Frontend Contact Technologies

Aim & Requirements

- long-term stable contact between sensor and readout electronics

Materials:

- Gold (electrode of GaAs/Si sensor, coated track of pcb/flex pcb)
- others?

Geometry:

- ‘coarse’ grid (few mm)
- very small height (200 ... 500µm)
- ‘long’ distance to frontend electronics (max. sensor length)

Electrical:

- extremely low current
- HV safe (?)
- low crosstalk, low capacitance

Frontend Contact Technologies

Current situation

- **sensor** with Au covered electrode pads
- **fanout**: flex pcb to frontend electronics (Au coated)
- **wire bonding** at sensor side
- **connector** at electronics side
- fixation by some glue dots

Advantages:

- known technology
- in-house manufacturing
- long term stable
- repairable

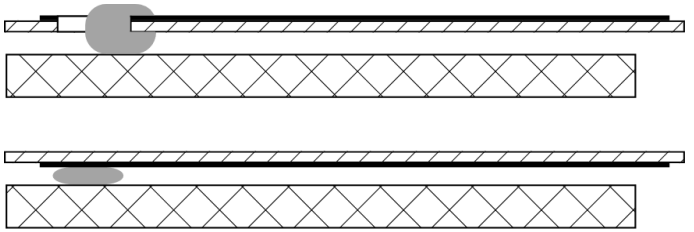
Disadvantages:

- touchy wire bond
- ‘high’ loop of bond wire

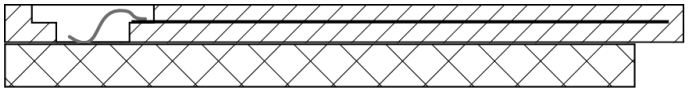
Frontend Contact Technologies

Alternatives (w.r.t. sensor contact)

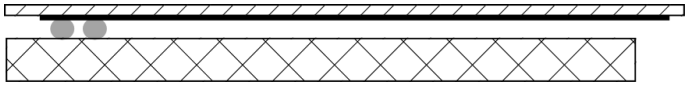
- conductive glue



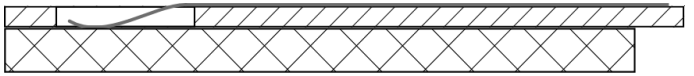
- flat loop wire bonding



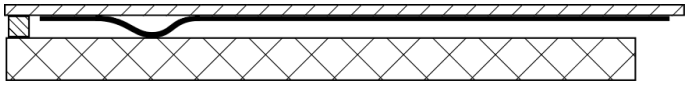
- bump bonding



- tab (‘tape automated’) bonding



- spring loaded contact



Frontend Contact Technologies

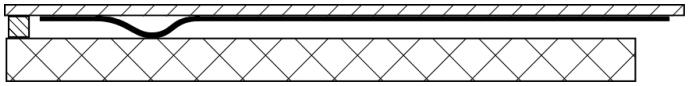
Survey

- Conductive Glue:
  - elasticity and resistance inversely proportional
  - low resistance contact suspect to thermal damage
- Flat Loop Wire Bonding
  - feasible with loop height ~ 100µm
  - flex pcb with buried copper layer
- Bump Bonding:
  - established for small grid, small balls
  - big grid: **very** problematic (thermal distortion! underfill)
  - better prospects with ceramic pcb (expensive, ≥ 2mm height!)
- Tape Automated Bonding
  - should be feasible (for small grid and small sizes)
  - should meet lab technology (standard wire bonder)
    - however: outdated technology (production of ‘tapes’ no longer supported)

Spring Loaded Contact (1)

according to GED company quote:

- semi-flex pcb
- contacts are molded bumps (compare contacts of small size push button)



Advantages:

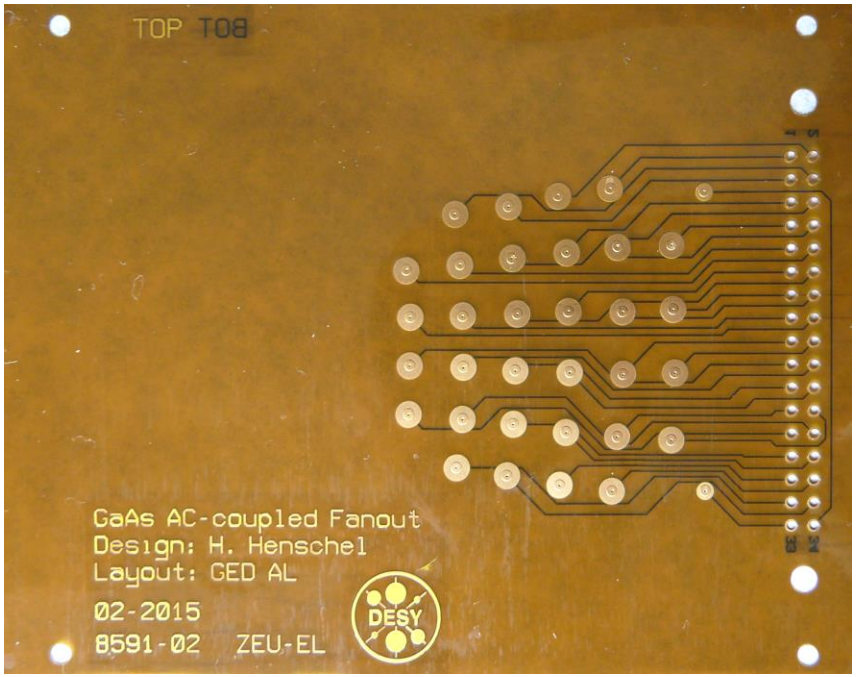
- assembly without thermal treatment
- robust against thermal impact and concussion
- residue-free removal
- easy exchange of either parts

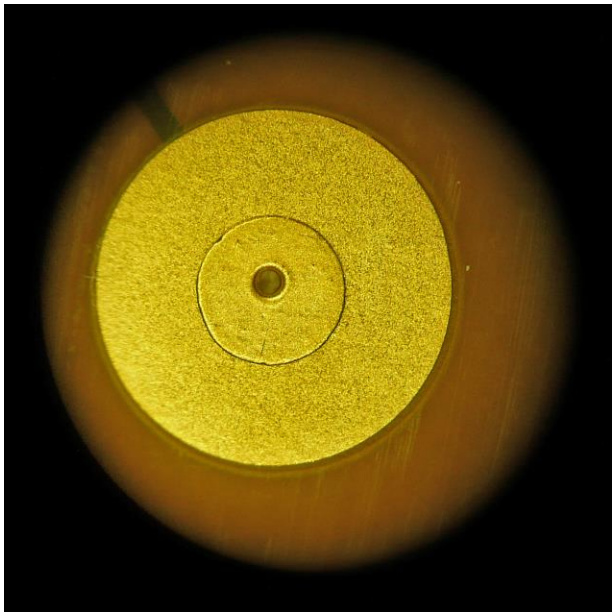
Disadvantage:

- contact force to be permanently maintained (spacer required)

Spring Loaded Contact (2)

- Sample production at GED company
- Contacts **NOT** spring loaded! Just embossed
- Nevertheless ...





Spring Loaded Contact (3)

- First contact (resistance) tests [Ohms]
  (Au coated fanout on Cu contact gauge)
- Series of three measurements
  in two different clamps throughout two days
- NO fail! No degradation.

	Sector 1	2	3	4	5	6
Ring 11		0.43	0.30	0.23	0.23	
10	0.43	0.40	0.33	0.37	0.27	0.33
9	0.30	0.30	0.27	0.33	0.27	0.27
8	0.77	0.23	0.23	0.53	0.23	0.27
7	0.30	0.27	0.23	0.27	0.20	0.30
6		0.37	0.27	0.23	0.23