Electric Tech Construction, Inc.
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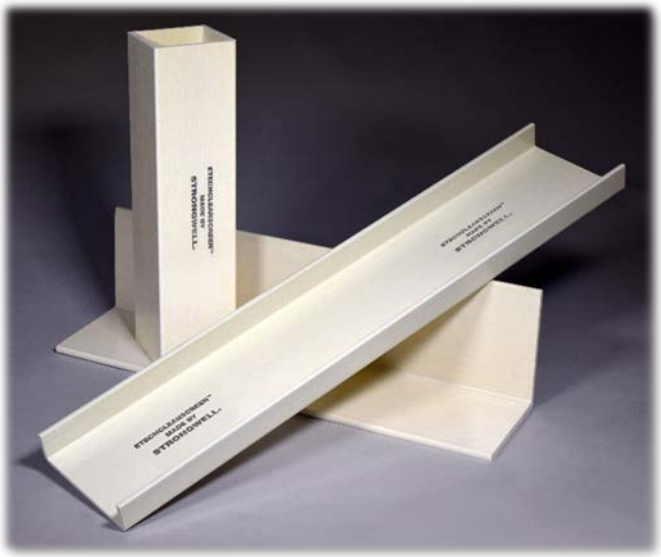
ETech installs its first ETechCleanScreen concealment at Stanford University April 14, 2018 and provides 46% better signal clarity for its customer.

E-Tech is the largest installer and provider of FRP concealment sites in Northern California. A couple years ago a major carrier had us testing a concealment site and we discovered how RF dirty virtually all concealment sites were. We discovered over 2 db loss in front of most framing members, which equates to over 16% of the surface area.



We were surprised by our results and brought this information to Strongwell, the world's leading FRP pultrusion company. Through years of research, development and RF testing, we're now releasing a revolutionary new version of RF friendly FRP, which is 46% cleaner than all similar size and shape material being used on concealment sites today.

Unlike other concealment companies which only test their exterior panel for RF signal loss, our ETechCleanScreen is an all-inclusive system which starts with the exterior panel, but also includes all framing members for the entire site. Structural Engineers will appreciate this new material because these new materials are the exact size, shape, strength, etc. as they've been using for years. Our guidelines to Strongwell was to keep all materials the same size, shape and strength, let's focus on a cleaner recipe of FRP. Through years of research and development, this cleaner new recipe created ETechCleanScreen. We recently partnered with Strongwell through an exclusive multi-year agreement and will be manufacturing and installing this revolutionary new FRP throughout the Country in the months ahead.

Concealment will be more critical in 5G deployment. Higher frequencies are much more sensitive to concealment, than lower frequencies. Existing concealments may not function with the new 5G frequencies. Many of the proposed frequency ranges will struggle to perform through many of the commonly used concealment materials on the market. Our new materials are not only made to stand the test of time, but to perform at the higher frequency ranges that 5G will require. Once RF Engineers understand how much better ETechCleanScreen performs, they will require Structural Engineers to include this material in their site plans. But unlike many construction materials listed in the blueprints, “SAME OR BETTER”, there is no material cleaner than ETechCleanScreen and there is no FRP manufacturer with a better reputation than Strongwell. This may be the only concealment system fully L.A.R.R. compliant, which is the most stringent construction standards in country. (Expecting full approval late summer 2018)

Our longer-term goal is to make ETechCleanScreen the standard for the concealment industry and resell ETechCleanScreen framing material to competing concealment companies so they also provide a cleaner signal to all carriers.

ELECTRIC TECH CONSTRUCTION, INC.

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**Purpose:** Verification of RF Signal Loss measurements on three fiberglass concealment material samples at multiple frequency bands. Low Band sweeps 698MHz to 896MHz and High Band sweeps 1.710GHz to 2.360GHz. We averaged 550 data points in each sweep for accuracy.

This document is intended to verify the measurements of Radio Frequency Signal Loss values performed on the following samples:

- No Material = Baseline
- Strongwell 1/4" Extren Plate (Industry standard which we use for our benchmark)
- Strongwell 3/8" Extren Plate (42% worse than 1/4" Extren Plate)
- Strongwell 1/4" ETechCleanScreen Plate (46% Cleaner than 1/4" Extren Plate)

**Test Methods:**

**Test Setup:** All tests were performed in ETech's FRP test table and verified onsite by Anritsu – Tom Martino (Strategic Account Manager). An Anritsu Site Master Cable & Antenna Analyzer + Spectrum Analyzer S332E was connected to a Commscope SBNHH-1D65A antenna as an RF source via the output port. A receive Anritsu 2000-1715-R Directional antenna was placed 24" from the source antenna and connected to the same Anritsu Site Master Cable & Antenna Analyzer + Spectrum Analyzer via the input port. RF frequency bands of 698MHz to 896MHz and 1.710GHz to 2.360GHz were used for the material sample evaluations.

**RF Signal Loss:** A reference run through-transmission calibration sweep was first performed with the material away from the antennas to obtain a flat transmission trace baseline. The Anritsu Site Master Cable & Antenna Analyzer + Spectrum Analyzer S332E swept in frequency while the input port recorded the received levels via the Anritsu 2000-1715-R Directional antenna. The FRP material was placed between the antennas perpendicular to the panel surface; i.e., no measurements were performed with the antennas at an angle to the panel to minimize RF power leaking around the edges. An individual Strongwell Extren 525 1/4" plate, then Strongwell Extren 525 3/8" plate, then ETechCleanScreen 1/4" plate sample was centered between transmit and receive antennas. The test sweep was repeated and the resulting values were recorded. The difference between the baseline and the sample run being the value of the RF signal loss for that material.

**Data Summary:** Reflection loss graphs and corresponding verification measurements data for frequency ranges are included on the following pages.

| DEVICE | MANUFACTURER<br>Material #<br>Style # | Sample Size<br>Ht. x Width x Thick<br>(inches) | Average<br>Signal Loss |
|---|---|---|---|
| **Fiberglass Materials** | Strongwell<br>Material: EXTREN<br>Style #: Series 525 | 48” x 48” x 1/4” | .19 dBm |
| **Fiberglass Materials** | Strongwell<br>Material: EXTREN<br>Style #: Series 525 | 48” x 48” x 3/8” | .27 dBm |
| **Fiberglass Materials** | Strongwell<br>Material: ETechCleanScreen | 48” x 48” x 1/4” | .11 dBm |

Values expressed are dBm of loss when sample is placed onto test fixture.

**Measurement Equipment Used**

| Equipment Used | | |
|---|---|---|
| Device | Model | Calibration dates |
| Commscope Multiband Antenna (Transmit) | SBNHH-1D65A | 2010 to Current |
| Anritsu Directional Antenna 698-2500MHz (RCV) | 2000-1715-R | 12/2/2010 to Current |
| Anritsu Site Master Analyzer (R & S) | S332E | 7/12/2010 to Current |
| Electric Tech Construction FRP Test Table | ETech | 4/20/2016 to Current |

**RF Transmission Loss Data Summary**

In all cases, the antennas were perpendicular to the panel surface; i.e., no measurements were performed with the antennas at an angle to the panel. The industry standard for RF Transmission Loss testing is a point to point measurement which we believe is flawed for many reasons. Mostly because when we changed the angle of the material or added framing members in-between the two antennas, we found hot and cold spots for the signal being recorded. Very similar to water flowing down a rocky river or wind blowing around a tree. The most consistent results were recorded at the 0° measurement and the results turned out as expected. Our 3/8” panel averaged 42% worse RF transmission then the same 1/4” material. This makes sense, because the 3/8” panel is 50% thicker than the 1/4” material.

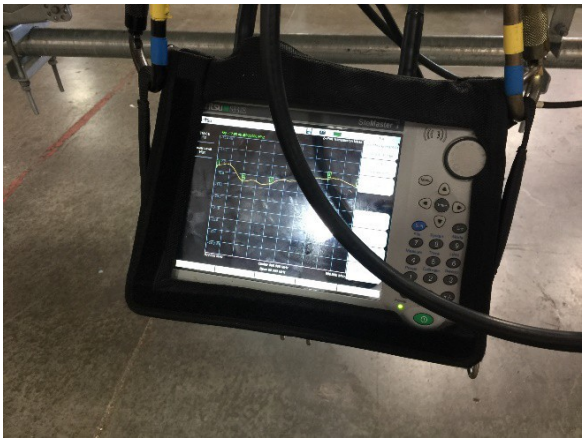
Electric Tech Construction is the largest telecom provider in Northern California. We have built hundreds of sites from the ground up and worked on and tested thousands of sites over the years. All our tests were performed with real world telecom antennas and the same Anritsu test gear we use every day to build and test telecom sites. We have dedicated crews which specialize in testing and perfecting radio frequency transmission. Anritsu has been the industry standard for many years and the only test gear we use.

We have certified test data from numerous concealment providers and they all send their 4’ x 4’ panel to a laboratory which test with Hewlett Packard or Rohde & Schwarz spectrum analyzers and transmit with no name Generic or Emco antennas. While this testing equipment might produce impressive information;

- We are not aware of any telecom GC using this gear in the real world for onsite testing.
- We have multiple reports from many Concealment providers and do not see an industry standard for testing.
- Not one report compares industry standard flat stock FRP (Strongwell, Fibergrate, Bedford) material to subject panel and produces a result of X% cleaner.
- Not one report even considers the interference of the framing member material. As if framing members are never placed in front of or near antennas. Who cares how clean your panel is if you have a 4” - 3/8” tube in front of your antenna which creates .54dBm loss.
- Insertion Loss as part of their report? Insertion loss for us in the field is the measurement from the radio to the antenna (ONLY). It has nothing to do with the RF signal hitting the concealment material which we refer to as reflection loss. They should ONLY report the reflection loss AFTER it leaves the antenna. That’s like measuring the throughput of a hose spraying through a screen with a leaky hose.

Being the largest telecom GC in Northern California has its advantages. We have access to just about every concealment providers panels. Many sites are purchased by the carrier and provided to us. This gives us the ability to RF test just about every concealment company’s materials. We know what works and we know which panels we continually have to repair for signal failure. We have used this knowledge to essentially build a better box. We have constructed 100’s of new concealment structures in the past few years and we have not have one callback for product failure or signal issues.

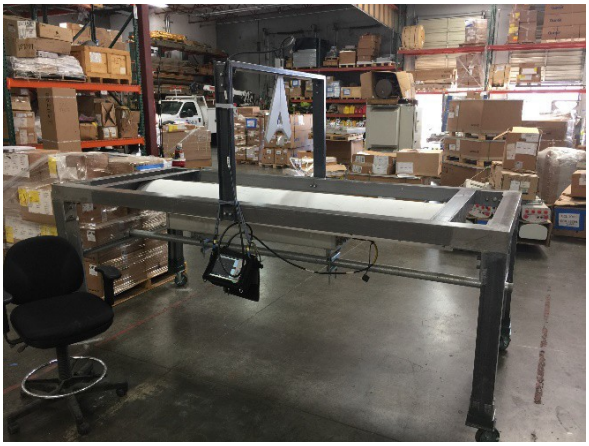
**Anritsu Site Master Cable**
**& Antenna Analyzer +**
**Spectrum Analyzer S332E**



**Baseline Test**

**1/4 Inch FRP Test**

**ETech FRP Test Table**
**& Anritsu 2000-1715-R**
**Directional Antenna**

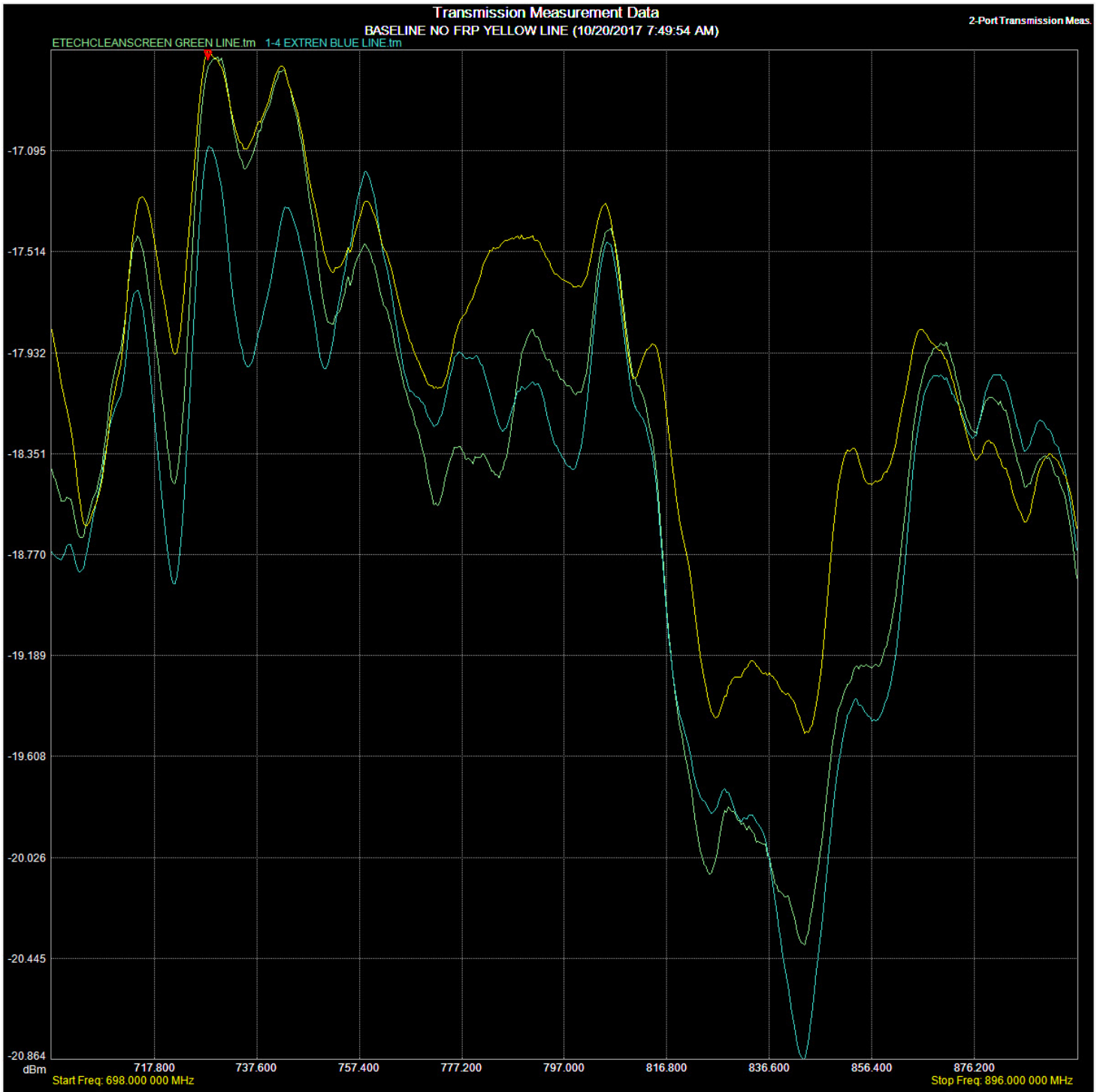


**3/8 Inch FRP Test**

**ETechCleanScreen Test**

# 698-896 MHz Frequency FRP Test

Baseline = No FRP  ¼" - Strongwell Extren  ¼" - ETechCleanScreen

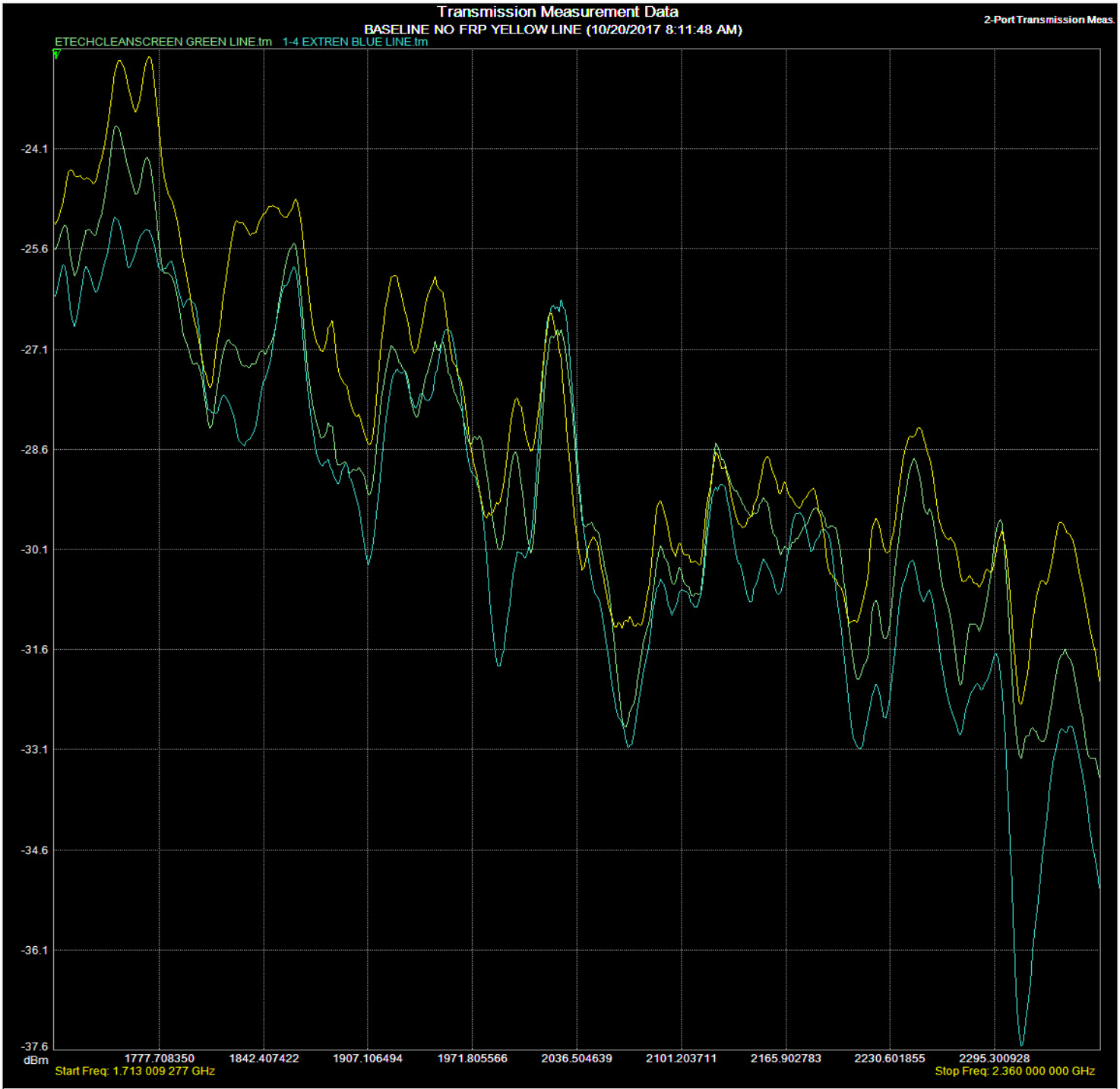



Measurement Parameters

| | | | |
|---|---|---|---|
| TM Cal | On | Serial Number | 1318017 |
| Power Level | High | Base Ver. | V5.83 |
| High Dynamic Range | On | App Ver. | V6.48 |
| Bias-Tee Voltage | 0.00 V | Model | S332E |
| Bias-Tee Current | 0.0 mA | Options | 10, 21 |
| Averaging | Off | Date | 10/20/2017 7:49:54 AM |
| Operator Name | | Device Name | |
| Tower | | | |

# 1.710 – 2.360 GHz Frequency FRP Test

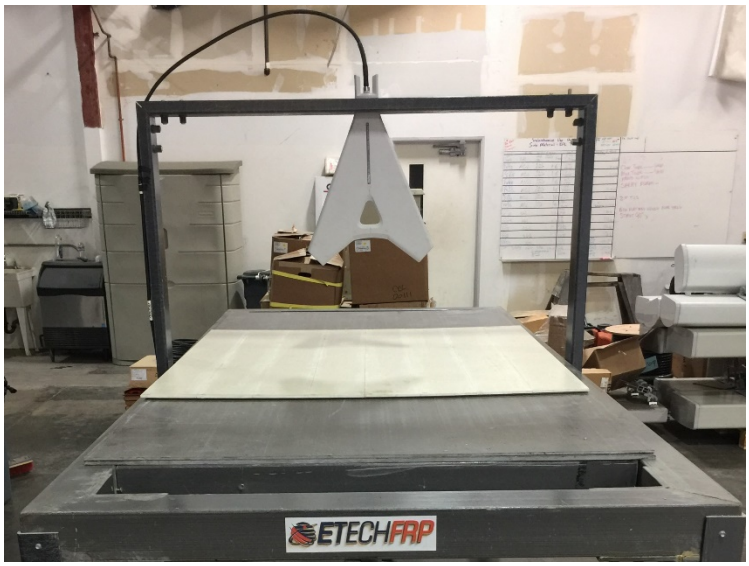
Baseline = No FRP  ¼" - Strongwell Extren  ¼" – EtechCleanScreen

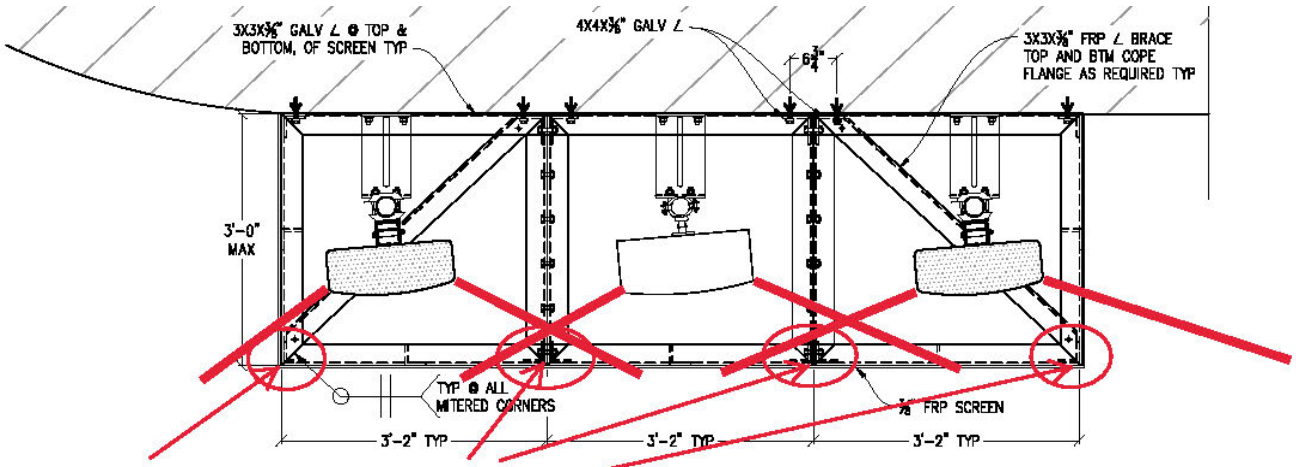



| Measurement Parameters | | | |
|---|---|---|---|
| TM Cal | On | Serial Number | 1318017 |
| Power Level | High | Base Ver. | V5.83 |
| High Dynamic Range | On | App Ver. | V6.48 |
| Bias-Tee Voltage | 0.00 V | Model | S332E |
| Bias-Tee Current | 0.0 mA | Options | 10, 21 |
| Averaging | Off | Date | 10/20/2017 8:11:48 AM |
| Operator Name | | Device Name | |
| Tower | | | |

ETECHCLEANSCREEN & STRONGWELL

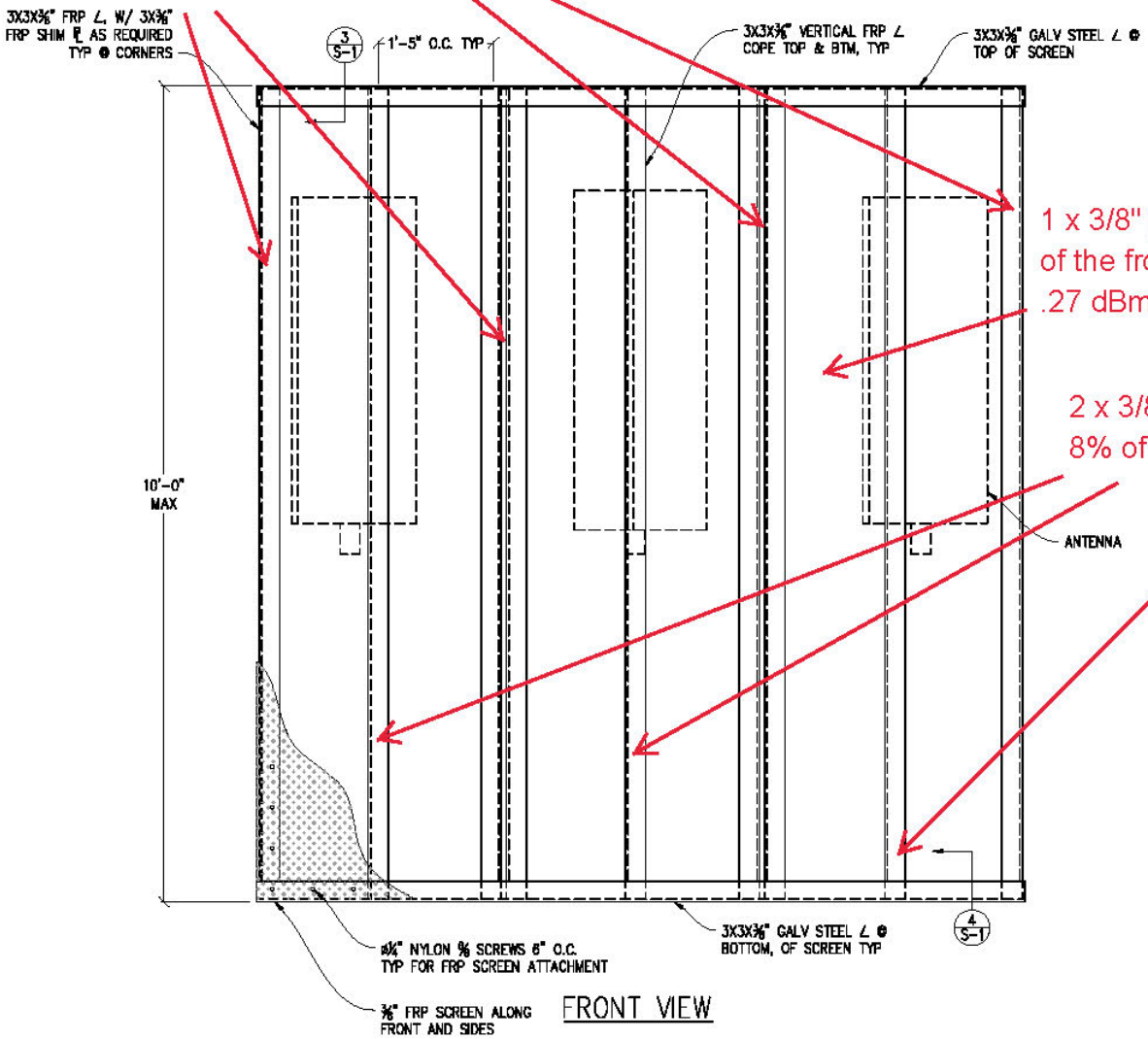
# JOINED FORCES TO CREATE THE WORLD'S FIRST RADIO FREQUENCY TRANSPARENT FIBERGLASS PANELS






The FRP is 3 x 3/8" thick in these areas
16% of front is .81 dBm loss

PLAN VIEW




1 x 3/8" panel is 76%
of the front area and is
.27 dBm loss and acceptable

2 x 3/8" in these areas
8% of front is .54 dBm loss

FRONT VIEW

1 FRP SCREEN DETAIL
1"=1'-0"

# ETECHCLEANSCREEN™

# MADE BY

# STRONGWELL®

**We stock all common sizes to build 80% of all FRP sites**

NuWest
TEXTILE GROUP