research instruments

iSAS WP4

Review of High Order Mode Coupler and Fundamental Power Coupler design

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Review of High Order Mode Coupler and Fundamental Power Coupler design

Table of content

1. Brief history of interaction with the WP
2. 3D-Designreview of HOM-Coupler and FPC
3. Collaborations activated with WPs born thanks to iSAS → Discussion and exchange with several institutes
4. Participation in future European projects → EPITA
5. Which industrial sectors will benefit from these project types?
6. Which industrial partners not involved in iSAS can work in these areas?

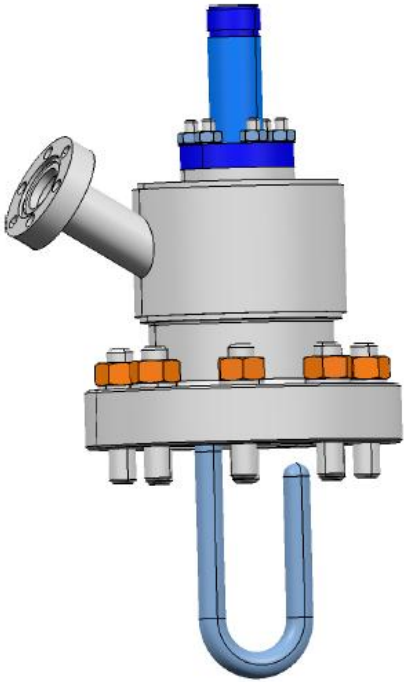
Review of High Order Mode Coupler and Fundamental Power Coupler design

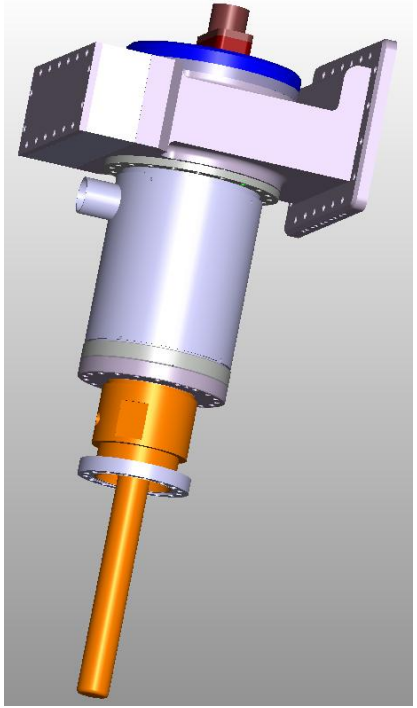
Brief history of interaction with the WP

Interaction with WP is based on the industrial review of the HOM Coupler (left) and FPC (right).

Goals of the industrial review are:

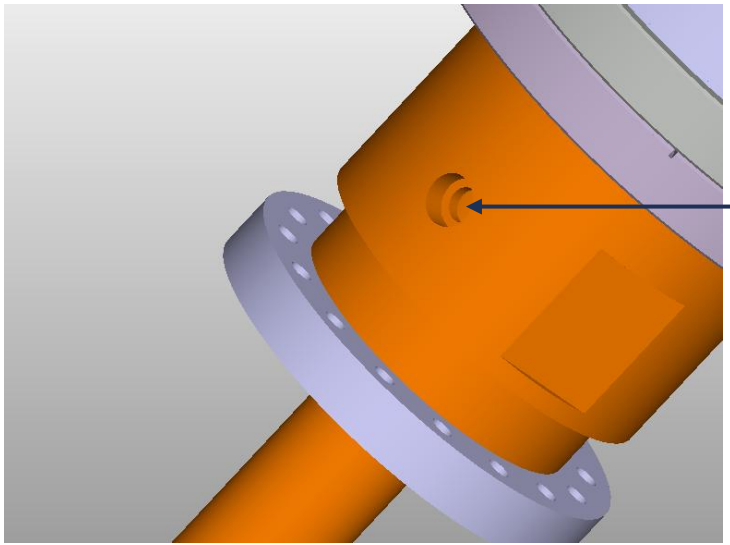
- Review of 3D-design (review ongoing, see following slides)
- Review of manufacturing design/ drawings (pending, finalization of drawings ongoing)
- Possible cost-savings for future industrialization





Review of High Order Mode Coupler and Fundamental Power Coupler design

3D-Designreview of FPC Power Coupler design



Vacuum port?

How will the connection be realized?

No port for antenna or light sensor?

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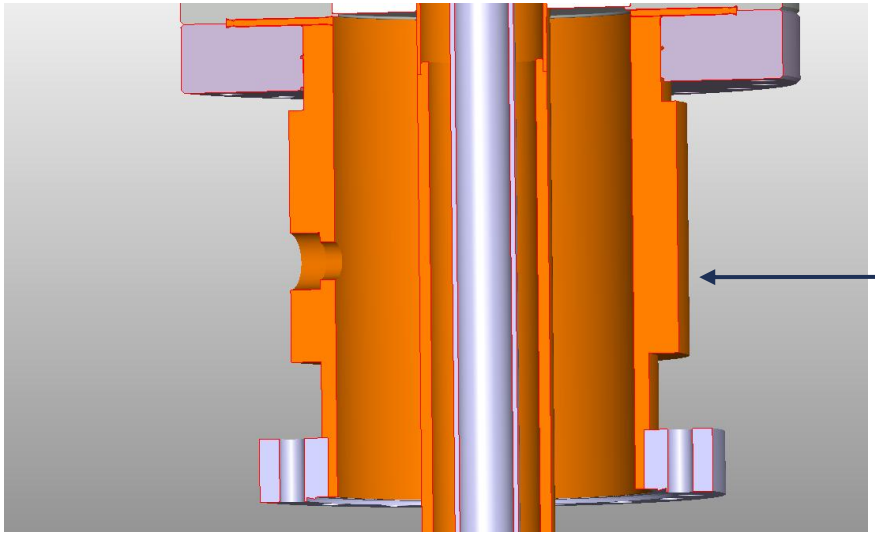

No active cooling needed?

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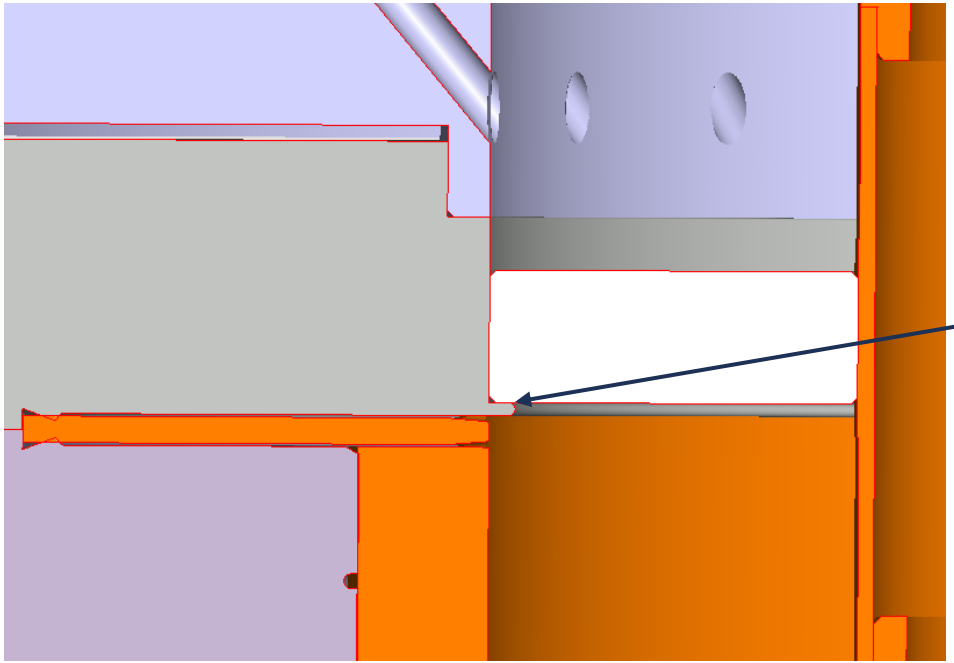

No problem for RF?

What is the application?

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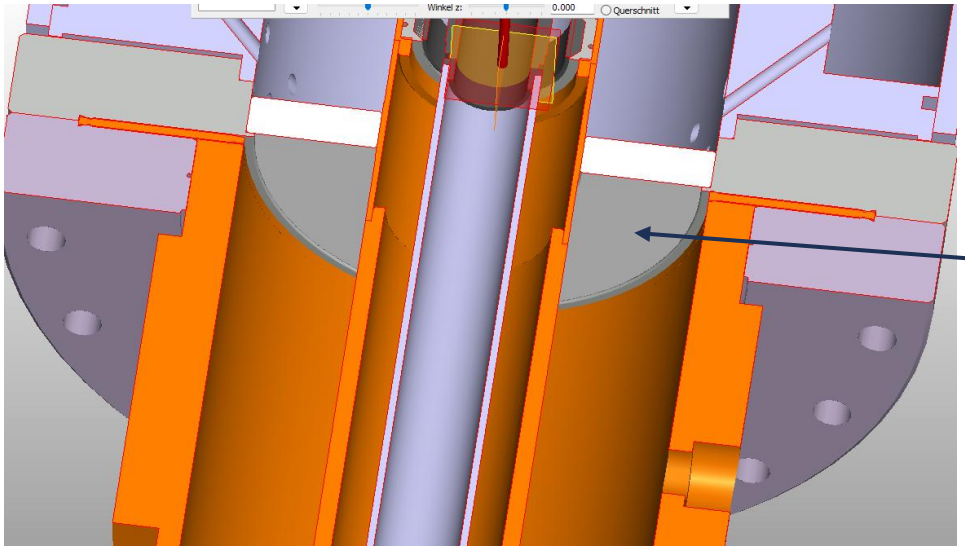

Sputtered with Titanium Oxide to reduce multi pacting? From our point of view TiN-coating is more common.

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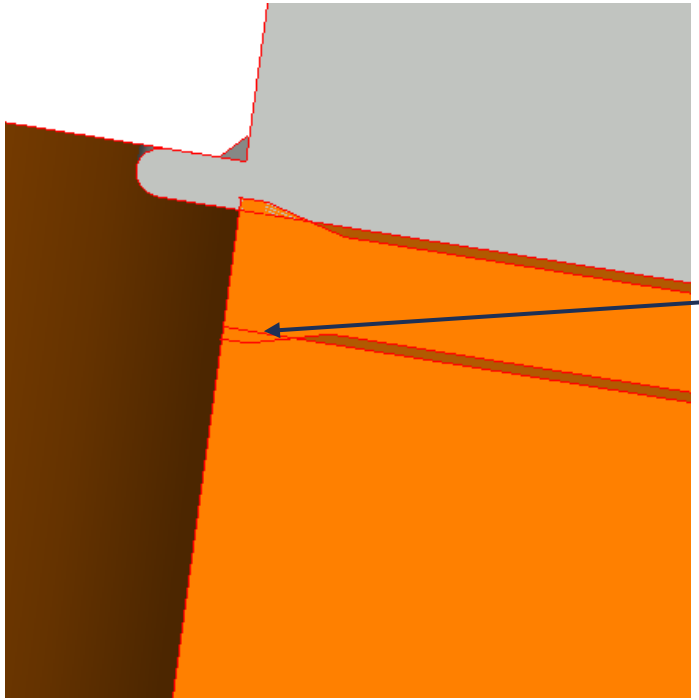

Sealing copper/ copper.

Is there any experience available?

High risk that the sealing will be not compressed or will damage the coupler?

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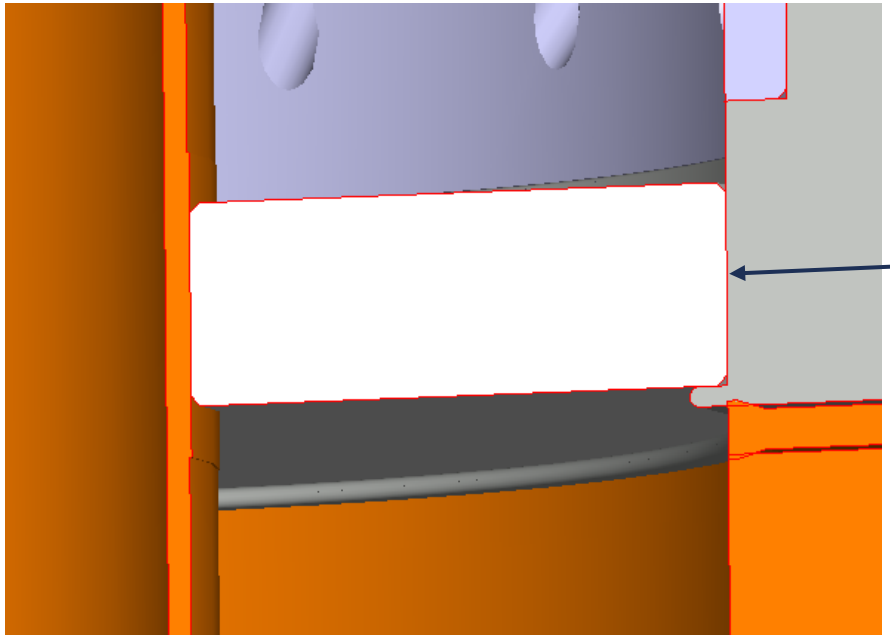
3D-Designreview of FPC Power Coupler design



Brazing of ceramic to Titanium is a not common connection. Could you please share the foreseen brazing material?

Thermal expansion from Titanium is a bit higher. Do you have experience with the brazing?

Is it foreseen to braze the Copper inside and Titanium outsie in one step with the same brazing material?

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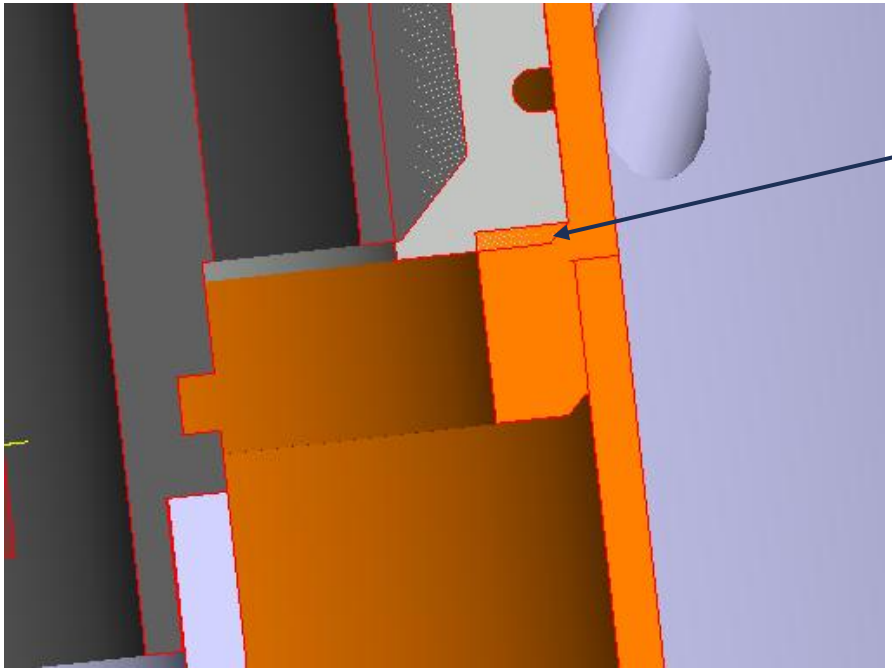
3D-Designreview of FPC Power Coupler design



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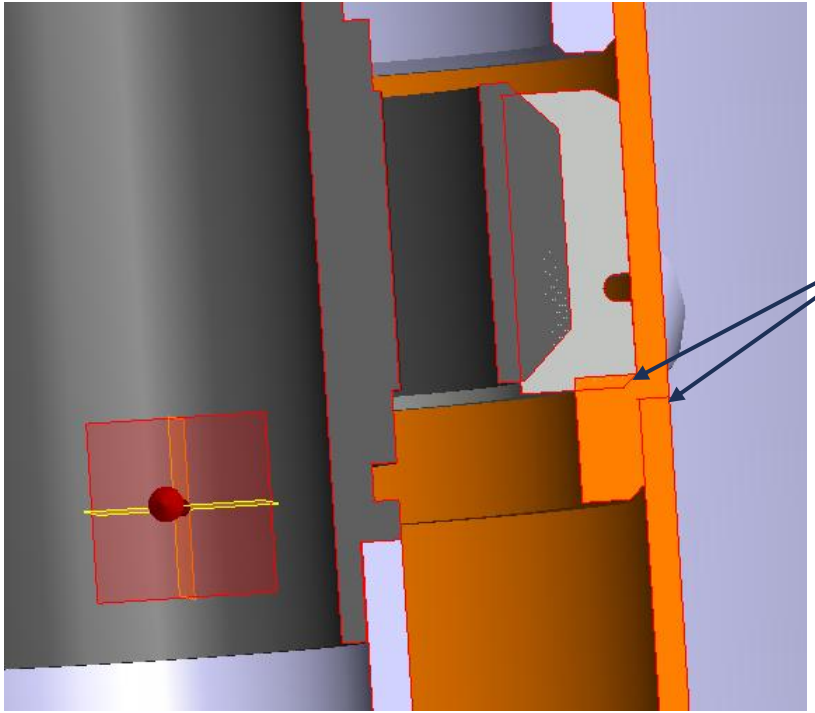
Fundamental Power Coupler design



EBW-seam is pretty narrow to the brazing of the SS insert.

Risk for brazing -/ welding seam?

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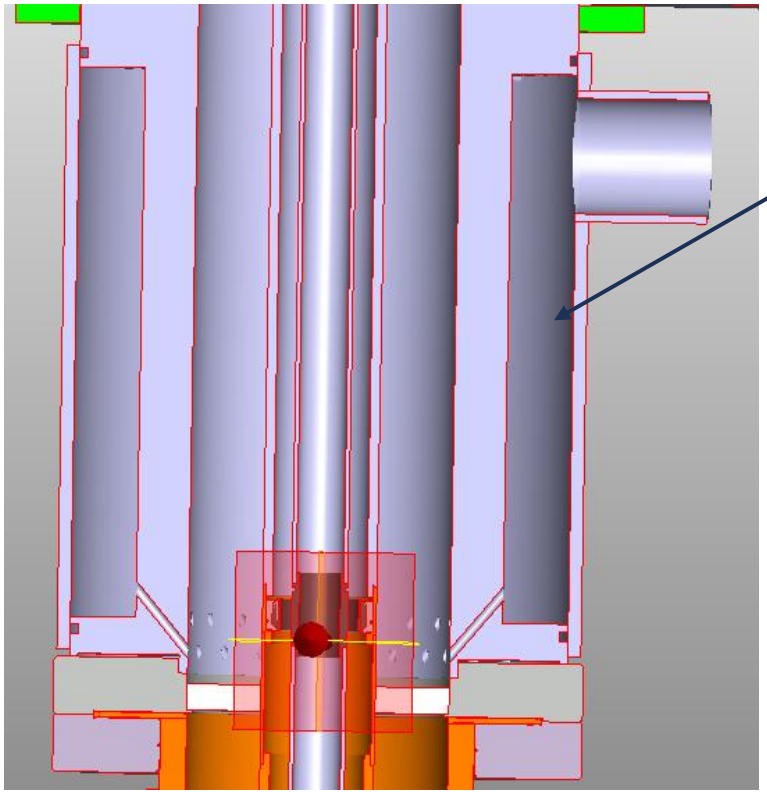
3D-Designreview of FPC Power Coupler design

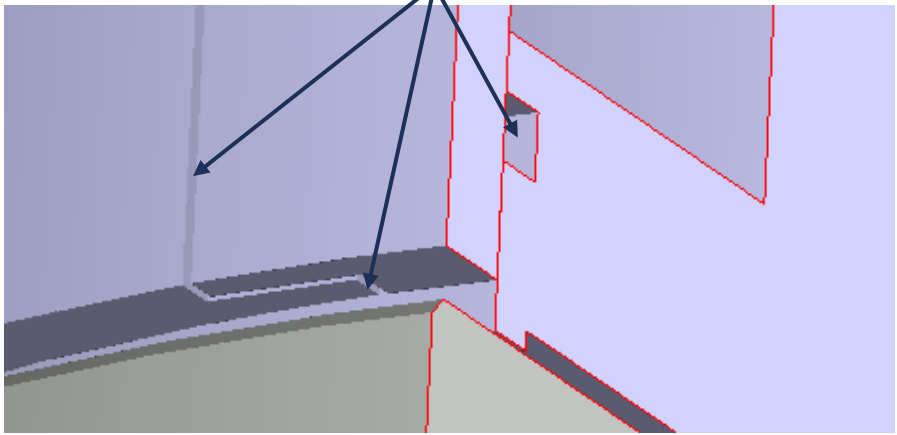


Ceramic air cooling?

The jacket will be assembled after the part has been fixed to the cold part?

Sealing with O-rings?

How to seal the half's longitudinal and in the cross sections?



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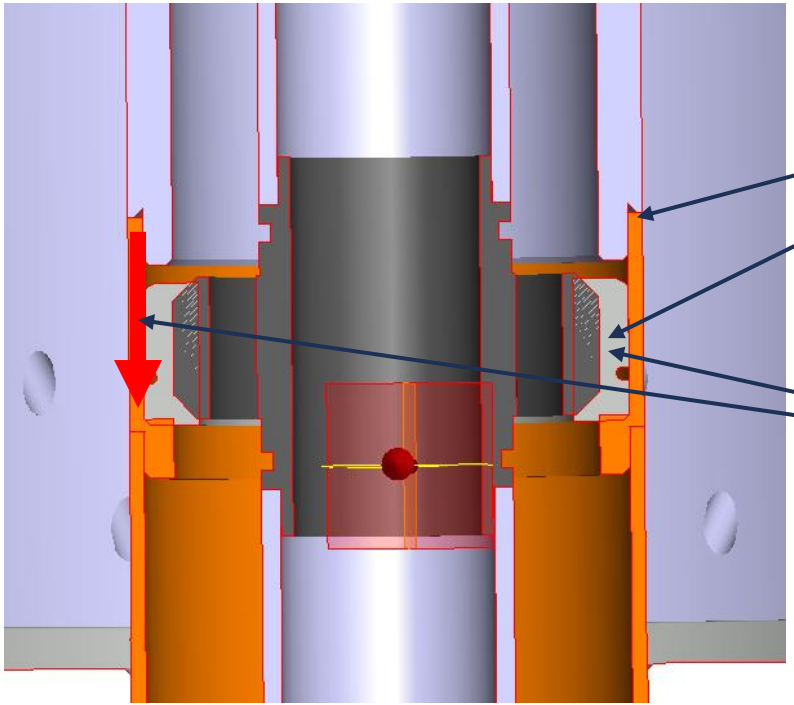
3D-Designreview of FPC Power Coupler design



Sealed by contact?

Sealing force generated by screwing of the inner cooling tube?

Will the assembly/ tightening of the inner cooling tube introduce stress on the ceramic?

Direction of force indicated by the red arrow.

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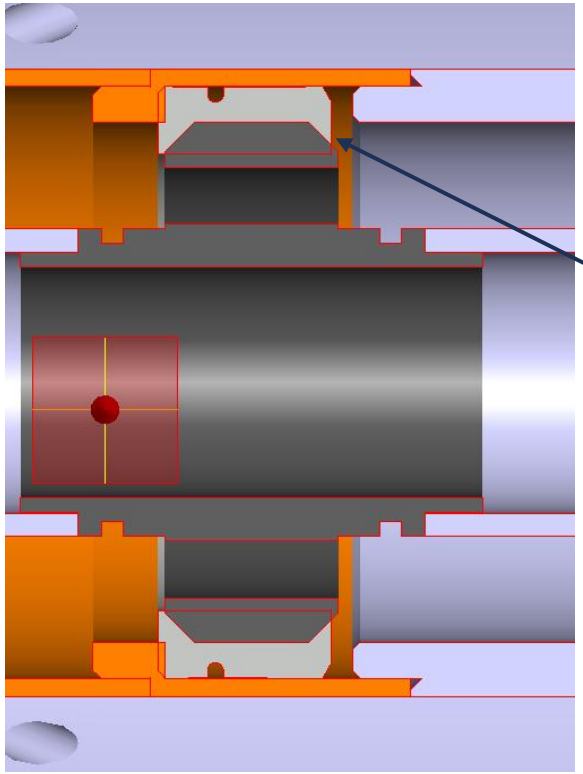
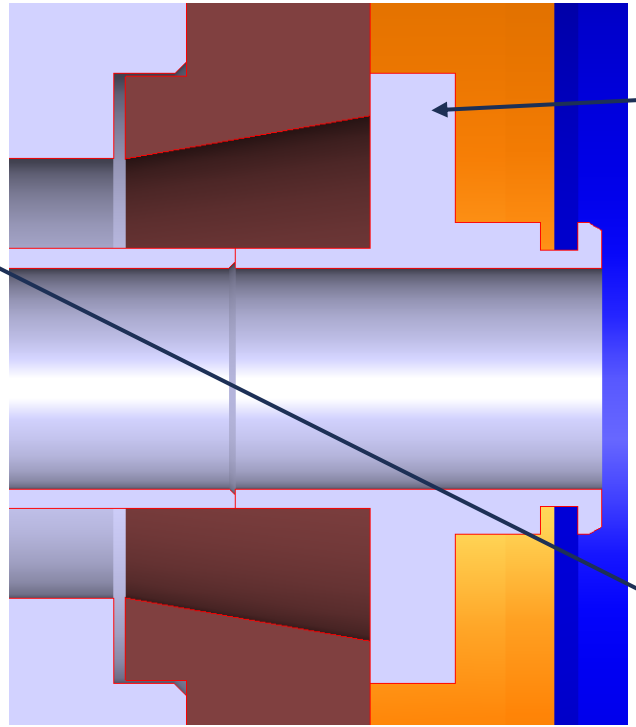
3D-Designreview of FPC Power Coupler design





No centering and not fixed?

Stress on ceramic?

Only fix point of inner antenna cooling?

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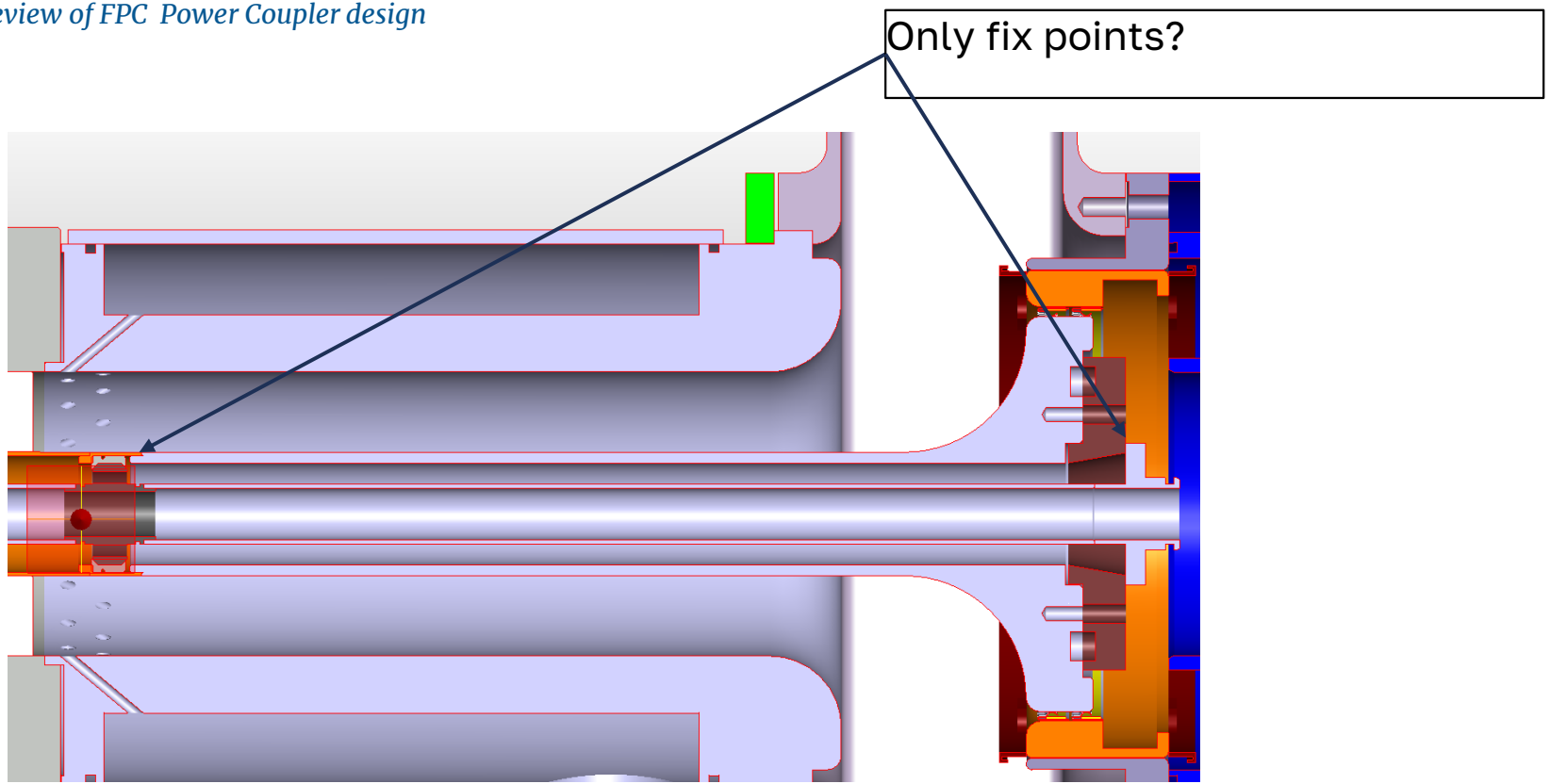

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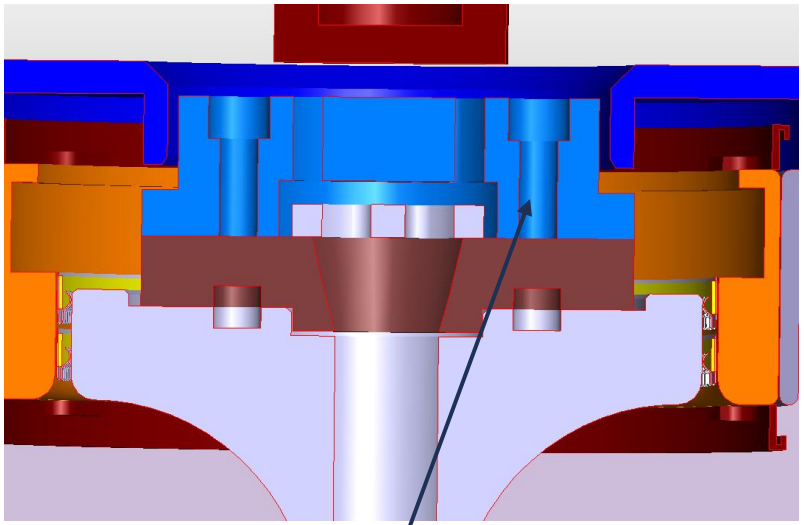
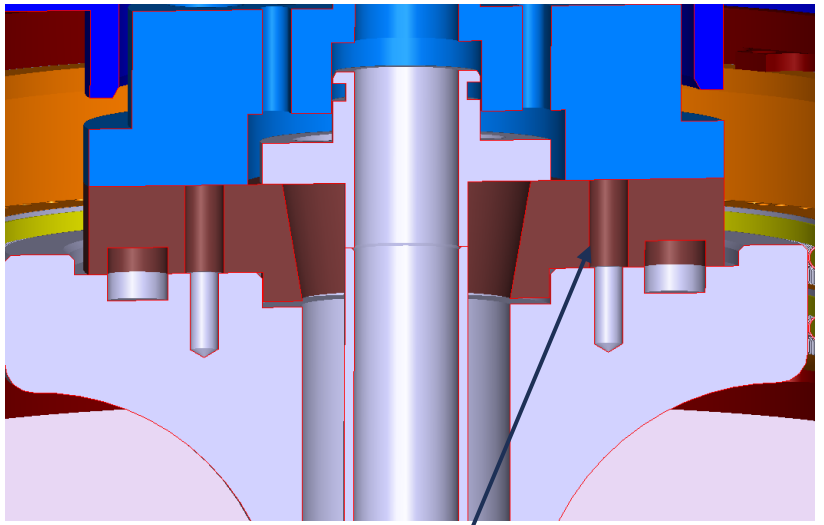


Blue part not fixed?



Just centered by pins?

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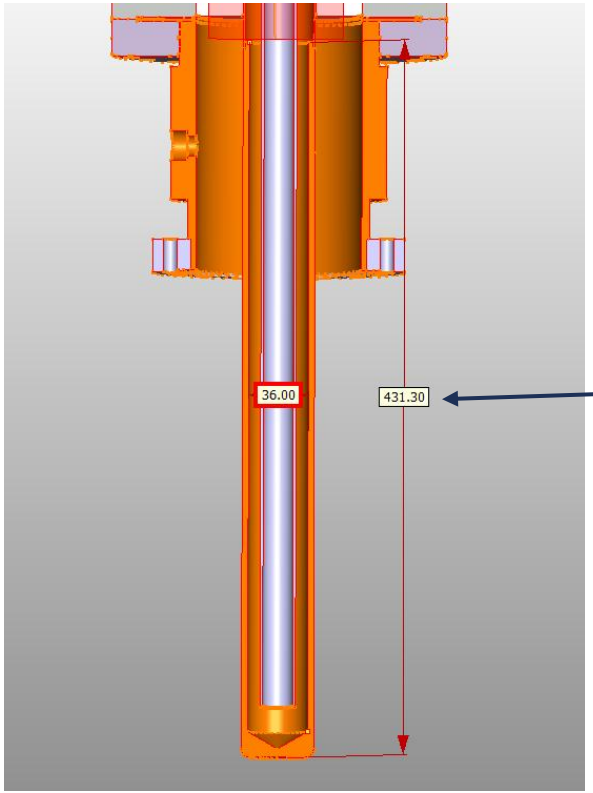

Did you checked if the deep drilled hole will work?

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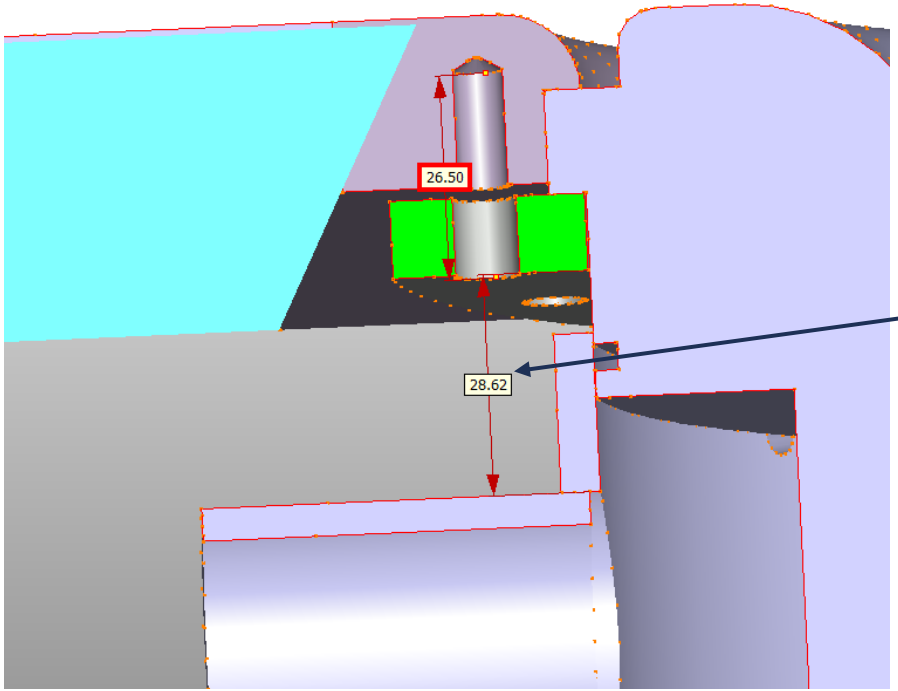
3D-Designreview of FPC Power Coupler design



Enough space to place the screw?

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3D-Designreview of FPC Power Coupler design

- The recessed part of the copper coaxial outer tube might be prone to bending because of large forces by the rectangular waveguide parts
- The inner conductor rf contact between copper tube and aluminum need careful consideration because of contact resistance
- The FPC vacuum instrumentation is hard to install because of limited space
- The rf contact between aluminum and titanium flange needs more details
- The aluminum WG design is pretty complex: Why not integrate more functions via additive manufacturing?
- Is DC bias really needed?

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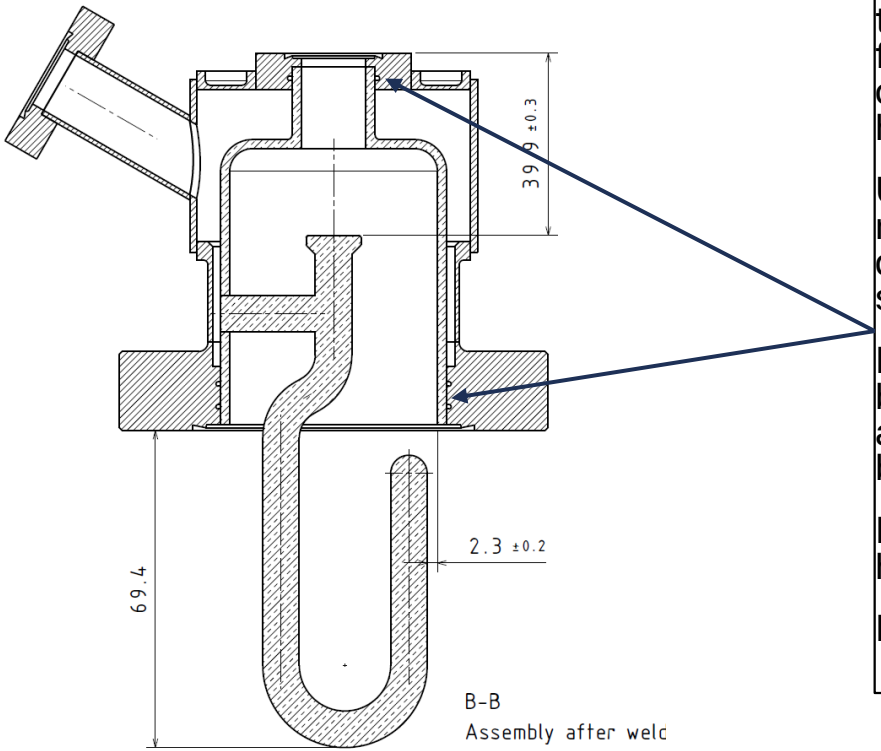
Designreview of HOM Coupler design



From our point of view it will be challenging to perform the brazing of the lower/ lager flange as it will be not possible to place a core at the inner diameter of the niobium housing due to the hook.

Usually, the core is needed to hold the niobium in place during brazing due to the different thermal expansion behavior of stainless steel and niobium.

Furthermore, the core need to be removed by machining (if it will be possible to place) after brazing as the core will be assembled by thermal shrinking.

Removal of the core by machining will be however difficult due to the hook.

Housing out of Titanium could be beneficial?

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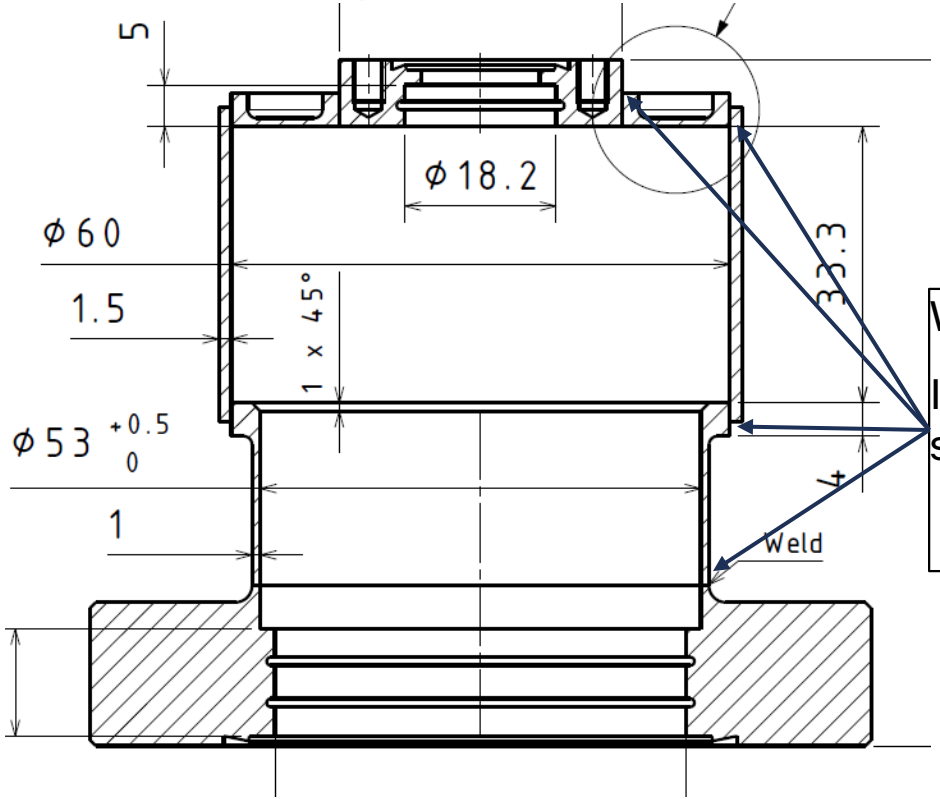
Designreview of HOM Coupler design



Why so many welding seams?

Is it possible to reduce the number of single parts? Is it beneficial?

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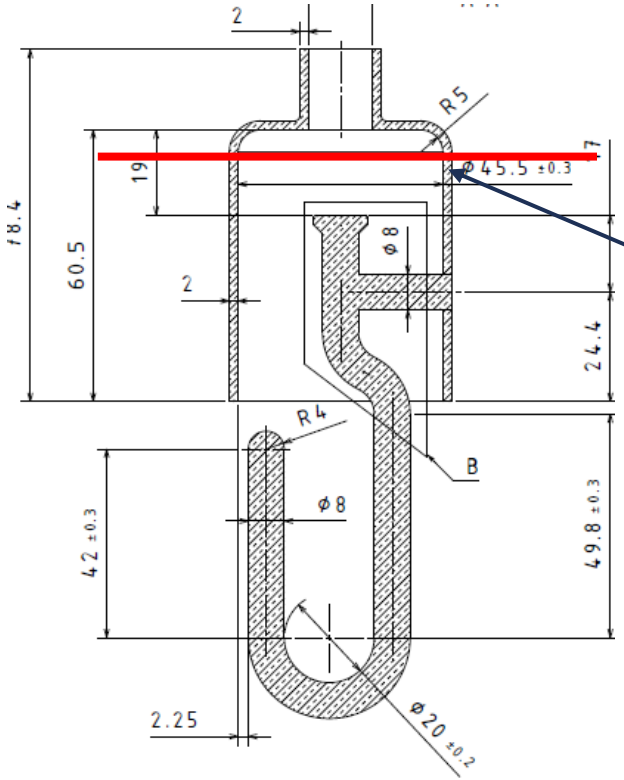
Designreview of HOM Coupler design



Niobium is quite expensive. It might be beneficial to do the “can” out of two parts.

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Which industrial sectors will benefit from these project types

Industrial sectors which could benefit:

- Production of radioactive isotopes
- Systems using light (Lithography)
- Water cleaning/ sterilization
- Material modification
- Material investigation

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Which industrial partners not involved in iSAS can work in these areas

Industrial partners who can work in these areas:

- Ceramic suppliers → WESGO
- Material suppliers → Tokio Denkai (Niobium), Metall Minotti (Copper)
- Companies with high manufacturing know how → RI

Thanks for your attention

- *Questions about the presentation?*

Feel free to contact us anytime.

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