

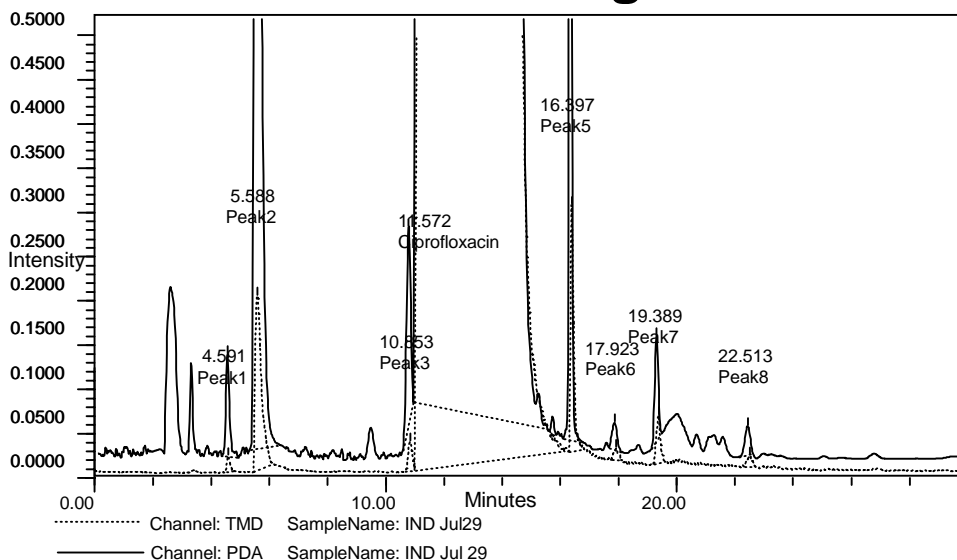
Waters Integrity System Applications

The Use of the Waters Integrity System for the Identification of Minor Impurities in Ciprofloxacin

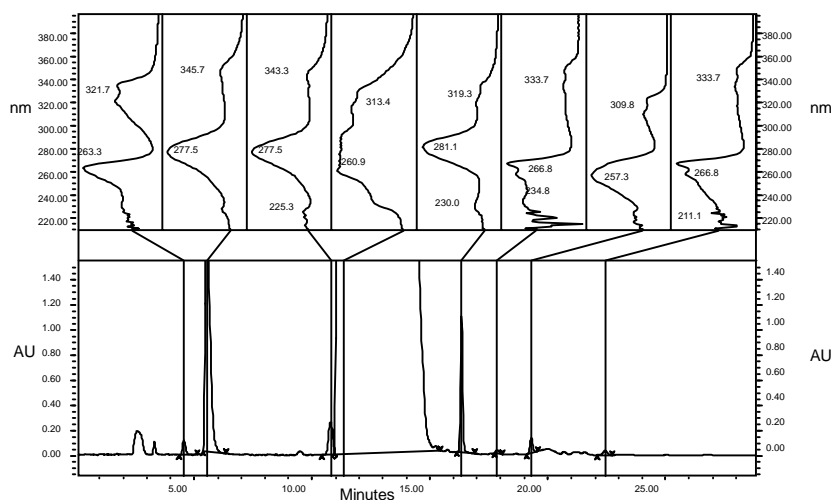
Highlights: Detection and identification of Ciprofloxacin impurities using combined PDA/MS detection and automated library search capabilities.

Impurity identification is becoming increasingly significant in regulated environments, and detection and identification of impurities at the ~0.1% level is critical. Since compound identification based solely on retention time is not absolute, the dual detection capabilities of the Integrity System is extremely useful for the absolute identification of impurities in pharmaceutical materials. Low dispersion chromatography is also becoming more and more desirable in the pharmaceutical industry. What follows demonstrates the use of the Integrity system for the detection and identification of such impurities in Ciprofloxacin, a very powerful broad spectrum antibiotic of the cephalosporin type.

Ciprofloxacin Overlay of PDA and MS Chromatograms

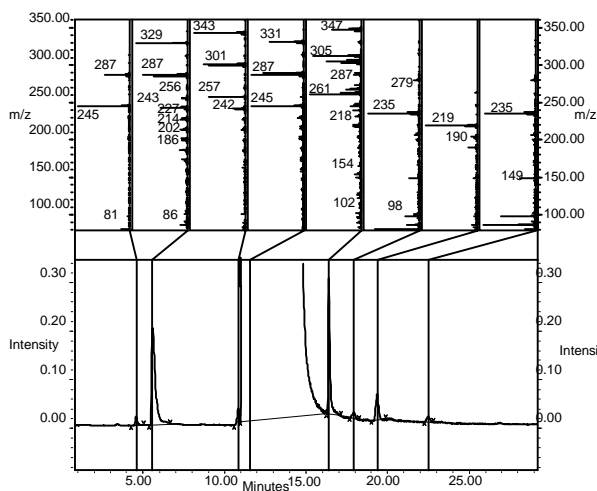


The ability to overlay PDA and MS chromatograms is unique to the Integrity System. Note there is almost no loss of chromatographic resolution when going from the PDA detector through the ThermoBeam mass spec interface. Both UV spectra and mass spectra can be acquired for each peak from the same sample injection and these can be used for compound identification.



The Spectrum Index Plot is one unique way that Millennium can display 996 PDA data. In the diagram at left, the UV spectrum over the preselected wavelength range is displayed for each chromatographic peak representing the individual compounds. Below, the mass spectra for each peak is displayed over the chromatogram. The spectral profile (PDA or MS) of each peak can be automatically compared, in Millennium software, to spectra stored in a user created library. By displaying the data in this way, some similarities in the spectra are seen which indicate the similarity of the compounds.

Ciprofloxacin TMD Spectrum Index Plot



The Spectrum Index Plot of Ciprofloxacin shows the compounds of interest and their molecular weights in the table to the right. It is very easy to pick out the identity of the compounds of interest and where they elute in the chromatography from the MS data and associated chromatogram.

Compound	MW
Ciprofloxacin	331
Byproduct A	347
Decarboxylated Compound	287

Positive identification of minor impurities is easily achieved using the Integrity LC/MS System. Simultaneous acquisition of PDA and MS data on a single injection and seamless processing and reporting of both channels of data as well as automated library search capabilities offer confidence in peak identification. In this example, Millennium Spectrum Index Plot displays the PDA and MS spectra of each chromatographic peak for powerful visual inspection and comparison of data.