AIRMAR TECHNOLOGY CORPORATION

White Paper

WXRS RAINFALL STUDY

AIRMAR has expanded the WeatherStation® product portfolio with the introduction of ultrasonic rain detection capabilities designated in the new products with WXRS. The AIRMAR rain detection module is an acoustic sensor that measures the impact energy of individual raindrops on an "umbrella" attached to the top of the WeatherStation. The rain detection sensor provides real-time data on rain intensity, duration, and accumulated rainfall. It is virtually maintenance-free as it has no moving parts or components that need to be emptied, cleaned or may become clogged by debris.

WXRS Features

WXRS Rain Measurement Functionality	
Rainfall Amount	Cumulative accumulation after the latest automatic or manual reset
Output Resolution:	0.01 mm
Accuracy:	5% Typical
Rainfall Intensity	One-minute running average in 10 second intervals
Range:	0 to 200 mm/hour (broader range with reduced accuracy)
Output Resolution:	0.1 mm/hour
Rainfall Duration	Counting starts whenever a water droplet is detected
Output Resolution:	1 second

The Study

The WXRS rain detection sensor has been tested for over two years under real world conditions in Milford, New Hampshire and Lake City, South Carolina. Comparisons are made to two different value priced tipping buckets and one high end rain gauge, providing alternative technology products to compare and validate the measurement performance of the WXRS rain detection sensor. This data provides performance comparison in mild (3 mm/hour) to more extreme (67 mm/hour) conditions that are often experienced in the real world.

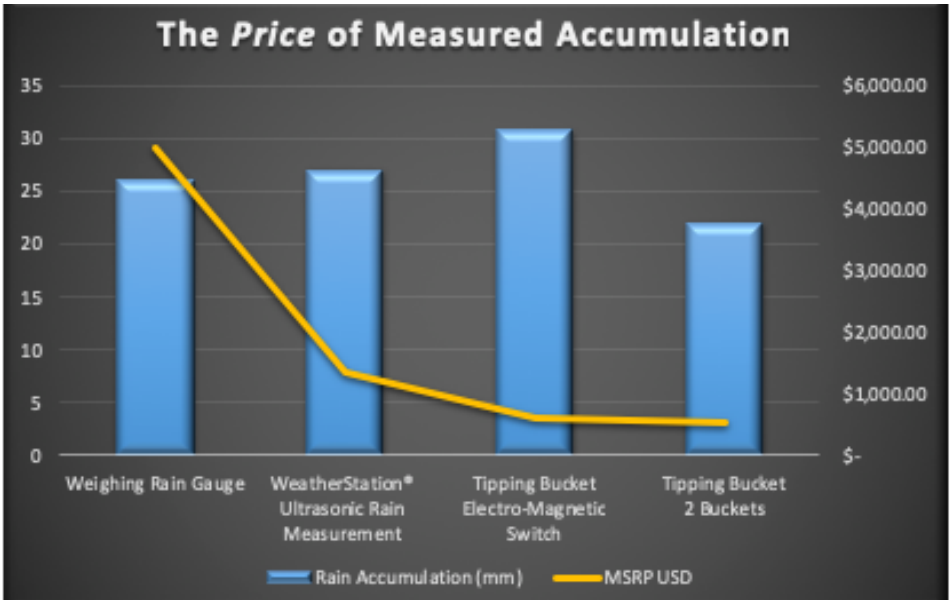
The following is comparative data from our rainfall study initiative. We have cited results from all three events that were monitored; 25 mm event, 12 mm event, 3 mm event. In each of the three, the pattern held true for performance accuracy.

Rain Study Highlights

Devices included in our ongoing study include:

1. Weighing Rain Gauge – MSRP $5,000 – *Reports Accumulation and Intensity*
2. Ultrasonic WeatherStation® WXRS – MSRP $1,365 – ***Reports Accumulation, Intensity, and Duration***
3. Tipping Bucket; 1 bucket with electro-magnetic switch – MSRP $600 – *Reports Accumulation Only*
4. Tipping Bucket; 2 Buckets – MSRP $525 – *Reports Accumulation Only*

The following chart shows comparative accumulation measurements of 25 mm over a 7 hour event overlaid with the MSRP of each device.



25 mm Event Results:

- Weighing gauge and WXRS were within 3.45% of each other for measured accumulation for this event
- TB EMS reported the highest result; measured 16.01% high
- TB 2B reported the lowest result; measured 16.76% low
- The AIRMAR WeatherStation WXRS is the only device that reported rain accumulation, intensity and duration

Total Cost of Ownership

- Device price plus
- Scheduled (cleaning) maintenance plus
- Unscheduled (debris) maintenance plus
- Data loss due to maintenance operations

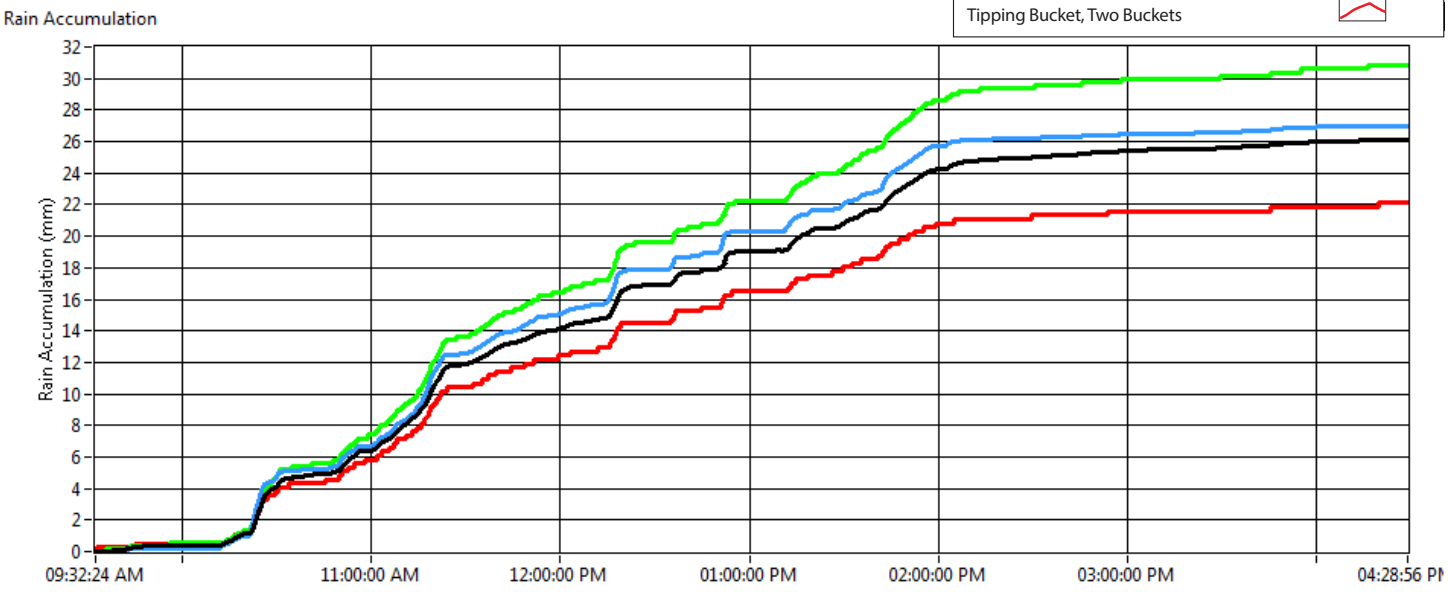
Background Data:

Following are the comparative results from three different rain events;

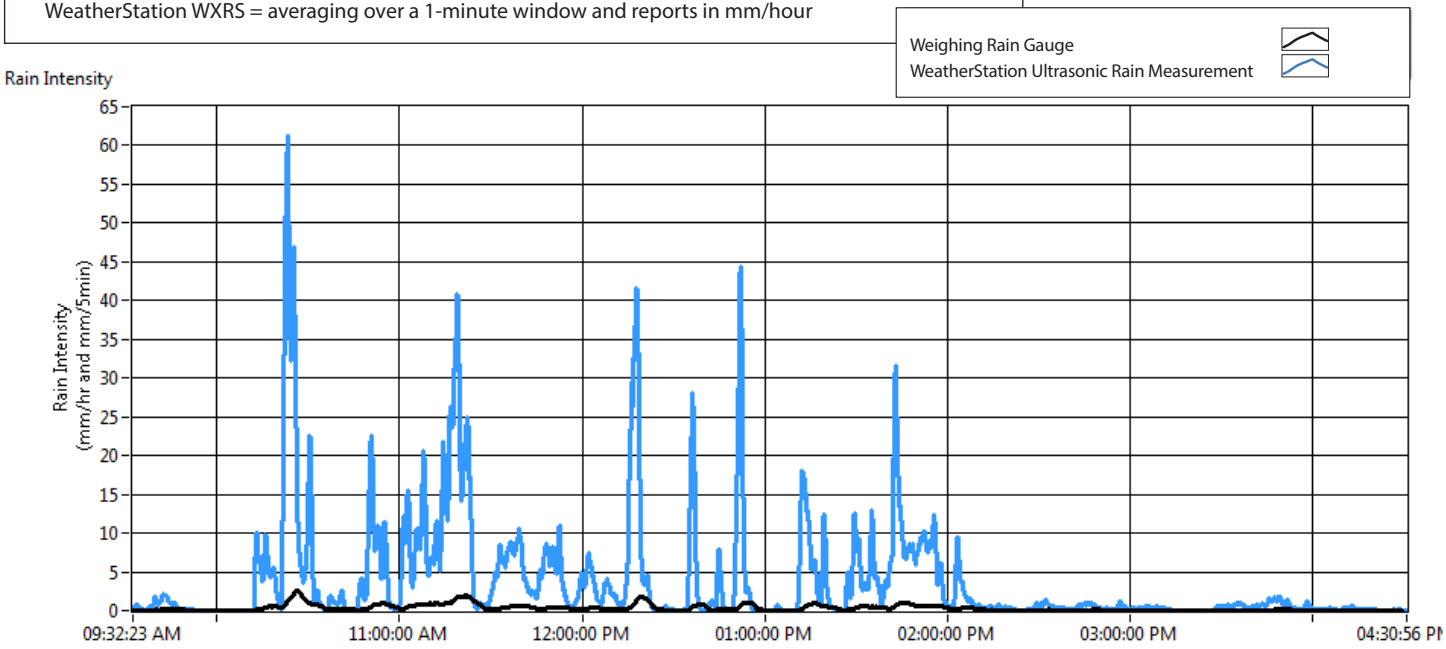
1. **25 mm** accumulation with a duration of 7 hours and peak intensity of 60 mm/hour
2. **12 mm** accumulation with a duration of 5.5 hours and peak intensity of 67 mm/hour
3. **3 mm** accumulation with a duration of 3.5 hours and peak intensity of 16.5 mm/hour

25 MM EVENT

Weighing Gauge and WXRS were within 3.45% of each other for measured accumulation for this event
TB EMS reported the highest result; measured 16.01% high
TB 2B reported the lowest result; measured 16.76% low
WeatherStation WXRS is the only device that reported rain accumulation, intensity and duration

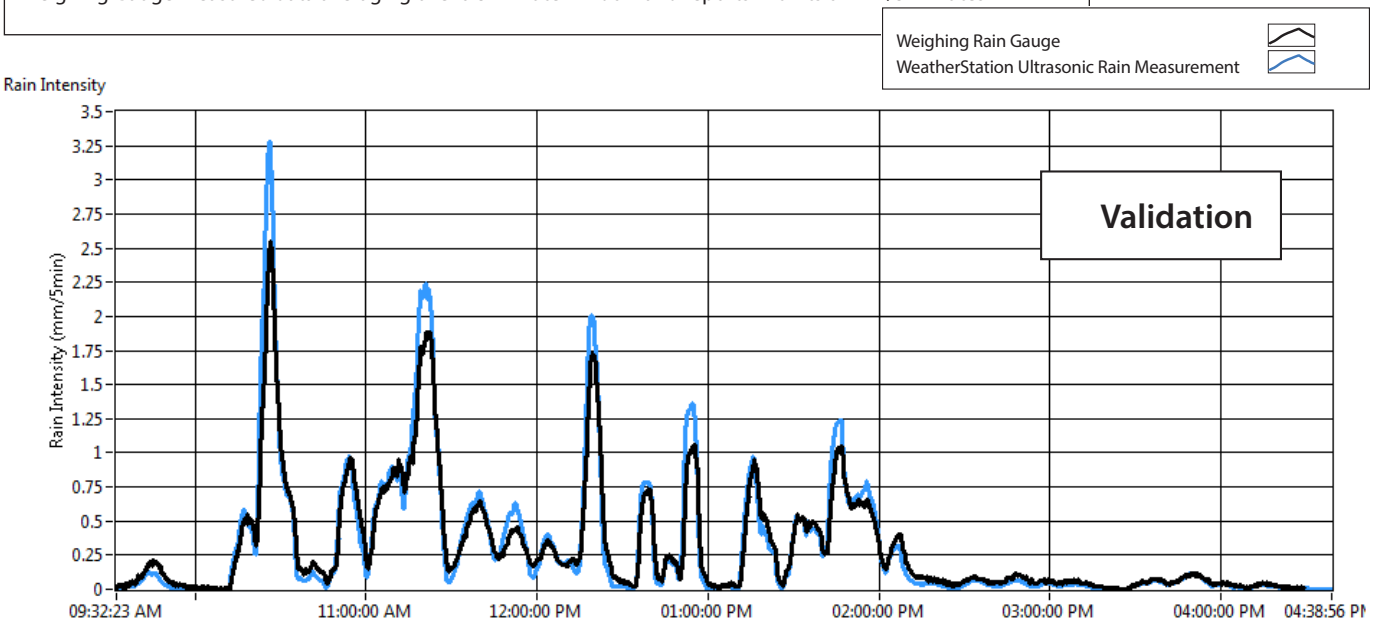


Weighing Station & WeatherStation WXRS measurements only – Tipping buckets do not report rain intensity
Different reporting methods;
Weighing Gauge = averaging over a 5-minute window and reports in units of mm/5 minutes
WeatherStation WXRS = averaging over a 1-minute window and reports in mm/hour



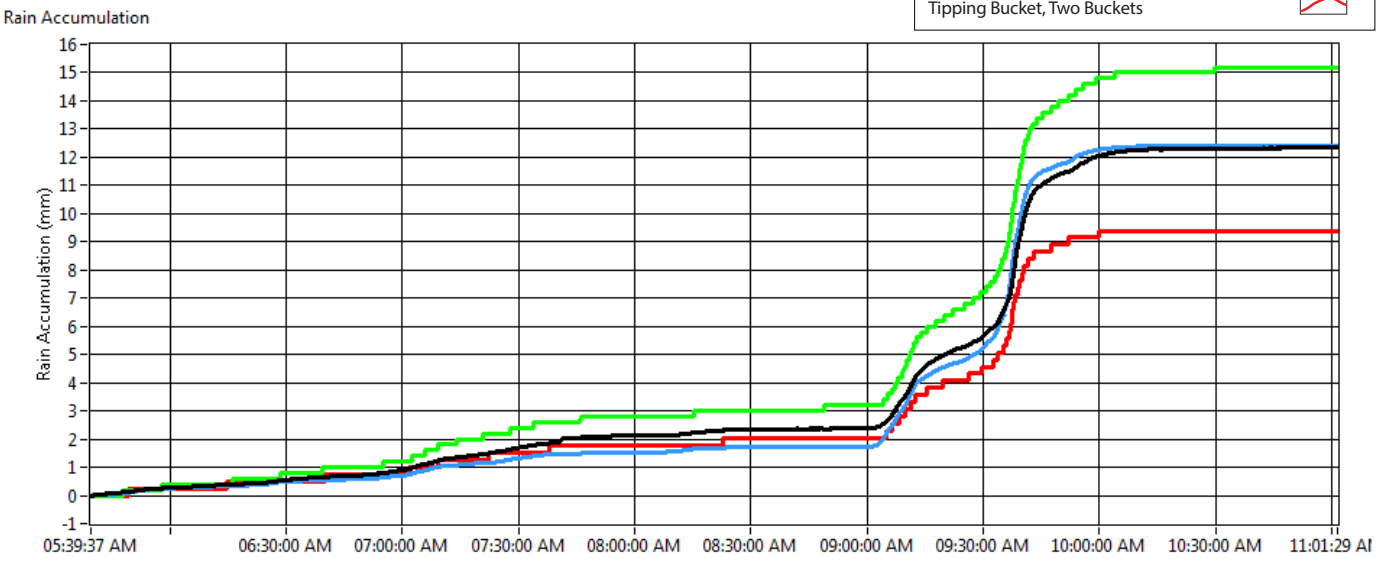
25 MM EVENT *(continued)*

WeatherStation WXRS measured data averaged over a 5-minute window and reported in units of mm/5 minutes
Weighing Gauge measured data averaging over a 5-minute window and reports in units of mm/5 minutes

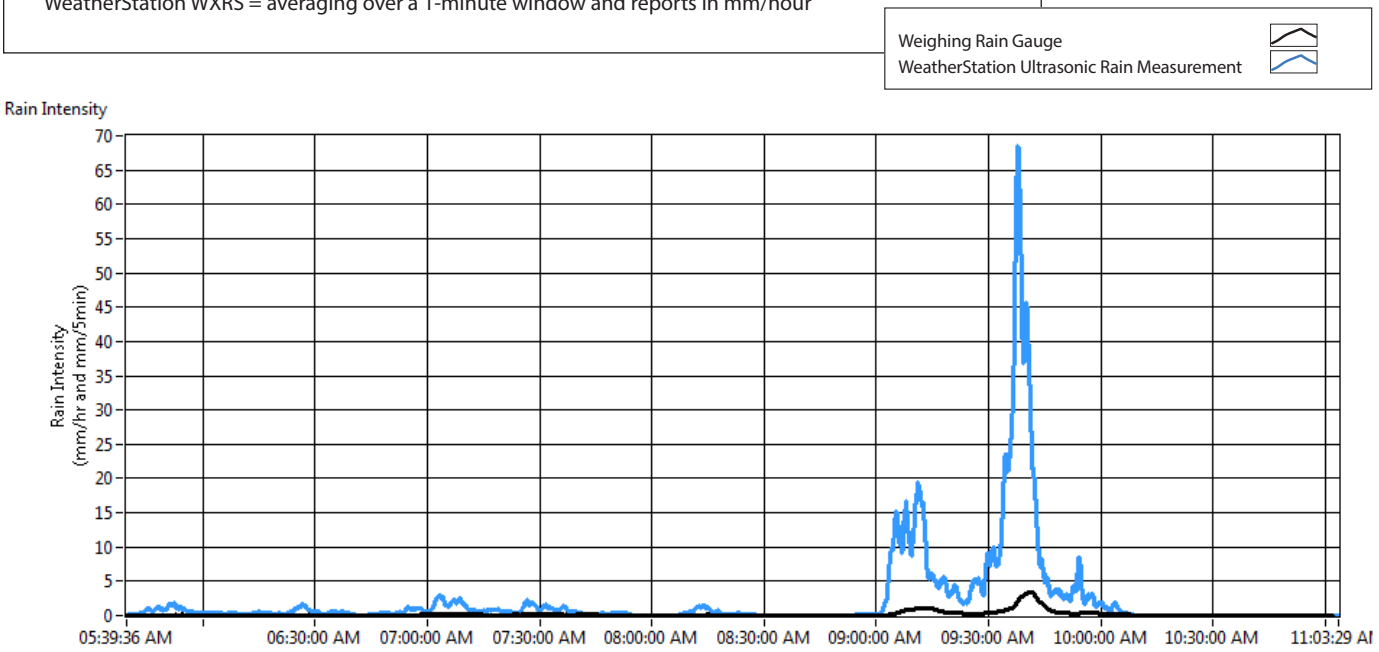


12 MM EVENT

Weighing Gauge and WXRS were within 0.23% of each other for measured accumulation for this event
TB EMS reported the highest result; measured 22.89% high
TB 2B reported the lowest result; measured 24.02% low
WeatherStation WXRS is the only device that reported rain accumulation, intensity and duration

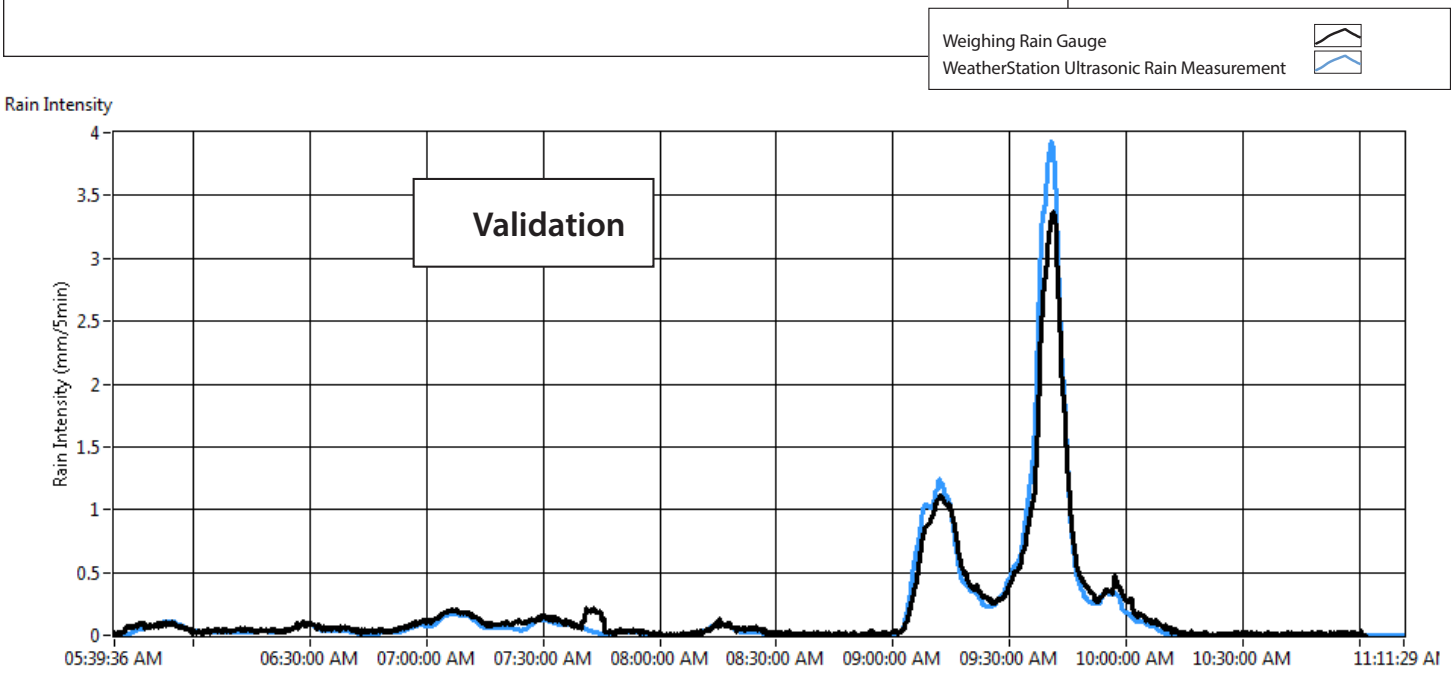


Weighing Station & WeatherStation WXRS measurements only – Tipping buckets do not report rain intensity
Different reporting methods;
Weighing Gauge = averaging over a 5-minute window and reports in units of mm/5 minutes
WeatherStation WXRS = averaging over a 1-minute window and reports in mm/hour



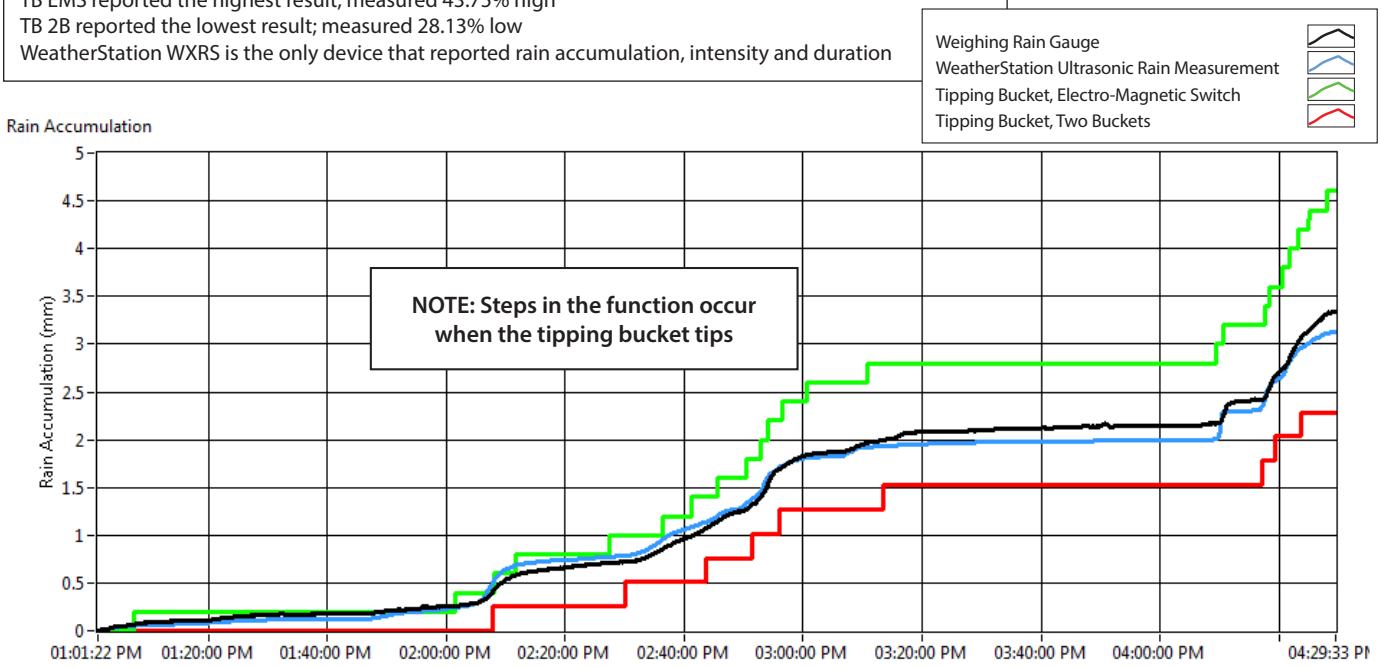
12 MM EVENT *(continued)*

WeatherStation WXRS measured data averaged over a 5-minute window and reported in units of mm/5 minutes
Weighing Gauge measured data averaging over a 5-minute window and reports in units of mm/5 minutes

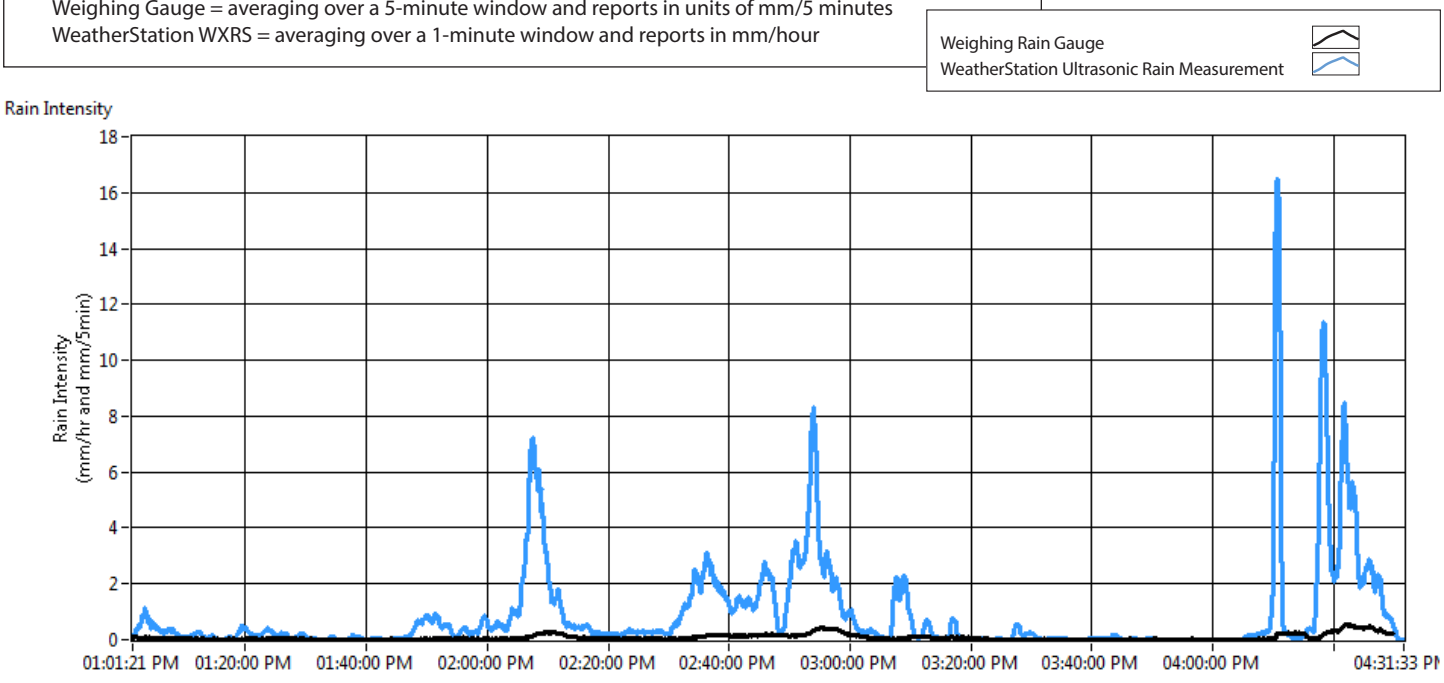


3 MM EVENT

Weighing Gauge and WXRS were within 6.06% of each other for measured accumulation for this event
TB EMS reported the highest result; measured 43.75% high
TB 2B reported the lowest result; measured 28.13% low
WeatherStation WXRS is the only device that reported rain accumulation, intensity and duration

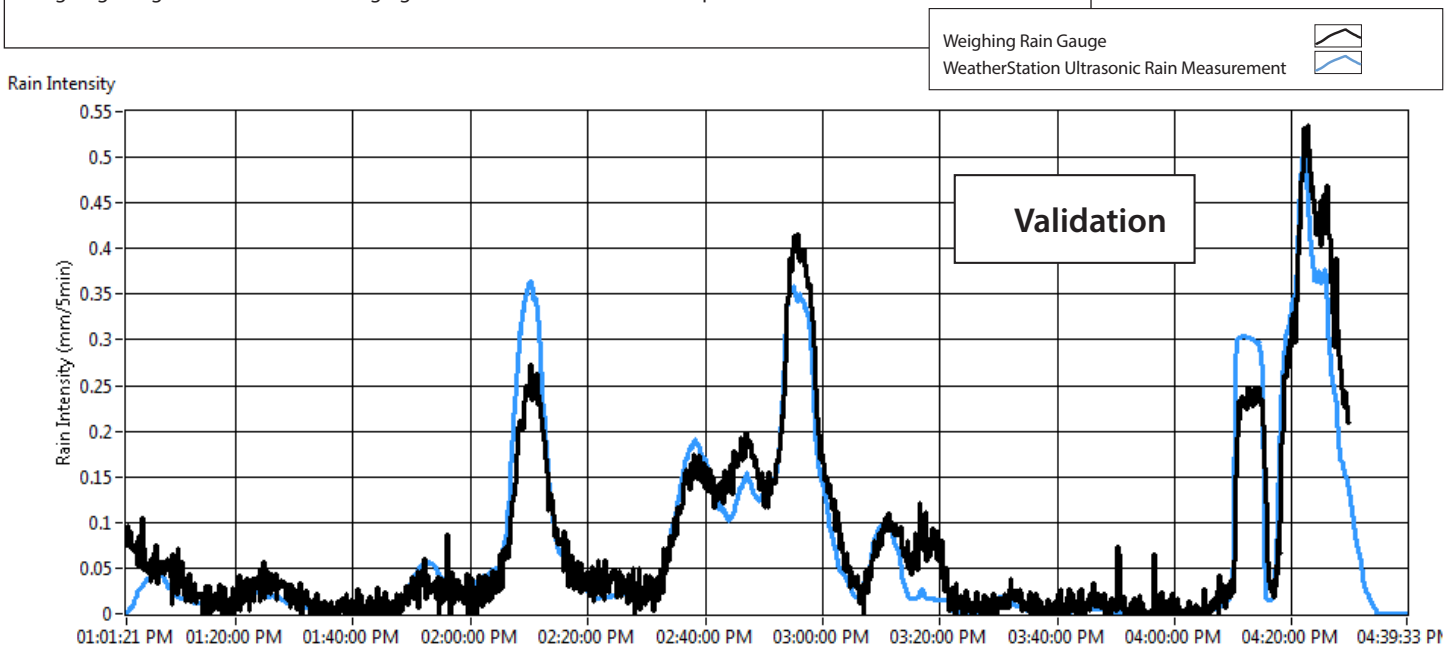


Weighing Station & WeatherStation WXRS measurements only – Tipping buckets do not report rain intensity
Different reporting methods;
Weighing Gauge = averaging over a 5-minute window and reports in units of mm/5 minutes
WeatherStation WXRS = averaging over a 1-minute window and reports in mm/hour



3 MM EVENT *(continued)*

WeatherStation WXRS measured data averaged over a 5-minute window and reported in units of mm/5 minutes
Weighing Gauge measured data averaging over a 5-minute window and reports in units of mm/5 minutes



Ultrasonic Beats Traditional Measurement

☑ Measurement ☑ Maintenance ☑ Reliability ☑ TCO (Total Cost of Ownership)

Measurement

	WXRS	Tipping Bucket	Rain Gauge
Technology	Acoustic Measurement of individual raindrops	Volume Measurement	Weight Measurement
Response	±0.01 mm/h	±0.1 mm/h	±0.05 mm/h
WMO Guideline 8 Measurement Uncertainty	No	No	Some Devices Yes, Not all Devices
Additional Weather Measurements	Wind, Temperature, Barometric Pressure, Relative Humidity, -more	No	No

Maintenance

	WXRS	Tipping Bucket	Rain Gauge
Type Required	None	Cleaning & Debris Removal	Emptying Bucket & Debris Removal
Frequency	Infrequently to Never	Scheduled & On Demand	Scheduled & On Demand

Data Availability/Reliability

	WXRS	Tipping Bucket	Rain Gauge
Data Availability	High	Medium	Medium

Total Cost of Ownership (TCO)

	WXRS	Tipping Bucket	Rain Gauge
TCO*	Very Low	High	Medium
Aquisition (MSRP)	Medium	Low to Medium	Medium to High

**** Total Cost of Ownership: Device Price plus Scheduled Maintenance (cleaning) Operation plus Unscheduled Maintenance (debris removal) Operation plus Data Lost due to Maintenance***

WEATHERSTATIONWX.COM

AIRMAR® TECHNOLOGY CORPORATION

ISO CERTIFIED CE MADE IN THE USA