

ePIC SVT WP3 Electrical Interfaces Meeting
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1

Al-wire bonding to Al-based FPCs from LTU: some obtained results

RPE LTU:

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Outline

2

- ❖ Reasons for activity
- ❖ Some comments
- ❖ Structures and steps for wire bond tests
- ❖ Used wedge wire bonder, wire and wedge
- ❖ Preliminary obtained results
- ❖ Possible next steps
- ❖ Conclusions



Reasons for activity

3

- ❖ For realization of the interconnection in ePIC SVT detector layers/modules SpTAB technique has lot of advantages but seems not applicable in all cases/areas
- ❖ For optimal realization of the detector layers/modules for ePIC SVT it seems that combination of SpTAB and wire bonding techniques need to be implemented/used
- ❖ SpTAB technique is relatively well worked-off by LTU for own aluminium-polyimide materials but wire bonding is not well worked-off

Some comments

4

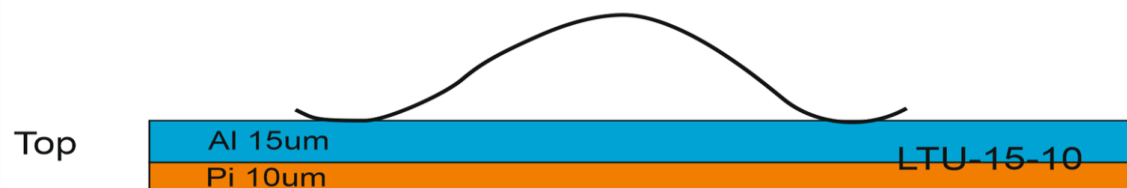
- ❖ Wire bonding was not considered significantly in the past by LTU team because it was not required and SpTAB was preferable/sufficient for the created flexes/modules/units and lead to some advantages/features (which were not possible to realize with wires)
- ❖ Some attempts of wire bonding to aluminium-polyimide materials were performed in the past but results were not to promising (possible reason is using standard/hard wire)
- ❖ At LTU equipment for wire bonding is available (Delvotec 6400) but it is tuned for SpTAB and for wire bonding the bonder need to be/might be retuned (can be done) but, unfortunately, significant experience in wire bonding is not present yet (time is needed)
- ❖ Taking into account possible needs of wire bonding for ePIC SVT, LTU was asking colleagues from GSI DetLab to assist and to define possibility of wire bonding to LTU's materials
- ❖ Performed tests by colleagues from GSI DetLab are preliminary and bond parameters were investigated not very precisely (but sufficient for this task) and it might be possible that some optimization of the bond parameters might be needed in the future

Base structures and steps for the tests

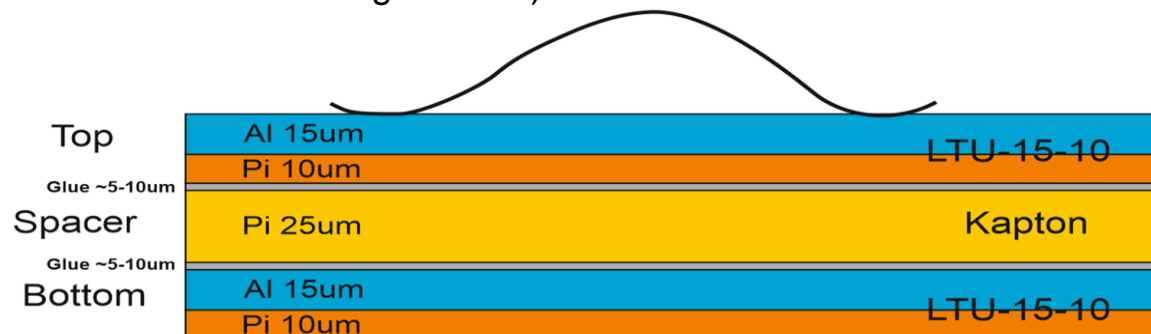
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❖ Wire bond tests were performed on following structures

➤ Single-layered (LTU-15-10 material)



➤ Multilayered structure (LTU-15-10+Kapton 25um + LTU-15-10 similar to ePIC FPC and similar ultralight flexes)



Note:

Similar tests were carried-out for thicker aluminium-polyimide material LTU-30-20 and multilayered structure based on LTU-30-20 and Kapton 50um thick

❖ Tests were carried-out according to following steps:

- investigating/choosing (preliminary) bond parameters
- performing wire bonds
- pull-tests of wire connections

Used bonder, wire and wedge

6

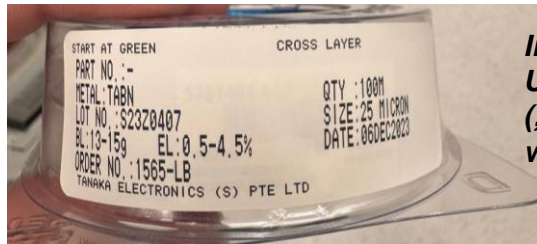
- ❖ Used wedge wire bonder:

Delvotec M17 series



- ❖ Used wire:

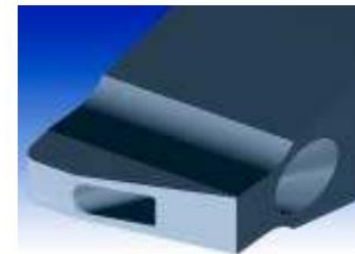
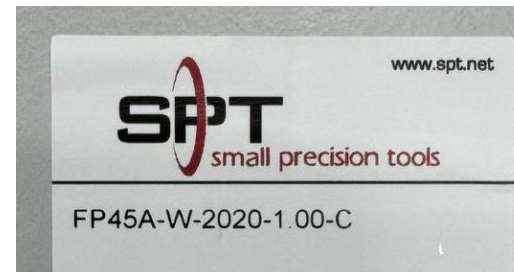
Tanaka TABN type 25um Al wire



Important note:
*Used wire is TABN Type
(,,soft,, wire , Al-1% Si,
with Nickel doping)*

- ❖ Used wedge:

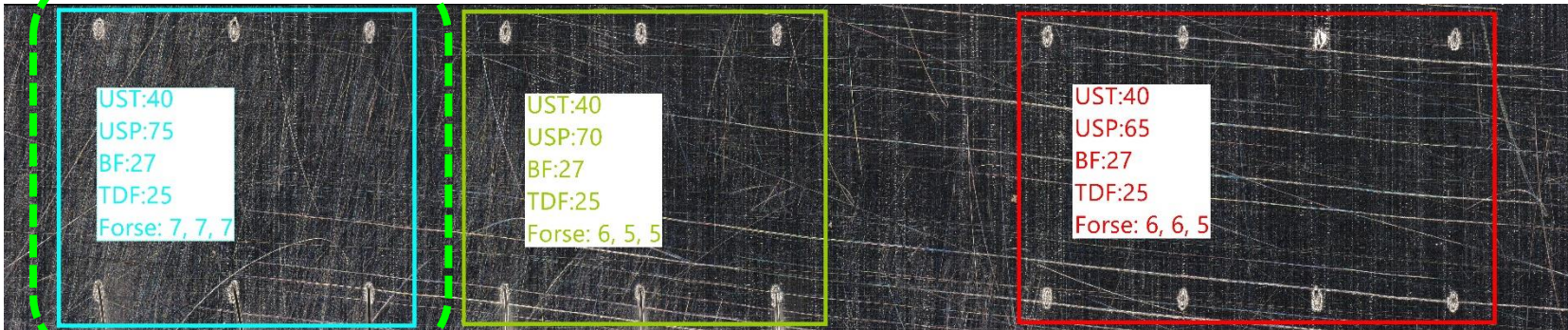
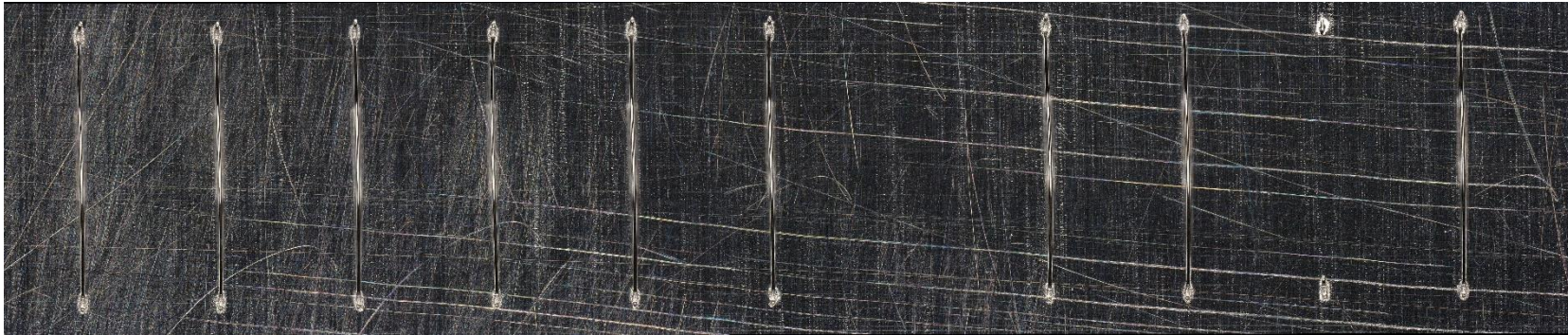
SPT FP45A-type



Preliminary obtained results

7

❖ Photos of bonded wires



❖ Outcomes:

- Obtained results are promising
- Such wire can be bonded to chosen films/structures based on adhesiveless aluminium-polyimide materials from LTU
- FPC (object on which wire is bonding) need to be fixed very well (e.g. by vacuum)

Thanks to colleagues from GSI Det Lab (Dr. C.J.Schmidt, C.Simons, R.Visinka, O.Suddia) for performed wire bond tests

Possible next steps

8

- ❖ Providing some test structures (similar to described above) for further verifying/investigating wire bonding to adhesiveless aluminium polyimide materials/structures at other labs (e.g. Birmingham, Liverpool)
- ❖ Designing and manufacturing daisy chain structures (both for SpTAB and wire bonding)
- ❖ Tuning wire bonding technique at LTU and perform some investigations
- ❖ Preparing proposal on possible realization of combined (SpTAB+wire) interconnection approach for ePIC SVT

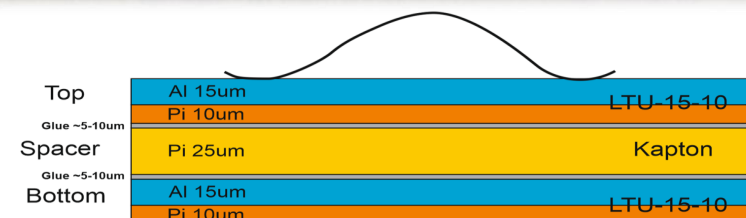
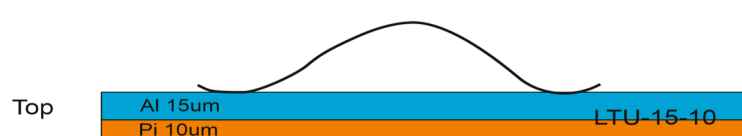
Test structures for wire bonding

9

Single layered structure



Multilayered structure



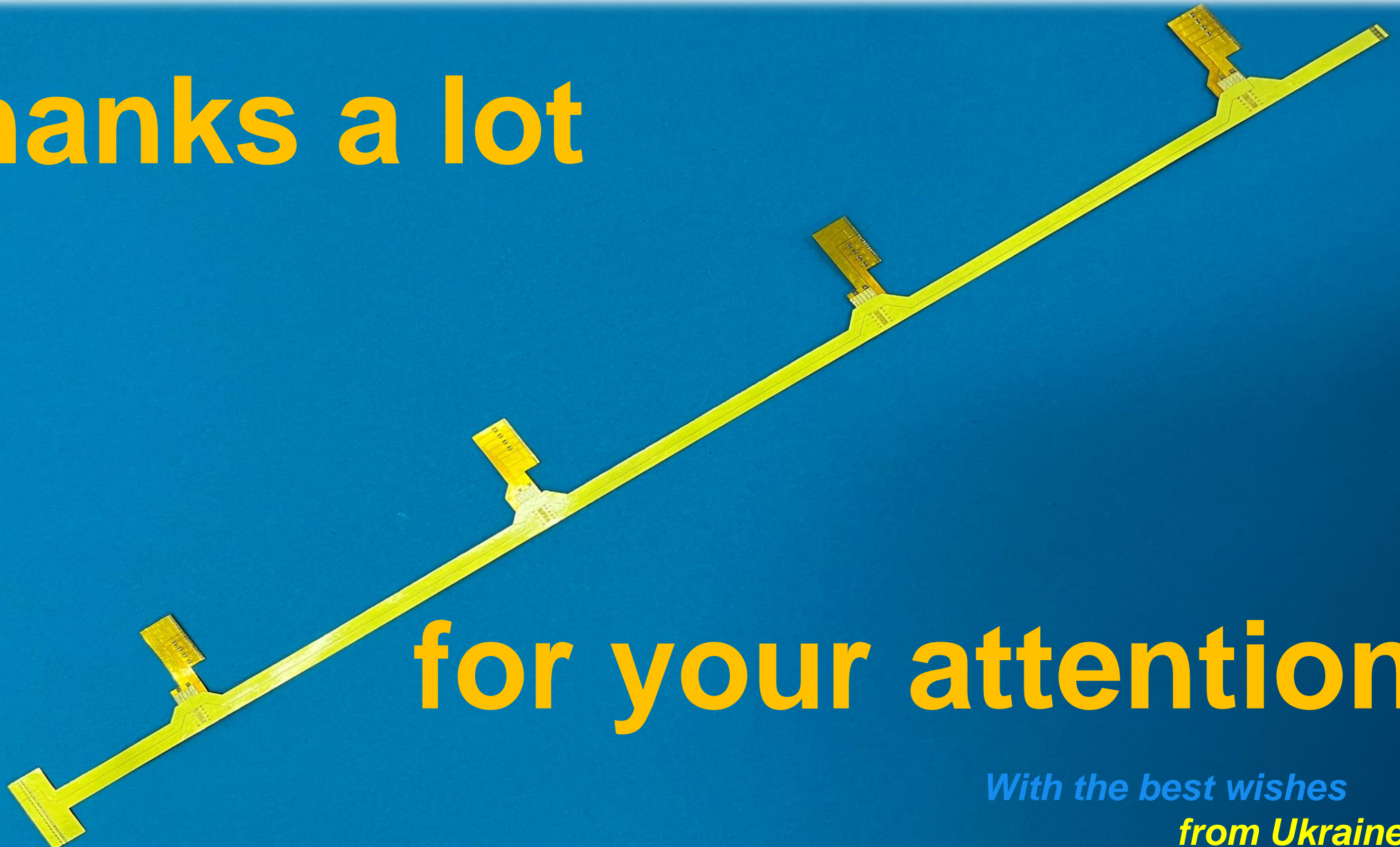
Note: test structures are already on their way to the UK (Oxford University)

Conclusions

10

- Some activities on possible using wire bonding as interconnection technique for connecting to FPCs from LTU's materials within ePIC SVT were performed
- Based on preliminary wire bond tests performed by colleagues from GSI DetLab wire bonding to aluminium-polyimide adhesiveless dielectrics (both to single layered/foil material and to multilayered) seems possible and obtained results look promising
- Need to be noted that for wire bonding tests „soft,, wire was used (Tanaka TABN type, with Nickel doping)
- Obtained results might be a good starting point for performing further more detailed investigations

Thanks a lot



for your attention!

*With the best wishes
from Ukraine!*