Increasing Productivity Through the Automation of the SPF-290AS™

The automated X-Y Sampling Stage option for the SPF-290AS™ will reduce the cost and improve both the repeatability and accuracy of SPF measurements.

This computer controlled accessory to the SPF-290AS™ provides two modes of operation:

- Programmed Readings – multiple readings are taken across a sample, compensating for variations in sample spreading, and,
- Time-Based Mode – which measures changes in SPF values over time and can only be accomplished with the X-Y Sampling Stage option.

As a result of the X-Y stage's automation, technicians are freed to carryout other work while the SPF-290AS™ takes the series of user-programmed measurements and computes the results.

Programmed Readings – Autoscan

In order to compensate for variations in sample thickness and to demonstrate sample spreading consistency, the X-Y Stage can read up to 12 pre-defined positions on the sample. The positions correspond to a set of non-overlapping reading circles that cover the sample area (Figure 1). These positions can be read using a choice of three modes: a fixed grid, a randomly generated grid or a user defined grid.

Figure 1A Scan Editing Screen

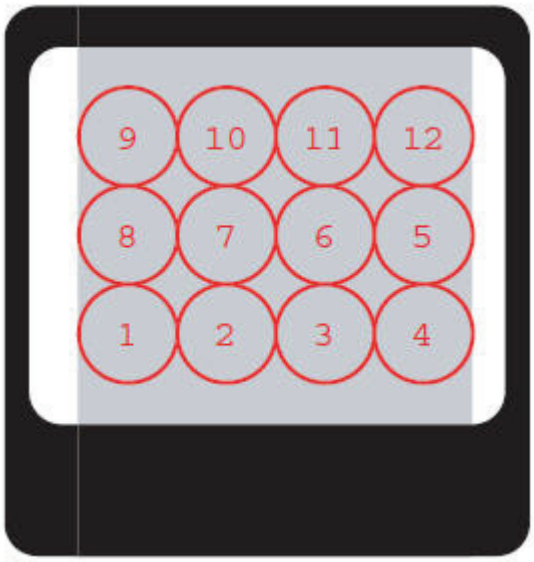

Figure 1B Reading Locations

In the fixed grid mode, the operator can choose the number of scans for a sample run and the software will refer to its stored patterns for sample positions (see table below - Figure 2). The stored patterns are designed to provide a spread of measurements across the sample. The user can add scans to the pattern. The additional scan(s) are chosen from the "Subsequent Sequence" list (Figure 2). For example, you may have chosen 6 scans [at pre-programmed positions 4, 9, 12, 1, 7, 6] and then added an additional scan. The system will add position 10 from the "Subsequent Sequence" list for the seventh scan. This provides flexibility in the sampling process. A sample report for six scans is shown in figure 3.

# of Scans	Initial Sequence	Subsequent Sequence
1	4	12, 9, 1, 7, 6, 5, 8, 2, 3, 10, 11
2	4, 9	12, 1, 7, 6, 5, 8, 2, 3, 10, 11
3	12, 6, 1	4, 7, 9, 10, 11, 2, 3, 8, 5
4	4, 7, 11, 9	1, 6, 10, 12, 5, 8, 2, 3
5	2, 10, 3, 12, 8	9, 5, 1, 4, 11, 6, 7
6	4, 9, 12, 1, 7, 6	10, 3, 11, 2, 5, 8
7	4, 6, 3, 11, 2, 9, 5	10, 12, 1, 7, 8
8	1, 2, 3, 4, 5, 6, 7, 8	9, 10, 11, 12
9	1, 2, 3, 4, 5, 6, 7, 8, 9	10, 11, 12
10	1, 2, 3, 4, 5, 6, 7, 8, 9, 10	11, 12
11	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11	12
12	4, 9, 1, 7, 6, 11, 2, 8, 5, 3, 10, 12	

Figure 2 Scans

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The random grid mode is used when less than the full 12 positions are being read and the user wants to eliminate any bias in the choice of reading positions. The computer's random number generator determines which reading positions are to be used.

The user specified grid mode can be used when a smaller sample substrate (such as Vitroskin) is used.

Once set, the operation, data collection and reporting of results are performed automatically. The stage moves the sample on the holder into the light beam, takes the measurements, moves to the next position and continues until all the measurements have been completed.

Time-Based Mode

In the course of developing sun-screen formulations it may useful to evaluate them over a period of time to determine the effects of drying and exposure to air and light. The Time-Based Mode provides this function and produces reports of SPF value (Figure 4) and/or Cumulative Absorbance (Figure 5) as a function of time. Once a sampling position has been selected, the controller will make the initial scan, wait the specified time delay, and then repeat the measurements until the study is complete.

Twelve measurements can be taken with the time interval between measurements ranging from less than a minute up to an hour, giving a maximum test duration of eleven hours. During the time delay, the sample can be moved to an "out of beam" position to avoid exposure to the light beam. The sample can also be removed from the instrument for processing (simulated weathering for example), and then replaced for a measurement; a count-down timer on the screen alerts the operator to replace the sample for the next reading.

Measurement Information

Date:	5/29/01	Substrate:	Transpore	Sample Name:	HS8
Time:	2:56:47 PM	Sample Prep:	2 ul/cm^2	Setup Filename:	assay.par
Operator:	GL	Num. of Scans:	6	Data Filename:	167HS8.sp1
Wavelength Range:	290 to 400	Num. of Ref:	1	Solar Filename:	wg320 sim.sol
Measurement Standard:	US FDA	Wavelength Step:	5 nm	Erythema Filename:	erythema.act

Summary Results

	Value	STDV
Solar Protection Factor:	4.56	0.78
UVA/UVB ratio:	0.306	0.03
Boots Star Rating:	1	Minimum
Average UVA PF:	2.77	0.49
Erythemal UVA PF:	2.98	0.38
Critical Wavelength:	371	2.96
Curve Area:	58.23	7.65

Measurement Parameters

Parameter	Value
SPF STDV:	Classical
Excluded Runs/Scans:	
Operating Mode:	Assay
Assay STDV:	N/A
Assay Skip Ref:	N/A
Time-Based Mode:	N/A
Time-Based Delay:	N/A

Figure 3A Graph Report

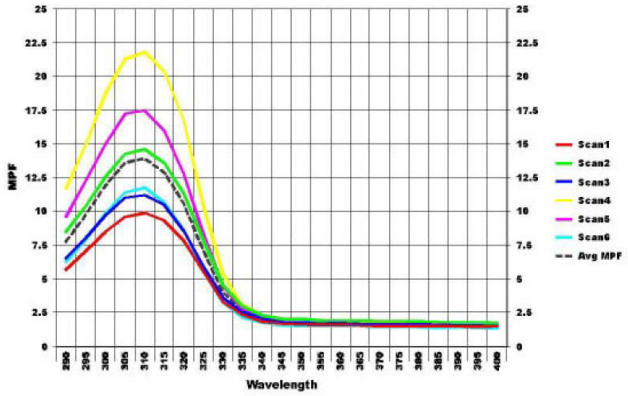

Figure 3B Graph Report

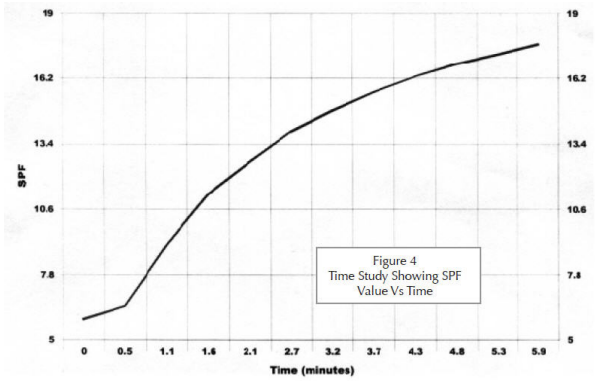

Figure 4 SPF Value Vs Time

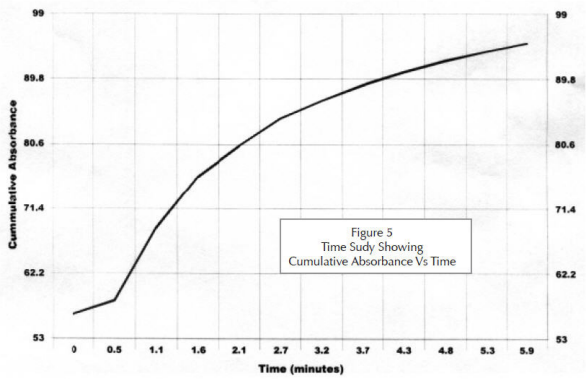

Figure 5 Cumulative Absorbance Vs Time