

Spectrum Compact CE System – A Personal, Benchtop Capillary Electrophoresis Device

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1. Introduction

The Spectrum Compact CE System allows laboratories of all sizes the freedom to carry out fragment analysis applications such as single nucleotide polymorphism, PCR sizing and microsatellite analysis, and Sanger sequencing applications like *de novo* sequencing, NGS confirmation, and mutation detection. This four-capillary benchtop capillary electrophoresis instrument allows running up to 32 samples and features single base resolution and 6-dye detection along with an integrated touch-screen for instrument operation. Pre-filled reagent cartridges, including a choice of separation polymers optimized for specific applications, streamline instrument setup.

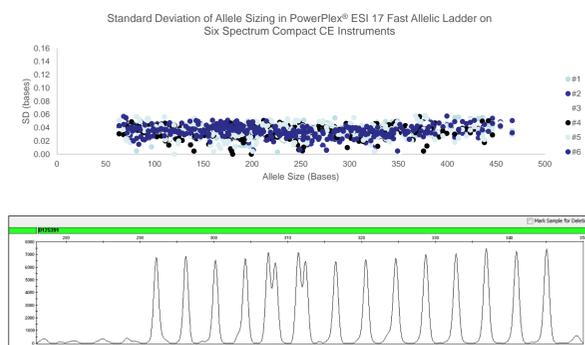
For Sanger sequencing applications, Promega has developed the prototype ProDye™ Terminator Sequencing System. This dideoxynucleotide dye-terminator based sequencing using proprietary polymerase can generate readable sequences from a variety of templates. In combination with the Spectrum Compact CE System, read lengths of ≥ 600 bases can be obtained with run times of ~30 minutes and ≥ 800 bases with a run time of ~60 minutes.

2. Instrument Specification



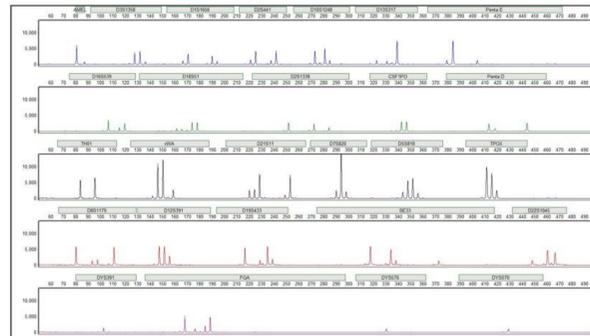
Number of Capillaries	4
Capillary Array Length	36cm
Number of Dye Colors	6
Throughput	Four 8-well strip tubes
Computer Platform	Integrated touch screen with built-in computer
Polymer	Polymer4 and Polymer7
Consumable Tracking	2D barcode
Data File Type	.fsa and .ab1
Secondary Analysis	GeneMarker®HID Software for Spectrum CE Systems, ProView™ Sequencing Software
Dimensions	40cm W x 60cm D x 60cm H (15.75in W x 23.62in D x 23.62in H)
Weight	45kg (99lb)
Power Input	100–240Vac; 50/60Hz; 260VA
Operating Temperature	15°C to 30°C

3. Sizing Precision and Resolution



PowerPlex® ESI 17 Fast Allelic Ladder was subject to electrophoresis on six Spectrum Compact CE Systems and sizing precision determined on each instrument. Maximum standard deviation observed was 0.07 bases. Single base resolution shown for D12S391 alleles with sizes up to 312 bases.

4. Mixture Analysis



PowerPlex® Fusion 6C System: 1ng of a 1:5 Male:Female DNA mixture was amplified with the PowerPlex® Fusion 6C System followed by electrophoresis on a Spectrum Compact CE System. Data were analyzed with GeneMarker® HID Software for Spectrum CE Systems. All unique minor contributor alleles were detected.

5. Spectral Performance– STR 5-Dye Systems

Bleedthrough Event	Average Percentage Bleedthrough by Instrument					
	Fusion		NGM		ESSplex SE QS	
	#1	#2	#1	#2	#1	#2
Blue into Green	0.89	NA	0.54	NA	NA	NA
Blue into Yellow	0.7	1.09	1.12	1.38	0.95	0.94
Blue into Red	0.61	NA	NA	1.13	NA	NA
Green into Blue	0.73	0.78	0.39	0.4	1.69	1.08
Green into Yellow	1.11	1.03	0.88	0.59	0.83	NA
Green into Red	NA	NA	1.05	0.71	NA	1.17
Yellow into Blue	0.84	0.71	0.27	NA	1.01	0.81
Yellow into Green	0.83	0.77	0.42	0.37	NA	NA
Yellow into Red	0.46	0.71	NA	0.84	NA	NA
Red into Blue	1.76	1.3	1.12	0.86	NA	NA
Red into Green	0.74	1.04	NA	NA	NA	NA
Red into Yellow	1.45	1.77	0.98	0.94	NA	NA

Representative 5-dye STR chemistries from Promega, ThermoFisher and Qiagen (PowerPlex® Fusion System, AmpFLSTR™ NGM™ PCR Amplification Kit, and Investigator® ESSplex SE QS) were run on two Spectrum Compact CE Systems and the average percent bleed through observed between dye channels was determined.

6. Signal Variability

PowerPlex® Fusion 6C System amplification reaction of 1ng of 2800M Control DNA was run on four Spectrum Compact CE Systems to determine signal variability.

	Cap to Cap Min/Max % By Injection #				Injection to Injection Min/Max % By Cap #				Min/Max % by Instrument	
	#1	#2	#3	#4	#1	#2	#3	#4	Blue	Green
Blue	74.5	75.6	74.8	75.9	95.9	83.0	95.9	98.6	79.8	78.9
Green	70.1	71.3	70.8	72	95.8	82.0	95.3	98.4	91.5	92.5
Yellow	86.4	70.7	80.2	84.3	95.8	83.4	97.0	99.2	86.4	86.4
Red	74.1	71.5	74.9	75.7	96.0	83.1	96.5	98.8	90.1	90.1
Purple	75	69.9	76.4	77	96.0	82.4	95.7	98.5		
All Dyes	79.8	74.2	80.5	81.7	95.9	82.9	96.3	99.1		

Capillary to Capillary Variability
Sample was injected four times. Signal variability determined by calculating the percentage signal between the lowest and highest signal capillary for each injection.

Injection to Injection Variability
Sample was injected four times. Signal variability determined by calculating the percentage signal between the lowest and highest signal injection for each capillary.

Instrument to Instrument Variability
Sample was injected four times on each of four Spectrum Compact CE Systems. Signal variation was determined by calculating the percentage signal between the lowest and highest instrument signal.

7. Sequencing Performance Specifications

Sequencing

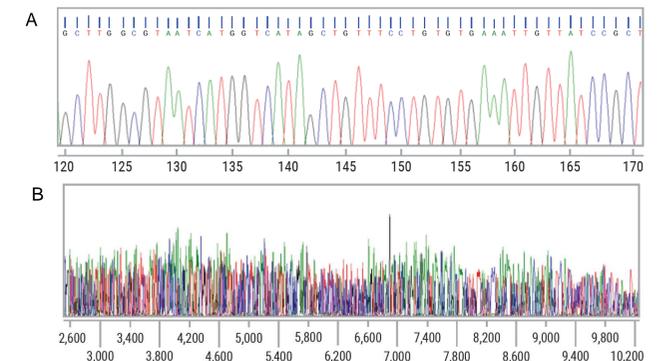
- Fast (~30 minutes) and Standard (~60 minutes) sequence run modules available
- QV20 CRL* of at least 600 nucleotides with Fast sequence run protocol
- QV20 CRL* of at least 800 nucleotides with Standard sequence run protocol.
- Sequencing data generated on multiple templates (plasmids and amplicons)

Reagents/Consumables

- Capillary cartridge: 800 samples/200 injections
- Anode and Cathode buffer cartridge: 320 samples/80 injections
- Polymer cartridge: 64 samples/16 injections

*The maximum number of contiguous bases in the analyzed sequence with an average QV≥20, calculated over a sliding window of 21 nucleotides.

8. Sanger Sequencing



Representative portion of an electropherogram (Panel A) of pGEM®-3Zf(+) generated using the prototype ProDye™ Terminator Sequencing System, on a Spectrum Compact CE System. (Panel B) raw data of standard sequencing run.

9. Summary

Easy to use benchtop capillary electrophoresis instrument

- Small footprint, conserving precious bench space
- 4-capillary (36cm), 6-color multiplex capability
- Barcoded consumables replaced in <5 minutes
- Easy to switch polymers without wash steps
- Integrated touch screen wizard-like interface
- Pre-loaded assays for commercially available kits
- Compatible with most data analysis packages

Fragment analysis

- Specially formulated, denaturing polymer for fragment analysis
- Single base resolution
- Compatible with commercial STR genotyping kits

Sanger sequencing

- Specially formulated denaturing polymer for optimized Sanger sequencing runs
- Compatible with Promega's upcoming ProDye™ Terminator Sequencing System

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