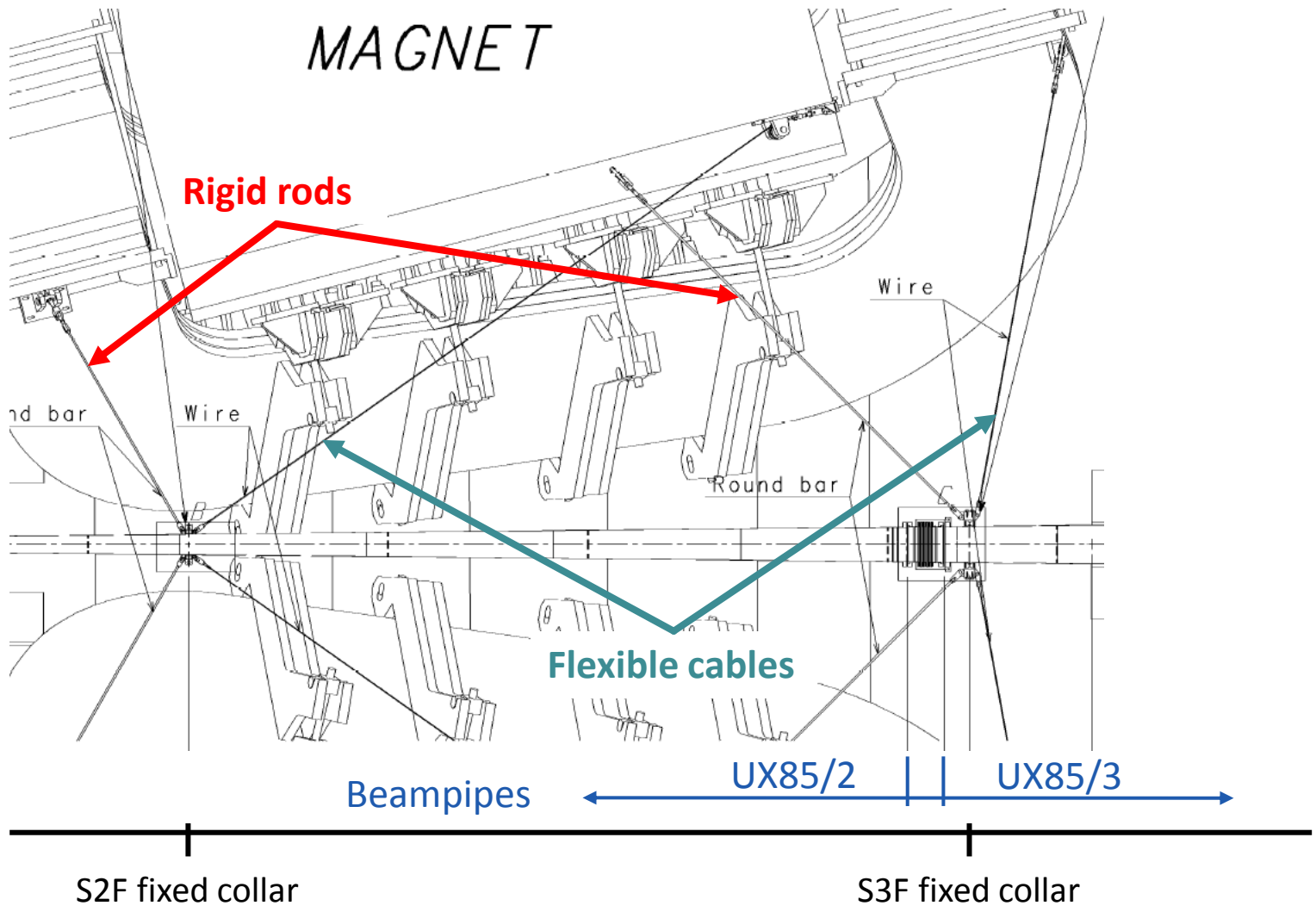


# LHCb Upgrade Beampipe Supports

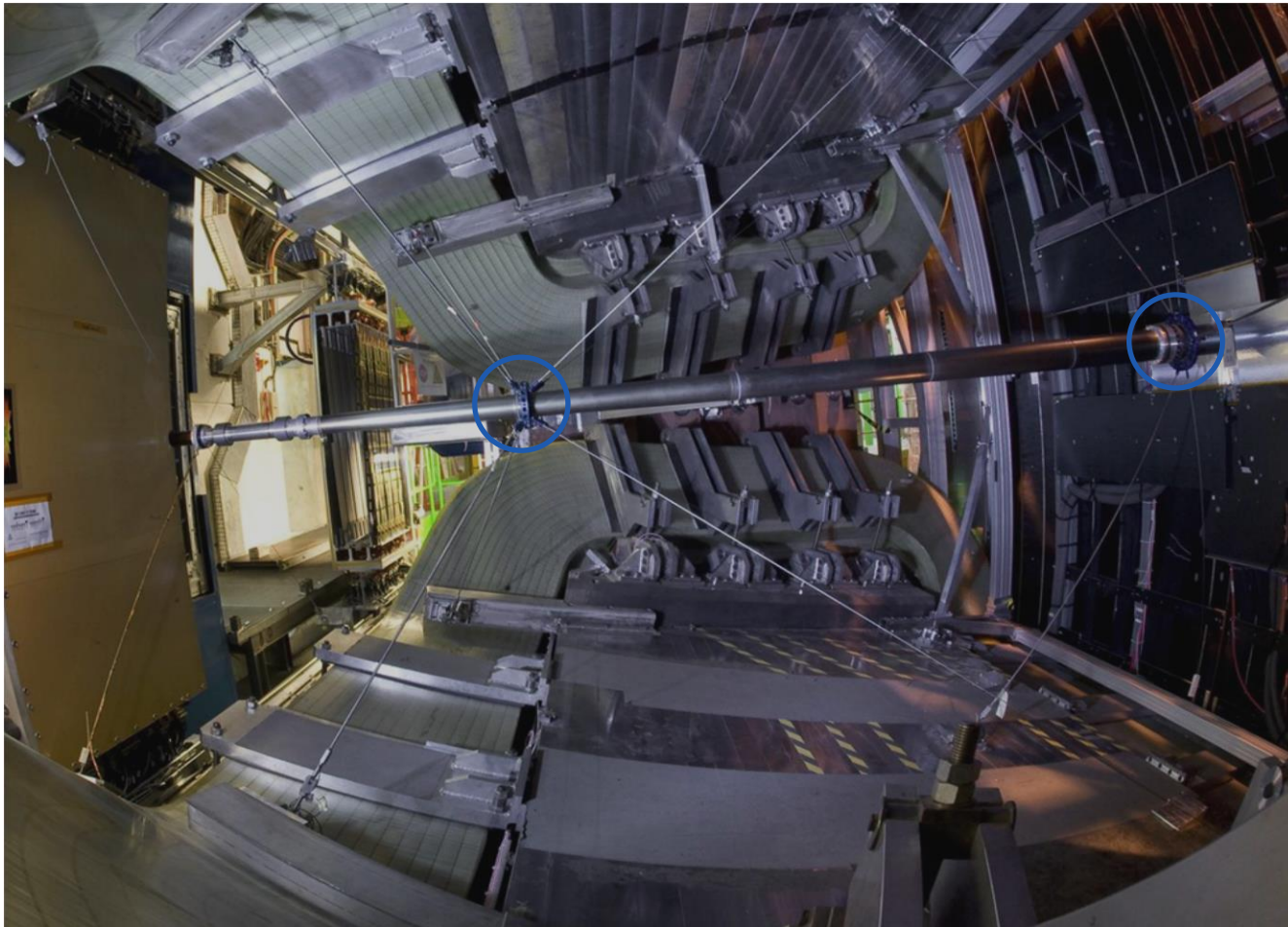
## LHCb Physics Motivations

- Reduce interaction of particles with beampipe structural components;
- Reduce production of secondary particles caused by incidence of primary particles on structural materials;
- Maximise transparency and minimise volume of materials in the acceptance region;
- Cable support systems should allow for remote sensing during operation as well as local readout.

# Pre LS1 Layout



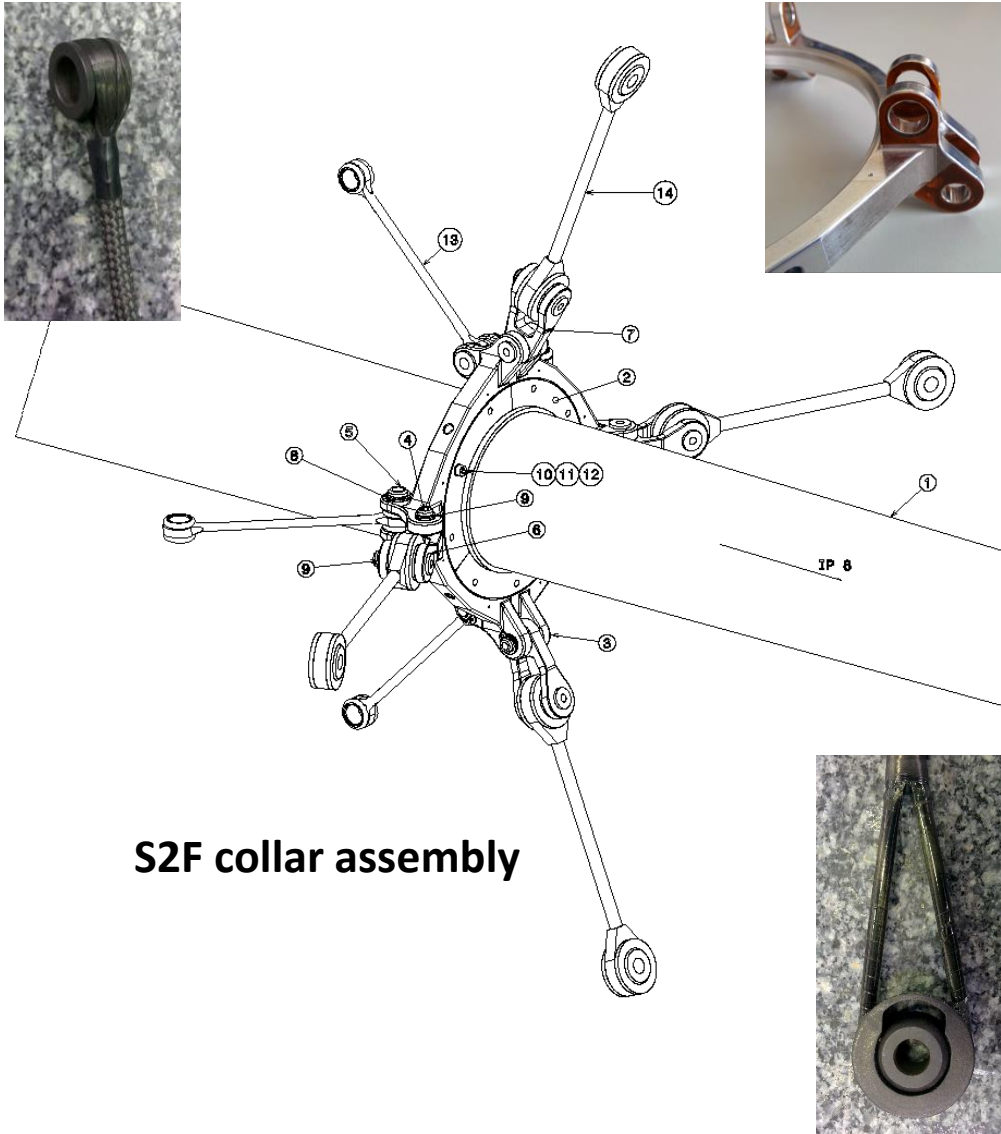
# Pre LS1 Layout



## Materials

- Optimised Collars - Aluminium
- Rods and Cables - Stainless steel
- Pins/bolts etc. - Stainless steel

# New Layout



**S2F collar assembly**

## Design Features

- Beryllium collars:
  - Maximum transparency
  - Safety features
- PBI Celazole interface ring:
  - High temp. resistance
- Carbon fibre rods:
  - High specific stiffness
- Technora cables:
  - High specific stiffness
- Aluminium or Titanium bolts/pins/nuts:
  - Maximum transparency

# Design Records

Reports	EDMS
Qualification of Celazole U-60 for a Cern High Energy Environment: Effects of Radiations and Temperature	1186764
Optimisation of the Cable Support System of the LHCb Beam pipe at S2F and S3F Fixed Points	1282617
Final Mechanical Analysis of UX85/2 and UX85/3 Beryllium Support Collars	1303329
Qualification of Celazole interface ring for S2F and S3F beam pipe support collars	1303335
Procedure for the Installation of LHCb S2F and S3F Beampipe Supports	1360120
Safety File [G:\Workspaces\d\div_lhc\VACUUM\Projects - Experimental Vacuum\LHCb\LB_2.2.1]	As per 1177755

# General Principles of Radiation Protection

## 1) Justification

any exposure of persons to ionizing radiation has to be justified

## 2) Limitation

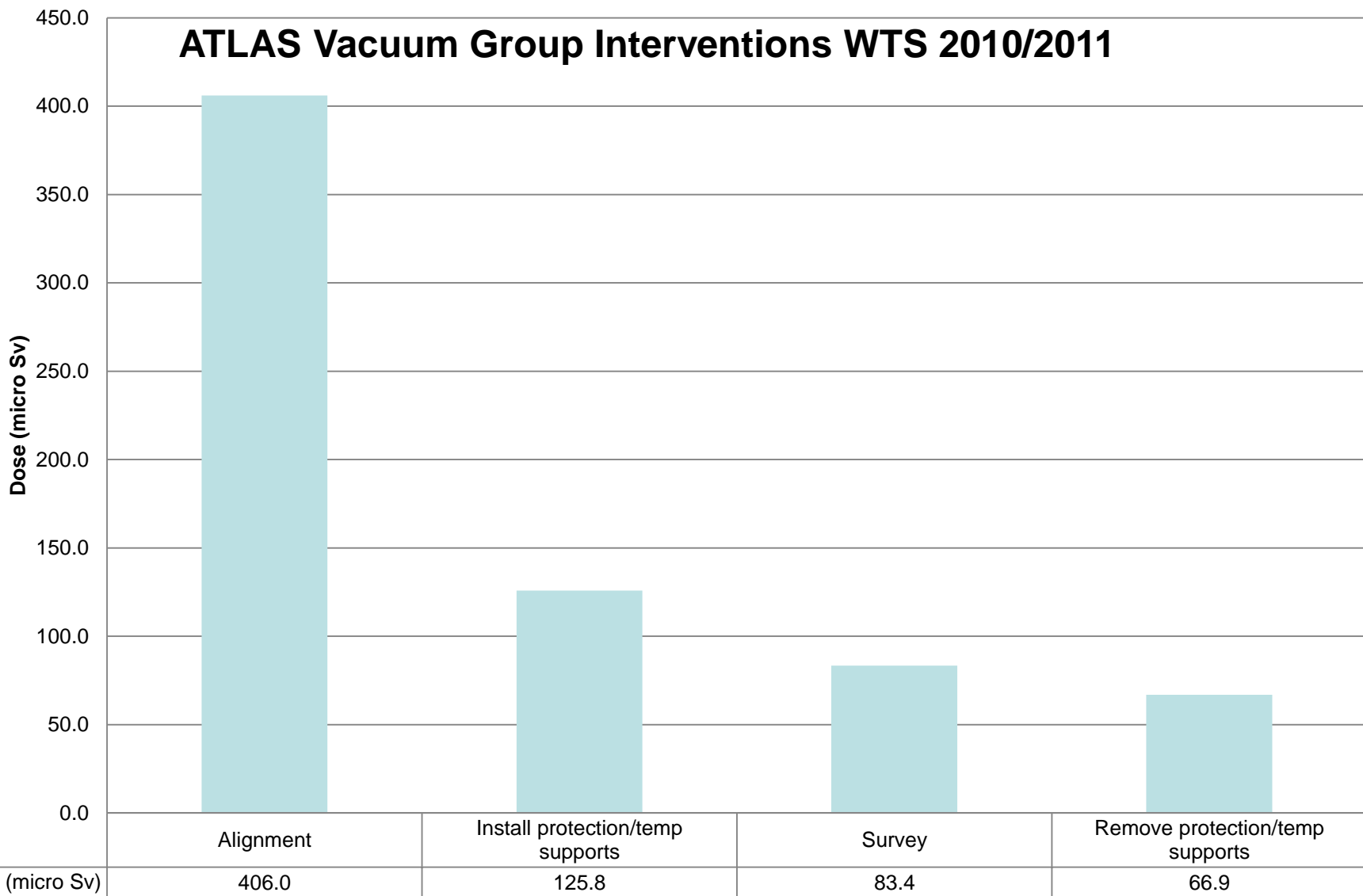
the personal doses have to be kept below the legal limits

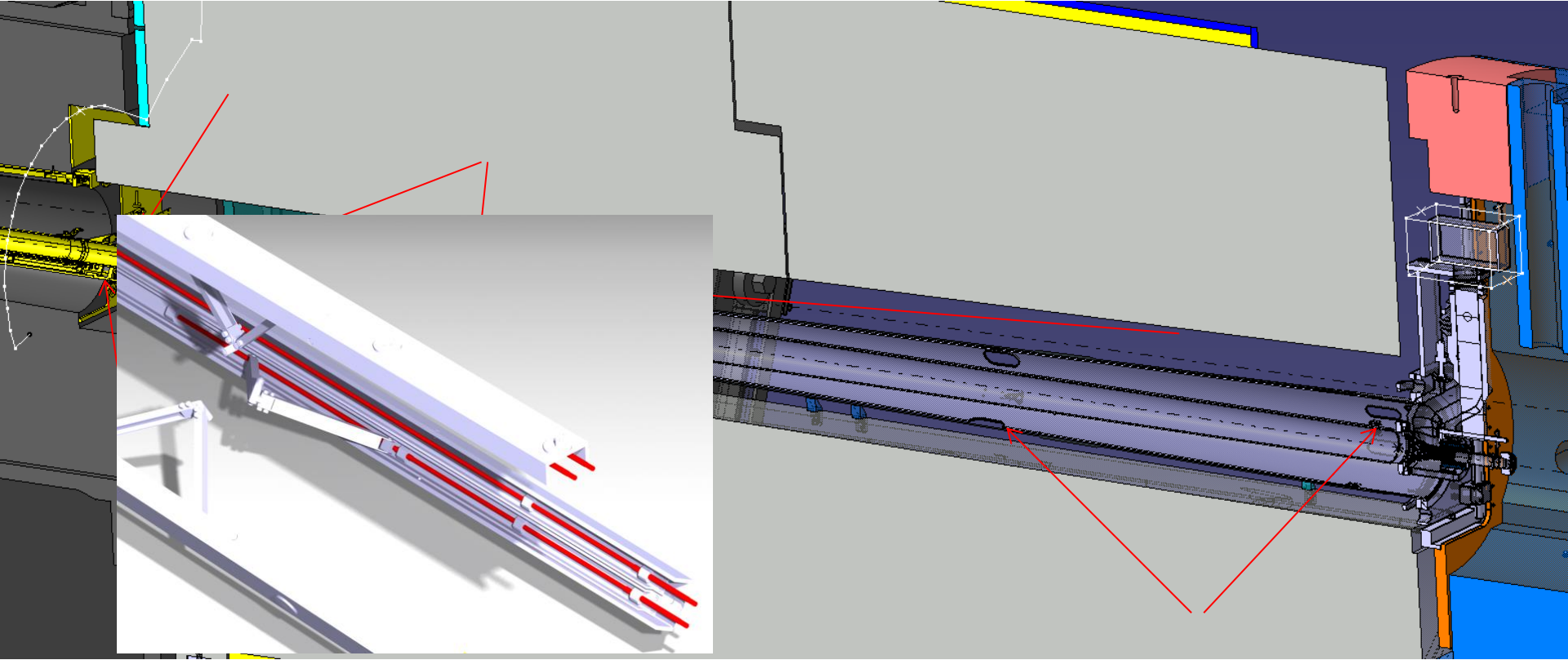
## 3) Optimization

the personal doses and collective doses have to be kept as low as reasonable achievable (ALARA)

source: Heinz Vincke DGS/RP ,IEFC workshop 2011, 21 - 24 March

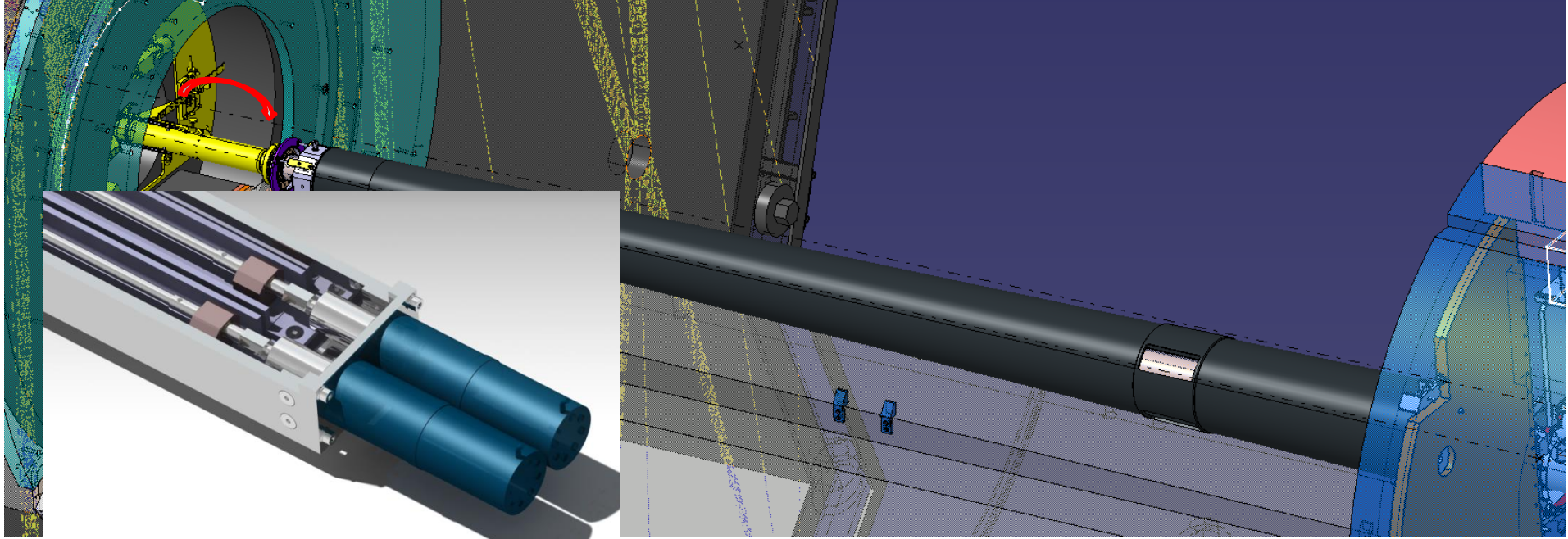
# ATLAS Vacuum Group Interventions WTS 2010/2011



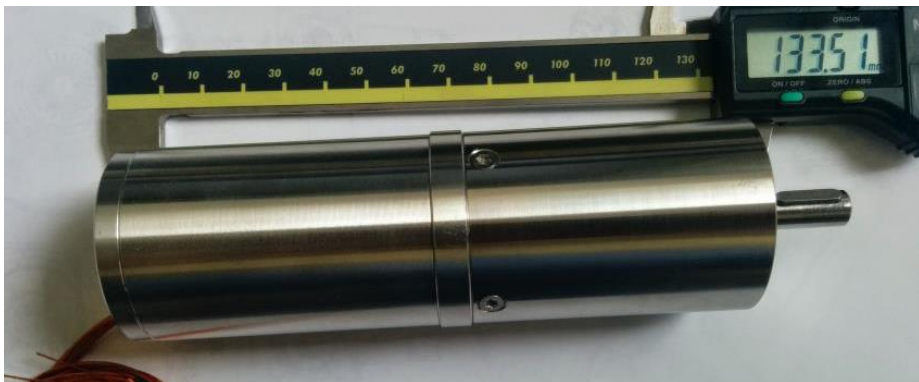


- Beam pipe fixed via VT Fixed support to ECT, no ECT movement without intervention
- Manual alignment of VT beam pipe with retractable supports
- Temporary support needed on VJ to stiffen bellows
- Survey from JFC1 required
- Lucid close to TAS, complicated accessibility





- Beam pipe fixed via VT Fixed support to ECT, no ECT movement without intervention
  - VT Fixed Support removed, now linked to carbon cone
- Manual alignment of VT beam pipe with retractable supports
  - Installation of radiation hard stepper motors
- Temporary support needed on VJ to stiffen bellows
  - Longer Carbon cone, no need for temporary supports
- Survey from JFC1 required
  - New targets added to new Cone, measurement from outside the JFC possible
- Lucid close to TAS, complicated accessibility
  - Bigger Access holes while keeping stiffness, Lucid moved away from TAS



Radiation hard Phytron VSS43 motors



3500 pins on Carbon Cone flange for mechanical connection



Carbon Cone with Lucid access holes

# Design Records

Reports	EDMS
Redesign of the ATLAS VJ Cone support-Documents (Technical specs, CFD report, Simulations, Temper data, Quality reports)	1316141 V.1
Redesign of the ATLAS VT/VJ Supports for LS1	1317812 v.1