Background Noise

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Presentation

- Review of -140dBm/Hz
- Noise Measurements
- RF Ingress
- Conclusion

-140 dBm/Hz

- **The –140dBm/Hz originally came from a study that was done on outside plant background noise in support of DSL technologies.**
- **There is a significant difference in the environment that we operate in:**
  - **The temperature extremes and noise inside buildings is less severe and in addition the steel structure of the building will mitigate some noise.**
  - **The previous studies were done on POTS cabling which has poor balance characteristics compared to that of Category 5e or 6.**

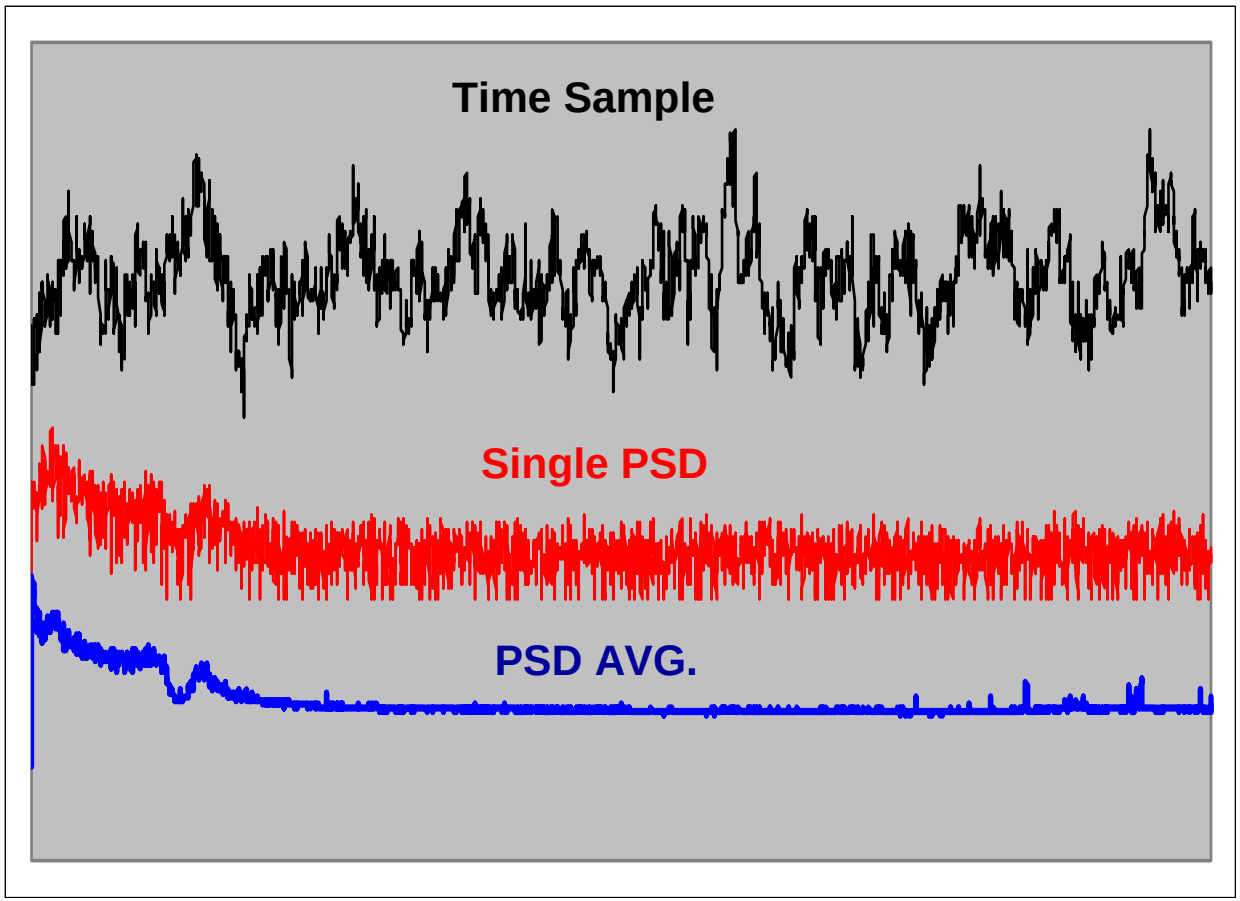
Noise Test for Inside Plant

- **To determine the spectral-density of the noise, a pair on an unused cable in a active wiring closet was measured.**
  - **A 2 μs time sample of the signal on the pair was taken every 4.167 minutes (4mHz) over a 24 hour period (346 samples).**
  - **The spectral-density was calculated for each time sample.**
  - **These were averaged together.**
- **All the cabling is Category 6.**
- **Most of the connections in the wiring closet were IP phones running 100Base-TX.**
- **Instruments:**
  - **LeCroy LC 584AM 1GHz Oscilloscope**
  - **HP8447D 1300MHz low noise amplifier**
  - **Pulse generator for external trigger**

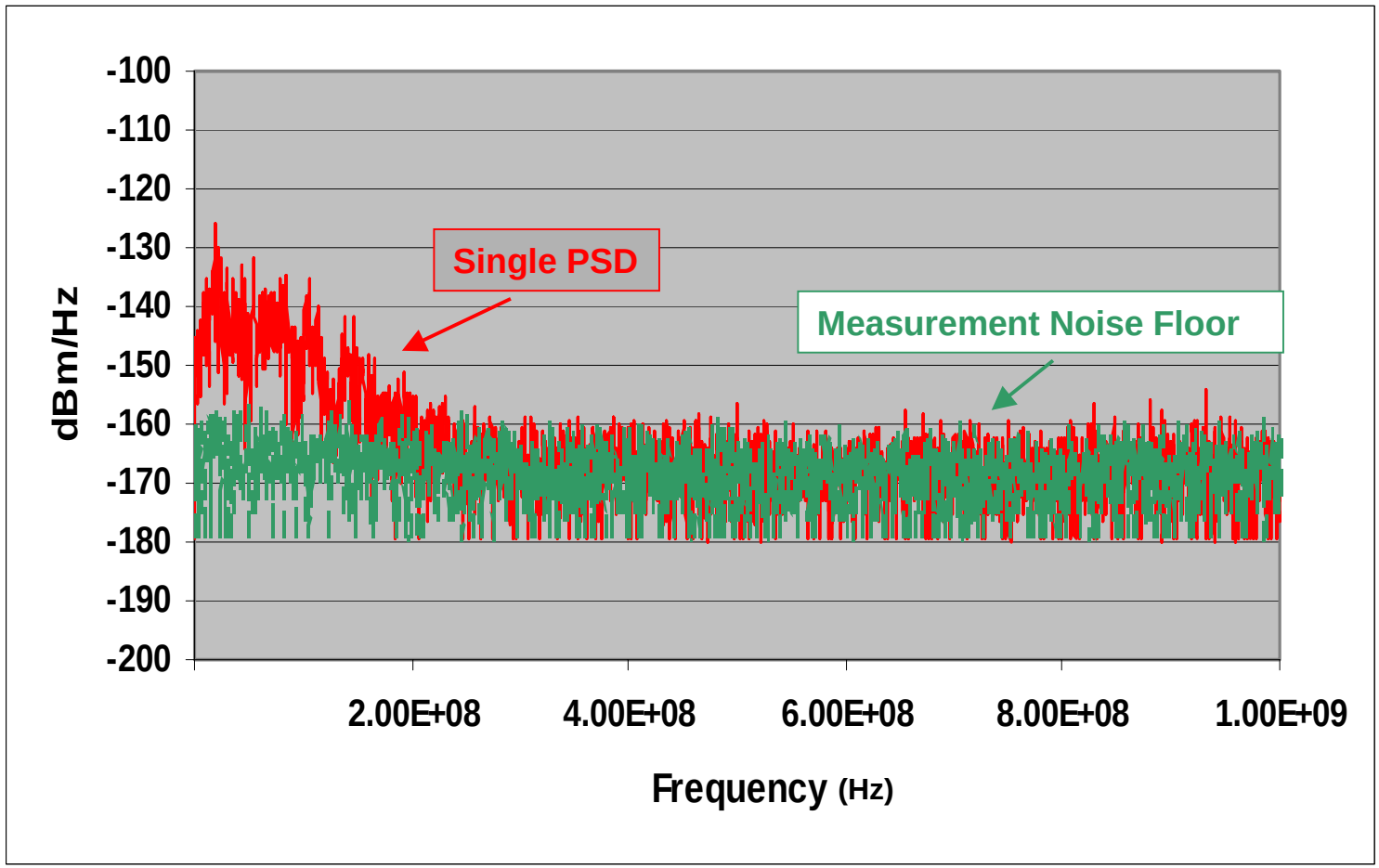
Noise Measurement

Noise Measurement

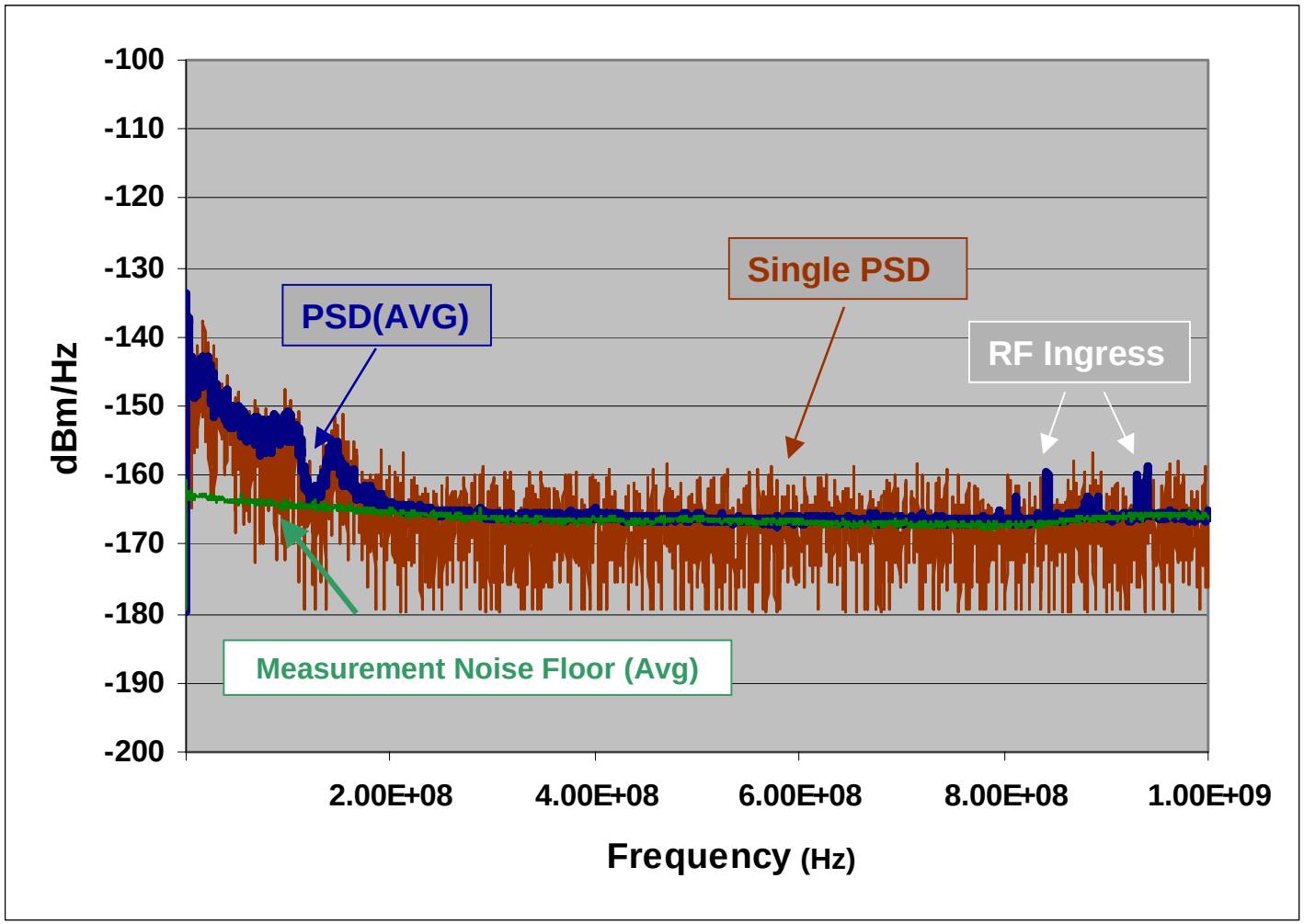
Noise Measurement



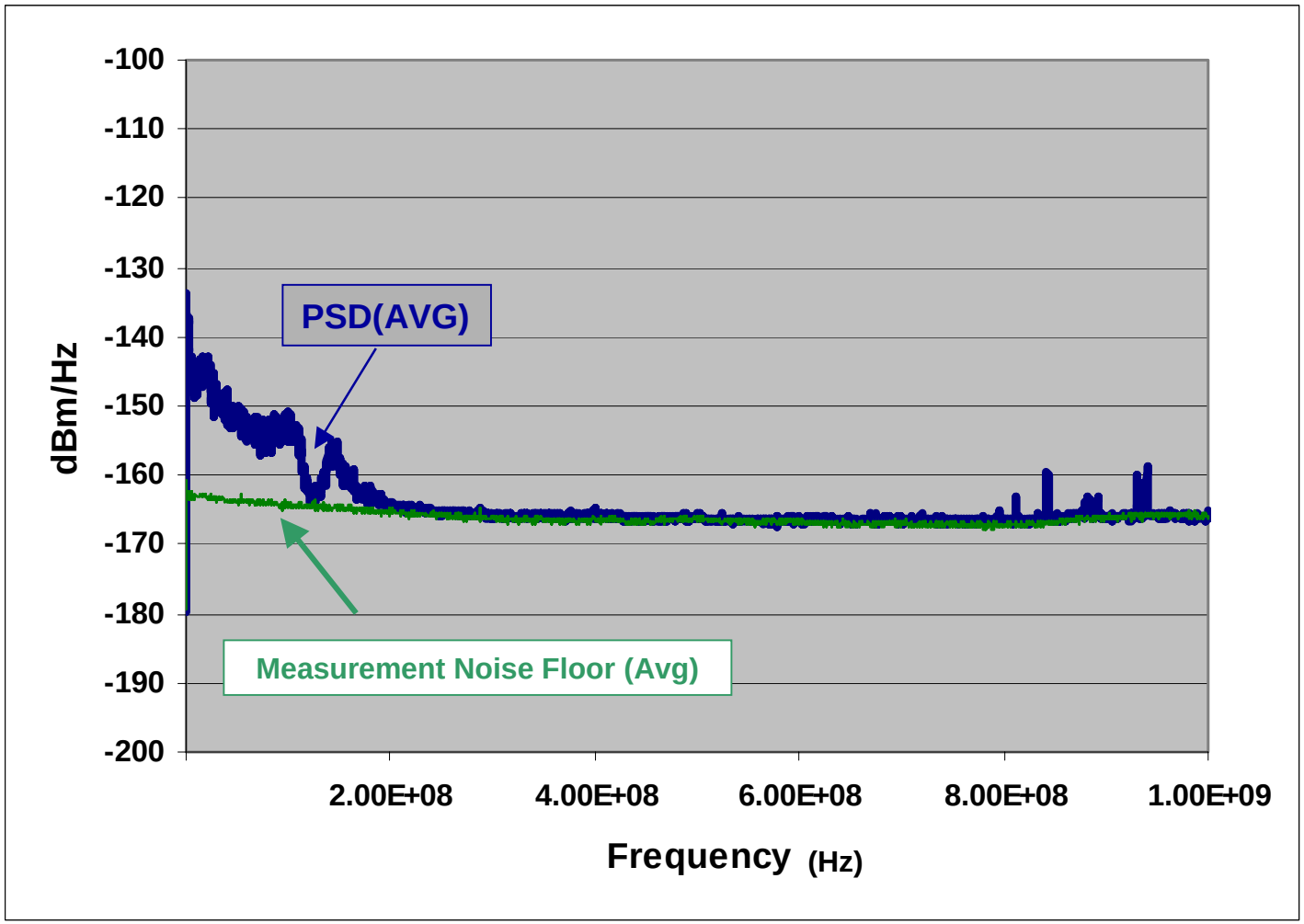
Measurement Noise Floor



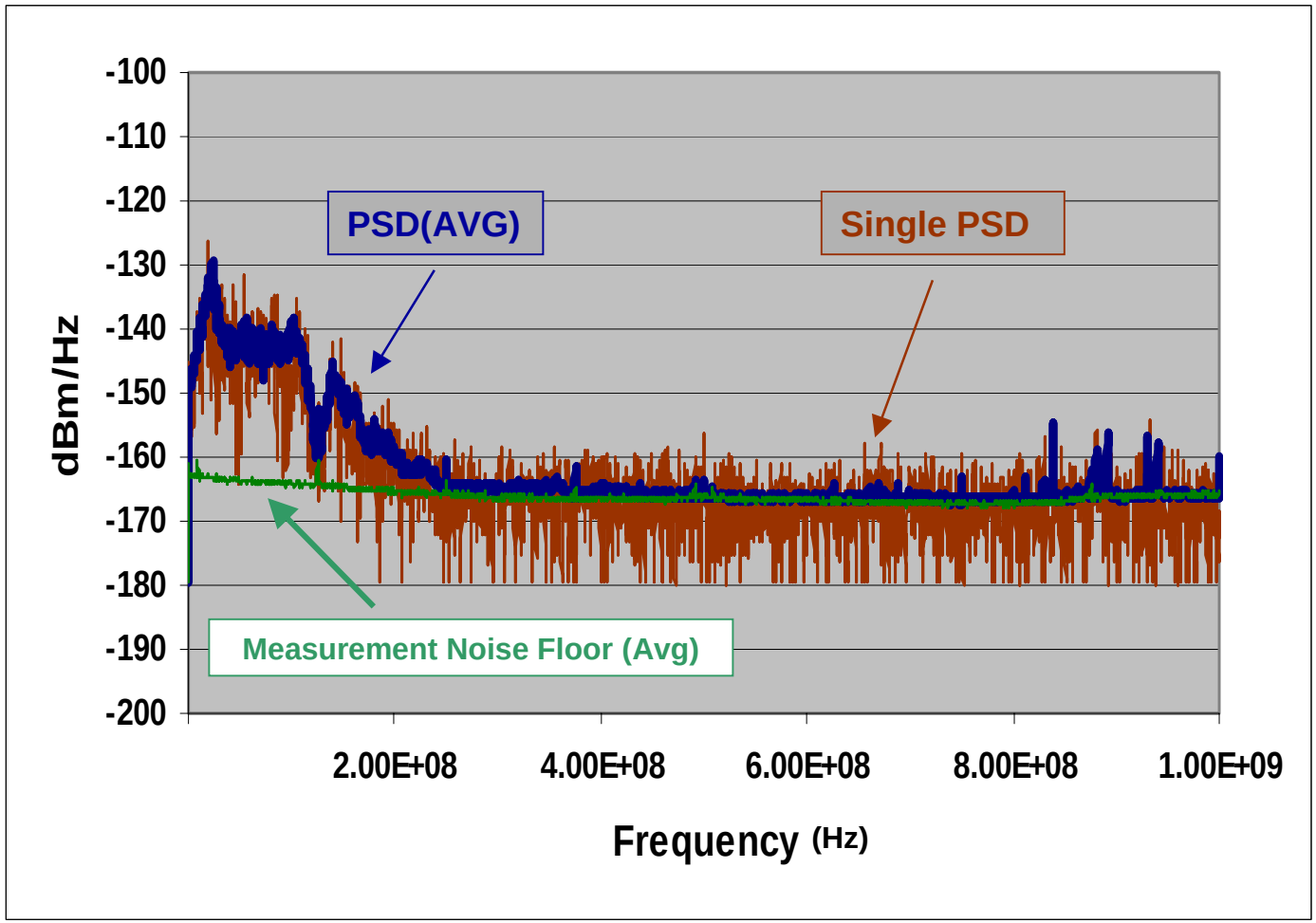
Cable Test #1


-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
dBm/Hz
PSD(AVG)
Single PSD
RF Ingress
Measurement Noise Floor (Avg)
2.00E+08
4.00E+08
6.00E+08
8.00E+08
1.00E+09
Frequency (Hz)

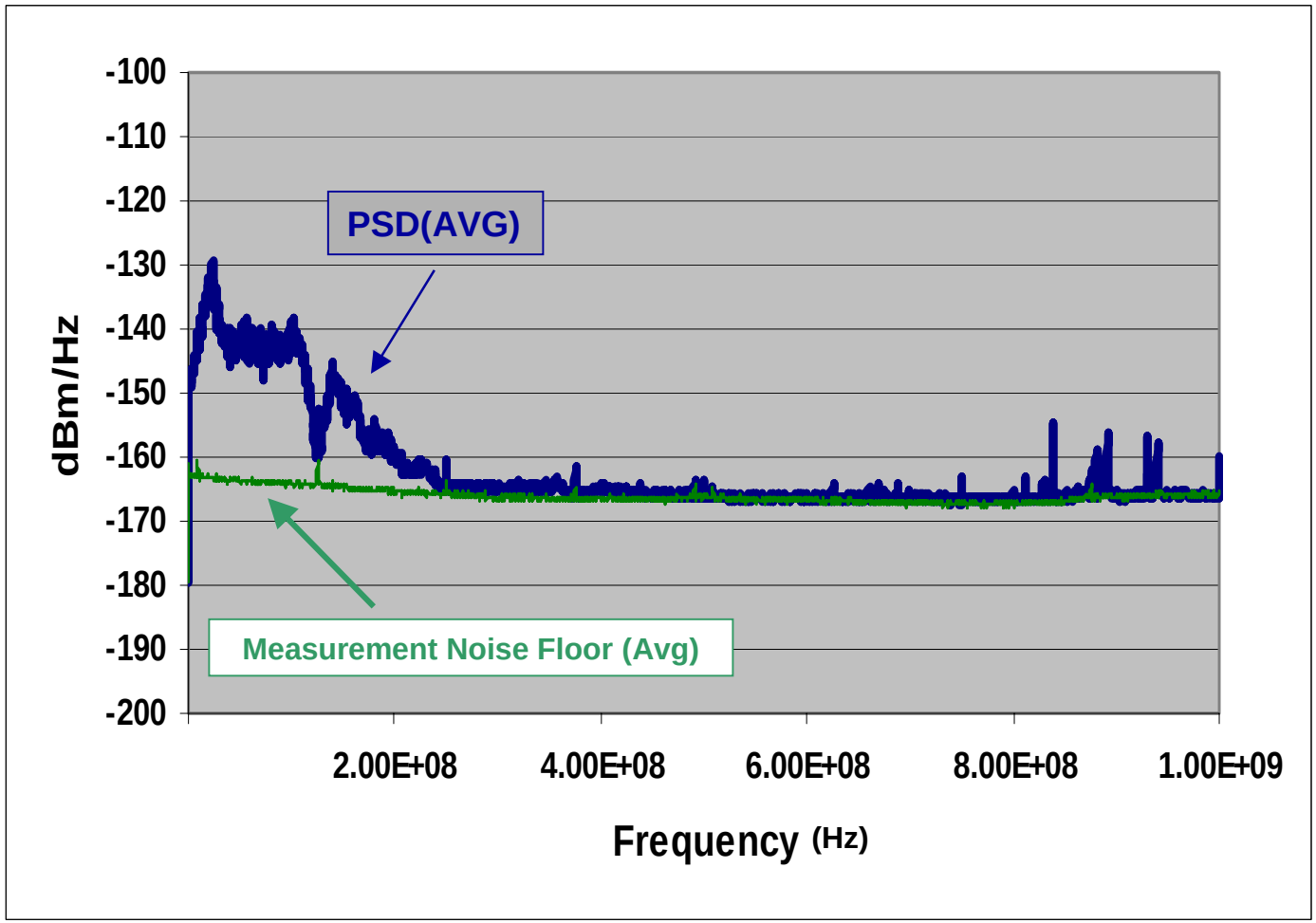
Cable Test #1


-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
dBm/Hz
PSD(AVG)
Measurement Noise Floor (Avg)
2.00E+08
4.00E+08
6.00E+08
8.00E+08
1.00E+09
Frequency (Hz)

Cable Test #2

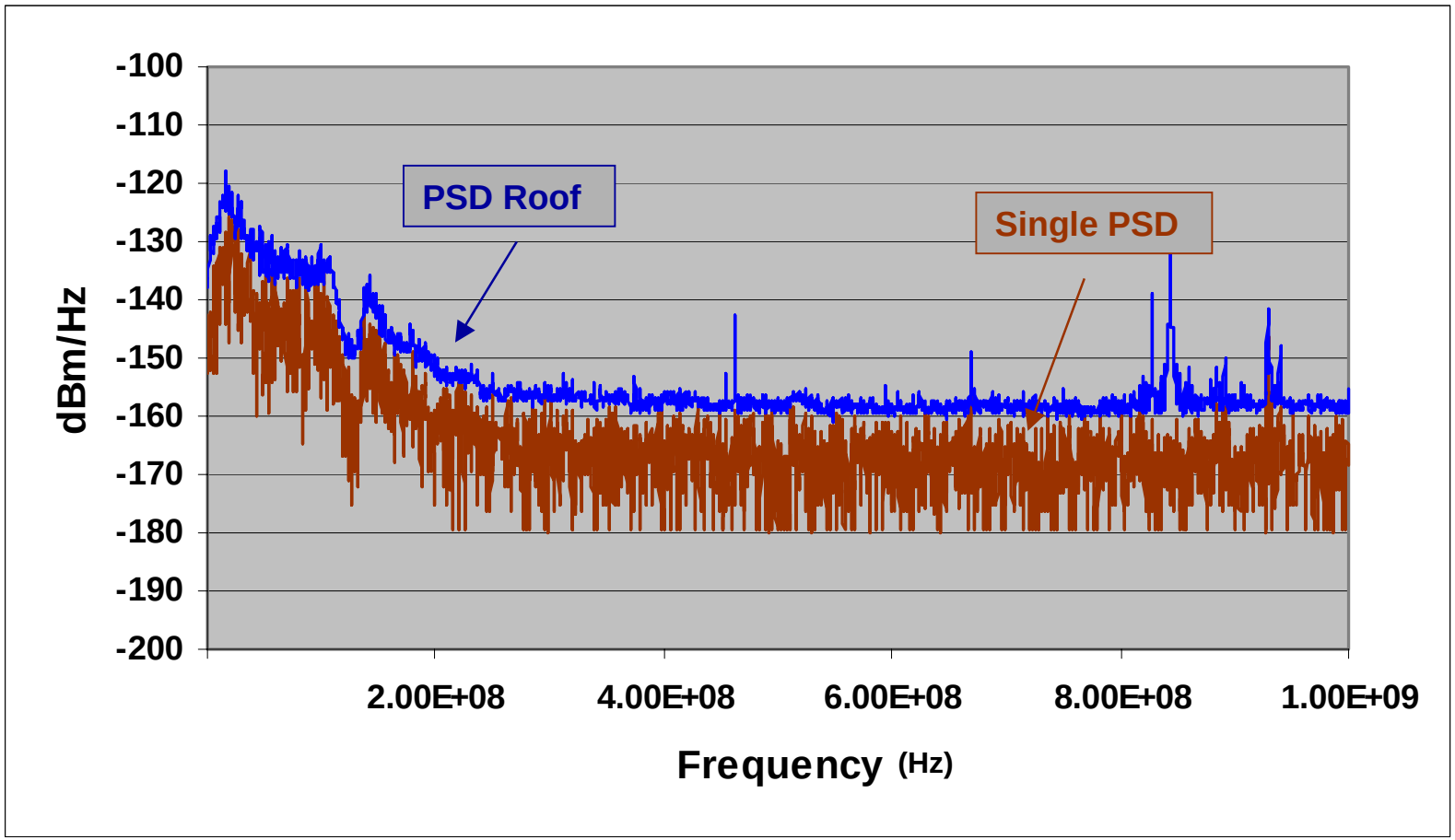

-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
dBm/Hz
PSD(AVG)
Single PSD
Measurement Noise Floor (Avg)
2.00E+08
4.00E+08
6.00E+08
8.00E+08
1.00E+09
Frequency (Hz)

Cable Test #2


-100
-110
-120
-130
-140
-150
-160
-170
-180
-190
-200
dBm/Hz
PSD(AVG)
Measurement Noise Floor (Avg)
2.00E+08
4.00E+08
6.00E+08
8.00E+08
1.00E+09
Frequency (Hz)

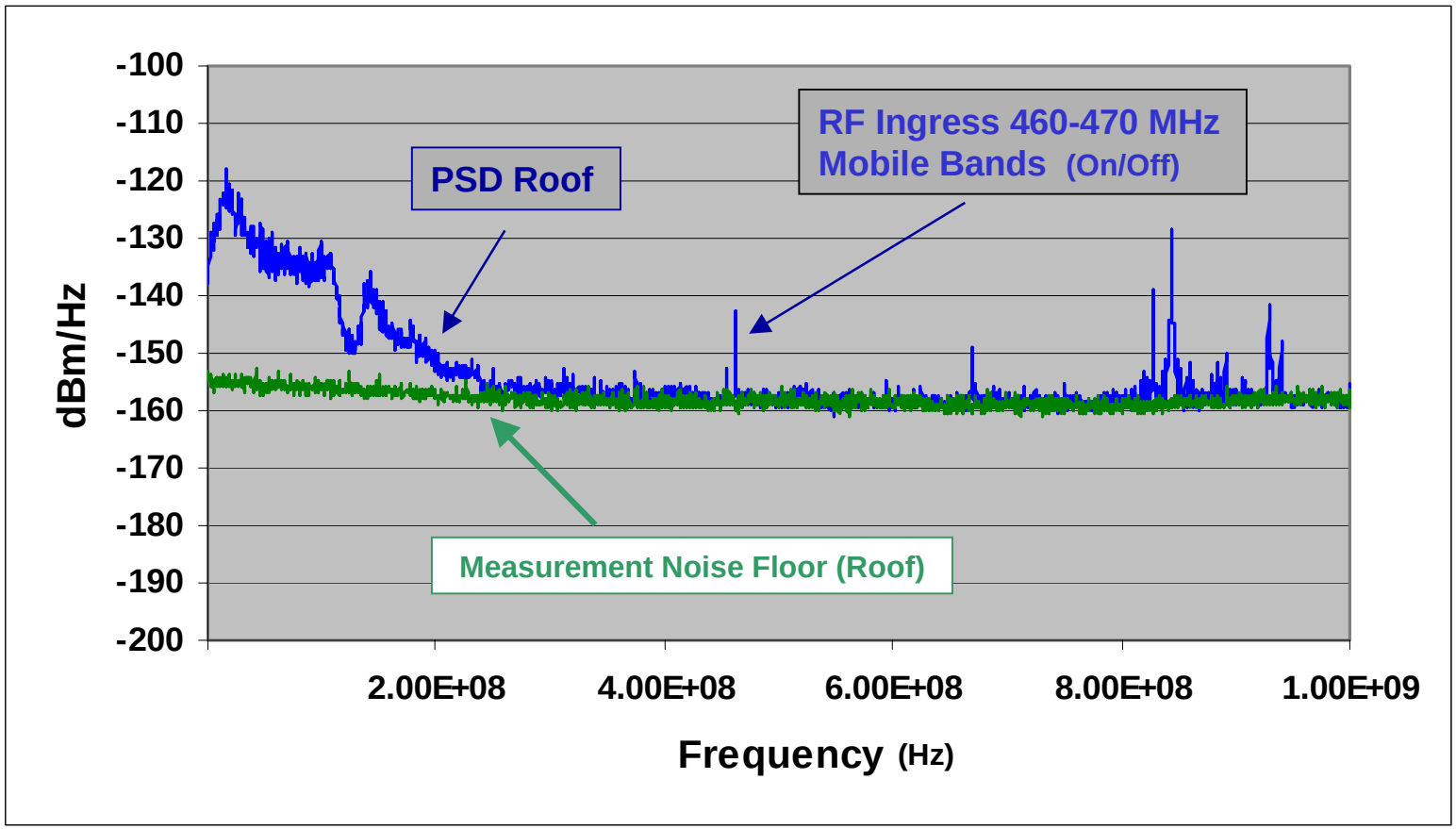
Cable Test #3
(worst case peak)

In this test the roof of the PSD for all 346 samples is saved.



Cable Test #3
(worst case peak)

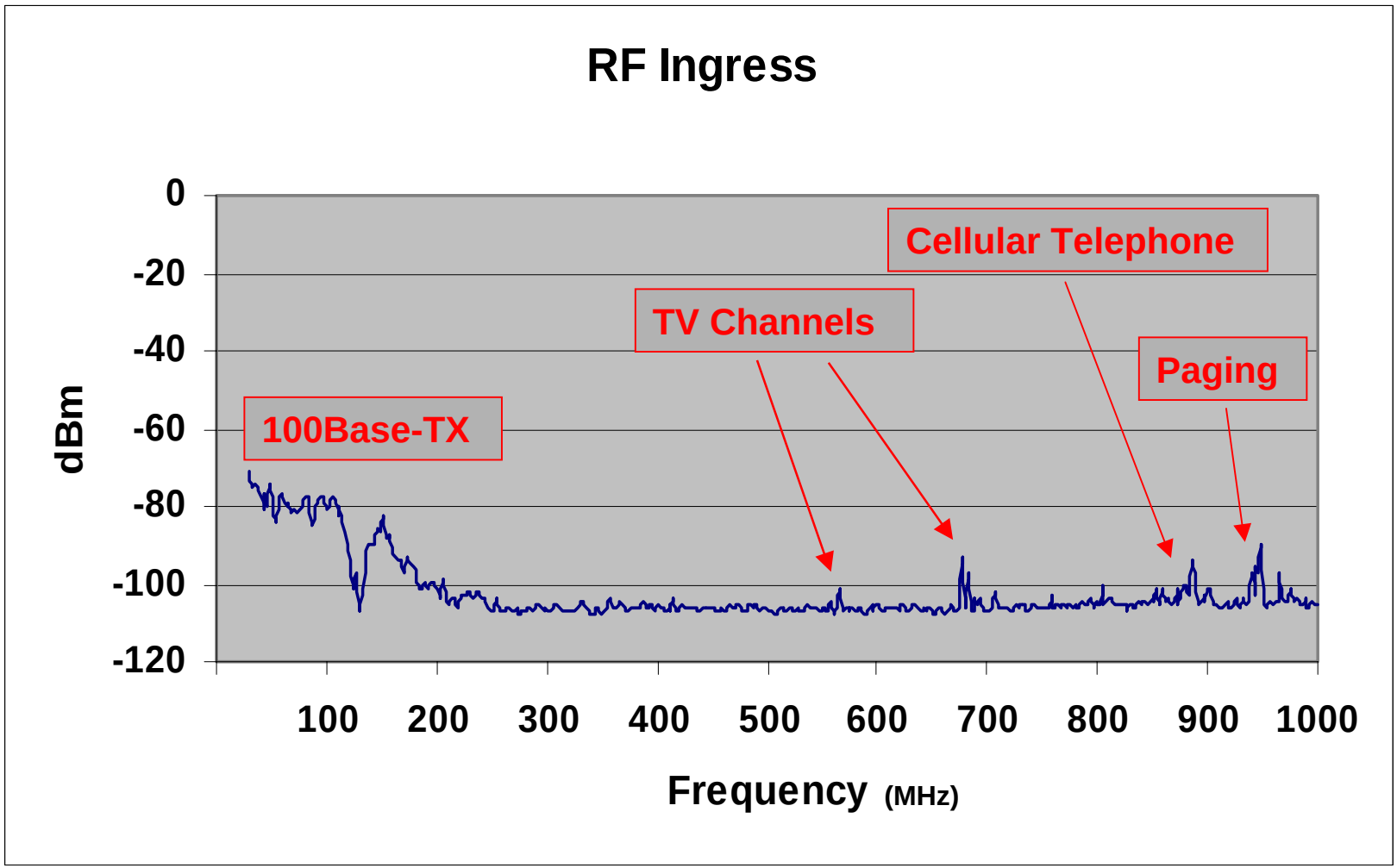
In this test the roof of the PSD for all 346 samples is saved.



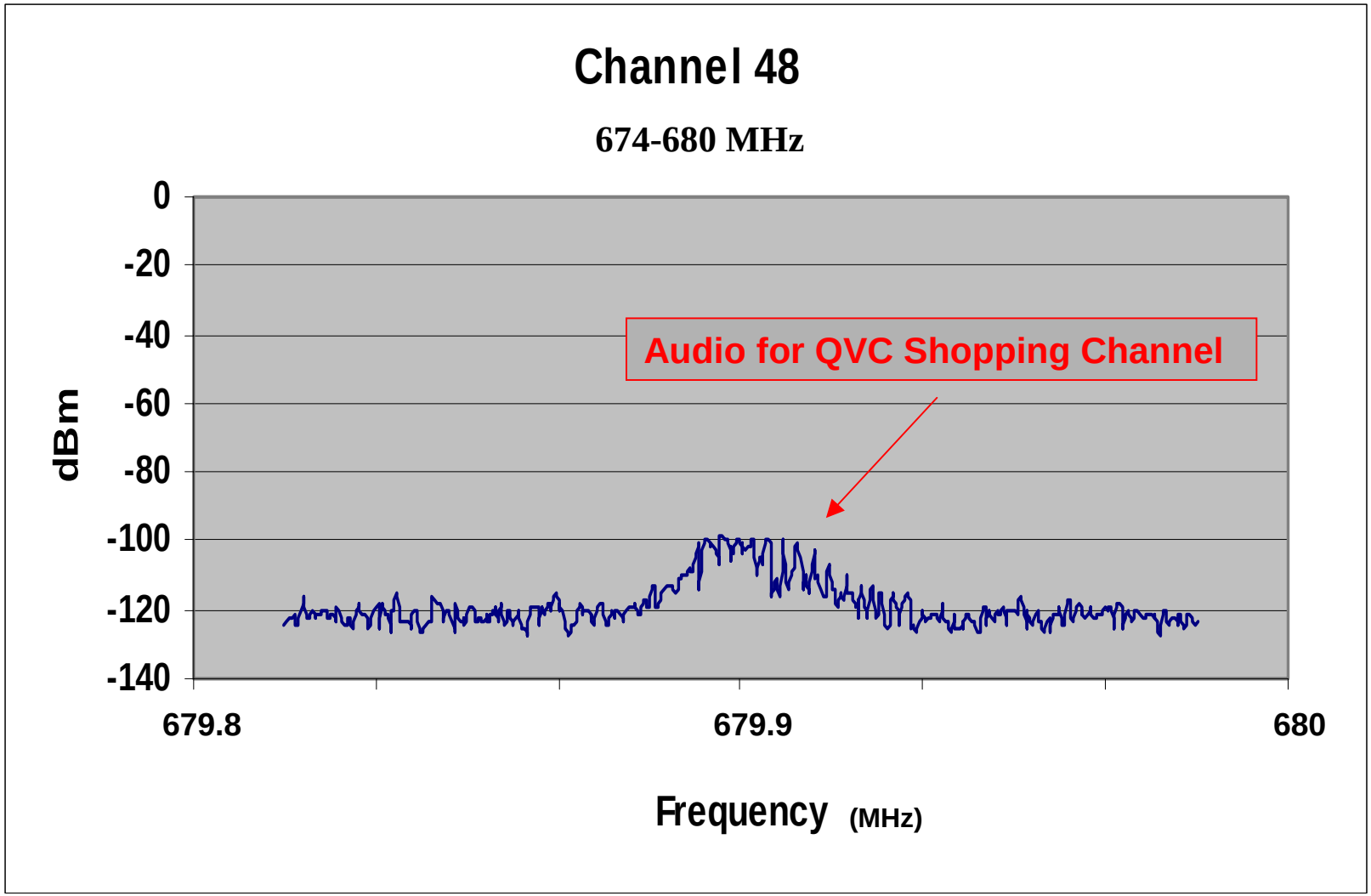
RF Ingress

- Using an HP 8546 EMI Receiver to measure the RF Ingress

RF Ingress


RF Ingress
0
-20
-40
-60
-80
-100
-120
dBm
100Base-TX
TV Channels
Cellular Telephone
Paging
100
200
300
400
500
600
700
800
900
1000
Frequency (MHz)

RF Ingress


Channel 48
674-680 MHz
0
-20
-40
-60
-80
-100
-120
-140
dBm
Audio for QVC Shopping Channel
679.8
679.9
680
Frequency (MHz)

Conclusion

- **AWGN for inside plant cabling is much better than the –140 dBm/Hz.**
  - **Recommend using –150 dBm/Hz for Cat 5e and –160 dBm/Hz for Cat 6.**
- **RF Ingress does not appear to be a significant problem below 650 Mhz.**
  - **This may be location dependent because of some of the general use frequency bands.**