REPORT: Solar cells cutting by Laser-MicroJet®

for Anonymous

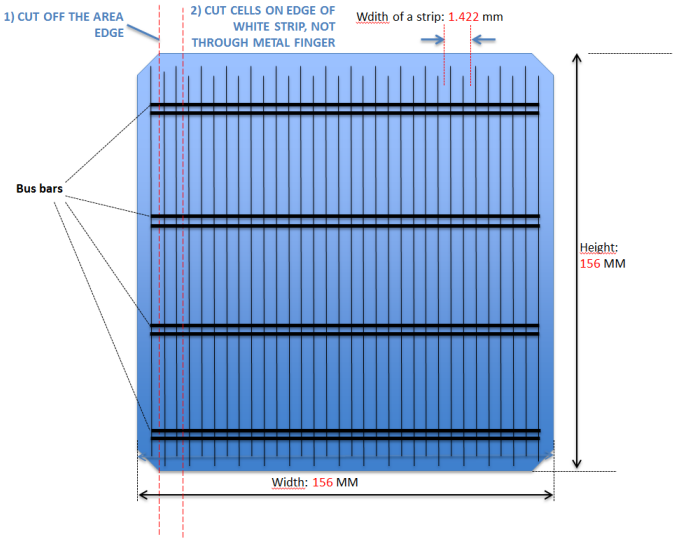
by Florent Bruckert, Synova SA

TASK

The Laser-MicroJet® technology has been tested for cutting 4 specific ZEBRA solar cells.
The aim is to prove that the Laser MicroJet® technology permits to cut solar cells efficiently.

SAMPLE DESCRIPTION

SUPPLIED MATERIAL	Material	Mono-crystalline Si + metallic fingers
	Description	156 X 156 X 0.17 mm^3 mold
	Quantity	3

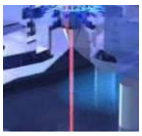


PICTURE 1: Drawing of the pattern to cut.

Release of application report			
Project Leader		Industry BU Responsible	
Name:	Mr Florent Bruckert	Name:	Dr Carron Benjamin
Date:	28.05.2013	Date:	30.05.2013
Visum:	FBR	Visum:	BC

PROCESS: INSTRUMENT & TEST PARAMETERS

For this application, the LCS300, equipped with a frequency doubled, Q-switched, Nd:YAG laser, has been selected as the best machine configuration available in the lab.
In the table below, the optimised processing parameters used in the experiments are summarised:

	**SYSTEM**	Machine type	LCS300
		Fixture	Clamped
	**MICROJET® PARAMETER**	Nozzle diameter	50 *µm*
		MicroJet® diameter	42 *µm*
		Water pressure	300 *bar*
		Working distance	12 *mm*
		Assist gas	He
	**LASER AND CUTTING PARAMETERS**	Laser type	L101G
		Wavelength	532 *nm*
		Laser repetition rate	7 *kHz*
		Power in the laser head	18.5 *W*
		Power in the waterjet	12 *W*
		Pulse width	100 *ns*
		Number of passes	7
		Process time per strip	30 *s*
		Effective cutting speed	14.3 *mm/s*

RESULTS

Optical pictures are not significant of the quality of the cut.
Only an IV-curve under a low illumination (<1 sun) will be interesting on the LaserMicroJet® ability to cut your specific ZEBRA solar cells with a low loss of efficiency
Concerning a classical mono-crystalline solar cell, we can assume a loss lower than 2.5%rel which is similar to the scribe and break process. Nevertheless, the cracks are limited and all shapes are possible.

CONCLUSION

The cutting of solar cells was performed with a SYNOVA LCS 300. This machine is based on the MicroJet® technology and combines the advantages of the high energy pulsed laser with a hair-thin water jet. While the laser is used for material ablation, the water jet is used for guiding the laser light, cooling the edges and preventing the sample from particle contamination, advantages that are essential for cutting crystalline solar cells.

These tests show that:

- There is a good repeatability of the process for this material.
- The cutting walls are parallel by optical analysis.

We are open to further discuss your needs regarding:

- The cutting speed / process time.
- The generated micro-cracks.

We thank you for your interest in our technology and we hope our results meet your requirements. Our sales agent will contact you soon to obtain a feedback about the analysis of these results and to discuss with you the further steps.