Joint Stock Company
Scientific & Production Association
Spetsneftegaz

EMAT

A new capabilities

RUSSIA

A new EMAT capabilities
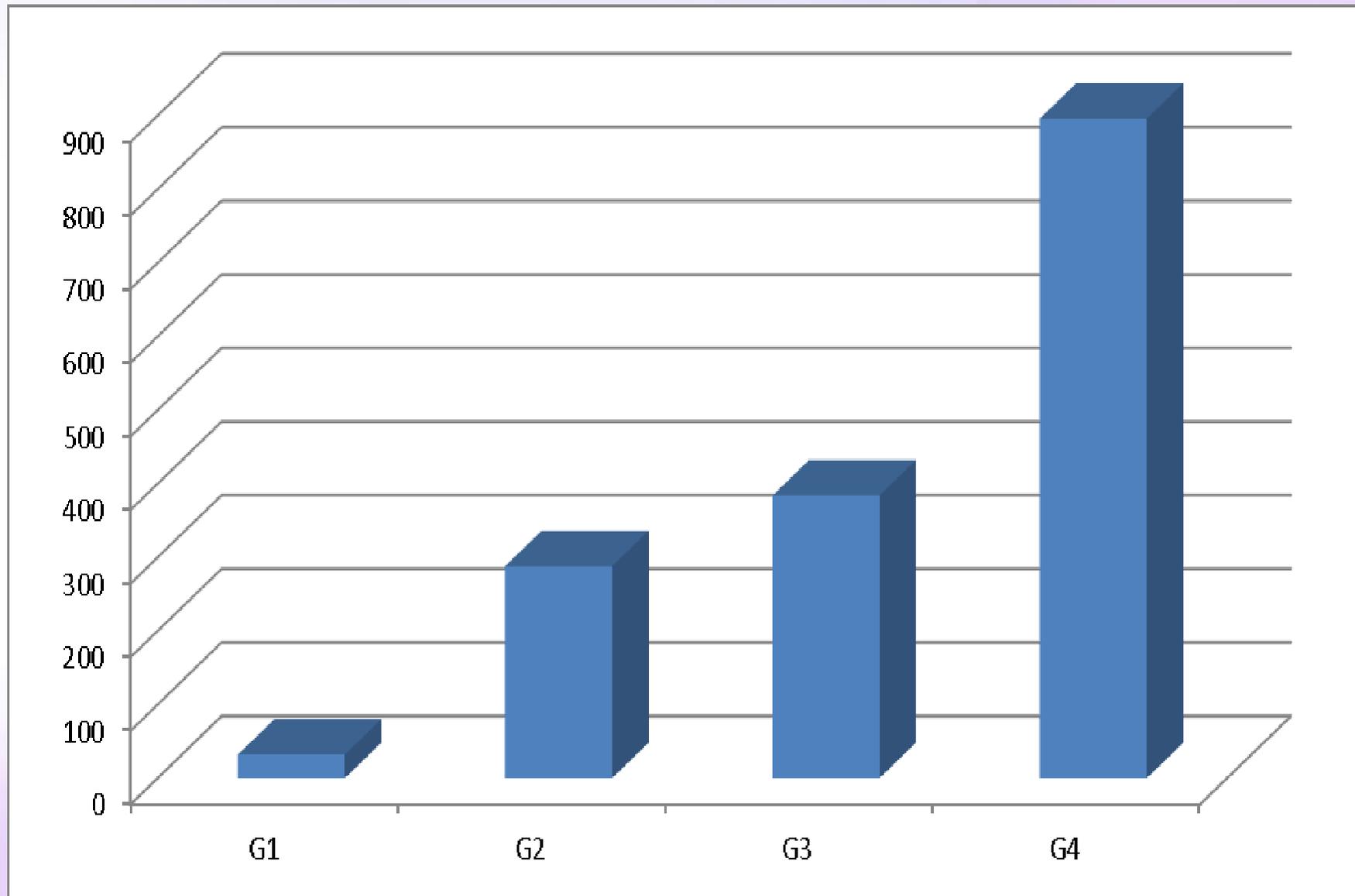
UT vs MFL

What is better?

Magnetic flux leakage

Longitudinal & Transverse Magnetization

MFL
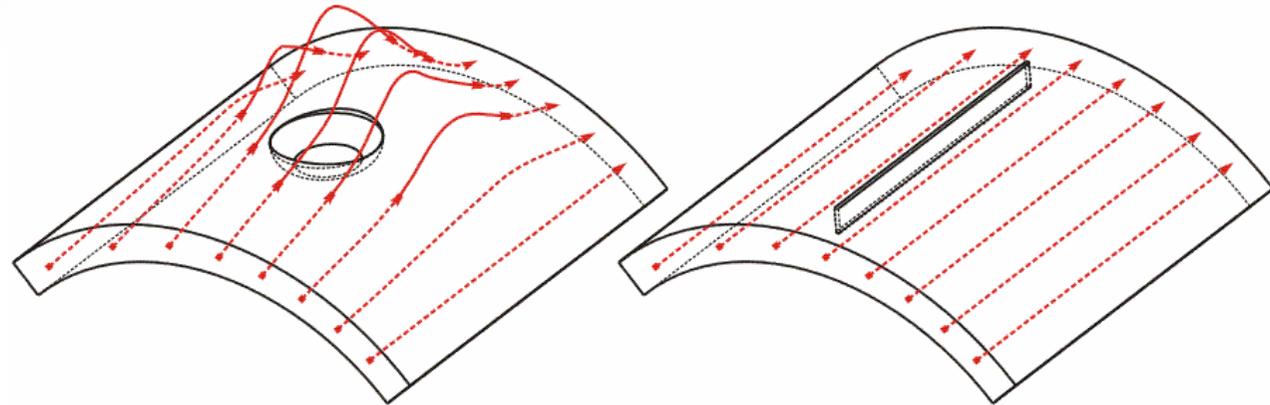
TFI
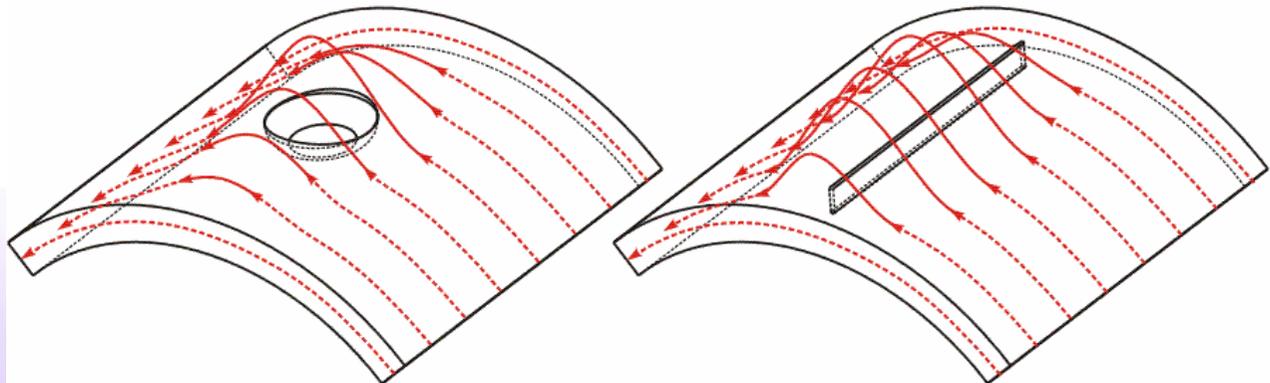
Magnetic flux leakage in-line inspection

Magnetic flux leakage in-line inspection

Magnetic flux leakage in-line inspection

- Magnetic in-line inspection methods are indirect methods

- A well trained personnel is required

- A collection of pipe spools from field is required

- A substantial number of defects digging study is required

- The resolution and accuracy of ILI tools indirectly depends on number of sensors

- Different types of magnetizations have to be used

Ultrasound inspection

- UT is direct method

- The wave length should be at least two times smaller then the size of object and more then five times smaller then the pipe wall thickness

- The direction of sound wave have to be 45 degrees to the vertical in case of SCC detection

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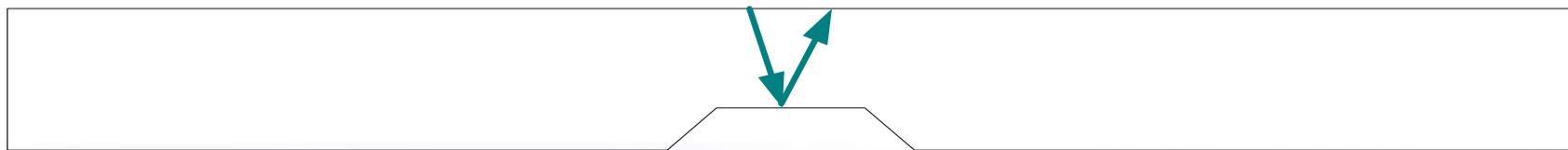
EMAT

Is it direct inspection method?

Electro-magnetic acoustic transformation

- The sound waves are excited in thin layer at pipe surface by means of electro-magnetic acoustic transformation

- The received direct signal is 1000 times smaller then initial one

- EMAT is extremely power consuming method

- There is strong dependence of direction of optimal sound wave excitation vs. wave length

- There is no need for accurate surface preparation and pipeline cleaning

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EMAT 45^0 impulse energy λ dependence

Wave length, mm

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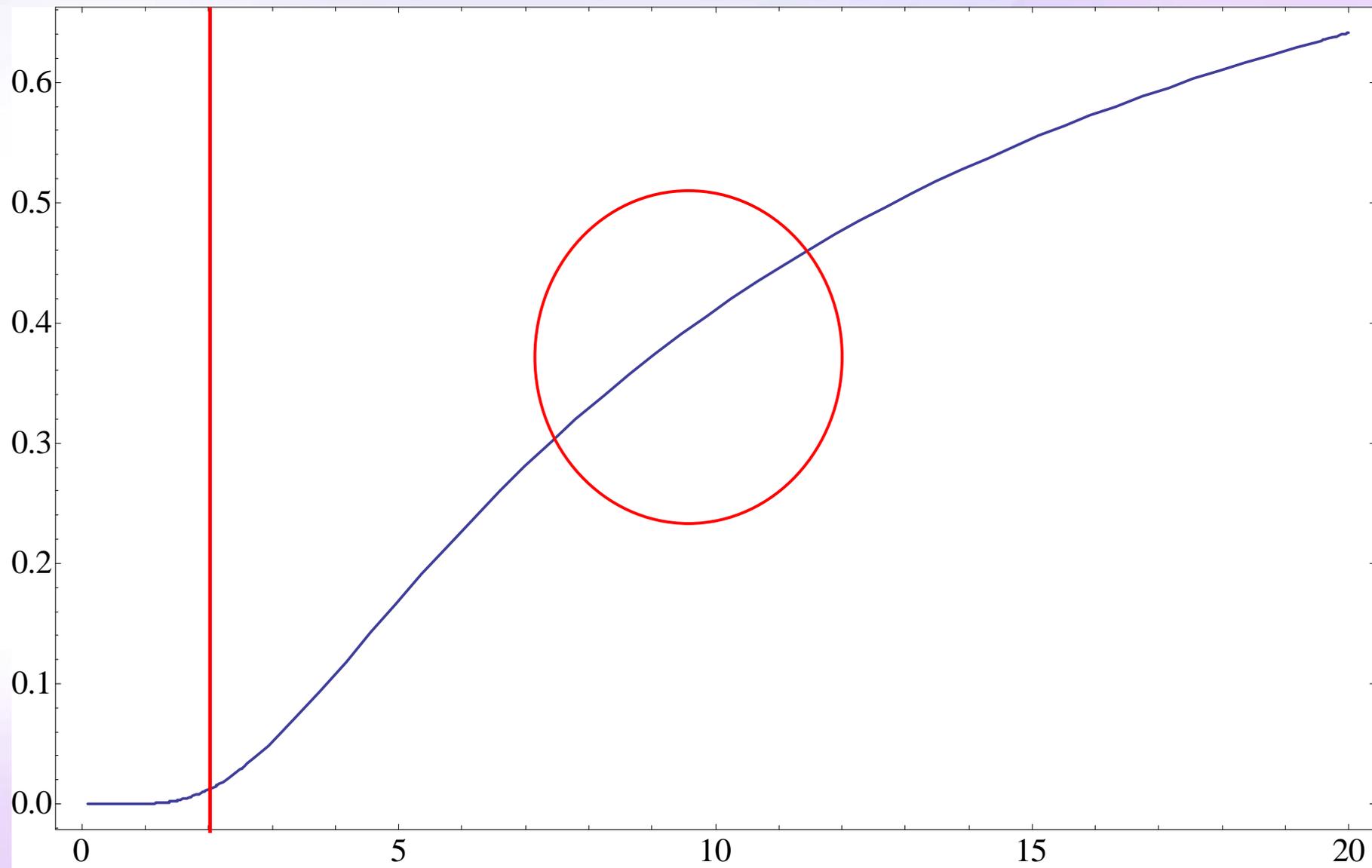
Electro-magnetic acoustic transformation

- The optimal wave length is 10 mm, which is comparable with pipe wall thickness

- The sound waves produced by EMA are guided resonance waves

- The form and amplitude of response signal is strongly depends on pipe wall thickness

- Different types of defects can give same signal

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Guided waves inspection
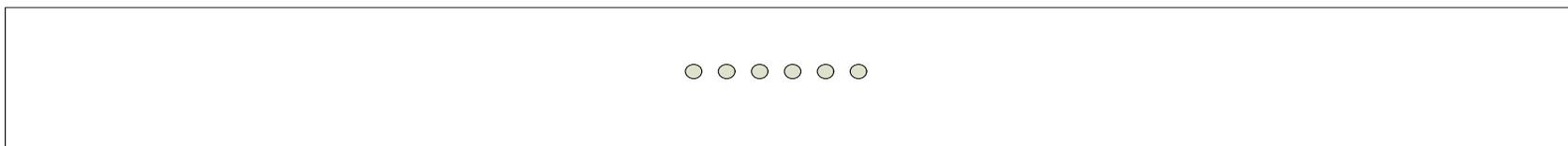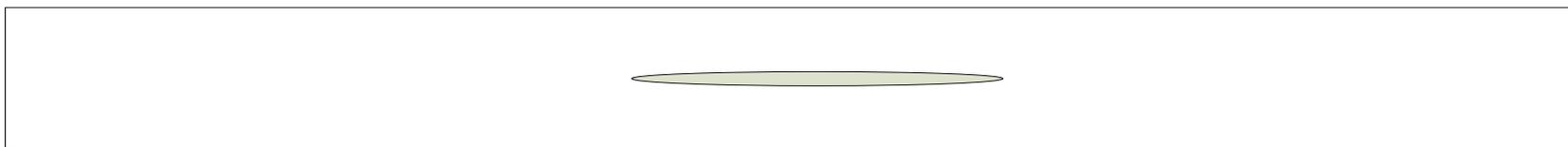
EMAT in-line inspection

- EMAT in-line inspection is indirect method

- A well trained personnel is required

- A collection of pipe spools from field is required

- A substantial number of defects digging study is required

- The resolution and accuracy of ILI tools indirectly depends on number of sensors

- Different types of sound waves direction and types have to be used

EMAT

SNG experience

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G1Run (24") (2007)

High-pH SCC

24" Gas Pipeline
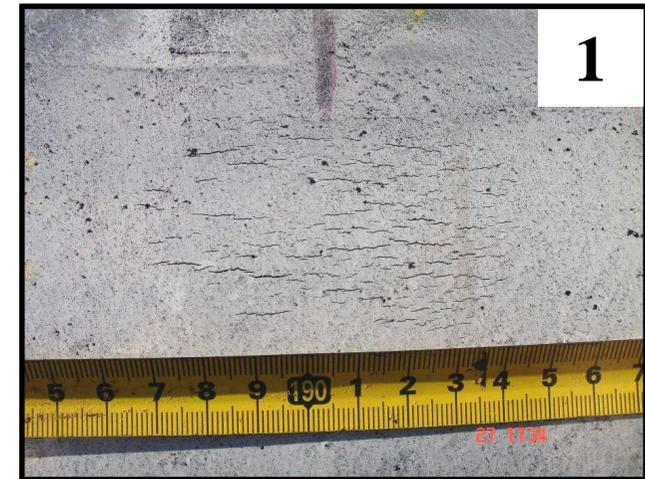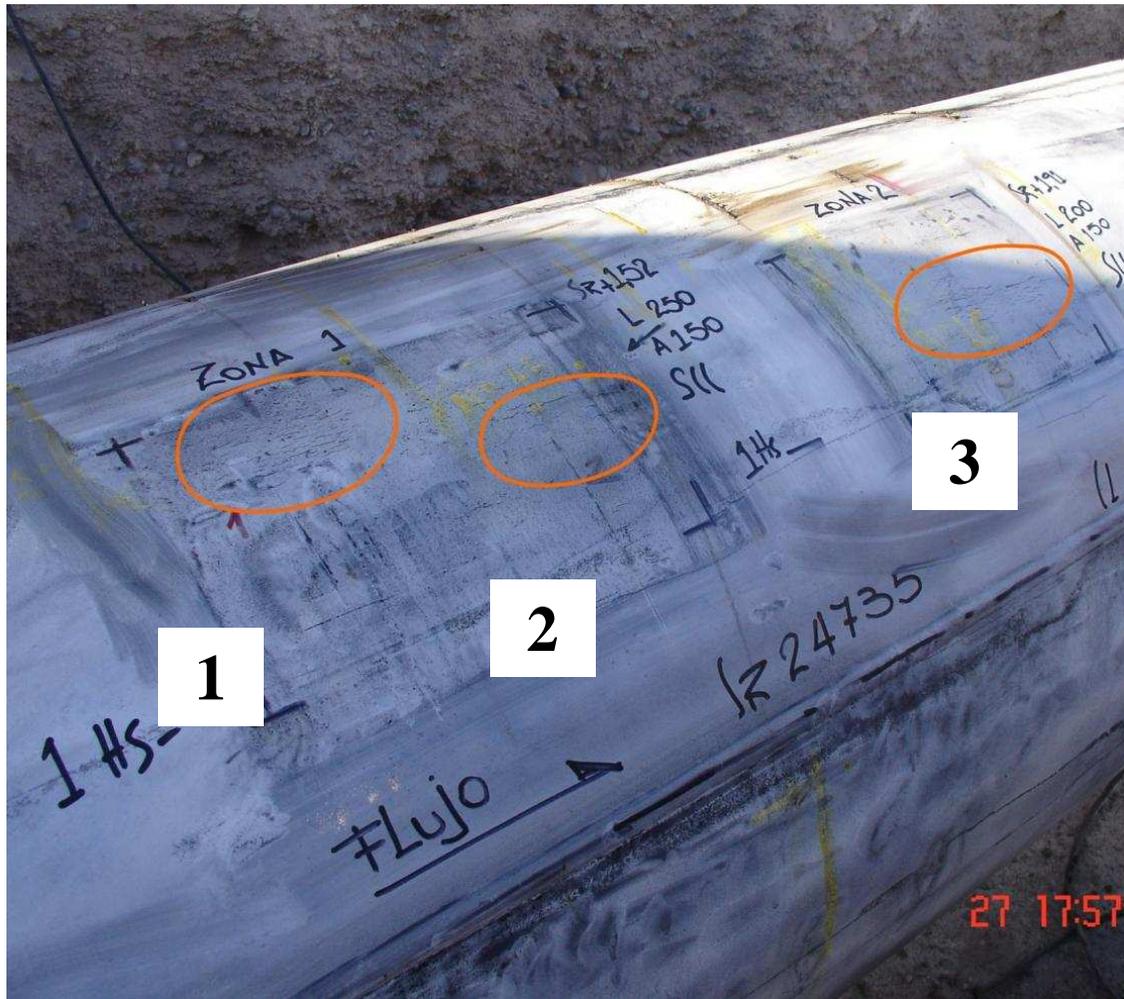
Echo EMA Anomalies

ILI Inspections Plots
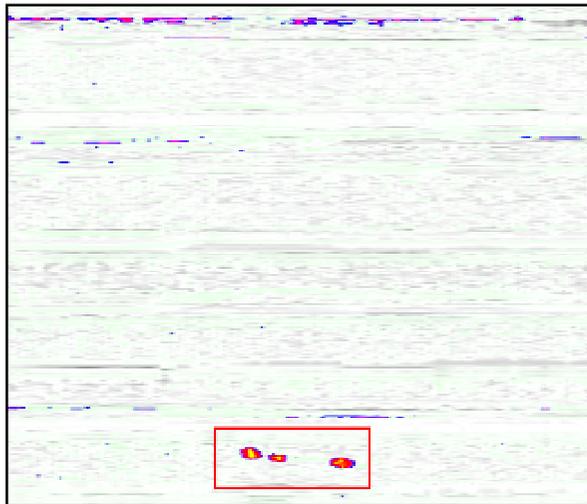
SCC (2%)　　　　LAMINATIONS (15%)　　ROLLED NON-METALLIC INCLUSION (83%)
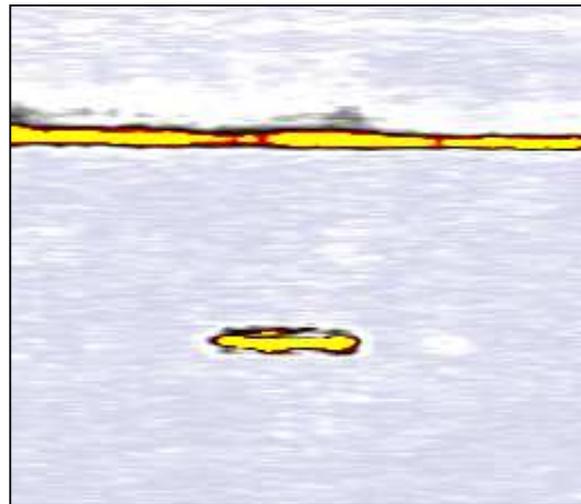
SPETSNEFTEGAZ
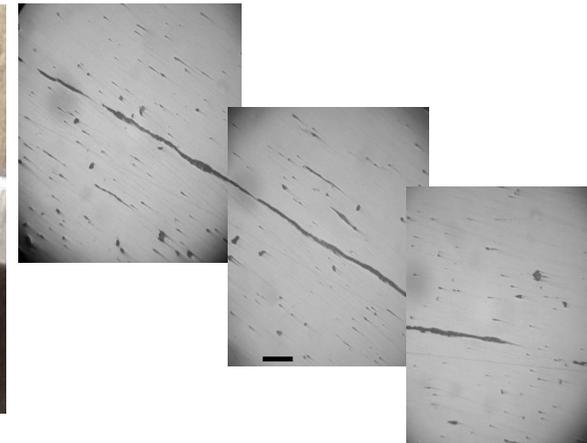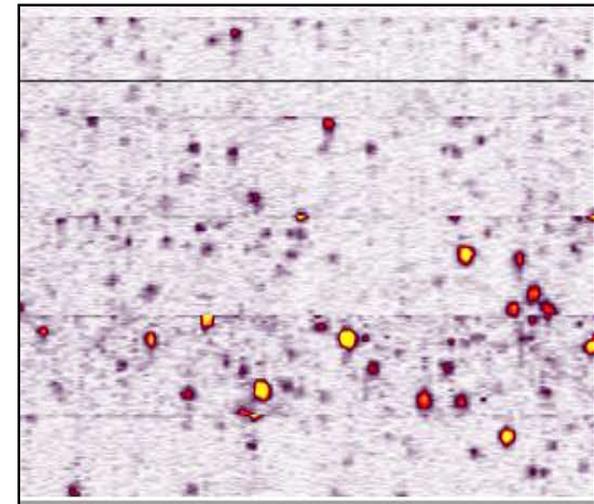
Echo EMA Anomalies

ROLLED NON-METALLIC INCLUSIONS (83%)

LAMINATIONS (15%)
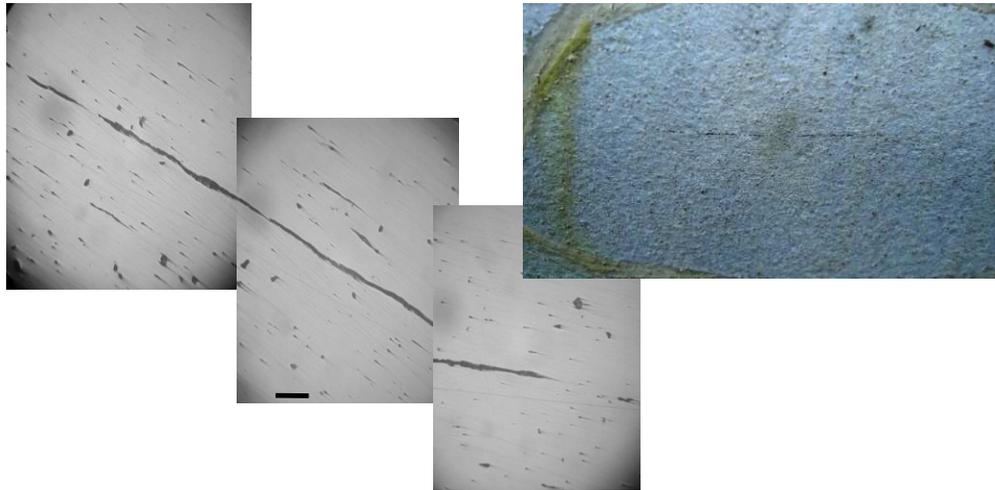
SCC (2%)

PERCENTAGE RATIO

- Rolled non-metallic inclusion
- Laminations
- SCC

2%

15%

83%
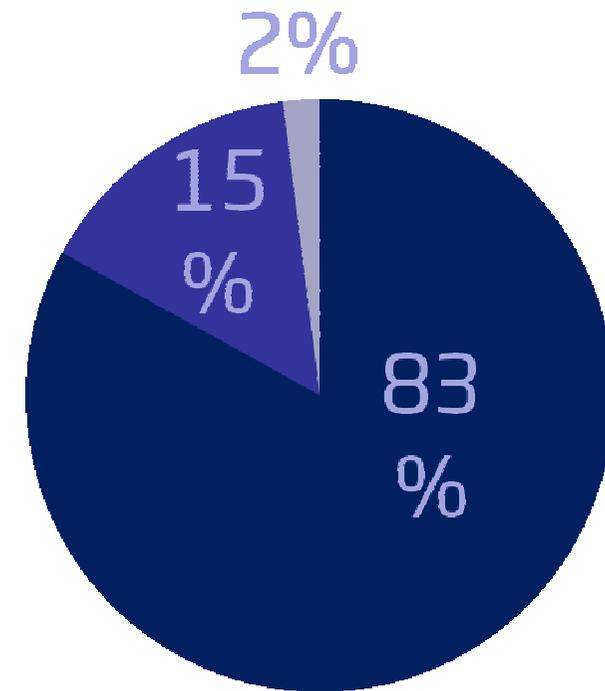
Comparison of Inspection Plots

EMAT - SCC & Inclusions in 24" pipe

MODE 1

MODE 2

MODE 1

MODE 2

CRACK

INCLUSIONS
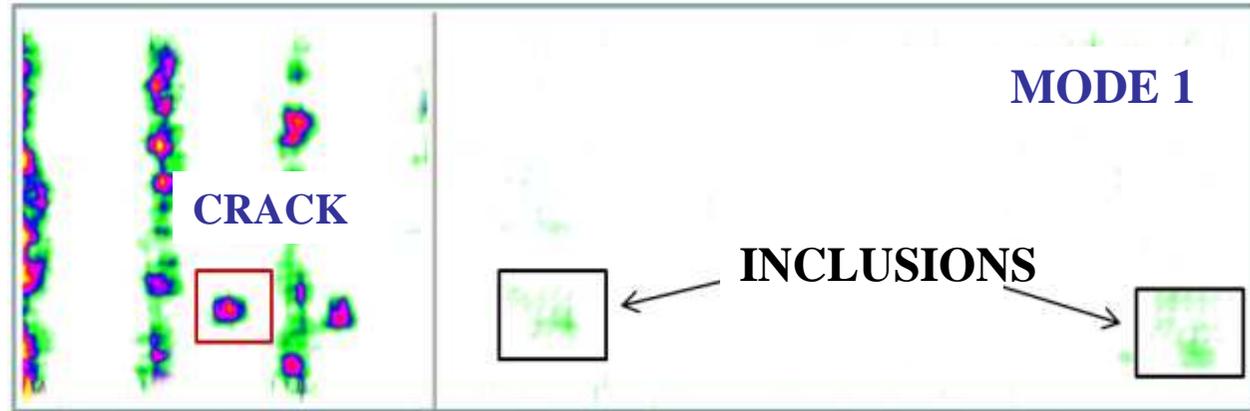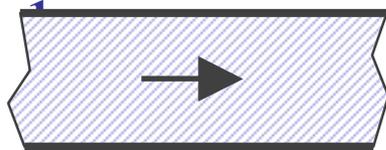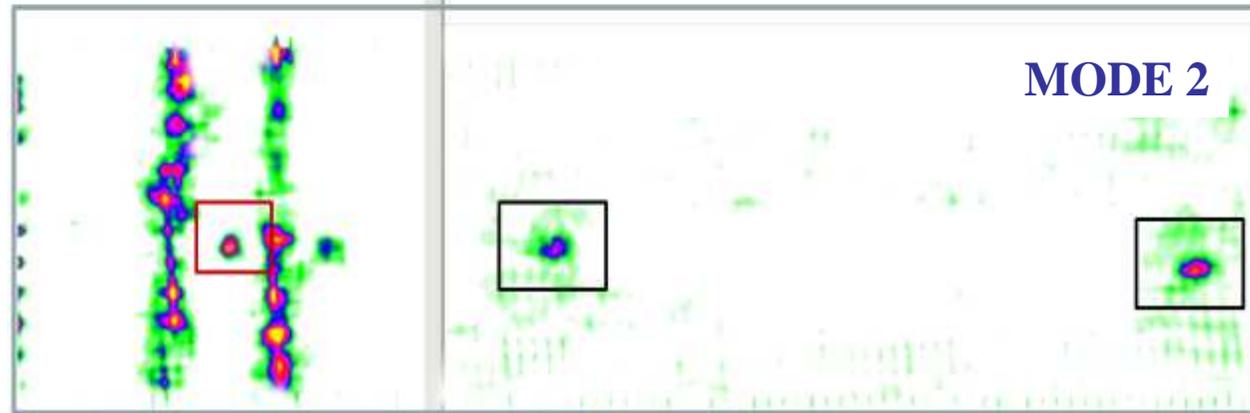
TGS – ARGENTINA 2011 / EMAT

G3 Generation EMAT – 24'' Model: 2010
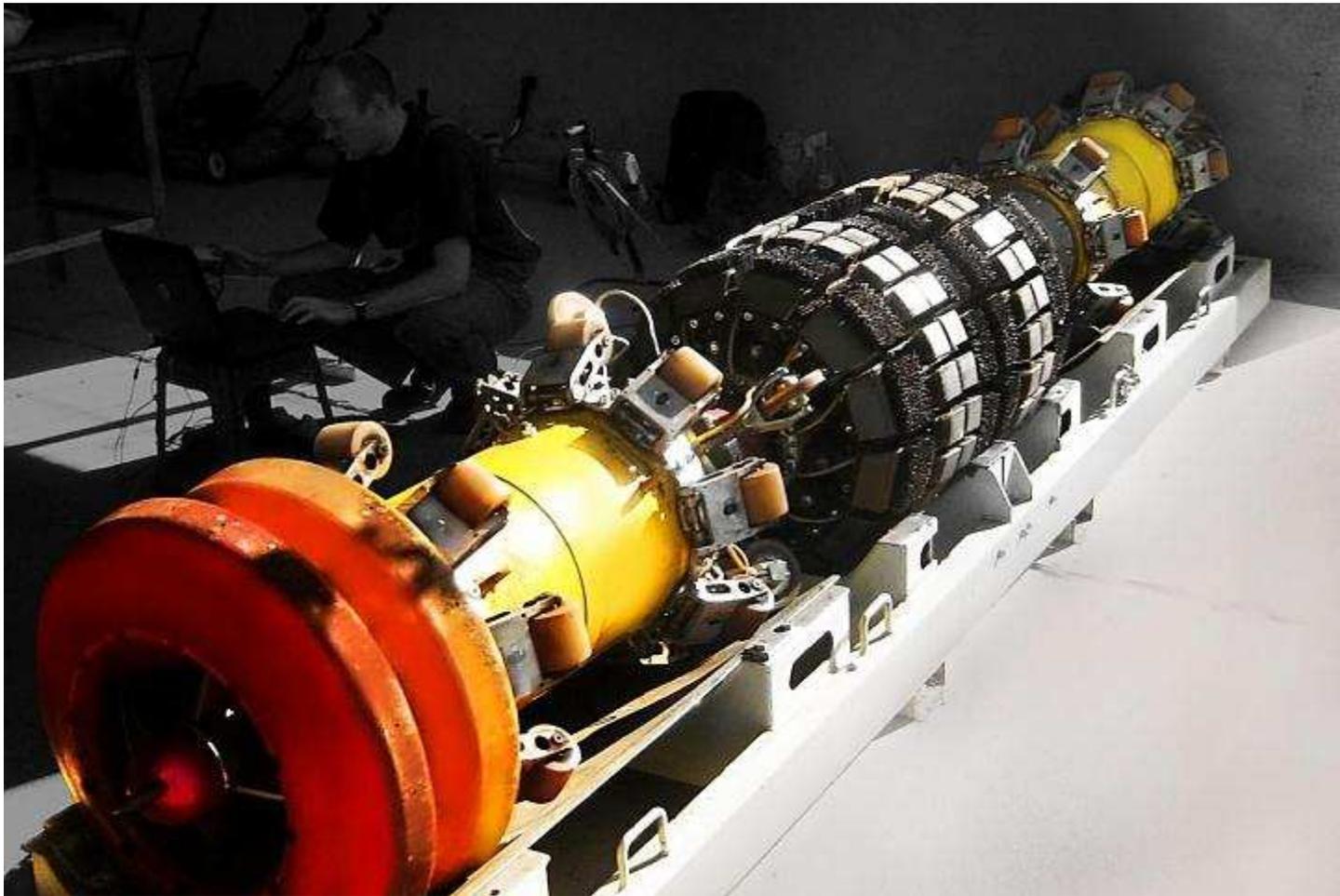
TGS – ARGENTINA 2011 / EMAT

Condition of the tool after running!

Excavations

Argentina 2011

TGS – ARGENTINA 2011 / EMAT

High PH SCC

TGS – ARGENTINA 2011 / EMAT

High PH SCC
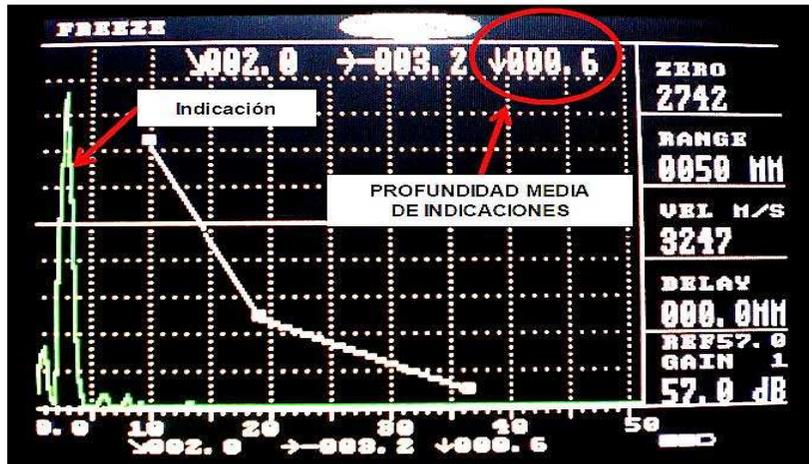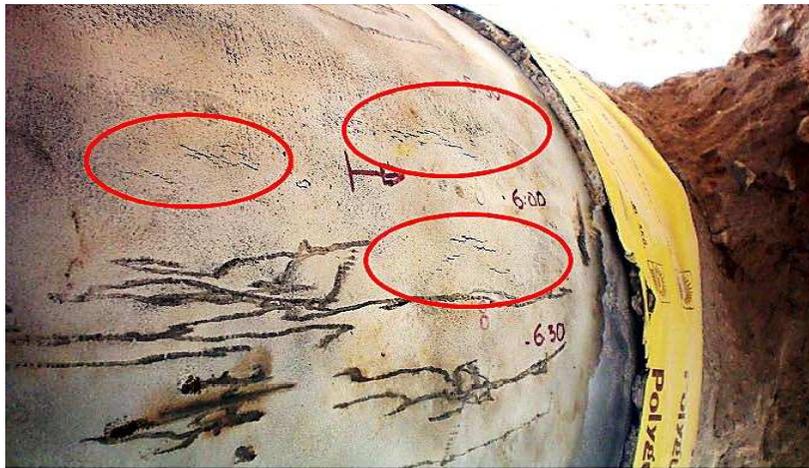
HF EMA Technologies
Combined EMA/MFL, EMA/TFI ILI Tools
G4 EMA Tools (Models: 2012)

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EMA/MFL-30" (2012) G4

The aim is

∗Detection and sizing **metal loose** defects by **MFL** and **MFL+**

∗Detection and sizing **transverse crack like** defects by **MFL**

∗Detection and sizing **metal loose** defects by **EMA**

∗**Inclusions** identification by **EMA**
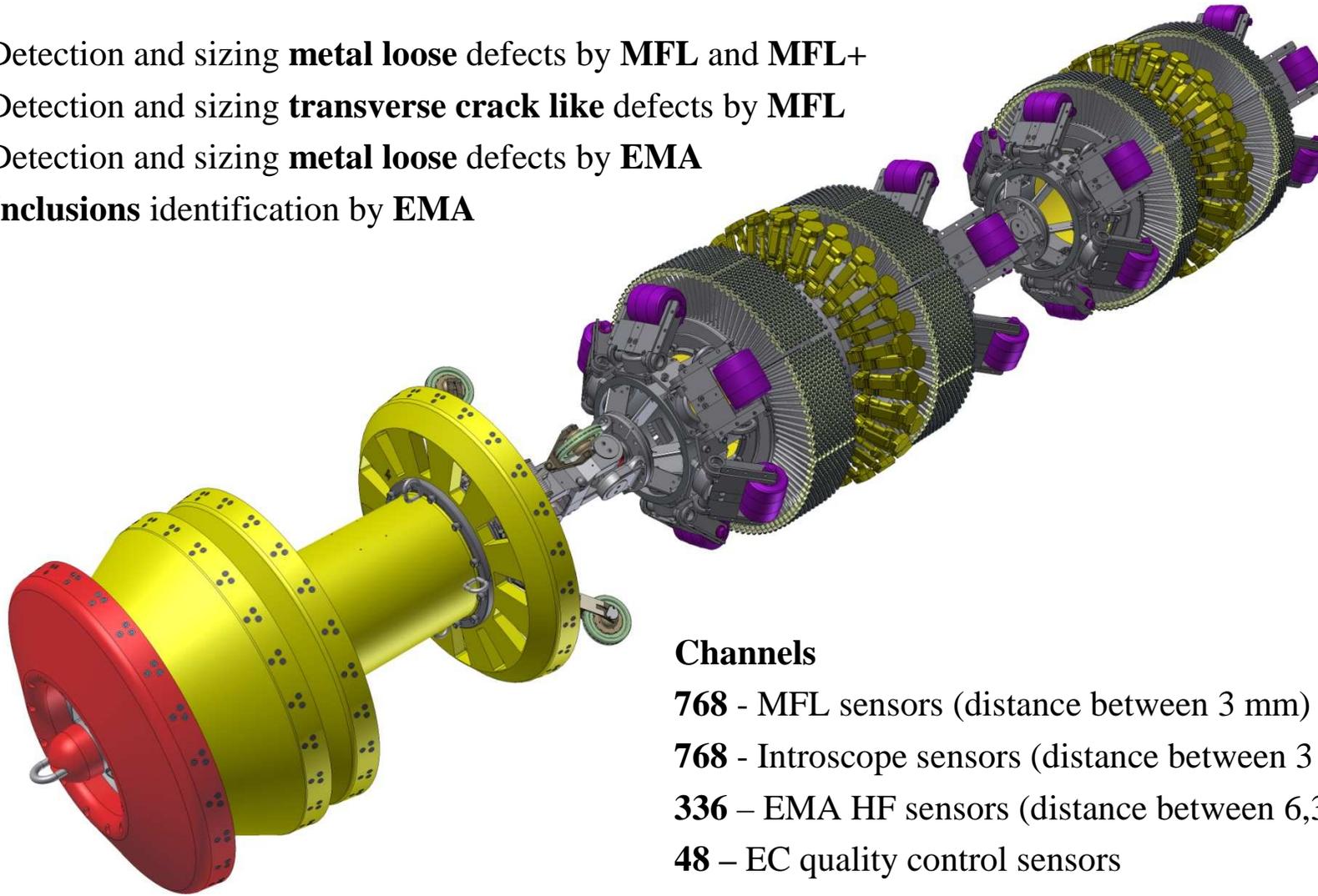
Channels

768 - MFL sensors (distance between 3 mm)

768 - Introscope sensors (distance between 3 mm)

336 – EMA HF sensors (distance between 6,3 mm)

48 – EC quality control sensors

EMA/TFI-30" (2012) G4

The aim is

∗Detection and sizing **metal loose** defects by **TFI**

∗Detection and sizing **axial crack like** defects by **TFI**

∗Detection and sizing **axial & transverse
crack like** defects by **EMA**

∗**Coating disbondment** detection by **EMA**
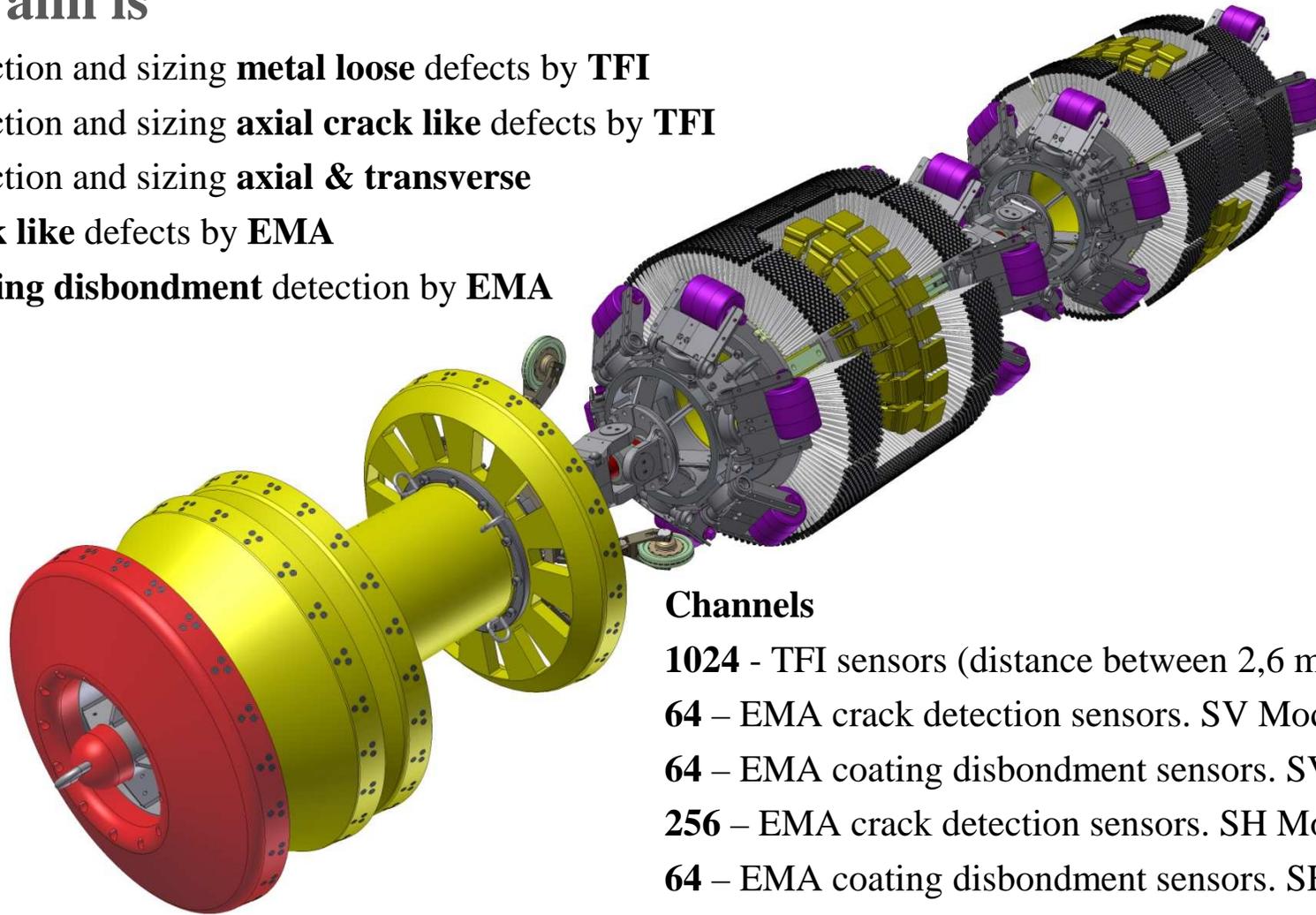
Channels

1024 - TFI sensors (distance between 2,6 mm)

64 – EMA crack detection sensors. SV Mode

64 – EMA coating disbondment sensors. SV Mode

256 – EMA crack detection sensors. SH Mode

64 – EMA coating disbondment sensors. SH Mode

64 – EC quality control sensors

IF it is NO SCC

Is any sense to use EMAT?