

## **MUSICES first expert meeting and COST tomo workshop**

**Nuremberg and Fürth, 20 and 21 May, 2015**

**Schedule, list of participants, and presentations**

Please note:

- The following schedule of the meeting is the original one. Due to train strikes in Germany, the actual sequence had been slightly changed
- Only presentations whereof the authors had granted a formal permission for publication until 8 July 2015 are included. This report may be updated according to later permissions

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## MUSICES first expert meeting and COST tomo workshop

Day 1: Wednesday, 20 Mai 2015

Germanisches Nationalmuseum, Nürnberg (GNM)

from 14:00 h	Participants are welcomed in the musical instruments exhibition where already scanned reference instruments and instruments to be scanned are presented
15:00 h	Session I: General presentations <ol style="list-style-type: none"><li>1. Frank P. Bär: GNM and its musical instrument collection</li><li>2. Theobald Fuchs: Fraunhofer EZRT and X-ray equipment</li><li>3. Frank P. Bär and Theobald Fuchs: The MUSICES project</li></ol>
16:00 h	Coffee break in the museum's Café Arte
16:30 h	Session II <ol style="list-style-type: none"><li>4. Sandie Leconte: COST WoodMusICK and 3D-CT for musical instruments</li><li>5. Christian Kretzer: A brief history about cultural heritage scans</li><li>6. Markus Zepf, Sebastian Kirsch: Packaging and transport of instruments - workshop report</li><li>7. Christina Young: Measuring the Strain Distribution of Clarinets in real-time</li><li>8. Francesco Piasentini / Fabrizio Rosi: MicroCT applied to bowed stringed instruments: an industrial perspective</li></ol>
17:45-18:30 h	Guided tour: reference instruments in the musical instrument collection
19:30 h	Dinner in a typical Franconian beer cellar

**Day 2: Thursday 21 May 2015**  
**Fraunhofer EZRT, Fürth**

- 8:30 h / 8:45 h      Departure from the hotels to Fraunhofer EZRT in Fürth
- 10:00 h              Presentation and guided tour of Fraunhofer EZRT, followed by a coffee break
- 11:30 h              Session III
- 9. Richard Schielein: Positioning and data acquisition
  - 10. Theobald Fuchs: Meta information, documentation and data formats
  - 11. Gabriele Rossi Rognoni / Marco Fioravanti: The use of CT scanning for bowed stringed instrument identification and comparison
  - 12. Giovanni Paolo di Stefano / Marco Fioravanti: The use of CT scanning for other stringed instruments
- 12:30 h              Lunch (invited by Fraunhofer EZRT)
- 13:30 h              Session IV
- 13. Conny Restle: Measuring precision for musical instruments
  - 14. Thierry Maniguet: Details in instruments deserving special attention for imaging
  - 15. Tom Lerch: Details in Woodwind-Instruments Deserving Special Attention for Imaging
  - 16. Darryl Martin: CT scanning: the uses for museums and makers
- 14:30 h              Coffee break
- 15:00 h              Discussion of the project progress, of issues, further proceedings etc.
- 16:30 h / 17:00 h    Closing and travelling back to Nuremberg

## MUSICES first expert meeting

20/21 May 2015

Nürnberg / Fürth

### List of participants

#### MUSICES team GNM

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## MUSICES cooperation partners

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## COST action FP 1302 WoodMusICK

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\* Participants unfortunately not having been able to attend due to train strikes in Germany

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**GNM and its musical instrument collection**

**Frank P. Bär**

# Germanisches Nationalmuseum

MUSICES – COST – 1st expert meeting, May 20/21 2015

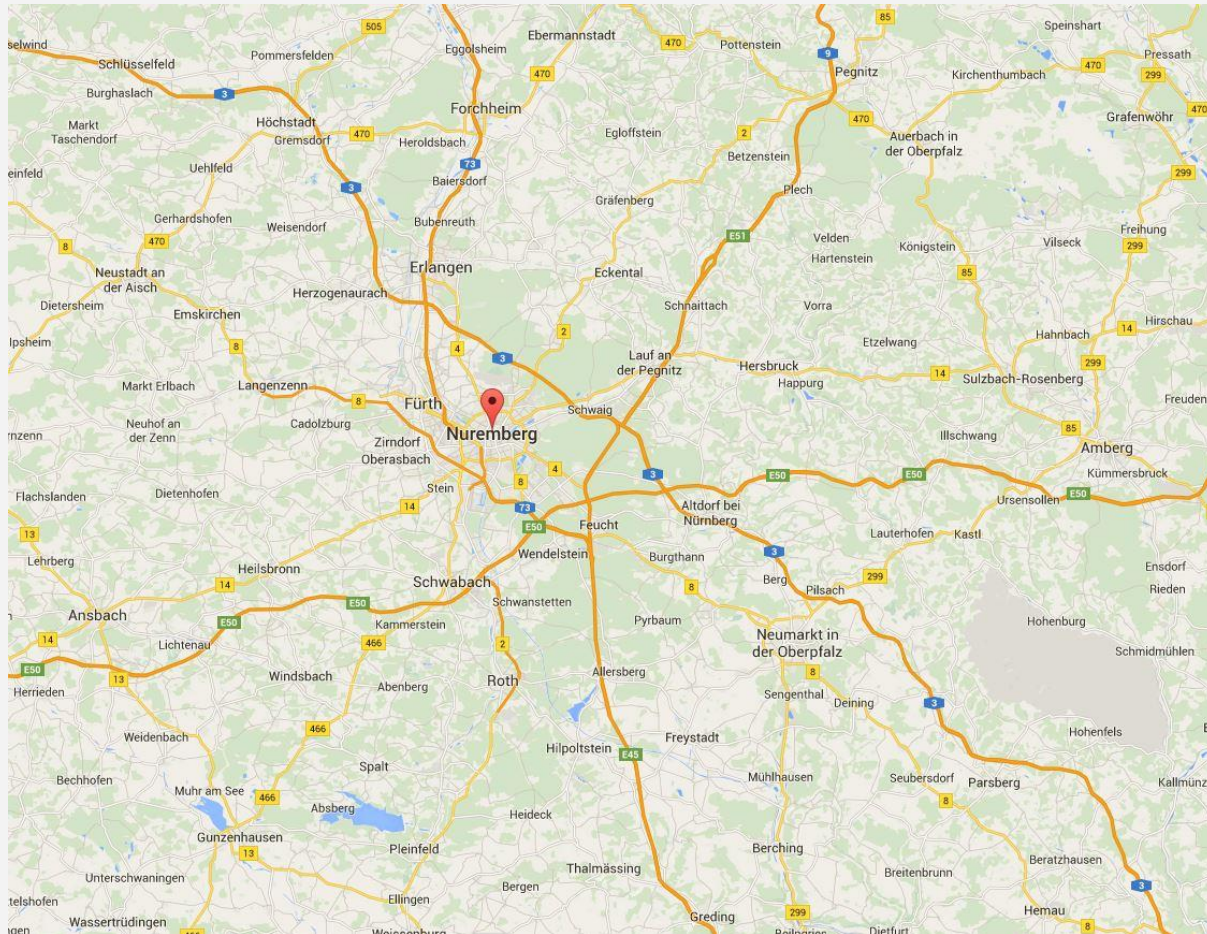
Frank P. Bär

GERMANISCHES  
NATIONAL  
MUSEUM



# Germanisches Nationalmuseum

Nuremberg – a hub for travelling and trade from the middle ages on





# Germanisches Nationalmuseum

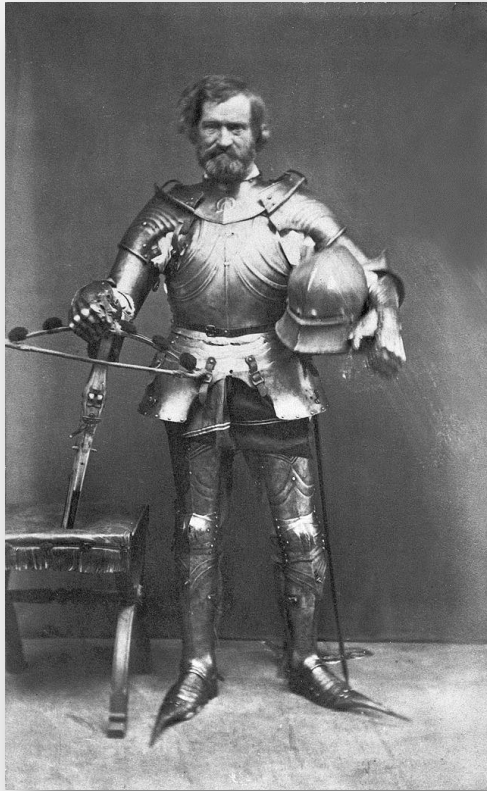
Nuremberg – a preferred city of the Emperor of the Holy Roman Empire



The imperial castle; source: Wikipedia, Dalibri

# Germanisches Nationalmuseum

Founded in 1852 by Hans Freiherr von und zu Aufseß as identification place for citizens of German mother speakers („German nation“)


























# Germanisches Nationalmuseum

The largest museum for cultural history of the German speaking lands



# Germanisches Nationalmuseum

1.3 million objects

	<p><b>19th century</b> The collection covers Neoclassicism, Romanticism, realism in the Biedermeier period, historicism and the Secessionist currents at the end of the century. <a href="#">Find out more</a></p>		<p><b>20th century</b> Founded in the 1950s, the collection of 20th century art and culture comprises painting, sculpture and design. <a href="#">Find out more</a></p>		<p><b>Painting up to 1800 and Glass Painting</b> The collection contains 600 years in the history of painting, from stained glass art from the 13th century to the academic painting of the late 18th century. <a href="#">Find out more</a></p>		<p><b>Furniture</b> Historical furniture is spread over the various exhibition departments at the Germanisches Nationalmuseum and its external divisions. <a href="#">Find out more</a></p>
	<p><b>Old Jurisdiction</b> The collection includes realia that shed light on criminal-justice practices (torture, public humiliation and punishment), as well as symbols of the law. <a href="#">Find out more</a></p>		<p><b>Historical Building and Construction</b> This collection, unique in style and character, contains documents relating to construction and interior design in the past. <a href="#">Find out more</a></p>		<p><b>Numismatic Collection</b> The numismatic collections are among the most important of their kind in Germany, especially in the area of medallion art and seal stamps. <a href="#">Find out more</a></p>		<p><b>Musical Instruments</b> Due to its sheer size, the collection of historical musical instruments is one of the most important of its kind in the world. <a href="#">Find out more</a></p>
	<p><b>Deutsches Kunstarchiv</b> The Deutsches Kunstarchiv is the largest archive of estate collections and legacies of manuscripts relating to the art and culture of the German-speaking world. <a href="#">Find out more</a></p>		<p><b>Museum of Applied Arts and the Design Collection</b> On show are decorative art and related objects. The Design Collection was established in 1966. <a href="#">Find out more</a></p>		<p><b>Sculpture up to 1800</b> The collection is the largest and most comprehensive of its kind in the German-speaking regions. <a href="#">Find out more</a></p>		<p><b>Toys</b> The collection of toys for adults and children stretches to some 20,000 objects and features a collection of Nuremberg dollhouses from the 17th century. <a href="#">Find out more</a></p>
	<p><b>Department of Prints and Drawings</b> With some 350,000 sheets, the graphic arts collection is one of the largest in Europe. <a href="#">Find out more</a></p>		<p><b>Library: Manuscripts and Rare Prints</b> The library is the largest specialist library of German art and cultural history open to the public. <a href="#">Find out more</a></p>		<p><b>Textiles and Jewellery</b> The collection is one of the oldest and most important in Europe, featuring textiles, clothing and jewellery from late antiquity up to the present. <a href="#">Find out more</a></p>		<p><b>Folk Art</b> This cross-departmental, transregional collection focuses on rural living, household appliances and religious folk art. <a href="#">Find out more</a></p>
	<p><b>History of Crafts</b> The collection featuring important objects relating to the history of guilds and rare tools is one of the largest of its kind. <a href="#">Find out more</a></p>		<p><b>Historical Archives</b> The Historical Archives contain historical documents from the German-speaking regions ranging in date from the 10th to 21st century. <a href="#">Find out more</a></p>		<p><b>Prehistory and Protohistory</b> The collection contains archaeological finds from Central Europe, ranging from the Palaeolithic age to the age of Charlemagne. <a href="#">Find out more</a></p>		<p><b>Arms, Armour and Hunting Culture</b> Masterpieces represent the art of the armourer, swordsmith and gunmaker from the 11th to 19th century. <a href="#">Find out more</a></p>
	<p><b>Judaica</b> The collection contains artefacts of Jewish art and culture that were used in religious practices in the synagogue or home. <a href="#">Find out more</a></p>		<p><b>Decorative Arts up to 1800</b> The collection presents design objects used in celebrations and everyday life. <a href="#">Find out more</a></p>		<p><b>Scientific Instruments and the History of Medicine</b> Nine centuries in the history of science - from measuring the entire world to the minuscule pocket watch. <a href="#">Find out more</a></p>	<p>Library Historical archives German art archives</p>	

Institute for Art Technology and Conservation

# Germanisches Nationalmuseum

## Musical Instrument Collection

- ca. 3.000 objects
- 16th to 20th century
- Large collection of keyboard instruments
- Small, but important collection of lutes
- Instruments from the free imperial city of Nuremberg:
  - Woodwinds: Denner, Kinsecker etc.
  - Brasswinds: Ehe, Hainlein etc.
  - Bowed strings: Widhalm, Maussiell etc.



# Germanisches Nationalmuseum

## Musical Instrument Collection

- Collection parts:
  - Rück collection: 1.500 of all types
  - Neupert collection: 300 keyboards and related
  - Hachenberg collection: 200 brass, mainly 19th and 20th century
  - Janssen collection: 30 bassoons, mainly 19th century
  - Fischer collection: 80 oboes, 19th and 20th century
  - Schreinzer: several hundreds pieces, violin parts and related



# MIMO – Musical Instrument Museums Online

Musical instrument collection – projects

Initial targets and basic data:

- EU-funded 2009–2011
- Creating a central access point for digital assets and information about musical instrument collections in European museums
- Forwarding Data to EUROPEANA
- 45.000 musical instrument images with metadata online
- 1.800 audio files
- 300 video files
- controlled vocabularies
- 11 partners, 9 collections
- six languages
- digitisation standard



# MIMO – Project partners (WP lead)

## Musical instrument collection – projects

- University of Edinburgh
  - WP4 Coordinator
- Germanisches Nationalmuseum
  - WP1 Digitisation
- Philharmonie de Paris
  - WP2 OAI harvesting, Europeana connect
- Horniman Museum, London
  - WP3 Thesaurus and Classification
- Koninklijk Museum voor Midden-Afrika, Tervuren
  - WP5 Assessment and Evaluation
- Ethnologisches Museum, Staatliche Museen zu Berlin
  - WP6 Dissemination and Awareness



# Project partners (content providers)

Musical instrument collection – projects

- Museum für Musikinstrumente der Universität Leipzig
- Muziekinstrumentenmuseum, Brüssel
- „Amici del Museo degli Strumenti Musicali“, Florenz
- Università degli Studi di Firenze, Florenz
- Scenkonsmuseet, Stockholm



# MIMO – Musical Instrument Museums Online

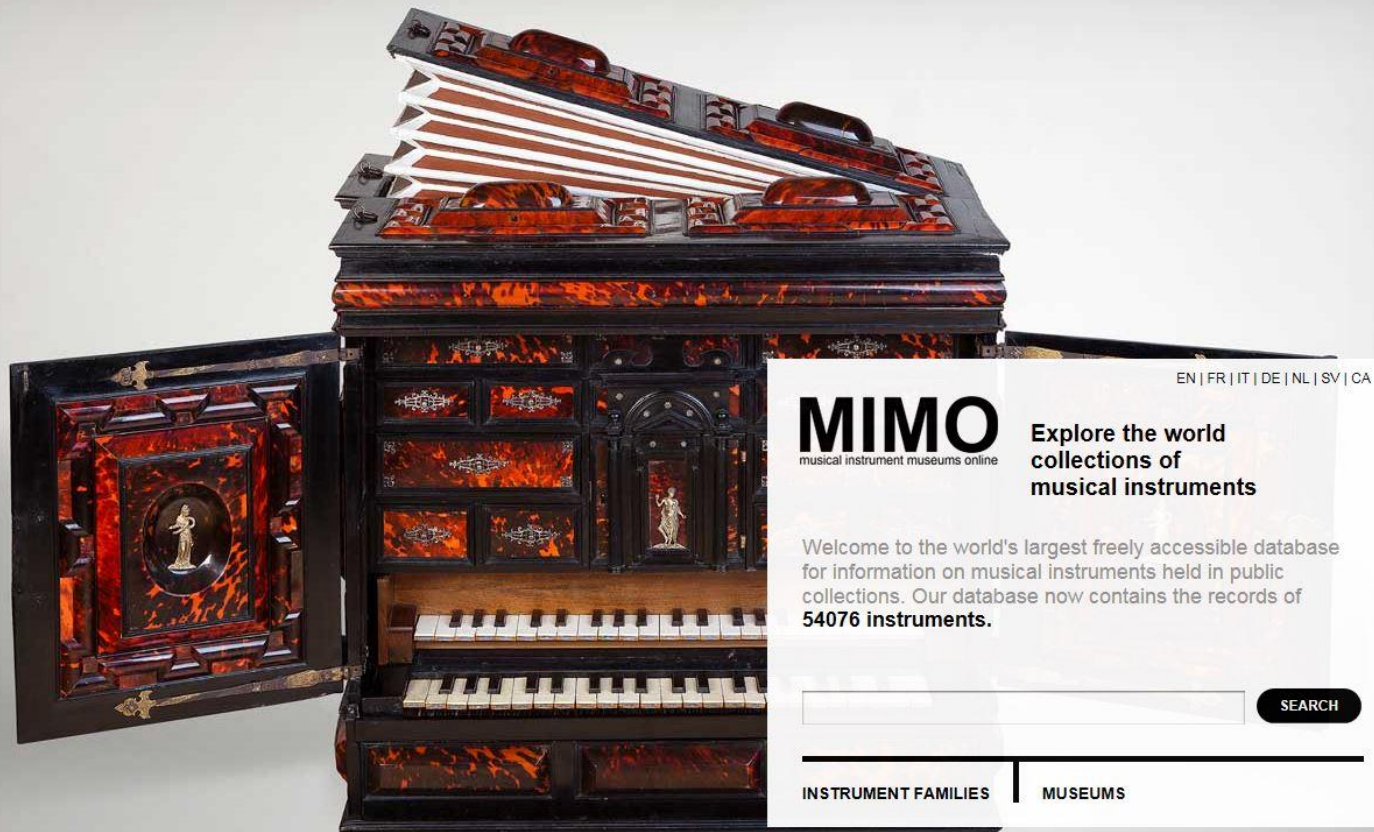
Musical instrument collection – projects

May 2015:

- 54.076 musical instruments online
- 24 collections
- 7 languages
  - English
  - French
  - German
  - Italian
  - Dutch
  - Swedish
  - Catalanian
- Website: [www.mimo-international.com](http://www.mimo-international.com)

# Germanisches Nationalmuseum

## Musical Instrument Collection – projects



EN | FR | IT | DE | NL | SV | CA

**MIMO**  
musical instrument museums online

Explore the world collections of musical instruments

Welcome to the world's largest freely accessible database for information on musical instruments held in public collections. Our database now contains the records of **54076 instruments**.

SEARCH

INSTRUMENT FAMILIES | MUSEUMS

Clavorgue - Lorenz Hauslaib, ca. 1590, Museu de la música de Barcelona



PHILHARMONIE  
DE PARIS



GERMANISCHES  
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mim



ICMIM  
INTERNATIONAL COUNCIL OF MUSICAL  
INSTRUMENT MUSEUMS AND COLLECTIONS

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# Germanisches Nationalmuseum

Musical instrument collection – projects



# Germanisches Nationalmuseum

## Musical instrument collection – projects

- MUSICES (project lead with Fraunhofer EZRT)

- November 2014 to October 2017

- Funded by 



- COST FP1302 WoodMusICK (German representative)

- November 2013 to November 2017



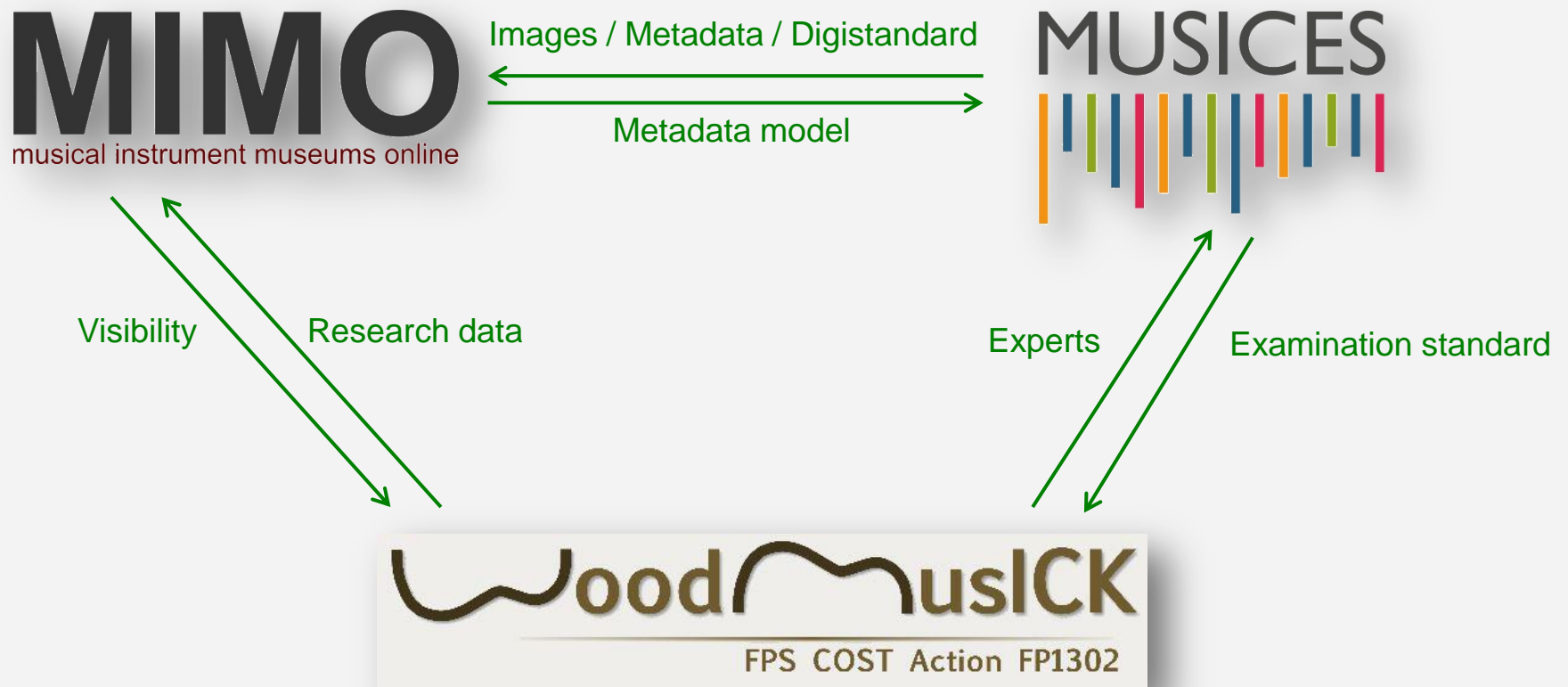
- Collecting musical instruments – the Rück example

- June 2015 to May 2018

- Funded by 

# Synergies

MIMO – COST FP 1302 – MUSICES



**Thank you!**

GERMANISCHES  
NATIONAL  
MUSEUM

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**Fraunhofer EZRT and X-ray equipment**

**Theobald Fuchs**



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# SCIENTIFIC APPLICATION CENTER A WIDE RANGE OF COMPUTED TOMOGRAPHY SYSTEMS

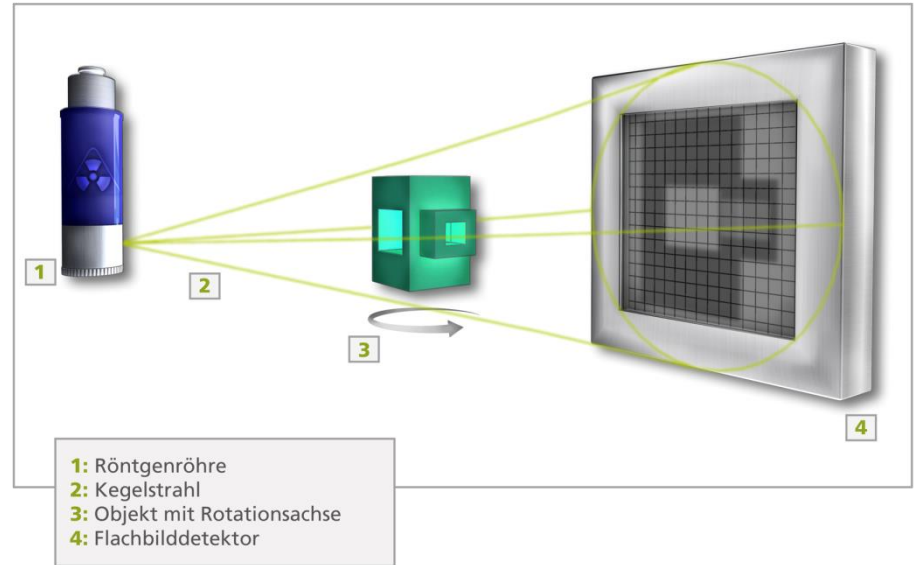
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**Fraunhofer**  
EZRT

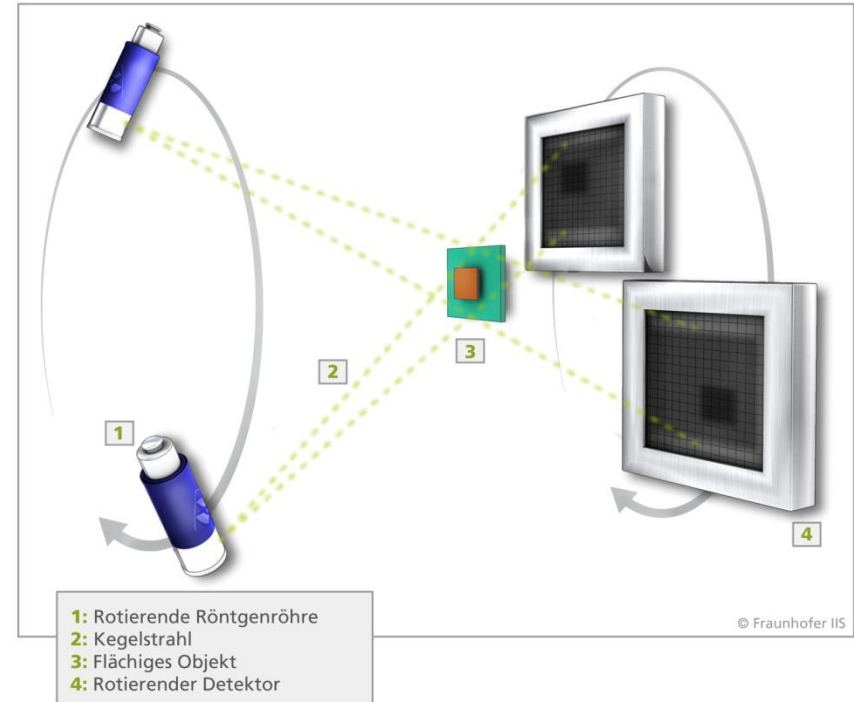
# Industrial Computed Tomography

- NDT by X-Ray imaging
- Generation of 3D data of complete volumes displaying surface and inner structures
- Metrological tasks
- Material analysis
- Inspection of closed containers and baggage
- Reverse Engineering



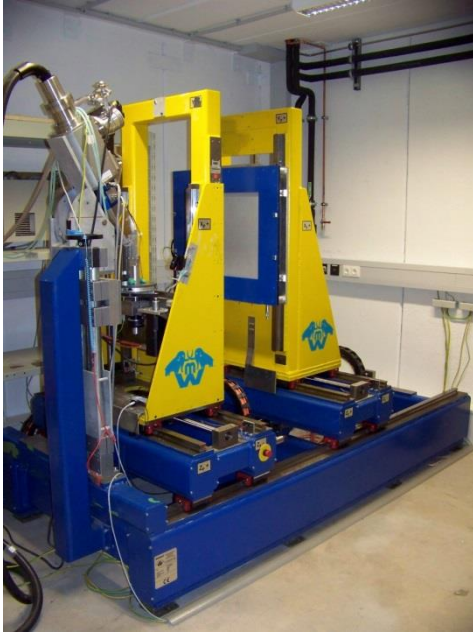
# Industrial Computed Tomography

- Different methods:
  - Radioscopy
  - Laminography
  - Computed tomography

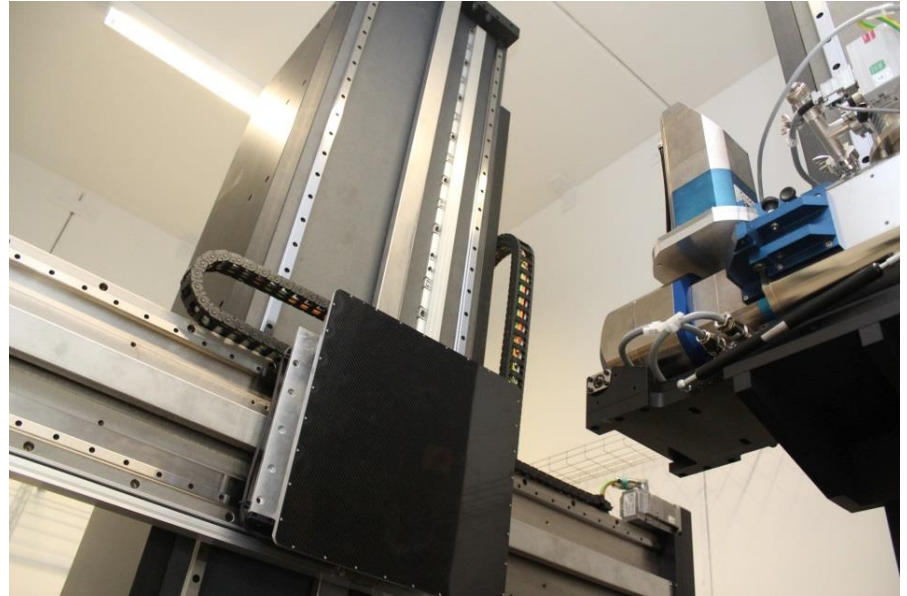


# CT systems

## Microfocus



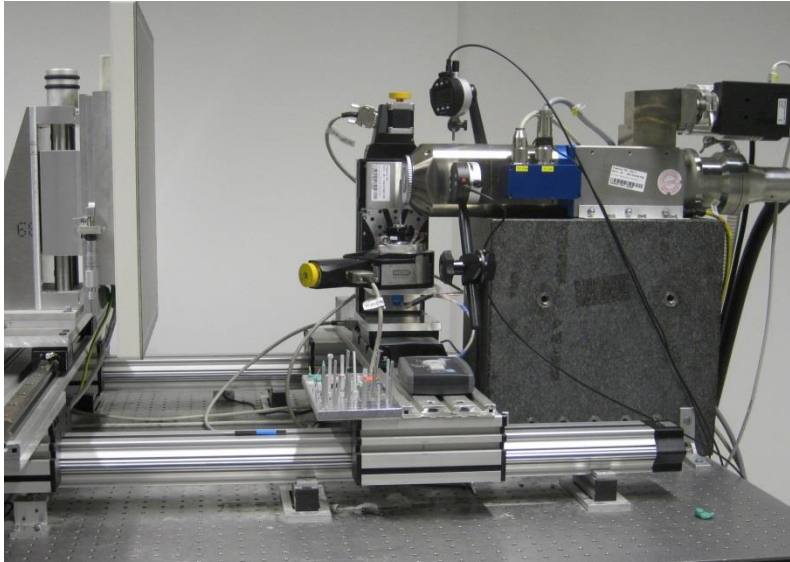
» $\mu$ CT«



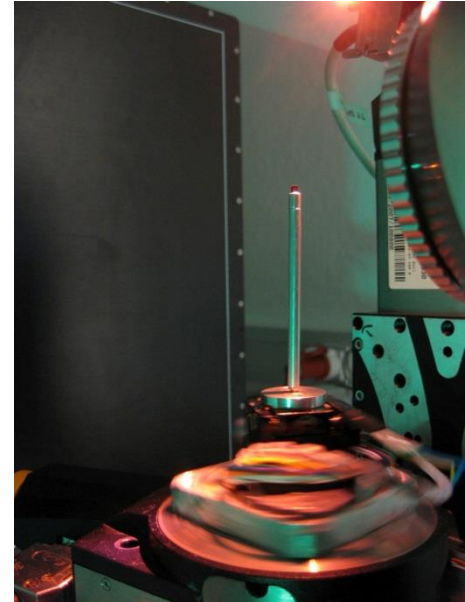
»Tomosynthesis machine«

# CT systems

## High resolution

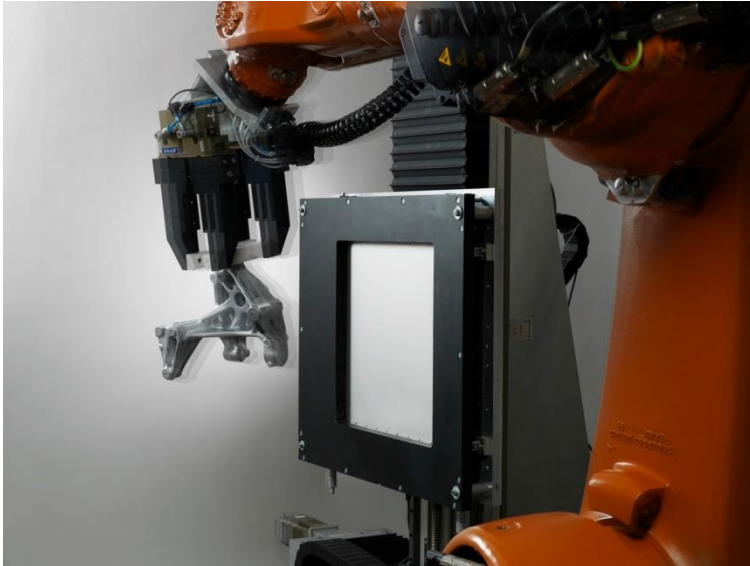


»Sub- $\mu$ CT«



# CT systems

## Minifocus



»MacroCT«



»Dragonfly«

# CT systems

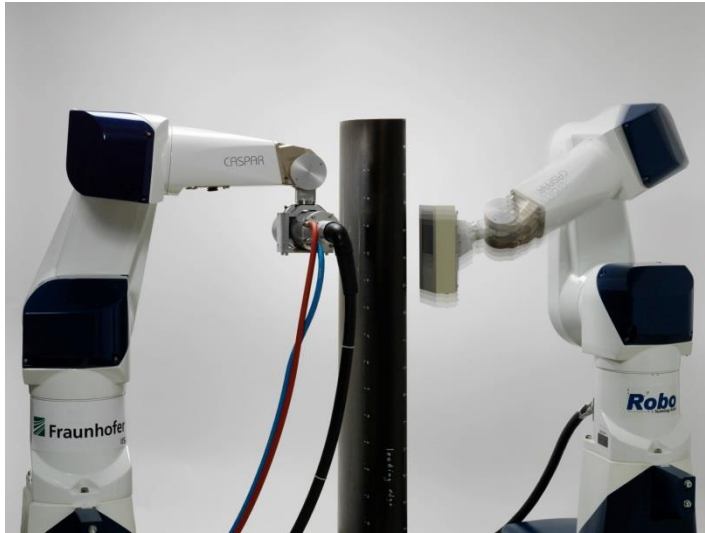
## High-energy imaging of very large objects

»XXL-CT«  
(9 MeV linear accelerator)



# CT systems

## Specialized equipment



»RoboCT«



»CTportable«



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The MUSICES project

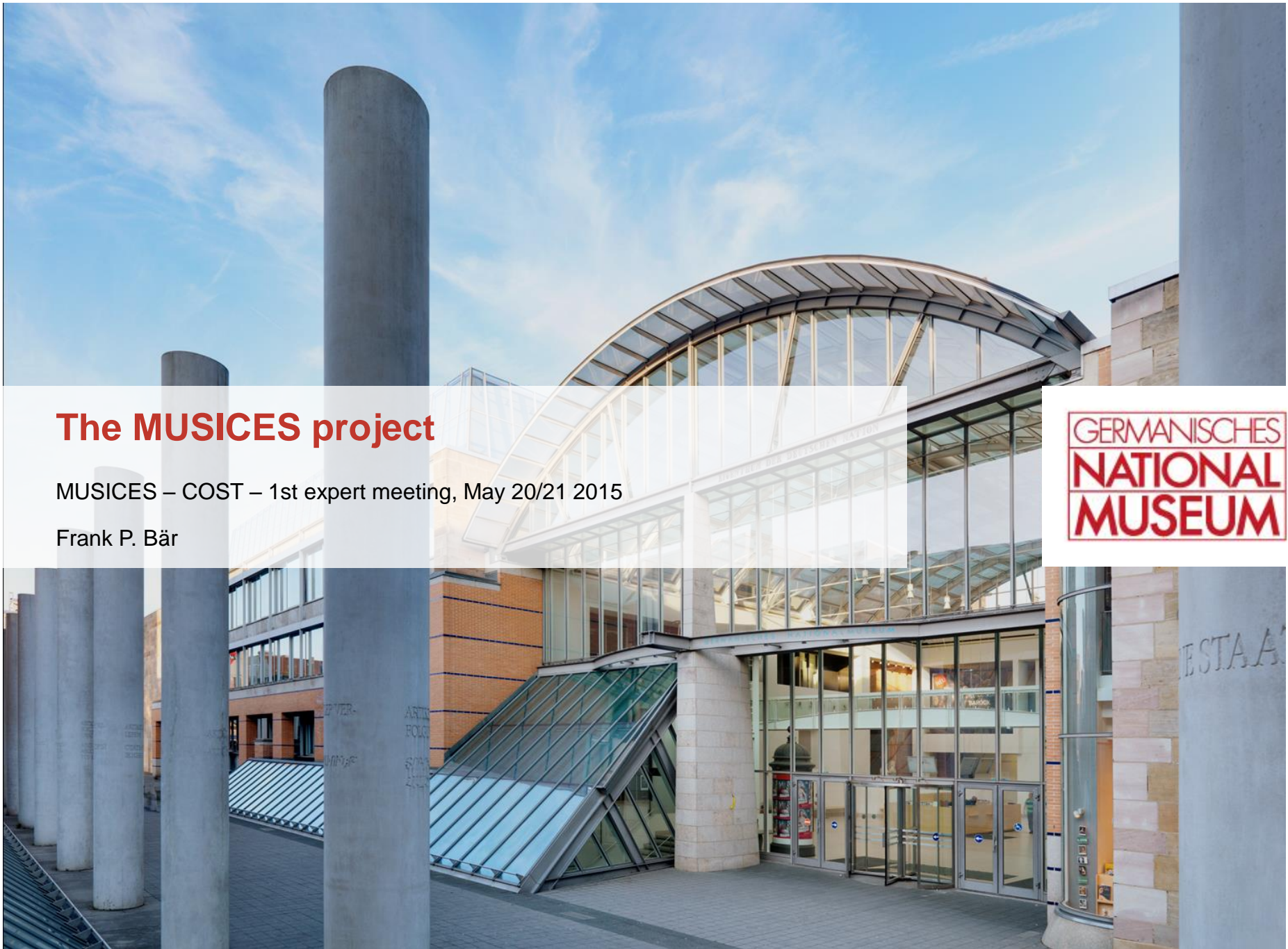
Frank P. Bär / Theobald Fuchs

# The MUSICES project

MUSICES – COST – 1st expert meeting, May 20/21 2015

Frank P. Bär

GERMANISCHES  
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# MUSICES

## Musical Instrument Computed Tomography Examination Standard

- Target: Creating a standard for 3D computed tomography of musical instruments and enhancing the MIMO digitization standard
- Funded by Deutsche Forschungsgemeinschaft (DFG)
- Proposers:
  - Germanisches Nationalmuseum (Project lead: Frank P. Bär)
  - Fraunhofer-Institut Integrierte Schaltungen (IIS), Entwicklungszentrum Röntgentechnik (EZRT) (Project lead: Theobald Fuchs)



# MUSICES

## Musical Instrument Computed Tomography Examination Standard

- Co-proposers:
  - Musikinstrumenten-Museum, Staatliches Institut für Musikforschung Preußischer Kulturbesitz, Berlin
  - Museum für Musikinstrumente der Universität Leipzig
  - Staatliche Museen zu Berlin, Ethnologisches Museum
- Cooperating partners:
  - Musée des instruments de musique, Brüssel
  - University of Edinburgh
  - Philharmonie de Paris

# MUSICES

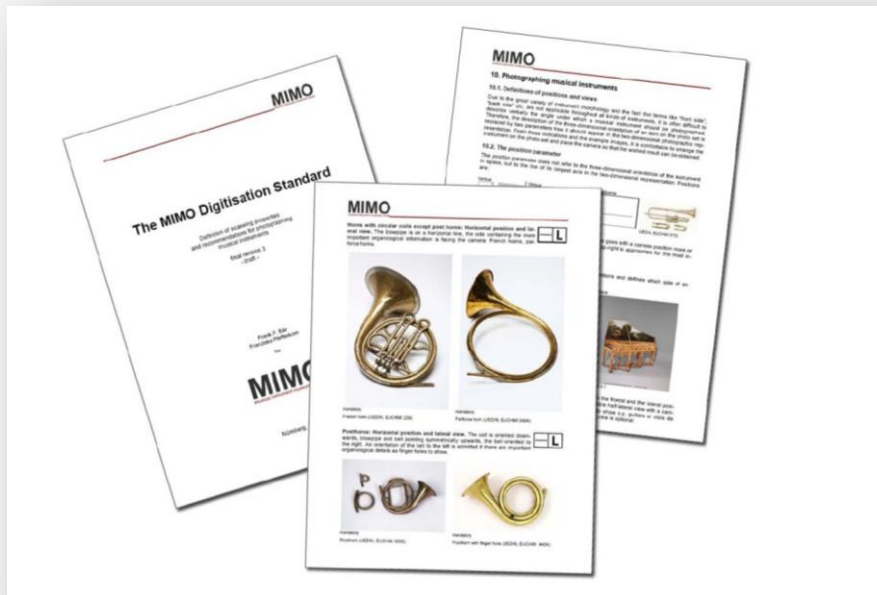
## Musical Instrument Computed Tomography Examination Standard

- Running time: 1 November 2014 to 31 October 2017
- Targets:
  - A device-independent description of technical parameters for 3D-CT imaging of various materials, object sizes and material combinations in musical instruments.
  - Description of open formats for the long-term archiving of high-resolution master scans.
  - Description of open formats for derivatives, for presentation on the web and the dissemination as open access.
  - Definition of minimum resolutions of 3D-CT scans for different types of instruments depending on size, material and potential applications.
  - Definition of details to be scanned more precisely for different types of instruments, particularly for larger instruments, when it is not useful or feasible to make a high-resolution total scan.
  - Definition of the necessary metadata for 3D-CT scans, compatible with LIDO and MIMO-LIDO respectively and with the ISO standard CIDOC-CRM (ISO 21127:2006).
  - Integration of the metadata and the generated 3D-CT scans into [MIMO](#). Transfer to [EUROPEANA](#) via harvesting.
  - A standard paper to be at DFG's disposal and supplementing the [MIMO digitalisation standard](#).
  - A best-practice paper according to the MIMO digitisation standard.

# MUSICES

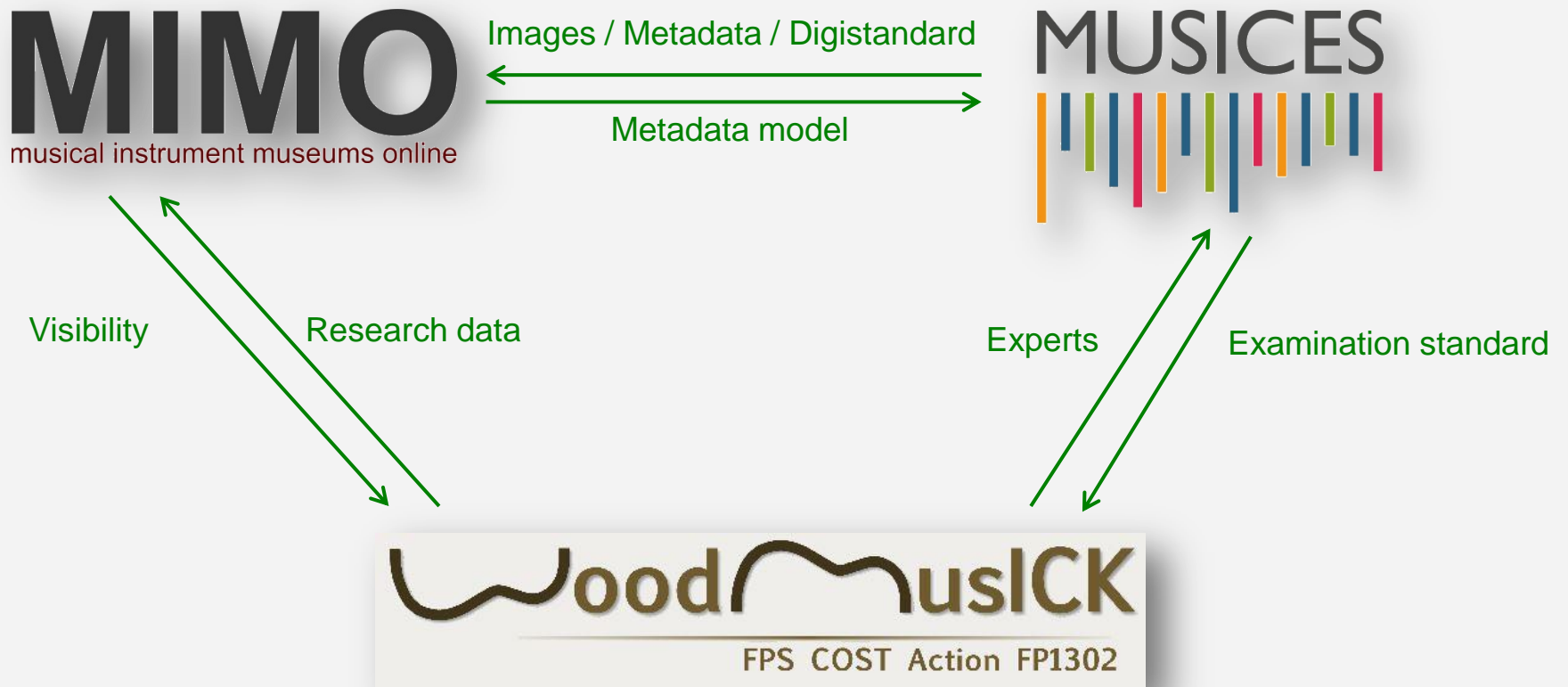
A standard

- The MIMO digitization standard



# Synergies

MIMO – COST FP 1302 – MUSICES



**Thank you!**

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NATIONAL  
MUSEUM



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**A brief history about cultural heritage scans**

**Christian Kretzer**

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# FRAUNHOFER DEVELOPMENT CENTER X-RAY TECHNOLOGY EZRT

A brief history about cultural heritage scans

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# First scans

## La Leona

- Fourth guitar from Antonio de Torres (1856)
- Changed the way guitars were built
- Material: wood, brass/bronze
- Task:
  - Display of inner structure
  - Measurement of inner structures
  - Display of treatment traces



Wikipedia.org

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# First scans

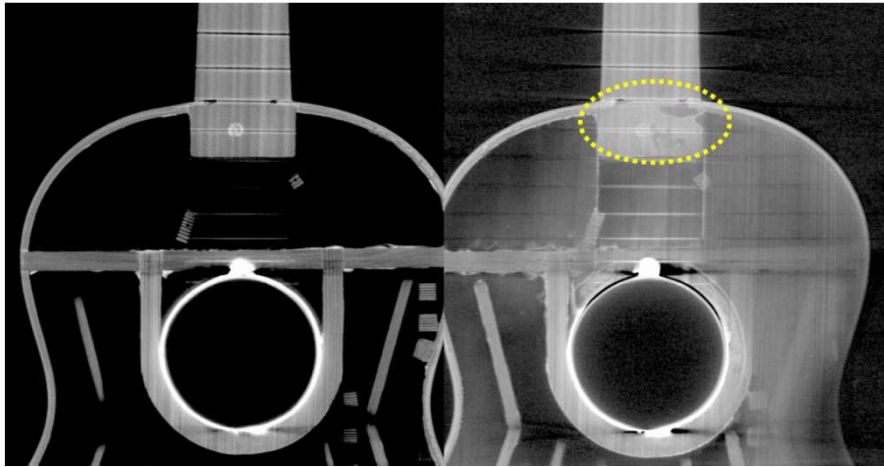
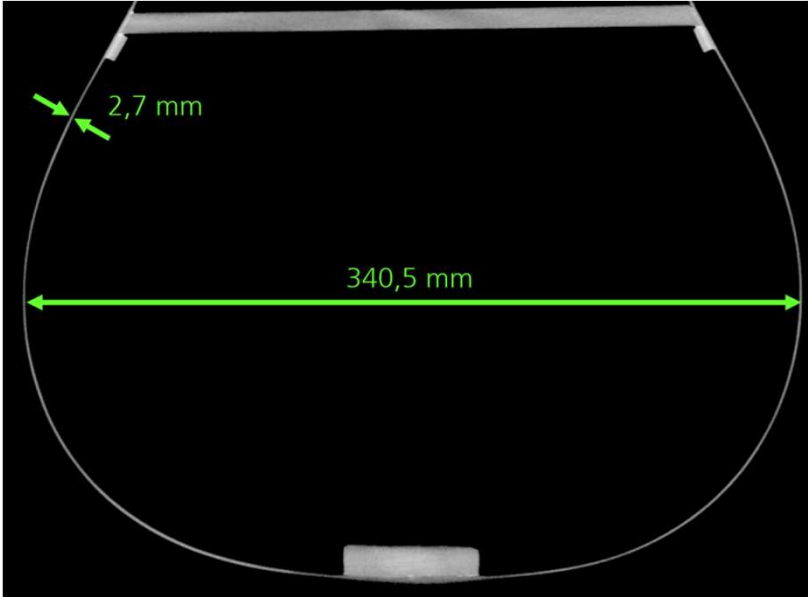
## La Leona

- 3D computed tomography on the MakroCT system
- Spatial resolution ca. 400  $\mu\text{m}$



# First scans

## La Leona



# First scans

## La Leona



# Further scans

## Attic round dish

- Material: ceramics
- Task:
  - Display of different ceramics to show repairs

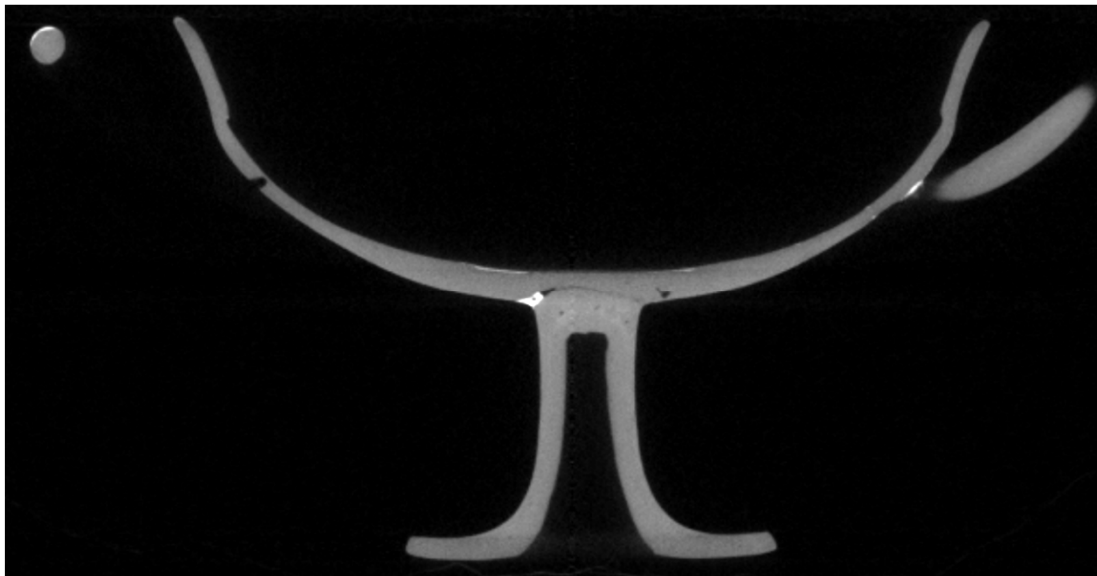


Wikipedia

# Further scans

## Attic round dish

- 3D computed tomography on the MakroCT System
- Spatial resolution ca. 200 $\mu$ m





# Further scans

## Attic round dish



# First contact with the GNM

## Armilla

- Armilla from the coronation of Frederick Barbarossa (1152-1190)
- Material: copper basis with gold and enamel coated
- Task:
  - Can this object be transported?
  - Display of the bonding of the coating
  - Is a restoration necessary?

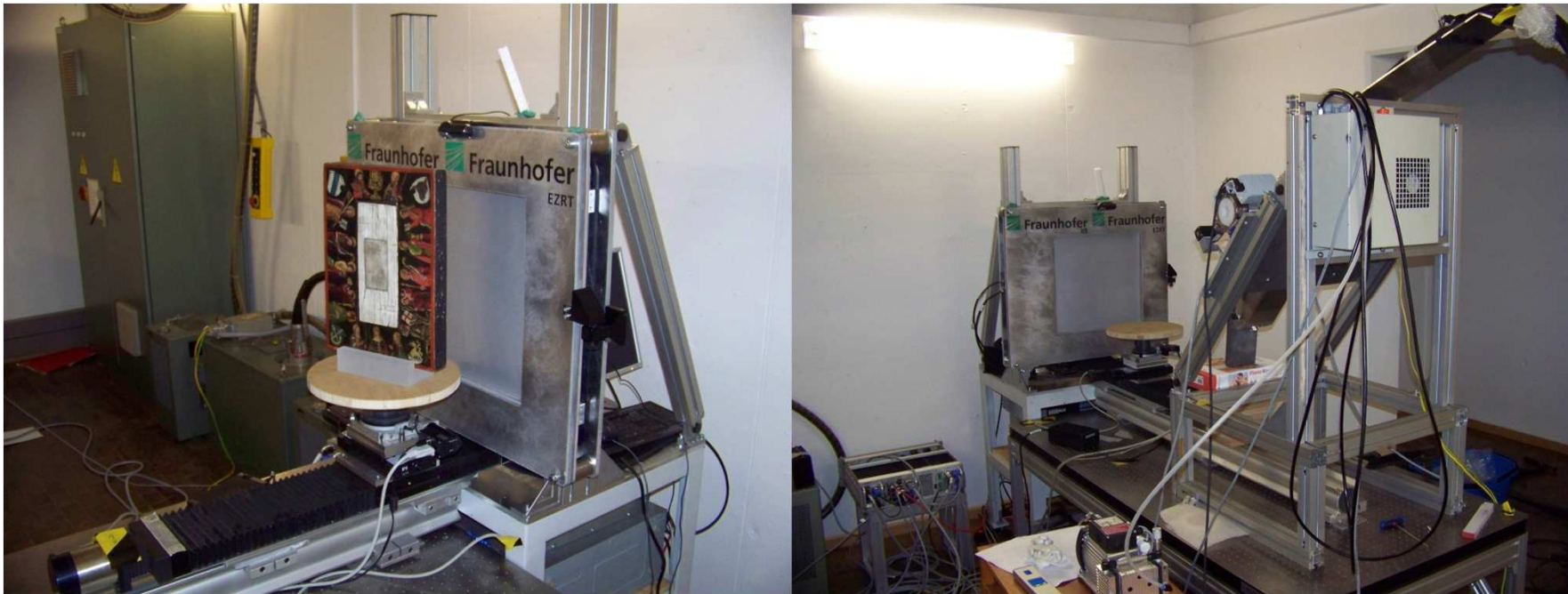


Germanisches Nationalmuseum, KG1239

# First contact with the GNM

## Armilla

- Realization of a mobile microfocus CT system at the Germanisches Nationalmuseum



# First contact with the GNM

## Armilla

- 3D computed tomography
- Planarisation for better visualisation of bonding layers



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# First contact with the GNM

## Further scans

- Sitting beggar woman
- Fully plastic figure from Simon Troger (1685-1768)
- Material: ivory, nutwood
- Task:
  - Display of the buildup
  - Identification of different materials in the figure

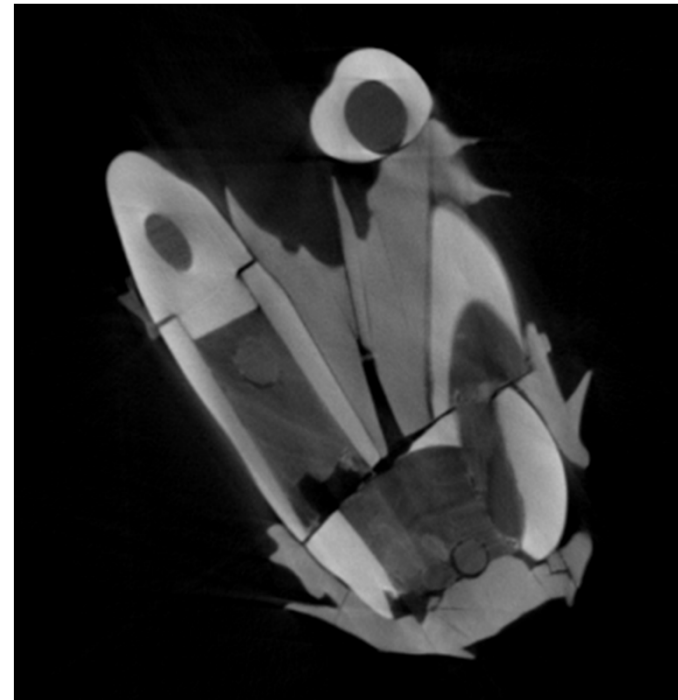


Germanisches Nationalmuseum, Pl.O. 2976

# First contact with the GNM

## Further scans

- 3D computed tomography



# Pocket watches

## First test scans

- Presumably oldest pocket watch from Peter Henlein
- Material: iron, brass
- Task:
  - Display of the clockwork and spring case
  - Examination of inscriptions or signatures (PH)
  - 3D visualization of the clockwork

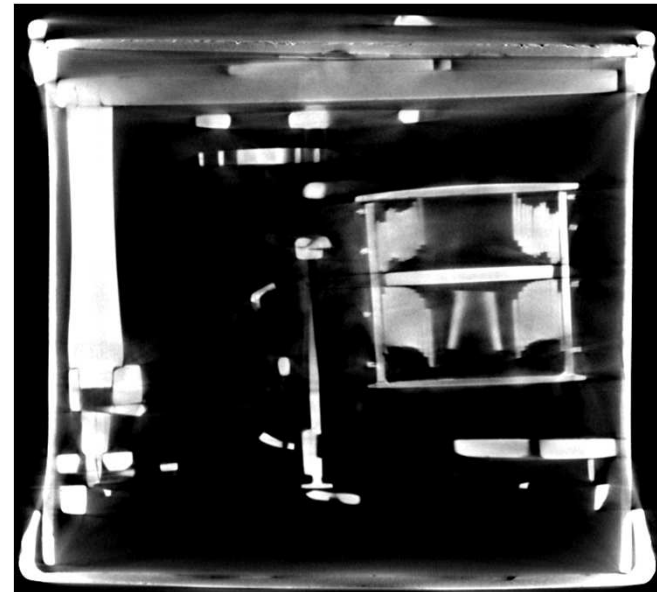
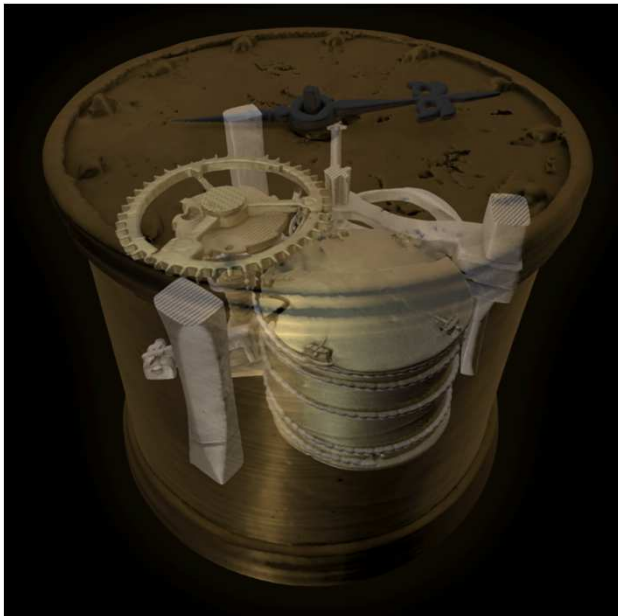


Germanisches Nationalmuseum, WI1265

# Pocket watches

## First test scans

- 3D computed tomography
- Correction algorithms to improve 3D visualization of the watch
- Spatial resolution ca.  $80\mu\text{m}$



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# Pocket watches

## Science project

- Which is the oldest pocket watch in the world?
- Special exhibit with old pocket watches at the Germanisches Nationalmuseum
- Funded by the Staedtler Stiftung
- Together with:
  - Germanisches Nationalmuseum
  - Technische Hochschule Nürnberg Georg Simon Ohm
  - Fraunhofer EZRT



STAEDTLER  
STIFTUNG



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# Pocket watches

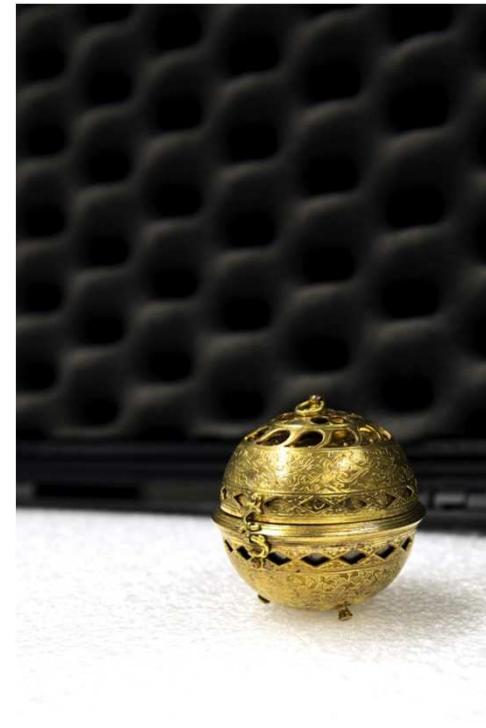
## Science project



# Pocket watches

## Science project

- The candidate??



# Pocket watches

## Science project

- The candidate??

