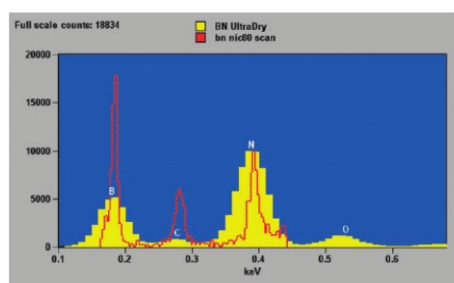


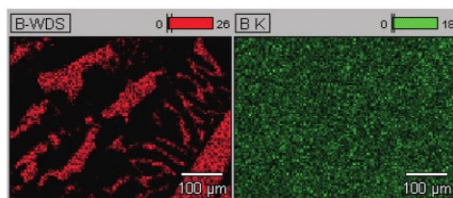
The Thermo Scientific MagnaRay is the first WDS spectrometer designed to be as easy to use as an EDS system. Automatic intelligent alignment and parameter settings offer unparalleled speed and confidence in elemental analysis in the electron microscope.

## MagnaRay

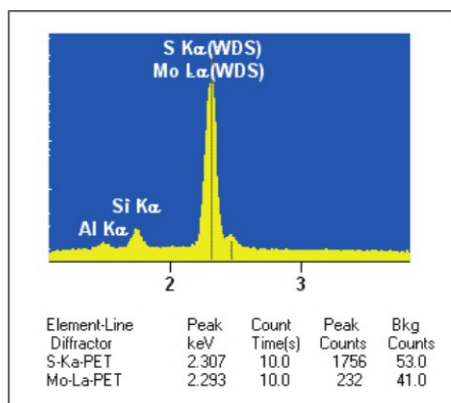
Wavelength dispersive spectrometer



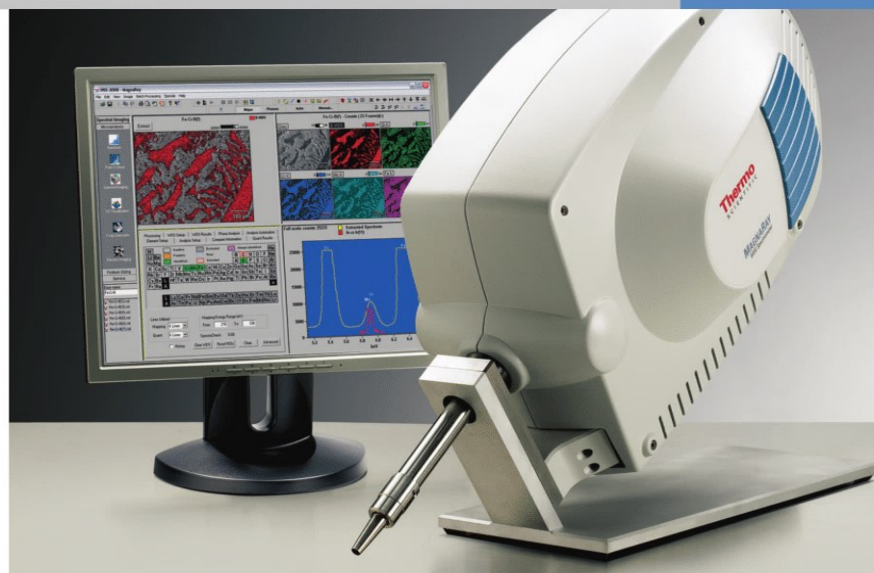
WDS scan of a Boron Nitride sample showing improved resolution and sensitivity as compared to EDS



Comparison of X-ray maps from MagnaRay and EDS from a steel sample containing 3% Boron



WDS confirmation of elements present



The Thermo Scientific MagnaRay revolutionizes the speed of WDS analysis using direct drive technology for the X-ray diffractors allowing element-to-element movement times as short as 0.25 seconds. MagnaRay incorporates an expert system to automatically determine optimum settings for analysis, eliminating time consuming and tedious input from the operator. The X-ray optic and Xenon proportional counter used in MagnaRay provides high throughput without the need for high beam currents.

MagnaRay is completely integrated into the NORAN System 7 making operation virtually transparent to the operator. Transparent WDS integration within NORAN System 7 software means an EDS operator is already trained for WDS analysis. Automatic confirmation of EDS peak identification using WDS and automatic alignment greatly simplifies operation, enhances throughput and provides exceptional elemental identification.

# Product Specifications

## Spectrometer

- Fully focusing wavelength dispersive spectrometer using parallel beam technology and  $\Theta$  range from  $14^\circ$  to  $77^\circ$  and six positions for diffractors
- Maximum element to element time on a single diffractor: 0.25 seconds (Si-K-TAP to O-K-TAP)
- Maximum element to element time on different diffractor: 3.00 seconds (Si-K-PET to Si-K-TAP)
- Sealed Xenon proportional counter with light element window
- Reproducibility in diffractor positioning:  $< 0.001$  degree

## Spectrometer Control Unit

- Motor drives for diffractor selection, position, detector position and 3 stage axes
- Single channel analyzer with automatic and manual control of threshold values
- Adjustable detector bias from 1400 – 2500 V
- Front panel LED indicators of communication and system health status
- X-ray mapping output
- Vacuum interlock

## Summary Software Specifications

- WDS fully integrated with NORAN System 7 EDS software
- Automatic spectrometer alignment based on EDS information
- Automatic spectrometer calibration
- Rate meter, strip chart spectrometer feedback
- Automatic WDS validation of EDS peak identifications
- One-button WDS scans of EDS peak for visual confirmation of peak validation
- WDS full-standards quantification, mixed ED-WD standards quantification
- Easy selection of WDS element line for acquisition in EDS Spectral Imaging and Linescan modes
- Automatic acquisitions for peak-to-background, peak search, standards and unknowns
- Reports to printer, Word or PowerPoint® (optional) appropriate for the data acquired: quantification, spectra, maps, linescans

## Table of Standard Specifications

| Line  | Diffractor | Vacc [kV] | Intensity [cps/nA] |
|-------|------------|-----------|--------------------|
| C Ka  | NiC80      | 10        | 1800               |
| Al Ka | TAP        | 20        | 1400               |
| Ti Ka | PET        | 30        | 1300               |
| Cu Ka | LIF 200    | 30        | 500                |

Intensity values are minimum guaranteed values for a sample mounted normal to the electron beam and an X-ray take-off-angle of 35 degrees.

## Scan Elements

- Automatically validate and select elements from EDS acquisition
- Manually select elements for analysis from periodic table
- Display of energy scans for selected elements or energy range including multiple diffractors overlapped on the EDS spectrum
- Determine presence/possibility/absence of elements to user-determined significance
- Scan spectrometer over elemental peaks automatically selecting energy range
- Scan spectrometer over energy range, including diffractor boundaries
- Identify and label peaks using KLM markers using either long or short labels

## Measure Elements

- Measures peak and background intensities and displays results numerically and graphically
- Order of element analysis can be defined
- Automatic optimization of element order
- Data acquisition can be terminated by time or statistics for each element

## Spectrum Display, Manipulation and Peak Identification

- Combined WDS-EDS spectral display
- Horizontal and vertical spectrum zoom
- KLM markers displayed for identified elements, including higher order lines
- Unlimited spectral comparison display
- Single-button report the spectra as overlapped or isolated

## Table of Available Diffractors

| Diffractors | Energy Range       | Comment                                           |
|-------------|--------------------|---------------------------------------------------|
| NiC80       | 160 eV to 640 eV   | Standard                                          |
| TAP         | 500 eV to 1.99 keV | Standard                                          |
| PET         | 1.47 eV to 5.8 keV | Standard                                          |
| LIF (200)   | 3.2 eV to 12 keV   | Standard                                          |
| MoB4C       | 65 eV to 255 eV    | Optional for Be analysis                          |
| WSi60       | 215 eV to 850 eV   | Optional for C and O analysis                     |
| CrSc80      | 160 eV to 640 eV   | Optional for N analysis                           |
| LIF (220)   | 4.5 eV to 17.9 keV | Optional for improved resolution at high energies |

## Measure Standards

- Peak search on standards
- Stage location stored per standard material
- Multiple elemental standards
- Average intensities from multiple locations
- Spectrometer-optimized element acquisitions with manual override
- Data acquisition can be terminated by time or statistics for each element
- Standards saved for use by multiple users across multiple projects
- Results for peak and background counts and intensities, and peak search

## Quantitative Analysis

- Quantitative analyses using independent cps/nA at peak and background energy locations for standard references and unknown analyses
- X-ray corrections using ZAF and PROZA algorithms
- Processing options for exclusively WDS, mixed WDS-EDS, by difference, by stoichiometry, compounds
- Quantification results display in tabular format
- Single-button report

## Data Export

- Native file format is industry-standard EMSA-ASCII with compatible Thermo Scientific additions
- Spectra display can be export as a JPEG figure

## Line Table Editor

- Factory default analysis conditions for all elements with manual override
- Operators' own line tables may be used by others, but not changed

## Direct Control

- Access to all spectrometer parameters including gain, lower level discriminator, upper level discriminator and bias
- Multichannel analyzer for pulse height distribution analysis