MCA-166, MCA-527

Multi-Channel Analyzers

MCA Data Spectral Format

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Exclusion of liability

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The MCA spectral data format is in compliance with the IAEA SPE Spectral Data Format (see SPEDAC PRO User's Manual Rel. 1.0, IAEA, Feb 1994). All information is stored in a block structured ASCII BSA file so that its content can be viewed with any text editor and the file content can be printed directly.

Each block of the file is identified by a string that starts with the dollar sign ($) and ends with a colon (:). The block name is case sensitive. The structure of the data blocks is uniquely defined.

The content of this chapter does not exclusively refer to the MCA166 or MCA527, it generally refers to the data format used by various applications.

File content	Explanation

$APPLICATION_ID:	**Application identification**
WSPC (WinSPEC for Automation) Version 2.00.0000	Application name and version

$DEVICE_ID:	**Device identification**
MCA-527	Device type
SN# 1012	Serial number
HW# 1001	Hardware version
FW# 1002	Firmware version

$MCA_166_ID:[1]	**Device identification**
SN# 609	Serial number
HW# 9912	Hardware version
FW# 9915	Firmware version
WSPC (WinSPEC for Automation) Version 2.00.0000	Application name and version

$SPEC_REM:	**Notes about the spectrum**
...	Remarks from the operator prompted before file save.

$DATE_MEA:	**Start date and time of the measurement.**
12/31/1996 16:00:00	mm/dd/yyyy hh:mm:ss

$MEAS_TIM:	**Spectrum measurement time in seconds**
120 203	(live time, real time)

$DATA:	**Spectral data**
0 4095	First channel (i. e. 0) last channel(i. e. 4095)
0	Channel content
...	
0	

$DATA_REJECTED:	**Spectral data (gating mode = sort by state)**
0 4095	First channel (i. e. 0) last channel(i. e. 4095)
0	Channel content
...	
0	

1 For compatibility, this block is even written if the device is not a MCA166.

File content	Explanation

$MCS_AMP_DATA:	MCS amplitude spectral data
0 4095	First channel (i. e. 0) last channel(i. e. 4095)
0	Channel content
...	
0	

$MCS_AMP_DATA_REJECTED:	MCS amplitude spectral data (gating mode = sort by state)
0 4095	First channel (i. e. 0) last channel(i. e. 4095)
0	Channel content
...	
0	

$ROI:	ROI (Region of Interest)
1	Number of ROIs
266 332	ROI start (i. e. 266) ROI begin (i. e. 332)

$ENER_FIT:	Energy calibration coefficients
0.000000 0.393559	Offset [keV] and slope [keV/channel]

$ENER_DATA:	Energy calibration data
2	Always 2 point calibration, because some older applications fail if the number is unequal 2.
0.000000 0.000000	Channel / energy pair (lower)
2981.000000 1173.199951	Channel / energy pair (higher)

$ENER_DATA_X:	Energy calibration data
2	n point calibration (in this case n = 2)
0.000000 0.000000	Channel / energy pair (lower)
2981.000000 1173.199951	Channel / energy pair (higher)

$ADC:	ADC resolution
4096	Channels
0	LLD (lower level discriminator channel)
3967	ULD (upper level discriminator channel)

$PRESETS:	MCA Presets
Integral	None, Real Time ,Live Time, Integral (sum of all counts within a ROI) Area (sum of all net counts within a ROI)
10000	Value
1	ROI number
266 332	ROI begin and end (optional line, depend on the application)

$PZC_VALUE:	PZC Settings
1232	Adjustment value for PZC (0..2499)
15	Pre-defined time parameter for PZC adjustment
15	Pre-defined time parameter for PZC adjustment

File content	Explanation

$FAST_DISCR:	Fast discriminator level
400	Factory setting for auto threshold

$SLOW_DISCR:	Slow discriminator level
400	Factory setting for auto threshold

$THR:	Threshold value [%]
2	% of ADC channels; 0 - 60 % possible

$GAIN_VALUE:	Amplifier gain
200	Coarse gain (2 … 1000)
1.0261	Fine gain (0.5000 … 6.5000)

$MCA_527_OFFSET_DAC:	Offset DAC of the MCA527
15352	Offset (0 … 16383)

$MCA_527_TRIGGER_FILTER:	Trigger filter
3 (+1,0,-2,0,+1)	Number and brief description

$FLAT_TOP:	Flattop time
1.2	Flattop time (0.0 … 25.5 µsec)

$MCA_527_TRIGGER_PARAM:	Trigger parameter
7.0000	Coefficient for automatic threshold calculation for shaping input
20.0000	Coefficient for automatic threshold calculation for direct input
0.00000000000000	Fixed trigger threshold for shaping input (0 = automatic)
0	Fixed trigger threshold for direct input (0 = automatic)
0	Fixed baseline for direct input (-1 = baseline determination at measurement start, 0 = continuous baseline re-determination)
3.500	Integration time for direct input PIA2 (µsec)

$MCA_527_BASELINE_RESTORING:	Baseline restoring
1/16	“off”, “1/1”, “1/2”, “1/4”, “1/8”, “1/16” or “1/32”

$MCA_527_JITTER_CORRECTION:	Jitter correction
off	“on” or “off”

$MCA_527_LF_REJECTION:	Low frequency rejection
off	“on” or “off”

$MCA_527_GATING:	Gating settings
off	Gating mode (“off”, “discard” or “sort”)
high	Gating signal (“low” or “high”)
20	Gating shift (0 … 255 * 0.1 µsec)
off	Transfer gating spectrum (“off” or “on”)

$MCA_527_CORE_CLOCK:	Core clock of the MCA527 processor
4	1 ... 6 * 100 MHz

File content	Explanation

$MCA_527_EXT_PORT:	Settings for the extension port of the MCA527
0	Settings for part A of the extension port
0	Settings for part B of the extension port
4	Settings for part C of the extension port
1,100000000,50000000,rising edge	Settings for part D of the extension port
1,rising edge	Settings for part E of the extension port
0	Settings for part F of the extension port

$MCA_527_EXT_PORT_RS232_SETUP:	RS232 settings for the extension port
4800	Baud rate
8	Bit count
none	Parity
1	Stop bits

$MCA_527_EXT_PORT_RS232_INPUT:	Data received from the RS232 of then extension port
367180717144 ...	The 1024 bytes received last in hexadecimal numbers. (32 lines with 32 hexadecimal numbers without white spaces.)

$DTC:	Shaping Time
1	1 = lower shaping time, 3 = higher shaping time
4.0	Actual shaping time (written by newer applications)

$INPUT:	ADC input source and polarity
Amplifier	Amplifier (internal main amplifier), Direct (+3V, -3V), direct input with full range amplitude of 3V
neg	“pos” or “neg” (amplifier input polarity)

$PUR:	State of the Pile Up Rejector (PUR)
on	”on” or ”off”

$STAB:	Stabilization
on	”on” or ”off”
230	ROI limits of the stabilization peak
370	
300	Stabilization target channel

$STAB_PARAM:	Stabilization parameter
10	Minimum stabilization cycle time (sec)
25000	Minimum stabilization cycle peak area

$POWER:	Preamplifier power supply
+12=on	”on” or ”off”
-12=on	”on” or ”off”
+24=off	”on” or ”off”
-24=off	”on” or ”off”

File content	Explanation
$HV:	**High voltage supply**
+500V	Polarity and value
unused	HV inhibit mode ("unused", "Canberra HPGe", "DSG HPGe" or "EG&G Ortec HPGe"
$MCS_CHANNELS:	**Multi Channel Scaler (MCS) setup**
4096	Channels
$MCS_INPUT:	**MCS input**
extern TTL	"extern TTL" (external TTL signal), "Input Rate" (count rate) or "LLD/ULD" (counts between LLD and ULD)
$MCS_TIME:	**MCS time per channel**
10	Time in msec
$MCS_SWEEPS:	**Number of sweeps**
0	0 65535
0	MCS repeat mode type
$MODE:	**Operation Mode**
MCA	MCA or MCS
$MCA_REPEAT:	**Number of sweeps**
1	0 65535
0	MCA repeat mode type
$TDF:	**Dead Time Correction Factor**
800	100 ... 3000, default 800 nsec

File content	Explanation

$POWER_STATE:	Power state at the end of the measurement
I+12= 8mA	Input current of the DC-DC converters for +12V preamplifier power supply from the battery
I-12= 3mA	Input current of the DC-DC converters for -12V preamplifier power supply from the battery
I+24= 0mA	Input current of the DC-DC converters for +24V preamplifier power supply from the battery
I-24= 1mA	Input current of the DC-DC converters for -24V preamplifier power supply from the battery
IBAT= 135mA	Total current drawn from battery
IHV = 14mA	Input current of the HV DC-DC converter drawn from the battery
ICHR= 0mA	External charger current
UBAT=7900mV	Battery Voltage
UHVs= 503V[2]	MCA166: HV corresponding to the measured control voltage of the HV module MCA527: HV measured on the output of the HV module
U+12=0.000V	Actual voltage of the +12V preamplifier power
U-12=0.000V	Actual voltage of the -12V preamplifier power
U+24=0.000V	Actual voltage of the +24V preamplifier power
U-24=0.000V	Actual voltage of the -24V preamplifier power

$COUNTS:	Integral counts
8370252	Sum of all input counts (from the internal amplifier / fast discriminator) of the whole measurement

$PD_COUNTS:	Integral peak detector counts
5113594	Sum of all input counts from the peak detector

$RT:	Real time [s]
203	It is possible that the value contains fractional digits.

$DT:	Dead time [ms]
883027	

$FAST_DT:	Fast dead time [ms] (MCA527
122	

$BT:	Busy time [ms] of the ADC (MCA166)
64042	

2 Older applications write the wrong unit ('mV' instead of 'V').

File content	Explanation

$STAB_OFFSET:	Current offset
315	

$STAB_OFFSET_MIN:	Minimal offset
310	

$STAB_OFFSET_MAX:	Maximal offset
408	

$STAB_COUNTER:	Stabilization cycles
19	

$REC_COUNTER:	Counter of received commands
2823	

$REC_ERROR_COUNTER:	Counter of received commands with errors
2	

$SPEC_INTEGRAL:	Counts in the spectrum
4098917	

$ROI_INFO:	ROI information
1 266 332 299.74 24.19 1233477 1142868 2066	ROI# Begin End Centroid FWHM Integral Area Area_Error

$ROI_INFO_REJECTED:	ROI information (gating mode = sort by state)
1 266 332 299.74 24.19 1233477 1142868 2066	ROI# Begin End Centroid FWHM Integral Area Area_Error

$TEMPERATURE:	Temperature
28.25	Detector temperature
30.75	MCA temperature

According to the specifications other blocks can be added depending on the type of the application. Almost each application add inspection information to the spectrum file. Following tables show the inspection information of applications written by the Research Center Rossendorf or the GBS Elektronik GmbH.

WinSPEC (inspection information if no external analysis application or MGAU is attached)

File content	Explanation
$WINSPEC_INFO:	**WinSPEC inspection information**
ANALYSIS:MGAU	External analysis application attached with WinSPEC
1999/001	Inspection number
1999/10/31	Inspection date
Inspector1/Inspector2	Inspector names
DIV1/DIV2	Division or section of the inspectors
Facility name	Facility name
FACC	Facility code
MBA	MBA
Stratum	Stratum
ItemID	Item ID
10.000 ± 1.000 wt%	Declared enrichment
Item description	Item description
767	Instrument code
0156	MMCA ID
8289/025	Computer ID
NAJ	Detector type
9475/020	Detector ID
Collimator	Collimator
Filter	Filter

WinSPEC (inspection information if CsRation is attached)

File content	Explanation
$WINSPEC_INFO:	**WinSPEC inspection information**
ANALYSIS:CSRATIO	External analysis application attached with WinSPEC
1999/001	Inspection number
1969/12/31	Inspection date
Inspector1/Inspector2	Inspector names
DIV1/DIV2	Division or section of the inspectors
FACC	Facility code
Item ID	Item ID
1997/01/01	Date of discharge
0.000 Mwd/tU	Burn up
0.000	Neutron rate
0.00E00	Calculated Cs ratio at discharge
0.000 %	Initial enrichment
ICOD	Instrument code
0156	MMCA ID
8289/025	Computer ID
NAJ	Detector type
9475/020	Detector ID
Collimator	Collimator
Filter	Filter

WinSPEC (inspection information if MGA is attached)

File content	Explanation
$WINSPEC_INFO:	**WinSPEC inspection information**
ANALYSIS:MGA	External analysis application attached with WinSPEC
1999/001	Inspection number
1999/01/01	Inspection date
Inspector1/Inspector2	Inspector names
DIV1/DIV2	Division or section of the inspectors
Facility name	Facility name
FACC	Facility code
MBA	MBA
Item ID	Item ID
Batch ID	Batch ID
1997/01/01	Date of declaration
10.000 wt% ± 1.000 %	Decl. isotopic abundance and relative uncertainty for 238 Pu
20.000 wt% ± 2.000 %	... for 239 Pu
20.000 wt% ± 2.000 %	... for 240 Pu
25.000 wt% ± 2.500 %	... for 241 Pu
10.000 wt% ± 1.000 %	... for 242 Pu
5.000 wt% ± 0.500 %	... for 241 Am
1.000 ± 0.100 %	U / Pu ratio
ICOD	Instrument code
0156	MMCA ID
8289/025	Computer ID
NAJ	Detector type
9475/020	Detector ID
Collimator	Collimator
Filter	Filter

WinSCAN (inspection information)

File content	Explanation
$WINSCAN_INFO:	**WinSCAN inspection information**
1999/001	Inspection number
1999/11/01	Inspection date
Inspector1/Inspector2	Inspector names
DIV1/DIV2	Division or section of the inspectors
Facility name	Facility name
FACC	Facility code
MBA	MBA
ItemID	Item ID
Stratum	Stratum
Item description	Item description
ICOD	Instrument code
0156	MMCA ID
8289/025	Computer ID
NAJ	Detector type
9475/029	Detector ID
1234/345	Collimator ID

File content	Explanation
2356/432	Motor drive ID
3478/384	Motor controller ID
3456/419	System ID
2578/456	External amplifier ID
1000/150	Gain (coarse/fine)
0.000	Time constant
OUT	Output
Good measurement.	Remarks

UF6 / WinUF6 (inspection information)

File content	Explanation
$UF6_INSP_INFO:	**UF6 / WinUF6 inspection information**
123	Inspection number
19991006	Inspection date
Inspector ID	Inspector ID
Facility code	Facility code
LOT	LOT ID
MBA	MBA
4.6%+10mmAl	Sample ID
4.462	Declared enrichment
0.003	Declared enrichment uncertainty
wt%	Scale unit (wt%=weight percent or At%= atom percent)
1.200	Wall thickness
0.012	Wall thickness uncertainty
0.340	Attenuation
0.000	Attenuation uncertainty
1.014	Material correction factor
0.000	Material correction factor uncertainty
ICOD	Instrument code
0156	MMCA ID
8289/025	Computer ID
NAJ	Detector type
9475/029	Detector ID
Collimator	Collimator
Filter	Filter

U235 / WinU235 (inspection information)

File content	Explanation
$INSP_INFO:	**U235 / WinU235 inspection information**
123	Inspection number
19991006	Inspection date
Inspector ID	Inspector ID
Facility code	Facility code
MBA	MBA
LOT	LOT ID
4.6%+10mmAl	Sample ID
4.462	Declared enrichment

File content	Explanation
0.003	Declared enrichment uncertainty
wt%	Scale unit (wt%=weight percent or At%= atom percent)
1.200	Wall thickness
0.012	Wall thickness uncertainty
0.340	Attenuation
0.000	Attenuation uncertainty
1.014	Material correction factor
0.000	Material correction factor uncertainty
ICOD	Instrument code
0156	MMCA ID
8289/025	Computer ID
NAJ	Detector type
9475/029	Detector ID
Collimator	Collimator
Filter	Filter