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Spectrum Evaluator

-a program for evaluating fluorescence spectra

Roger Berg

Lund Reports on Atomic Physics

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1. Abstract

This report describes the program Spectrum Evaluator. It is a Windows based program for evaluating fluorescence spectra obtained with the EG&G OMAIII system and the Spectroscopy Instruments (SI) multichannel analyser, using the programs called CSMA and WinSpec. The program is developed in Visual Basic 3.0. A complete program listing is included as an appendix to the report.

2. Introduction

The medical laser physics group at the Atomic Physics Division (Lund Institute of Technology, Sweden) has used laser-induced fluorescence in diagnostic research for many years. Thousands of fluorescence spectra have been obtained from all kind of samples, ranging from rat muscle, oak leaves, oil slicks to malignant tumours *in vivo*. During the last years two kinds of equipment have been used for obtaining the data: an EG&G OMAIII system and a multichannel analyser system manufactured by Spectroscopy Instruments. The OMAIII system and the SI system are briefly described in Refs. 1 and 2, respectively. The purpose of this report is to describe a program called Spectrum Evaluator. The program has been developed to evaluate the fluorescence spectra in a rational way. The program is used under the Microsoft Windows operating environment and it is developed in Microsoft Visual Basic 3.0. The predecessor to this program was developed by Dr. Sune Montán. It was a program called Eval that worked under MS-DOS and used a Hercules graphics card. As we more and more use the Windows environment and Super-VGA graphics, there was a need to develop a new program. Also, Eval could not handle spectra obtained with the Spectroscopy Instruments system. The foundation to Spectrum Evaluator was a program called CSMA2PS which is an MS-DOS program developed in C, and it was initially intended only for converting Spectroscopy Instruments spectra to postscript files to be able to print them out rapidly. As the program evolved it soon became an evaluation program and a new version emerged which soon was converted to a version for handling also the OMAIII spectra.

2.1 Installation

The program has been compressed using the Microsoft Application Setup Wizard. To install the program, insert the installation disk and run the program SETUP.EXE (under Windows). The set-up program will ask for a directory to place the program in and then expand all necessary files into this directory. The program needs the following files:

SPECEVAL.EXE - the program. SPECEVAL.HLP - the help file. CMDIALOG.VBX - Visual Basic control for the common dialogues, in this case the file open, file save and printer set-up dialogues. COMMDLG.DLL - dynamic link library used for the common dialogues. This file is often already present. SSBC.VBX - Visual Basic control for the spreadsheet (FarPoint Technologies, Inc., Richmond, VA, USA). This VBX comes with the Borland Visual Solution Pack. VBRUN300.DLL - the Visual Basic 3.0 run-time library. If the SPECAEVAL.INI file is not present, it will be created by the program.

2.2 Evaluation

The aim of the program is to in a rational way evaluate a large number of fluorescence spectra. The procedure when evaluating is to read the spectrum from the disk, display it, performing various corrections, fit parts of the spectrum to analytical expressions, calculating the intensity at different wavelengths and to print out the spectrum. The corrections that can be performed

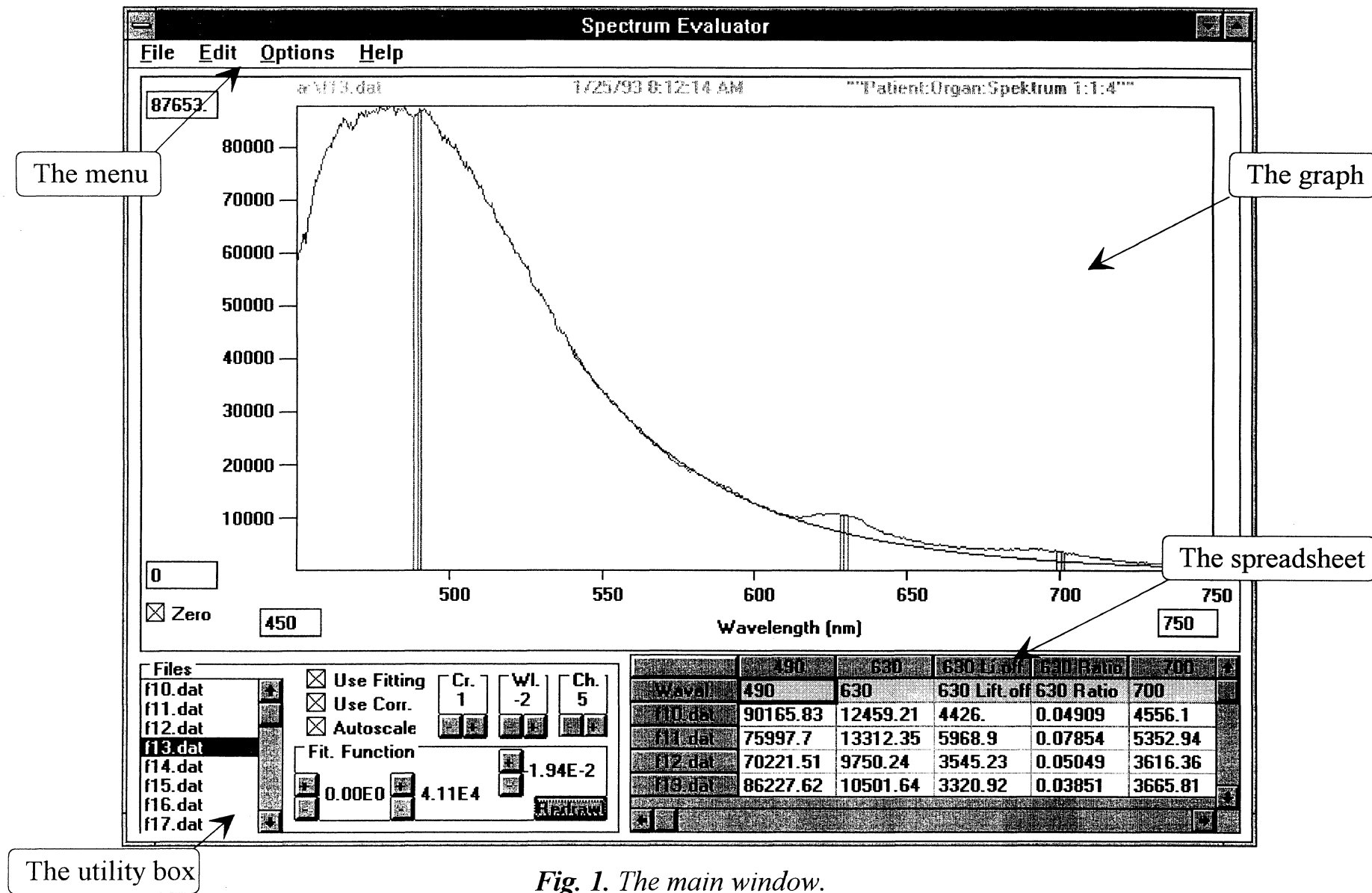


Fig. 1. The main window.

are correction for spectral sensitivity of the detection system and adjust any wavelength misalignments in the spectrum or the correction curve. To correct for the spectral sensitivity of the detection system, a correction curve obtained from a recording of a calibrated black-body radiator is used. See The Correction File section for further details. In the analysis of fluorescence spectra a fitting of an exponential can be performed. The reason for this is that very often the samples from which the fluorescence spectra are taken, consist of tissue with some kind of tumour marker in it, e.g. haematoporphyrin derivative (HPD) or protoporphyrin.¹⁻⁴ The tissue has an intrinsic fluorescence (autofluorescence) which is broad and has its maximum at 450-500 nm. The tumour markers fluoresce at a longer wavelength (above 600 nm) and very often this fluorescence sits on a background created by the autofluorescence. To lift off the marker fluorescence from the autofluorescence, the program models the long wavelength wing of the autofluorescence wavelengths with an exponential. The fluorescence contribution from the marker can thus be calculated by taking the difference between the spectrum and this exponential fit.

3. Using The Program

Below follows a brief description of how to use the program. The numbers in parenthesis refer to the section where to find details in this document. The first thing to do when the program has started is to select what type of data to read: OMAIII or SI files (4.1.3). Select the directory where the data is located (4.1.1). If a correction file is to be used, select one (4.1.1) and turn on the correction (4.2.2). Adjust the wavelength scale to the desired region (4.2.1). The vertical scale can also be adjusted (4.2.1) but usually the autoscale function should be turned on (4.2.2). Turn on the fitting function if necessary (4.2.2). Put in the wavelengths to evaluate in the spreadsheet (4.2.3) and adjust the numbers of channel to average over (4.2.2). Try a spectrum and if necessary adjust the wavelength scale and the position of the correction curve (4.2.2). When these initial adjustments have been performed the evaluation can start. Select the file in the file list box (4.2.2). Adjust the fitting manually if necessary (4.2.2). Now repeat these two steps for all files and then save the result from the spreadsheet (4.1.1) or copy it to the clipboard (4.1.2). Many of the initial adjustments are saved when the program is ended and restored when the program is started the next time.

4. The User Interface

Figure 1 shows the user interface. The main window and its components are automatically adjusted to fit any type of screen resolution.

4.1 The Menu

4.1.1 The File Menu

Open Corr File - Brings up the open correction file dialog box. If OMAIII files are selected (see The Options Menu) this dialogue wants a *.DAT file. The file should be a correction curve created with the OMAIII system. If SI is selected the dialogue wants a *.SPE or a *.PRN file. The *.SPE file should be a raw spectrum from a well defined calibration lamp. The *.PRN file should be a text file exported from the CSMA program. The file contains two columns with wavelength in the first column and intensity in the second. The intensity should be a raw spectrum from the calibration lamp. After the correction curve has been read you will be asked if the program should take the wavelength calibration from the correction curve. If you answer yes the program will not take any

wavelength data from the data files. To turn off this function, uncheck the Options-Wl. from Corr menu command.

Save Result - Brings up the save result dialogue box. The result from the spreadsheet is saved as a text file with tab-delimiter.

Directory - Brings up the directory dialogue box. In this dialogue the working directory is selected by clicking on the appropriate drive and directory. The corresponding data-files in that directory are shown in the file list box in the main window.

Printer Setup - Brings up the printer set-up dialogue box. This dialogue is a regular Windows printer set-up dialogue where the desired printer and its options can be set.

Print Graph - Prints the graph on the chosen printer. The contents of the spreadsheet are printed below the graph.

Exit - Ends the program.

4.1.2 The Edit Menu

Copy Graph - Copies the graph to the clipboard. The graph is copied as two numeric columns corresponding to the wavelength and the intensity as displayed in the program. This format is convenient to paste into a spreadsheet program, such as Excel.

Copy Result - Copies the result from the spreadsheet to the clipboard.

Clear Sheet - Deletes the result in the spreadsheet but keeps the selected evaluation wavelengths.

Clear Wavel. - Deletes the result in the spreadsheet and also the selected evaluation wavelengths. This command starts the spreadsheet from scratch.

4.1.3 The Options Menu

Data Type - Gives the option to select whether the program should read OMAIII files (*.DAT) or SI files (*.SPE).

Add Constant - Brings up the add constant dialogue box. In this dialogue it is possible to add a constant to the spectrum, if e.g. the background has drifted due to temperature fluctuations. See below how the resulting spectrum is calculated.

Label - Brings up the label dialogue box. In this dialogue the label belonging to the file can be changed. This is only for the printout of the graph.

Backgr. File - Brings up the background file dialogue box. In this dialogue a separate background file can be chosen. See below how the resulting spectrum is calculated.

Wl. from Corr. - By unchecking this menu item the program will read the wavelength information from the data files and not from the correction curve.

4.1.4 The Help Menu

Contents - Invokes the help file.

About - Brings up the about box.

4.2 The Main Window

4.2.1 The Graph

The major component of the main window is the graph where the fluorescence spectrum is shown. The graph shows the intensity as a function of wavelength. The graph is red and if an analytical fit is used, the fitting is blue. The evaluated wavelengths are displayed in green. The vertical as well as the horizontal scale can be chosen arbitrarily. Below the graph there are two edit boxes, one to the left and one to the right. With the use of these edit boxes the wavelength

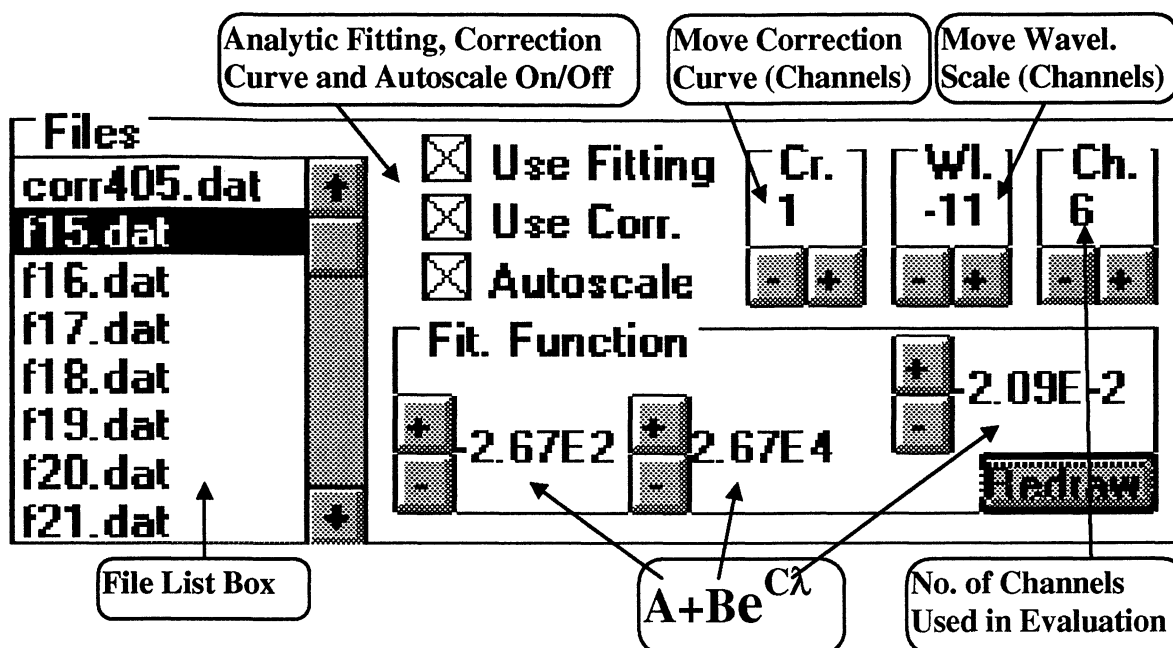


Fig. 2. The utility box.

scale (low and high) can be chosen. To the left of the graph similar edit boxes are located to choose the min.- and max.- intensity to display. The check box, called **Zero**, below left of the graph is used to force the min. value to zero even though the autoscale function is chosen (see The Utility Box). On top of the graph the file name, date and label are displayed.

4.2.2 The Utility Box

The utility box located below the graph contains functions for evaluating the spectrum. See Fig. 2. The file list box (labelled **Files**) shows the data files in the selected directory. By clicking a filename with the left mouse button, the file will be read, displayed and ready for evaluation. There are three check boxes in the utility box. The **Autoscale** check box turns the autoscaling of the graph on or off. If the max.- or min.- intensity is changed manually (see above) the autoscale function will be turned off automatically. The **Use Corr.** check box determines whether to multiply the spectrum with the correction curve or not. The **Use Fitting** check box turns the exponential fit to the curve on or off. When this box is checked you are asked to fill in three wavelengths, which are used to do an initial fit of the exponential to the curve. The wavelengths have to be entered in ascending order and the fit will start at the first entered wavelength. The fitting is displayed in blue colour. The exponential is of the form:

$$A+B e^{C\lambda}$$

Where λ is the wavelength. A, B and C are coefficients that are initially determined when the fit is performed. The coefficients can be fine tuned using the + and - buttons in the **Fit. Function** box. If the + or - buttons are clicked with the left mouse button, respective coefficient is altered approximately 1 %. If the buttons are clicked with the right mouse button they are altered approximately 5 %. When the coefficients are fine tuned the graph will zoom in to display only the region which involves the fitting. The wavelength scale will not change, thus it is obsolete during this process. To zoom out and redisplay the graph, click on the button labelled **Redraw**.

In the utility box there are three more small boxes with + and - buttons. The **Cr.** box is used to move the correction curve relative to the fluorescence spectrum. A click on the + or - button will move the correction curve one channel in respective direction. The **Wl.** box is used to

move the wavelength scale +/- one channel for each click. The **Ch.** box is used to set the number of channels to average over when the intensity is evaluated (see The Spreadsheet below).

4.2.3 The Spreadsheet

The spreadsheet located below the graph is used for the actual evaluation of the intensities at different wavelengths. The top row is yellow and it is there the wavelengths of interest are filled in. When the first wavelength is filled in there will appear a new column where it is possible to fill in the next wavelength. This first wavelength is a sort of reference wavelength. When this is filled in there will appear three new columns. The first is called “*** Lift. Off” where *** is the selected wavelength. This column contains the difference between the fluorescence spectrum and the fitted exponential. If the fitting is not turned on a 0 will be displayed. The next column is called “*** Ratio”. This shows the ratio between the lifted off intensity and the first selected wavelength (the column furthest to the left). If the fitting is off, the ratio will be taken between the not lifted off intensity and the reference wavelength. The third column is empty and into this a new evaluation wavelength can be filled in. The selected wavelengths are visualised in the graph as green vertical bars where the width is determined by the number of channels to average over (the **Ch.** box). When a new file is selected in the file list box, a new row will be created containing the evaluation results for that curve. The file name will be visible in the grey column to the left. The result from the spreadsheet can be saved as a text file or copied to the clipboard. A warning message will be displayed if the data has not been saved or copied, and you try to exit the program or reset the spreadsheet.

5. Technical Details

5.1 Calculation of the Resulting Spectrum

The resulting spectrum is calculated as:

$$R[i]=(O[i]-B[i]+K) * C[i+m]$$

where *i* is the index, *R* is the resulting spectrum, *O* is the original raw curve, *B* is a separate background file (if selected), *K* is a constant (if selected), *C* is the correction curve (if selected) and *m* is the optional index for moving the correction curve (in the **Cr.** box). As can be seen the separate background file should be spectrally uncorrected.

5.2 The File Formats

The **OMAI** system stores its data in a unique file system which can not be read by a MS-DOS PC. The OMA system can convert the data files to the FAT (file allocation table) file system and thus the files can be used on a PC. The PC files are text files and all the data is stored in one column. The first four rows are not used. Then follow the data on the next 1024 rows. In the program the data is read as float. After the data follow two rows with information not used by the program and then the file label. The next 36 rows are not used and then follow the wavelength information, first the wavelength for the first data channel and then the wavelength difference per channel. After this there are more rows, but none of them are used in the program.

The **Spectroscopy Instruments CSMA** and **WinSpec** programs are PC based. The data are stored as binary files. The files from the CSMA program do not contain any wavelength information but this is solved by getting the wavelength data from the correction file. Initially

the header is read, and from this the data type can be extracted (long int. or float). The program checks if the file is from the WinSpec program and in that case the wavelength data are read. It consists of the coefficients to a polynomial up to an order of five. Then follow the data. The data is 578 channels long. The data can be either float or long integers. What type to use depends on how the data are obtained in the CSMA program. The reader is referred to the CSMA manual for further details. In the WinSpec program you select explicitly what type of data you want to use.

5.3 The Correction File

The correction file from the **OMAI** system is created by the OMA system itself. A spectrum of a well defined calibration lamp is acquired. Then the known intensities from the calibration sheet for the calibration lamp are plugged in and a correction curve is created. The correction file has to be converted to MS-DOS format and then it can be used by multiplying it to any recorded spectrum to correct for the spectral sensitivity of the detection system.

The correction curve in the **SI** system is created in the program. The program wants a spectrum from a calibration lamp which is spectrally well defined. The program uses an equation to model the spectral intensity of a specific lamp, in this case an Oriel 200 W lamp (model no. 63355, serial no. 5_048, 6.5 A).

The correction curve ($\text{Corr}(\lambda)$) is calculated as:

$$\text{Corr}(\lambda) = \frac{3.023 \cdot 10^{-28} \frac{v^5}{e^{4.2433 \cdot 10^{-6} \cdot v} - 1}}{\text{Org}(\lambda)}$$

where

$$v = \frac{1}{(-24.167 + \lambda) \cdot 10^{-9}}$$

Here is λ the wavelength and $\text{Org}(\lambda)$ is the raw lamp spectrum.

If another lamp is used the parameters have to be changed. The correction curve is then normalised to 1 at 570 nm. This normalisation is similar to what the **OMAI** system does.

5.4 The SPECEVAL.INI File

When the program is finished some information will be stored in the .INI file. This file will be read the next time the program is launched. Here is an example of a typical file, with comments to the right. Generally, in Visual Basic the value -1 is treated as TRUE and 0 as FALSE:

| | |
|------------------------------------|--|
| [Spectrum Evaluator] | |
| OMA III=-1 | : -1= OMA III, 0= SI file type |
| Working Directory=E:\OMA | : Name of directory |
| Use Correction File=-1 | : 0= Use corr. file, -1= Do not use |
| Correction File=E:\OMA\CORR405.DAT | : Name of corr. file |
| Move Wavelength Scale=4 | : No. of channels to move wavel. scale |
| Move Correction Curve=-2 | : No. of channels to move corr. curve |
| Display Min Wavelength=450 | : Min. wavel. to display |
| Display Max Wavelength=750 | : Max. wavel. to display |
| No Of Evaluation Channels=5 | : No. of channels to evaluate over |
| Added Constant To Curve=0 | : Constant added to curve |
| Use Spectrum Wavel.=-1 | : -1= Use wavel. from data files, 0= Use from correction curve |

6. References

1. S. Andersson-Engels, Å. Elner, J. Johansson, S.-E. Karlsson, L. G. Salford, L.-G. Strömblad, K. Svanberg, and S. Svanberg, "Clinical recordings of laser-induced fluorescence spectra for evaluation of tumour demarcation feasibility in selected clinical specialities," *Lasers Med. Sci.* **6**, 415-424 (1991).
2. H. Nilsson, J. Johansson, K. Svanberg, S. Svanberg, G. Jori, E. Reddi, A. Segalla, D. Gust, A. L. Moore, and T. A. Moore, "Laser-induced fluorescence in malignant and normal tissue in mice injected with two different carotenoporphyrins," *Brit. J. Cancer* **70**, 873-879 (1994).
3. L. Baert, R. Berg, M. A. D'Hallewin, J. Johansson, K. Svanberg, and S. Svanberg, "Localization of superficial bladder tumours using low-dose HpD and laser-induced fluorescence," *J. Urology* **41**, 322-330 (1993).
4. K. Svanberg, T. Andersson, D. Killander, I. Wang, U. Stenram, S. Andersson-Engels, R. Berg, J. Johansson, and S. Svanberg, "Photodynamic therapy of non-melanoma malignant tumours of the skin utilizing topical δ -amino levulinic acid sensitization and laser irradiation," *Br. J. Dermatol.* **130**, 743-751 (1994).

7. File Listings

7.1 SPECMOD.BAS

```

1 Option Explicit
2 Declare Function WinHelp Lib "User" (ByVal hwnd As Integer, ByVal
3     HelpFile$, ByVal wCommand As Integer,
4     ByVal dwData As Long) As Integer
5 Global OMAIII As Integer
6 Global MAXARR As Integer
7 Global InpMask As String
8 Global Label As String
9 Global Datum As String
10 Global Tid As String
11 Global CurrentFile As String
12 Global CorrFile As String
13 Global OrgArr(1023) As Single
14 Global GraphArr(1023) As Single
15 Global CorrArr(1023) As Single
16 Global WavelArr(1023) As Single
17 Global WOrgArr(1023) As Single
18 Global BackArr(1023) As Single
19 Global WavelStart As Single
20 Global DeltaWavel As Single
21 Global WStartGraph As Single
22 Global MaxVal As Single
23 Global MinVal As Single
24 Global DispMinVal As Integer
25 Global DispMaxVal As Integer
26 Global AutoScale As Integer
27 Global UseCorr As Integer
28 Global MoveCorr As Integer
29 Global MoveWavel As Integer
30 Global DrawFit As Integer
31 Global FitStart As Single
32 Global FitMid As Single
33 Global FitStop As Single
34 Global FitA As Single
35 Global FitB As Single
36 Global FitC As Single
37 Global EvalWavel(1 To 16) As Single
38 Global NoOfEvWavel As Integer
39 Global NoOfEvChans As Integer
40 Global CurrRow As Integer
41 Global AddCon As Single
42 Global Start As Integer
43 Global Stopp As Integer
44 Global DrawM As Integer
45 Global Modified As Integer
46 Global MStart As Integer
47 Global ForceZero As Integer
48 Global HelpFilePath As String
49 Global UseFloat As Integer
50 Global UseSpWl As Integer
51 *****
52 Static Sub CalcArray ()
53     Dim i As Integer
54
55     For i = 0 To MAXARR
56         If UseCorr Then
57             If i + MoveCorr < 0 Or i + MoveCorr > MAXARR Then
58                 GraphArr(i) = 0
59             Else
60                 GraphArr(i) = (OrgArr(i) - BackArr(i) + AddCon) *
61                     CorrArr(i + MoveCorr)
62             End If
63         Else
64             GraphArr(i) = OrgArr(i) - BackArr(i) + AddCon
65         End If
66
67         If i + MoveWavel < 0 Or i + MoveWavel > MAXARR Then
68             WavelArr(i) = WavelStart + DeltaWavel * (i + MoveWavel)
69         Else
70             WavelArr(i) = WOrgArr(i + MoveWavel)
71         End If
72     Next
73     WStartGraph = WavelStart
74
75 End Sub
76 *****
77 Static Sub CalcFit ()
78     On Error GoTo Logerr
79     Dim i, j, k, l, s, t As Integer
80     Dim sdump1, sdump2 As Single
81
82     s = True
83     t = True
84     For i = 0 To MAXARR
85         If WavelArr(i) > FitStart And s Then
86             s = False
87             j = i
88         End If
89         If WavelArr(i) > FitMid And t Then
90             t = False
91             l = i
92         End If
93         If WavelArr(i) > FitStop Then
94             k = i
95             Exit For
96         End If
97     Next
98     FitA = 0
99     Form1!OffLabel = Format(FitA, "0.00E-0")
100    FitB = GraphArr(j)
101    Form1!AmpLabel = Format(FitB, "0.00E-0")
102    sdump1 = (Log(GraphArr(k)) - Log(GraphArr(j))) / (WavelArr(k)
103        - WavelArr(j))
104    sdump2 = (Log(GraphArr(l)) - Log(GraphArr(j))) / (WavelArr(l) -
105        WavelArr(j))
106    FitC = (sdump1 + sdump2) / 2
107    Form1!ExpLabel = Format(FitC, "0.00E-0")
108    Exit Sub
109 Logerr:
110
111    MsgBox "Fitting incorrect!", 48, "Log Error"
112    Exit Sub
113
114 End Sub
115 *****
116 Static Sub DrawGraph ()
117     Dim i, s, j As Integer
118     Dim x As Single
119     Dim y As Single
120     Dim Steg2 As Single
121     Dim CurrVal As Single
122     Dim Steg As Long
123     Dim CurrWl As Long
124     Dim sdump, sdump2 As Single
125     Dim RefWl As Single
126
127     If DrawM = 1 Then
128         If Not DrawFit Then Exit Sub
129         Form1!Graph.Line (.02, .02)-(9.97, 9.97), RGB(255, 255, 255),
130             BF
131         Start = MStart
132         GoTo Dr1
133     End If
134
135     Start = 0
136     Stopp = MAXARR
137     For i = 0 To MAXARR
138         If WavelArr(i) >= DispMinVal And Start = 0 Then Start = i
139         If WavelArr(i) >= DispMaxVal And Stopp = MAXARR Then
140             Stopp = i
141         Next

```

```

142
143 If Start >= Stopp Then
144     Stopp = Start + 10
145 End If
146
147 If AutoScale Then
148     MaxVal = -100000
149     MinVal = 100000
150     For i = Start To Stopp
151         If GraphArr(i) > MaxVal Then MaxVal = GraphArr(i)
152         If GraphArr(i) < MinVal Then MinVal = GraphArr(i)
153     Next
154     If ForceZero Then MinVal = 0
155     Form1!Text3.Text = CStr(MinVal)
156     Form1!Text4.Text = CStr(MaxVal)
157 End If
158 If MaxVal <= MinVal Then
159     MaxVal = MinVal + 1
160 End If
161
162 Form1!Graph.Cls
163 Form1!Graph.Line (0, 0)-(10, 0), RGB(0, 0, 0)
164 Form1!Graph.Line -(10, 10), RGB(0, 0, 0)
165 Form1!Graph.Line -(0, 10), RGB(0, 0, 0)
166 Form1!Graph.Line -(0, 0), RGB(0, 0, 0)
167
168 Steg2 = 10 ^ Int(Log(MaxVal - MinVal) / Log(10))
169 If (MaxVal - MinVal) / Steg2 < 2 Then
170     Steg2 = Steg2 / 5
171 ElseIf (MaxVal - MinVal) / Steg2 < 5 Then
172     Steg2 = Steg2 / 2
173 End If
174
175 CurrVal = Steg2 * (Int(MinVal / Steg2) + 1)
176 Do
177     y = 10 * (CurrVal - MinVal) / (MaxVal - MinVal)
178     Form1!Graph.CurrentX = 0
179     Form1!Graph.CurrentY = y
180     Form1!Graph.Line -Step(-.2, 0), RGB(0, 0, 0)
181     If CurrVal = 0 Then Form1!Graph.Line -Step(10.2, 0), RGB(0, 0,
182         0)
183     Form1!Graph.CurrentX = -
184         Form1!Graph.TextWidth(CStr(CurrVal)) -
185         .3
186     Form1!Graph.CurrentY = y +
187         Form1!Graph.TextHeight(CStr(CurrVal)) /
188         2
189     Form1!Graph.Print CurrVal
190     CurrVal = CurrVal + Steg2
191 Loop Until CurrVal > MaxVal
192
193 Steg = 10 ^ Int(Log(WavelArr(Stopp) - WavelArr(Start)) / Log(10))
194 If (WavelArr(Stopp) - WavelArr(Start)) / Steg < 2 Then
195     Steg = Steg / 5
196 ElseIf (WavelArr(Stopp) - WavelArr(Start)) / Steg < 5 Then
197     Steg = Steg / 2
198 End If
199
200 CurrWl = Steg * (Int(WavelArr(Start) / Steg) + 1)
201 For i = Start To Stopp
202     If WavelArr(i) >= CurrWl Then
203         x = 10 * (CurrWl - WavelArr(Start)) / (WavelArr(Stopp) -
204             WavelArr(Start))
205         Form1!Graph.CurrentX = x
206         Form1!Graph.CurrentY = 0
207         Form1!Graph.Line -Step(0, -.2), RGB(0, 0, 0)
208         Form1!Graph.CurrentX = x -
209             Form1!Graph.TextWidth(CStr(CurrWl)) / 2
210         Form1!Graph.CurrentY = -.3
211         Form1!Graph.Print CurrWl
212         CurrWl = CurrWl + Steg
213     End If
214 Next
215 Form1!Graph.CurrentX = 4.6
216 Form1!Graph.CurrentY = -1
217 Form1!Graph.Print "Wavelength (nm)"
218
219 Dr1:
220 For i = Start To Stopp
221     x = 10 * (WavelArr(i) - WavelArr(Start)) / (WavelArr(Stopp) -
222         WavelArr(Start))
223     y = 10 * (GraphArr(i) - MinVal) / (MaxVal - MinVal)
224     If y >= 10 Then y = 9.98
225     If y <= 0 Then y = .02
226     If i = Start Then
227         Form1!Graph.CurrentX = x
228         Form1!Graph.CurrentY = y
229     Else
230         Form1!Graph.Line -(x, y), RGB(255, 0, 0)
231     End If
232 Next
233
234 If DrawFit Then
235     s = True
236     For i = Start To Stopp
237         If WavelArr(i) >= FitStart Then
238             x = 10 * (WavelArr(i) - WavelArr(Start)) / (WavelArr(Stopp)
239                 - WavelArr(Start))
240             y = 10 * (FitA + FitB * Exp(FitC * (WavelArr(i) - FitStart)) -
241                 MinVal) / (MaxVal - MinVal)
242             If y >= 10 Then y = 9.98
243             If y <= 0 Then y = .02
244             If s Then
245                 Form1!Graph.CurrentX = x
246                 Form1!Graph.CurrentY = y
247                 s = False
248             Else
249                 Form1!Graph.Line -(x, y), RGB(0, 0, 255)
250             End If
251         Else
252             MStart = i
253         End If
254     Next
255 End If
256
257 If DrawM = 0 Then
258     If NoOfEvWavel > 0 Then
259         Form1!Spread1.Row = CurrRow
260         For s = 1 To NoOfEvWavel
261             For j = 0 To MAXARR
262                 If EvalWavel(s) <= WavelArr(j) Then Exit For
263             Next j
264             sdump = 0
265             sdump2 = 0
266             For i = j - NoOfEvChans / 2 To j - NoOfEvChans / 2 +
267                 NoOfEvChans - 1
268                 x = 10 * (WavelArr(i) - WavelArr(Start)) /
269                     (WavelArr(Stopp) - WavelArr(Start))
270                 y = 10 * (GraphArr(i) - MinVal) / (MaxVal - MinVal)
271                 If y >= 10 Then y = 9.98
272                 If y <= 0 Then y = .02
273                 If x >= 10 Then x = 9.98
274                 If x <= 0 Then x = .02
275                 Form1!Graph.CurrentX = x
276                 Form1!Graph.CurrentY = y
277                 Form1!Graph.Line -(x, 0), RGB(0, 255, 0)
278                 sdump = sdump + GraphArr(i)
279                 If DrawFit Then sdump2 = sdump2 + (GraphArr(i) - (FitA
280                     + FitB * Exp(FitC * (WavelArr(i) -
281                         FitStart))))
282             Next i
283             sdump = sdump / NoOfEvChans
284             sdump2 = sdump2 / NoOfEvChans
285             If s = 1 Then
286                 Form1!Spread1.Col = 1
287                 Form1!Spread1.Text = Format(sdump, "#####0.##")
288                 RefWl = sdump
289             Else
290                 Form1!Spread1.Col = (s - 2) * 3 + 2
291                 Form1!Spread1.Text = Format(sdump, "#####0.##")
292                 Form1!Spread1.Col = (s - 2) * 3 + 3
293                 Form1!Spread1.Text = Format(sdump2, "#####0.##")

```

```

294     Form1!Spread1.Col = (s - 2) * 3 + 4
295     If DrawFit Then
296         Form1!Spread1.Text = Format(sdump2 / RefW1,
297             "0.#####")
298     Else
299         Form1!Spread1.Text = Format(sdump / RefW1,
300             "0.#####")
301     End If
302 End If
303
304     Next s
305 End If
306 End If
307 DrawM = 0
308 End Sub
309 *****
310 Sub GetArray ()
311     On Error GoTo Errh96
312     Dim Ts
313     Dim Dump As String
314     Dim i, j, Order As Integer
315     Dim fdump As Single
316     Static Chrs As String * 1
317     Dim ldump As Long
318     Static Coeffs(0 To 5) As Double
319
320     If OMAIII Then
321         Open CurrentFile For Input As 1
322         For i = 1 To 4
323             Input #1, fdump
324             Next
325             For i = 0 To MAXARR
326                 Input #1, OrgArr(i)
327             Next
328             For i = 1 To 2
329                 Input #1, fdump
330             Next
331             Label = ""
332             Do
333                 Chrs$ = Input(1, #1)
334                 If Asc(Chrs$) = 13 Then Exit Do
335                 Label = Label + Chrs$
336             Loop
337             For i = 1 To 36
338                 Input #1, fdump
339             Next
340             Input #1, WavelStart
341             Input #1, DeltaWavel
342
343             Close #1
344             If UseSpW1 Then
345                 For i = 0 To MAXARR
346                     WOrgArr(i) = WavelStart + DeltaWavel * i
347                 Next
348             End If
349
350             Form1!LabelLabel = Label
351         Else
352             Open CurrentFile For Binary As #1
353             For i = 1 To 27
354                 Get #1, , ldump
355             Next
356             Get #1, , j
357             UseFloat = False
358             If j = 0 Then UseFloat = True
359             Get #1, , j
360             For i = 1 To 721
361                 Get #1, , ldump
362             Next
363             Get #1, , ldump
364             If ldump = &H1234567 And UseSpW1 Then
365                 For i = 1 To 102
366                     Get #1, , Chrs
367                 Next
368                 Order = Asc(Chrs)
369                 For i = 1 To 161
370                     Get #1, , Chrs
371                 Next
372                 For i = 0 To 5
373                     Get #1, , Coeffs(i)
374                 Next
375                 For i = 0 To MAXARR
376                     WOrgArr(i) = 0
377                     For j = 0 To Order
378                         WOrgArr(i) = WOrgArr(i) + Coeffs(j) * (i ^ j)
379                     Next
380                 Next
381                 For i = 1 To 797
382                     Get #1, , Chrs
383                 Next
384             Else
385                 For i = 1 To 275
386                     Get #1, , ldump
387                 Next
388             End If
389
390             For i = 0 To MAXARR
391                 If UseFloat Then
392                     Get #1, , fdump
393                     OrgArr(i) = fdump
394                 Else
395                     Get #1, , ldump
396                     OrgArr(i) = ldump
397                 End If
398             Next
399             Close #1
400             WavelStart = WOrgArr(1)
401             DeltaWavel = WOrgArr(2) - WOrgArr(2)
402             Form1!LabelLabel = ""
403         End If
404         Ts = FileDateTime(CurrentFile)
405         Datum = Format(Ts, "General Date")
406         Form1!DateLabel = Datum
407         Form1!FileLabel = CurrentFile
408     Exit Sub
409 Errh96:
410     Exit Sub
411 End Sub
412 *****
413 Function Help_File_In_Path ()
414     Dim Path As String, CurrentDir As String
415     Dim Found, SemiColon As Integer
416
417     On Error Resume Next
418     CurrentDir = App.Path
419     If Right$(CurrentDir, 1) <> "\" Then CurrentDir = CurrentDir + "\"
420     Found = Dir$(CurrentDir + "SPECEVAL.HLP") <> ""
421     If Not Found Then
422         Path = Environ$("PATH")
423         If Path <> "" Then
424             If Right$(Path, 1) <> ";" Then Path = Path + ";"
425             SemiColon = InStr(Path, ";")
426             Do
427                 CurrentDir = Left$(Path, SemiColon - 1)
428                 If Right$(CurrentDir, 1) <> "\" Then CurrentDir =
429                     CurrentDir + "\"
430                 Found = Dir$(CurrentDir + "SPECEVAL.HLP") <> ""
431                 Path = Right$(Path, Len(Path) - SemiColon)
432                 SemiColon = InStr(Path, ";")
433                 Loop While ((SemiColon <> 0) And Not Found)
434             End If
435         End If
436     If Found Then
437         HelpFilePath = CurrentDir + "SPECEVAL.HLP"
438         App.HelpFile = CurrentDir + "SPECEVAL.HLP"
439     End If
440     Help_File_In_Path = Found
441
442     On Error GoTo 0
443
444 End Function

```

7.2 SPECEVAL.FRM

```

1  VERSION 2.00
2  Begin Form Form1
3  Caption = "Spectrum Evaluator"
4  ClientHeight = 7530
5  ClientLeft = 4260
6  ClientTop = 2010
7  ClientWidth = 9840
8  ClipControls = 0 'False
9  Height = 8220
10 Icon = SPECEVAL.FRX:0000
11 Left = 4200
12 LinkTopic = "Form1"
13 ScaleHeight = 9.525
14 ScaleMode = 6 'Millimeter
15 ScaleWidth = 9.525
16 Top = 1380
17 Width = 9960
18 Begin SpreadSheet Spread1
19 FontBold = -1 'True
20 FontItalic = 0 'False
21 FontName = "MS Sans Serif"
22 FontSize = 8.25
23 FontStrikethru = 0 'False
24 FontUnderline = 0 'False
25 Height = 1815
26 Left = 5400
27 TabIndex = 35
28 Top = 5520
29 Width = 4095
30 End
31 Begin Frame Frame1
32 Caption = "Files"
33 Height = 1812
34 Left = 120
35 TabIndex = 12
36 Top = 5520
37 Width = 4812
38 Begin FileListBox File1
39 Height = 1590
40 Left = 0
41 TabIndex = 0
42 Top = 240
43 Width = 1455
44 End
45 Begin CheckBox Check1
46 Caption = "Autoscale"
47 Height = 252
48 Left = 1680
49 TabIndex = 6
50 Top = 600
51 Width = 1092
52 End
53 Begin CheckBox Check2
54 Caption = "Use Corr."
55 Height = 252
56 Left = 1680
57 TabIndex = 7
58 Top = 360
59 Width = 1212
60 End
61 Begin Frame Frame5
62 Caption = "Cr."
63 Height = 732
64 Left = 3000
65 TabIndex = 8
66 Top = 120
67 Width = 492
68 Begin CommandButton CBCrMin
69 Caption = "-"
70 Height = 252
71 Left = 0
72 TabIndex = 9
73 Top = 480
74 Width = 252
75 End
76 Begin CommandButton CBCrPlu
77 Caption = "+"
78 Height = 252
79 Left = 240
80 TabIndex = 10
81 Top = 480
82 Width = 252
83 End
84 Begin Label CorrLabel
85 Alignment = 2 'Center
86 Height = 252
87 Left = 120
88 TabIndex = 11
89 Top = 240
90 Width = 252
91 End
92 End
93 Begin Frame Frame2
94 Caption = "W1."
95 Height = 732
96 Left = 3600
97 TabIndex = 28
98 Top = 120
99 Width = 492
100 Begin CommandButton CBWIMin
101 Caption = "-"
102 Height = 252
103 Left = 0
104 TabIndex = 30
105 Top = 480
106 Width = 252
107 End
108 Begin CommandButton CBWIPlu
109 Caption = "+"
110 Height = 252
111 Left = 240
112 TabIndex = 29
113 Top = 480
114 Width = 252
115 End
116 Begin Label WaveLabel
117 Alignment = 2 'Center
118 Height = 252
119 Left = 120
120 TabIndex = 31
121 Top = 240
122 Width = 252
123 End
124 End
125 Begin CheckBox Check3
126 Caption = "Use Fitting"
127 Height = 252
128 Left = 1680
129 TabIndex = 27
130 Top = 120
131 Width = 1212
132 End
133 Begin Frame Frame3
134 Caption = "Fit. Function"
135 Height = 852
136 Left = 1560
137 TabIndex = 17
138 Top = 840
139 Width = 3132
140 Begin CommandButton CBRedraw
141 Caption = "Redraw"
142 Height = 252
143 Left = 2400
144 TabIndex = 34
145 Top = 600
146 Width = 732
147 End
148 Begin CommandButton CBAPlu
149 Caption = "+"

```

```

150     Height = 252
151     Left   = 0
152     TabIndex = 23
153     Top    = 360
154     Width  = 252
155     End
156     Begin CommandButton CBAMin
157         Caption = "-"
158         Height = 252
159         Left = 0
160         TabIndex = 22
161         Top = 600
162         Width = 252
163     End
164     Begin CommandButton CBBPlu
165         Caption = "+"
166         Height = 252
167         Left = 960
168         TabIndex = 21
169         Top = 360
170         Width = 252
171     End
172     Begin CommandButton CBBMin
173         Caption = "-"
174         Height = 252
175         Left = 960
176         TabIndex = 20
177         Top = 600
178         Width = 252
179     End
180     Begin CommandButton CBCPlu
181         Caption = "+"
182         Height = 252
183         Left = 2040
184         TabIndex = 19
185         Top = 120
186         Width = 252
187     End
188     Begin CommandButton CBCMin
189         Caption = "-"
190         Height = 252
191         Left = 2040
192         TabIndex = 18
193         Top = 360
194         Width = 252
195     End
196     Begin Label OffLabel
197         Alignment = 2 'Center
198         Height = 252
199         Left = 240
200         TabIndex = 26
201         Top = 480
202         Width = 732
203     End
204     Begin Label AmpLabel
205         Alignment = 2 'Center
206         Height = 252
207         Left = 1200
208         TabIndex = 25
209         Top = 480
210         Width = 732
211     End
212     Begin Label ExpLabel
213         Alignment = 2 'Center
214         Height = 252
215         Left = 2280
216         TabIndex = 24
217         Top = 240
218         Width = 732
219     End
220     End
221     Begin Frame Frame4
222         Caption = "Ch."
223         Height = 732
224         Left = 4200
225         TabIndex = 13
226         Top = 120
227         Width = 492
228     Begin CommandButton CBChMin
229         Caption = "-"
230         Height = 252
231         Left = 0
232         TabIndex = 15
233         Top = 480
234         Width = 252
235     End
236     Begin CommandButton CBChPlu
237         Caption = "+"
238         Height = 252
239         Left = 240
240         TabIndex = 14
241         Top = 480
242         Width = 252
243     End
244     Begin Label ChanLabel
245         Alignment = 2 'Center
246         Height = 252
247         Left = 120
248         TabIndex = 16
249         Top = 240
250         Width = 252
251     End
252     End
253     End
254     Begin CommonDialog CMDialog1
255         DialogTitle = "Open Corr File"
256         Filter = "OMAIII file (*.DAT)*.DAT\CSMA file
                (*.SPE)*.SPE\CSMA text file
                (*.PRN)*.PRN"
259         Left = 5040
260         Top = 6840
261     End
262     Begin PictureBox Graph
263         ClipControls = 0 'False
264         Height = 5052
265         Left = 120
266         ScaleHeight = -12.877
267         ScaleLeft = -2
268         ScaleMode = 0 'User
269         ScaleTop = 11
270         ScaleWidth = 13
271         TabIndex = 1
272         Top = 120
273         Width = 9636
274     Begin TextBox DateLabel
275         BorderStyle = 0 'None
276         Enabled = 0 'False
277         Height = 195
278         Left = 1320
279         TabIndex = 38
280         Top = 1560
281         Width = 2532
282     End
283     Begin TextBox FileLabel
284         BorderStyle = 0 'None
285         Enabled = 0 'False
286         Height = 195
287         Left = 1320
288         TabIndex = 4
289         Top = 960
290         Width = 2052
291     End
292     Begin TextBox LabelLabel
293         BackColor = &H00FFFFFF&
294         BorderStyle = 0 'None
295         Enabled = 0 'False
296         ForeColor = &H00000000&
297         Height = 195
298         Left = 2040
299         TabIndex = 5
300         Top = 360
301         Width = 2772

```



```

302 End
303 Begin CheckBox ChkZero
304   Caption = "Zero"
305   Height = 30
306   Left = 120
307   TabIndex = 36
308   Top = 4560
309   Width = 855
310 End
311 Begin TextBox Text2
312   Height = 285
313   Left = 8520
314   TabIndex = 33
315   Top = 4680
316   Width = 612
317 End
318 Begin TextBox Text1
319   Height = 285
320   Left = 1200
321   MaxLength = 4
322   TabIndex = 32
323   Top = 4680
324   Width = 612
325 End
326 Begin TextBox Text4
327   Height = 285
328   Left = 120
329   TabIndex = 3
330   Top = 120
331   Width = 612
332 End
333 Begin TextBox Text3
334   Height = 285
335   Left = 120
336   TabIndex = 2
337   Top = 4200
338   Width = 612
339 End
340 Begin Label Label1
341   Caption = "Label1"
342   Height = 15
343   Left = 1440
344   TabIndex = 37
345   Top = 1320
346   Width = 2415
347 End
348 End
349 Begin Menu mnuFile
350   Caption = "&File"
351   Begin Menu mnuOpenCFfile
352     Caption = "&Open Corr File"
353   End
354   Begin Menu mnuSave
355     Caption = "&Save Result"
356   End
357   Begin Menu mnuDirectory
358     Caption = "&Directory"
359   End
360   Begin Menu mnuSep2
361     Caption = "-"
362   End
363   Begin Menu mnuPrSetUp
364     Caption = "Printer Set&up"
365   End
366   Begin Menu mnuPrint
367     Caption = "&Print Graph"
368   End
369   Begin Menu mnuSep
370     Caption = "-"
371   End
372   Begin Menu mnuExit
373     Caption = "E&xit"
374   End
375 End
376 Begin Menu mnuEdit
377   Caption = "&Edit"
378   Begin Menu mnuCpyGrp
379     Caption = "Copy &Graph"
380   End
381   Begin Menu mnuCpyRes
382     Caption = "&Copy Result"
383     Shortcut = ^{INSERT}
384   End
385   Begin Menu mnuSep4
386     Caption = "-"
387   End
388   Begin Menu mnuClear
389     Caption = "Clear &Sheet"
390   End
391   Begin Menu mnuSep5
392     Caption = "-"
393   End
394   Begin Menu mnuCIWav
395     Caption = "Clear &Wavel."
396   End
397 End
398 Begin Menu mnuOptions
399   Caption = "&Options"
400   Begin Menu mnuDataType
401     Caption = "&Data Type"
402     Begin Menu mnuOMAI
403       Caption = "&OMA III"
404     End
405     Begin Menu mnuCSMA
406       Caption = "&CSMA"
407     End
408   End
409   Begin Menu mnuAddCon
410     Caption = "&Add Const."
411   End
412   Begin Menu mnuLabel
413     Caption = "&Label"
414   End
415   Begin Menu mnuBackFile
416     Caption = "&Backgr. File"
417   End
418   Begin Menu mnuSep6
419     Caption = "-"
420   End
421   Begin Menu mnuWl
422     Caption = "&Wl. from Corr"
423   End
424 End
425 Begin Menu mnuHelp
426   Caption = "&Help"
427   Begin Menu mnuCont
428     Caption = "&Contents"
429     Shortcut = {F1}
430   End
431   Begin Menu mnuSep3
432     Caption = "-"
433   End
434   Begin Menu mnuAbout
435     Caption = "&About"
436   End
437 End
438 End
439 Option Explicit
440 *****
441 Sub CBAMin_MouseDown (Button As Integer, Shift As Integer, X As
442   Single, Y As Single)
443   If Button = 1 Then
444     FitA = FitA - FitB * .01
445   Else
446     FitA = FitA - FitB * .05
447   End If
448   OffLabel = Format(FitA, "0.00E-0")
449   DrawM = 1
450   If NoOfEvWavel > 0 Then Modified = True
451   DrawGraph
452 End Sub
453 *****

```

```

454 Sub CBAPlu_MouseDown (Button As Integer, Shift As Integer, X As
455     Single, Y As Single)
456     If Button = 1 Then
457         FitA = FitA + FitB * .01
458     Else
459         FitA = FitA + FitB * .05
460     End If
461     OffLabel = Format(FitA, "0.00E-0")
462     If NoOfEvWavel > 0 Then Modified = True
463     DrawM = 1
464     DrawGraph
465 End Sub
466 *****
467 Sub CBBMin_MouseDown (Button As Integer, Shift As Integer, X As
468     Single, Y As Single)
469     If Button = 1 Then
470         FitB = FitB * .99
471     Else
472         FitB = FitB * .95
473     End If
474     AmpLabel = Format(FitB, "0.00E-0")
475     If NoOfEvWavel > 0 Then Modified = True
476     DrawM = 1
477     DrawGraph
478 End Sub
479 *****
480 Sub CBBPlu_MouseDown (Button As Integer, Shift As Integer, X As
481     Single, Y As Single)
482     If Button = 1 Then
483         FitB = FitB * 1.01
484     Else
485         FitB = FitB * 1.05
486     End If
487     AmpLabel = Format(FitB, "0.00E-0")
488     If NoOfEvWavel > 0 Then Modified = True
489     DrawM = 1
490     DrawGraph
491 End Sub
492 *****
493 Sub CBChMin_Click ()
494     If NoOfEvChans > 1 Then
495         NoOfEvChans = NoOfEvChans - 1
496         ChanLabel = CStr(NoOfEvChans)
497         If NoOfEvWavel > 0 Then Modified = True
498         DrawGraph
499     End If
500 End Sub
501 *****
502 Sub CBChPlu_Click ()
503     NoOfEvChans = NoOfEvChans + 1
504     ChanLabel = CStr(NoOfEvChans)
505     If NoOfEvWavel > 0 Then Modified = True
506     DrawGraph
507 End Sub
508 *****
509 Sub CBCMin_MouseDown (Button As Integer, Shift As Integer, X As
510     Single, Y As Single)
511     If Button = 1 Then
512         FitC = FitC * .99
513     Else
514         FitC = FitC * .95
515     End If
516     ExpLabel = Format(FitC, "0.00E-0")
517     If NoOfEvWavel > 0 Then Modified = True
518     DrawM = 1
519     DrawGraph
520 End Sub
521 *****
522 Sub CBCPlu_MouseDown (Button As Integer, Shift As Integer, X As
523     Single, Y As Single)
524     If Button = 1 Then
525         FitC = FitC * 1.01
526     Else
527         FitC = FitC * 1.05
528     End If
529     ExpLabel = Format(FitC, "0.00E-0")
530     If NoOfEvWavel > 0 Then Modified = True
531     DrawM = 1
532     DrawGraph
533 End Sub
534 *****
535 Sub CBCrMin_Click ()
536     MoveCorr = MoveCorr - 1
537     CorrLabel.Caption = CStr(MoveCorr)
538     If NoOfEvWavel > 0 And UseCorr Then Modified = True
539     CalcArray
540     DrawGraph
541 End Sub
542 *****
543 Sub CBCrPlu_Click ()
544     MoveCorr = MoveCorr + 1
545     CorrLabel.Caption = CStr(MoveCorr)
546     If NoOfEvWavel > 0 And UseCorr Then Modified = True
547     CalcArray
548     DrawGraph
549 End Sub
550 *****
551 Sub CBRedraw_Click ()
552     DrawM = 0
553     DrawGraph
554 End Sub
555 *****
556 Sub CBWMin_Click ()
557     MoveWavel = MoveWavel - 1
558     WavelLabel.Caption = CStr(MoveWavel)
559     If NoOfEvWavel > 0 Then Modified = True
560     CalcArray
561     DrawGraph
562 End Sub
563 *****
564 Sub CBWPlu_Click ()
565     MoveWavel = MoveWavel + 1
566     WavelLabel.Caption = CStr(MoveWavel)
567     If NoOfEvWavel > 0 Then Modified = True
568     CalcArray
569     DrawGraph
570 End Sub
571 *****
572 Static Sub Check1_Click ()
573     If Check1.Value = 1 Then
574         AutoScale = True
575         DrawGraph
576     Else
577         AutoScale = False
578     End If
579 End Sub
580 *****
581 Sub Check2_Click ()
582     If Check2.Value = 1 Then
583         UseCorr = True
584     Else
585         UseCorr = False
586     End If
587     If NoOfEvWavel > 0 Then Modified = True
588     CalcArray
589     If DrawFit Then CalcFit
590     DrawGraph
591 End Sub
592 *****
593 Sub Check3_Click ()
594     On Error GoTo Errh13
595     Dim dump As Single
596     dump = FitStart
597     If Check3.Value = 1 Then
598         FitStart = InputBox("Enter start wavelength for fitting.", "Fitting
599             Start", CStr(FitStart))
600         FitMid = InputBox("Enter middle wavelength for fitting.", "Fitting
601             Start", CStr(FitMid))
602         FitStop = InputBox("Enter stop wavelength for fitting.", "Fitting
603             Stop", CStr(FitStop))
604         DrawFit = True
605         CalcFit

```

```

606 Else
607     DrawFit = False
608 End If
609 If NoOfEvWavel > 0 Then Modified = True
610 CalcArray
611 DrawGraph
612 Exit Sub
613
614 Errh13:
615     FitStart = dump
616     Check3.Value = 0
617     Exit Sub
618 End Sub
619 *****
620 Sub ChkZero_Click ()
621     If ChkZero.Value = 1 Then
622         ForceZero = True
623         DrawGraph
624     Else
625         ForceZero = False
626         DrawGraph
627     End If
628 End Sub
629 *****
630 Sub File1_Click ()
631     Dim idump As Integer
632     If Right(File1.Path, 1) = "\" Then
633         CurrentFile = File1.Path + File1.FileName
634     Else
635         CurrentFile = File1.Path + "\" + File1.FileName
636     End If
637     GetArray
638     CalcArray
639     If DrawFit Then CalcFit
640     If NoOfEvWavel > 0 Then
641         Spread1.MaxRows = Spread1.MaxRows + 1
642         Spread1.Row = Spread1.MaxRows
643         Spread1.Col = 0
644         Spread1.Text = File1.FileName
645         Spread1.Col = -1
646         Spread1.Lock = True
647         CurrRow = Spread1.MaxRows
648         idump = Spread1.Height
649         Spread1.TopRow = CurrRow - 4
650         Modified = True
651     Else
652         Spread1.Col = 0
653         Spread1.Row = CurrRow
654         Spread1.Text = File1.FileName
655     End If
656     DrawGraph
657 End Sub
658 *****
659 Sub Form_Load ()
660     On Error GoTo Errh14
661     Dim i, j, Order, Exists As Integer
662     Dim sdump As String
663     Dim Ext As String
664     Dim fdump As Single
665     Static Chrs As String * 1
666     Dim Idump As Long
667     Static Coeffs(0 To 5) As Double
668
669     LoadForm.Left = (Screen.Width - LoadForm.Width) / 2
670     LoadForm.Top = (Screen.Height - LoadForm.Height) / 2
671     LoadForm.Show
672     Width = Screen.Width * .95
673     Height = Screen.Height * .95
674     Left = (Screen.Width - Width) / 2
675     Top = (Screen.Height - Height) / 2
676
677     Frame1.Left = ScaleWidth * .01
678     Frame1.Top = ScaleHeight * .99 - Frame1.Height
679
680     Graph.Left = ScaleWidth * .01
681     Graph.Width = ScaleWidth * .98
682     Graph.Top = ScaleHeight * .01
683     Graph.Height = .97 * (ScaleHeight - Frame1.Height)
684     Graph.ScaleMode = 0
685     Graph.ScaleHeight = -12.3
686     Graph.ScaleLeft = -1.7
687     Graph.ScaleTop = 10.6
688     Graph.ScaleWidth = 12
689     Text1.Top = -.8
690     Text1.Left = -.4
691     Text2.Top = -.8
692     Text2.Left = 9.4
693     Text3.Top = .2
694     Text3.Left = -1.65
695     Text3.Width = .8
696     Text4.Top = 10.3
697     Text4.Left = -1.65
698     Text4.Width = .8
699     Spread1.Left = Frame1.Left + Frame1.Width + ScaleWidth * .01
700     Spread1.Top = Frame1.Top
701     Spread1.Height = Frame1.Height
702     Spread1.Width = ScaleWidth * .97 - Frame1.Width
703     FileLabel.Top = 10.6
704     FileLabel.Left = 0
705     FileLabel.Height = .65
706     FileLabel.Width = 2.9
707     DateLabel.Top = 10.6
708     DateLabel.Left = 3
709     DateLabel.Height = .65
710     DateLabel.Width = 2.9
711     LabelLabel.Top = 10.6
712     LabelLabel.Left = 6
713     LabelLabel.Height = 5.65
714     LabelLabel.Width = 4
715
716     ChkZero.Top = -.7
717     ChkZero.Left = -1.65
718
719     Exists = True
720     Open App.Path + "\" + "speceval.ini" For Input As #1
721     If Exists Then
722         Line Input #1, sdump
723         Line Input #1, sdump
724         OMAIII = CInt(Mid(sdump, InStr(sdump, "=") + 1))
725         Line Input #1, sdump
726         File1.Path = Mid(sdump, InStr(sdump, "=") + 1)
727         Line Input #1, sdump
728         UseCorr = CInt(Mid(sdump, InStr(sdump, "=") + 1))
729         If UseCorr Then
730             Line Input #1, sdump
731             CorrFile = Mid(sdump, InStr(sdump, "=") + 1)
732         End If
733         Line Input #1, sdump
734         MoveWavel = CInt(Mid(sdump, InStr(sdump, "=") + 1))
735         Line Input #1, sdump
736         MoveCorr = CInt(Mid(sdump, InStr(sdump, "=") + 1))
737         Line Input #1, sdump
738         DispMinVal = CInt(Mid(sdump, InStr(sdump, "=") + 1))
739         Line Input #1, sdump
740         DispMaxVal = CInt(Mid(sdump, InStr(sdump, "=") + 1))
741         Line Input #1, sdump
742         NoOfEvChans = CInt(Mid(sdump, InStr(sdump, "=") + 1))
743         Line Input #1, sdump
744         AddCon = CSng(Mid(sdump, InStr(sdump, "=") + 1))
745         Line Input #1, sdump
746         UseSpW1 = CInt(Mid(sdump, InStr(sdump, "=") + 1))
747         Close #1
748
749         If OMAIII Then
750             MAXARR = 1023
751         Else
752             MAXARR = 577
753         End If
754         If UseCorr Then
755             Open CorrFile For Input As #2
756             Exists = True
757             If Exists Then

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758 Close #2
759 If OMAIII Then
760 Open CorrFile For Input As #2
761 For i = 1 To 4
762 Input #2, fdump
763 Next
764 For i = 0 To 1023
765 Input #2, CorrArr(i)
766 Next
767 For i = 1 To 2
768 Input #2, fdump
769 Next
770 Input #2, Label
771 For i = 1 To 36
772 Input #2, fdump
773 Next
774 Input #2, WavelStart
775 Input #2, DeltaWavel
776 Close #2
777
778 For i = 0 To MAXARR
779 WOrgArr(i) = WavelStart + DeltaWavel * i
780 OrgArr(i) = CorrArr(i)
781 Next
782 Else
783 Ext = Mid(CorrFile, InStr(CorrFile, ".") + 1)
784 If UCase$(Ext) = "PRN" Then
785 Open CorrFile For Input As #2
786
787 For i = 0 To MAXARR
788 Input #2, WOrgArr(i), CorrArr(i)
789 Next
790 Close #2
791 Else
792 Open CorrFile For Binary As #2
793 For i = 1 To 27
794 Get #2, , ldump
795 Next
796 Get #2, , j
797 UseFloat = False
798 If j = 0 Then UseFloat = True
799 Get #2, , j
800 For i = 1 To 721
801 Get #2, , ldump
802 Next
803 Get #2, , ldump
804 If ldump = &H1234567 Then
805 For i = 1 To 102
806 Get #2, , Chrs
807 Next
808 Order = Asc(Chrs)
809 For i = 1 To 161
810 Get #2, , Chrs
811 Next
812 For i = 0 To 5
813 Get #2, , Coeffs(i)
814 Next
815 For i = 0 To MAXARR
816 WOrgArr(i) = 0
817 For j = 0 To Order
818 WOrgArr(i) = WOrgArr(i) + Coeffs(j) * (i ^ j)
819 Next
820 Next
821 For i = 1 To 797
822 Get #2, , Chrs
823 Next
824 Else
825 For i = 1 To 275
826 Get #2, , ldump
827 Next
828 For i = 0 To MAXARR
829 WOrgArr(i) = i
830 Next
831 End If
832
833 For i = 0 To MAXARR
834
835 If UseFloat Then
836 Get #2, , fdump
837 CorrArr(i) = fdump
838 Else
839 Get #2, , ldump
840 CorrArr(i) = ldump
841 End If
842 Next
843 Close #2
844 End If
845
846 WavelStart = WOrgArr(1)
847 DeltaWavel = WOrgArr(2) - WOrgArr(1)
848
849 For i = 0 To MAXARR
850 If CorrArr(i) <= 0 Then
851 CorrArr(i) = (3.02299117E-28 * ((1 / ((-
852 24.16706244 + WOrgArr(i)) *
853 .000000001)) ^ 5) / (Exp(.000004243352 /
854 ((-24.16706244 + WOrgArr(i)) *
855 .000000001) - 1)) / CorrArr(i)
856 Else
857 CorrArr(i) = 0
858 End If
859 End If
860 Next
861
862 For i = 0 To MAXARR
863 If WOrgArr(i) >= 570 Then Exit For
864 Next
865
866 If i > MAXARR Then i = MAXARR / 2
867 fdump = CorrArr(i)
868 If fdump = 0 Then fdump = 1
869
870 For i = 0 To MAXARR
871 CorrArr(i) = CorrArr(i) / fdump
872 OrgArr(i) = CorrArr(i)
873 Next
874 End If
875 Else
876 UseCorr = False
877 End If
878
879 End If
880 Else
881 OMAIII = True
882 UseCorr = False
883 MoveWavel = 0
884 MoveCorr = 0
885 DispMinVal = 100
886 DispMaxVal = 10000
887 NoOfEvChans = 5
888 AddCon = 0
889 WavelStart = 0
890 DeltaWavel = 10
891 UseSpWl = True
892 End If
893
894 If OMAIII Then
895 mnuOMAIII.Checked = True
896 mnuCSMA.Checked = False
897 InpMask = "*.DAT"
898 MAXARR = 1023
899 Else
900 mnuOMAIII.Checked = False
901 mnuCSMA.Checked = True
902 InpMask = "*.SPE"
903 MAXARR = 577
904 End If
905 File1.Pattern = InpMask
906
907 If Not UseCorr Then
908 For i = 0 To MAXARR
909 OrgArr(i) = i
910 GraphArr(i) = i
911 CorrArr(i) = 1
912 WOrgArr(i) = i * 10

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```

910     BackArr(i) = 0
911     Next
912 End If
913
914 AutoScale = True
915 DrawFit = False
916 CalcArray
917
918 Check1 = 1
919 If UseCorr Then
920     Check2 = 1
921 Else
922     Check2 = 0
923 End If
924 Check3 = DrawFit
925 mnuBackFile.Checked = False
926
927 CorrLabel = CStr(MoveCorr)
928 WaveLabel = CStr(MoveWavel)
929 ChanLabel = CStr(NoOfEvChans)
930 Text1 = CStr(DispMinVal)
931 Text2 = CStr(DispMaxVal)
932 OffLabel = "0"
933 AmpLabel = "0"
934 ExpLabel = "0"
935 ForceZero = False
936 ChkZero = 0
937
938 Spread1.Protect = True
939 Spread1.MaxCols = 1
940 Spread1.MaxRows = 2
941 Spread1.Col = 0
942 Spread1.Row = 1
943 Spread1.Text = "Wavel."
944 Spread1.Col = 0
945 Spread1.Row = 2
946 Spread1.Text = " "
947 Spread1.Col = 1
948 Spread1.Row = 0
949 Spread1.Text = " "
950 Spread1.ColWidth(0) = 9
951 Spread1.Col = 1
952 Spread1.Row = 2
953 Spread1.Lock = True
954 Spread1.Col = 1
955 Spread1.Row = 1
956 Spread1.BackColor = RGB(255, 255, 0)
957 Spread1.SelectBlockOptions = 0
958
959 NoOfEvWavel = 0
960 CurrRow = 2
961 Modified = False
962
963 Unload LoadForm
964
965 If Not Help_File_In_Path() Then
966     sdump = "SPECEVAL.HLP not found in your path."
967     MsgBox sdump, 48, "Help not available"
968 End If
969 Exit Sub
970 Errh14:
971     Exists = False
972     Resume Next
973 End Sub
974 *****
975 Sub Form_Unload (Cancel As Integer)
976     Dim Ok As Integer
977     Ok = 1
978     If Modified Then
979         Ok = MsgBox("Exit whitout saving changes?", 1 + 32, "Result
980             Modified")
981     End If
982     If Ok = 1 Then
983         Open App.Path + "\ + "speceval.ini" For Output As #1
984         Print #1, "[Spectrum Evaluator]"
985         Print #1, "OMA III=" + CStr(OMAI)

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986     Print #1, "Working Directory=" + File1.Path
987     Print #1, "Use Correction File=" + CStr(UseCorr)
988     If UseCorr Then
989         Print #1, "Correction File=" + CorrFile
990     End If
991     Print #1, "Move Wavelength Scale=" + CStr(MoveWavel)
992     Print #1, "Move Correction Curve=" + CStr(MoveCorr)
993     Print #1, "Display Min Wavelength=" + CStr(DispMinVal)
994     Print #1, "Display Max Wavelength=" + CStr(DispMaxVal)
995     Print #1, "No Of Evaluation Channels=" + CStr(NoOfEvChans)
996     Print #1, "Added Constant To Curve=" + CStr(AddCon)
997     Print #1, "Use Spectrum Wavel.=" + CStr(UseSpWl)
998     Close #1
999     Else
1000         Cancel = 1
1001     End If
1002 End Sub
1003 *****
1004 Sub Graph_Paint ()
1005     DrawGraph
1006 End Sub
1007 *****
1008 Sub mnuAbout_Click ()
1009     frmAbout.Show 1
1010 End Sub
1011 *****
1012 Sub mnuAddCon_Click ()
1013     On Error GoTo Errh15
1014     Dim dump As Single
1015     If mnuAddCon.Checked Then
1016         mnuAddCon.Checked = False
1017         AddCon = 0
1018     Else
1019         dump = AddCon
1020         AddCon = InputBox("Enter constant to add to curve.", "Added
1021             Constant", CStr(AddCon))
1022         If AddCon <> 0 Then mnuAddCon.Checked = True
1023     End If
1024     If NoOfEvWavel > 0 Then Modified = True
1025     CalcArray
1026     DrawGraph
1027     Exit Sub
1028 Errh15:
1029     AddCon = dump
1030     Resume Next
1031 End Sub
1032 *****
1033 Sub mnuBackFile_Click ()
1034     On Error GoTo Errh93
1035     Dim fdump As Single
1036     Dim stdump As String
1037     Dim i As Integer
1038     Dim ldump As Long
1039
1040     If mnuBackFile.Checked Then
1041         mnuBackFile.Checked = False
1042         For i = 0 To MAXARR
1043             BackArr(i) = 0
1044         Next
1045     Else
1046         CMDialog1.DialogTitle = " Open Background File"
1047         CMDialog1.Flags = &H800& Or &H4& Or &H1000&
1048         CMDialog1.CancelError = True
1049         CMDialog1.InitDir = File1.Path
1050         CMDialog1.FileName = ""
1051         If OMAIII Then
1052             CMDialog1.Filter = "OMA III File (*.DAT)*.DAT"
1053             CMDialog1.Action = 1
1054             If CMDialog1.FileName <> "" Then
1055                 Open CMDialog1.FileName For Input As #1
1056                 For i = 1 To 4
1057                     Input #1, fdump
1058                 Next
1059                 For i = 0 To MAXARR
1060                     Input #1, BackArr(i)
1061                 Next

```

```

1062     Close #1
1063 End If
1064 Else
1065   CMDialog1.Filter = "CSMA File (*.SPE)*.SPE"
1066   CMDialog1.Action = 1
1067   If CMDialog1.FileName <> "" Then
1068     Open CMDialog1.FileName For Binary As #1
1069     For i = 1 To 1025
1070       Get #1, , ldump
1071     Next
1072     For i = 0 To MAXARR
1073       Get #1, , ldump
1074       BackArr(i) = ldump
1075     Next
1076     Close #1
1077   End If
1078 End If
1079   mnuBackFile.Checked = True
1080 End If
1081 CalcArray
1082 DrawGraph
1083 Exit Sub
1084 Errh93:
1085 Exit Sub
1086
1087 End Sub
1088 *****
1089 Sub mnuClear_Click ()
1090   Dim i, Ok As Integer
1091   Ok = 1
1092   If Modified Then
1093     Ok = MsgBox("Clear whitout saving changes?", 1 + 32, "Result
1094       Modified")
1095   End If
1096   If Ok = 1 Then
1097     Spread1.TopRow = 1
1098     If NoOfEvWavel = 0 Then
1099       Spread1.MaxRows = 2
1100       Spread1.Row = 2
1101       For i = 0 To Spread1.MaxCols
1102         Spread1.Col = i
1103         Spread1.Text = " "
1104       Next
1105     Else
1106       Spread1.MaxRows = 1
1107       Spread1.Row = 1
1108     End If
1109     CurrRow = 2
1110     Modified = False
1111   End If
1112 End Sub
1113 *****
1114 Sub mnuClWav_Click ()
1115   Dim i, Ok As Integer
1116   Ok = 1
1117   If Modified Then
1118     Ok = MsgBox("Clear whitout saving changes?", 1 + 32, "Result
1119       Modified")
1120   End If
1121   If Ok = 1 Then
1122     Spread1.TopRow = 1
1123     Spread1.MaxCols = 1
1124     Spread1.MaxRows = 2
1125     Spread1.Col = 1
1126     Spread1.Row = 0
1127     Spread1.Text = " "
1128     Spread1.Row = 1
1129     Spread1.Text = " "
1130     Spread1.Row = 2
1131     Spread1.Text = " "
1132     Spread1.Col = 0
1133     Spread1.Text = File1.FileName
1134     NoOfEvWavel = 0
1135     CurrRow = 2
1136     Modified = False
1137
1138   End If
1139 End Sub
1140 *****
1141 Sub mnuCont_Click ()
1142   Dim R As Integer
1143   R = WinHelp(hWnd, HelpFilePath, &H3, 0)
1144 End Sub
1145 *****
1146 Sub mnuCpyGrp_Click ()
1147   Dim i As Integer
1148   Dim strdump As String
1149   strdump = ""
1150   For i = Start To Stopp
1151     strdump = strdump + CStr(WavelArr(i)) + Chr$(9) +
1152       CStr(GraphArr(i)) + Chr$(10)
1153   Next
1154   Clipboard.Clear
1155   Clipboard.SetText strdump
1156 End Sub
1157 *****
1158 Sub mnuCpyRes_Click ()
1159   Spread1.Row = -1
1160   Spread1.Col = -1
1161   Clipboard.SetText Spread1.Clip
1162   Modified = False
1163 End Sub
1164 *****
1165 Sub mnuCSMA_Click ()
1166   If OMAIII Then
1167     UseCorr = False
1168     Check2.Value = 0
1169     OMAIII = 0
1170     mnuOMAIII.Checked = False
1171     mnuCSMA.Checked = True
1172     File1.Pattern = "*.SPE"
1173     MAXARR = 577
1174   End If
1175 End Sub
1176 *****
1177 Sub mnuDirectory_Click ()
1178   frmDir.Show 1
1179 End Sub
1180 *****
1181 Sub mnuExit_Click ()
1182   Unload Form1
1183 End Sub
1184 *****
1185 Sub mnuInpMask_Click ()
1186   InpMask = InputBox("Enter input file mask:", "Input Mask")
1187   File1.Pattern = InpMask
1188 End Sub
1189 *****
1190 Sub mnuLabel_Click ()
1191   LabelLabel = InputBox$("Enter a new label to the spectrum",
1192     "Label", LabelLabel.Text)
1193 End Sub
1194 *****
1195 Sub mnuOMAIII_Click ()
1196   If Not OMAIII Then
1197     UseCorr = False
1198     Check2.Value = 0
1199     OMAIII = 1
1200     mnuOMAIII.Checked = True
1201     mnuCSMA.Checked = False
1202     File1.Pattern = "*.DAT"
1203     MAXARR = 1023
1204   End If
1205 End Sub
1206 *****
1207 Sub mnuOpenCFile_Click ()
1208   On Error GoTo Errh92
1209   Dim fdump As Single
1210   Dim i, j, Order As Integer
1211   Dim Ext As String
1212   Dim ldump As Long
1213   Static Coeffs(0 To 5) As Double

```

```

1214 Static Chrs As String * 1
1215 Dim sdump As String
1216
1217 CMDialog1.Flags = &H800& Or &H4& Or &H1000&
1218 CMDialog1.CancelError = True
1219 CMDialog1.InitDir = File1.Path
1220 CMDialog1.DialogTitle = "Open Correction File"
1221 CMDialog1.FileName = CorrFile
1222 If OMAIII Then
1223   CMDialog1.Filter = "OMA III File (*.DAT)*.DAT"
1224   CMDialog1.Action = 1
1225   If CMDialog1.FileName <> "" Then
1226     i = MsgBox("Use wavelength cal. from correction file?", 32 + 4,
1227       "Wavel. Cal.")
1228     UseSpWl = True
1229     If i = 6 Then
1230       UseSpWl = False
1231       mnuWl.Checked = True
1232     End If
1233     CorrFile = CMDialog1.FileName
1234     Open CorrFile For Input As #1
1235     For i = 1 To 4
1236       Input #1, fdump
1237     Next
1238     For i = 0 To MAXARR
1239       Input #1, CorrArr(i)
1240     Next
1241
1242     For i = 1 To 2
1243       Input #1, fdump
1244     Next
1245     Input #1, sdump
1246     For i = 1 To 36
1247       Input #1, fdump
1248     Next
1249     If Not UseSpWl Then
1250       Input #1, WavelStart
1251       Input #1, DeltaWavel
1252
1253       For i = 0 To MAXARR
1254         WOrgArr(i) = WavelStart + DeltaWavel * i
1255       Next
1256     End If
1257     Close #1
1258   End If
1259 Else
1260   CMDialog1.Filter = "CSMA File (*.SPE)*.SPE|CSMA Text File
1261     (*.PRN)*.PRN"
1262   CMDialog1.Action = 1
1263   If CMDialog1.FileName <> "" Then
1264     i = MsgBox("Use wavelength cal. from correction file?", 32 + 4,
1265       "Wavel. Cal.")
1266     UseSpWl = True
1267     If i = 6 Then
1268       UseSpWl = False
1269       mnuWl.Checked = True
1270     End If
1271     CorrFile = CMDialog1.FileName
1272     Ext = Mid(CorrFile, InStr(CorrFile, ".") + 1)
1273     If UCase$(Ext) = "PRN" Then
1274       Open CorrFile For Input As #1
1275
1276       For i = 0 To MAXARR
1277         Input #1, fdump, CorrArr(i)
1278         If Not UseSpWl Then WOrgArr(i) = fdump
1279       Next
1280       Close #1
1281     Else
1282       Open CorrFile For Binary As #1
1283       For i = 1 To 27
1284         Get #1, , ldump
1285       Next
1286       Get #1, , j
1287       UseFloat = False
1288       If j = 0 Then UseFloat = True
1289       Get #1, , j
1290
1291       For i = 1 To 721
1292         Get #1, , ldump
1293       Next
1294       Get #1, , ldump
1295       If ldump = &H1234567 And (Not UseSpWl) Then
1296         For i = 1 To 102
1297           Get #1, , Chrs
1298         Next
1299         Order = Asc(Chrs)
1300         For i = 1 To 161
1301           Get #1, , Chrs
1302         Next
1303         For i = 0 To 5
1304           Get #1, , Coeffs(i)
1305         Next
1306         For i = 0 To MAXARR
1307           WOrgArr(i) = 0
1308           For j = 0 To Order
1309             WOrgArr(i) = WOrgArr(i) + Coeffs(j) * (i ^ j)
1310           Next
1311         Next
1312         For i = 1 To 797
1313           Get #1, , Chrs
1314         Next
1315         Else
1316           For i = 1 To 275
1317             Get #1, , ldump
1318           Next
1319         End If
1320       For i = 0 To MAXARR
1321         If UseFloat Then
1322           Get #1, , fdump
1323           CorrArr(i) = fdump
1324         Else
1325           Get #1, , ldump
1326           CorrArr(i) = ldump
1327         End If
1328       Next
1329       Close #1
1330     End If
1331
1332     WavelStart = WOrgArr(1)
1333     DeltaWavel = WOrgArr(2) - WOrgArr(2)
1334
1335     For i = 0 To MAXARR
1336       If CorrArr(i) <> 0 Then
1337         CorrArr(i) = (3.02299117E-28 * ((1 / ((-24.16706244 +
1338           WOrgArr(i)) * .000000001)) ^ 5) /
1339           (Exp(.000004243352 / ((-24.16706244 +
1340           WOrgArr(i)) * .000000001) - 1)) /
1341           CorrArr(i)
1342       Else
1343         CorrArr(i) = 0
1344       End If
1345     Next
1346
1347     For i = 0 To MAXARR
1348       If WOrgArr(i) >= 570 Then Exit For
1349     Next
1350
1351     If i > MAXARR Then i = MAXARR / 2
1352     fdump = CorrArr(i)
1353     If fdump = 0 Then fdump = 1
1354
1355     For i = 0 To MAXARR
1356       CorrArr(i) = CorrArr(i) / fdump
1357     Next
1358
1359     CalcArray
1360     DrawGraph
1361   End If
1362 End If
1363
1364 If UseCorr Then
1365   If NoOfEvWavel > 0 Then Modified = True

```

```

1366     CalcArray
1367     DrawGraph
1368     End If
1369     Exit Sub
1370
1371 Errh92:
1372     Exit Sub
1373 End Sub
1374 *****
1375 Sub mnuPrint_Click ()
1376     On Error GoTo errh96
1377     Dim i, s, j As Integer
1378     Dim Start As Integer
1379     Dim Stopp As Integer
1380     Dim X As Single
1381     Dim Y As Single
1382     Dim Steg2 As Single
1383     Dim CurrVal As Single
1384     Dim Steg As Long
1385     Dim CurrWl As Long
1386     Dim sdump, Sdump2 As Single
1387     Dim RefWl As Single
1388     Dim strdump As String
1389
1390     PrForm.Left = (Screen.Width - PrForm.Width) / 2
1391     PrForm.Top = (Screen.Height - PrForm.Height) / 2
1392     PrForm.Show
1393
1394     Printer.ScaleMode = 0
1395     Printer.ScaleLeft = -2
1396     Printer.ScaleTop = 11
1397     Printer.ScaleWidth = 13
1398     Printer.ScaleHeight = -13
1399     Printer.DrawWidth = 2
1400     Printer.FontName = "Times"
1401     Printer.FontSize = 10
1402
1403     Start = 0
1404     Stopp = MAXARR
1405     For i = 0 To MAXARR
1406         If WavelArr(i) >= DispMinVal And Start = 0 Then Start = i
1407         If WavelArr(i) >= DispMaxVal And Stopp = MAXARR Then
1408             Stopp = i
1409     Next
1410
1411     If AutoScale Then
1412         MaxVal = -100000
1413         MinVal = 100000
1414         For i = Start To Stopp
1415             If GraphArr(i) > MaxVal Then MaxVal = GraphArr(i)
1416             If GraphArr(i) < MinVal Then MinVal = GraphArr(i)
1417         Next
1418         If ForceZero Then MinVal = 0
1419         'Form1!Text3.Text = CStr(MinVal)
1420         'Form1!Text4.Text = CStr(MaxVal)
1421     End If
1422     If MaxVal <= MinVal Then
1423         MaxVal = MinVal + 1
1424     End If
1425
1426     Printer.Line (0, 0)-(10, 0), RGB(0, 0, 0)
1427     Printer.Line -(10, 10), RGB(0, 0, 0)
1428     Printer.Line -(0, 10), RGB(0, 0, 0)
1429     Printer.Line -(0, 0), RGB(0, 0, 0)
1430
1431     For i = Start To Stopp
1432         X = 10 * (WavelArr(i) - WavelArr(Start)) / (WavelArr(Stopp) -
1433             WavelArr(Start))
1434         Y = 10 * (GraphArr(i) - MinVal) / (MaxVal - MinVal)
1435         If Y >= 10 Then Y = 9.98
1436         If Y <= 0 Then Y = .02
1437         If i = Start Then
1438             Printer.CurrentX = X
1439             Printer.CurrentY = Y
1440         Else
1441             Printer.Line -(X, Y), RGB(255, 0, 0)
1442         End If
1443     Next
1444
1445     If DrawFit Then
1446         s = True
1447         For i = Start To Stopp
1448             If WavelArr(i) >= FitStart Then
1449                 X = 10 * (WavelArr(i) - WavelArr(Start)) /
1450                     (WavelArr(Stopp) - WavelArr(Start))
1451                 Y = 10 * (FitA + FitB * Exp(FitC * (WavelArr(i) - FitStart))
1452                     - MinVal) / (MaxVal - MinVal)
1453                 If Y >= 10 Then Y = 9.98
1454                 If Y <= 0 Then Y = .02
1455                 If s Then
1456                     Printer.CurrentX = X
1457                     Printer.CurrentY = Y
1458                     s = False
1459                 Else
1460                     Printer.Line -(X, Y), RGB(0, 0, 255)
1461                 End If
1462             End If
1463         Next
1464     End If
1465
1466     Steg2 = 10 ^ Int(Log(MaxVal - MinVal) / Log(10))
1467     If (MaxVal - MinVal) / Steg2 < 2 Then
1468         Steg2 = Steg2 / 5
1469     ElseIf (MaxVal - MinVal) / Steg2 < 5 Then
1470         Steg2 = Steg2 / 2
1471     End If
1472
1473     CurrVal = Steg2 * (Int(MinVal / Steg2) + 1)
1474     Do
1475         Y = 10 * (CurrVal - MinVal) / (MaxVal - MinVal)
1476         Printer.CurrentX = 0
1477         Printer.CurrentY = Y
1478         Printer.Line -Step(-.2, 0), RGB(0, 0, 0)
1479         If CurrVal = 0 Then Printer.Line -Step(10.2, 0), RGB(0, 0, 0)
1480         Printer.CurrentX = -Printer.TextWidth(CStr(CurrVal)) - .3
1481         Printer.CurrentY = Y + Printer.TextHeight(CStr(CurrVal)) / 2
1482         Printer.Print CurrVal
1483         CurrVal = CurrVal + Steg2
1484     Loop Until CurrVal > MaxVal
1485
1486     Steg = 10 ^ Int(Log(WavelArr(Stopp) - WavelArr(Start)) / Log(10))
1487     If (WavelArr(Stopp) - WavelArr(Start)) / Steg < 2 Then
1488         Steg = Steg / 5
1489     ElseIf (WavelArr(Stopp) - WavelArr(Start)) / Steg < 5 Then
1490         Steg = Steg / 2
1491     End If
1492
1493     CurrWl = Steg * (Int(WavelArr(Start) / Steg) + 1)
1494     For i = Start To Stopp
1495         If WavelArr(i) >= CurrWl Then
1496             X = 10 * (CurrWl - WavelArr(Start)) / (WavelArr(Stopp) -
1497                 WavelArr(Start))
1498             Printer.CurrentX = X
1499             Printer.CurrentY = 0
1500             Printer.Line -Step(0, -.2), RGB(0, 0, 0)
1501             Printer.CurrentX = X - Printer.TextWidth(CStr(CurrWl)) / 2
1502             Printer.CurrentY = -.3
1503             Printer.Print CurrWl
1504             CurrWl = CurrWl + Steg
1505         End If
1506     Next
1507     Printer.CurrentX = 4.6
1508     Printer.CurrentY = -.6
1509     Printer.Print "Wavelength (nm)"
1510
1511     If NoOfEvWavel > 0 Then
1512         For s = 1 To NoOfEvWavel
1513             For j = 0 To MAXARR
1514                 If EvalWavel(s) <= WavelArr(j) Then Exit For
1515             Next j
1516             sdump = 0
1517             Sdump2 = 0

```



```

1518 For i = j - NoOfEvChans / 2 To j - NoOfEvChans / 2 +
1519     NoOfEvChans - 1
1520     X = 10 * (WavelArr(i) - WavelArr(Start)) /
1521         (WavelArr(Stopp) - WavelArr(Start))
1522     Y = 10 * (GraphArr(i) - MinVal) / (MaxVal - MinVal)
1523     If Y >= 10 Then Y = 9.98
1524     If Y <= 0 Then Y = .02
1525     If X >= 10 Then X = 9.98
1526     If X <= 0 Then X = .02
1527     Printer.CurrentX = X
1528     Printer.CurrentY = Y
1529     Printer.Line -(X, 0), RGB(0, 255, 0)
1530     sdump = sdump + GraphArr(i)
1531     If DrawFit Then Sdump2 = Sdump2 + (GraphArr(i) - (FitA +
1532         FitB * Exp(FitC * (WavelArr(i) -
1533         FitStart))))
1534     Next i
1535
1536 Next s
1537 End If
1538 Printer.CurrentX = 0
1539 Printer.CurrentY = 10.5
1540 Printer.Print FileLabel.Text
1541 Printer.CurrentX = 3
1542 Printer.CurrentY = 10.5
1543 Printer.Print DateLabel.Text
1544 Printer.CurrentX = 6
1545 Printer.CurrentY = 10.5
1546 Printer.Print LabelLabel.Text
1547 If NoOfEvWavel > 0 Then
1548     Printer.CurrentX = 0
1549     Printer.CurrentY = -.9
1550     Spread1.Row = 0
1551     strdump = ""
1552     For i = 1 To Spread1.MaxCols
1553         Spread1.Col = i
1554         strdump = strdump + Spread1.Text + Chr$(9)
1555         If Len(Spread1.Text) < 7 Then strdump = strdump + Chr$(9)
1556     Next
1557     Printer.Print strdump
1558     Printer.CurrentX = 0
1559     Printer.CurrentY = -1.2
1560     Spread1.Row = CurrRow
1561     strdump = ""
1562     For i = 1 To Spread1.MaxCols
1563         Spread1.Col = i
1564         strdump = strdump + Spread1.Text + Chr$(9)
1565         If Len(Spread1.Text) < 7 Then strdump = strdump + Chr$(9)
1566     Next
1567     Printer.Print strdump
1568 End If
1569
1570 Printer.EndDoc
1571
1572 errh96:
1573     Unload PrForm
1574     Exit Sub
1575 End Sub
1576 *****
1577 Sub mnuPrSetUp_Click ()
1578     On Error GoTo errh95
1579     CMDialog1.FileName = "XXX.PS"
1580     CMDialog1.Flags = &H40& Or &H4&
1581     CMDialog1.Action = 5
1582     Exit Sub
1583 errh95:
1584     Exit Sub
1585 End Sub
1586 *****
1587 Sub mnuSave_Click ()
1588     On Error GoTo Errh90
1589     Dim i As Integer
1590     CMDialog1.Flags = &H4&
1591     CMDialog1.InitDir = File1.Path
1592     CMDialog1.DialogTitle = "Save Result"
1593     CMDialog1.CancelError = True
1594
1595     CMDialog1.Filter = "Text File (*.TXT)|*.TXT"
1596     CMDialog1.FileName = ""
1597     CMDialog1.Action = 2
1598     Open CMDialog1.FileName For Output As #1
1599     Spread1.Row = -1
1600     Spread1.Col = -1
1601     Print #1, Spread1.Clip
1602     Modified = False
1603     Close #1
1604     Exit Sub
1605 Errh90:
1606     Exit Sub
1607 End Sub
1608 *****
1609 Sub mnuWl_Click ()
1610     If mnuWl.Checked Then
1611         mnuWl.Checked = False
1612         UseSpWl = True
1613     End If
1614 End Sub
1615 *****
1616 Sub Spread1_Change (Col As Long, Row As Long)
1617     On Error GoTo Errh12
1618     Dim i As Integer
1619     Dim Txt As String
1620     If Col = 1 Then
1621         i = 1
1622     Else
1623         i = (Col - 2) / 3 + 2
1624     End If
1625     Spread1.Row = Row
1626     Spread1.Col = Col
1627     Txt = Spread1.Text
1628     EvalWavel(i) = Cdbl(Txt)
1629     Spread1.Row = 0
1630     Spread1.Text = Txt
1631     If Col = Spread1.MaxCols Then
1632         If i = 1 Then
1633             Spread1.MaxCols = Col + 1
1634         Else
1635             Spread1.MaxCols = Col + 3
1636         End If
1637     Spread1.Row = 1
1638     Spread1.Col = -1
1639     Spread1.BackColor = RGB(255, 255, 0)
1640     Spread1.Row = 0
1641     Spread1.Col = Spread1.MaxCols
1642     Spread1.Text = ""
1643     NoOfEvWavel = NoOfEvWavel + 1
1644 End If
1645 If i <> 1 Then
1646     Spread1.Col = Col + 1
1647     Spread1.Row = Row
1648     Spread1.Text = Txt + " Lift.off"
1649     Spread1.Lock = True
1650     Spread1.Row = 0
1651     Spread1.Text = Txt + " Li.off"
1652     Spread1.Col = Col + 2
1653     Spread1.Row = Row
1654     Spread1.Text = Txt + " Ratio"
1655     Spread1.Lock = True
1656     Spread1.Row = 0
1657     Spread1.Text = Txt + " Ratio"
1658 End If
1659 DrawM = 0
1660 Modified = True
1661 DrawGraph
1662 Exit Sub
1663 Errh12:
1664     If Col = Spread1.MaxCols Then
1665         Spread1.Text = ""
1666     Else
1667         Spread1.Text = CStr(EvalWavel(i))
1668     End If
1669 Exit Sub

```

```

1670 End Sub
1671 *****
1672 Sub Text1_KeyPress (KeyAscii As Integer)
1673   If (KeyAscii < 48 Or KeyAscii > 57) And KeyAscii <> 8 Then
1674     KeyAscii = 0
1675 End Sub
1676 *****
1677 Sub Text1_LostFocus ()
1678   Dim i As Long
1679   On Error GoTo Errh
1680   i = CLng(Text1.Text)
1681   If i < WavelArr(0) Or i > (DispMaxVal - 10) Then
1682     Text1.Text = CStr(DispMinVal)
1683   Else
1684     DispMinVal = i
1685     DrawGraph
1686   End If
1687 Exit Sub
1688
1689 Errh:
1690   i = 0
1691   Resume Next
1692 End Sub
1693 *****
1694 Sub Text2_KeyPress (KeyAscii As Integer)
1695   If (KeyAscii < 48 Or KeyAscii > 57) And KeyAscii <> 8 Then
1696     KeyAscii = 0
1697 End Sub
1698 *****
1699 Sub Text2_LostFocus ()
1700   Dim i As Long
1701   On Error GoTo Errh2
1702   i = CLng(Text2.Text)
1703   If i > WavelArr(MAXARR) Or i < (DispMinVal + 10) Then
1704     Text2.Text = CStr(DispMaxVal)
1705   Else
1706     DispMaxVal = i
1707     DrawGraph
1708   End If
1709 Exit Sub
1710 Errh2:
1711   i = 0
1712   Resume Next
1713 End Sub
1714 *****
1715 Sub Text3_KeyPress (KeyAscii As Integer)
1716   If (KeyAscii < 45 Or KeyAscii > 57 Or KeyAscii = 47) And
1717     KeyAscii <> 69 And KeyAscii <> 101 And
1718     KeyAscii <> 8 Then KeyAscii = 0
1719 End Sub
1720 *****
1721 Sub Text3_LostFocus ()
1722   Dim i As Single
1723   On Error GoTo Errh3
1724   i = CSng(Text3.Text)
1725   If i >= MaxVal Then
1726     Text3.Text = CSng(MinVal)
1727   Else
1728     MinVal = i
1729     Check1.Value = 0
1730     DrawGraph
1731   End If
1732 Exit Sub
1733
1734 Errh3:
1735   i = 0
1736   Resume Next
1737 End Sub
1738 *****
1739 Sub Text4_KeyPress (KeyAscii As Integer)
1740   If (KeyAscii < 45 Or KeyAscii > 57 Or KeyAscii = 47) And
1741     KeyAscii <> 69 And KeyAscii <> 101 And
1742     KeyAscii <> 8 Then KeyAscii = 0
1743 End Sub
1744 *****
1745 Sub Text4_LostFocus ()
1746   Dim i As Single
1747   On Error GoTo Errh4
1748   i = CSng(Text4.Text)
1749   If i <= MinVal Then
1750     Text3.Text = CSng(MaxVal)
1751   Else
1752     MaxVal = i
1753     Check1.Value = 0
1754     DrawGraph
1755   End If
1756 Exit Sub
1757
1758 Errh4:
1759   i = 0
1760   Resume Next
1761 End Sub

```

7.3 SPEC DIR.FRM

```

1 VERSION 2.00
2 Begin Form frmDir
3   Caption = "Directory"
4   ClientHeight = 2430
5   ClientLeft = 1155
6   ClientTop = 2970
7   ClientWidth = 3540
8   Height = 2835
9   Left = 1095
10  LinkTopic = "Form2"
11  ScaleHeight = 2430
12  ScaleWidth = 3540
13  Top = 2625
14  Width = 3660
15  Begin CommandButton Cancel
16    Caption = "Cancel"
17    Height = 492
18    Left = 240
19    TabIndex = 3
20    Top = 1680
21    Width = 1092
22  End
23  Begin CommandButton OK
24    Caption = "OK"
25    Height = 492
26    Left = 240
27  TabIndex = 2
28  Top = 960
29  Width = 1092
30  End
31  Begin DirListBox Dir1
32    Height = 1968
33    Left = 1800
34    TabIndex = 1
35    Top = 240
36    Width = 1572
37  End
38  Begin DriveListBox Drive1
39    Height = 288
40    Left = 240
41    TabIndex = 0
42    Top = 240
43    Width = 1332
44  End
45  End
46  Option Explicit
47  *****
48  Sub Cancel_Click ()
49    Unload frmDir
50  End Sub
51  *****
52  Sub Drive1_Change ()
53    Dir1.Path = Drive1.Drive
54  End Sub
55  *****

```

```

56 Sub Form_Load ()
57     Drive1.Drive = Form1.File1.Path
58     Dir1.Path = Form1.File1.Path
59 End Sub
60 *****

```

7.4 SPECLOAD.FRM

```

1 VERSION 2.00
2 Begin Form LoadForm
3     Caption = "Loading"
4     ClientHeight = 1500
5     ClientLeft = 4830
6     ClientTop = 4140
7     ClientWidth = 4005
8     ControlBox = 0 'False
9     Height = 1905
10    Left = 4770
11    LinkTopic = "Form2"
12    MaxButton = 0 'False
13    MinButton = 0 'False
14    ScaleHeight = 1500
15    ScaleWidth = 4005

```

7.5 SPECPRINT.FRM

```

1 VERSION 2.00
2 Begin Form PrForm
3     Caption = "Printing"
4     ClientHeight = 1245
5     ClientLeft = 4170
6     ClientTop = 3855
7     ClientWidth = 3300
8     Height = 1650
9     Left = 4110
10    MaxButton = 0 'False
11    MinButton = 0 'False
12    ScaleHeight = 1245
13    ScaleWidth = 3300
14    Top = 3510

```

7.6 SPECABOU.FRM

```

1 VERSION 2.00
2 Begin Form frmAbout
3     Caption = "About Spectrum Evaluator"
4     ClientHeight = 1650
5     ClientLeft = 4920
6     ClientTop = 3720
7     ClientWidth = 4500
8     Height = 2055
9     Left = 4860
10    LinkTopic = "Form2"
11    MaxButton = 0 'False
12    MinButton = 0 'False
13    ScaleHeight = 1650
14    ScaleWidth = 4500
15    Top = 3375
16    Width = 4620
17    Begin CommandButton btnOK
18        Caption = "OK"
19        Height = 372
20        Left = 3240
21        TabIndex = 2
22        Top = 1080
23        Width = 972
24    End
25    Begin PictureBox Picture1
26        AutoSize = -1 'True
27        Height = 510
28        Left = 240
29        Picture = SPECABOU.FRX:0000
30        ScaleHeight = 480

```

```

61 Sub OK_Click ()
62     Form1.File1.Path = Dir1.Path
63     Unload frmDir
64 End Sub

```

```

16 Top = 3795
17 Width = 4125
18 Begin Label Label1
19     Alignment = 2 'Center
20     Caption = "Loading Spectrum Evaluator"
21     FontBold = -1 'True
22     FontItalic = 0 'False
23     FontName = "MS Sans Serif"
24     FontSize = 13.5
25     FontStrikethru = 0 'False
26     FontUnderline = 0 'False
27     Height = 855
28     Left = 120
29     TabIndex = 0
30     Top = 360
31     Width = 3615
32 End
33 End

```

```

15 Width = 3420
16 Begin Label Label1
17     Alignment = 2 'Center
18     Caption = "Printing"
19     FontBold = -1 'True
20     FontItalic = 0 'False
21     FontName = "MS Sans Serif"
22     FontSize = 12
23     FontStrikethru = 0 'False
24     FontUnderline = 0 'False
25     Height = 375
26     Left = 720
27     TabIndex = 0
28     Top = 360
29     Width = 1575
30 End
31 End

```

```

31 ScaleWidth = 480
32 TabIndex = 1
33 Top = 1080
34 Width = 510
35 End
36 Begin Label Label4
37     Alignment = 2 'Center
38     Height = 255
39     Left = 1560
40     TabIndex = 5
41     Top = 1080
42     Width = 1215
43 End
44 Begin Label Label3
45     Alignment = 2 'Center
46     Caption = "Lund Medical Lasercenter, Lund, Sweden"
47     Height = 255
48     Left = 240
49     TabIndex = 4
50     Top = 720
51     Width = 3855
52 End
53 Begin Label Label2
54     Alignment = 2 'Center
55     Caption = "by Roger Berg"
56     Height = 255
57     Left = 1080
58     TabIndex = 3
59     Top = 480
60     Width = 2175
61 End
62 Begin Label Label1
63     Alignment = 2 'Center

```

```
64 Caption = "Spectrum Evaluator ver. 1.1"
65 FontBold = -1 'True
66 FontItalic = 0 'False
67 FontName = "MS Sans Serif"
68 FontSize = 9.75
69 FontStrikethru = 0 'False
70 FontUnderline = 0 'False
71 Height = 255
72 Left = 600
73 TabIndex = 0
74 Top = 120
75 Width = 3135
76 End

77 End
78 *****
79 Sub btnOK_Click ()
80     Unload frmAbout
81 End Sub
82 *****
83 Sub Form_Load ()
84     Dim sdump As String
85     sdump = App.Path + "\SPECEVAL.EXE"
86     Label4 = Format(FileDateTime(sdump), "General Date")
87     frmAbout.Left = (Screen.Width - frmAbout.Width) / 2
88     frmAbout.Top = (Screen.Height - frmAbout.Height) / 2
89 End Sub
```