



TOMSK STATE UNIVERSITY

Sapphire X-ray sensors: construction and characterization

Workshop on sapphire detector construction

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remote meeting

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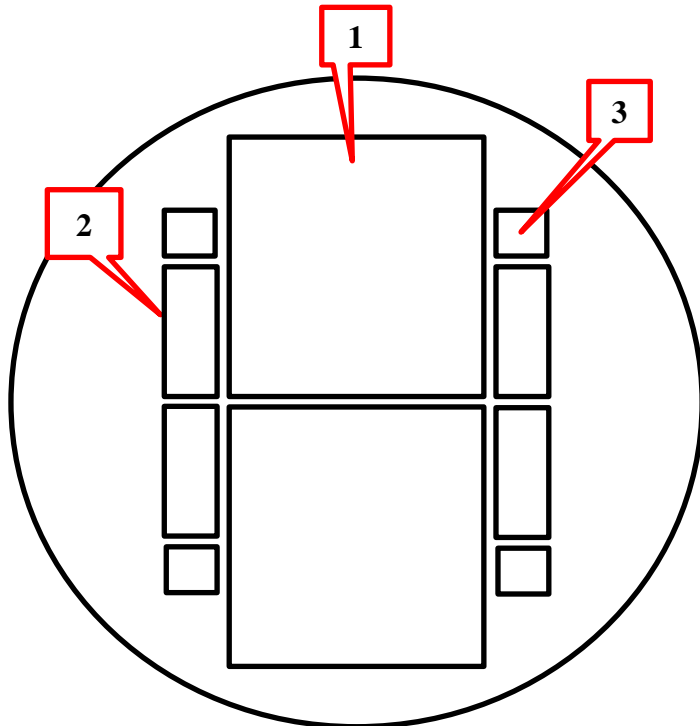
Tomsk, Russia

Sapphire X-ray sensors construction

The wafers were used for sensor producing

- Three wafers from different producers were pixelated:
 - Wafer # 1 - Monocrystal Ltd (Russia), 30 mm*48 mm, and 0.15 mm thick;
 - Wafer # 2 – SITUS Technicals GmbH (Wuppertal, Germany), 50 mm diameter, and 0.1 mm thick.
 - Wafer # 3 – US university (US), 50 mm diameter, and 0.15 mm thick.

Sapphire microstrip sensor layout

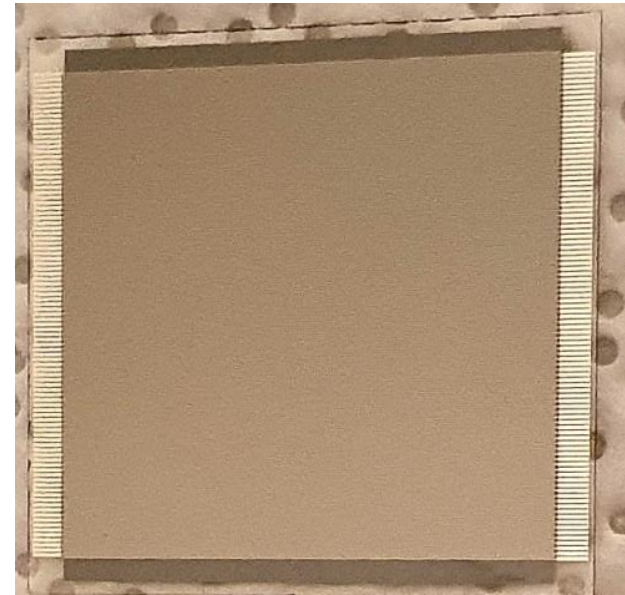
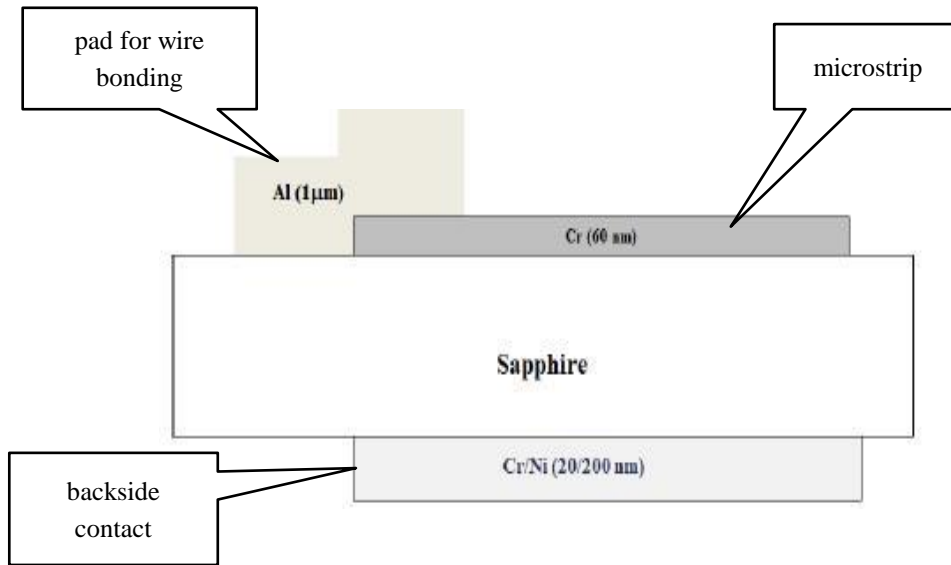


1 – 192 channels microstrip sensor
with sizes of $23 \times 22 \text{ mm}^2$

2 - 4 channels microstrip sensor
with sizes of $3 \times 11 \text{ mm}^2$ (10 mm strip length)

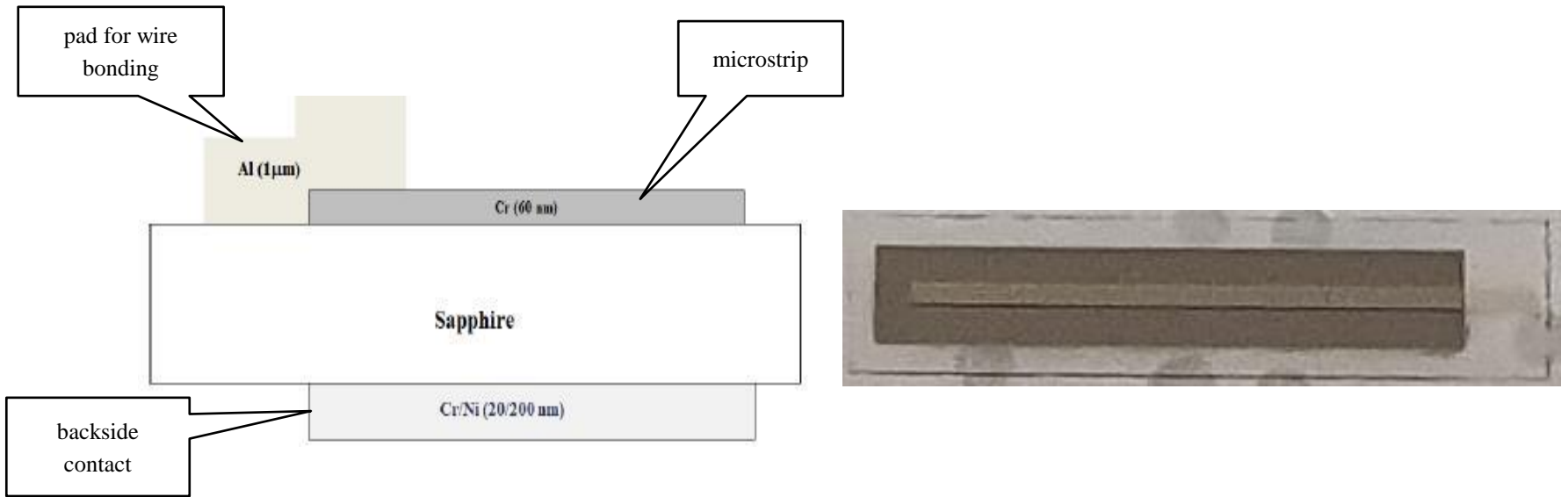
3 – $2.5 \times 2.5 \text{ mm}^2$ pad sensor

Microstrip sapphire X-ray sensors for 192 channels



Sapphire thickness, μm	100-150
Metallization	60 nm Cr (microstrip) 20 nm Cr/200 nm Ni (backside)
Bonding pads	1.0 μ m Al
Bonding pad size, μm	1200x160
Bonding pad location	Left-right
Number of microstrips	192

Microstrip sapphire X-ray sensors for 4 channels



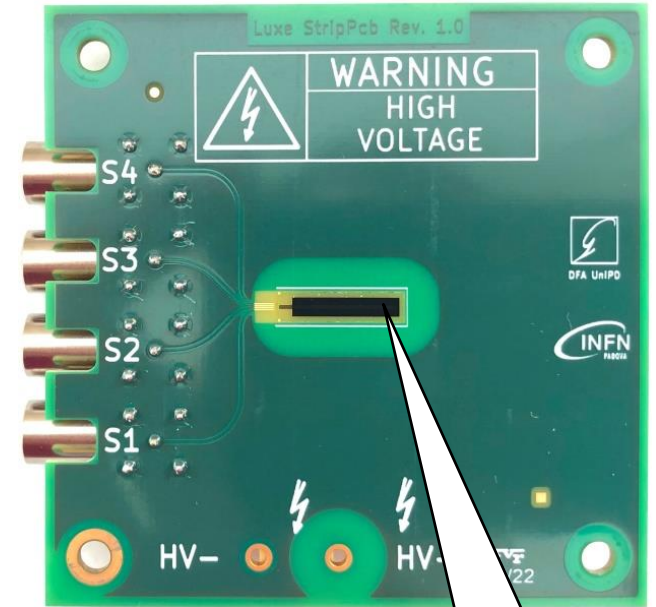
Sapphire thickness, μm	100-150
Metallization	60 nm Cr (microstrip) 20 nm Cr/200 nm Ni (backside)
Bonding pads	1.0 μm Al
Bonding pad size, μm	1200x160
Bonding pad location	Left-right
Number of microstrips	192

Sensor module based on 4 channel sensor



Module # 1

Module # 2



4 channel sensor



192 channel microstrip sensors



Sensor module based
on 4 channel sensor (6 items)
and 192 channel microstrip
sensors (8 items)
Were delivered to Padova in
May-June, 2022



Conclusion

4 channel sensor (6 items) and 192 channel microstrip sensors (8 items) microstrip sapphire X-ray sensors were design and produced

4 sensor modules based on 4 channel sensor (6 items) were assembled and tested under DC X-ray beam

The devices were delivered to Padova in May-June, 2022

Thank you for your time !