MoGr procurement and status of the characterization

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2nd Special ColUSM: Material and design readiness for LS2 productions

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Outline

• MoGr Procurement

• Status of thermophysical characterization

• Conclusions
MoGr procurement

- Quantities included in the invitation to tender:
  - 4+1+1 TCPPM, blocks and taperings
  - 8+2+2 TCSPM, blocks and taperings
  - 4+1 TCTPM, taperings only

- FC gave the green light in September to sign the contract with a single supplier

- **Price per unit increases in case of production of lesser items.** Price to be re-discussed with the company once number of items is confirmed.

- Taperings for TCTPM will be included as an option.
MoGr sampling and characterization

• CERN paid to the supplier only the samples for the market survey qualification
• The supplier took then the initiative to produce several plates, **at their own expense**, even much before having the confirmation of the contract adjudication.
• 8 of these plates were sent to CERN for checking electrical, thermal, mechanical and vacuum properties
• The company showed quick learning capabilities and **significantly improved the material performance in a short time** (e.g., electrical conductivity improved from 0.6 to ~1MS/m!)
• Vacuum results → see Carlotta’s talk

- Last grade received on end of October, thermophysical characterization ongoing
### MoGr sampling and characterization

<table>
<thead>
<tr>
<th>Property</th>
<th>Orientation</th>
<th>Unit</th>
<th>NW-8301Eb</th>
<th>NB-8304Je</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density at 20°C</td>
<td>2.40 – 2.60</td>
<td>[g/cm³]</td>
<td>2.59</td>
<td>2.57</td>
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<tr>
<td>Specific heat at 20°C</td>
<td>&gt;0.6</td>
<td>[J/(g·K)]</td>
<td>0.63</td>
<td>0.61</td>
</tr>
<tr>
<td>Electrical conductivity at 20°C</td>
<td>&gt;0.90</td>
<td>[MS/m]</td>
<td>0.83</td>
<td>0.96</td>
</tr>
<tr>
<td>Thermal Diffusivity 20°C /at 300°C</td>
<td>&gt;390/120</td>
<td>[mm²/s]</td>
<td>388/108</td>
<td>425/120</td>
</tr>
<tr>
<td>Thermal conductivity at 20°C /at 300°C</td>
<td>&gt;500/300</td>
<td>[W/(m·K)]</td>
<td>633/314</td>
<td>670/336</td>
</tr>
<tr>
<td>Volumetric CTE 20-1000°C</td>
<td>&lt;7</td>
<td>[10⁻⁶K⁻¹]</td>
<td>6.6</td>
<td>6.2</td>
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<tr>
<td>Coefficient of thermal expansion 20-1000°C</td>
<td>&lt;2.9</td>
<td>[10⁻⁶K⁻¹]</td>
<td>2</td>
<td>16</td>
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<tr>
<td>Young’s Modulus at 20°C</td>
<td>35&lt;E&lt;70</td>
<td>[GPa]</td>
<td>61.6</td>
<td>80</td>
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<tr>
<td>Flexural strength at 20°C</td>
<td>&gt;60</td>
<td>[MPa]</td>
<td>89</td>
<td>93</td>
</tr>
<tr>
<td>Flexural strain to rupture at 20°C</td>
<td>&gt;2500</td>
<td>[µm/m]</td>
<td>2000</td>
<td>4100</td>
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<tr>
<td>Dimensional stability</td>
<td>&lt;0.05</td>
<td>%</td>
<td>0.01</td>
<td>0.23</td>
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</table>

<table>
<thead>
<tr>
<th>Figures of merit</th>
<th>Baseline</th>
<th>MG-6403Fc</th>
<th>NW-8301Eb</th>
<th>NB-8304Je</th>
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</thead>
<tbody>
<tr>
<td>TRI</td>
<td>160</td>
<td>230</td>
<td>287</td>
<td>241</td>
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<tr>
<td>TSI</td>
<td>38</td>
<td>56</td>
<td>47</td>
<td>54</td>
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<td>RFI</td>
<td>0.95</td>
<td>1.03</td>
<td>0.91</td>
<td>0.98</td>
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</tbody>
</table>
MoGr sampling and characterization

- **Quantities to be produced are to be confirmed to the company**, in order to re-negotiate the price and sign the contract.

- **After that, at least one month** should be foreseen before receiving the first preseries of blocks/taperings at CERN.

- Already the penultimate grade was showing figures of merit **above the specification**, except for the RF index.

- Last grade received shows **good electrical conductivity and RF index**, as well as better thermal conductivity and CTE.

- Last grade: **FOM above specification**.
Thanks for your attention
Backup slides