PAUL SCHERRER INSTITUT

PSI

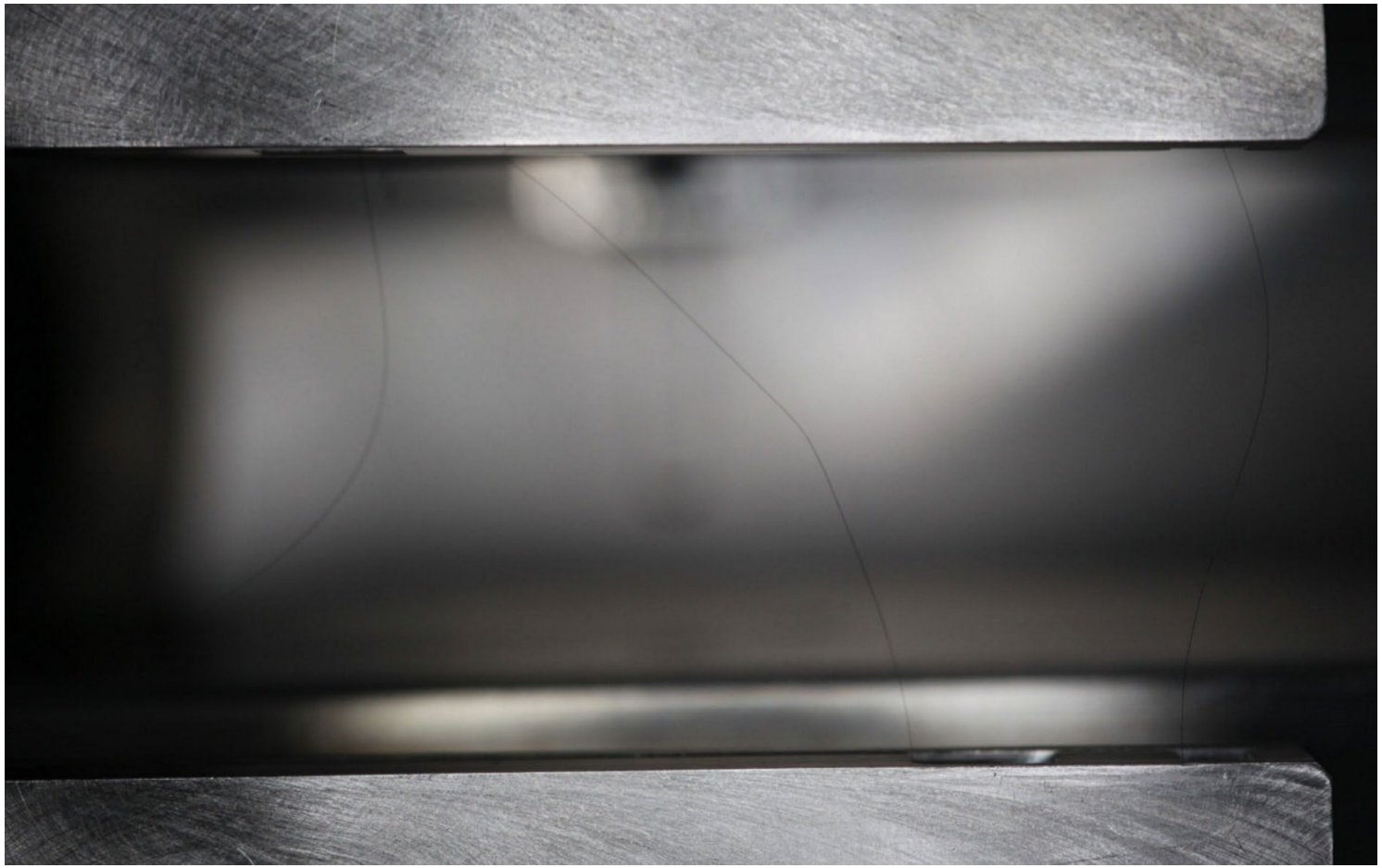
Mariusz Sapinski :: Paul Scherrer Institute

RRL Strahlentwicklung results

PSI, September 19th, 2023, Strahlentwicklung Nachbesprechung

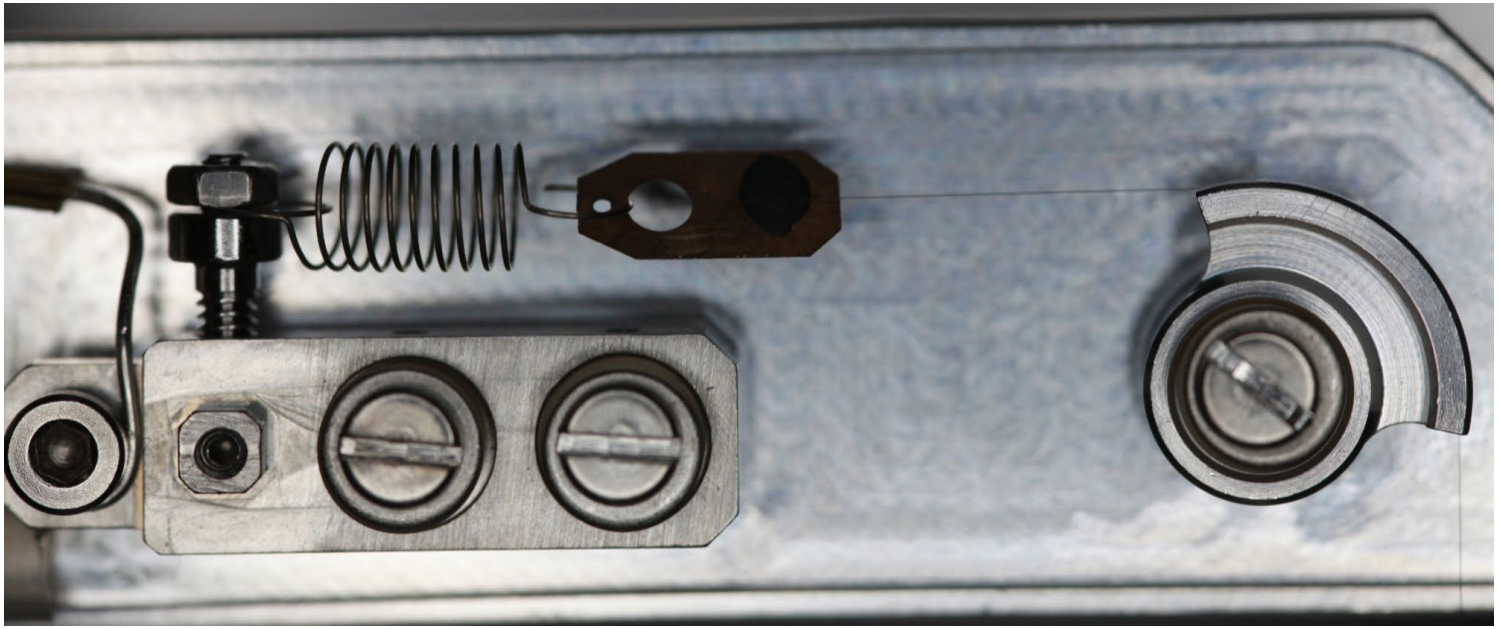
Before the Service

- All three wires damaged, no electrical connections but still crossing the beam:



Changes during ServiceTag (I)

- Using ‘old’ wagon, with Alumina insulators (not Silica)
- actually this change has been done already in July, but during previous experiments RF was unstable and wires got broken very fast (bad luck)



Material	Thermal conductivity [W/(m*K)]	Relative permittivity (dielectric constant)
Silica (SiO2)	1.4	3.9
Alumina	12	9.1
Aluminum nitride	180	9.0

Changes during ServiceTag (II)

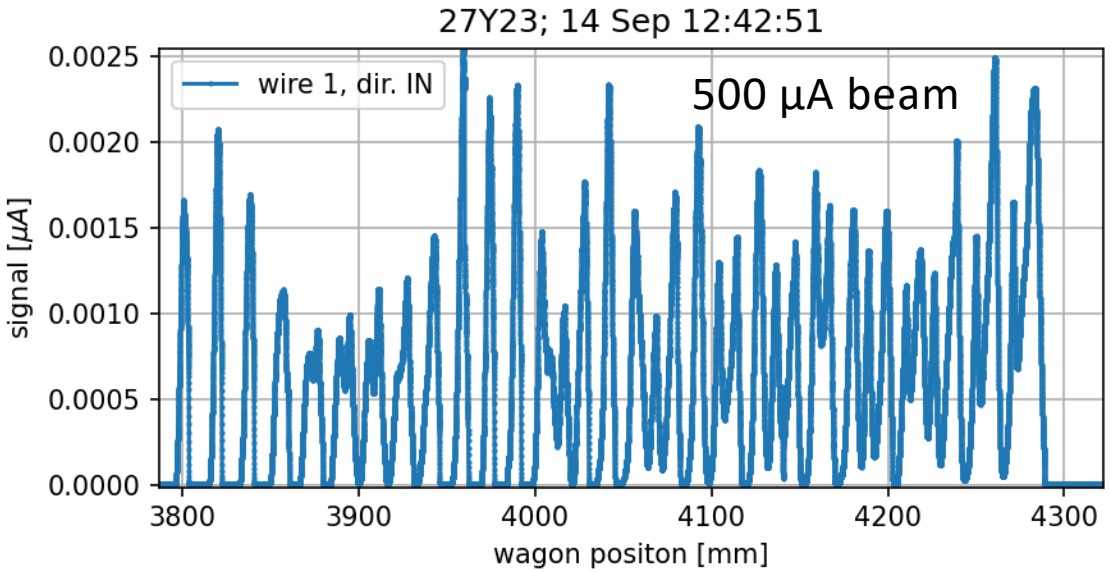
- Change of wire attachment system
- Reinstall wires
- Test spring stabilizers on wire 2,3

Problems found during ServiceTag

- Wire 2 and 3 connections on default side found to have 250 kOhm “short” to the ground
- The default side (upper) connections of wire 2,3 were removed on the wagon, readout switched to “reverse” ends (bottom).
- Wire 1 – “reverse” connection was removed long time ago in an attempt to decrease RF coupling

Measurements (I)

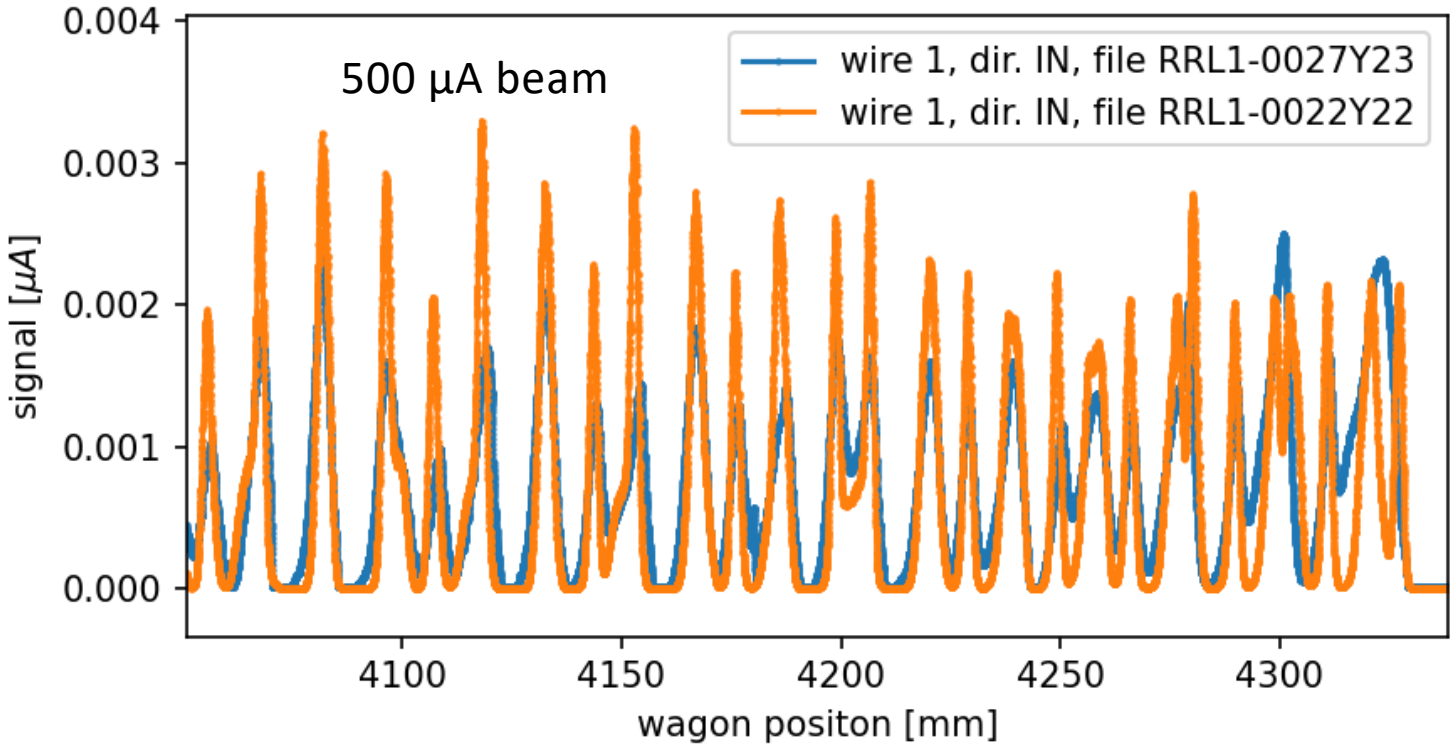
- Wire 3 – no signal at all.
- Wire 2 – gave some signals at the beginning, but then died
- Conclusion: “stabilizers” do not work
- Wire 1 seems to give familiar profiles finally!:



Measurements (II)

Wire 1 – compared to 2022:

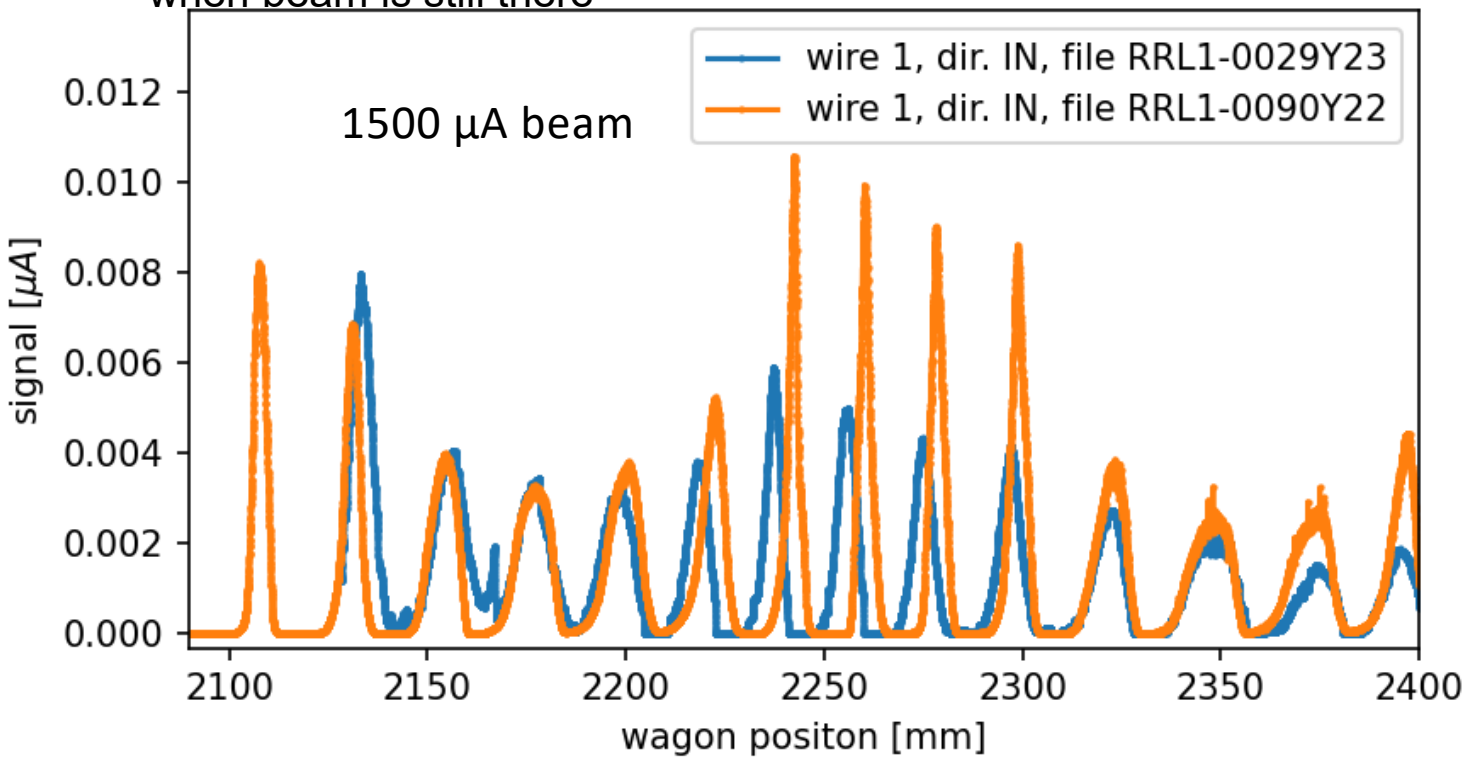
- 100x smaller amplitude!
- Shift by 27Y23 by + 40 mm to overlap the results
- Signal quality is significantly worse, signal sometimes disappears when beam is still there



Measurements (III)

Wire 1 – compared to 2022:

- 100x smaller amplitude!
- Shift by 27Y23 by + 80 mm to overlap the results ? Is the wire already bend?
- Signal quality is significantly worse, signal sometimes disappears when beam is still there



Conclusions

- First time in 2023 we see wire surviving scans
- Most likely it is due to insulator made of material with better thermal conductivity (Al2O3)
  - thanks, Christian, for the suggestion!
- Unfortunately, we clearly have problem with electrical connection
- Also, the idea of spring stabilizers did not work
- U-shape target (wagon B) tested up to 600 µA, ionization chamber signal saturates – to be investigated

Next steps:

- Check the electrical connections, exchange the wires, abandon stabilizers (October)
- Install alumina nitride insulators (November)
- Install RF dampers inside the wagon (October or November)
- Find a better power supply for the ionization chamber (currently we have strong 100 Hz noise)
- (Potentially try scans with reduced Cavity 5 voltage - October)