Reliable Transfer of Existing Agilent 6890/5973 GC/MSD Methods to the New 7890/5975 GC/MSD

Application

Gas Chromatography/Mass Spectroscopy

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Abstract

The performance of the Agilent Technologies' new series of instruments, the 7890 Series GC and 5975 Series MSD, is compared to that of the previous versions, the 6890 Series GC and the 5973 Series MSD. Performance is shown to be fully equivalent in test comparisons using a 16-component polynuclear aromatic hydrocarbon (PAH) sample. Excellent reproducibility and calibration characteristics were obtained. These results indicate that one can migrate a method currently running on a 6890/5973 system to a 7890/5975 system with high confidence that the performance will be equivalent or better.

Introduction

Agilent Technologies recently introduced new gas chromatograph and mass spectrometer platforms, the 7890 Series GC and the 5975 Series MSD, containing improved software, firmware, and hardware over the prior series, the 6890 GC and the 5973 MSD.

It was necessary to validate instrument performance of the 7890 Series GC for methods previously created and run on 6890 Series instrument to ensure equivalence. It was also desirable to demonstrate the ease of method transfer from existing 6890 GC methods using the prior ChemStation software to new 7890A GC methods using the new ChemStation software.

Table 1. System Configurations Compared

6890 System configuration	7890A System configuration
Agilent 6890A GC	Production prototype 7890 Series GC
S/SI inlet	S/SI inlet
ALS + tray	7683 ALS + tray
Agilent 5973N MSD	Agilent 5975B MSD
Diffusion pump	Standard turbo
Inert E.I. source	Inert E.I. source
ChemStation 1701 DA version D.00.01	ChemStation 1701DA version D.03.00

The method conditions used for this comparison were similar and are summarized in Table 2.

Table 2. Semivolatiles Method Conditions

Column	HP-5 MS, 25 m x 250 µm id (p/n 19091S-433)
Carrier gas	He, constant pressure mode, nominal 13 psig
RTL	Anthracene @ 8.300 min
Split/splitless inlet	300 °C, pulsed splitless: 25 psig for 0.3 min, 30 mL/min purge @ 0.75 min
Oven	55 °C (1 min) → 320 °C (3 min) @ 25 °C/min; total time 14.60 min
Sample	1-µL injection of PAHs in 0.32 to 10 ppm concentration range
MSD	Scan 45 to 400 u Samples = 2^2 Autotune EM offset +200 V Source = 230 °C Quad = 150 °C Transfer line = 280 °C

Experimental

Our goals were to determine the performance metrics on a current 6890 GC for a typical retention time locked method, to transfer method conditions to a new 7890A GC and relock, and to determine the 7890A performance metrics and compare them to those of the 6890. The system configurations used are shown in Table 1.

Results and Discussion

The test sample contained 16 different polynuclear aromatic hydrocarbons (PAHs), covering a wide range of physical properties. Total ion chromatograms (TICs), derived from each of the Agilent systems are compared in Figure 1. The comparison reveals a very high level of reproduciblity.

More detailed comparisons for selected PAHs are shown in Figures 2 and 3.

We note from the TICs shown in Figures 1 to 3 that the performance of both systems is nearly identical. The reproducibility data for all 16 PAHs are shown in Table 3, along with the delta RT, illustrating the ability to move methods between systems without the need for method redevelopment.

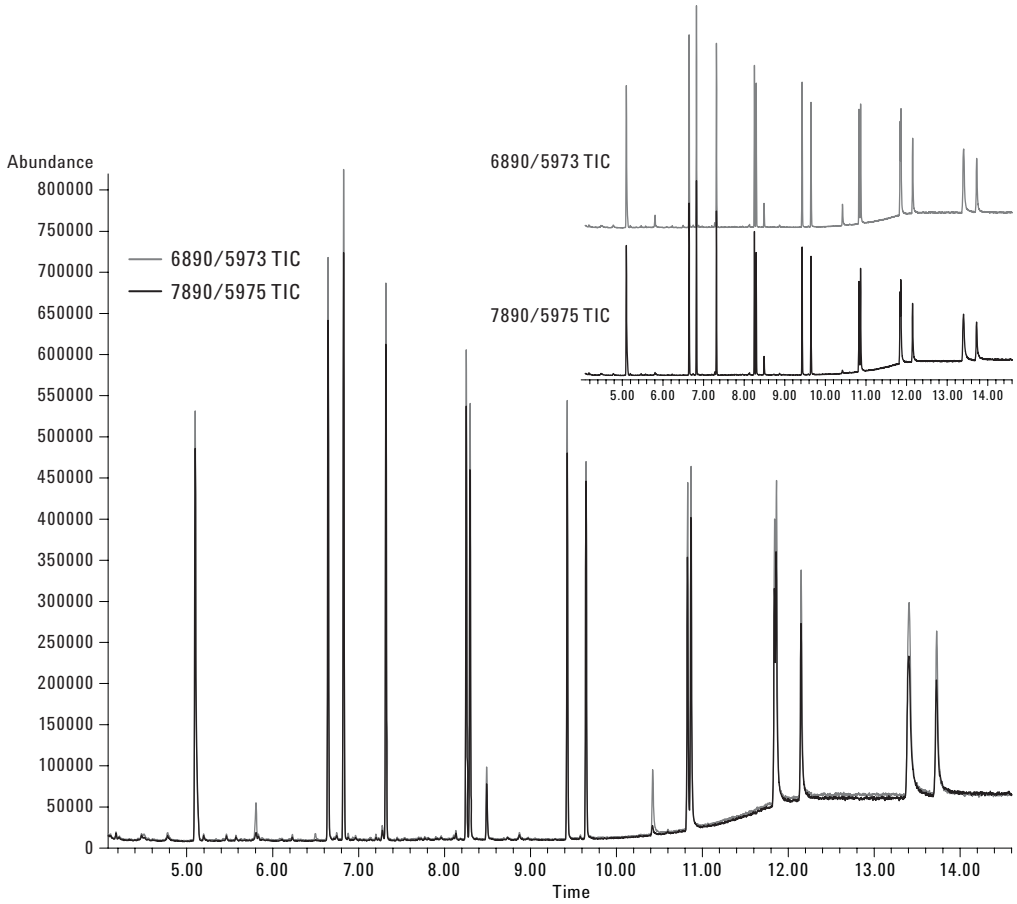

Figure 1. Overlays of TICs of the same sample of PAHs are virtually indistinguishable. Inset shows the TICs in separated format.

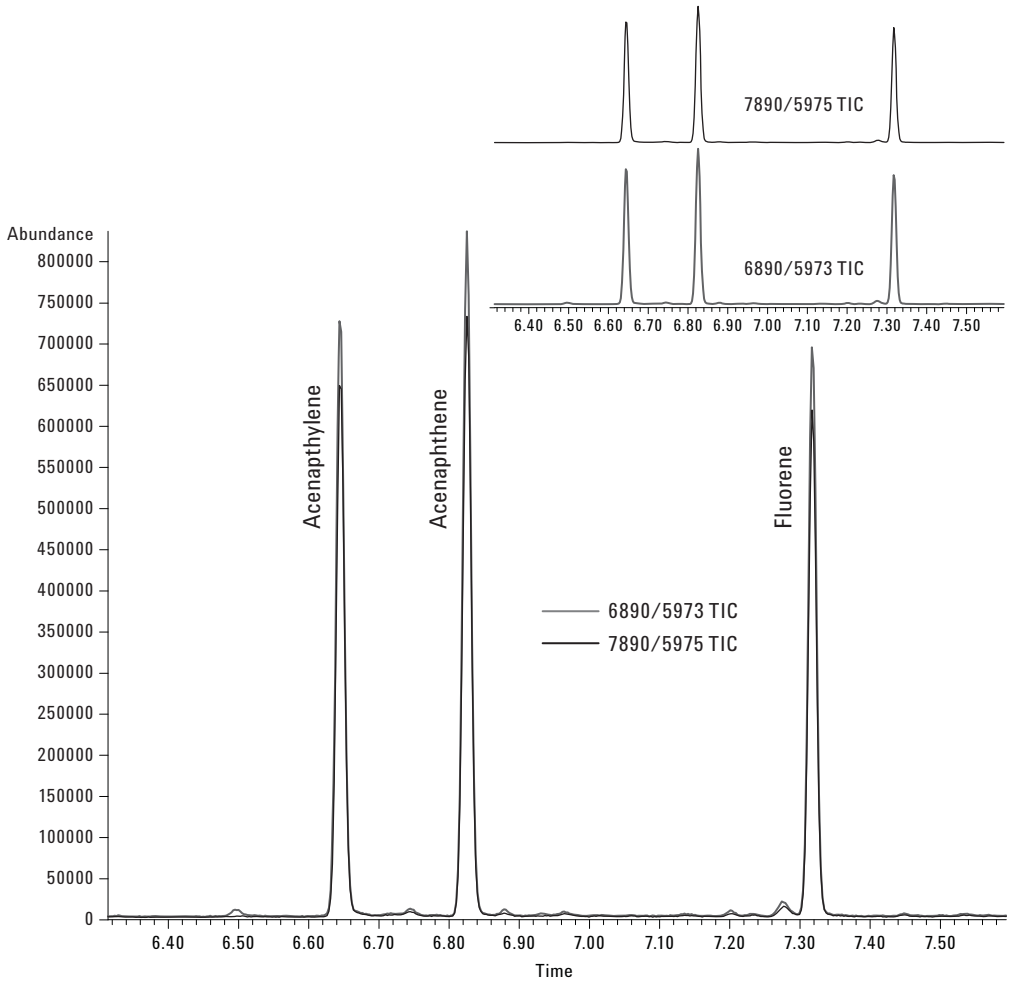

Figure 2. System TICs for acenapthylene, acenaphthene, and fluorene are compared.

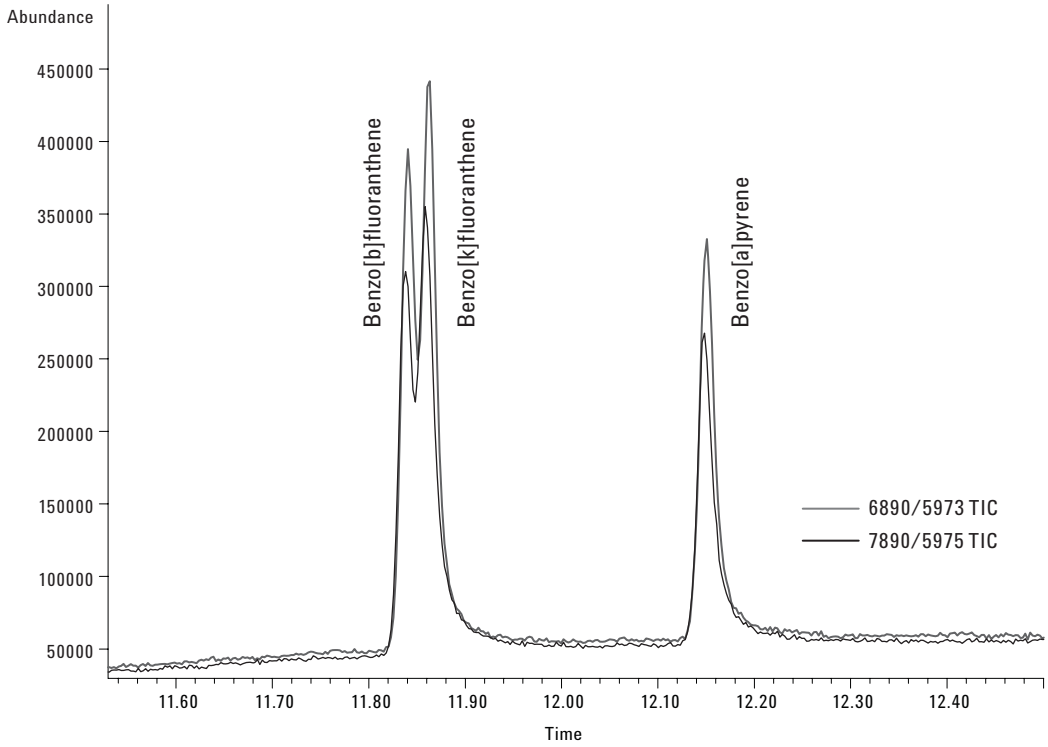

Figure 3. System TICs for benzo[b]fluoranthene, benzo[k]fluoranthene, and benzo[a]pyrene are compared.

Table 3. Comparison of Performance Metrics

Solute	6890/5973				7890/5975				
	Avg RT (min)	SD	RSD	Calibration linearity, r^2	Avg RT (min)	SD	RSD	Calibration linearity, r^2	ΔRT
Naphthalene	5.103	0.005	0.098	0.992	5.103	0.005	0.098	0.995	0.000
Acenapthylene	6.650	0.000	0.000	0.998	6.649	0.003	0.050	0.998	0.001
Acenaphthene	6.830	0.000	0.000	0.993	6.830	0.000	0.000	0.995	0.000
Fluorene	7.320	0.000	0.000	0.997	7.320	0.000	0.000	0.998	0.000
Phenanthrene	8.256	0.005	0.064	0.999	8.251	0.003	0.040	0.999	0.004
Anthracene	8.300	0.000	0.000	0.999	8.300	0.000	0.000	0.998	0.000
Fluoranthene	9.430	0.000	0.000	0.997	9.430	0.000	0.000	0.995	0.000
Pyrene	9.650	0.000	0.000	0.997	9.650	0.000	0.000	0.996	0.000
Chrysene	10.830	0.000	0.000	0.991	10.830	0.000	0.000	0.992	0.000
Benz[a]anthracene	10.870	0.000	0.000	0.995	10.870	0.000	0.000	0.994	0.000
Benz[b]fluoranthene	11.848	0.010	0.082	0.999	11.849	0.011	0.089	0.997	-0.001
Benz[k]fluoranthene	11.862	0.004	0.037	0.997	11.862	0.004	0.037	0.999	0.000
Benzo[a]pyrene	12.151	0.003	0.027	0.999	12.150	0.000	0.000	0.999	0.001
Indeno[1,2,3-cd]pyrene	13.412	0.008	0.062	0.998	13.412	0.004	0.033	0.995	0.000
Dibenz[a,h]anthracene	13.404	0.005	0.039	0.994	13.396	0.005	0.039	0.996	0.009
Benzo[ghi]perylene	13.732	0.004	0.032	0.993	13.729	0.008	0.057	0.995	0.003

Figure 4 shows that the response characteristics for all PAH components are similar on both the 6890/5873 and 7890/5975C systems.

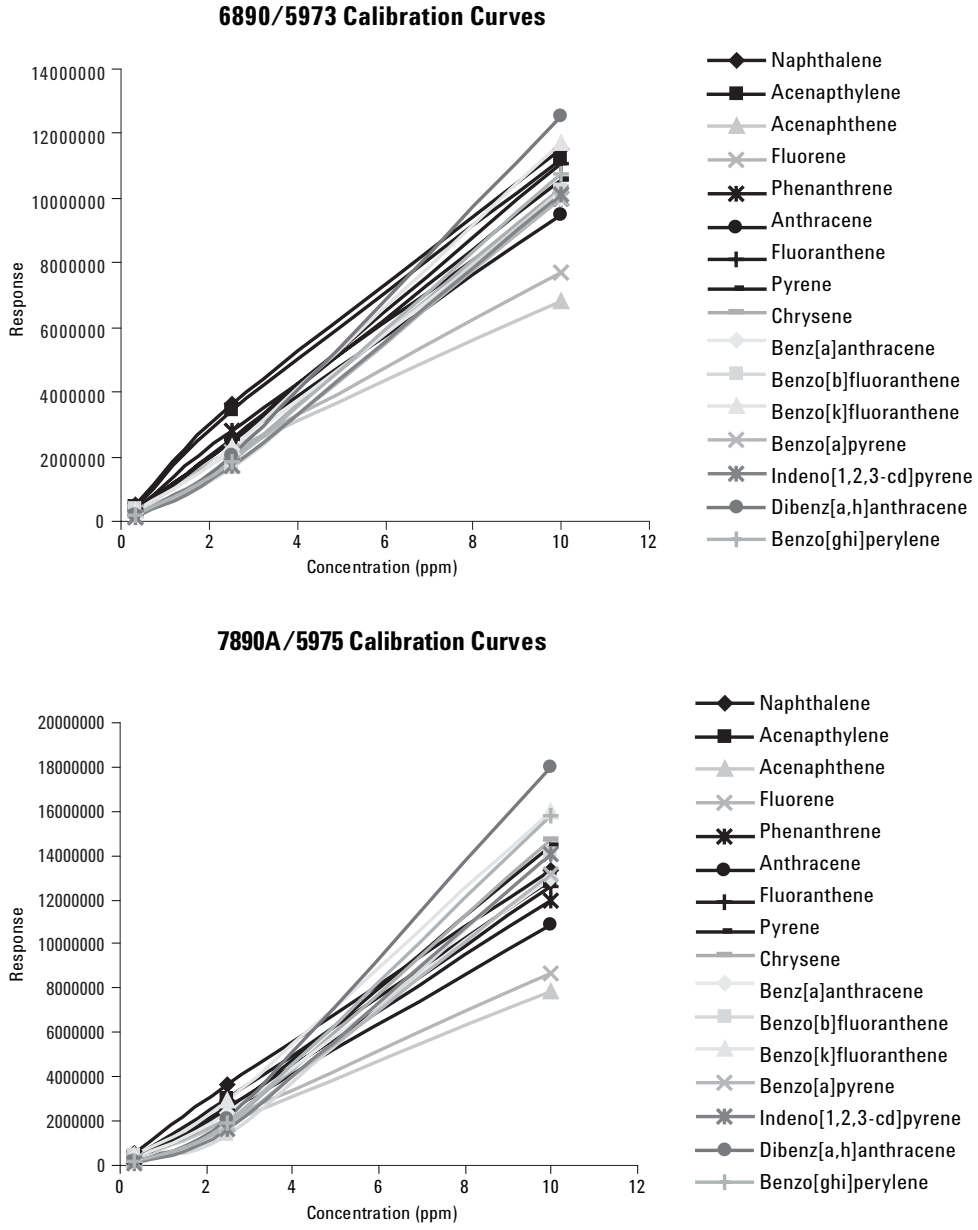

Figure 4. PAH calibration plots over the 0.32-10 ppm concentration range using both the 6890/5973 (upper) and 7890A/5975C (lower) GC/MSD systems.

Conclusions

System equivalence is demonstrated. The new Agilent 7890 Series GC and 5975 Series MSD system easily reproduced method characteristics of the prior Agilent 6890 Series GC and 5973 Series MSD systems, using a 16-component PAH sample and retention time locking. This demonstrates that methods can be confidently migrated to the new systems without loss in performance, allowing rapid and trouble free implementation of the new platforms.

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Printed in the USA
April 4, 2007
5989-6569EN

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