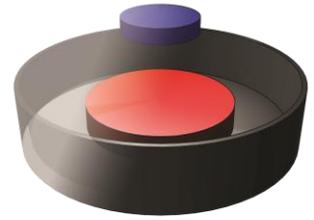


Möbius maglev kit

Superconducting magnetic flux pinning demonstrator



MOSEM²

100 years of superconductivity

In **1911** it was discovered that some materials become superconducting when cooled below a certain "critical temperature". In this state they have **zero electrical resistance** and also very special magnetic properties. The critical temperature was very low, it was necessary to use liquid helium at minus 269°C.

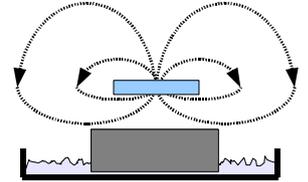
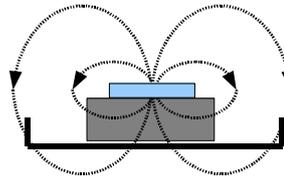
In 1986 researchers discovered a special kind of "**high-temperature superconductors**" which can be cooled with liquid nitrogen at minus 196°C. They are cheap enough and safe enough to use in education and public displays.

Magic? No, just physics!!

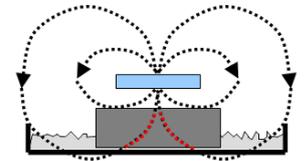
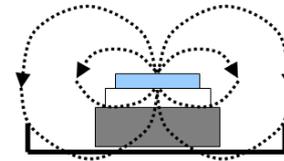
We know two kinds of **superconductors**, type I and type II. Both types can display the "**Meissner effect**" where the magnetic field from a magnet is completely pushed out. A magnet on top of the superconductor will literally "take off" and **levitate**. This works just like two magnets with opposite poles and is therefore also very unstable.

Only type II can also enter the "Abrikosov phase" where the magnetic **flux lines are "pinned" inside the superconductor**. A different kind of levitation can be done with such pinning. If we turn the superconductor and magnet upside down, they stay in place without falling apart.

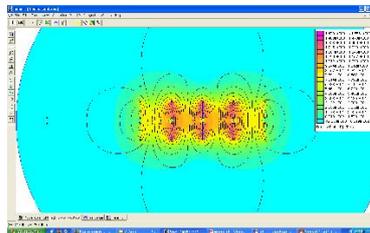
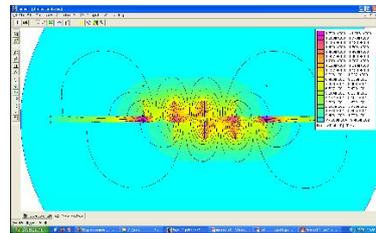
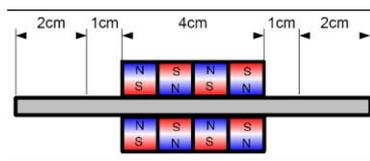
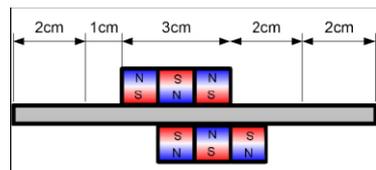
Meissner effect!



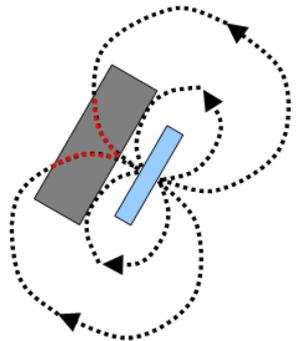
Flux pinning...



Simulating the magnetic field from different track designs



... works upside down!

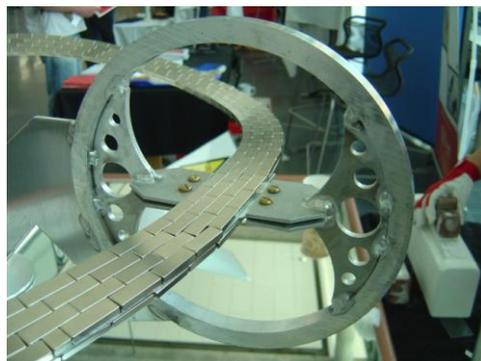


Because we would have magnets on both sides of the track body, we did **simulations** and found out that four rows of magnets was better for the **Möbius track**. We also designed an aluminium frame for the track.

From MOSEM to MOSEM²

The **MOSEM** project developed two kits with materials for minds-on experiments in magnetism and superconductivity. A small train and a 50 cm long track with three rows of magnets fit inside the superconductivity kit.

By turning the track upside down it is possible to show the amazing results of flux pinning. But we wanted to make something more spectacular in the **MOSEM²** project. Others already made looping tracks, so we had to go further. Our twist on things was to make a track shaped like a Möbius band. The track rotates around its own axis along the circle.



Track diameter	98 cm
Track width	4 cm
Magnet size	30 x 10 x 5 mm³
# magnets	820
Total weight	15 kg
Superconductor	64 x 32 x 16 mm³

Want to learn more?

mosem.eu – materials and activities

online.supercomet.eu – animations

youtube.mosem.eu – videos

forum.mosem.eu – community