AEON PHOCUS
Electromagnetic Steering of Interventional Instruments
History of Aeon Scientific

2003
- Start of **technology development** at the Institute of Robotics and Intelligent Systems of **ETH Zurich**
- **Electromagnetic steering** of drug release inserts for retinal treatment was the objective

2010
- **Spin-off company** Aeon Scientific founded
- **Exclusive license** for life sciences applications
- Shift of focus and start of development of **catheter steering** system

2013
- Successful **animal trials** on first full-scale prototype
- **ISO 13485** certification
- Company location **moved to Schlieren** near Zurich

2014
- **Aeon Phocus** prototype installed
- **1st clinic contract** for installation in Q1 2015
- **Swiss Technology Award**
Technology – Remote magnetic steering with an array of electromagnets

**Patented technology**

- Algorithm to control magnetic fields
- Also works for asymmetrical arrangement of magnets
- Suitable for robotic/automated motion

**First full-scale prototype**

5-DOF motion with high level of speed, control, precision and flexibility
Cardiac electrophysiology selected as first application of technology

**Target conditions: Arrhythmias such as Atrial Fibrillation**

- 1 – 2% of the overall population
- 25% of people over 40
- In US alone: **26 billion USD** costs to the health care system
- Numbers **doubling until 2050** due to aging population
Clinical need: control over catheter ablation for the treatment of cardiac arrhythmias

Favourable treatment method

- Catheter ablation is standard method in the treatment of the majority of tachyarrhythmias
- Most effective approach
- Cost-efficient in the long-term

BUT

- Not all patients are offered treatment
- Extensive training required for electrophysiologists
- Ablation of some arrhythmias can be challenging even in experienced hands

Need for better control of catheter steering!
Aeon Phocus – Electromagnetic catheter steering system

Joystick controlled mapping and ablation
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Electromagnetic catheter steering system
Aeon Phocus – Benefits

CONTROL

- **Reachability** – Any target site in the heart
- **Precision** – Form continuous lesions
- **Learning curve** – Intuitive user interface and high dexterity
- **Safety** – Soft catheter tip
- **Stability** – Flexible catheter tip moving with heart
- **Contact force** – High field strength

WORKFLOW

- **Flexibility** – Use of EP lab for other applications
- **Patient access** – Open design with access points
- **X-ray exposure** – Remote operation protected from radiation
- **Compatibility** – All devices incl. full-scale angiography
Pre-clinical trials successfully completed

- Complete anatomical mapping of all 4 chambers
- Stable and continuous ablations
- Transmural and continuous ablation lines
- No damage identified in pathology
- Faster procedure in comparison to manual mapping
- Reduced X-ray radiation

Electrophysiologist operating catheter steering system during live animal case

3D map of right atrium and ventricle with isthmus ablation

Pathological analysis of treatment success
Market size

- Clinics conducting ablation procedures are potential customers
- All arrhythmia patients treatable through catheter ablation are in scope
- First product approval is for Europe; approval for additional geographical markets starting in 2015

<table>
<thead>
<tr>
<th></th>
<th>Europe</th>
<th>Worldwide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential customers</td>
<td>1'150</td>
<td>&gt; 3'000</td>
</tr>
<tr>
<td>Patients per year</td>
<td>250'000</td>
<td>&gt;1'000'000</td>
</tr>
</tbody>
</table>

## Comparison with competing solutions

<table>
<thead>
<tr>
<th>Solution</th>
<th>Companies</th>
<th>Disadvantages compared to Aeon Phocus</th>
</tr>
</thead>
</table>
| 1. Manual | ![St. Jude Medical](image1), Biosense Webster, BIOTRONIK, Medtronic, Boston Scientific | • Limited **control** over catheter tips  
• High **stiffness** leading to risk of perforation  
• High **x-ray exposure** for both physician and patient |
| 2. Electromechanical | ![hansen](image2), Catheter Robotics Inc | • High **stiffness** leading to risk of perforation  
• Limited **control** over catheter tips  
• **Expensive** disposables |
| 3. Permanent magnets | ![Stereotaxis](image3) | • Lower field strength and **contact force**  
• **Response time** limited due to mechanical motion  
• Inability to **switch off** magnets  
• **Only rotational** motion |
| 4. Magnet cube | ![Magnetecs](image4) | • **No compatibility** with critical angiography system  
• Limited **flexibility in use of EP lab** for other types of procedures  
• Limited **access** to the patient and patient comfort |
Business model

**Sub-system and disposable suppliers**
- Subsystems
  - Price per sub-system or disposable

**OEM catheters**
- Catheters
  - Price per catheter

**Customers (electrophysiology clinics)**
- Installed systems
  - Training / support
  - Maintenance
  - Upgrades
  - Price for system, maintenance contract and upgrades
- Catheters with other disposables
  - Price per set of disposables
- Price per catheter
- Price for system, maintenance contract and upgrades
Milestones with regard to clinical use

- **July 2015**: CE marking and 1st patient
- **October 2015**: Beginning of 1st post-market clinical trial
- **March 2016**: 1st installation outside Switzerland
- **December 2016**: 2nd clinical application ready for human trials
Potential product portfolio (examples, partly conceptual)
AEON PHOCUS

Electromagnetic Steering of Interventional Instruments