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MULTIPOLE INJECTION KICKER (MIK), A COOPERATIVE PROJECT SOLEIL AND MAX IV

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Abstract

The cooperative MIK project SOLEIL / MAX IV started in 2012 and is part of the Franco-Swedish scientific collaboration agreement, signed in 2009 and followed by framework agreements signed in 2011. The MIK is a particular electromagnet using theoretical principles of the 1950s and recently used by the new generation of synchrotrons to significantly improve the Top-Up injection of electrons into the storage rings. Indeed, this type of magnet can drastically reduce disturbances on stored beams and also offers substantial space savings. The MIK is a real opportunity for synchrotrons wishing to upgrade their facilities. One of the first MIK developed by BESSY II in 2010 gave significant results. These results motivated SOLEIL and MAX IV to develop together their own MIK. Many technical challenges have been overcome in the area of mechanical design and manufacture as well as in magnetic and high voltage design of the MIK. Currently the first series is in operation at MAX IV and displays already outstanding performances. Optimization work is in progress.

COMPLEMENTARY DESCRIPTION

Figure 1 shows the principles of the MIK. Figure 2 shows more technical details. The MIK is composed of a chamber in two part of synthetic monocrystalline Sapphire. Parts are assembled by diffusion bonding (Kyocera Japan). Chamber can also be made in alumina with two parts assembled by glass gluing or brazing depending on the subcontractor (Friatec or Coorstek). The chamber has to be machined with a very high precision to ensure a good magnet. 8 grooves positioning the 8 conductors (copper) are machined in the hundredth of a millimeter. The conductors formed and there insulating bars (alumina) are glued in the grooves, with specific tools designed and used by Soleil team. The connection between the chamber and the flanges is ensured by a brazed Sapphire/copper interface, then a brazed copper/ stainless steel interface and finally a stainless steel / flange weld.

A titanium coating of a few microns inside the sapphire vacuum chamber (made at ESRF) allows the flow of the image current without disturbing the magnetic field.

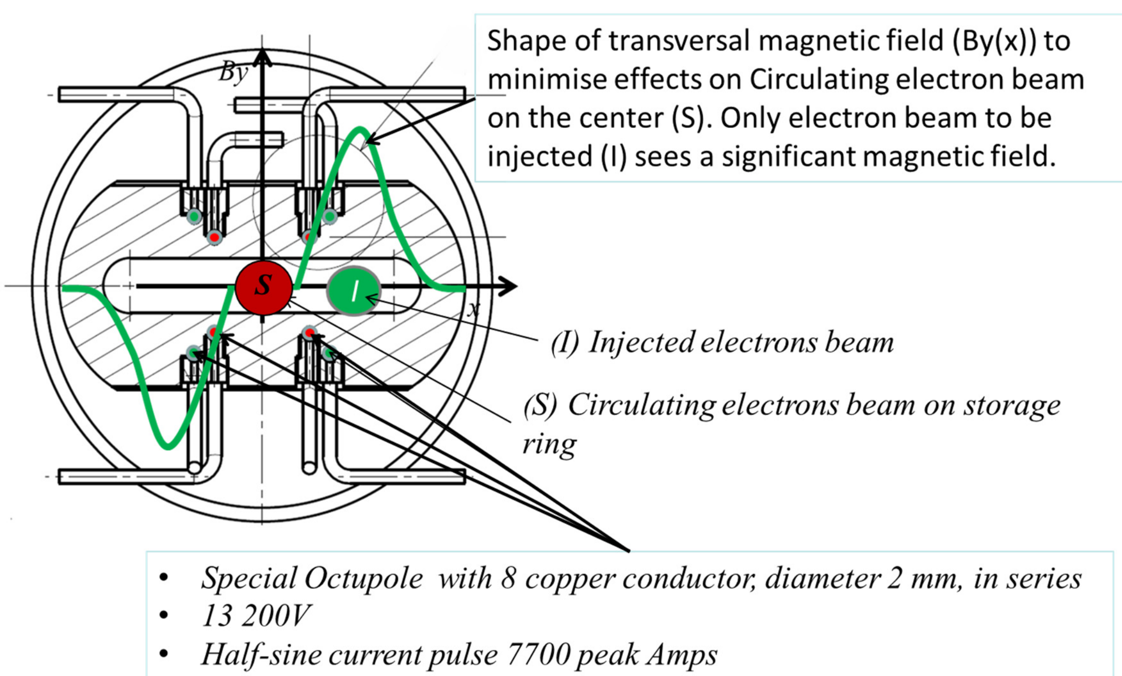

Figure 1: Cross-sectional view and principals of the MIK.

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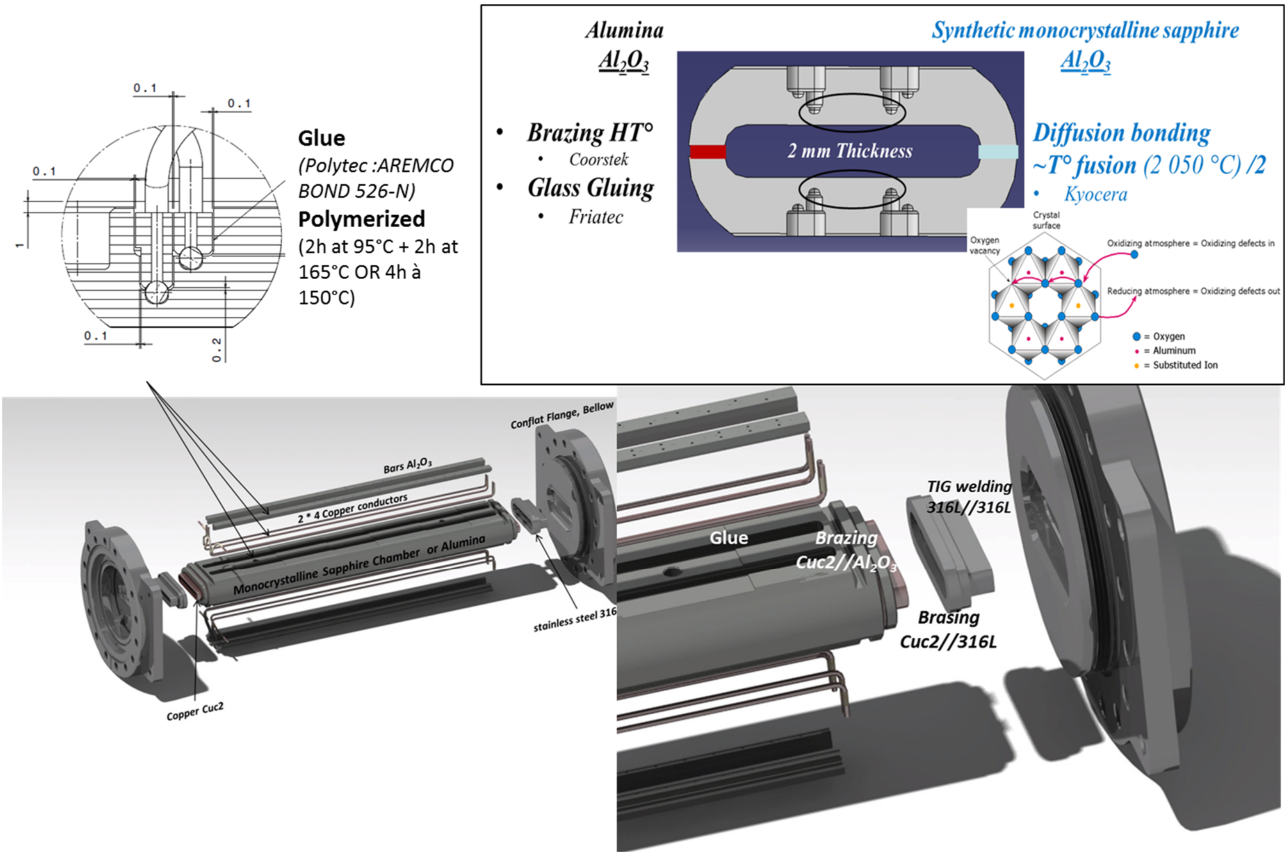

Figure 2: A few technical details.

CONCLUSION

MIK is a good example of collaborative project involving many partners. This particular electromagnet is an opportunity for the new generation of synchrotrons by reducing drastically disturbances on stored beams during top up injection, and also offers substantial space savings. Technical challenges have been overcome and a great know-how has been acquired. The first MIK displays already outstanding performances in MAX IV.

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