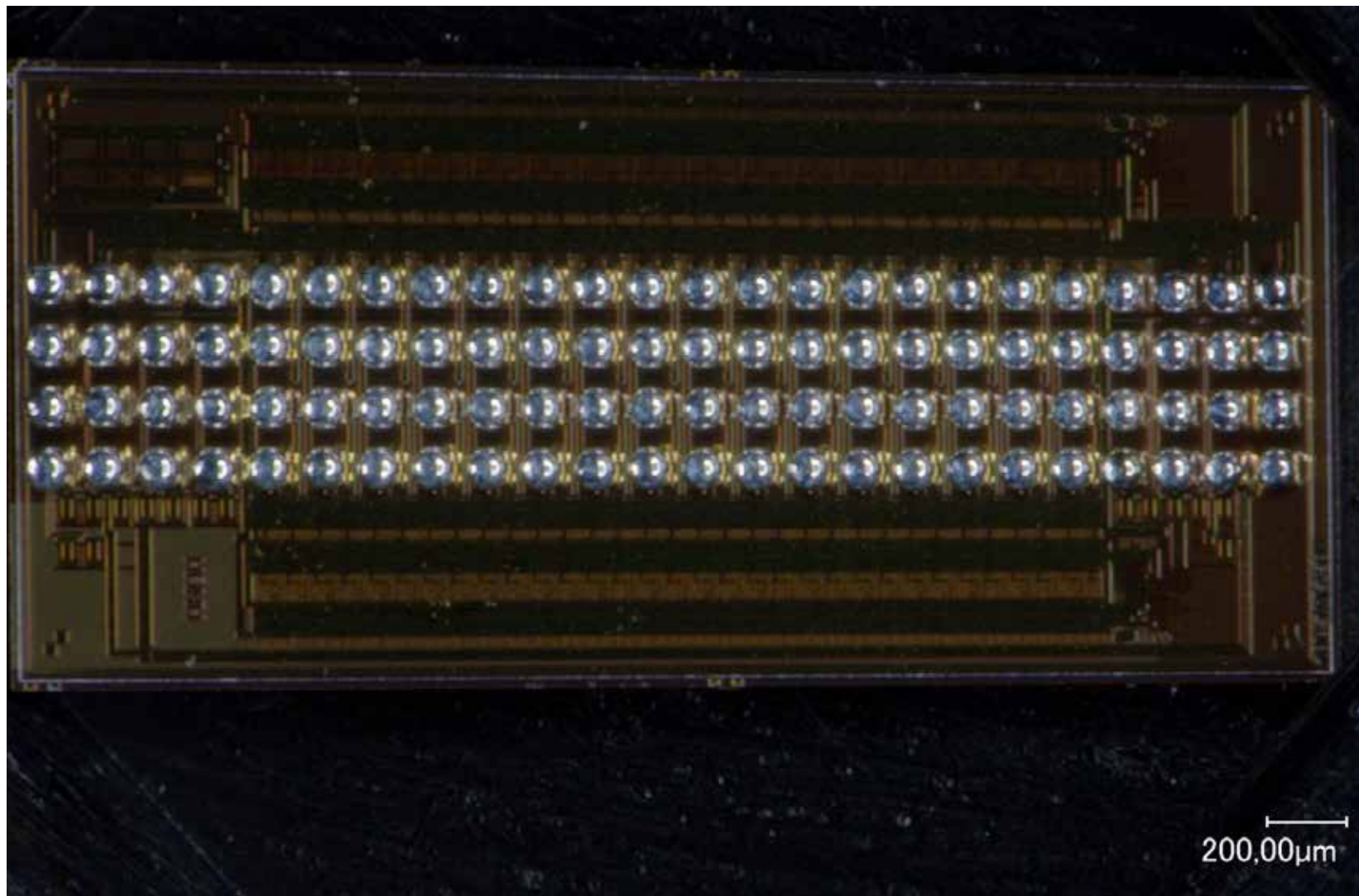


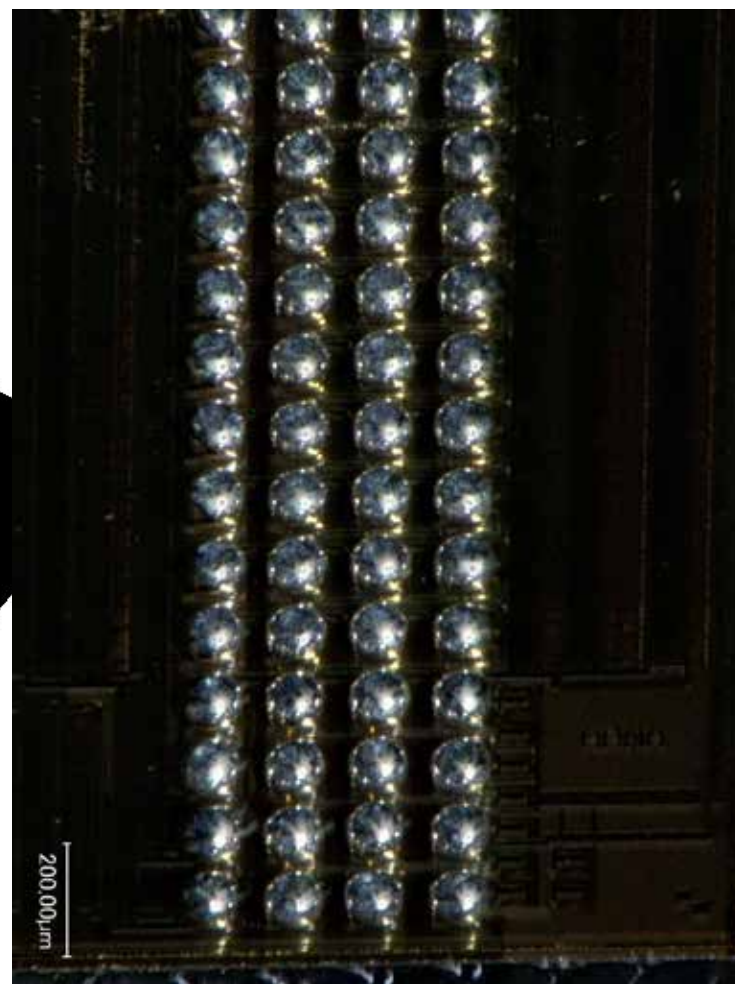
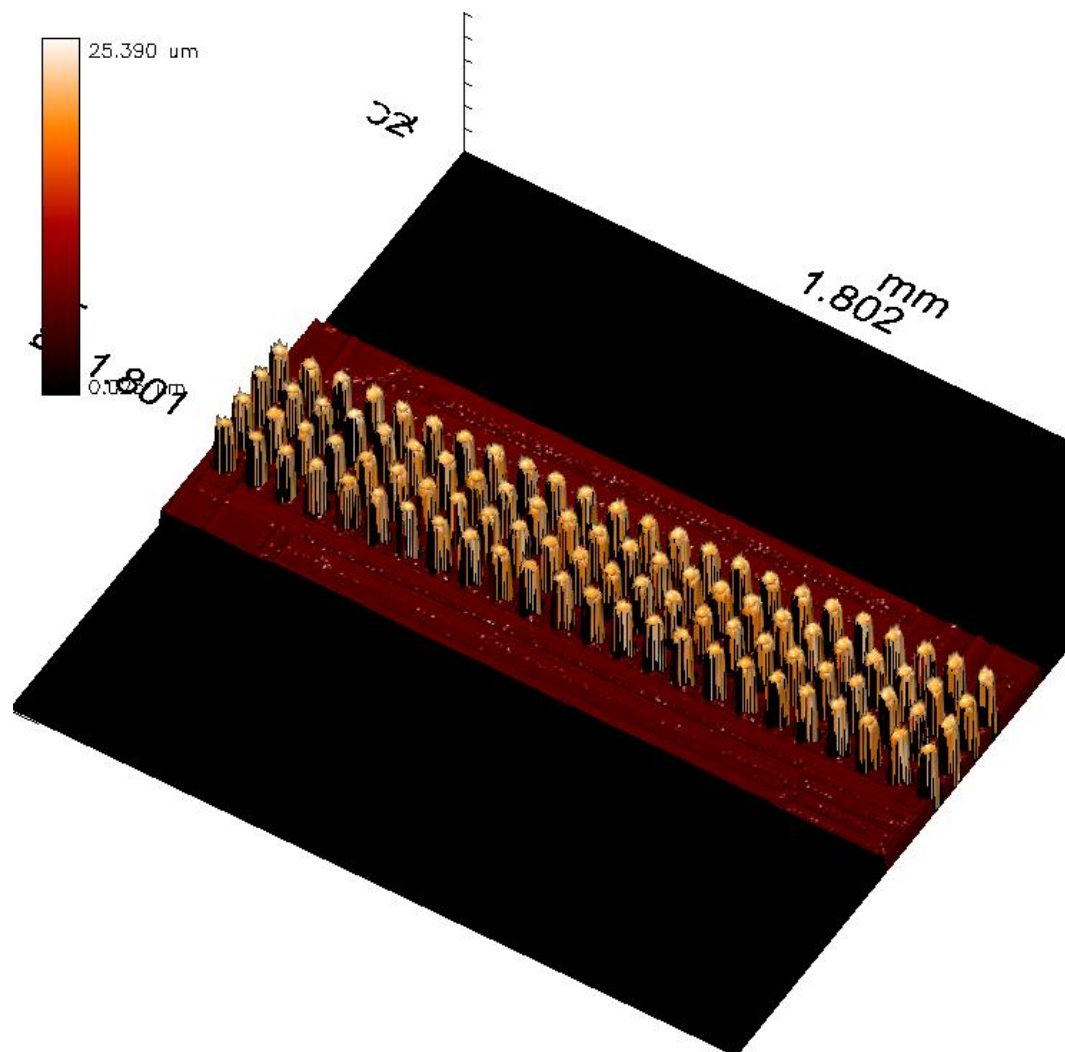
Image of PacTech's SB² tool dropping and laser reflowing a solder sphere.

6 June 2014: 20 hot SWB18 1.0 + 10 setup dummies sent to PacTech
:- received warnings because of scratches and probe marks on the pads
:- confirmed that we take the risk

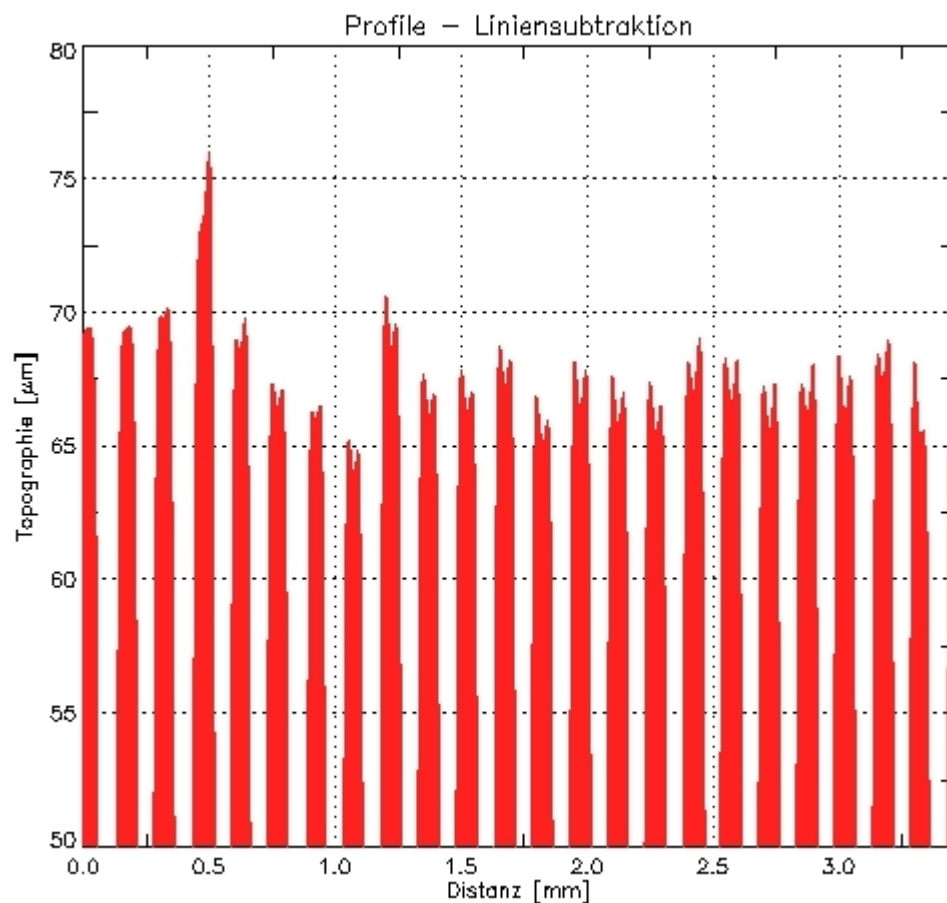
10 July 2014: received 20 bumped hot chips + 6 from setup



- Bump height à very homogeneous

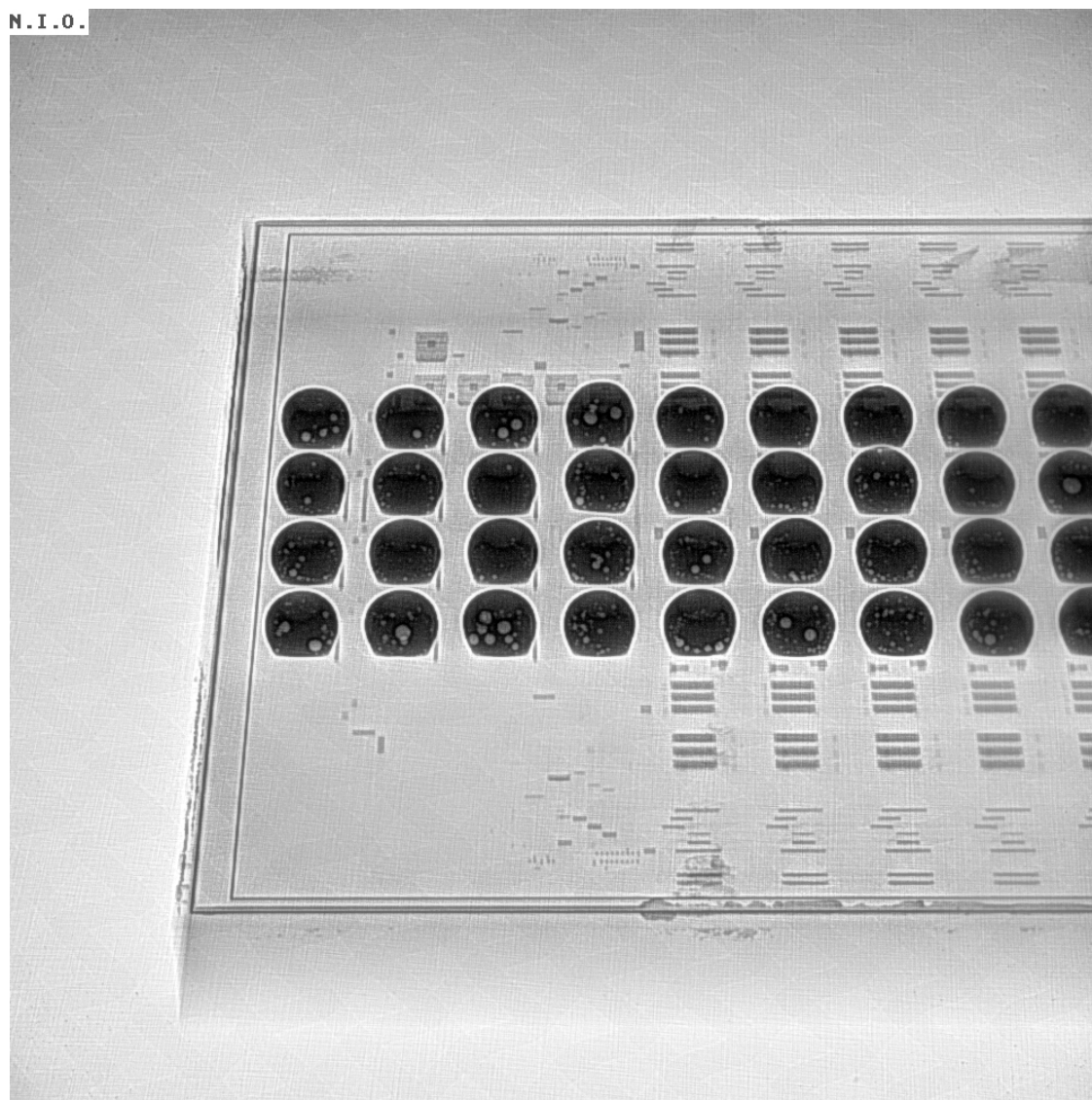


- Bump height à very homogeneous

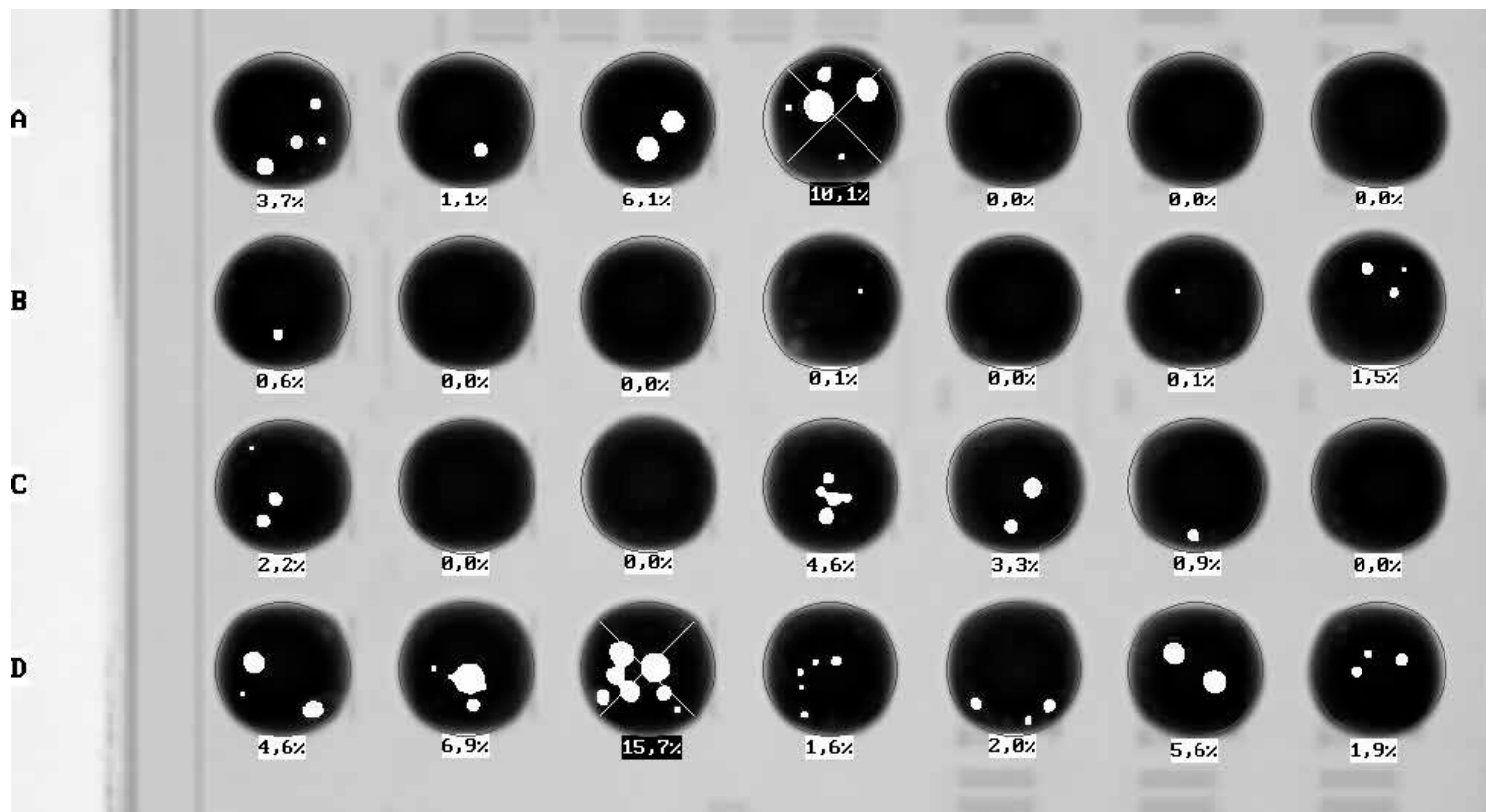


One row of a sample: $\sim 67 \mu\text{m}$ (-2/+8)

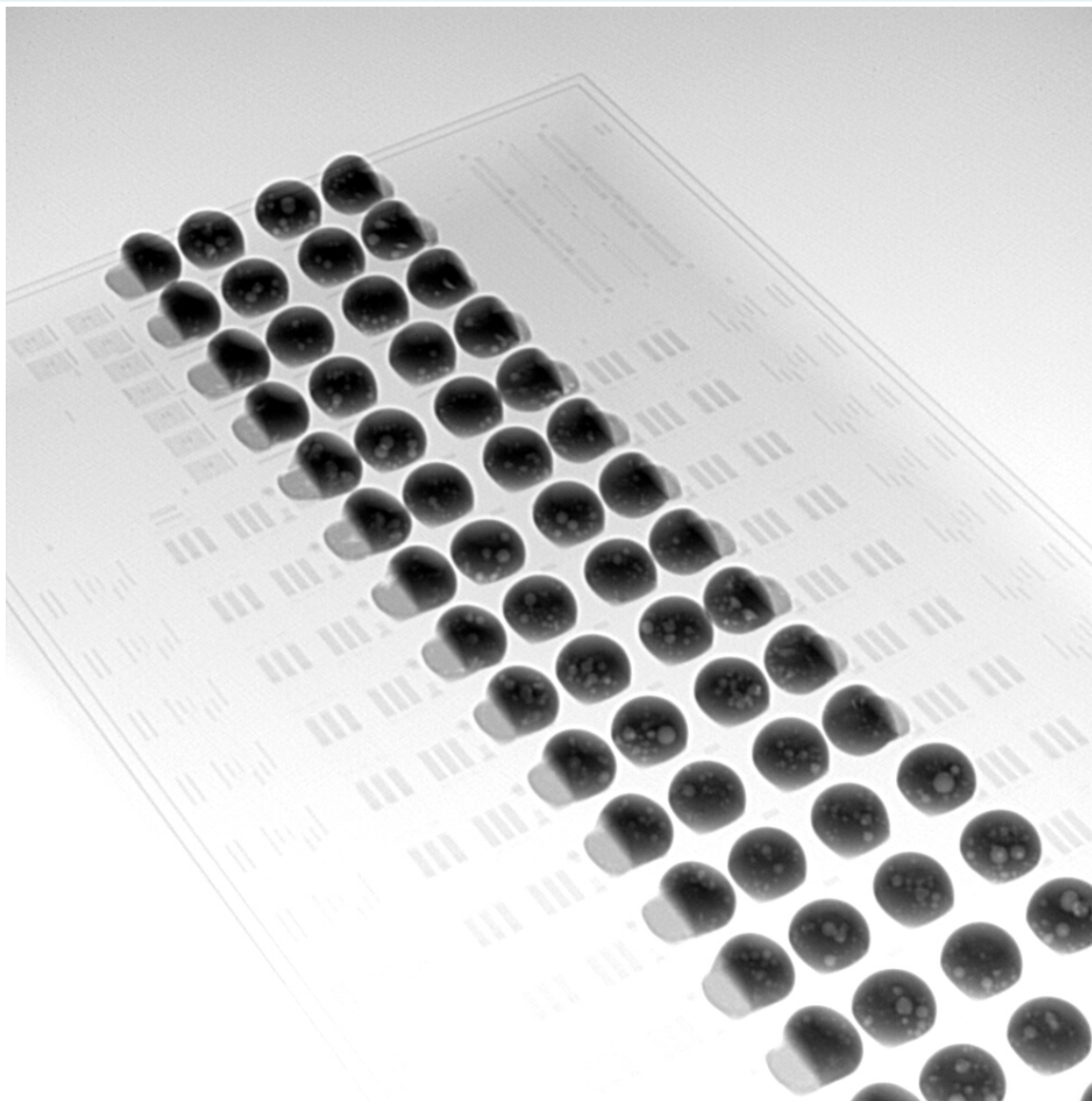
- X-ray à some blisters, <20%, acceptable



- X-ray à some blisters, <20%, acceptable

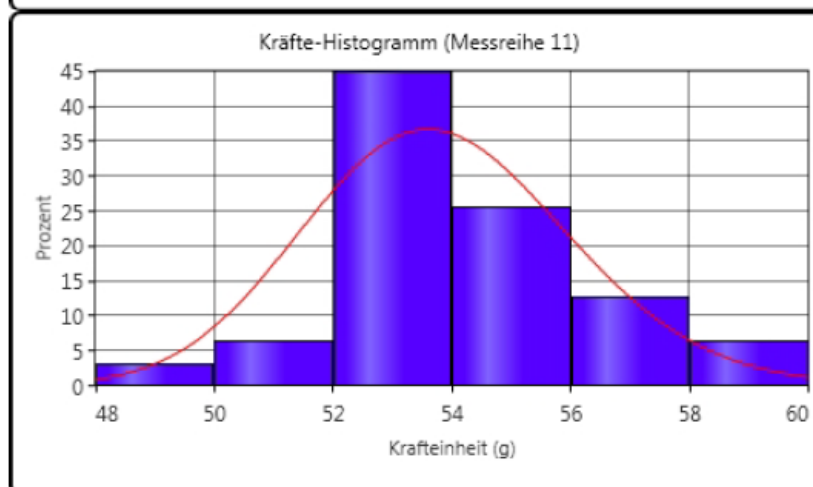
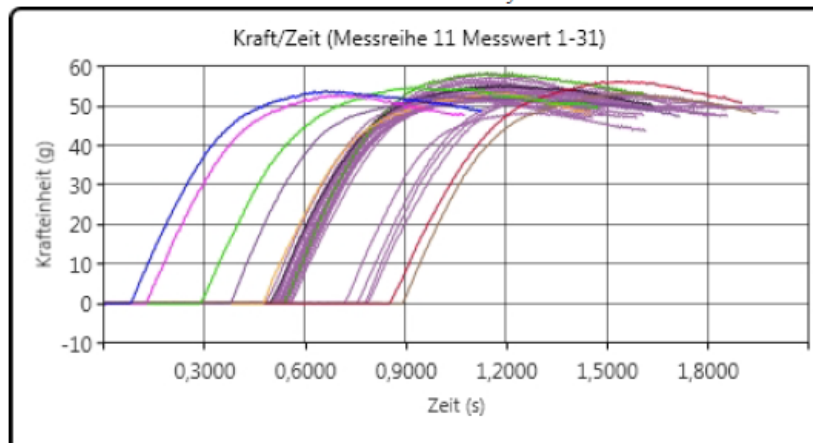


- Shear tests



● Shear tests

Total number of tests: 31
 Projekt: SWT PacTech SAC
 Datum: 14.07.2014
 Bauteil: SWT Dummy 2



● Shear tests

Kräftestatistik (Messreihe 11)			
Mittelwert (Kraft)	54,095 g	Standardabweichung (Kraft)	2,1401 g
Minimum (Kraft)	48,388 g	Maximum (Kraft)	58,438 g
Bereich (Kraft)	10,050 g		
Fehler	0		
Cp	keine Spezifikationsgrenzen	Cpk	keine Spezifikationsgrenzen
oberes Vertrauen	keine Spezifikationsgrenzen	unteres Vertrauen	keine Spezifikationsgrenzen
Benutzer	Danilo	Maschine	20187112
Ergebnis	31	gespeichert	14.07.2014 11:34
Projekt	SWT PacTech SAC	Datum	14.07.2014
Bauteil	SWT Dummy 2		

Destructive tests summary

Number of tests:	31
Mean - 3 * standard deviation:	47,675 g
Minimum load:	48,388 g
Maximum load:	58,438 g
Mean:	54,095 g
Standard Deviation:	2,1401 g

All ball shear, 54g/bump à pass