3DMC 3D METROLOGY CONFERENCE

3DMC 2022
Aachen
November 15 - November 17

GEATOP Metrology & Survey

ISO 9001 BUREAU VERITAS Certification

The importance of Virtual Fitting and Uncertainty estimation in Nuclear Fusion field

GEATOP - Who we are

We are a Metrology company based in North-Italy close to Turin

We are Hexagon Technical partner

HEXAGON

Authorised **Hexagon** technical partner

We work on Nuclear Fusion field since from 10 years

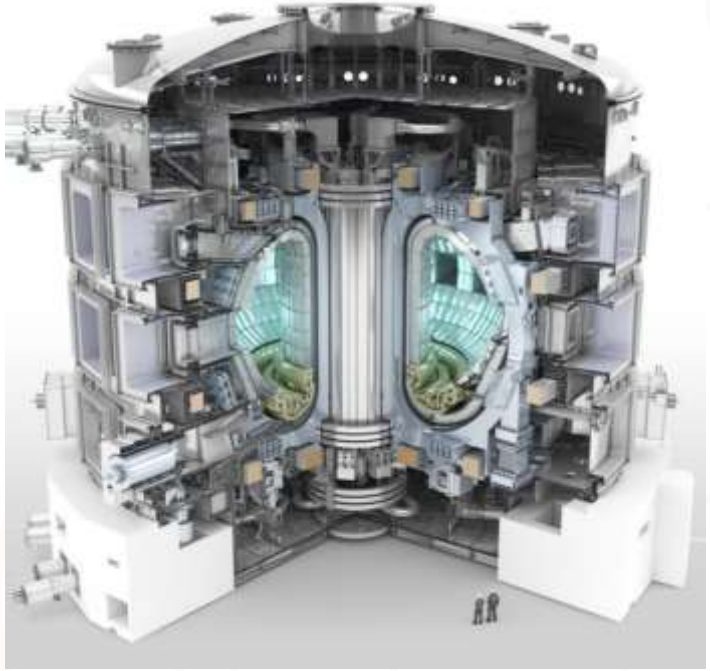
iter

china eu india japan korea russia usa

KEYWORDS

- **FIDUCIALS:** fixed points of known coordinates X, Y, Z in reference system
- **LASER TRACKER (LT):** 3D measurement system useful to make Large Volume Metrology with a typical MPE of 15µm + 6µm*meter
- **SPATIAL ANALYZER (SA):** metrology software of New River Kinematics (part of Hexagon) used to make measurements, simulation, unceratinty computation, etc..
- **VIRTUAL FITTING (VF):** simulation of two (or more) parts fitting based on real measurements set of data and CAD model (nominal or reversed).
- **ITER PROJECTS:** one of the most ambitious energy projects in the world today.
- **NUCLEAR FUSION:** Fusion is the energy source of the Sun and stars.
- **TOKAMAK:** The tokamak is an experimental machine designed to harness the energy of fusion.

ITER in numbers



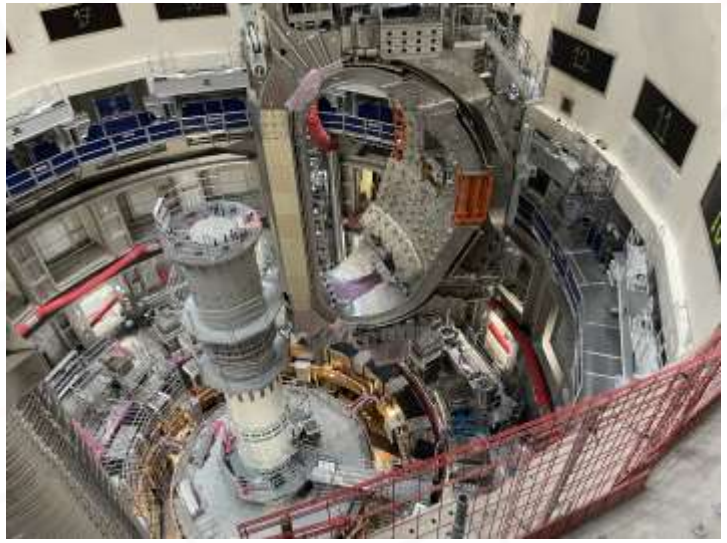
Height: 24 meters

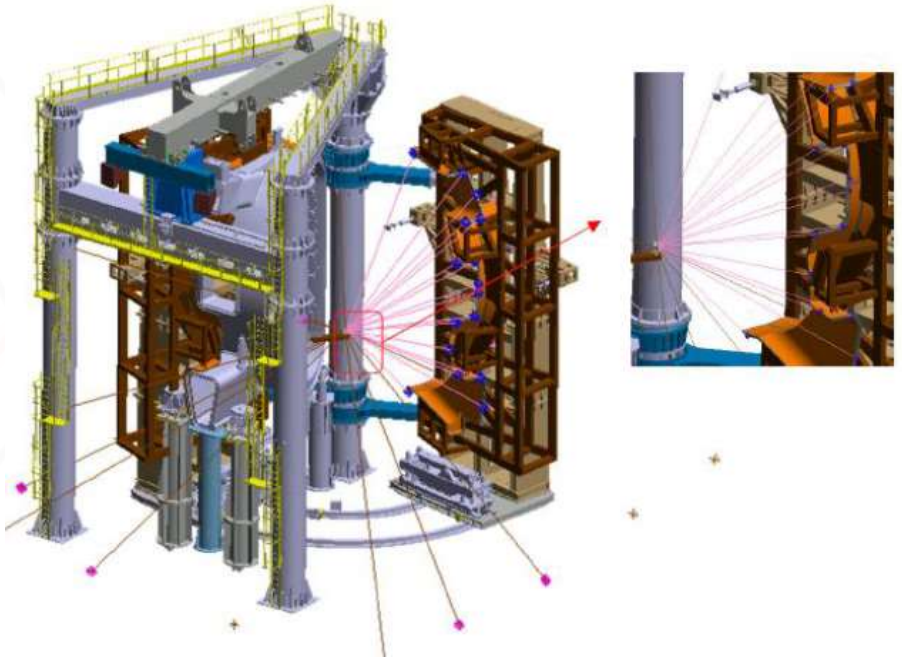
Widht: 30 meters

Plasma Radius: 6.2 meters

Total Weight of the Tokamak: 23000tons

Total Weight of the Vacuum Vessel: 8000 tons

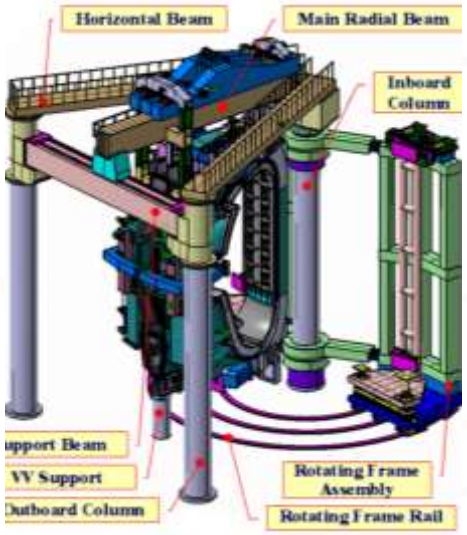




Big numbers, but tight tolerances (±0.25mm in final positioning!)

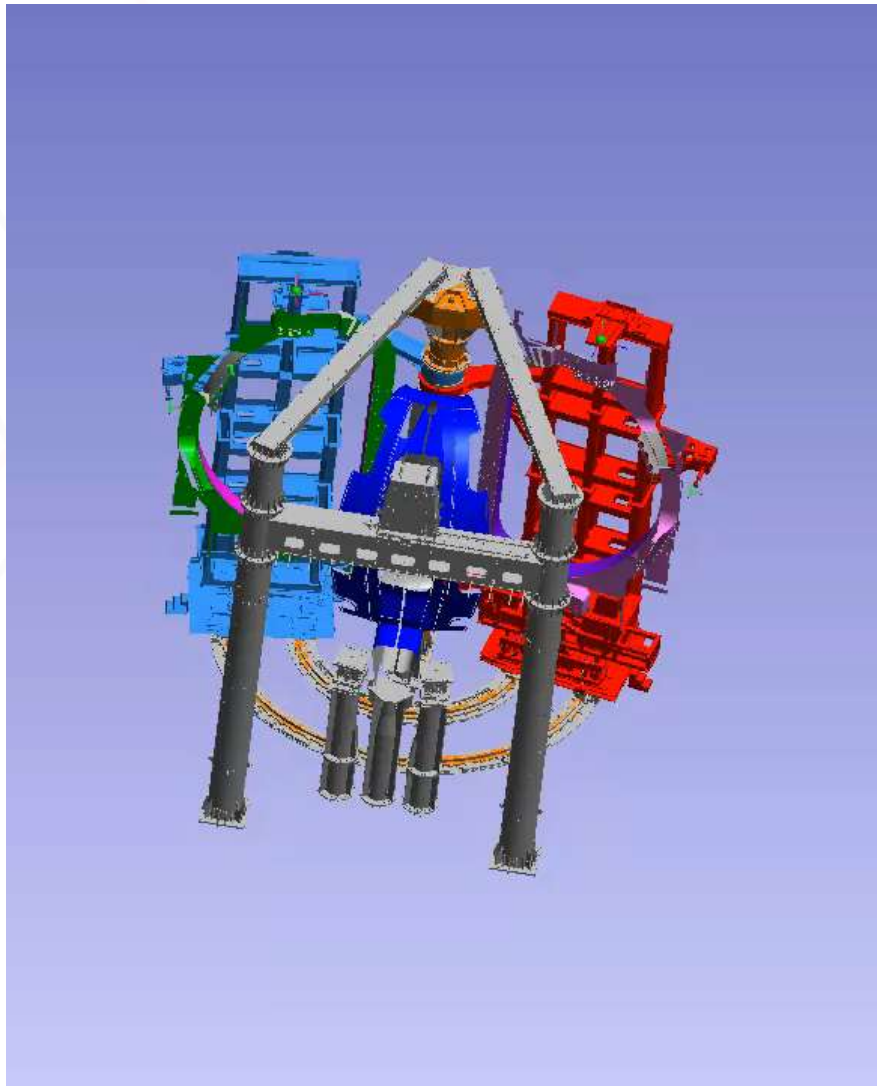
VIRTUAL FITTING (VF)

- **Back office** activity- no impact on the field
- **Risk Assesment** of assembly thanks to **Spatial Analyzer** software
- **Time saving** - no negative impact on time schedule
- **Cost saving**



VF on ITER Assembly

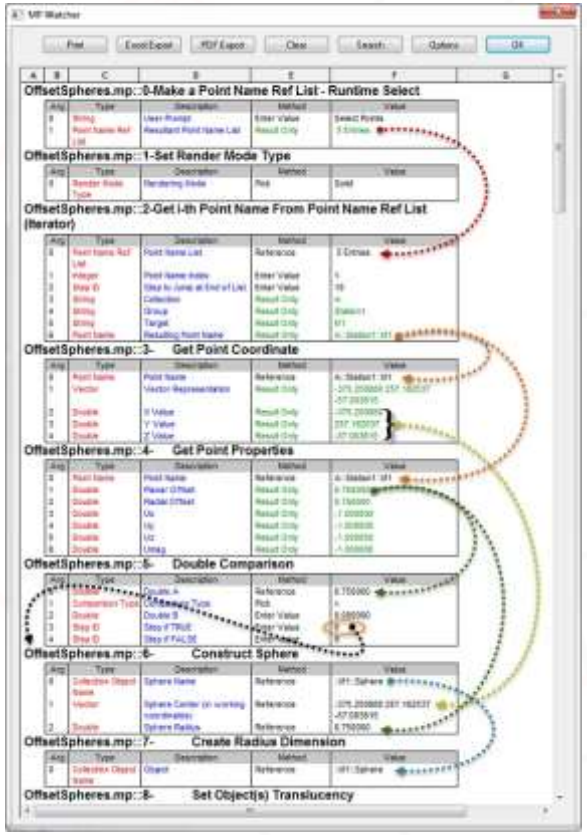
- **Trajectory definition to avoid clashes**
- **Final gap prediction**
- **Final fiducial position prediction**

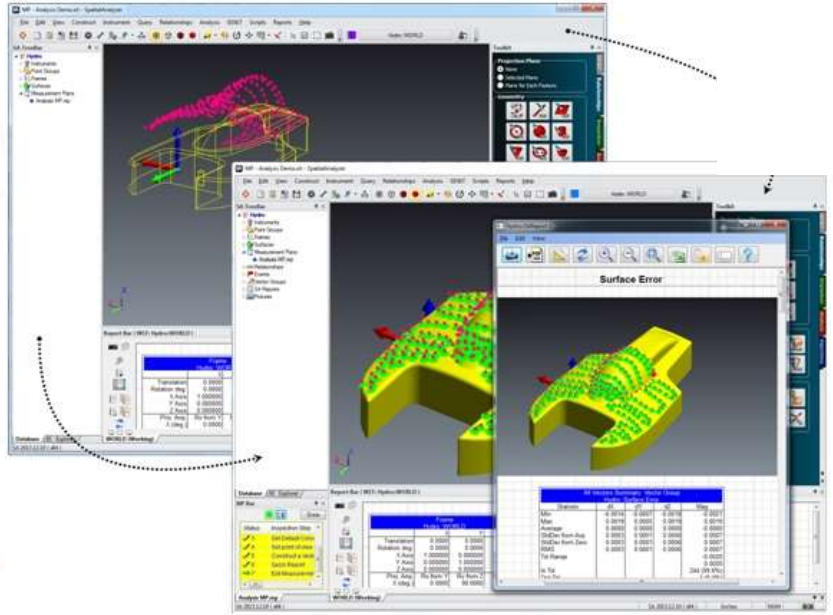


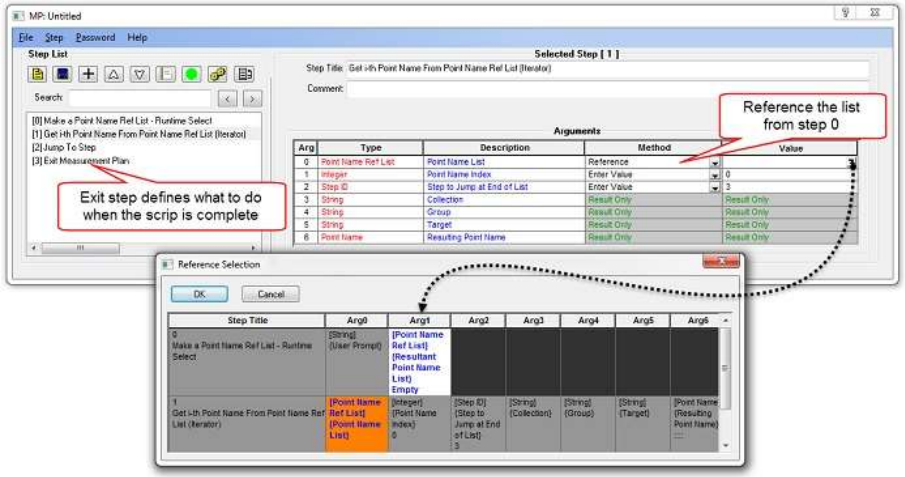
SCRIPTING

Highly recommended to **speed up** VF

It could be done directly on **SA**





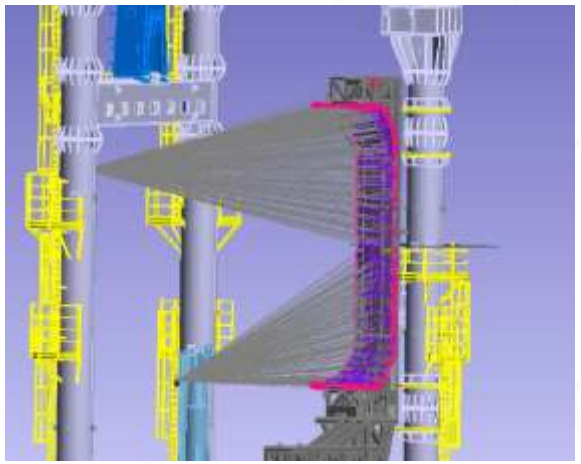


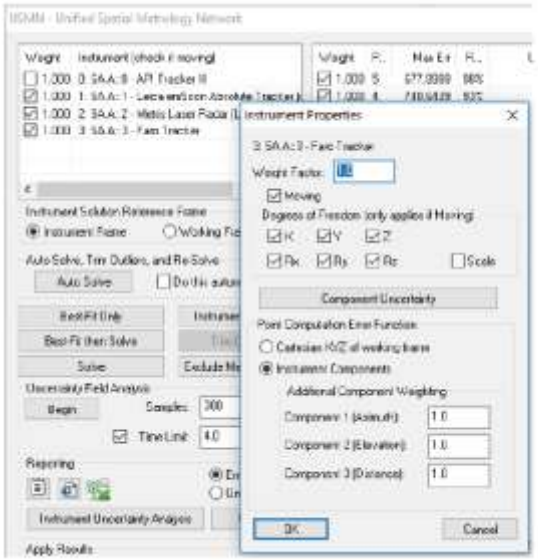
Thanks to scripting we **save time** and we minimize the **risks of human error** in VF!

UNCERTAINTY

Fundamental to ensure **good final results**!

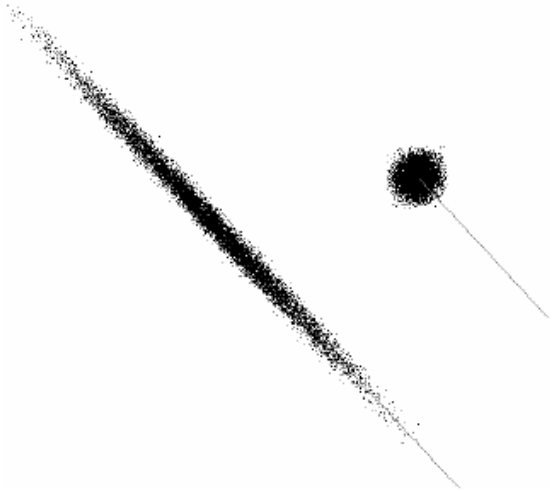
To be **estimated** in advance thanks to simulation





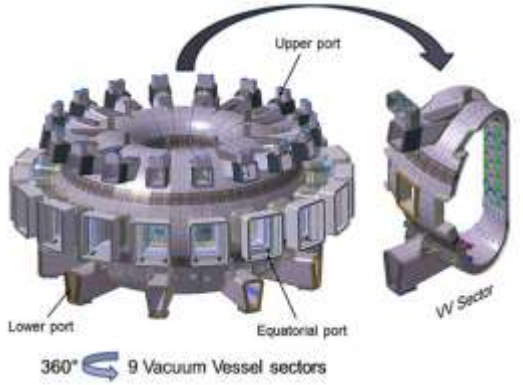
To be **calculated after survey** using real world parameters

Thanks to uncertainty prediction, we could ensure to be in line with tight tolerances despit the big dimensions!



VF + UNCERTAINTY

The combination of the two, allow us to be **confident** in each manufacturing\assembly step



If metrology is used just in the final phase, its **contribution** to the project is **minimum**

Use metrology during all the process, since from the preparatory activity, is the best way to **minimize risks**!

Q&A

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