510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY

A. 510(k) Number:

K161573

B. Purpose for Submission:

To obtain a substantial equivalence determination for the FilmArray RP EZ Control Panel M265.

C. Measurand:

Multi-analyte quality control materials

D. Type of Test:

FilmArray RP EZ Control Panel M265 is intended for *in vitro* diagnostic use as external assayed quality control materials to monitor the qualitative amplification, detection and identification steps of the laboratory nucleic acid test, FilmArray RP EZ assay on the FilmArray 2.0 instrument, which detects respiratory pathogens: Adenovirus, Coronavirus, Human Metapneumovirus, Human Rhinovirus/ Enterovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus, Respiratory Syncytial Virus, *Bordetella pertussis, Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae*.

E. Applicant:

Maine Molecular Quality Controls, Inc. (MMQCI)

F. Proprietary and Established Names:

FilmArray RP EZ Control Panel M265

G. Regulatory Information:

1. Regulation section:

   21 CFR 866.3920, Assayed quality control material for clinical microbiology assays

2. Classification:

   Class II (Special Controls)

3. Product code:

   PMN

4. Panel:

   83- Microbiology

H. Indication(s) for use:

1. Indications for use(s):

   FilmArray RP EZ Control Panel M265 is intended for use as an external positive and negative assayed quality control to monitor the performance of *in vitro* laboratory nucleic acid testing procedures for the qualitative detection of Adenovirus, Coronavirus, Human Metapneumovirus, Human Rhinovirus/ Enterovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus, Respiratory Syncytial Virus, *Bordetella pertussis, Chlamydophila pneumoniae*, and *Mycoplasma pneumoniae* on the FilmArray RP EZ assay performed on the FilmArray systems. FilmArray RP Positive Control is composed of synthetic RNA transcripts specifically designed for and intended to be used solely with the FilmArray RP EZ assay. This product is not intended to replace manufacturer controls provided with the device.

2. Special conditions for use statement(s):

   For *in vitro* diagnostic use only

   For prescription use only

3. Special instrument requirements:

   The FilmArray RP EZ Control Panel M265 was evaluated on FilmArray 2.0 instrument.

I. Device Description:

FilmArray RP EZ Control Panel M265 is a quality control panel consisting of two controls: FilmArray RP EZ Positive Control and FilmArray RP EZ Negative Control. The Positive Control contains non-infectious surrogate control material; a solution of synthetic RNA in buffers, stabilizers and preservatives. The RNA carries segments of all respiratory pathogens detected by the FilmArray RP EZ assay (see Table below) on the FilmArray instrument 2.0 EZ Configuration system. The RNA in the Negative Control is non-specific RNA in buffers, stabilizers and preservatives. Each liquid control of FilmArray RP EZ Control Panel M265 is processed separately according to FilmArray RP EZ assay manufacturer's Instructions for Use for patient samples (nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infection and placed in Viral Transport Media (VTM)).

The FilmArray RP EZ Positive Control M265 is prepared nucleic acid concentrations of 3X-10X LoD for each of the organisms detected by the FilmArray RP EZ assay.

Respiratory pathogens detected by FilmArray RP EZ assay	
Adenovirus	Influenza A H1-2009
Coronavirus	Influenza B
Human Metapneumovirus	Parainfluenza Virus
Human Rhinovirus/ Enterovirus	Respiratory Syncytial Virus
Influenza A	*Bordetella pertussis*
Influenza A subtype H1	*Chlamydophila pneumoniae*
Influenza A subtype H3	*Mycoplasma pneumoniae*

J. Substantial Equivalence Information:

1. Predicate device name(s):

   Amplichek II, Bio-Rad Laboratories

2. Predicate 510(k) number(s):

   DEN150058

3. Comparison with predicate:

Similarities		
Item	**FilmArray RP EZ Control Panel M265 (K161573)**	**Amplichek II (DEN150058)**

Intended Use	FilmArray RP EZ Control Panel M265 is intended for use as external positive and negative, surrogate assayed quality control materials to monitor the performance of in vitro laboratory nucleic acid testing procedures for the qualitative detection of Adenovirus, Coronavirus, Human Metapneumovirus, Human Rhinovirus/ Enterovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus, Respiratory Syncytial Virus, *Bordetella pertussis, Chlamydophila pneumoniae*, and *Mycoplasma pneumonia* on the FilmArray RP EZ assay performed on the FilmArray systems. The control panel also contains a negative control. This product is not intended to replace manufacturer controls provided with the device.	Amplichek II is intended for use as an external assayed quality control material to monitor the performance of in vitro laboratory nucleic acid testing procedures for the qualitative detection of Methicillin Resistant *Staphylococcus aureus*, Methicillin Sensitive *Staphylococcus aureus*, *Clostridium difficile* and Vancomycin-resistant *Enterococci* performed on Cepheid GeneXpert Systems. This product is not intended to replace manufacturer controls provided with the device. This product is only for use with assays and instruments listed in the Representative Results Chart in this labeling.

Similarities		
Item	**FilmArray RP EZ Control Panel M265**	**Amplichek II (DEN150058)**
Directions for Use	Process like patient sample Same	Same
Number of targets monitored in one assay	Multiplex	Same

Differences		
Item	**FilmArray RP EZ Control Panel M265 (K161573)**	**Amplichek II (DEN150058)**
Composition	Synthetic RNA	Intact microorganisms
Assay Steps Monitored	Same except does not monitor extraction	Extraction, reverse transcription, amplification, detection, identification

K. Standard/Guidance Document Referenced (if applicable):

None were referenced

L. Test Principle:

Not applicable

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Reproducibility:

A multi-site reproducibility study was performed with the FilmArray RP EZ Control Panel M265 on FilmArray instrument 2.0 EZ Configuration system at two CLIA-waived clinical sites and one simulated CLIA-waived test site (e.g., testing was performed at a laboratory with users that were screened to have training and educational backgrounds consistent with those in the CLIA-waived testing environment). Testing consisted of three positive and three negative controls run per day, and spanned a period of 10 days (total of 60 control runs per site). Multiple operators participated in testing at each of the three locations. Three lots each of external control material and three lots of RP EZ pouches were tested across all sites. A total of 182 external controls were tested (91 positive and 91 negative). Two tests were excluded from the final data analysis due to Invalid results caused by internal pouch control failures. The results are shown in the tables below:

FilmArray RP EZ Control Panel Summary of External Reproducibility Test Results

Category	SITE						All Sites	All Sites
	Site #1		Site #2		Site #3		Overall Percent Agreement	95% Confidence Interval
	#expected results/# tested[1]	% Agreement with Expected Result [1]	#expected results/# tested	% Agreement with Expected Result [1]	#expected results/# tested	% Agreement with Expected Result [1]		
FilmArray RP EZ Positive Control	30/30	100%	30/30	100%	30/30	100%	100% 90/90	95.9% to 100%
FilmArray RP EZ Negative Control	30/30	100%	30/30	100%	28/30[3]	93.3%	97.78% 88/90	92.3% to 99.4%

[1] Expected result for the FilmArray RP EZ Positive Control is positive. Expected result for the FilmArray RP EZ Negative Control is negative.
[2] The 2 Invalid samples were re-tested according to BioFire instructions and were not included in the Percent Correct analysis.
[3] Two false positives were observed with the FilmArray RP EZ Negative Control at site #3. The detected organisms were 1) Coronavirus CoV-NL63, 2) Coronavirus CoV-229E. The FilmArray RP EZ assay only reports Coronavirus as Detected or Not Detected.

Crossing Point (Cp) data for FilmArray RP EZ Control Panel External Reproducibility Study								
Respiratory Pathogen Analyte	Site		Site 2		Site		**All Sites**	
	Mean Cp	SD	Mean Cp	SD	Mean Cp	SD	**Mean Cp**	**SD**
Adeno	22.6	1.2	22.0	1.3	22.2	1.2	22.3	1.2
Adeno2	21.0	1.1	20.6	1.2	20.7	1.0	20.8	1.1
CoV-229E[1]	20.9	0.7	20.5	1.1	20.5	0.8	20.6	0.9
CoV-HKU1[1]	19.8	1.1	19.3	1.1	19.4	0.8	19.5	1.0
CoV-NL63[1]	19.6	1.5	18.8	1.0	18.9	0.7	19.1	1.1
CoV-OC43[1]	19.4	0.8	19.0	1.2	18.9	0.6	19.1	0.9
hMPV	21.8	1.3	21.4	1.4	21.2	1.0	21.5	1.2
Entero1	20.4	1.0	20.0	1.1	20.0	0.8	20.1	1.0
Entero2	20.4	1.2	20.0	1.1	20.0	0.8	20.1	1.0
HRV1	17.5	0.7	17.2	1.1	16.9	0.7	17.2	0.8
HRV2	18.0	0.7	17.7	1.0	17.4	0.7	17.7	0.8
HRV3	22.7	0.9	22.6	1.3	21.8	0.7	22.4	1.0
HRV4	19.5	0.9	19.2	1.0	18.9	0.6	19.2	0.8
FluA-H1-2009	18.7	1.2	18.2	1.1	18.2	0.8	18.4	1.0
FluA-H1-pan	18.8	1.1	18.3	1.1	18.4	0.8	18.5	1.0
FluA-H3	18.1	0.8	17.7	1.2	17.6	0.9	17.8	1.0
FluA-pan1	19.7	0.8	19.2	1.1	19.1	0.7	19.3	0.9
FluA-pan2	20.0	1.0	19.5	1.1	19.5	0.6	19.7	0.9
FluB	19.3	0.7	18.9	1.2	18.7	0.7	19.0	0.9
PIV1	20.5	1.4	19.7	1.3	19.9	0.9	20.0	1.2
PIV2	20.1	0.9	19.8	1.1	19.6	0.6	19.8	0.9
PIV3	18.8	0.9	18.4	1.1	18.2	0.6	18.5	1.1
PIV4	19.2	1.2	18.6	1.3	18.5	0.8	18.8	1.1
RSV	18.8	0.8	18.4	1.2	18.1	0.7	18.4	0.9
Bper	20.9	0.8	20.5	1.0	20.5	0.7	20.6	0.8
Cpne	19.0	0.8	18.5	1.2	18.4	0.7	18.6	0.9
Mpne	19.5	1.2	18.7	1.2	18.6	0.7	18.9	1.0

The results suggest that there are no significant differences between different users and different sites on different days. External reproducibility studies for the FilmArray RP EZ Control Panel M265 are acceptable.

b. Precision:

An internal precision study for the FilmArray RP EZ Control Panel M265 was conducted over multiple days by testing three FilmArray RP EZ Control Panel lots with four FilmArray RP EZ assay lots performed by one operator. The results are shown in the table below:

FilmArray RP EZ Control Panel Summary of Internal Precision Test Results				
Category	**Operator #1**		**Combined**	
	#expected results/ #tested[1]	**% Agreement with Expected Result [1]**	**Overall Percent Agreement**	**95% Confidence Interval**
FilmArray RP EZ Positive Control	39/39	100%	100%	91% to 100%
FilmArray RP EZ Negative Control	49/49	100%	100%	92.7% to 100%

Crossing Point (Cp) data for FilmArray RP EZ Control Panel External Precision Study								
Respiratory Pathogen Analyte	Control Lot#: M40DEC15A		Control Lot#: A28DEC15A		Control Lot#: A06JAN16A		**All Lots**	
	Mean Cp	SD	Mean Cp	SD	Mean Cp	SD	**Mean Cp**	**SD**
Adeno	22.1	1.1	21.9	1.4	21.6	0.6	21.4	0.5
Adeno2	20.2	0.7	19.9	1.1	19.7	0.4	19.5	0.3
CoV-229E[1]	19.7	0.6	19.5	0.6	19.4	0.5	19.2	0.1
CoV-HKU1[1]	18.5	0.7	18.4	0.6	18.2	0.4	18.0	0.2
CoV-NL63[1]	18.1	0.4	18.0	0.5	17.9	0.4	17.8	0.3
CoV-OC43[1]	18.1	0.3	17.9	0.5	17.9	0.4	17.8	0.4
hMPV	21.4	0.8	21.0	1.0	21.1	0.4	21.1	0.4
Entero1	19.1	0.7	19.1	0.8	18.9	0.4	19.1	0.3
Entero2	19.0	0.6	19.0	0.8	18.9	0.4	19.1	0.3
HRV1	16.2	0.1	16.0	0.4	16.0	0.4	16.0	0.3
HRV2	17.1	0.2	16.8	0.4	16.9	0.4	16.8	0.3
HRV3	24.9	1.6	23.6	1.9	23.8	1.7	22.9	0.5
HRV4	19.9	0.5	19.6	0.7	19.9	0.4	20.0	0.4
FluA-H1-2009	17.2	0.6	17.1	0.6	16.8	0.4	16.6	0.3
FluA-H1-pan	18.1	0.8	17.8	0.8	17.5	0.5	17.3	0.4
FluA-H3	17.6	0.5	17.2	0.6	17.3	0.3	17.2	0.3
FluA-pan1	18.5	0.4	18.2	0.4	18.4	0.4	18.5	0.4
FluA-pan2	19.0	0.5	18.7	0.4	18.6	0.3	18.5	0.3
FluB	18.1	0.4	17.9	0.4	17.8	0.5	17.6	0.4
PIV1	18.8	0.7	18.8	0.8	18.3	0.3	18.2	0.3
PIV2	19.0	0.3	18.8	0.4	18.8	0.6	18.4	0.4
PIV3	17.9	0.5	17.4	0.5	17.6	0.4	17.5	0.4
PIV4	19.2	0.7	18.7	0.9	18.9	0.5	18.9	0.7
RSV	17.6	0.2	17.4	0.5	17.5	0.4	17.4	0.4
Bper	19.9	0.4	19.7	0.8	19.7	0.4	19.6	0.4
Cpne	17.6	0.2	17.4	0.3	17.6	0.4	17.5	0.4
Mpne	17.8	0.2	17.6	0.4	17.7	0.5	17.6	0.4

There appears to be no significant differences in mean Cp value when testing different control lots on different days. Precision studies are acceptable.

c. *Within-run Testing*:

Within-run reproducibility was demonstrated in a separate study conducted by one operator testing two lots of FilmArray RP EZ Control Panel M265 with one lot of FilmArray RP EZ pouches on the FilmArray 2.0, each within one day. The results are shown in the tables below:

FilmArray RP EZ Control Panel Summary of Within-run Reproducibility Results				
Control	**Control Lot#**	**No. of Tests**	**Pouch Lot**	**Correct Results**
FilmArray RP EZ Positive Control	A06JAN16A	6	239115	6/6 (100%)
FilmArray RP EZ Negative Control	M41DEC15A	5	239115	5/5 (100%)

Crossing Point (Cp) data for FilmArray RP EZ Control Panel Within-run Reproducibility		
Respiratory Pathogen Analyte	**FilmArray RP EZ Positive Control (Lot A06JAN16A)**	
	Mean Cp	**SD**
Adeno	21.4	0.5
Adeno2	19.5	0.3
CoV-229E[1]	19.2	0.1
CoV-HKU1[1]	18.0	0.2
CoV-NL63[1]	17.8	0.3
CoV-OC43[1]	17.8	0.4
hMPV	21.1	0.4
Entero1	19.1	0.3
Entero2	19.1	0.3
HRV1	16.0	0.3
HRV2	16.8	0.3
HRV3	22.9	0.5
HRV4	20.0	0.4
FluA-H1-2009	16.6	0.3
FluA-H1-pan	17.3	0.4
FluA-H3	17.2	0.3
FluA-pan1	18.5	0.4
FluA-pan2	18.5	0.3
FluB	17.6	0.4
PIV1	18.2	0.3
PIV2	18.4	0.4
PIV3	17.5	0.4
PIV4	18.9	0.7
RSV	17.4	0.4
Bper	19.6	0.4
Cpne	17.5	0.4
Mpne	17.6	0.4

Within-run reproducibility studies for the FilmArray RP EZ Control Panel M265 are acceptable.

d. Lot-to-Lot Testing:

Lot-to-lot reproducibility was demonstrated by testing three lots of FilmArray RP EZ Positive Control using the same pouch lot. Results are shown in the following tables.

FilmArray RP EZ Control Panel Summary of Lot-to-Lot Reproducibility Results			
Control Lot #	**Number of Tests**	**Pouch Lot**	**Correct Results**
M40DEC15A	4	238915	4/4 (100%)
A28DEC15A	3	238915	3/3 (100%)
A06JAN16A	5 (1 Invalid)	238915	4/4 (100%)

Crossing Point (Cp) data for FilmArray RP EZ Control Panel Lot-to-Lot Reproducibility					
Respiratory Pathogen Analyte	**M40DEC15A**	**A28DEC15A**	**A06JAN16A**	**All Lots**	**All Lots**
	Mean Cp	**Mean Cp**	**Mean Cp**	**Mean Cp**	**SD**
Adeno	21.6	20.8	21.7	21.4	0.5
Adeno2	19.8	18.8	19.7	19.5	0.6
CoV-229E[1]	19.3	18.8	19.4	19.2	0.4
CoV-HKU1[1]	18.1	17.7	18.4	18.1	0.4
CoV-NL63[1]	18.1	17.7	18.1	18.0	0.4
CoV-OC43[1]	18.3	17.5	18.2	18.0	0.5
hMPV	21.1	20.1	20.8	20.7	0.6
Entero1	18.4	18.0	18.5	18.3	0.4
Entero2	18.4	18.0	18.5	18.3	0.4
HRV1	16.2	15.8	16.2	16.1	0.4
HRV2	17.1	16.6	17.2	17.0	0.4
HRV3	25.6	24.2	25.3	25.1	1.9
HRV4	19.6	18.9	19.6	19.4	0.5
FluA-H1-2009	16.9	16.4	16.8	16.7	0.3
FluA-H1-pan	17.8	17.1	17.7	17.5	0.4
FluA-H3	17.4	16.6	17.4	17.2	0.5
FluA-pan1	18.5	17.8	18.4	18.3	0.4
FluA-pan2	18.7	18.3	18.6	18.5	0.3
FluB	17.9	17.4	18.0	17.8	0.4
PIV1	18.5	18.0	18.3	18.3	0.4
PIV2	19.1	18.4	19.3	19.0	0.5
PIV3	17.8	17.1	17.8	17.6	0.4
PIV4	19.2	17.9	18.8	18.7	0.7
RSV	17.7	17.1	17.7	17.6	0.4
Bper	19.7	19.1	19.8	19.6	0.5

Crossing Point (Cp) data for FilmArray RP EZ Control Panel Lot-to-Lot Reproducibility					
Respiratory Pathogen Analyte	**M40DEC15A**	**A28DEC15A**	**A06JAN16A**	**All Lots**	**All Lots**
	Mean Cp	**Mean Cp**	**Mean Cp**	**Mean Cp**	**SD**
Cpne	17.6	17.1	17.8	17.5	0.4
Mpne	17.9	17.3	18.0	17.8	0.5

Lot-to-Lot reproducibility studies for the FilmArray RP EZ Control Panel M265 are acceptable.

e. *Linearity/assay reportable range:*

Not applicable

f. *Traceability, Stability, Expected values (controls, calibrators, or methods):*

Traceability:

Not applicable

Stability:

Open Vial Stability: Not applicable because FilmArray RP EZ Control Panel M265 is packaged for single use.

Closed Vial Real-time Stability: An accelerated stability study was performed to establish the shelf life stability claims for FilmArray RP EZ Control Panel M265. Based on this study, the FilmArray RP EZ Control Panel M265 is expected to be stable until the expiration date (12 months) when stored frozen (– 20°C or colder) and unopened. This product is for single use.

Real-Time Stability Program: Real-time stability studies are ongoing to support product claims and to monitor potential assay modifications for which the FilmArray RP EZ Control Panel M265 is indicated for use. Real-time stability study protocols and acceptance criteria were reviewed and found to be acceptable.

Shipping Stability: MMQCI ships the FilmArray RP EZ Control Panel on dry ice with overnight delivery, ensuring that the control material remains frozen upon receipt. The frozen control material is then to be stored at -20^{o}C, as indicated in the FilmArray RP EZ Control Panel Package insert. A shipping study was performed to confirm the shipping process and to investigate the outcome of a possible shipping delay and subsequent arrival with no dry ice. The study evaluated two (2) lots of the FilmArray RP EZ Positive Control placed in dry ice and was stored for two (2) days at ambient temperature then tested using the FilmArray RP EZ Assay. To simulate a shipping delay, two (2) lots of the FilmArray RP EZ Positive Control M266 were

stored for up to 6 days at ambient temperature and tested using the FilmArray RP EZ Assay.

The study demonstrated that the FilmArray RP EZ Positive Control M265 is stable for two (2) days on dry ice in MMQCI's standard shipping box. FilmArray RP EZ Positive Control is stable after five (5) days at ambient temperatures of approximately 19-21°C. The FilmArray RP EZ Positive Control should be stored frozen (–20°C or colder) as indicated in the package insert.

Expected Values:

FilmArray RP EZ Control Panel M265 is a qualitative control and the expected results are listed in the tables below.

FilmArray RP EZ Positive Control FilmArray Result Summary

Multiple Organisms Detected. Influenza A – Multiple Subtypes Detected	
Results Summary	
Detected	**Not Detected**
Adenovirus Coronavirus Human Metapneumovirus Human Rhinovirus Enterovirus Influenza A H1-2009 Influenza A H3 Influenza B Parainfluenza Virus Respiratory Syncytial Virus *Bordetella pertussis* *Chlamydophila pneumoniae* *Mycoplasma pneumoniae*	

FilmArray RP EZ Negative Control FilmArray Result Summary

Negative	
Results Summary	
Detected	**Not Detected**
	Adenovirus Coronavirus Human Metapneumovirus Human Rhinovirus Enterovirus Influenza A Influenza B Parainfluenza Virus Respiratory Syncytial Virus *Bordetella pertussis* *Chlamydophila pneumoniae* *Mycoplasma pneumoniae*

Matrix Effects:

A study was performed to evaluate the effect of the FilmArray RP EZ Control Panel M265 in the presence of viral transport media (VTM). Equal volumes of the same concentration of inactivated Influenza A H1N1-2009 were spiked into 300µL of VTM as well as 300µL of FilmArray RP EZ Negative Control, which contains the identical matrix found in the FilmArray RP EZ Positive Control. Both sample types of the H1N1-2009 were tested in triplicate by the FilmArray RP EZ assay.

Results demonstrated that samples prepared with FilmArray RP EZ Control Panel M265 matrix generate equivalent results to samples prepared with VTM. Study results are shown in the table below:

Respiratory Pathogen Analyte	**Spiked BEI H1N1-2009 Crossing Point (Cp) Data**							
	VTM			**Mean Cp**	**MMQCI Matrix**			**Mean Cp**
FluA-H1-2009	16.9	17.2	17.2	**17.1**	17.4	16.3	16.5	**16.7**
FluA-H1-pan	18.1	18.5	18.2	**18.3**	18.7	17.5	17.4	**17.8**
FluA-pan1	13.9	13.6	14.5	**14.0**	12.4	12.8	12.7	**12.6**
FluA-pan2	19.1	19.3	19.6	**19.4**	18.9	18.2	18.6	**18.5**

g. *Detection limit:*

Not applicable

h. *Analytical Reactivity (Inclusivity*):

Not applicable

i. *Cross Reactivity:*

Not applicable

j. *Interference:*

Not applicable

k. *Assay cut-off:*

Not applicable.

2. Comparison studies:

a. *Method comparison with predicate device:*

Not applicable.

3. Clinical Studies:

a. *Clinical Sensitivity:*

Not applicable

b. *Clinical specificity:*

Not applicable

c. *Other clinical supportive data (when a. and b. are not applicable):*

Not applicable.

4. Clinical cut-off:

Not Applicable.

N. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Parts 801 and 809 and the specials controls for this device type.

O. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.