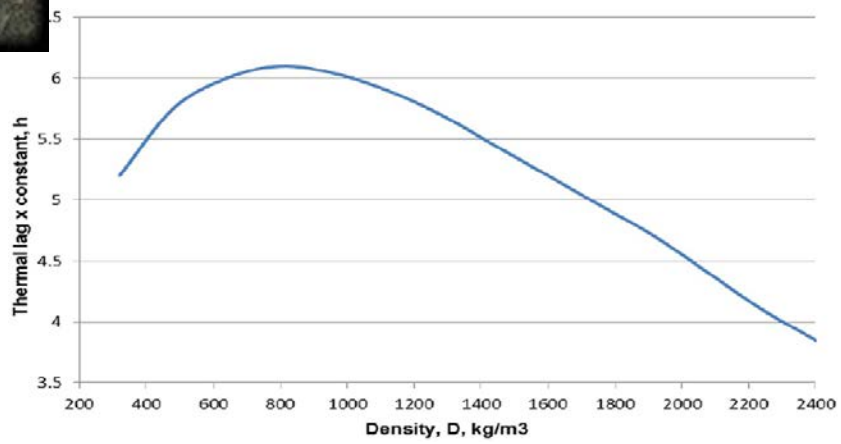
SHRP2 GPR - Rolling Density Meter (RDM) – Implementation Activities

Prepared by Maine DOT

- Summary of data collected to date
- Use of OriginLab
- General Observations

How do we determine density now?



Summary of Data Collected

2016:

1 ¼" overlay, Rt.1 Cherryfield,1500 ft

¾" overlay, Route 9, Clifton, 3000 ft

1 ¼" overlay, I-95 S.B., Pittsfield, 4000 ft

2017:

1 ½" overlay, I-95 N.B., Pittsfield – 9 miles

1 ½" overlay, Rt. 104 Fairfield, 10,000 ft.

(no calibration cores)

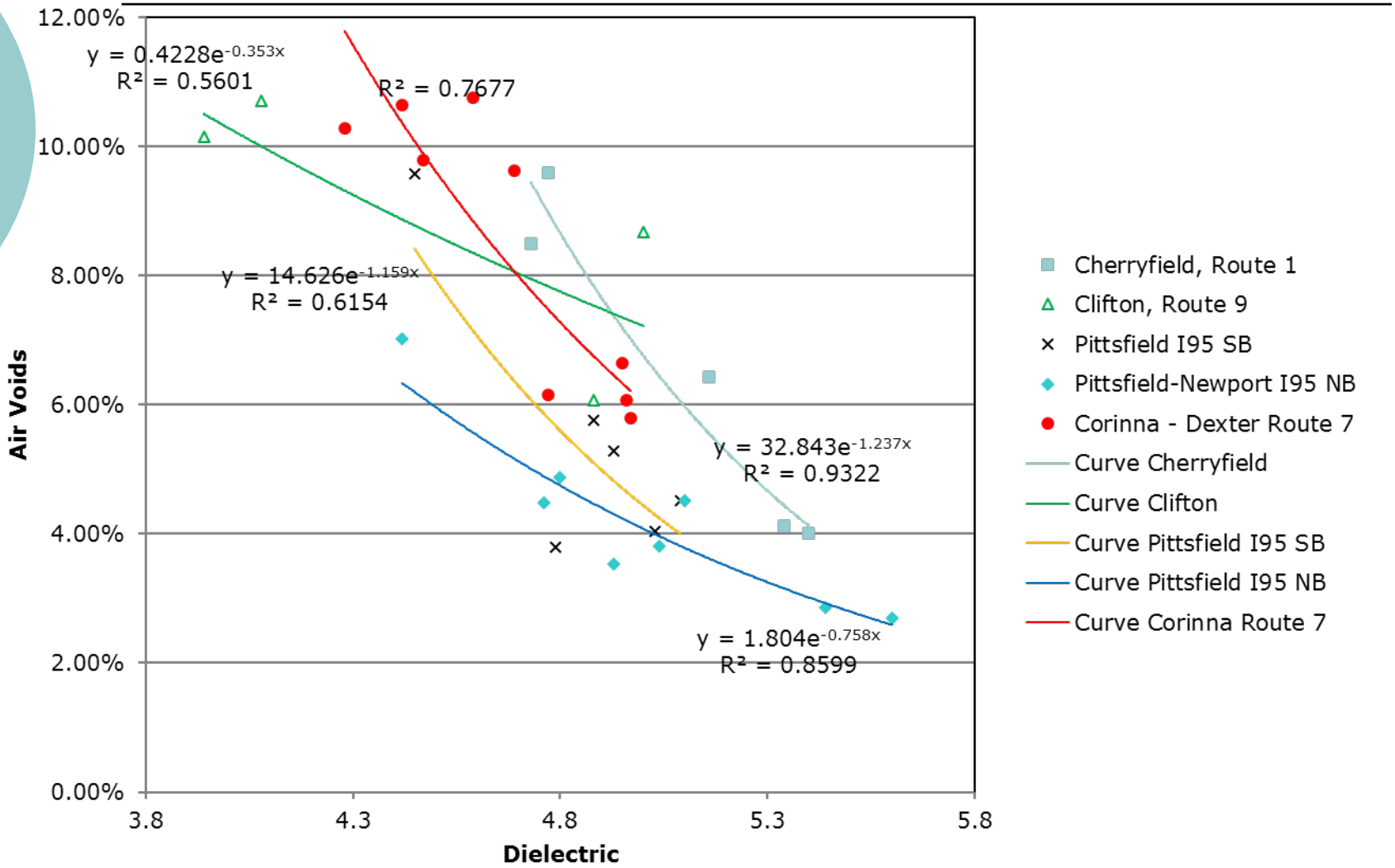
2018:

1" overlay, Rt. 7 Corinna, 6.6 miles

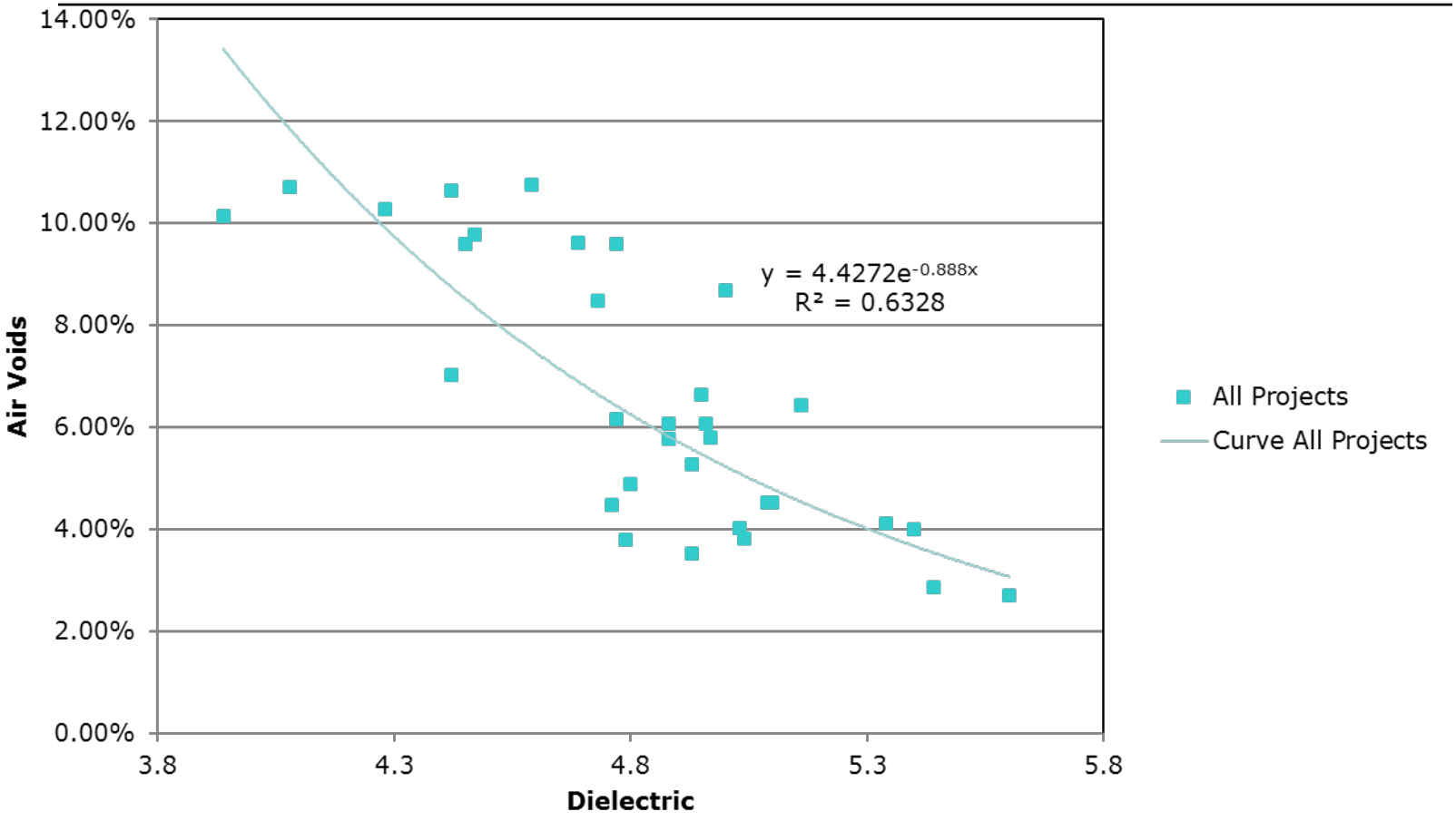
1" overlay, Rt. 9 Wesley, planned

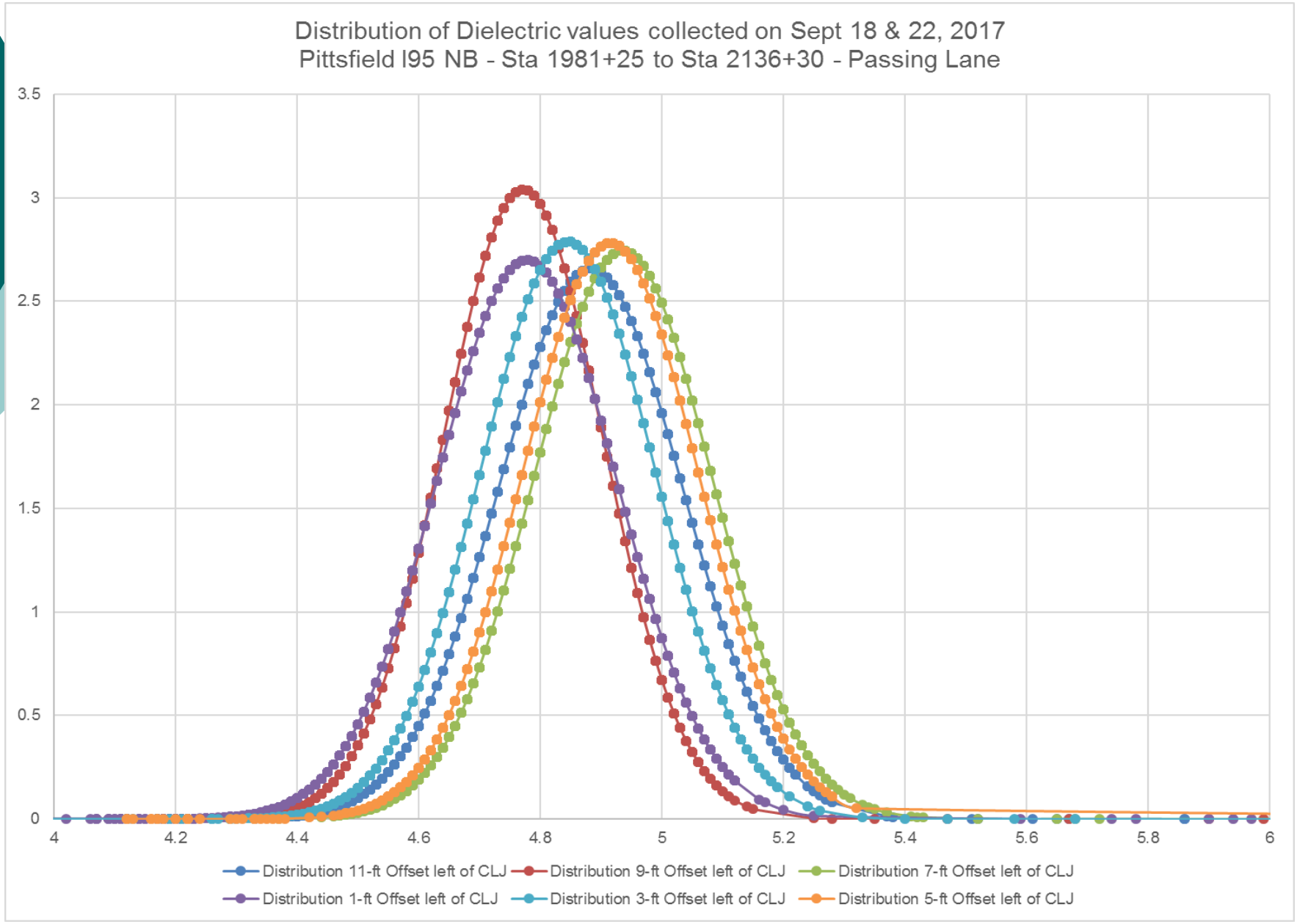
1 ½" overlay, I-95 Sherman, planned

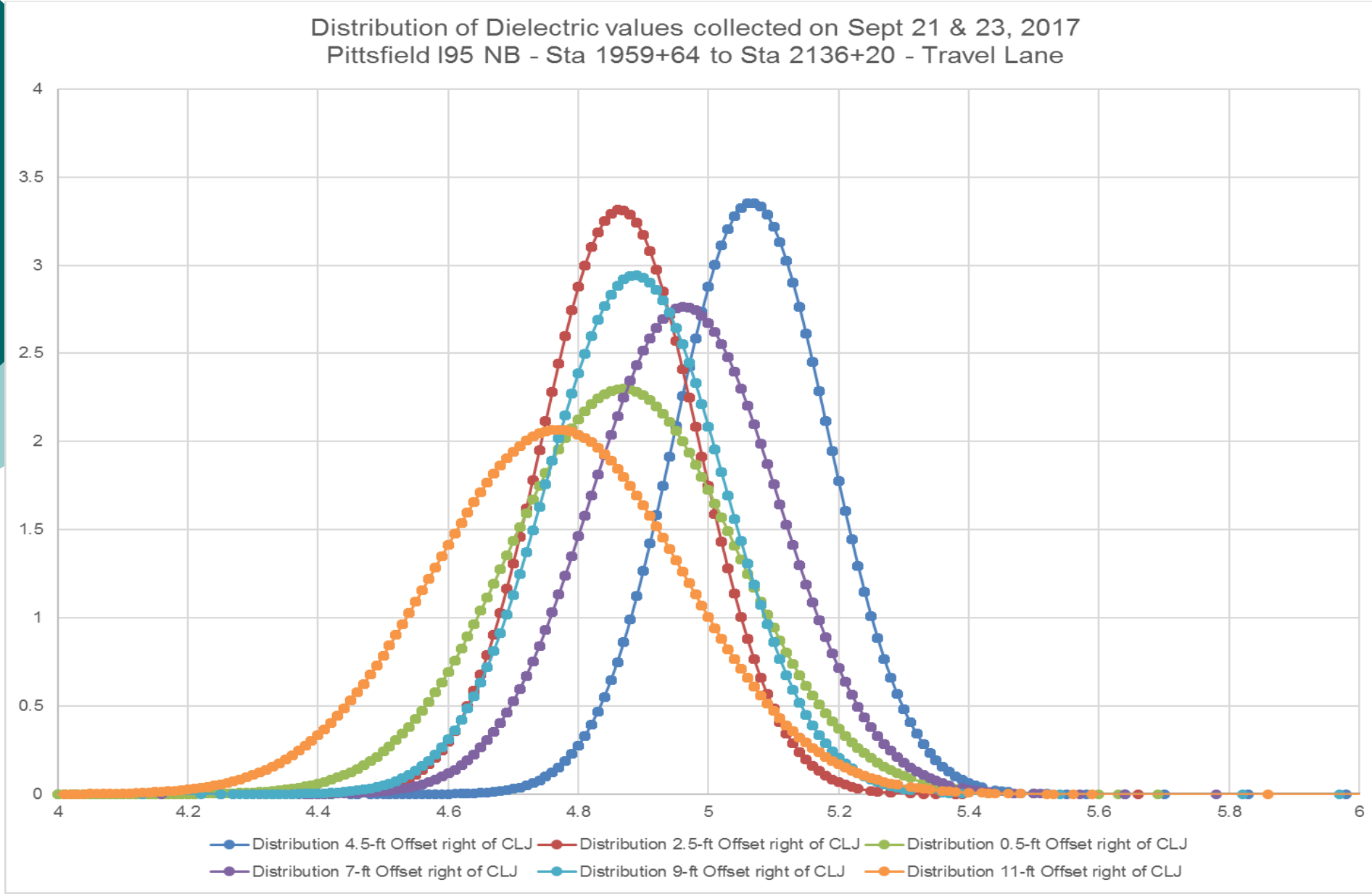
Calibration Dielectric vs Air voids

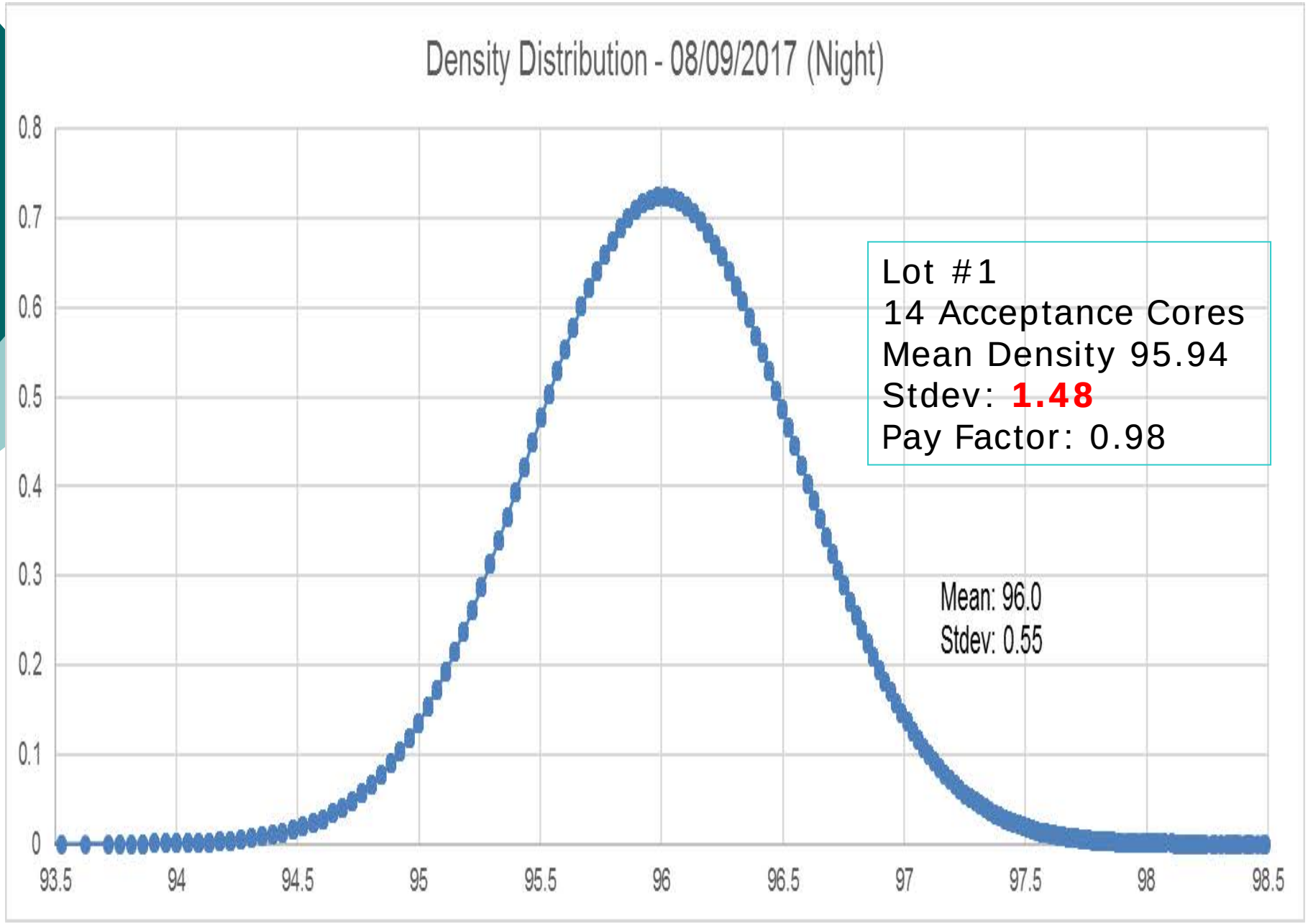


Calibration Dielectric vs Air voids

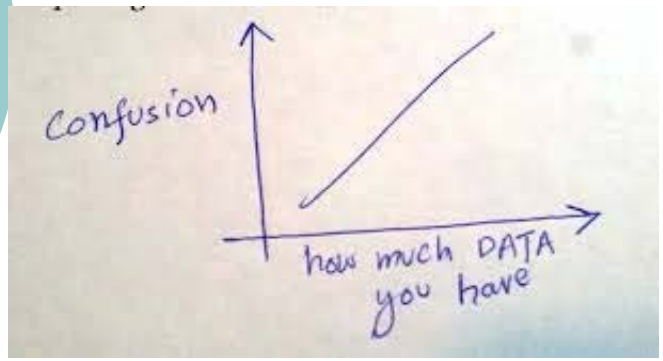



Distribution of Dielectric values collected on Sept 18 & 22, 2017
Pittsfield I95 NB - Sta 1981+25 to Sta 2136+30 - Passing Lane
3.5
3
2.5
2
1.5
1
0.5
0
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
6
Distribution 11-ft Offset left of CLJ
Distribution 9-ft Offset left of CLJ
Distribution 7-ft Offset left of CLJ
Distribution 1-ft Offset left of CLJ
Distribution 3-ft Offset left of CLJ
Distribution 5-ft Offset left of CLJ


Distribution of Dielectric values collected on Sept 21 & 23, 2017
Pittsfield I95 NB - Sta 1959+64 to Sta 2136+20 - Travel Lane
4
3.5
3
2.5
2
1.5
1
0.5
0
4
4.2
4.4
4.6
4.8
5
5.2
5.4
5.6
5.8
6
Distribution 4.5-ft Offset right of CLJ
Distribution 2.5-ft Offset right of CLJ
Distribution 0.5-ft Offset right of CLJ
Distribution 7-ft Offset right of CLJ
Distribution 9-ft Offset right of CLJ
Distribution 11-ft Offset right of CLJ

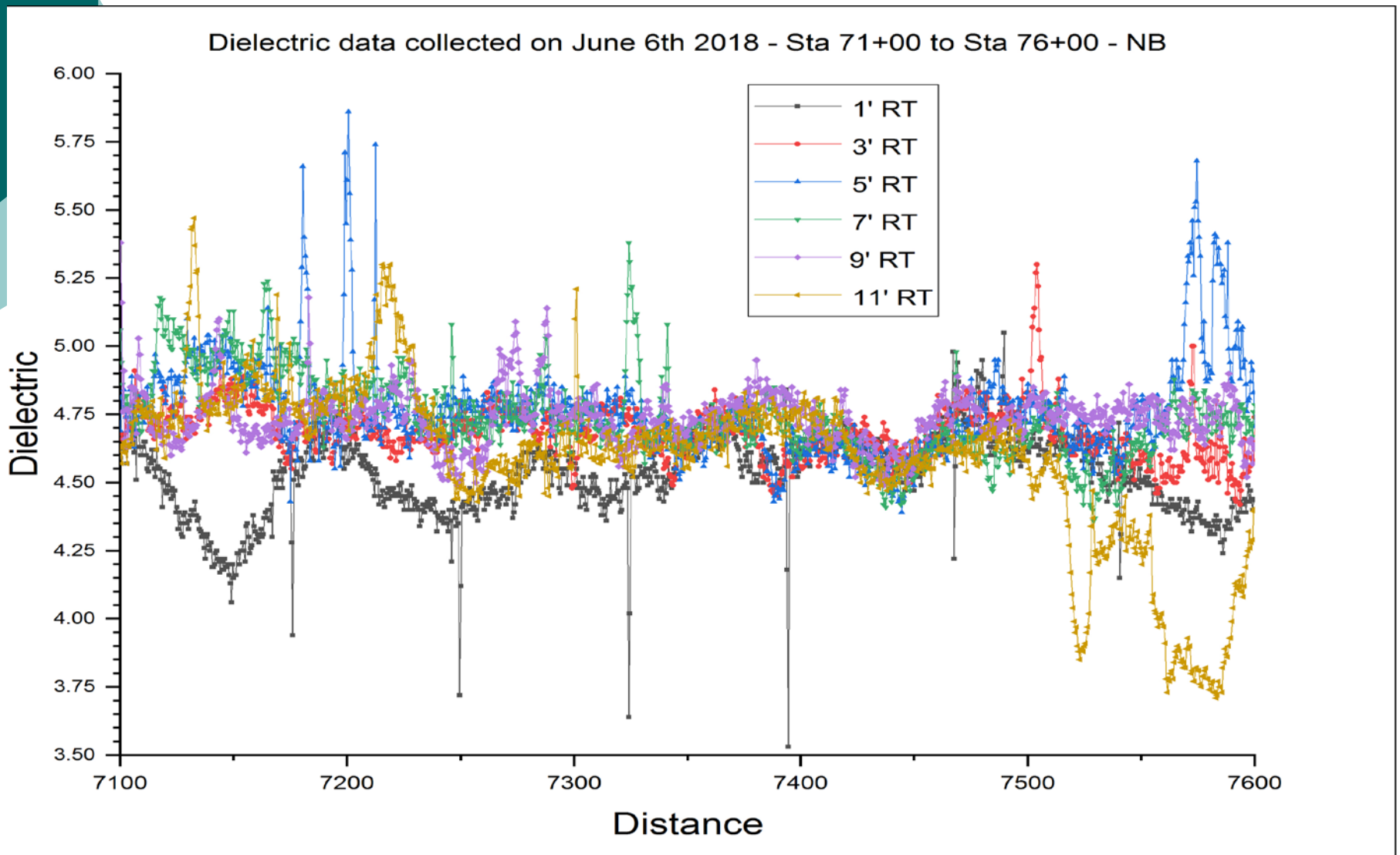

Density Distribution - 08/09/2017 (Night)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
93.5
94
94.5
95
95.5
96
96.5
97
97.5
98
98.5
Lot #1
14 Acceptance Cores
Mean Density 95.94
Stdev: 1.48
Pay Factor: 0.98
Mean: 96.0
Stdev: 0.55

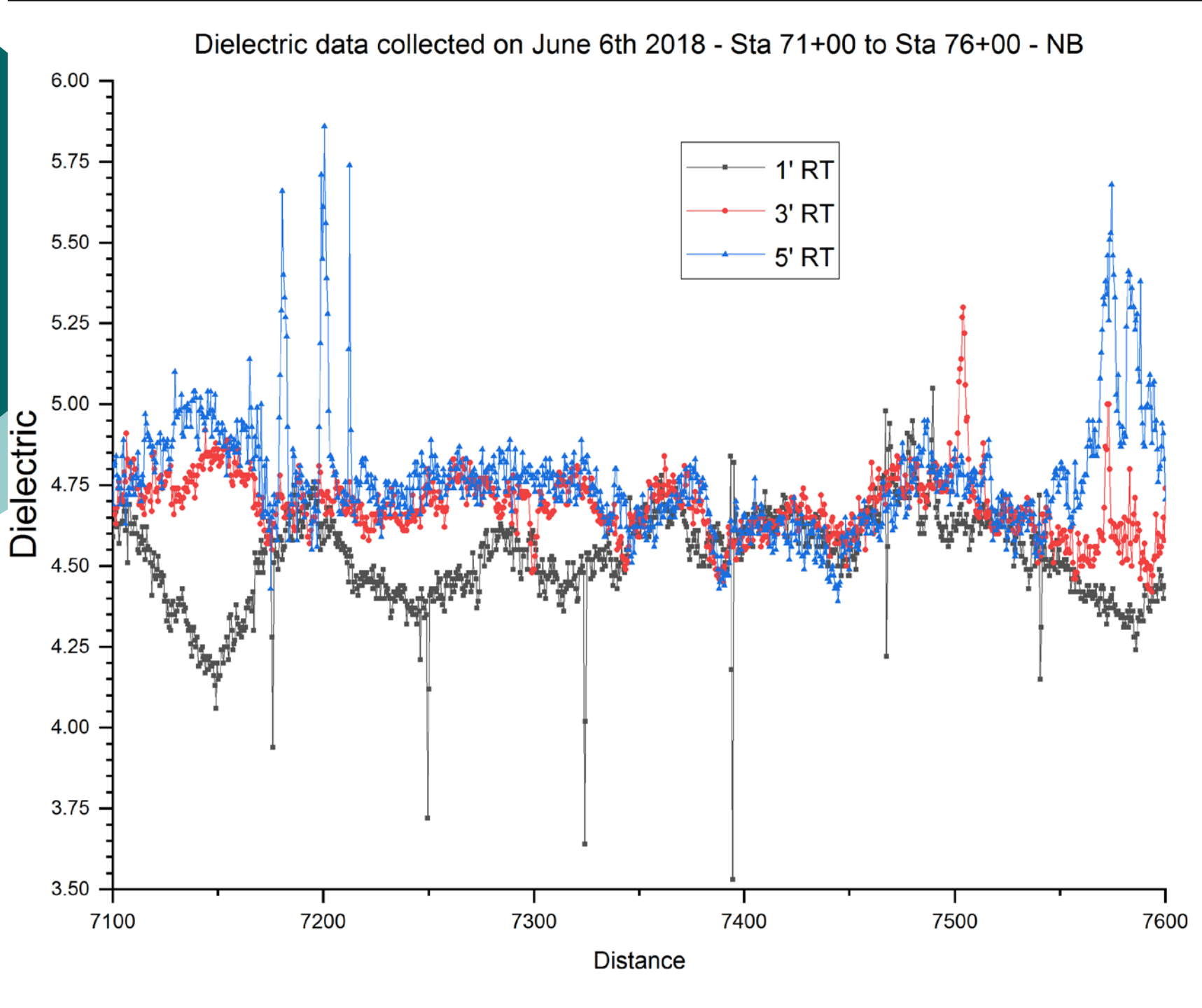
Is there a Better Way to Manage the Tons of Data?

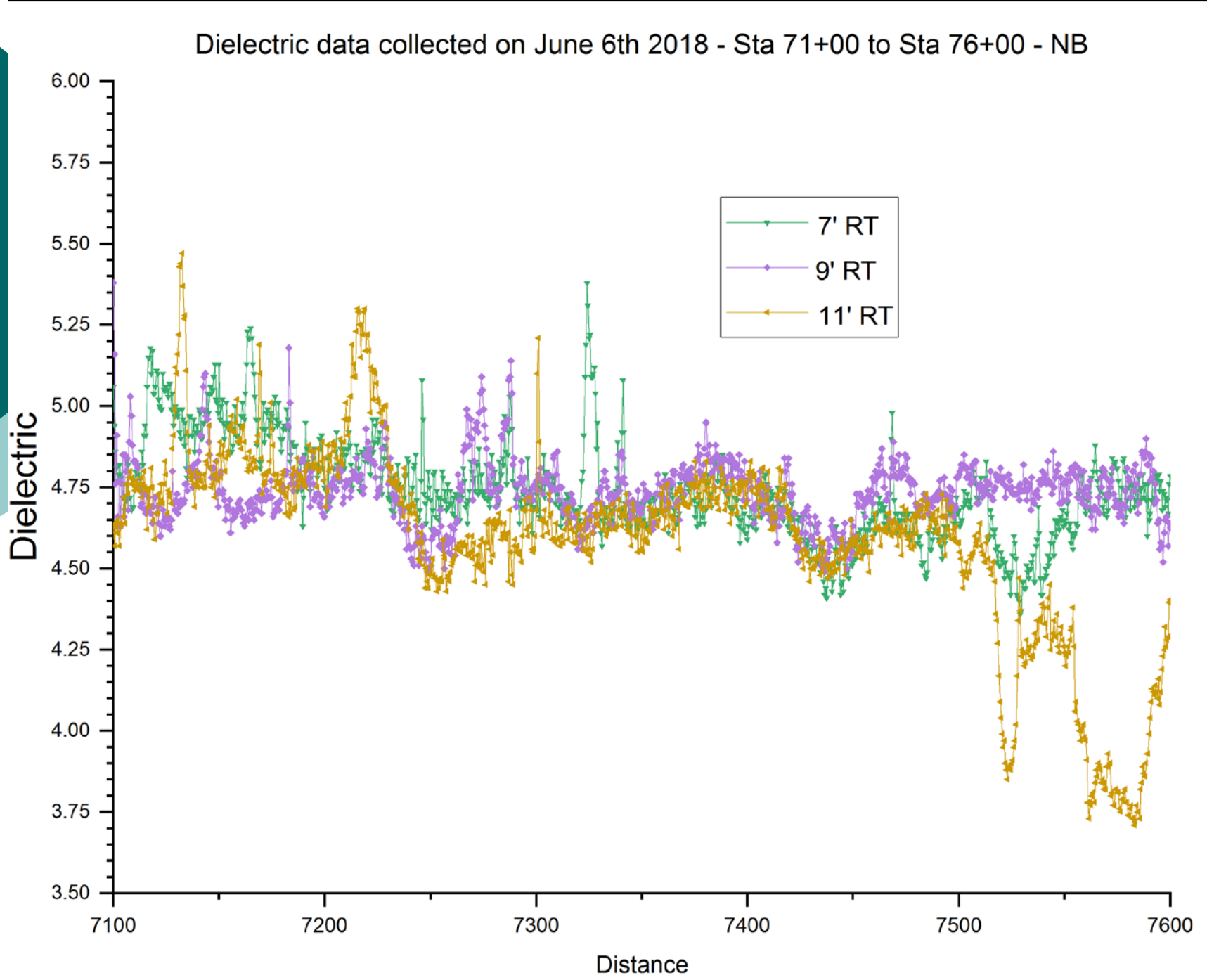


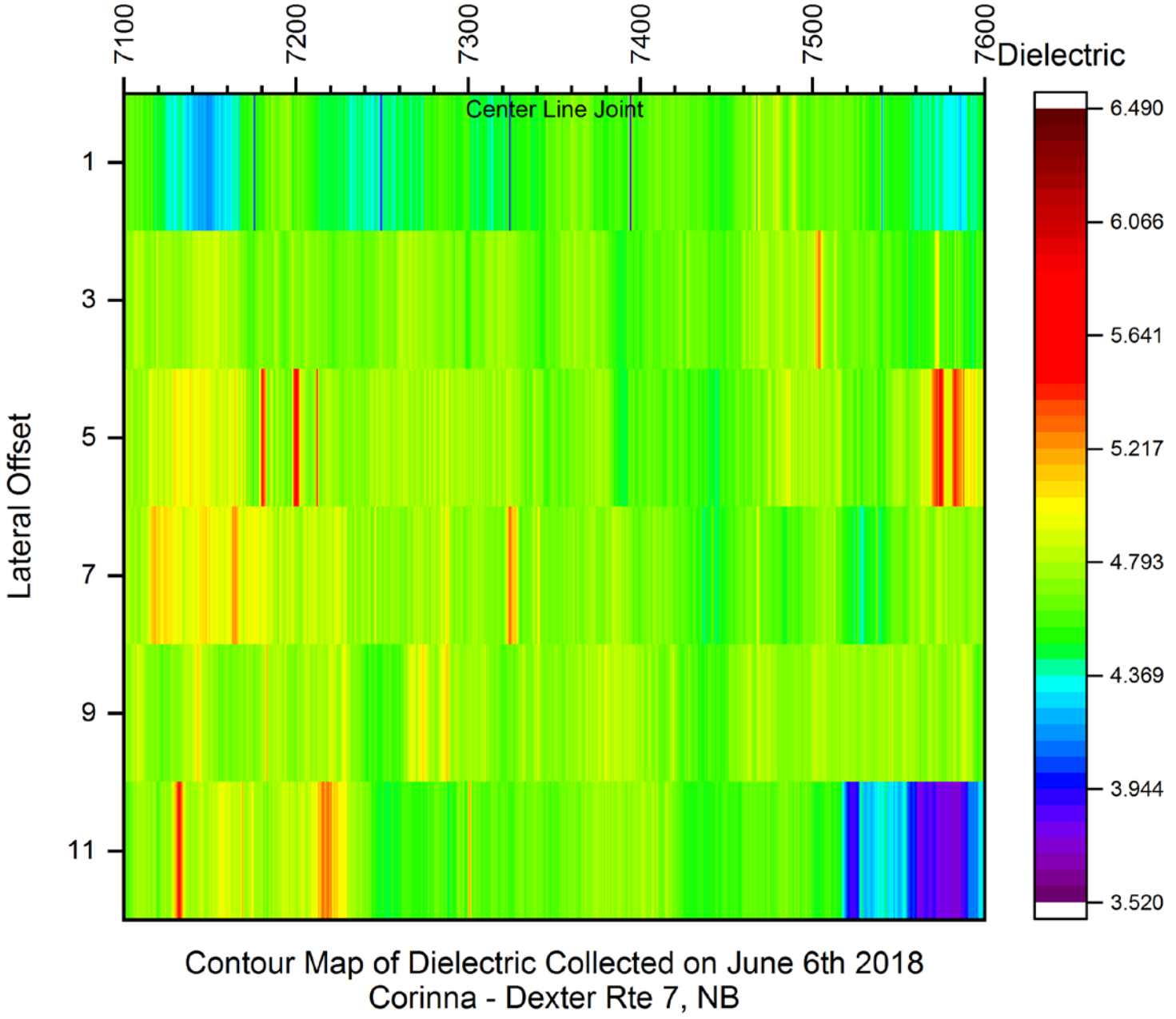
Maybe….. We're trying OriginLab

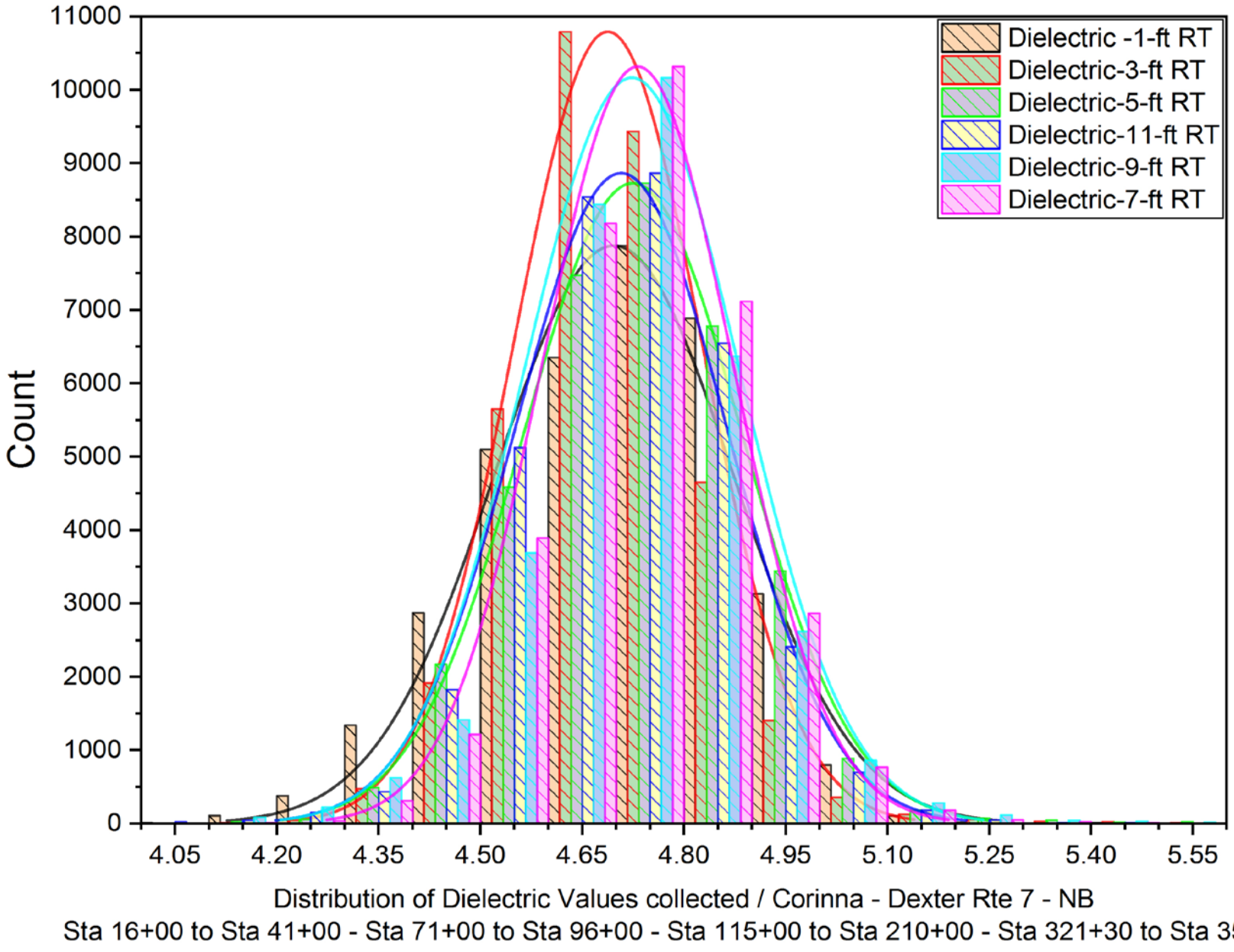
Corinna Rt. 7 project – OriginLab




Dielectric data collected on June 6th 2018 - Sta 71+00 to Sta 76+00 - NB
1' RT
3' RT
5' RT
Dielectric
6.00
5.75
5.50
5.25
5.00
4.75
4.50
4.25
4.00
3.75
3.50
7100
7200
7300
7400
7500
7600
Distance


Dielectric data collected on June 6th 2018 - Sta 71+00 to Sta 76+00 - NB
Dielectric
6.00
5.75
5.50
5.25
5.00
4.75
4.50
4.25
4.00
3.75
3.50
7100
7200
7300
7400
7500
7600
Distance
7' RT
9' RT
11' RT


7100
7200
7300
7400
7500
7600
Dielectric
Center Line Joint
1
3
5
7
9
11
Lateral Offset
6.490
6.066
5.641
5.217
4.793
4.369
3.944
3.520
Contour Map of Dielectric Collected on June 6th 2018
Corinna - Dexter Rte 7, NB


Dielectric -1-ft RT
Dielectric-3-ft RT
Dielectric-5-ft RT
Dielectric-11-ft RT
Dielectric-9-ft RT
Dielectric-7-ft RT
Count
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
4.05
4.20
4.35
4.50
4.65
4.80
4.95
5.10
5.25
5.40
5.55
Distribution of Dielectric Values collected / Corinna - Dexter Rte 7 - NB
Sta 16+00 to Sta 41+00 - Sta 71+00 to Sta 96+00 - Sta 115+00 to Sta 210+00 - Sta 321+30 to Sta 351+30

General Observations

- Conversion of the RDM survey dielectric data to air void data suggests that overall compaction was moderate, averaging between 5% to 6% air voids (**94 – 95% density**) for Cherryfield and Pittsfield I95SB projects and around 8.6% (**91.4%** density)for Clifton.
- Lower densities are measured on the joint surveys compared to lane surveys (Cherryfield and Pittsfield I95SB)
- For notched-wedge joint use joint cores for calibration

General Observations

- **The center of the lane was found to consistently have the highest compaction and lowest variability of any data taken in the lane surveys.**
- **Don’t calibrate using the side of van**

Conclusion & Recommendations

Several lessons have been learned from the RDM survey:

- Equipment is very user – friendly (issue w/battery)
- Process for re-locating high and low spots for coring is a bit challenging – **Experience has improved this issue**
- The RDM surveys show a good correlation between the dielectric value and the air void contents.
- We can use the survey to quickly identify and investigate low density areas.
- The survey can be used to check the consistency of the compaction.
- Data management is a HUGE effort

Conclusion & Recommendations

For future trial implementation, it is recommended to:

1. Implement RDM surveys on projects with full closures until more experience is gained;
2. Make more personnel available for core collection and RDM surveying (have the contractors drill cores once identified for example);
3. Do a survey without core data collection (real time feedback on relative compaction can still be provided with dielectric data);
4. Future implementation of the RDM in Maine should include the collection of lane, joint, and wheel path data within the same sections to get a better characterization of compaction across the lane;
5. Use the RDM survey in conjunction with others new technologies such as Intelligent compaction and pave IR for complementarity and possibly for a correlation.