RIGA TECHNICAL UNIVERSITY

Institute of Particle Physics and Accelerator Technologies

SRP State Research Programme

3rd CERN Baltic Conference

Latvian Industry in CMS

G.Pikurs on behalf of development team

TAL TECH

09/10/2023

CMS

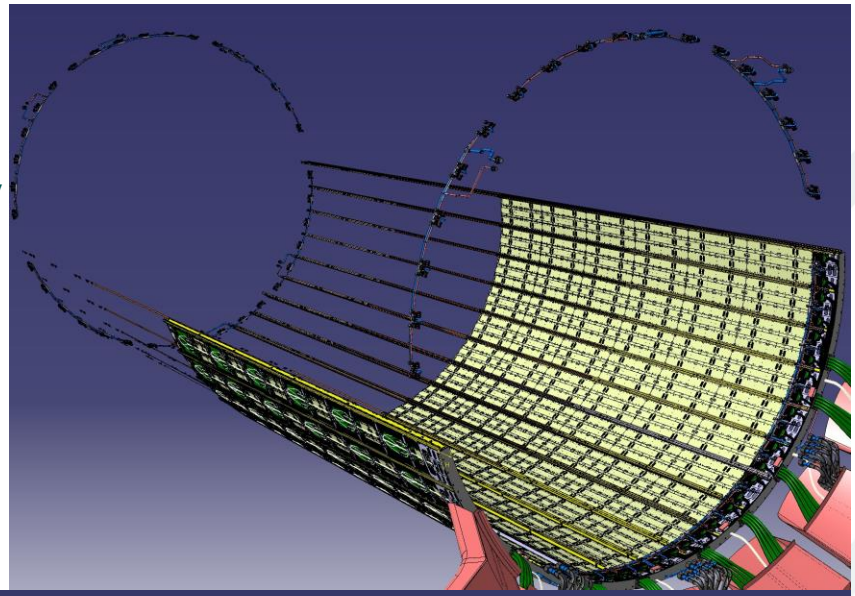
CERN Baltic Group

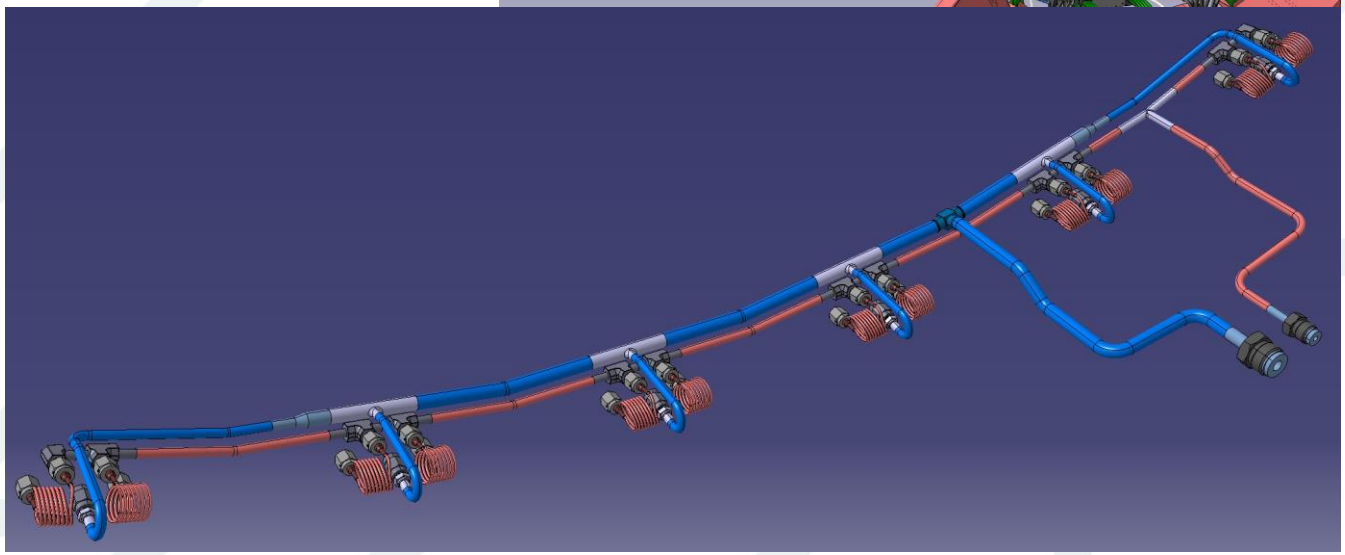
CMS MTD BTL subdetector cooling

CO_2 system qualification:

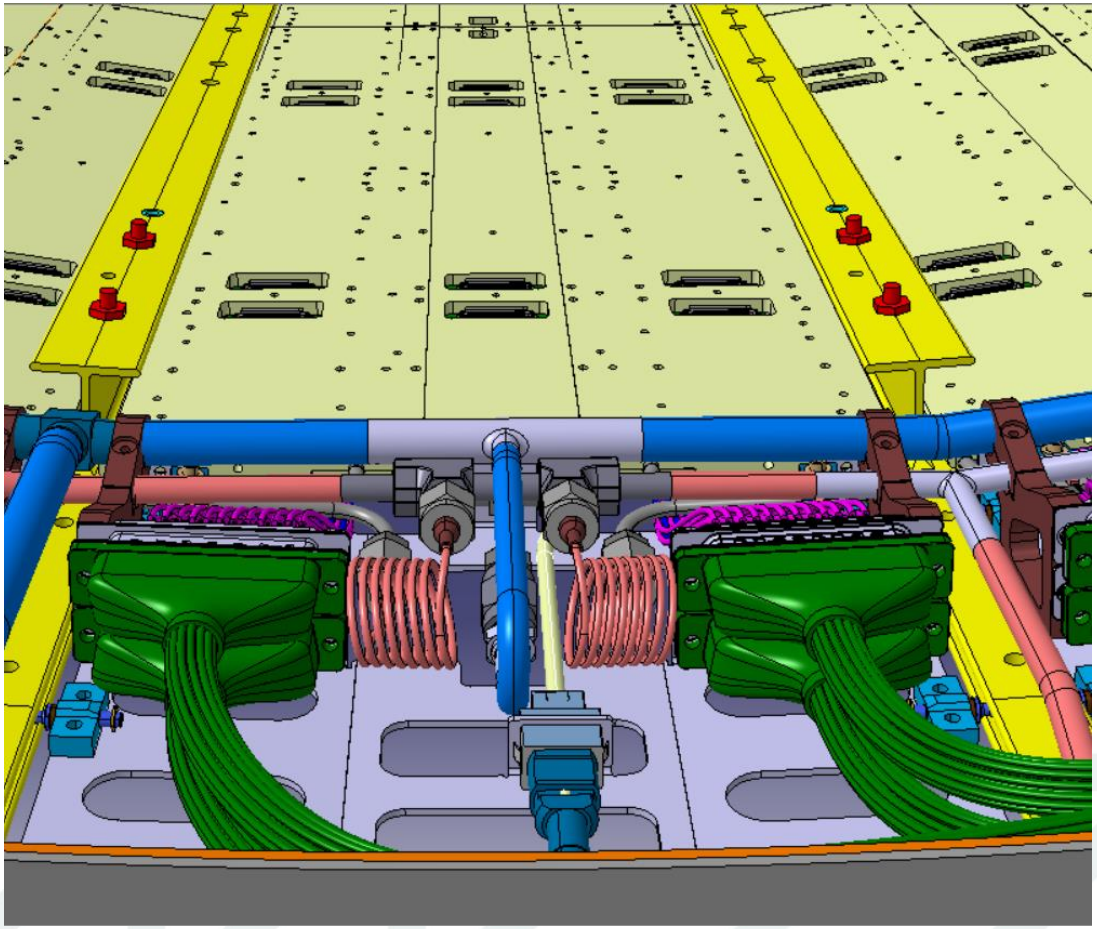
- Design pressure: 130bar; test: 186bar
- Helium leak: < $1 \cdot 10^{-8}$ mbar·l·s^{-1}
- Leak rate with 40bar CO_2 gas less than 5g/y
- Material: 316L (316)
- Joining technique preference: orbital TIG (examination: ISO 17636-2, class B, acceptance: ISO 10675-1, Level 1)
- Disassemblable joints - Swagelok VCR

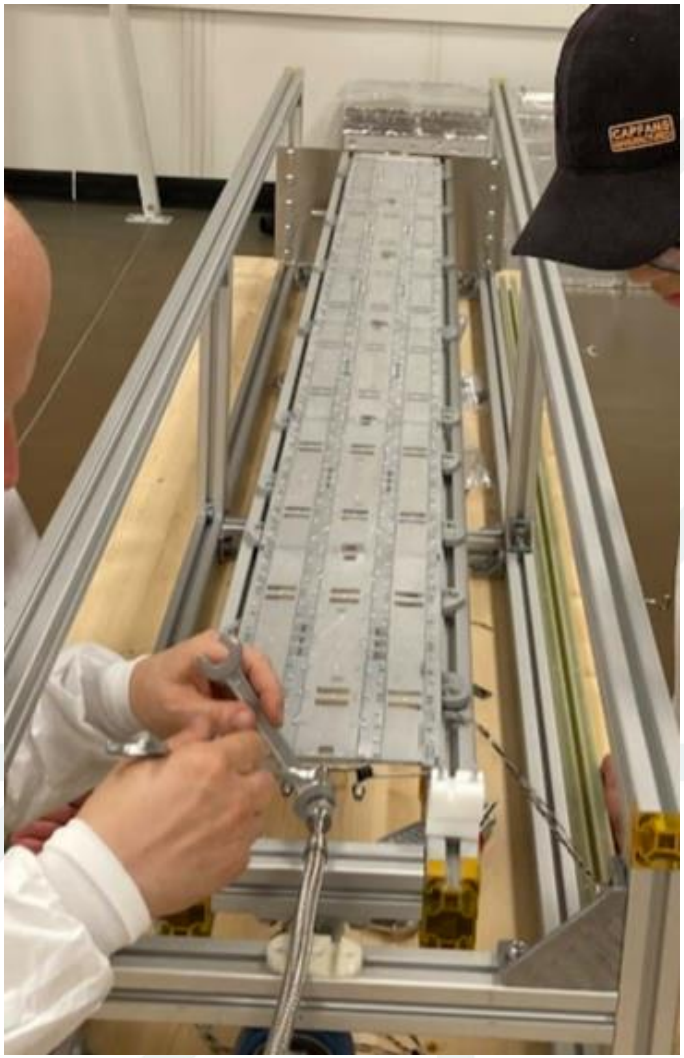
Ref: EDMS Nb. 2631824 v.2





Development for TIF





Latvian companies involved

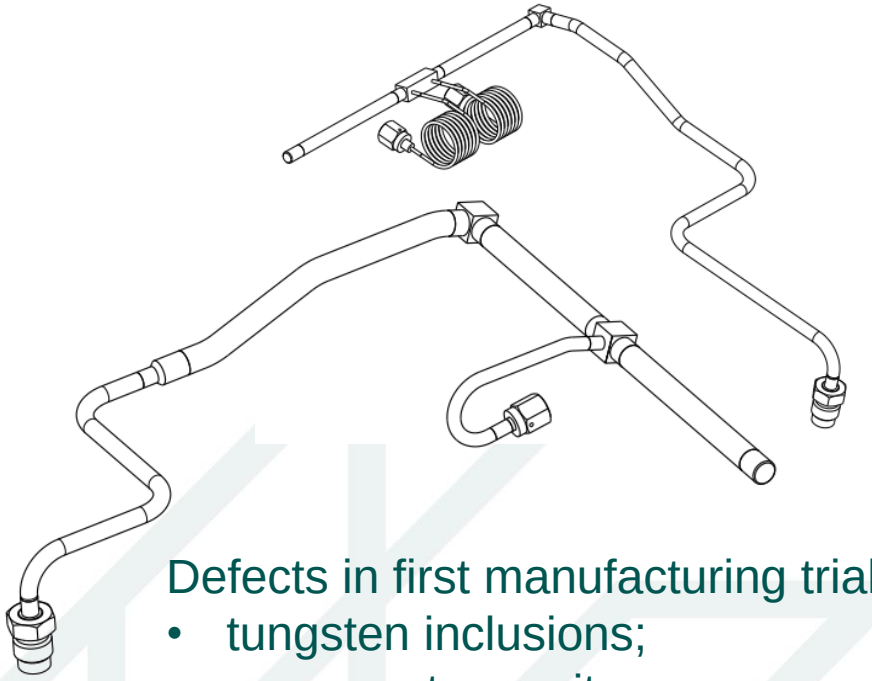
The company focuses on **thermal management systems** for hi-tech applications like space technologies and electronics. The company is known as a participant in several EU-funded projects on the R&D of thermal systems.

OrBe, SIA

More than ten years experience on **orbital TIG** and **TIG** service providing for Baltic's customers, primarily subcontracting under Linde Industrial gases Latvia(ex. AGA), personnel and equipment is certified by KIWA (ex. Inspecta). ISO qualifications for orbital TIG welds.

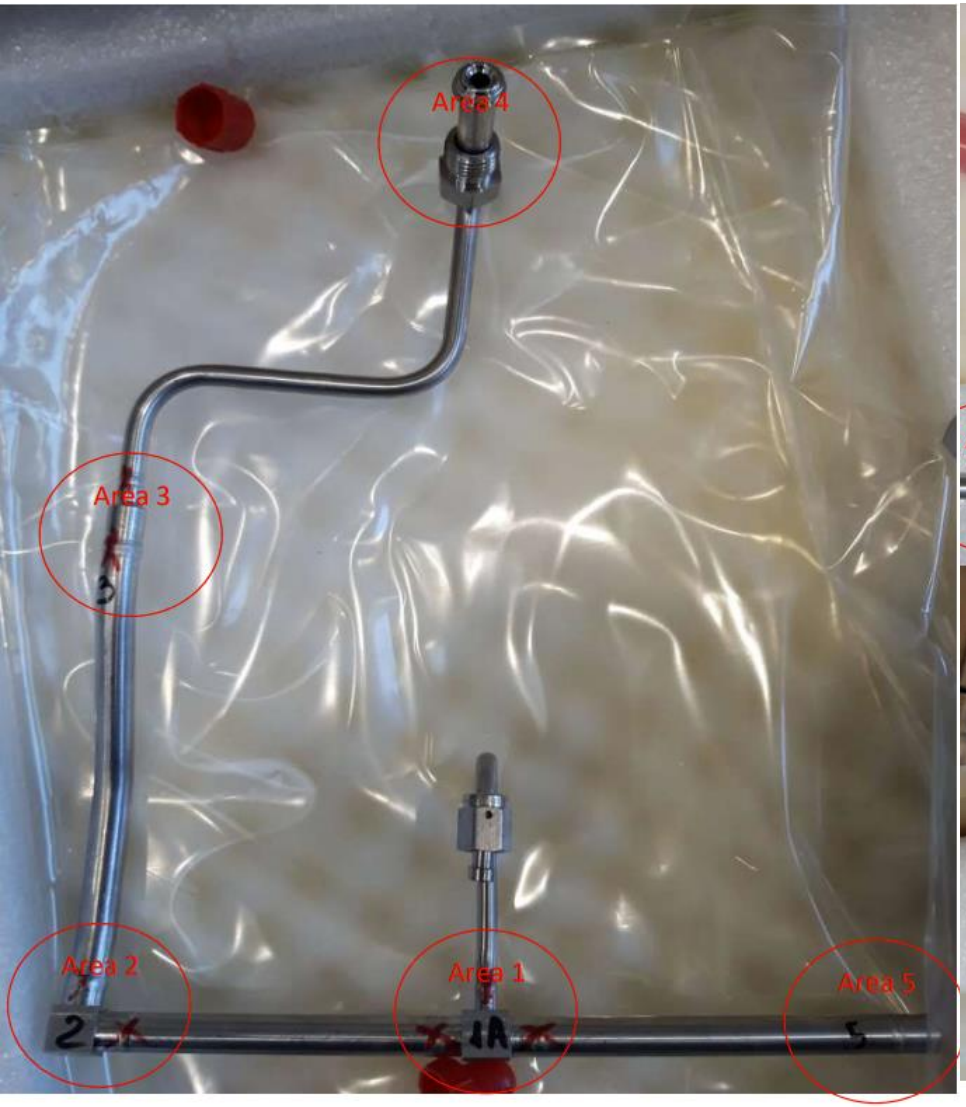
all about thermal management

Manufactured in summer of 2021
Repaired in December 2021
Installed in TIF spring of 2022

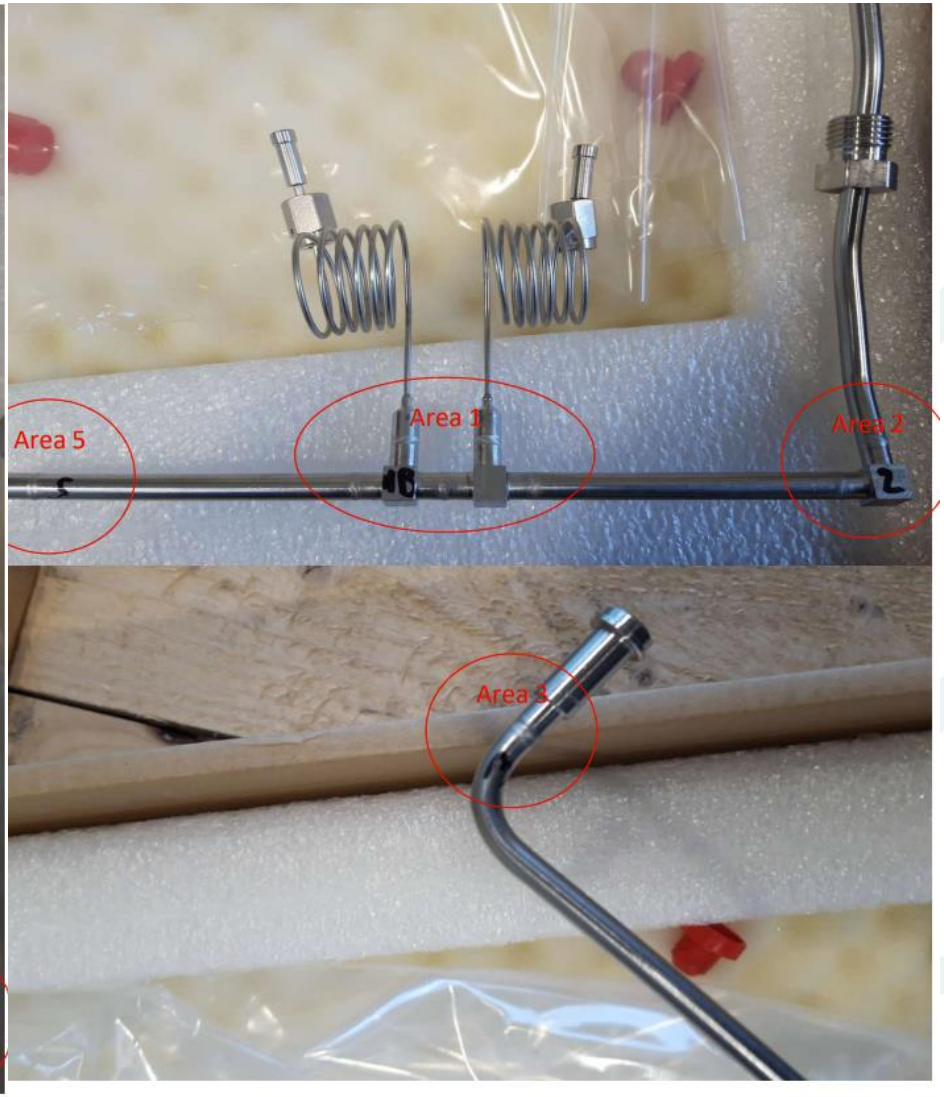


Defects in first manufacturing trial:

- tungsten inclusions;
- seam root porosity;
- lack of penetration



Pipe A



Pipe B

2723850_CMS_MTD_BTL_Pipes.pdf

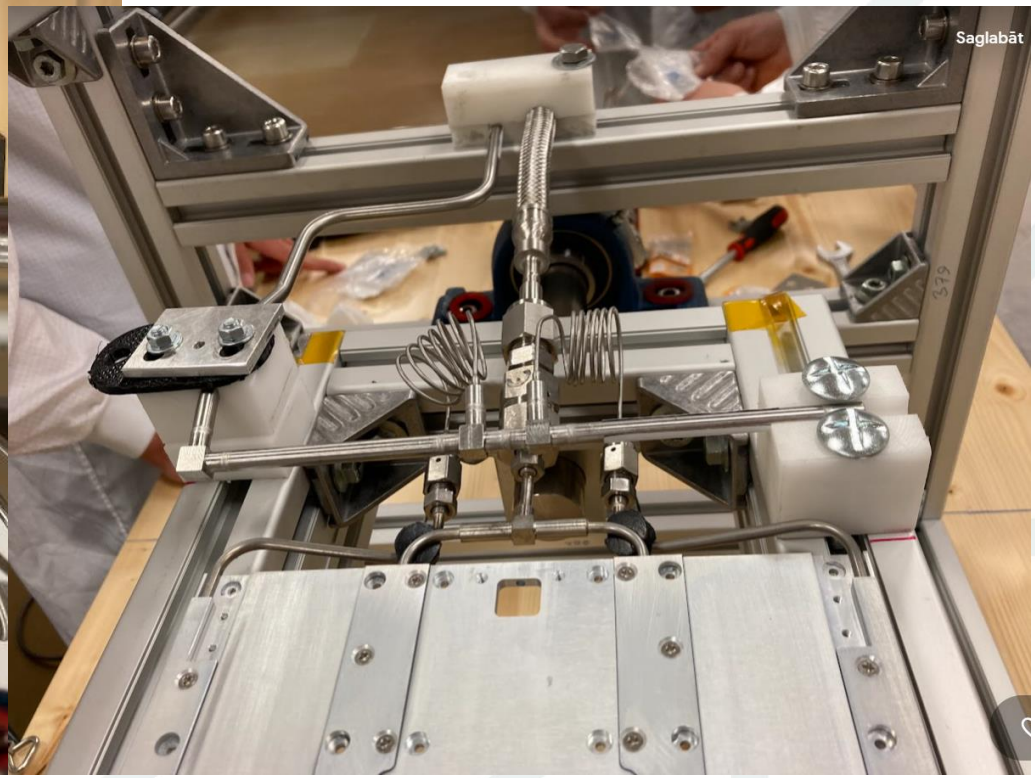
Repère d'identification : *Identification mark*	MTD BTL Prototype	Pipes

Matière : *Material*	Stainless Steel	-	Méthode de Soudage *Method of Welding*	TIG A	-	Type de Chanfrein: *Type of Groove*

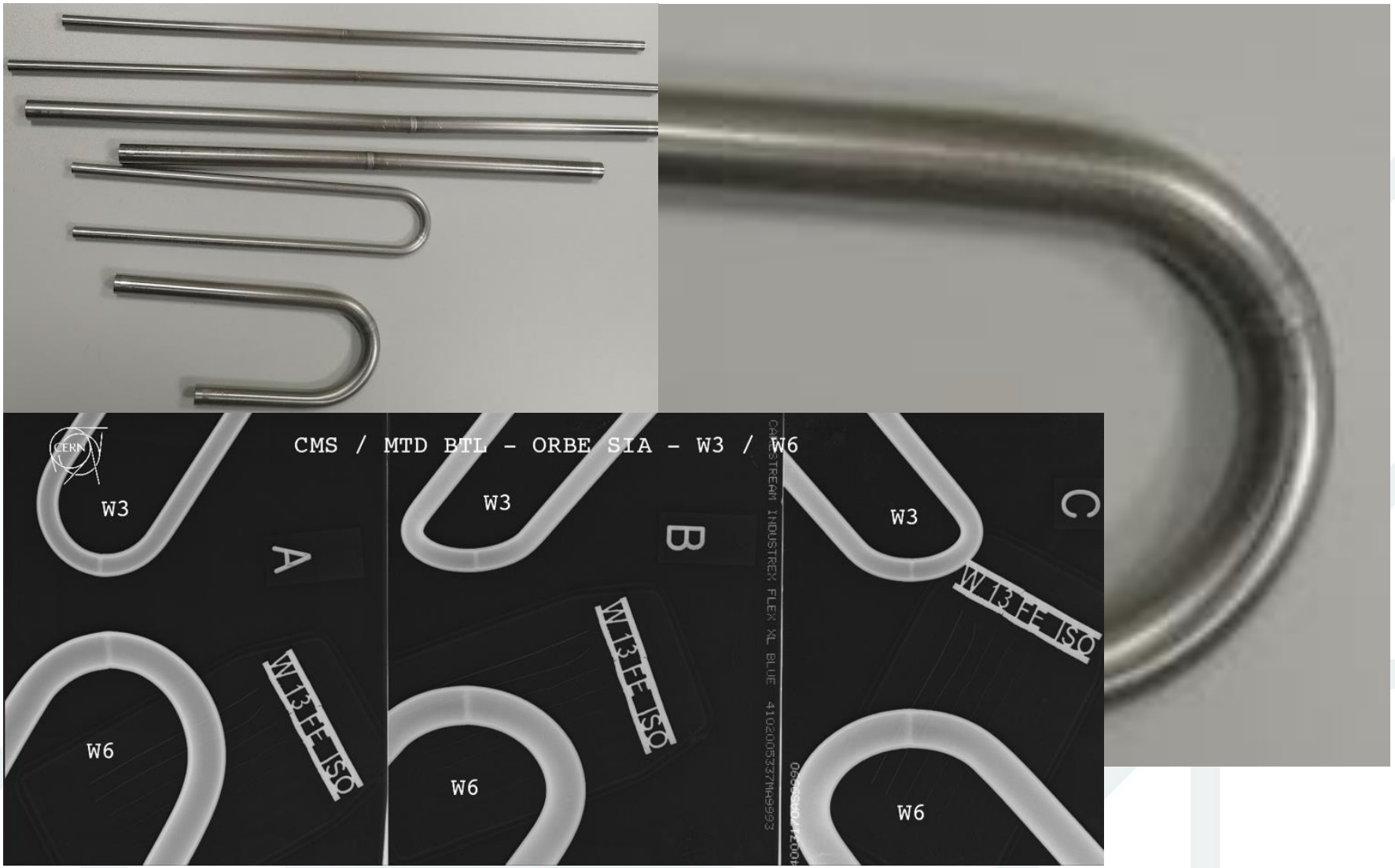
Spécification(s) de Référence : *Specification (S) of Reference*	ISO 10675-1, Level 1

REFERENCE				TYPE DE DEFAUTS - *TYPE OF DEFECT*													Conc	
N° de Plan ou Asset *Drawing N° or Asset*	N° de Soudure ou Pièce *Weld N° or Production*	IQI: Trou ou Fil vu *IQI: hole or wire seen*	SNR_N Obtenu *SNR_N Obtained*	2011 Soufflure sphéroïdale / Gas Pore	2024 Retassure de cratère / Crater pipe	3041 Inclusion métallique de tungstène / Metallic inclusion of tungsten	401 Manque de fusion / Lack of fusion	402 Manque de pénétration / Lack of penetration	5011 Caniveau continu / Continuous undercut	5012 Morsure - Caniveau discontinu / Intermittent undercut	5013 Caniveaux à la racine / Shrinkage grooves	509 Effondrement / Sagging	511 Manque d'épaisseur / Incompletely filled groove	515 Retassure à la racine / Root concavity	516 Rochage / Root porosity	517 Mauvaise reprise / Poor restart	Acceptable *Acceptable*	Non Acceptable *Not Acceptable*
Pipe A	3 welds Area 1	W19						X							X			X
	2 welds Area 2	W19													X			X
	2 welds Area 3	W19													X			X
	1 weld Area 4	W19					X											X
	1 welds Area 5	W19															X	
Pipe B	5 welds Area 1	W19															X	
	2 welds Area 2	W19															X	
	1 weld Area 3	W19															X	
	1 weld Area 5	W19															X	

Prototype installed in TIF



OrBe, SIA sample welds tested at CERN



Repère d'identification : *Identification mark*	ORBE SIA	Welds

Matière : *Material*	Stainless Steel	-	Méthode de Soudage *Method of Welding*	TIG A	-	Type de Chanfrein: *Type of Groove*

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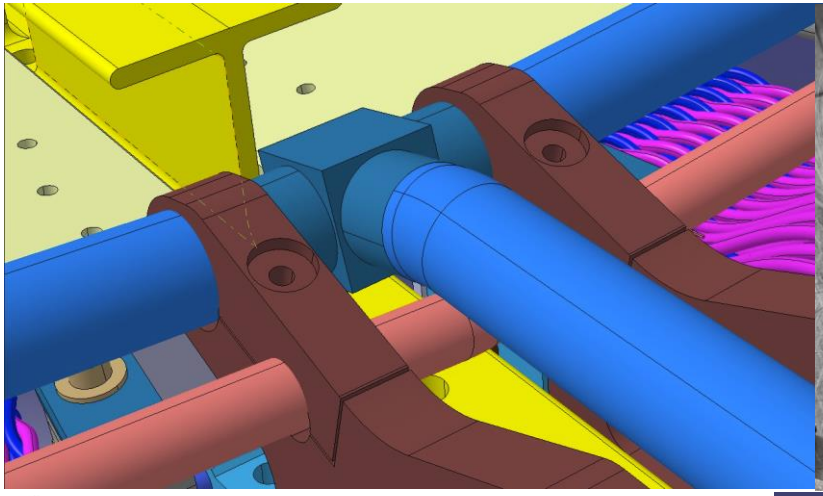
REFERENCE					TYPE DE DEFAUTS - *TYPE OF DEFECT*													Conc	
N° de Plan ou Asset *Drawing N° or Asset*	N° de Soudure ou Pièce *Weld N° or Production*	Paramètres (voir page 1) *Parameters (see page 1)*	IQI: Trou ou Fil vu *IQI: hole or wire seen*	SNR_N Obtenu SNR_N *Obtained*	2011 Soufflure sphéroïdale / Gas Pore	2024 Retassure de cratère / Crater pipe	3041 Inclusion métallique de tungstène / Metallic inclusion of tungsten	401 Manque de fusion / Lack of fusion	402 Manque de pénétration / Lack of penetration	5011 Caniveau continu / Continuous undercut	5012 Morsure - Caniveau discontinu / Intermittent undercut	5013 Caniveaux à la racine / Shrinkage grooves	509 Effondrement / Sagging	511 Manque d'épaisseur / Incompletely filled groove	515 Retassure à la racine / Root concavity	516 Rochage / Root porosity	517 Mauvaise reprise / Poor restart	Acceptable *Acceptable*	Non Acceptable *Not Acceptable*
	W1	1	W18															X	
	W2	1	W18															X	
	W3	1	W18															X	
	W4	2	W18															X	
	W5	2	W18															X	
	W6	2	W18															X	

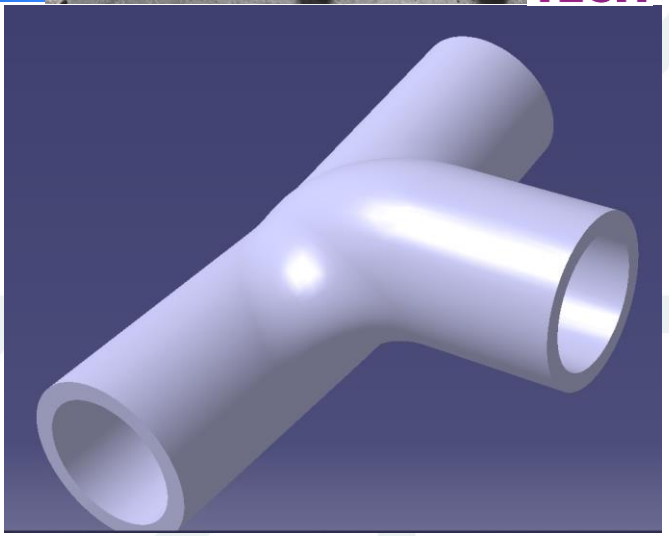
Development for future

Taltech
-Manufacturing
-CT X-ray
-Postprocesing

SIA ORBE
-Orbital TIG



RTU@CERN
-Design
-Cleaning
-Helium leak test
-CO_2 leak test
-CT X-ray
-Pressure tests
-Ultimate pressure test



Thank you for attention!