NEUTRON MEASUREMENTS PRODUCT WITH A ULTRASONIC POLYVALENT PIEZONUCLEARE REACTOR

Steriwave Startec Ltd

The Company

Our core competencies are in design and realization of industrial prototypes of devices with ultrasonic sonotrode.

Board of Directors:

Franco Selleri, Francesco Fucilla, Bruno Denantes,

Adrian J. Eyre, Mike Goddard, Mike Goodrich: Company Secretary

Roberto Mignani - Chief Scientist

Fabio Cardone - Senior Scientific Advisor

Piezonuclear Reactor

This polyvalent reactor is capable of producing piezionuclear reactions on both liquid and solid materials.

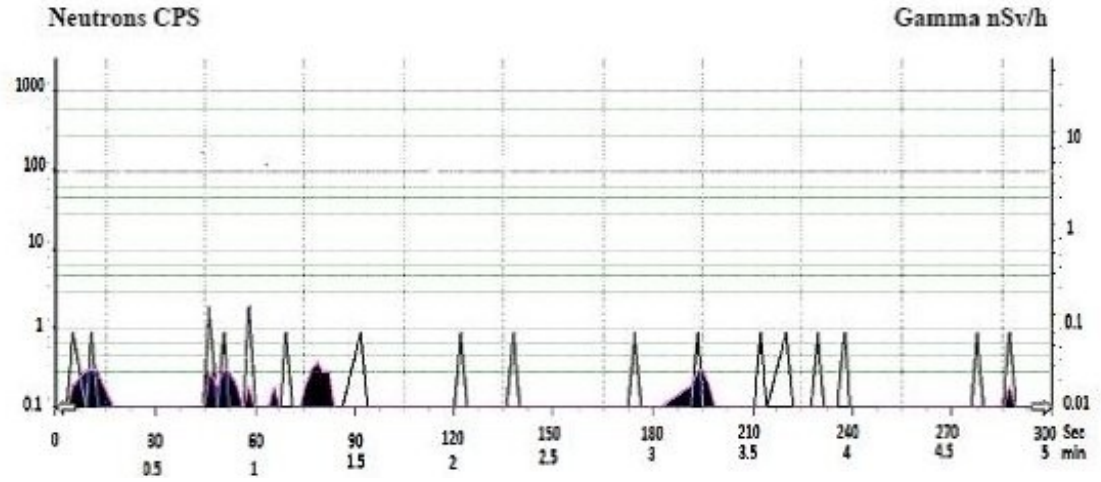
Operating conditions of the reactor:

- Subcritical, low production of neutrons;
- Critics, production of pulses of neutrons equal to that published in the scientific literature;
- Supercritical, producing neutrons at levels higher than those published in scientific literature.

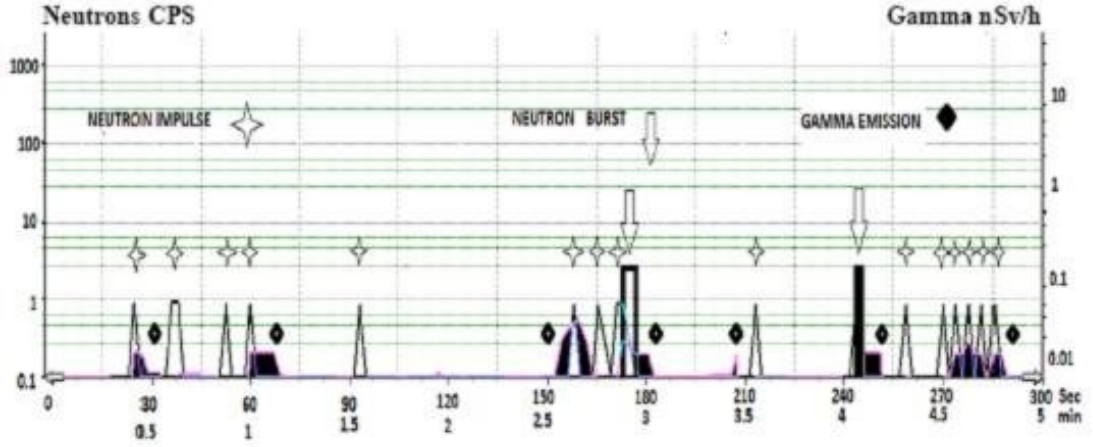
The **measurements** were performed with:

- spectrometer Microspec 2 produced by BTI in energy spectra of neutrons produced in subcritical conditions. First measure in historic order of spectra of neutrons produced by reactions piezonuclear.
- neutron detector PDS 100 G-GN/ID produced by Mirion-MGP. Measurement of neutron pulses as a function of elapsed time during the reactor operation in critical condition.

S. Ambrogio R-1-S Project

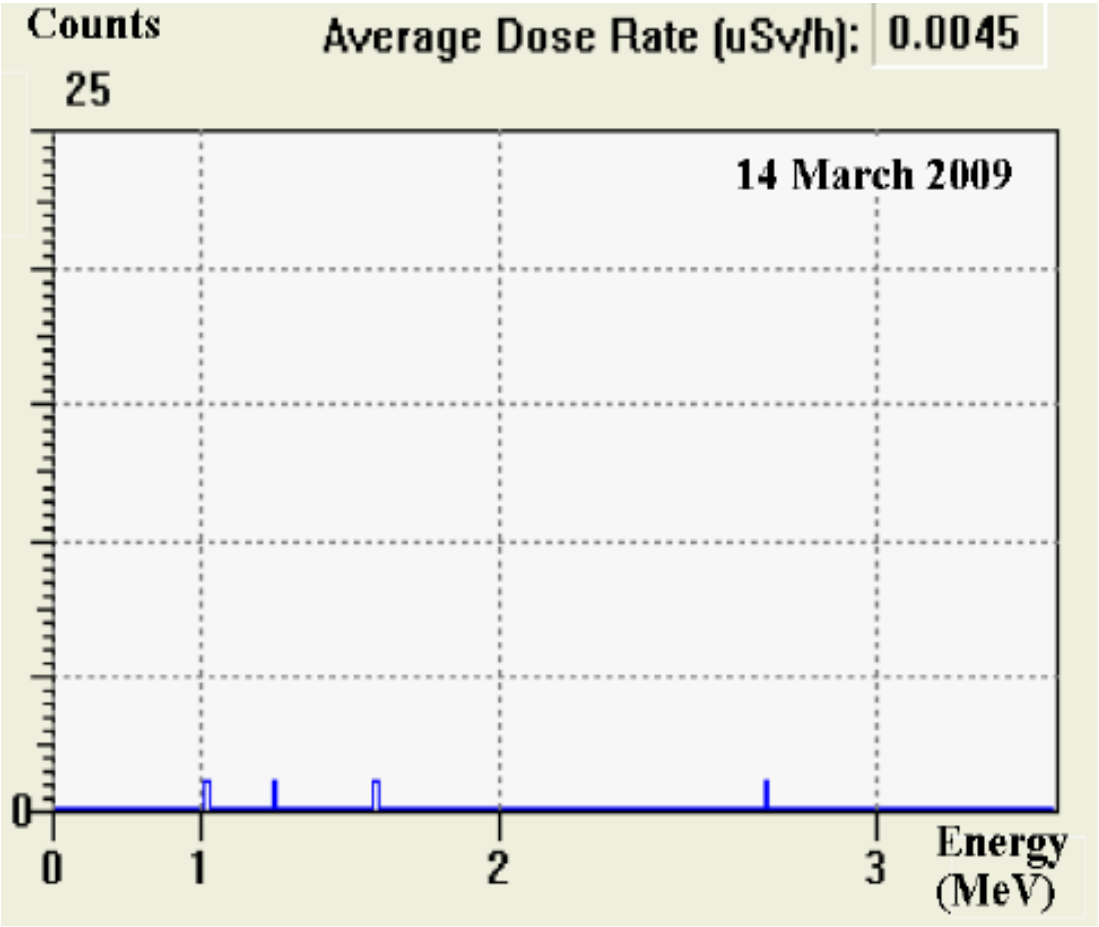


Measurement of the counting rate of neutron and gamma dose rate.
Background measurement, duration of measurement 5 minutes.



Measurement of the counting rate of neutron and gamma dose rate.
Visit our application to a bar of iron of mass 500 g of 20 kHz ultrasound 19 Watt, 5 minutes duration of the measure. Are evident daily emissions (Burst) of neutrons corresponding to areas of damage the image of the central area of the bar.

S. Ambrogio R-1-S Project

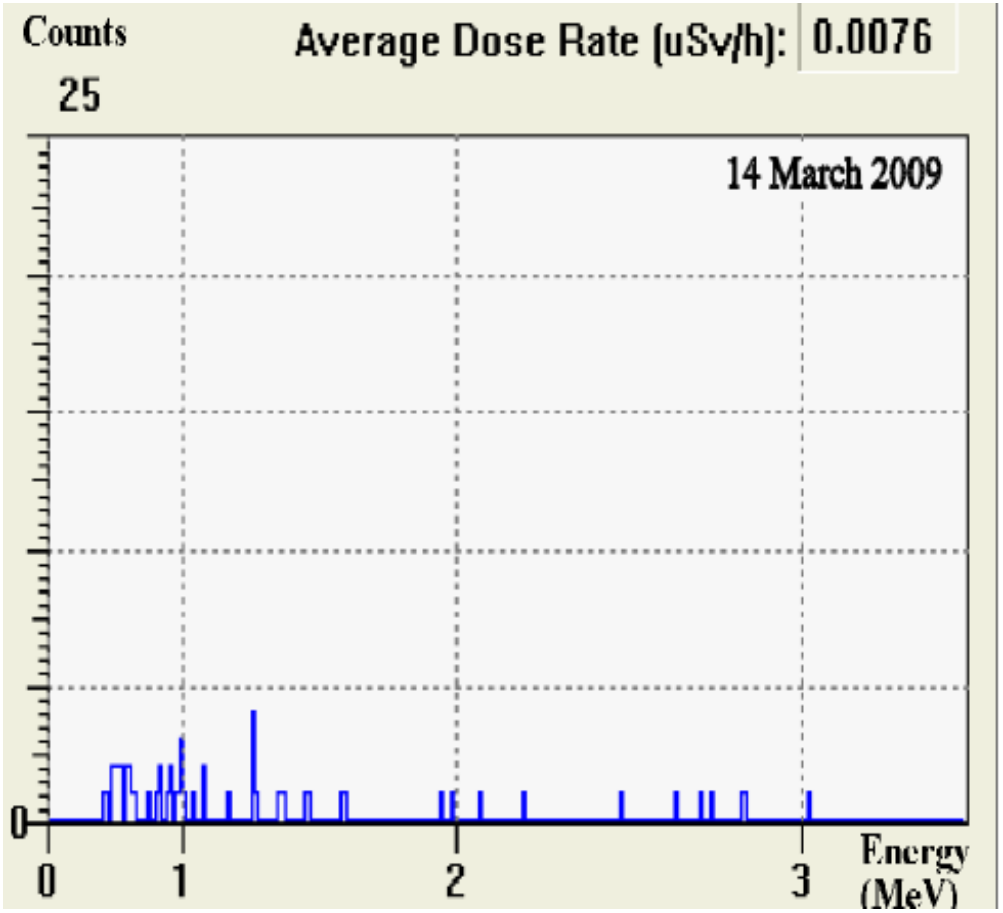


14 March 2009

Neutron spectrum measurements in the laboratory located at Startec in Brugherio (MI).

Measurements taken from Radtech at our laboratories.

S. Ambrogio R-1-S Project



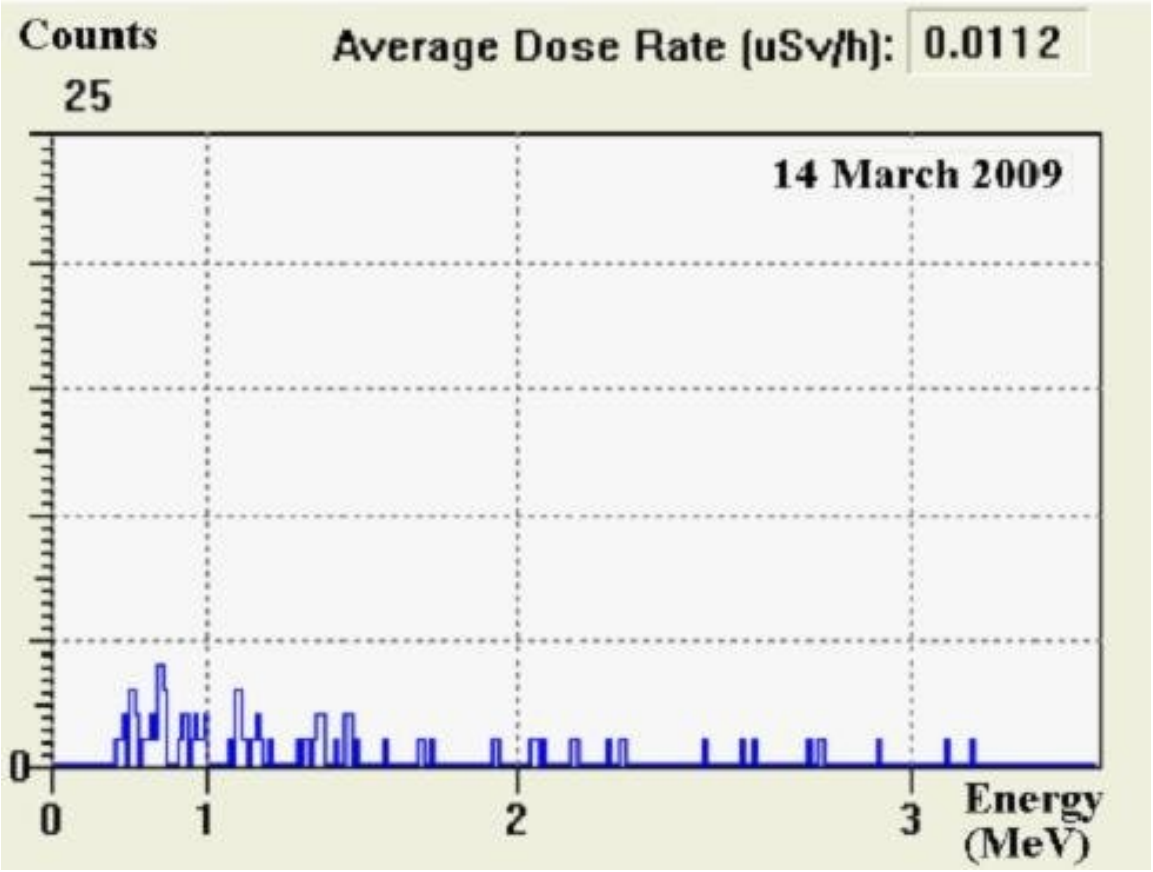
14 March 2009

Neutron spectrum measurements at 20 kHz with ultrasonic power absorbed from the external network 19w duration of the measure 60 minutes.

Material reaction used: Iron

Measurements taken from Radtech at our laboratories.

S. Ambrogio R-1-S Project



14 March 2009

Neutron spectrum measurements at 20 kHz with ultrasonic power absorbed from the external network 19w duration of the measure 60 minutes.

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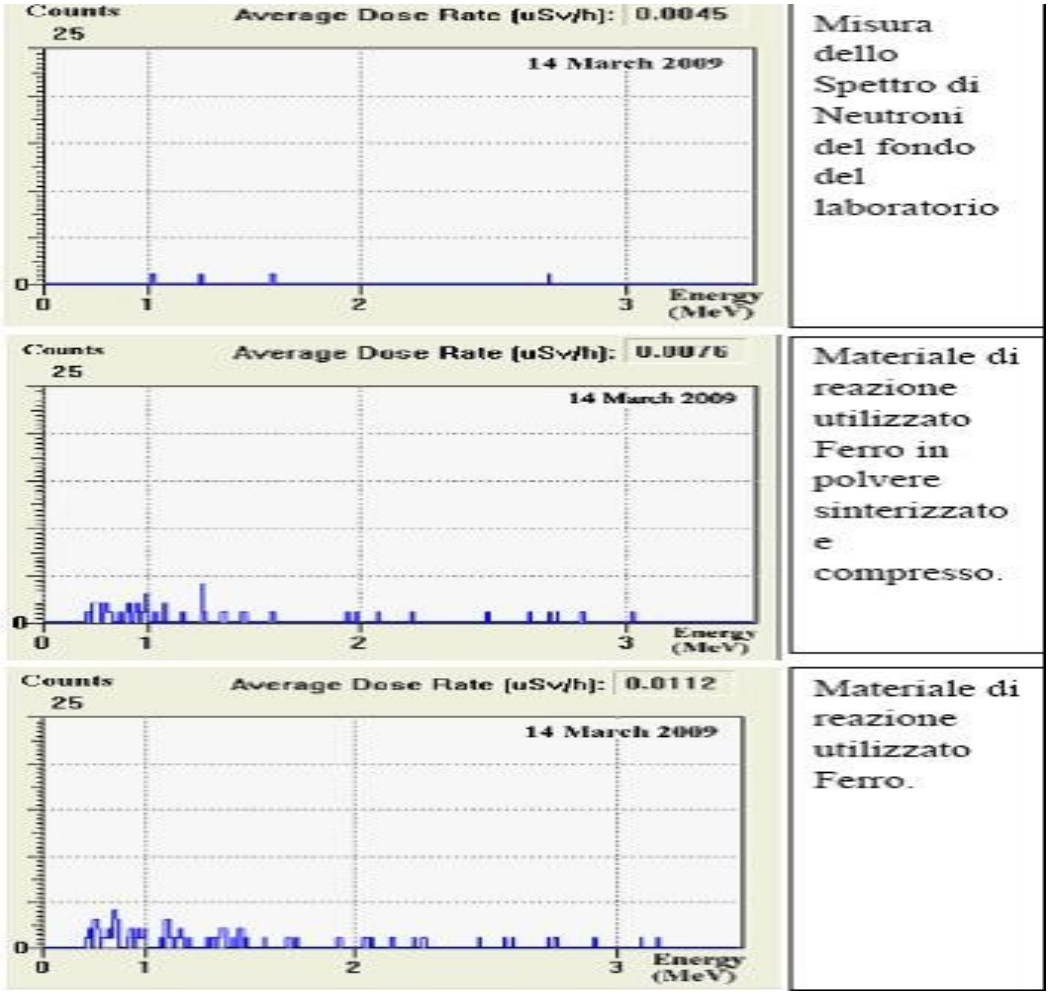
Measurements taken from Radtech at our laboratories.

S. Ambrogio R-1-S Project

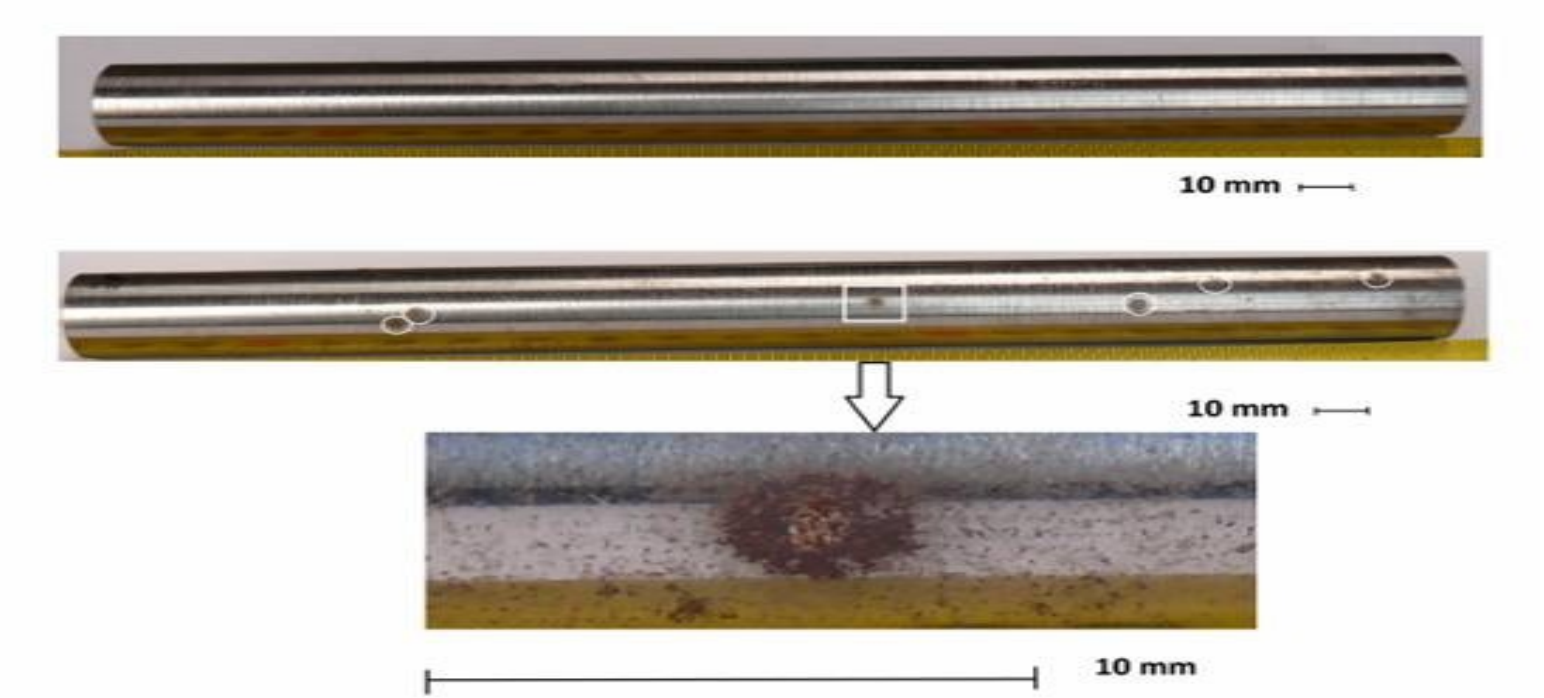
14 Marzo 2009

Neutron spectrum measurements.



Measurements taken from Radtech at our laboratories.

Iron bar subjected to ultrasonic



Iron bar subjected to ultrasound of 20 kHz with power of 19 watts:
a) iron bar before the application of ultrasound
b) iron bar after 5 minutes of ultrasound. 6 zones of damage are visible by emission of pulses of neutron flux estimated 10 / 8 - 10/10 neutroni/cm2 sec
c) magnification of one of the damaged regions from the issuance of the neutron pulses

Physical and Chemical Analysis Calibration

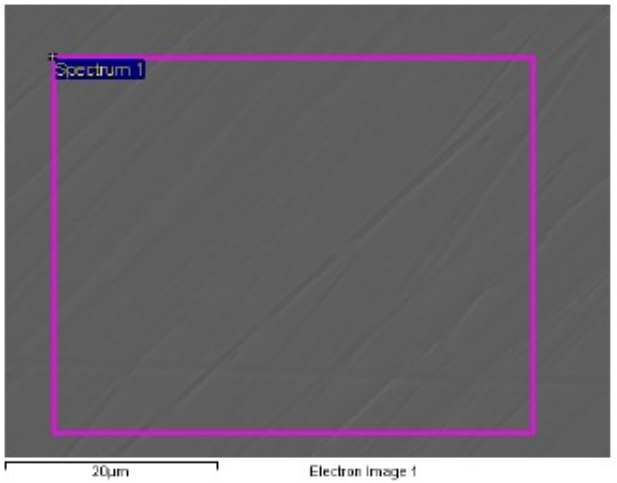
Project 1 11/24/2009 4:02:43 PM

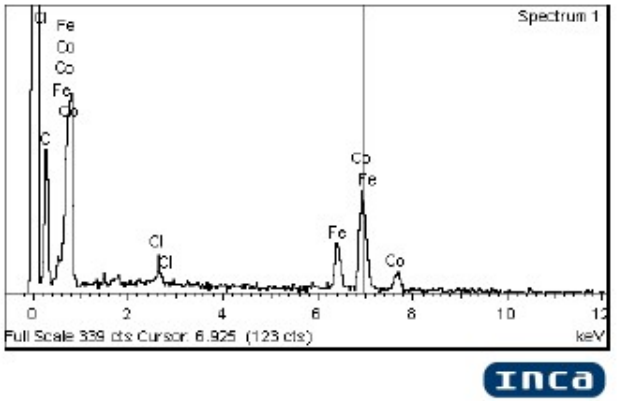
Spectrum processing :
No peaks omitted

Processing option : All elements analyzed (Normalised)
Number of iterations = 4

Standard :
C CaCO3 1-Jun-1999 12:00 AM
Cl KCl 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Co Co 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	32.15	69.30
Cl K	1.74	1.27
Fe K	16.21	7.51
Co K	49.90	21.92
Totals	100.00	





Comment: calibrazione riga K(alpha) del cobalto = 6.295KeV
Tempo acquisizione: 120s

Physical and Chemical Analysis Normal Sample

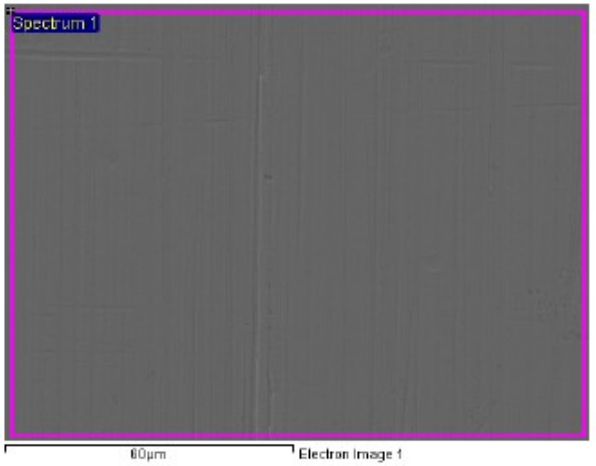
Project 1 11/24/2009 4:39:00 PM

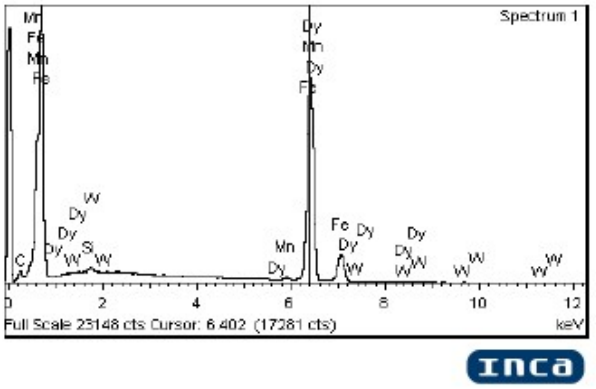
Spectrum processing :
No peaks omitted

Processing option : All elements analyzed (Normalised)
Number of iterations = 4

Standard :
C CaCO3 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Dy DyF3 1-Jun-1999 12:00 AM
W W 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	2.43	10.69
Si K	0.31	0.57
Mn K	0.70	0.67
Fe K	91.41	86.41
Dy L	4.69	1.52
W M	0.47	0.13
Totals	100.00	





Comment: campione normale 1 K(alpha) ferro = 6.4KeV
Tempo acquisizione 120 s
Ingrandimento 3000x

Physical and Chemical Analysis Normal Sample

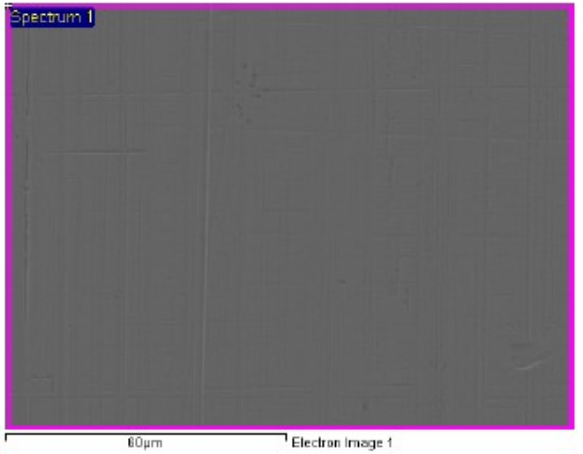
Project 1 11/24/2009 4:44:48 PM

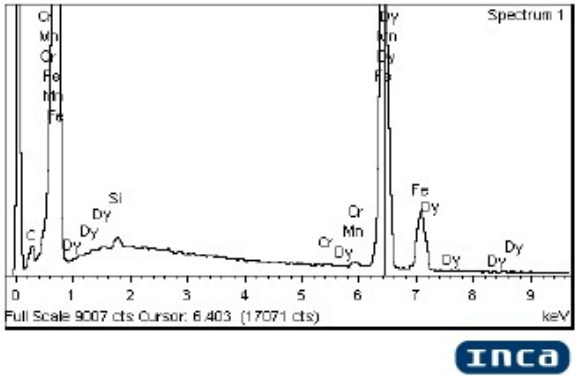
Spectrum processing :
No peaks omitted

Processing option : All elements analyzed (Normalised)
Number of iterations = 3

Standard :
C CaCO3 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
Cr Cr 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Dy DyF3 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	2.24	9.85
Si K	0.36	0.68
Cr K	0.19	0.19
Mn K	0.68	0.66
Fe K	92.10	87.19
Dy L	4.44	1.44
Totals	100.00	





Comment: campione normale 2 K(alpha) ferro = 6.4KeV
Tempo acquisizione 120 s
Ingrandimento 3000x

Physical and Chemical Analysis Normal Sample

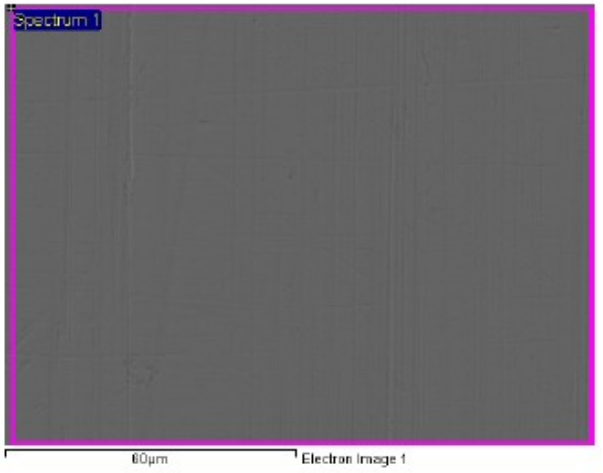
Project 1 11/24/2009 4:49:09 PM

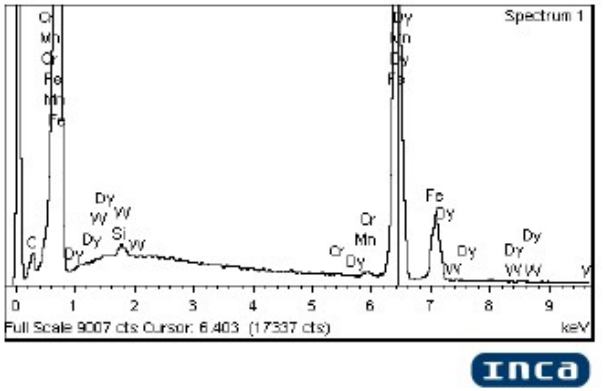
Spectrum processing :
No peaks omitted

Processing option : All elements analyzed (Normalised)
Number of iterations = 3

Standard :
C CaCO3 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
Cr Cr 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Dy DyF3 1-Jun-1999 12:00 AM
W W 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	2.37	10.43
Si K	0.21	0.39
Cr K	0.18	0.19
Mn K	0.66	0.63
Fe K	91.92	86.87
Dy L	4.12	1.34
W M	0.53	0.15
Totals	100.00	





Comment: campione normale 3 K(alpha) ferro = 6.4KeV
Tempo acquisizione 120 s
Ingrandimento 3000x

Physical and Chemical Analysis Ultrasonic Sample

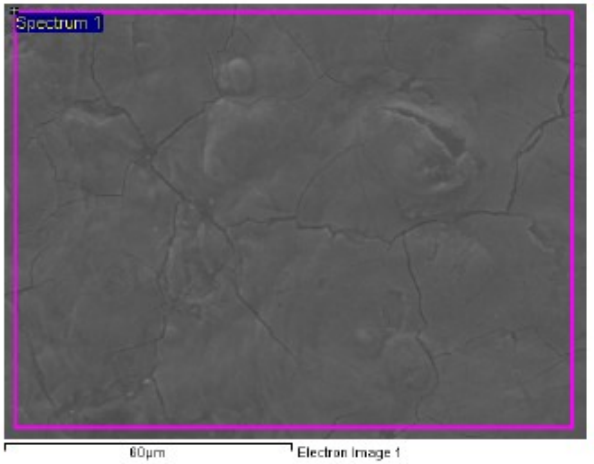
Project 1 11/24/2009 4:18:14 PM

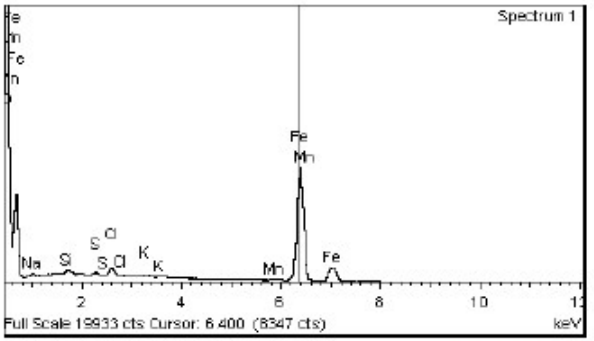
Spectrum processing :
No peaks omitted

Processing option : All elements analyzed (Normalised)
Number of iterations = 6

Standard :
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Na Albite 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
S FeS2 1-Jun-1999 12:00 AM
Cl KCl 1-Jun-1999 12:00 AM
K MAD-10 Feldspar 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	8.46	18.07
O K	34.31	55.01
Na K	0.39	0.43
Si K	0.20	0.18
S K	0.18	0.15
Cl K	0.65	0.47
K K	0.31	0.20
Mn K	0.58	0.27
Fe K	54.91	25.22
Totals	100.00	





Comment: campione ultrasuoni 1 K(alpha) ferro = 6.4KeV
Tempo acquisizione 120 s
Ingrandimento 3000x

Physical and Chemical Analysis Ultrasonic Sample

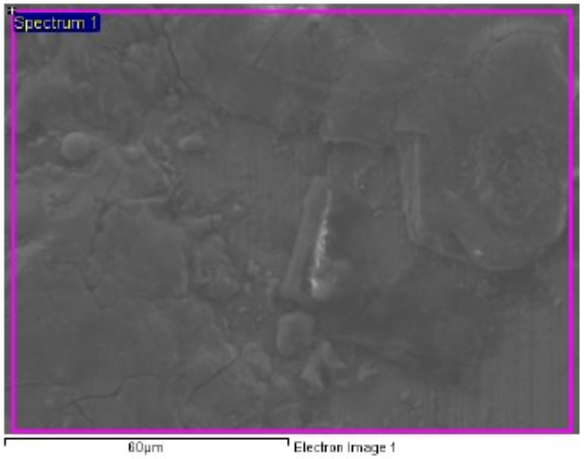
Project 1 11/24/2009 4:24:37 PM

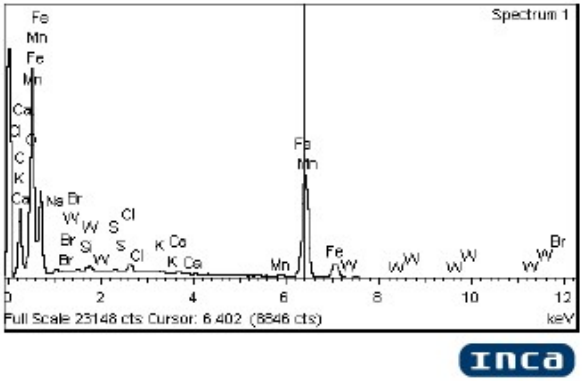
Spectrum processing :
Peak possibly omitted : 14.180 keV

Processing option : All elements analyzed (Normalised)
Number of iterations = 6

Standard :
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Na Albite 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
S FeS2 1-Jun-1999 12:00 AM
Cl KCl 1-Jun-1999 12:00 AM
K MAD-10 Feldspar 1-Jun-1999 12:00 AM
Ca Wollastonite 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
Br KBr 1-Jun-1999 12:00 AM
W W 1-Jun-1999 12:00 AM

Element	Weight%	Atomic%
C K	10.78	23.85
O K	27.77	46.13
Na K	0.70	0.81
Si K	0.27	0.25
S K	0.17	0.14
Cl K	0.76	0.57
K K	0.30	0.21
Ca K	0.23	0.16
Mn K	0.65	0.31
Fe K	57.54	27.38
Br L	0.36	0.12
W M	0.47	0.07
Totals	100.00	





Comment: campione ultrasuoni 2 K(alpha) ferro = 6.4KeV
Tempo acquisizione 120 s
Ingrandimento 3000x

Physical and Chemical Analysis Ultrasonic Sample

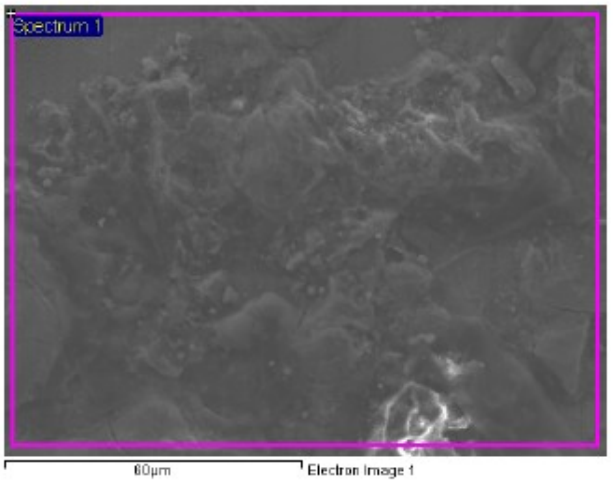
Project 1 11/24/2009 4:29:31 PM

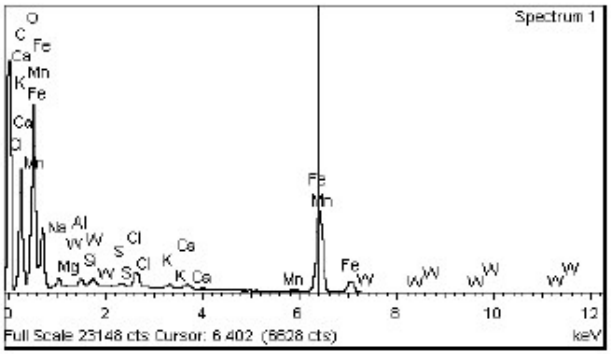
Spectrum processing :
No peaks omitted

Processing option : All elements analyzed (Normalised)
Number of iterations = 7

Standard :
C CaCO3 1-Jun-1999 12:00 AM
O SiO2 1-Jun-1999 12:00 AM
Na Albite 1-Jun-1999 12:00 AM
Mg MgO 1-Jun-1999 12:00 AM
Al Al2O3 1-Jun-1999 12:00 AM
Si SiO2 1-Jun-1999 12:00 AM
S FeS2 1-Jun-1999 12:00 AM
Cl KCl 1-Jun-1999 12:00 AM
K MAD-10 Feldspar 1-Jun-1999 12:00 AM
Ca Wollastonite 1-Jun-1999 12:00 AM
Mn Mn 1-Jun-1999 12:00 AM
Fe Fe 1-Jun-1999 12:00 AM
W W 1-Jun-1999 12:00 AM

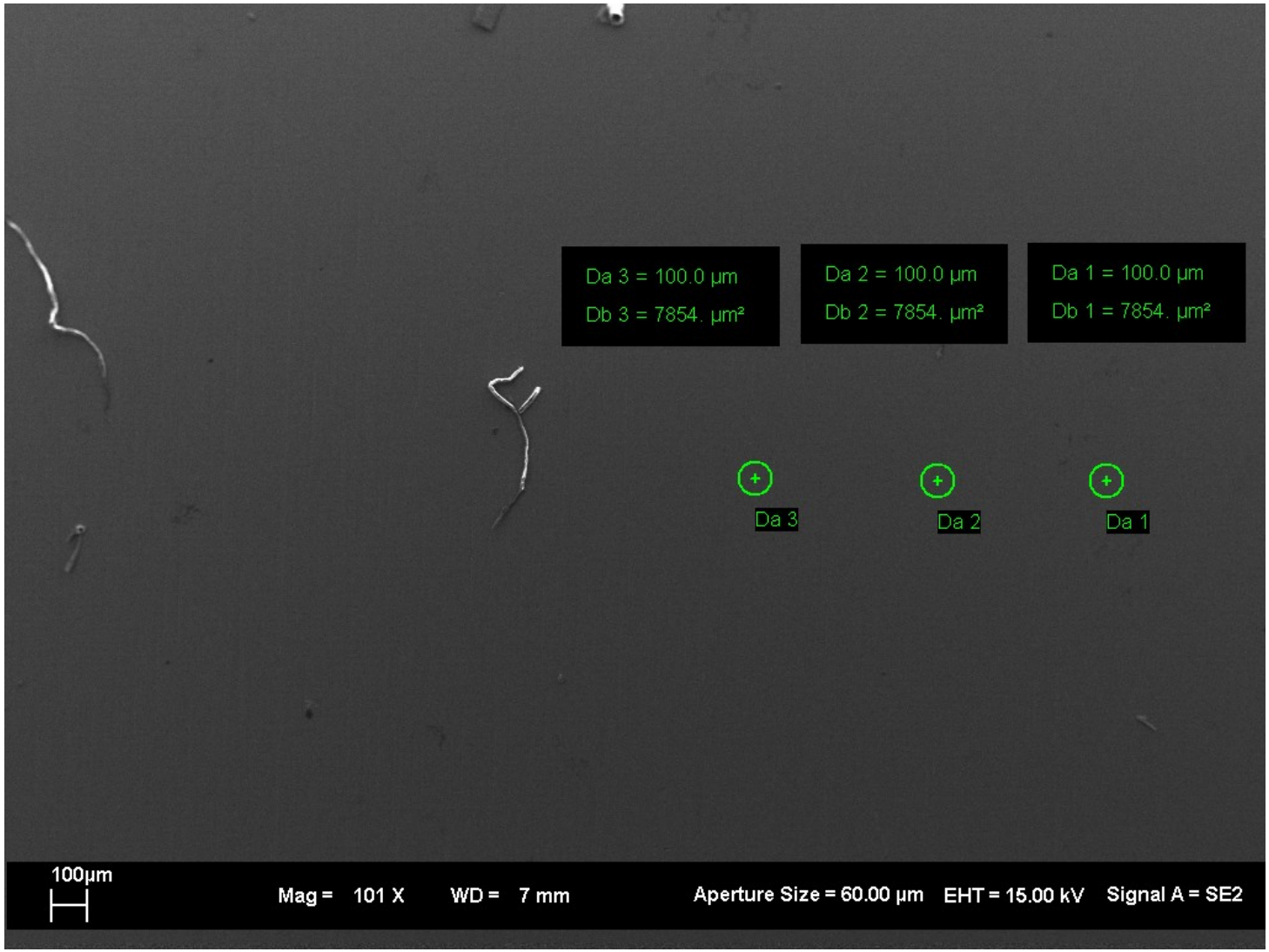
Element	Weight%	Atomic%
C K	19.80	36.90
O K	29.27	40.96
Na K	1.20	1.16
Mg K	0.19	0.17
Al K	0.53	0.44
Si K	0.49	0.39
S K	0.27	0.19
Cl K	1.61	1.02
K K	0.54	0.31
Ca K	0.68	0.38
Mn K	0.47	0.19
Fe K	44.45	17.82
W M	0.50	0.06
Totals	100.00	



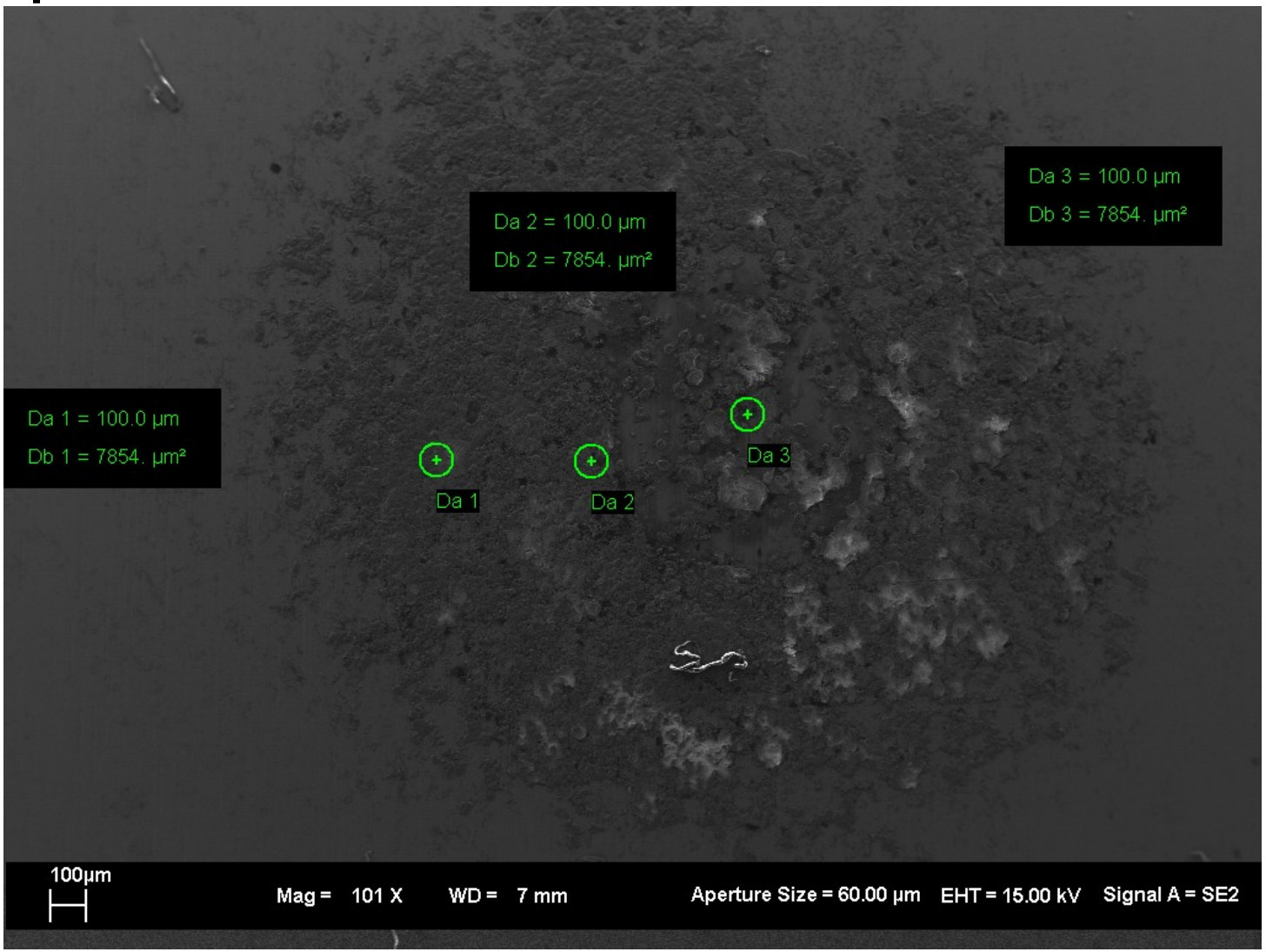


Comment: campione ultrasuoni 3 K(alpha) ferro = 6.4KeV
Tempo acquisizione 120 s
Ingrandimento 3000x

Physical and Chemical Analysis
Normal analysed zone



Physical and Chemical Analysis
Ultrasonic analysed zone



Neutron Probe BTI

Bubble Technology Industries N-PROBE is a revolutionary portable neutron scintillation spectrometer, designed to be used by non-specialists for measurement of low-intensity neutron doses in the mixed field environments often found in nuclear utilities, fuel storage areas, fuel and waste processing operations and military applications. It is compatible with the current generation of BTI MICROSPEC analyzers and shares the philosophy of spectral dosimetry with other BTI spectroscopic probes, where the dosimetric quantities are computed from the spectrum using appropriate fluence-dose conversion functions.

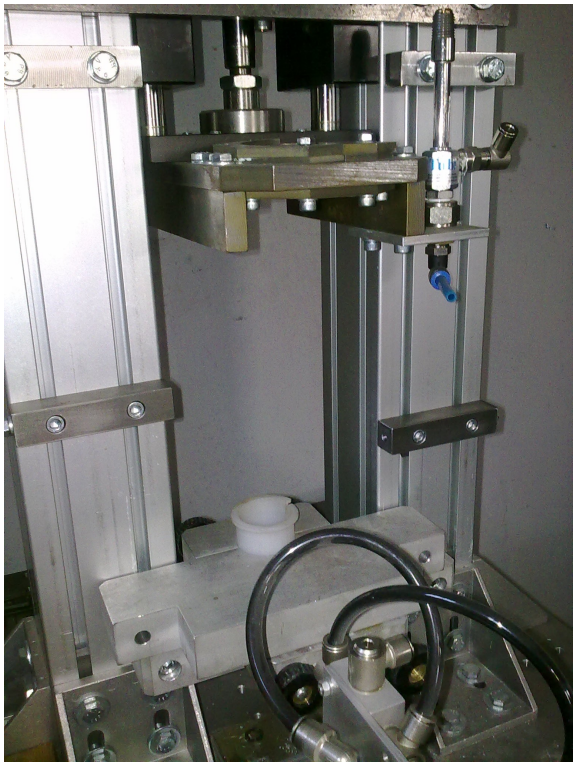
The N-Probe uses two separate detectors to cover the neutron energy range from thermal to 20 MeV. A NE213-type liquid scintillator is used to cover from 800 keV to 20 MeV while a ^{3}He proportional counter based on the ^{3}He(n,p) T reaction is used to cover the energy region from thermal to 800 keV. Sophisticated pulse-shape discrimination circuitry distinguishes unwanted gamma-ray signals from the desired neutron signals. The two detectors work in unison and pulse-height distributions from both are shown during data collection. With one command from the keyboard, these distributions are merged and processed automatically to yield the desired neutron spectrum.

HDS-100G/GN Mirion-MPG

R-1-S Reactor demo model

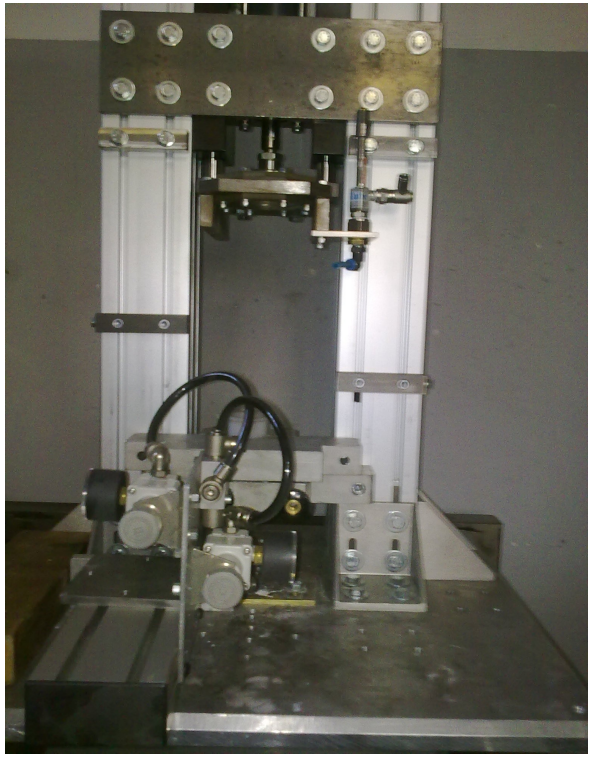
Outside view of the containment chamber and control system

R-1-S Reactor demo model



Inside view of the containment chamber and control system

R-1-S Reactor demo model



Inside view of the containment chamber and control system

Contact

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