# Application Note 34: Analysis of German Meat Samples

**Introduction:**

NIR transmission analysis is a proven technique for measuring fat, protein and moisture content of processed and raw meats. This study was a preliminary evaluation of the NIT-38 Meat Analyser to measure fat, protein and moisture in small goods, ie, sausage and salami mixes.

**Description:**

12 samples of various processed meats were provided with data for fat, protein and moisture as determined by the Foss Infratec Meat Analyser. Each sample was scanned in the NIT-38 Meat Analyser using a Squeeze Cell with a 10mm pathlength. Approximately 100 grams of meat was placed into the squeeze cell and compressed between the two glass windows. The cell was inspected for holes in the meat sample and for even spread across the cell. The cell was loaded into the NIT-38 and five scans were collected using a variable integration time of between 10 and 20mseconds per pixel. Duplicate scans for each sample were collected. Figure 1. shows the scans of the samples of meat.

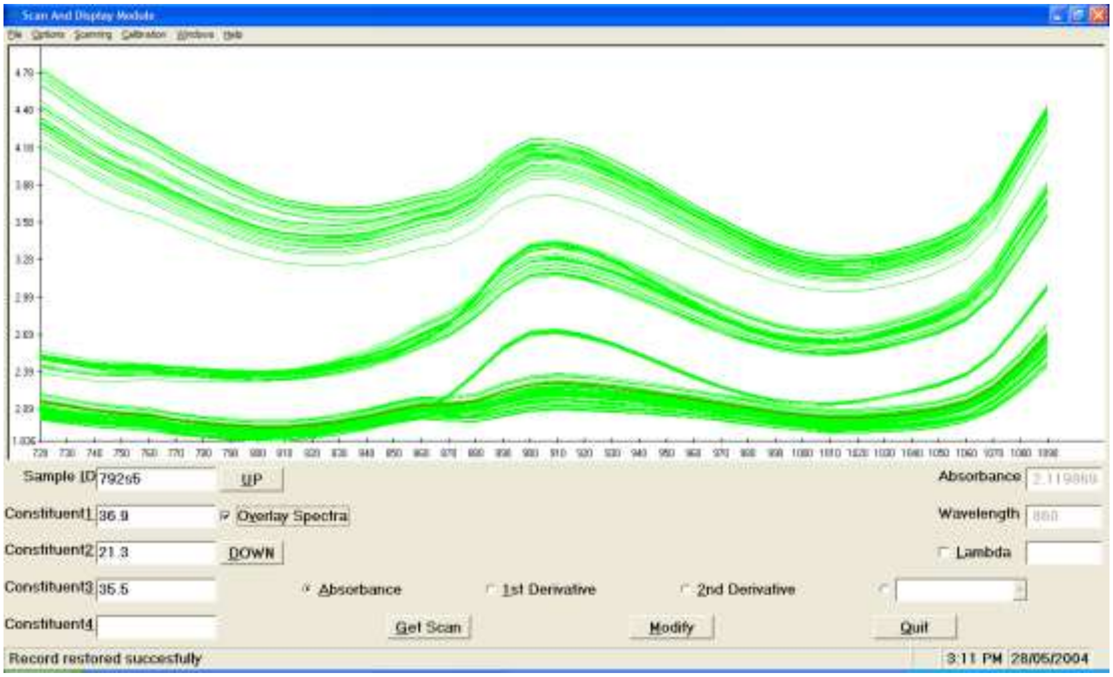


Figure 1. Absorbance spectra of 12 processed meat samples, each with five scans.

Note that the spectra exhibited considerable baseline shifts and spectral features due to the different types of meat, ie, sausage, salami, raw ham. To reduce the baseline shifts, the second derivative spectra were computed. Figure 2. shows the second derivative spectra of the meat samples.

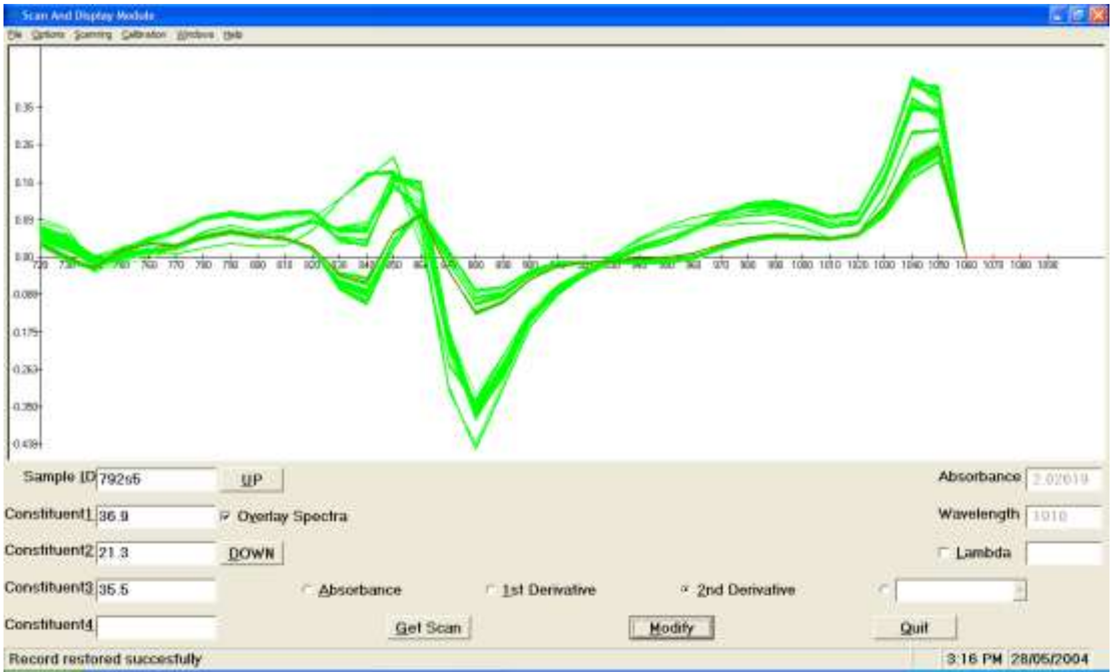


Figure 2. Second Derivative spectra of processed meat samples.

A further refinement was to apply MSC(Multiplicative Scatter Correction) to the spectra, as shown in figure 3. MSC is used to correct for variations in effective pathlength due to packing density and particle size. Although the meat samples were packed consistently, the different meats had significantly different proportions of moisture and fat. As such MSC is a suitable math treatment to convert all the spectra to a common optical density.

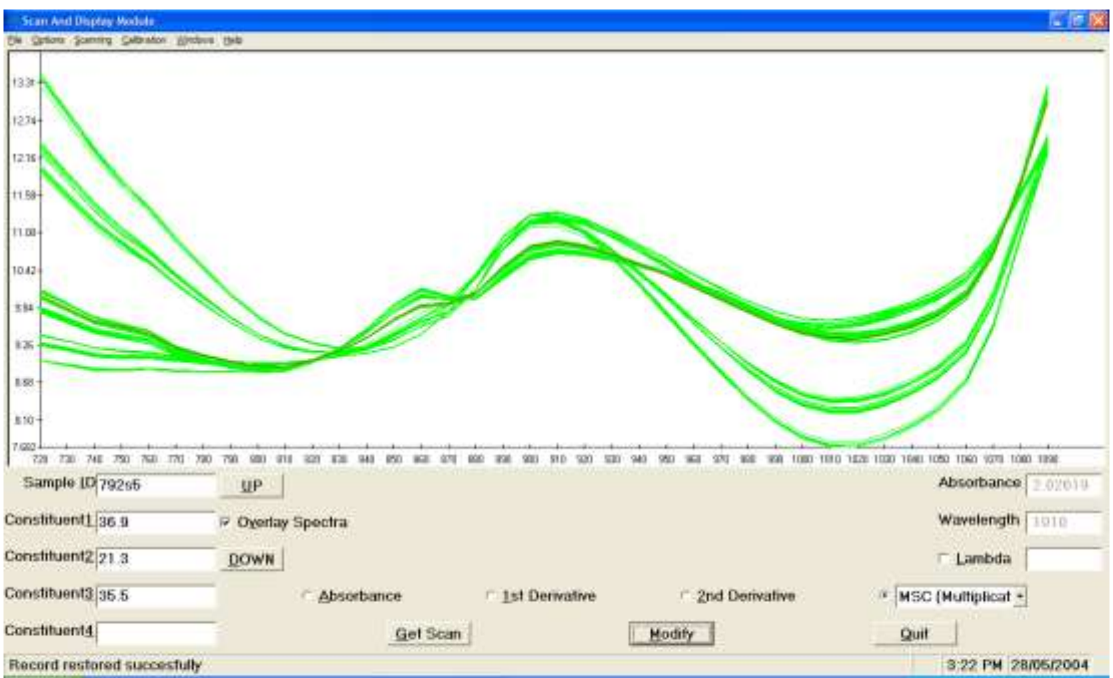


Figure 3. MSC Spectra of processed meat samples.

**Calibration Data**

NTAS (NIR Technology Australia Software) chemometrics software was used to perform PLS (Partial Least Squares Regression) analysis on the above meat samples.

Figure 4, 5 and 6 shows the calibration plots of the NIT-38 Predicted vs the Infratec for constituents Fat, Protein and Moisture respectively. These calibrations were performed using Absorbance spectra.

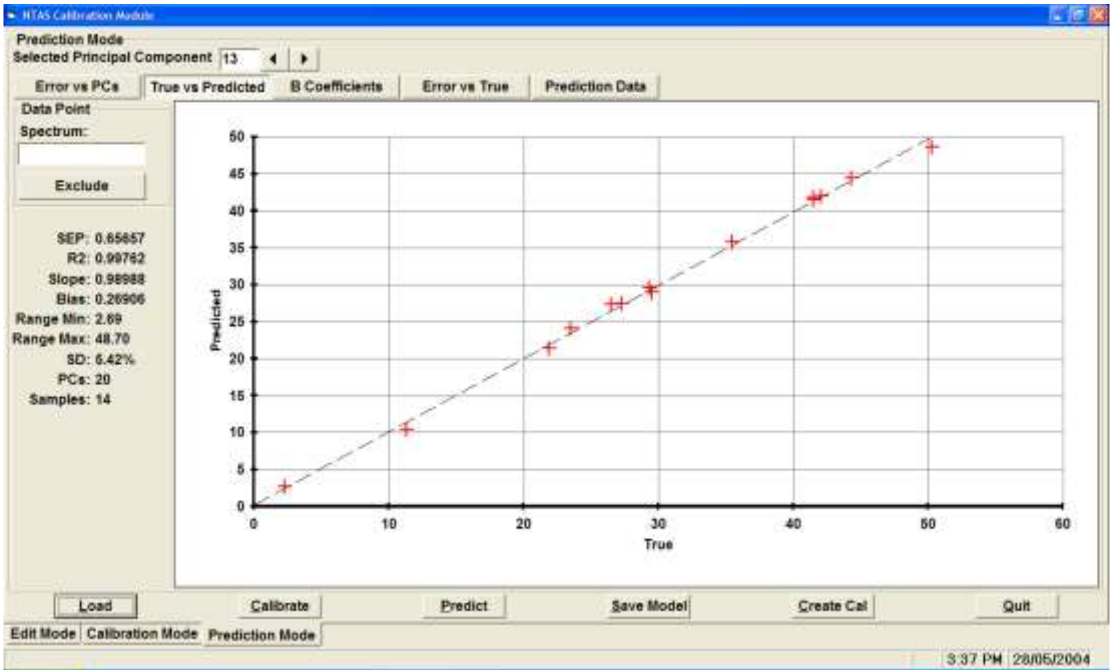


Figure 4. Calibration plot for Fat.

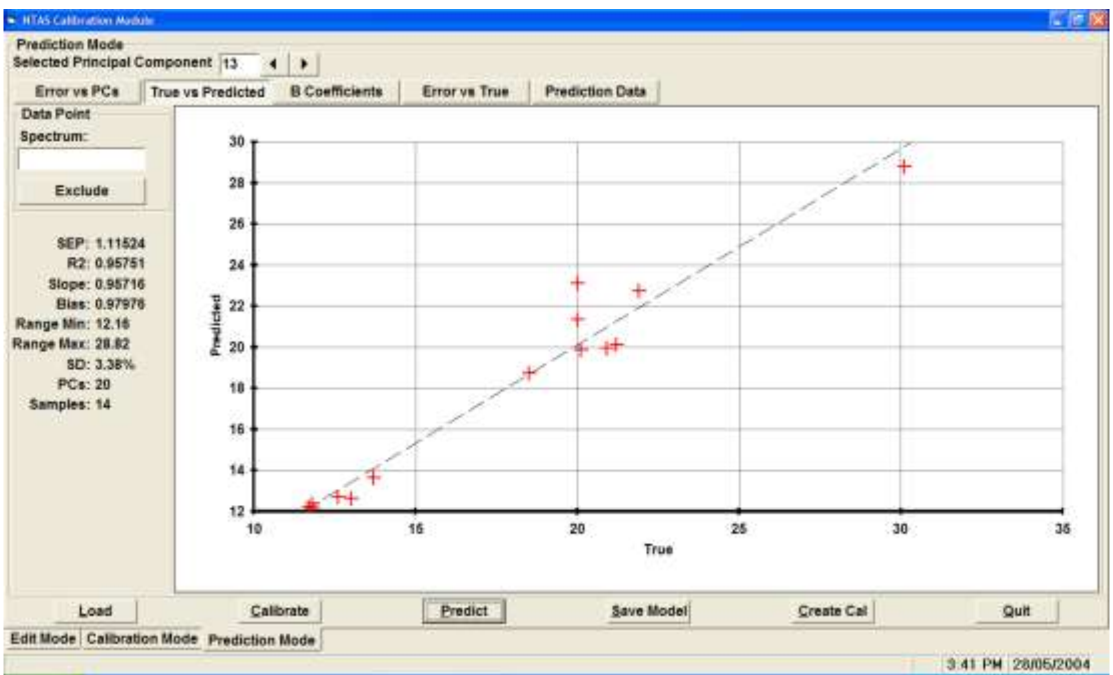


Figure 5. Calibration plot for Protein.

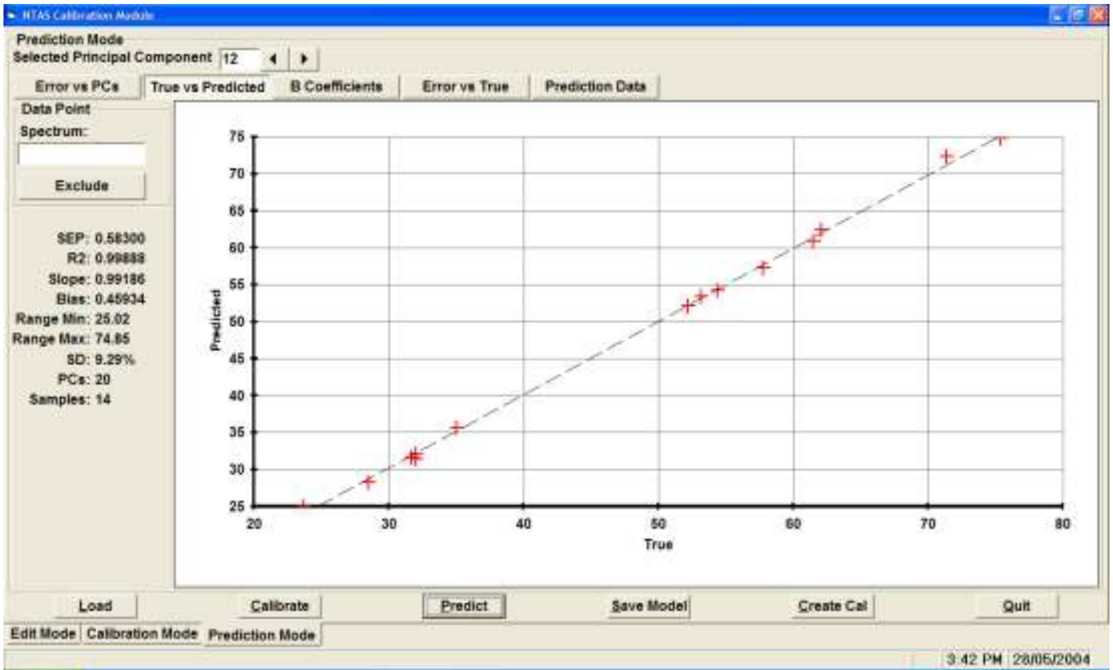


Figure 6. Calibration plot for Moisture.

The second derivative spectra did not provide any significant improvement in calibration data as compared to the Absorbance spectra. However the MSC spectra provided an improvement. Figures 7, 8 and 9 show the calibration plots for the Fat, Protein and Moisture using MSC spectra.

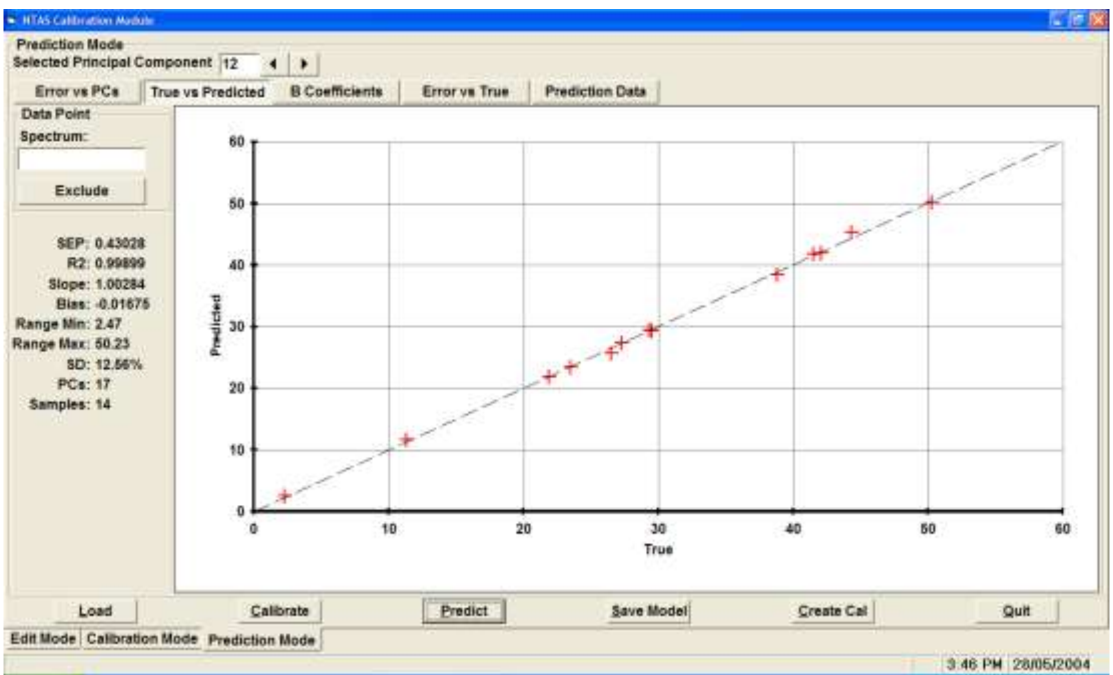


Figure 7. MSC Spectra calibration plot for Fat.

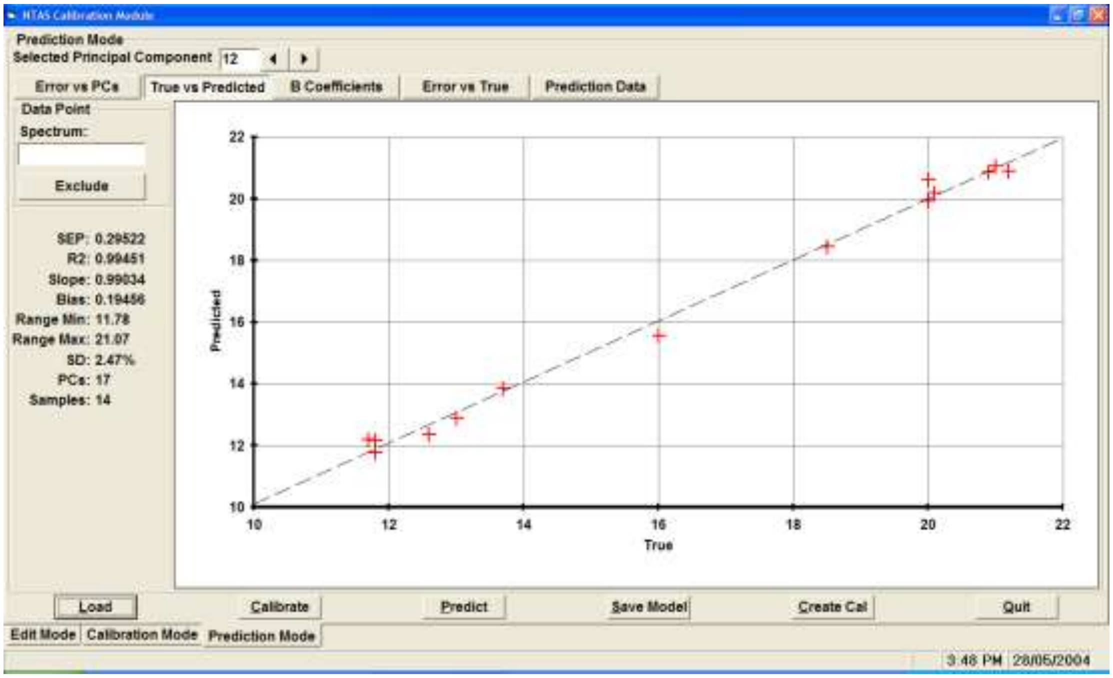


Figure 8. MSC Spectra calibration plot for Protein.

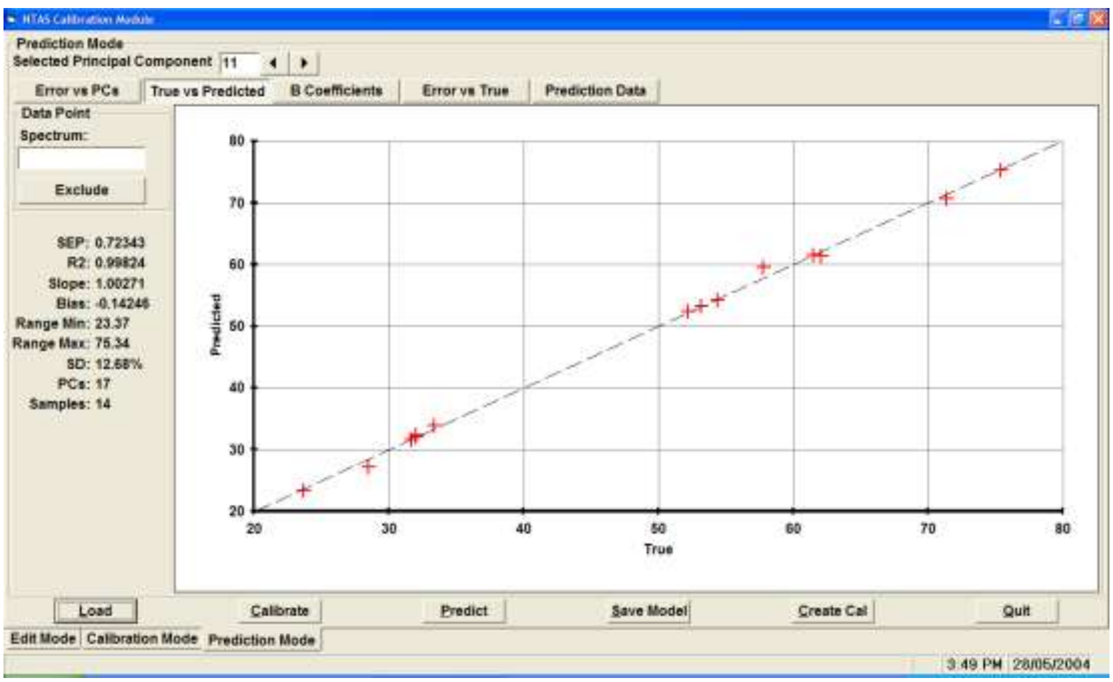


Figure 9. MSC Spectra calibration plots for Moisture.

**Comments:**

The data presented in this study is only calibration data. It does not provide an absolute evaluation of the NIT-38 for prediction of meat samples. With the limited number of samples available, it was not possible to develop calibrations for each type of meat. In general, several calibration models are used by the Infratec Meat Analyser to provide more accurate models for predicting each type of meat sample. Nonetheless, it is considered that this preliminary study shows that the NIT-38 Meat Analyser has the ability to provide comparable data to the Infratec Meat Analyser.