APPENDIX 3

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 1 Fracture

Energy Range: 0 - 20 keV 10 eV/ch HiRes

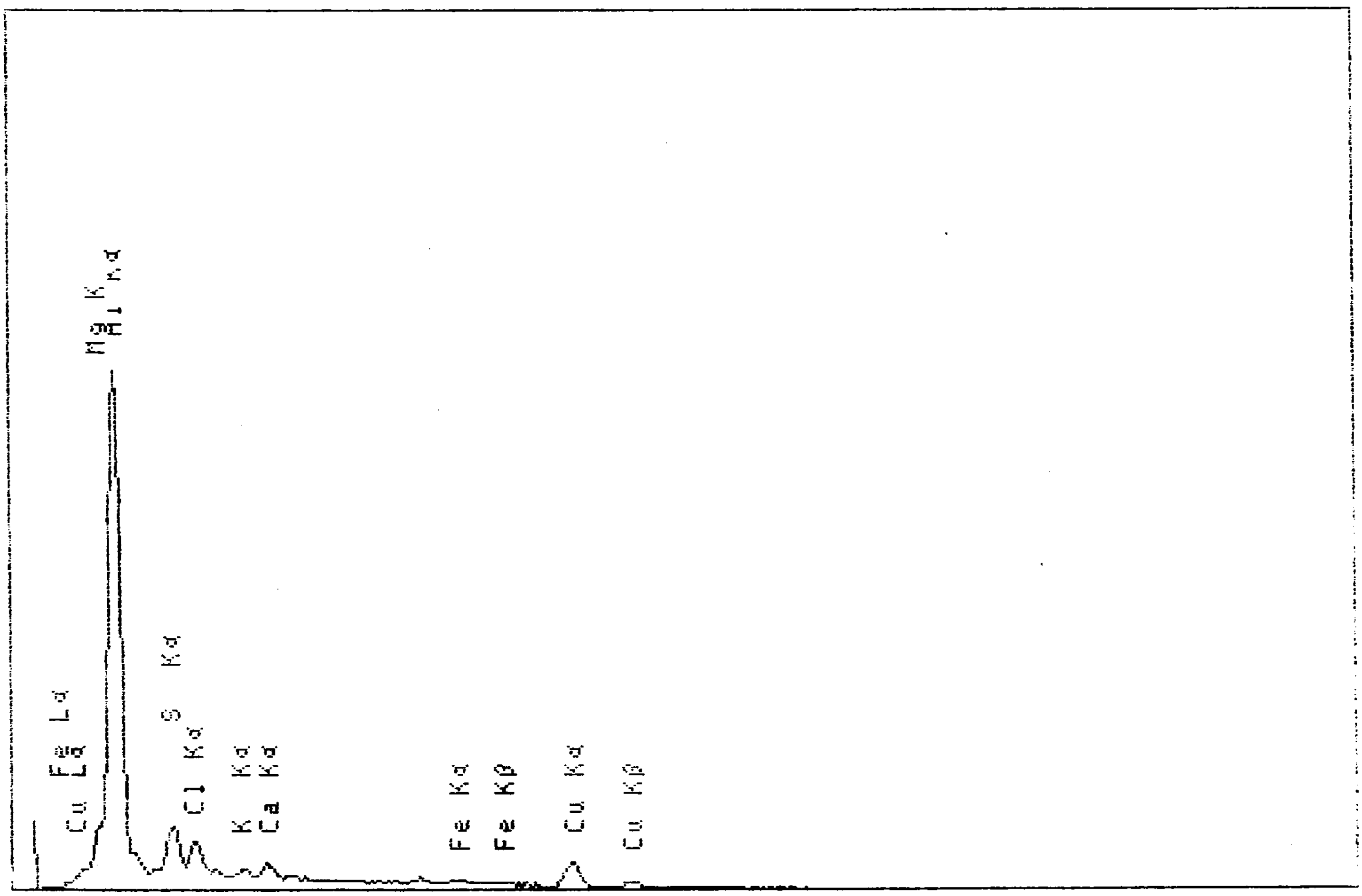
Preset: Live Time 100 Seconds

Real Time: 135.97 Sec. Live Time: 100.00 Sec.

25% Deadtime 3112 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 14:02:42

Cfs 16K



<0.000 keV Cursor = 120 (1.200 keV) = 813 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 1 Fracture-2

Energy Range: 0 - 20 keV 10 eV/ch HiRes

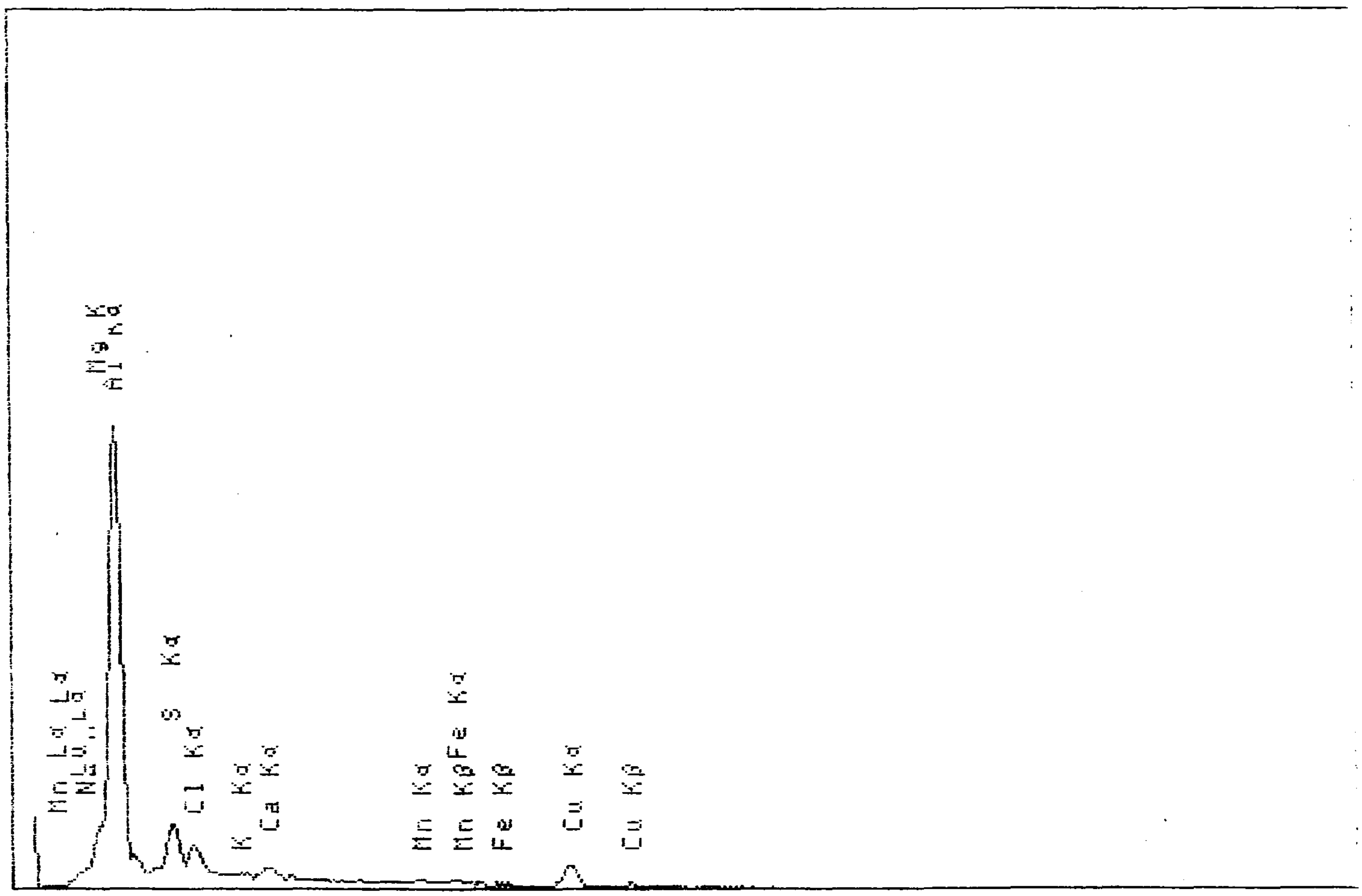
Preset: Live Time 100 Seconds

Real Time: 132.35 Sec. Live Time: 100.00 Sec.

25% Deadtime 2958 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 14:09:01

Cfs 16K



<0.000 keV Cursor = 120 (1.200 keV) = 790 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 2 Fracture

Energy Range: 0 - 20 keV 10 eV/ch HiRes

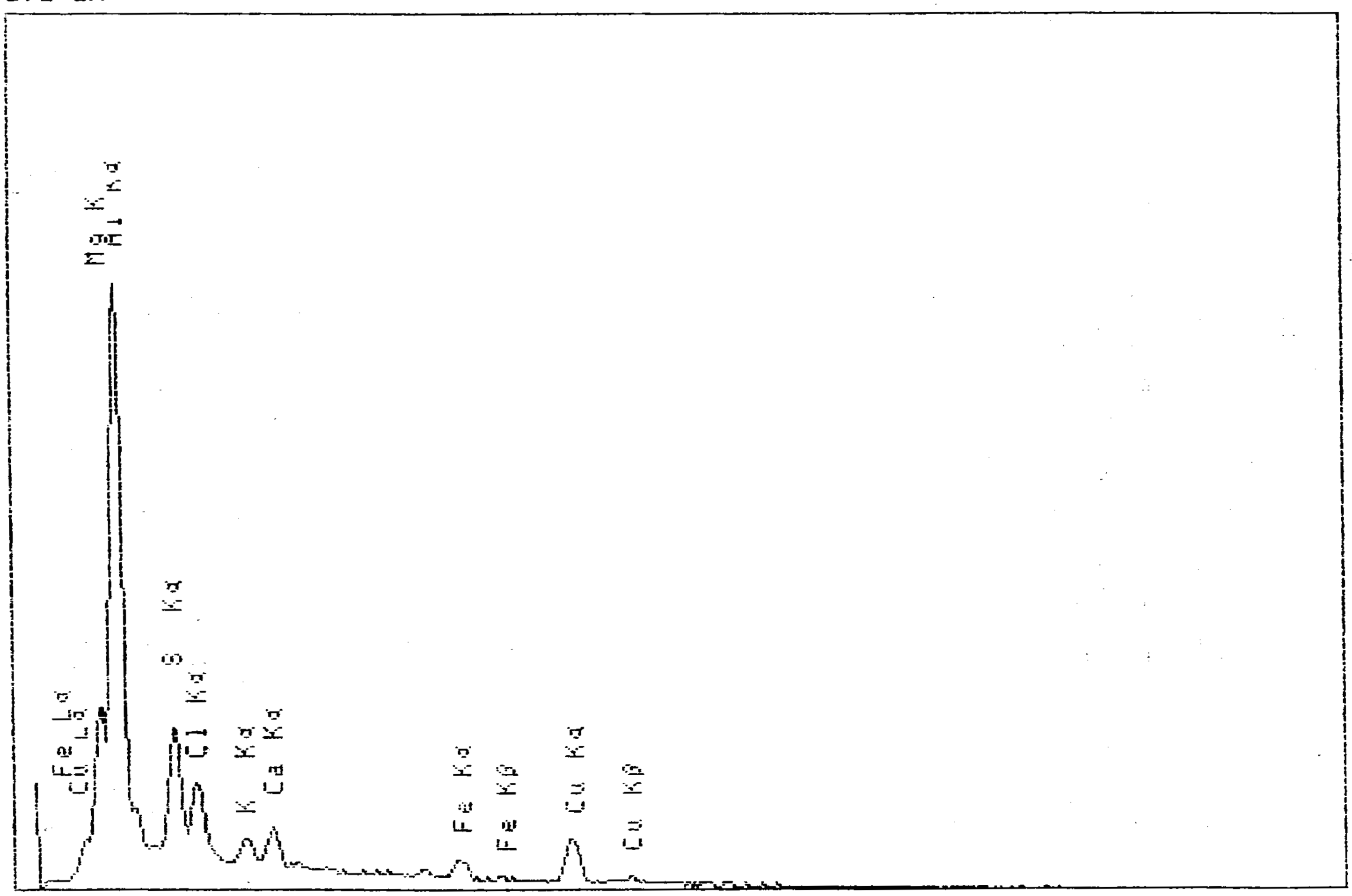
Preset: Live Time 100 Seconds

Real Time: 130.88 Sec. Live Time: 100.00 Sec.

26% Deadtime 3176 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 13:23:17

Cfs 8K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 2 Fracture-2

Energy Range: 0 - 20 keV 10 eV/ch HiRes

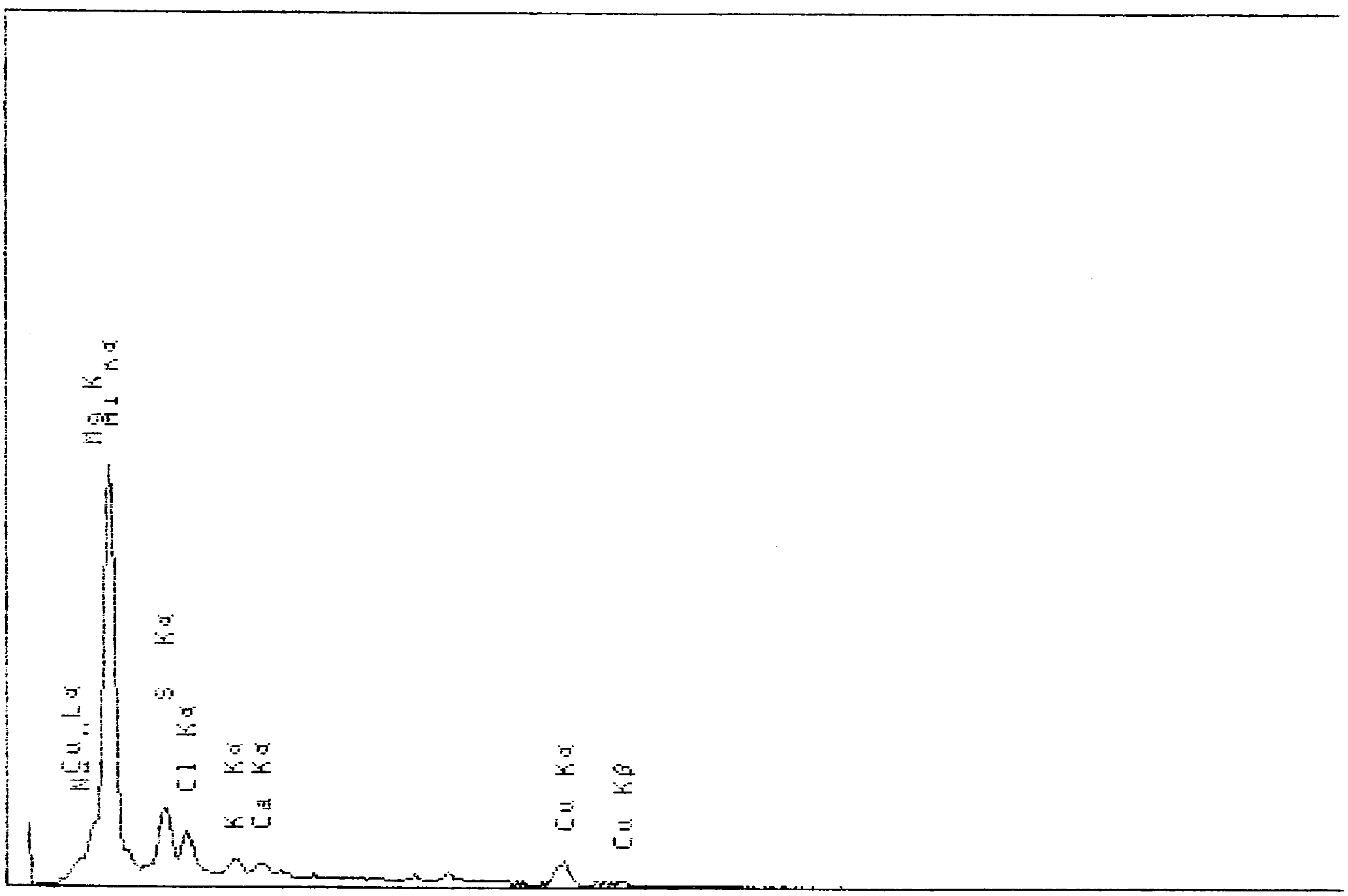
Preset: Live Time 100 Seconds

Real Time: 135.29 Sec. Live Time: 100.00 Sec.

27% Deadtime 3341 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 13:31:29

Cfs 16K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 2 Fracture-3

Energy Range: 0 - 20 keV 10 eV/ch HiRes

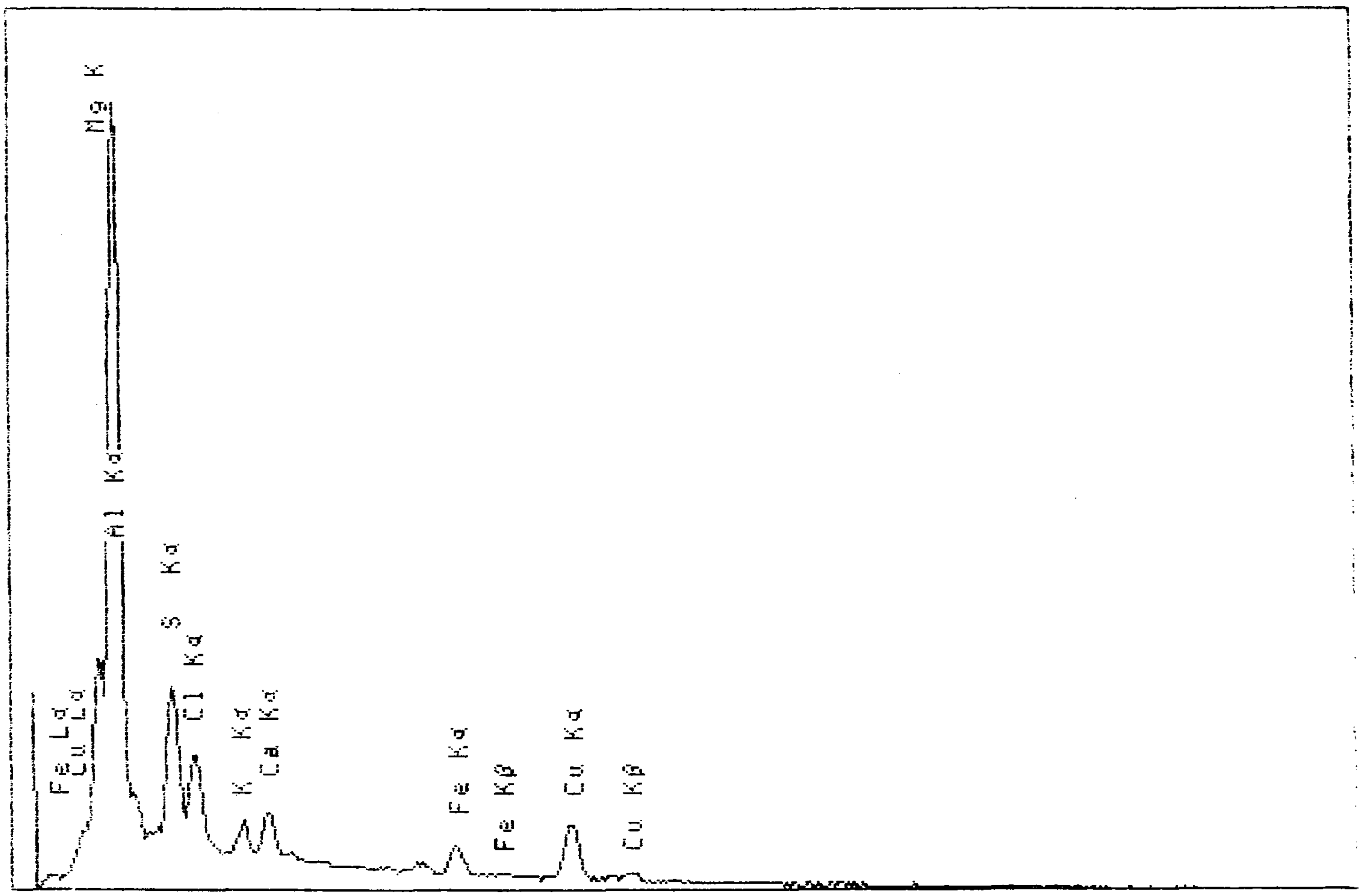
Preset: Live Time 100 Seconds

Real Time: 140.83 Sec. Live Time: 100.00 Sec.

23% Deadtime 2895 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 13:39:30

Cfs 8K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 3 Fracture
AT TIGHT CORNER

Energy Range: 0 - 20 keV 10 eV/ch HiRes

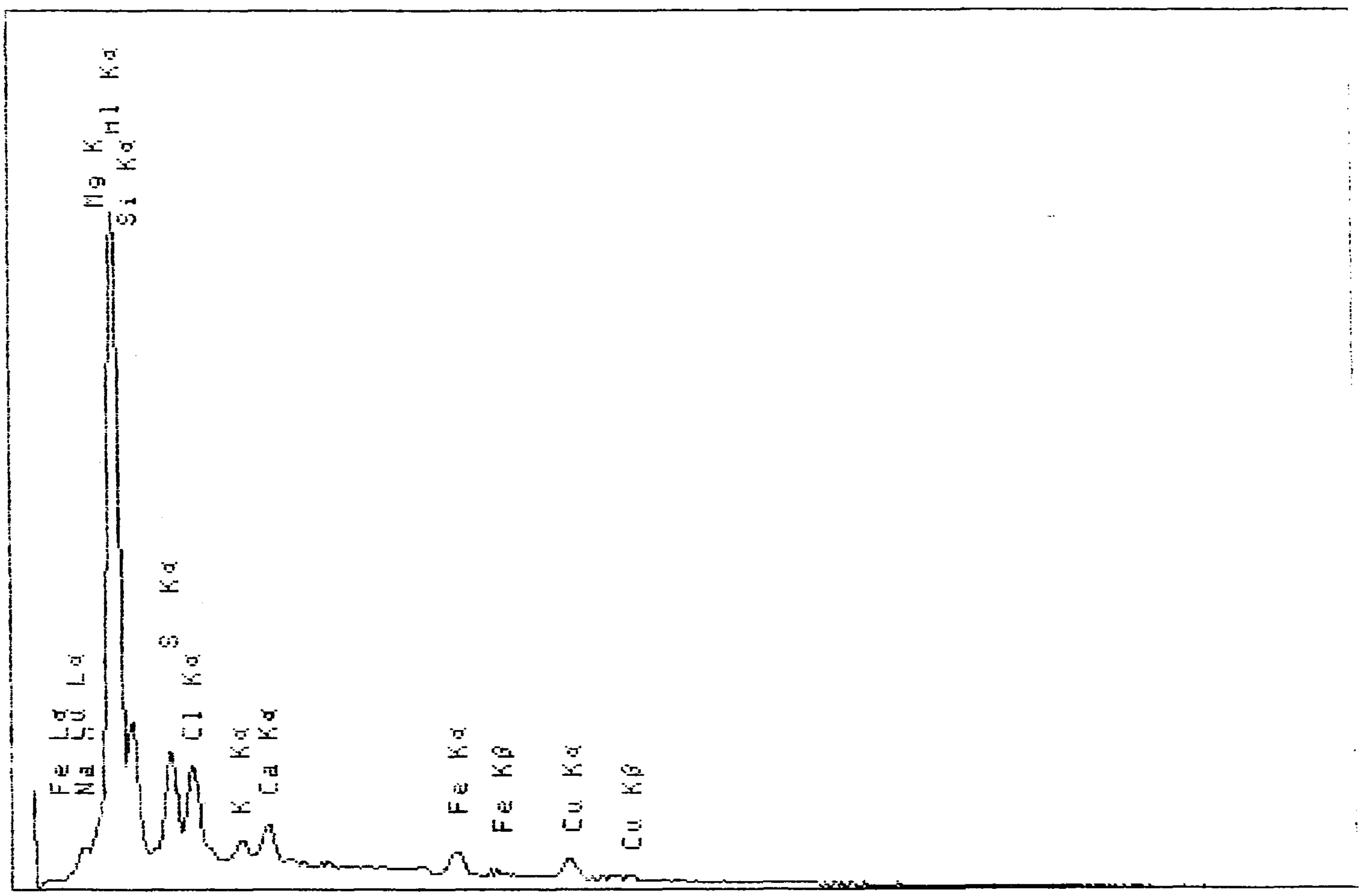
Preset: Live Time 100 Seconds

Real Time: 134.57 Sec. Live Time: 100.00 Sec.

27% Deadtime 3436 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 14:30:32

Cfs 8K



<0.000 keV Cursor = 120 (1.200 keV) = 480 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW236-Section 3 Fracture-2

Energy Range: 0 - 20 keV 10 eV/ch HiRes

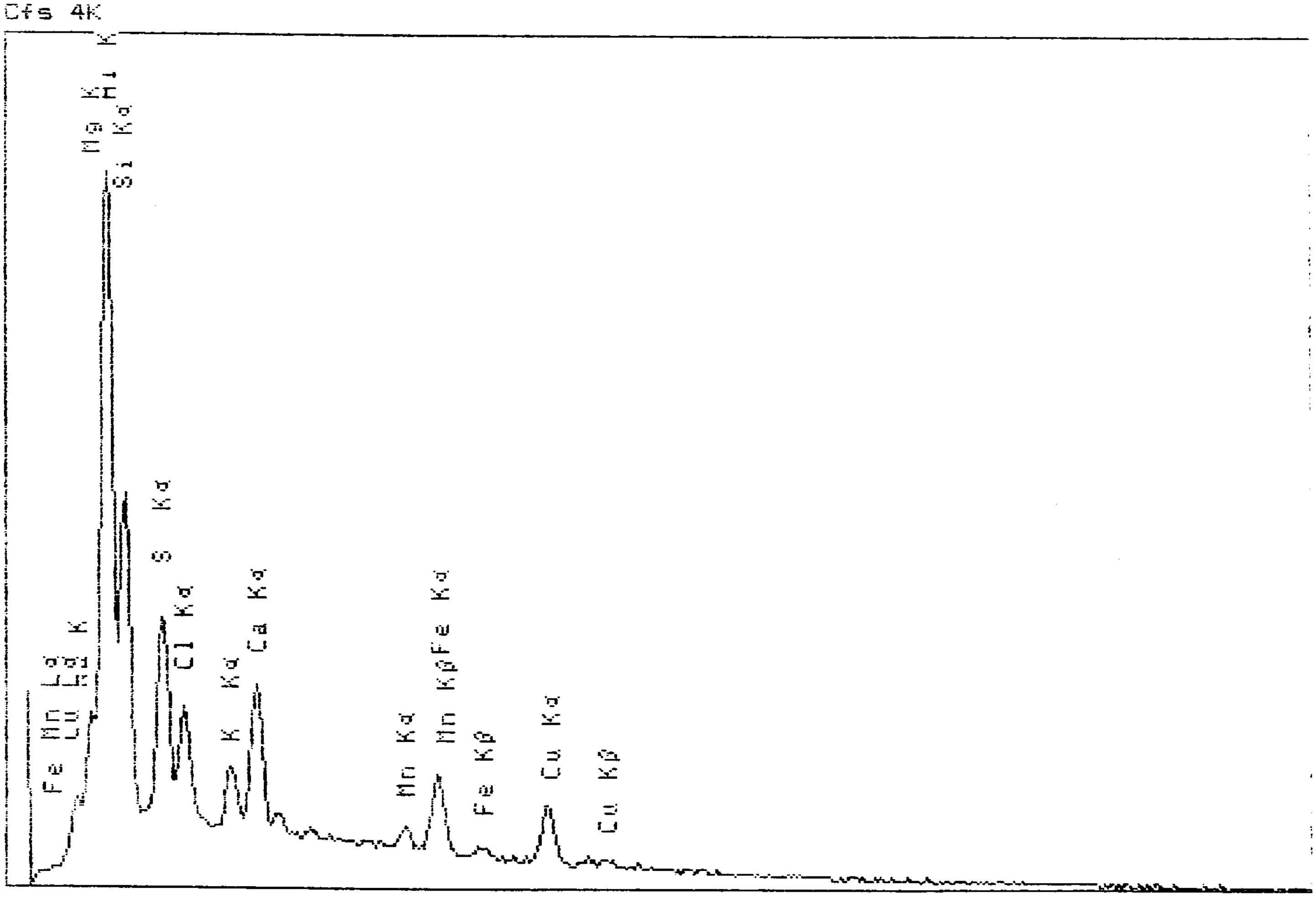
Preset: Live Time 100 Seconds

Real Time: 133.60 Sec. Live Time: 100.00 Sec.

27% Deadtime 3607 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 15:00:25

Cfs 4K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW238; Stained Area

Energy Range: 0 - 20 keV 10 eV/ch HiRes

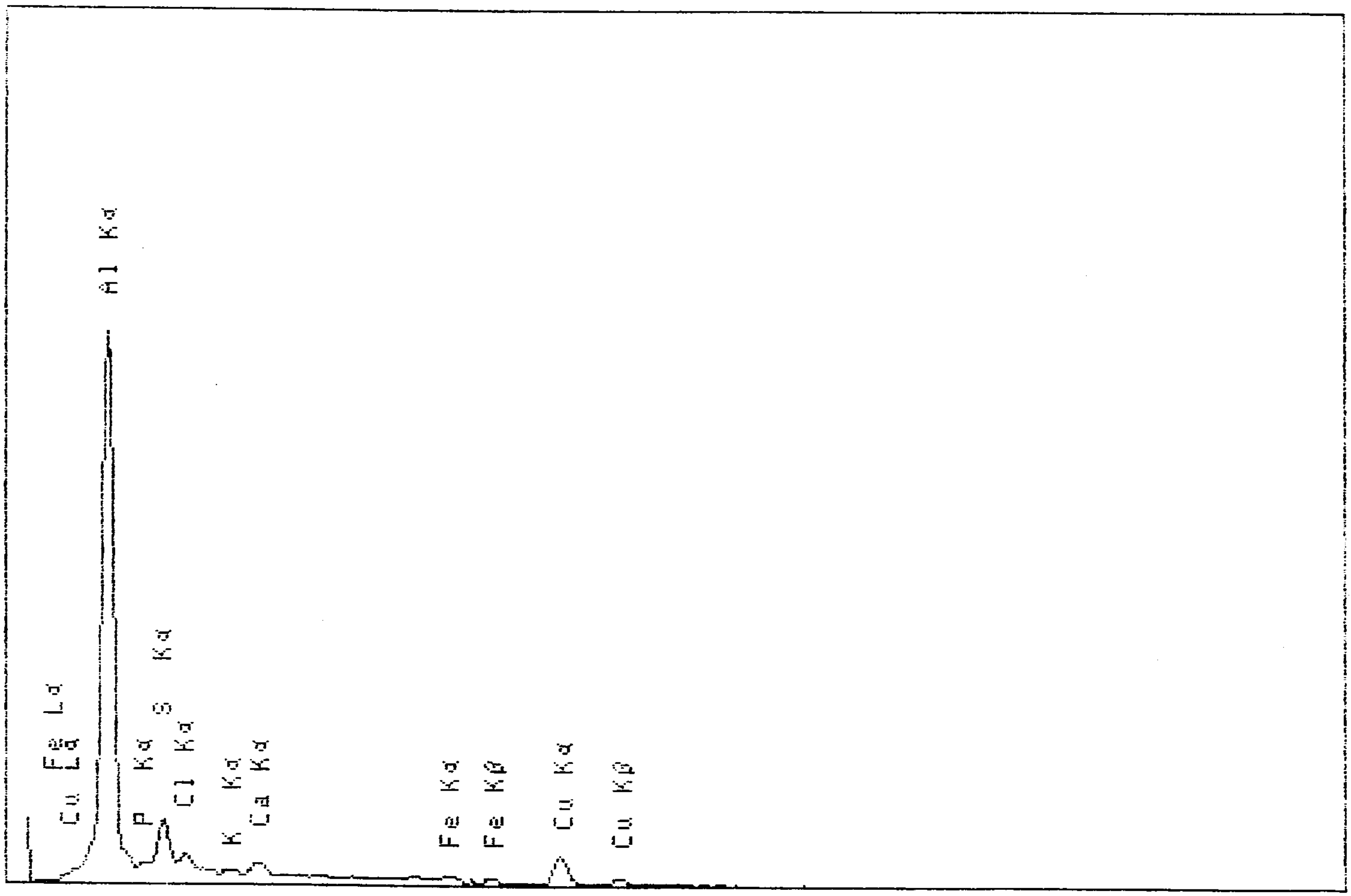
Preset: Live Time 100 Seconds

Real Time: 133.56 Sec. Live Time: 100.00 Sec.

24% Deadtime 2926 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 12:50:33

Cfs 16K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW238; Stained Area 2

Energy Range: 0 - 20 keV 10 eV/ch HiRes

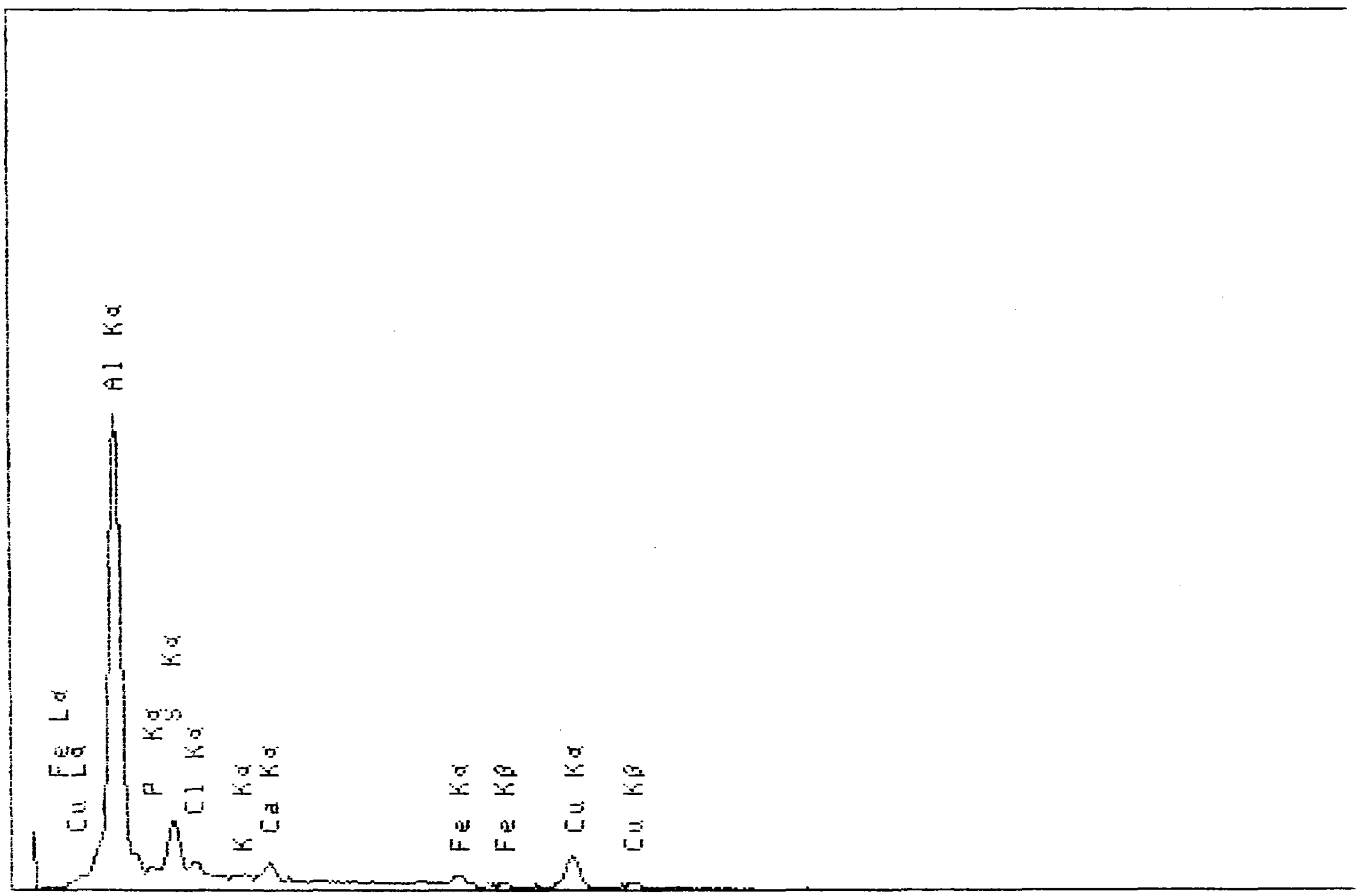
Preset: Live Time 100 Seconds

Real Time: 132.22 Sec. Live Time: 100.00 Sec.

28% Deadtime 3439 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 12:56:42

Cfs 16K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

HNU X-RAY System 5000
Spectrum Plotting Program
Printplot V3.000

Sample ID: M90127; CW238; Unstained Area

Energy Range: 0 - 20 keV 10 eV/ch HiRes

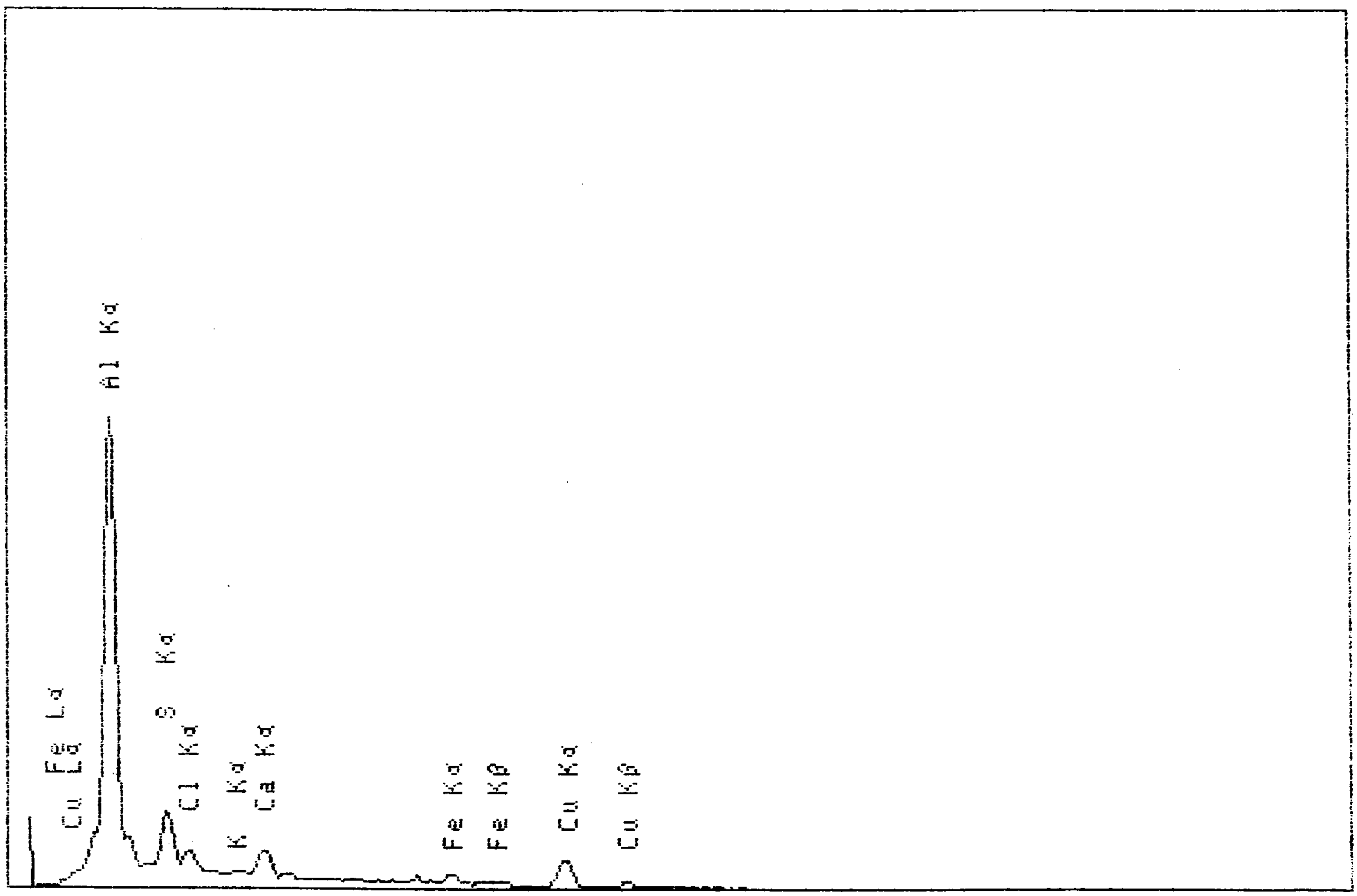
Preset: Live Time 100 Seconds

Real Time: 134.26 Sec. Live Time: 100.00 Sec.

25% Deadtime 3032 Counts/Second

Acquisition date: 04-Nov-99 Acquisition time: 13:02:00

Cfs 16K



<0.000 keV Cursor = 0 (0.000 keV) = 0 19.200 keV >

TEST PROTOCOL

PROTOCOL FOR THE METALLURGICAL EXAMINATION OF ITEMS CW 236 AND CW 238

For the purposes of this test protocol the "fracture surfaces" to be examined are those on items CW 236 and CW 238 which form the boundary of the hole. The tests are designed to establish the event which caused the hole and from which direction it was made. As with all such examinations the non-destructive tests should be carried out first in order to collect as much information as possible before the sample is cut and destructively tested. It is difficult to provide precise details of a proposed examination because invariably some procedures depend on the results of the previous test.

NON-DESTRUCTIVE TESTING

1. The location and shape of the hole should be recorded, diagrammatically and photographically.

2. The dimensions of the hole should be measured.

3. The immediate area surrounding the hole should be examined for evidence of plastic deformation in order to establish whether there is any evidence of directional impact.

4. The fracture surfaces should be examined for the presence of surface deposits such as:
   (i) soot,
   (ii) metallic debris,
   (iii) paint,
   (iv) any other.

5. If any deposits are found on the fracture surfaces they should be analysed for their composition in order to identify their potential source. This should involve a variety of techniques such as scanning electron microscopy (SEM) in conjunction with energy dispersive spectroscopy (EDX), gas chromatography mass spectrometry (GCMS), Fourier transform infrared spectroscopy (FTIR).

6. A detailed microscopic examination, (optical and SEM) of the fracture faces should be conducted in order to establish:
   (i) the fracture mode,
   (ii) the direction of propagation,
   (iii) the presence of any burrs and their locations,
   (iv) the presence of any delaminations and their locations.

DESTRUCTIVE TESTING

1. The sample may have to be reduced in size in order to examine it under the scanning electron microscope. This will depend on the size of the vacuum chamber for the particular instrument used.

2. The fracture surfaces should then be cut at right angles and the microstructure of the cross section of the fracture face examined microscopically. Features such as the movement of grain boundaries should be noted in order to assist in establishing the direction and speed of the applied force.

The above tests are recommendations in order to establish the cause of the hole formed between CW 236 and CW 238. They are not exclusive and depending on the results, it may be necessary to undertake further tests, e.g. a micro-hardness survey across the fracture surface may be appropriate. This can be determined by the metallurgist who performs the examination.

We want to conduct the following tests:

1. Scavenge Pump Inlet Tube. It is proposed that a clean swab be used to rub any residue off the interior surface of the tubing. This swab would then be tested by Fourier Transform Infrared Spectroscopy (FTIR) to determine whether any soot is present. A control swab that has not been wiped should be analyzed to determine the background FTIR. If the FTIR analysis does show positive evidence of soot, it may be useful to consider further tests on the swab such as chomatography to further characterize the soot.

2. Center Wing Tank Spar. It is proposed that razor blade scrapings be taken from either side of the scavenge pump portal on the spar. These would be taken within six inches of the portal at any convenient orientation to the portal. Both samples would be tested by FTIR and compared to other soot FTIR samples (if any) already taken by the NTSB from other regions of the aircraft.

Razor blade scrapings from the tires and brake pads closest to this left side Center Wing Tank rear spar should be subjected to the same FTIR analysis as performed on the scrapings from both sides of the spar.