



# EnVision Wireless

Design|Optimization|Consulting|Drive Testing



## 1XRTT Data Network Quality Surveys Sample Report

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**Agilent Technologies**

Authorized Services Provider

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## 1. Executive Summary

EnVision Wireless has been contracted by Customer to conduct a competitive analysis between Customer and two of its competitors for CDMA1X data network performance. These studies provide an objective, unbiased view of the quality of service for each market evaluated. This report presents the results for the survey of the Green Bay, WI market conducted in June of 2003.

EnVision uses the Agilent Nitro Data Test technology to benchmark data service. This equipment allows for an accurate, repeatable network evaluation. Results collected in this method are useful for comparison at the local level and can also be effectively used to compare performance on a much larger scale by ranking relative network statistics country wide to assess regional performance and differences.

In keeping with previous collaborative work between EnVision and Customer, the following parameters were measured and compared by operator:

- Forward RLP Throughput (kbps)
- SCH Data Rate Percentages (1x, 2x, 4x, 8x and 16x)
- Forward FER (%)
- SCH FER (%)
- Mobile RX Power (dBm)
- Mobile TX Power (dBm)
- Aggregate Ec/Io (dB)
- Best Ec/Io (dB)
- Number of Active PNs

The following table summarizes the overall average results of the survey. For detailed results, please refer to Section 3 of this report.

Carrier	Fwd RLP Throughput (kbps)	Fwd FER (%)	SCH FER (%)	RX Power (dBm)	TX Power (dBm)	Best Ec/Io (dB)	Aggregate Ec/Io (dB)	# of Active Pilots
Carrier 1	81.98	2.33	4.61	-77.36	-13.92	-9.19	-5.33	2.18
Carrier 2	60.09	3.23	3.27	-87.05	3.29	-10.00	-6.41	2.01
Carrier 3	76.31	3.29	4.18	-83.68	0.08	-10.01	-5.40	2.03

Table 1: Overall Survey Results

## 2. Test Parameters

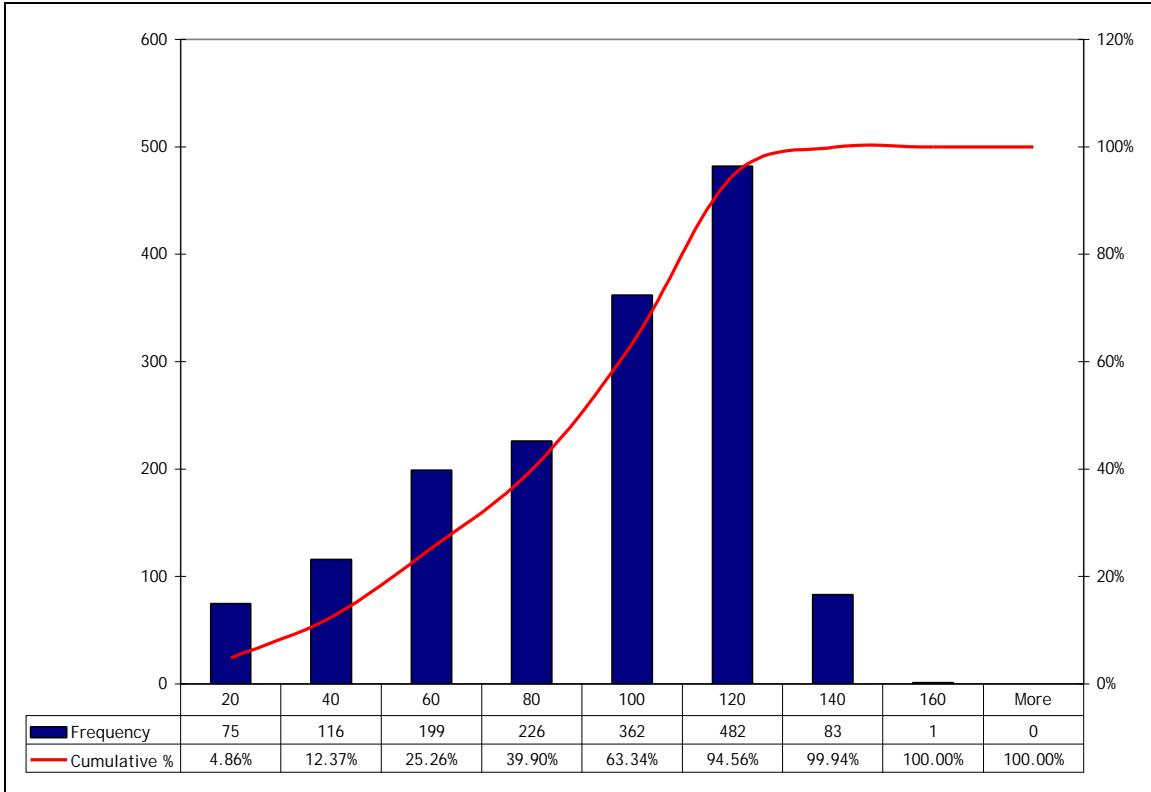
This section provides a summary of the test parameters used during the project.

Test Parameter	Value
Networks surveyed	Carrier 1 CDMA 1x Carrier 2 CDMA 1x Carrier 3 CDMA 1x
Hardware used	Agilent E6473A (x2) Agilent E6452C (x1)
Handsets used	Kyocera 2235 Samsung A500
Software used	Agilent E6474A
Miles surveyed	Approximately 400
Drive route selection methodology	100% Interstate highways 100% US highways 50% State highways 50% of 'core' roads
Data collection window	7:00 a.m. - 7:00 p.m. daily
Test file size	FTP Download - 10 Megabytes
Location of FTP server	EnVision office in Melbourne, FL
Test sequence	Wait 30 seconds -> Connect -> Wait 5 seconds -> FTP Download 10M file -> Wait 5 seconds -> Disconnect -> Repeat
Drive test vehicle	Standard passenger vehicle
Handset separation	Minimum of 18 inches
Handset location	Cradles near headrests
Antenna location	External - PN Scanner and GPS Internal - All handsets
Dates of survey	June 16 to June 17, 2003

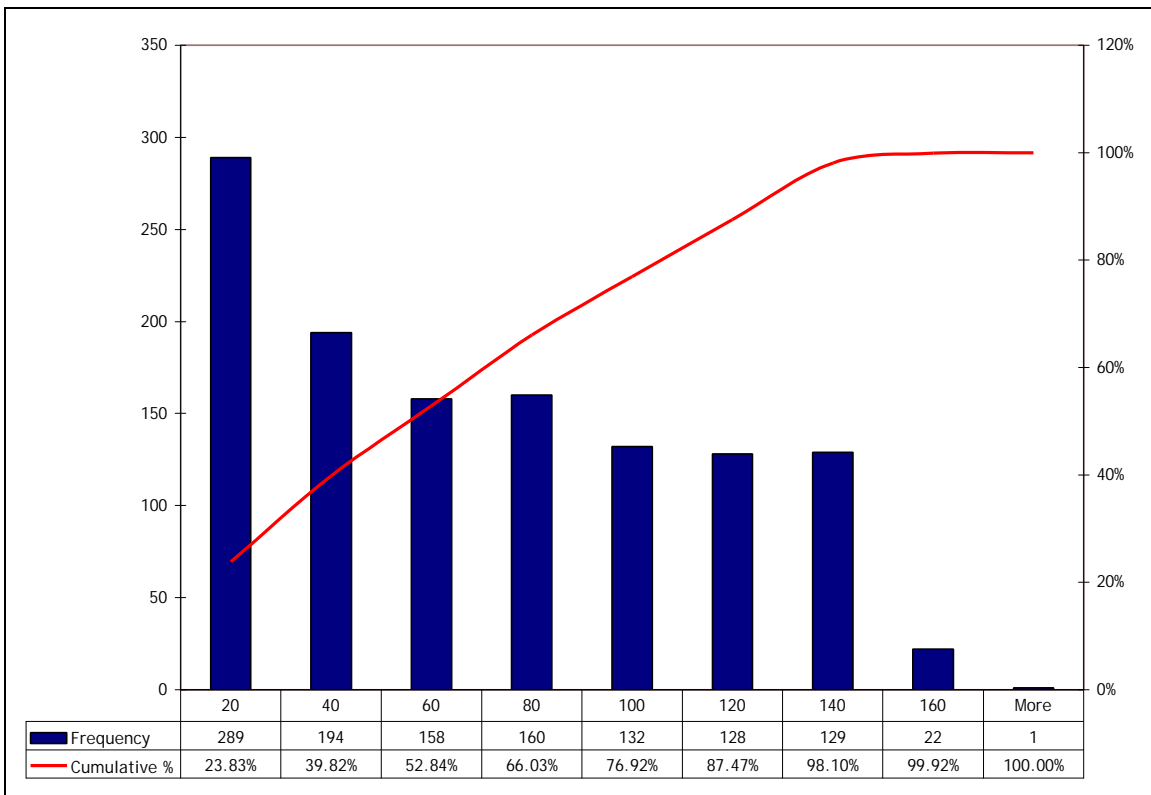
### 3. Results

This section provides the graphical results of the data performance survey. Graphs are provided for the following metrics:

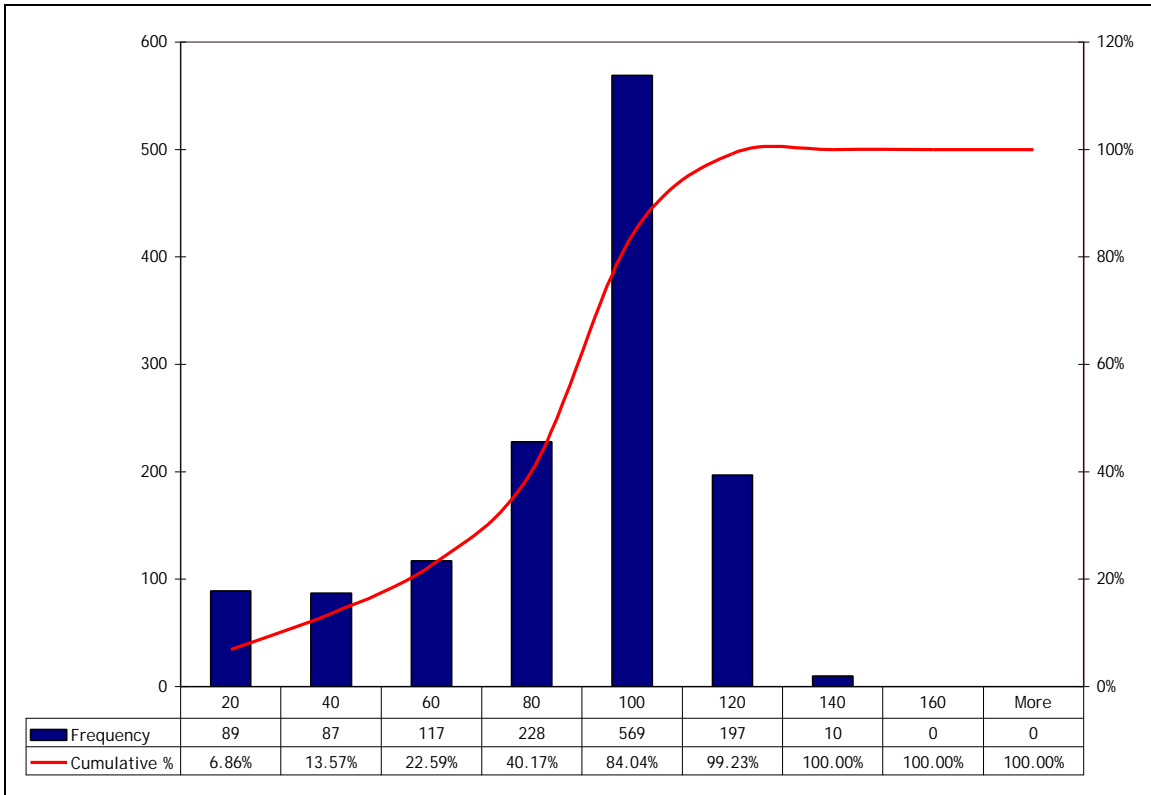
- Forward RLP Throughput (kbps)
- SCH Data Rate Percentages (1x, 2x, 4x, 8x and 16x)
- Forward FER (%)
- SCH FER (%)
- Mobile RX Power (dBm)
- Mobile TX Power (dBm)
- Aggregate Ec/Io (dB)
- Best Ec/Io (dB)
- Number of Active PNs



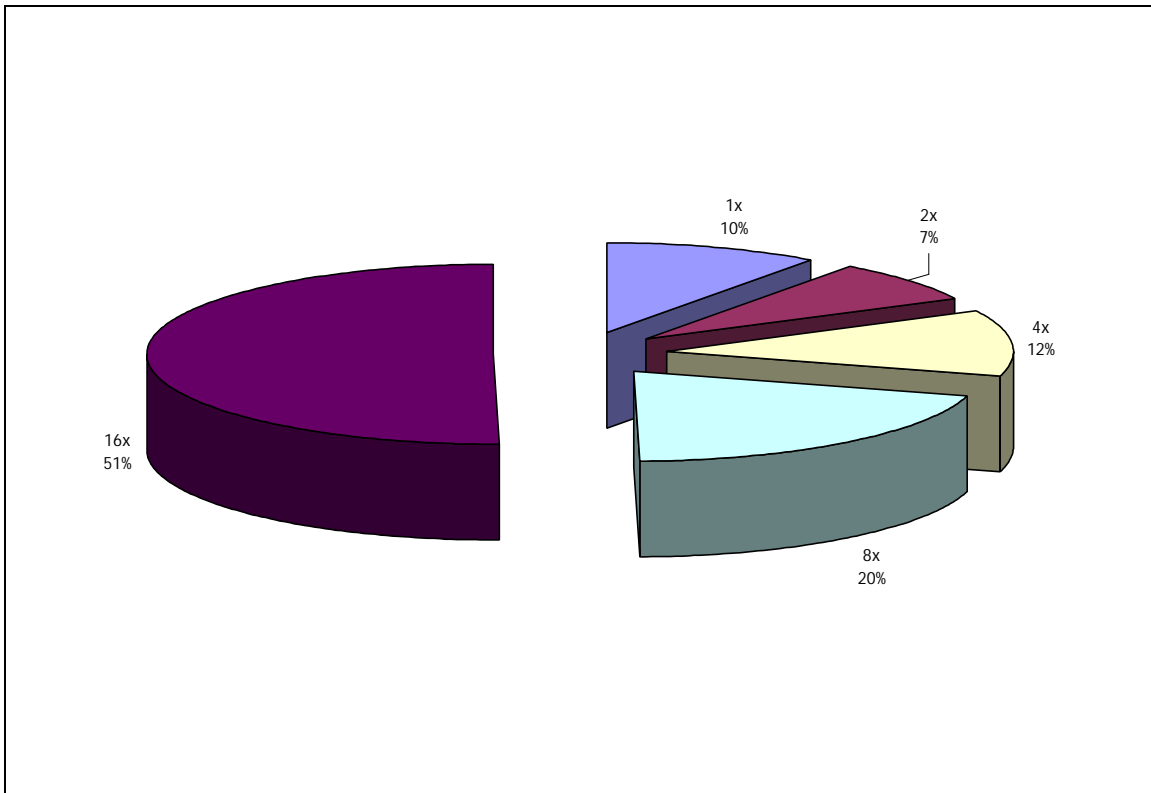
**Figure 1: Carrier 1 Forward RLP Throughput (kbps)**



**Figure 2: Carrier 2 Forward RLP Throughput (kbps)**



**Figure 3: Carrier 3 Forward RLP Throughput (kbps)**



**Figure 4: Carrier 1 SCH Data Rate**

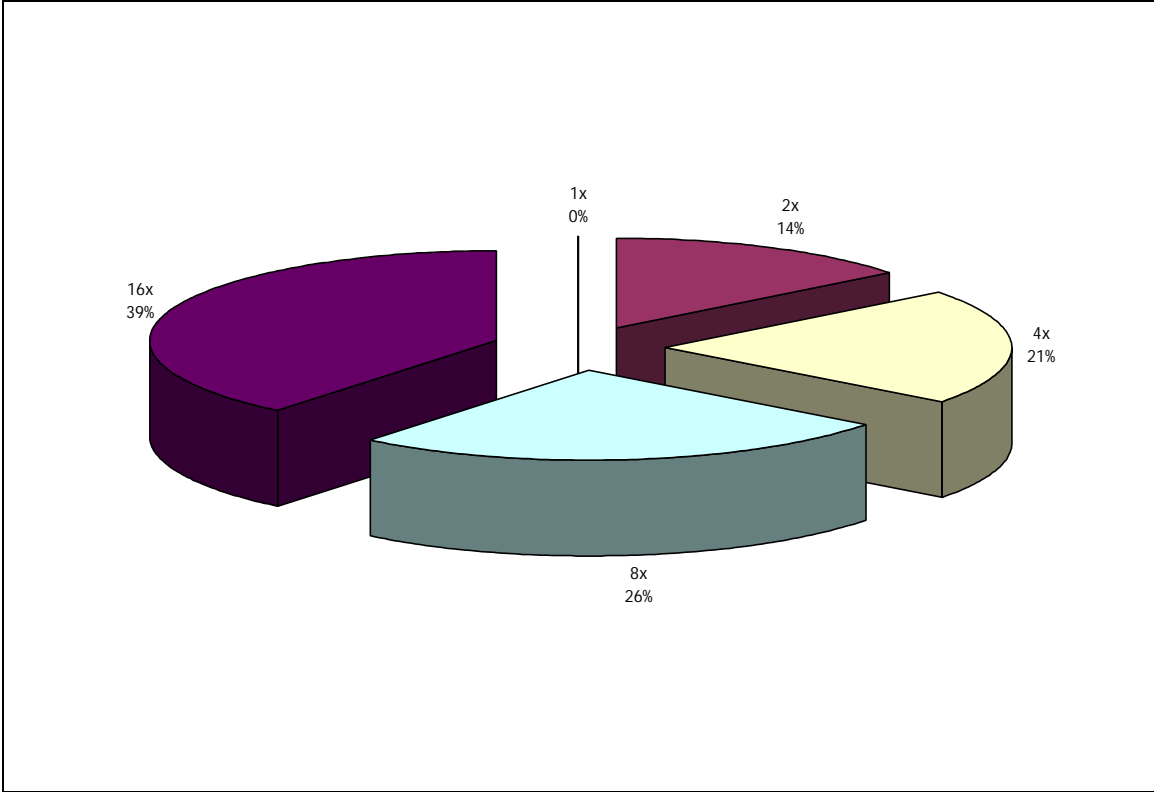


Figure 5: Carrier 2 SCH Data Rate

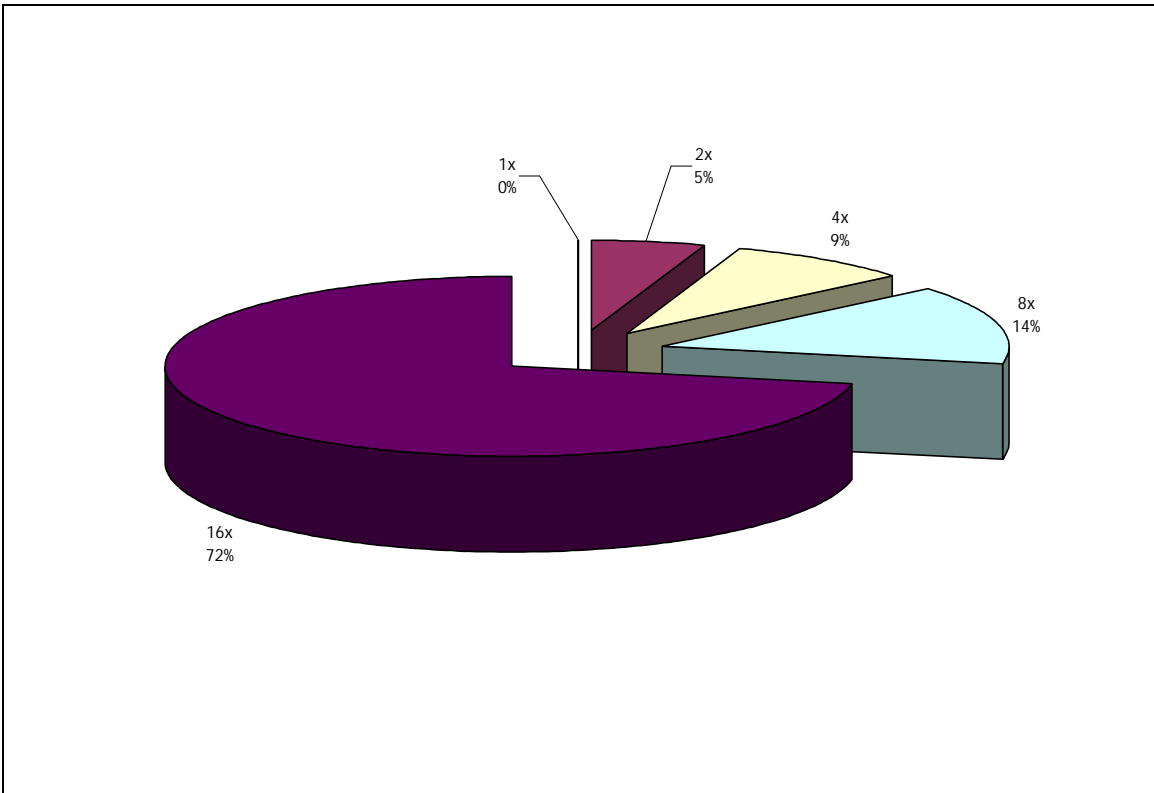
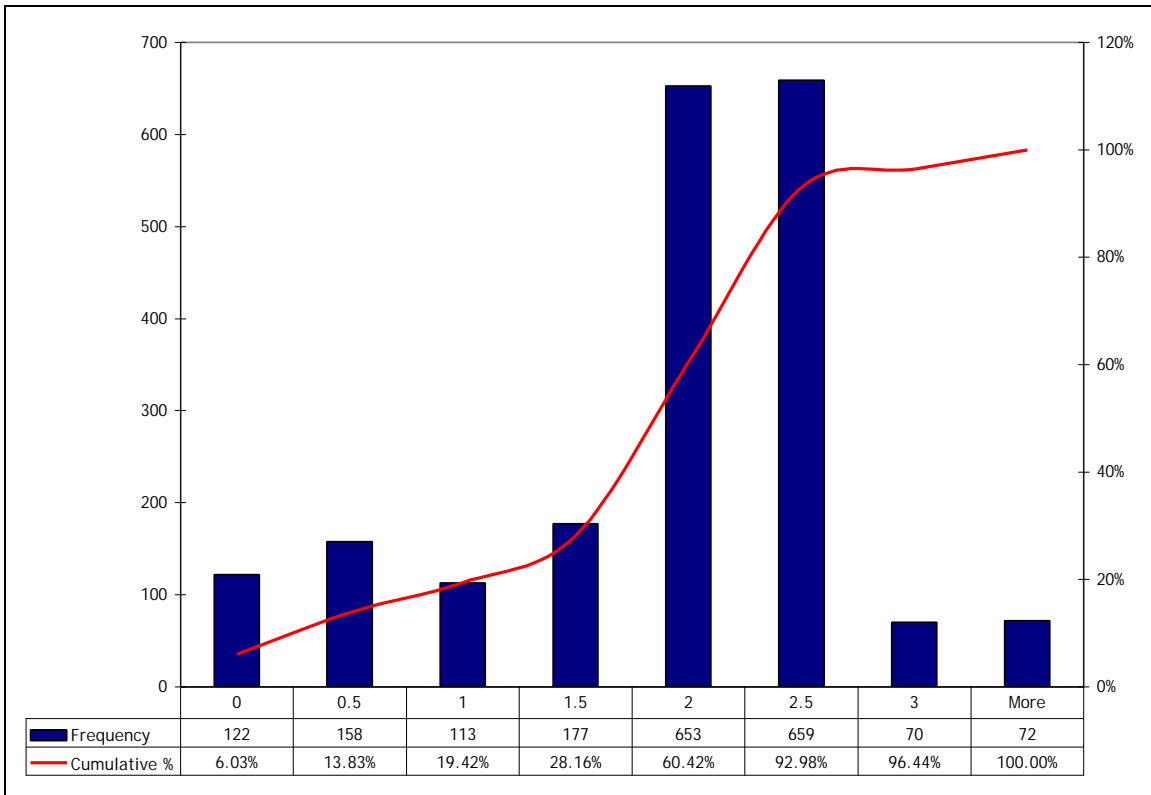
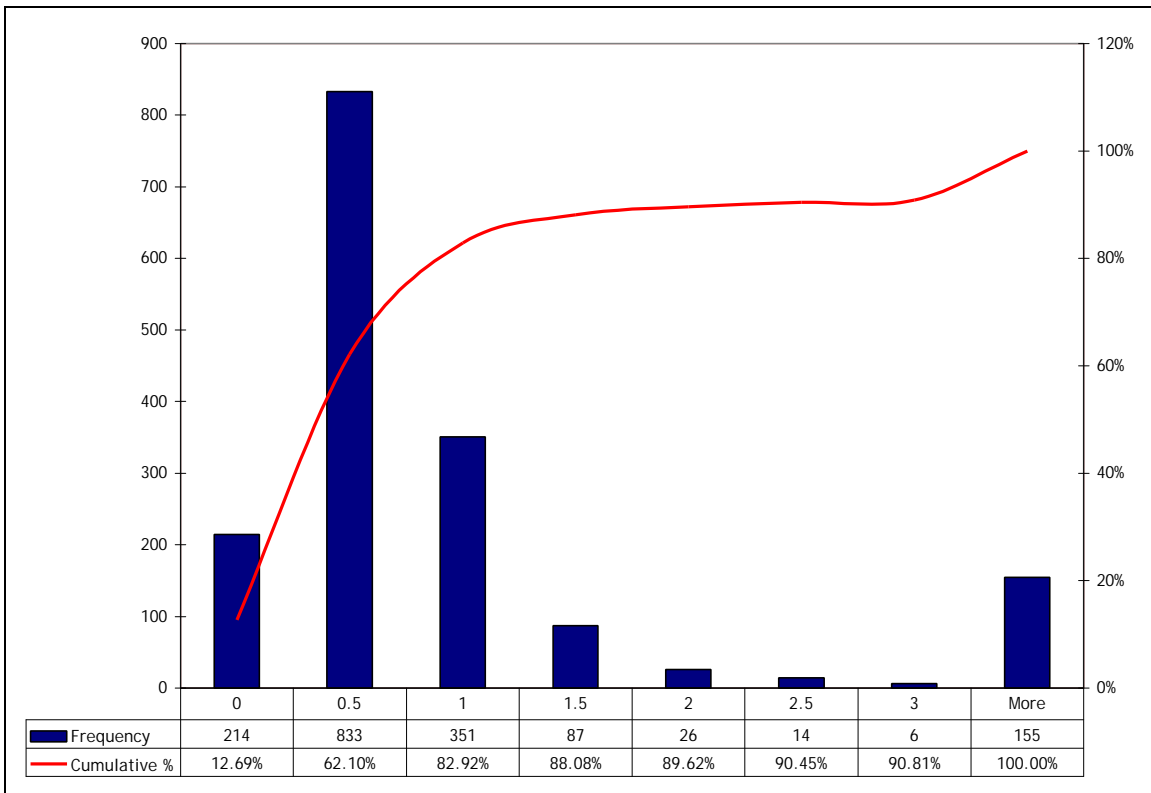


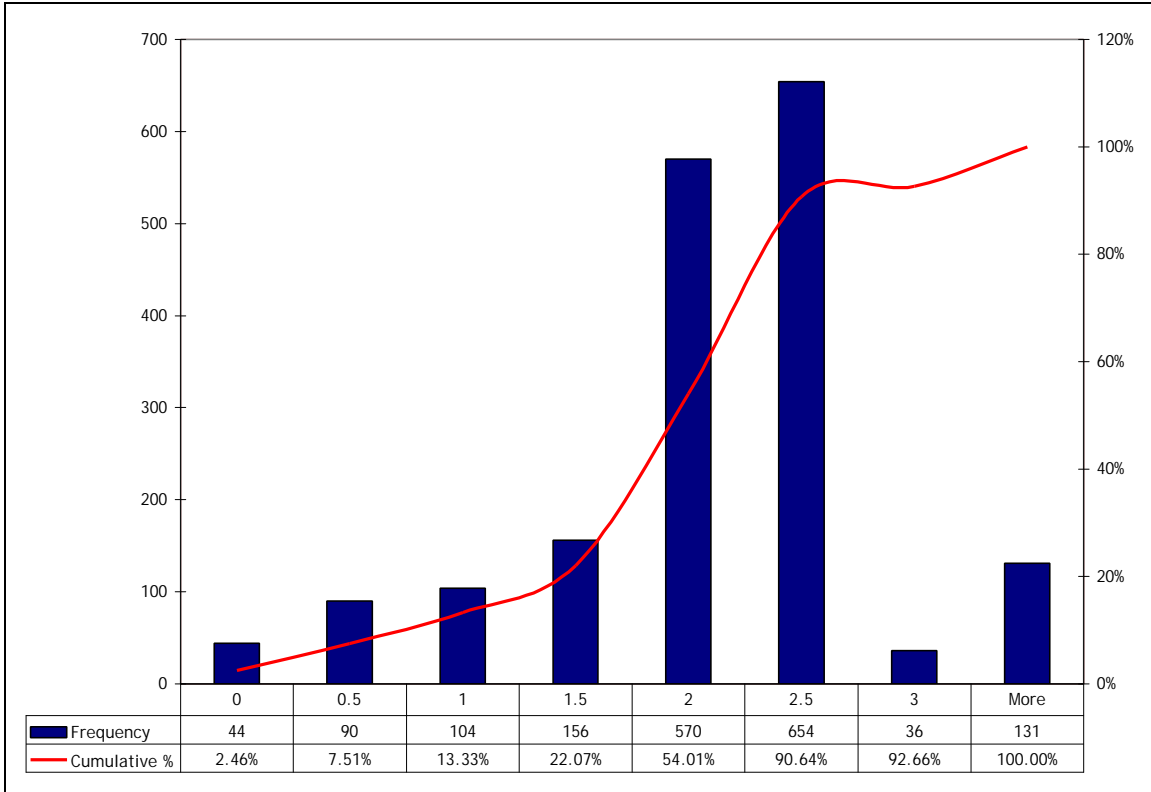
Figure 6: Carrier 3 SCH Data Rate



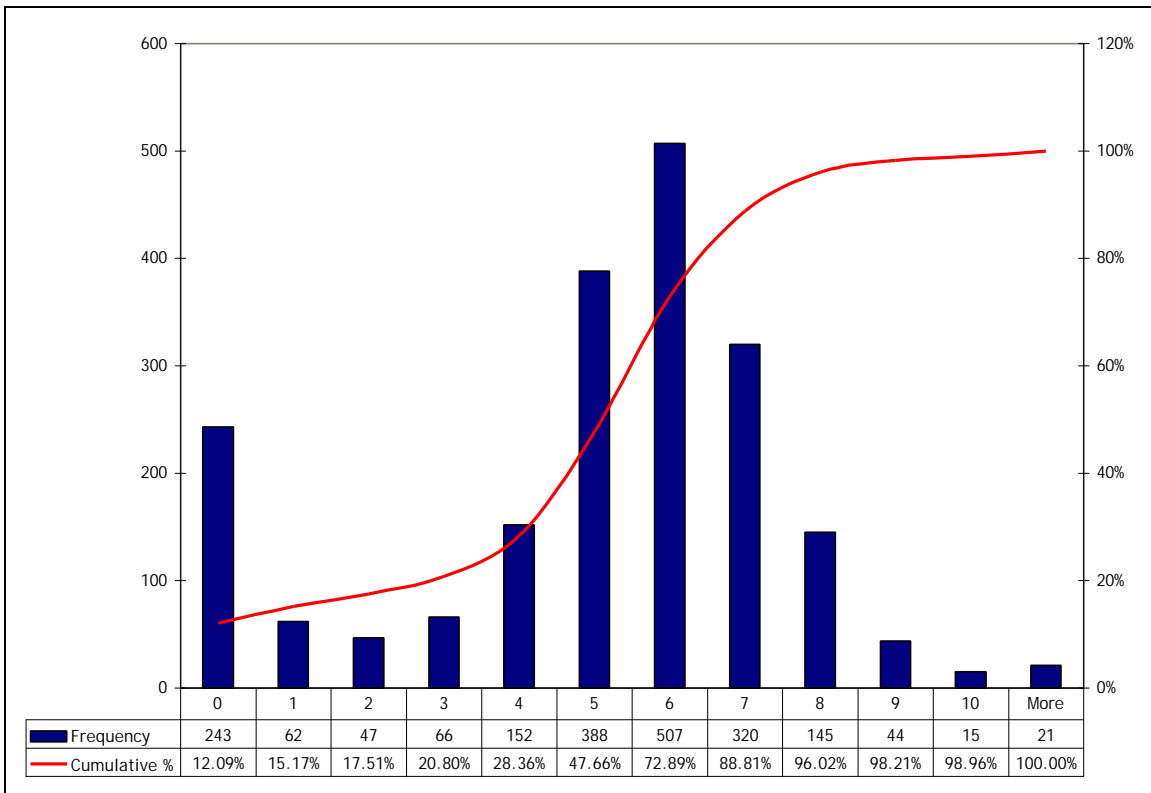
**Figure 7: Carrier 1 Forward FER (%)**



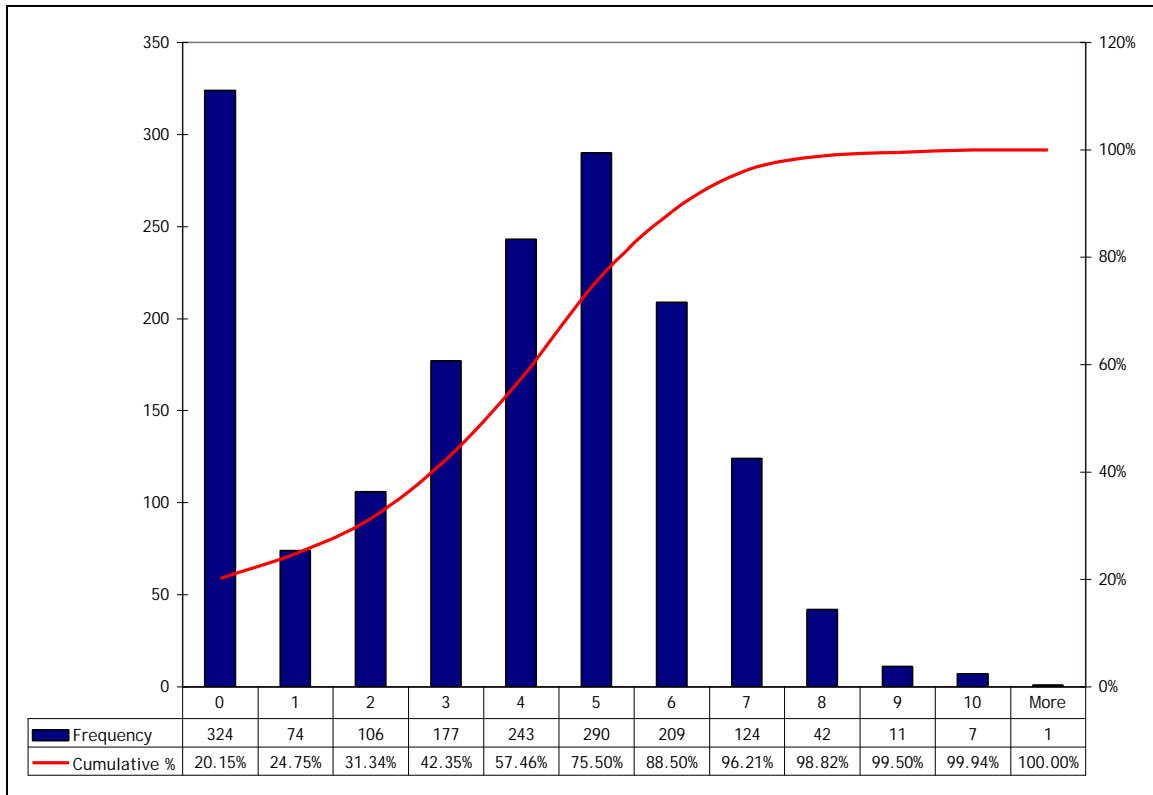
**Figure 8: Carrier 2 Forward FER (%)**



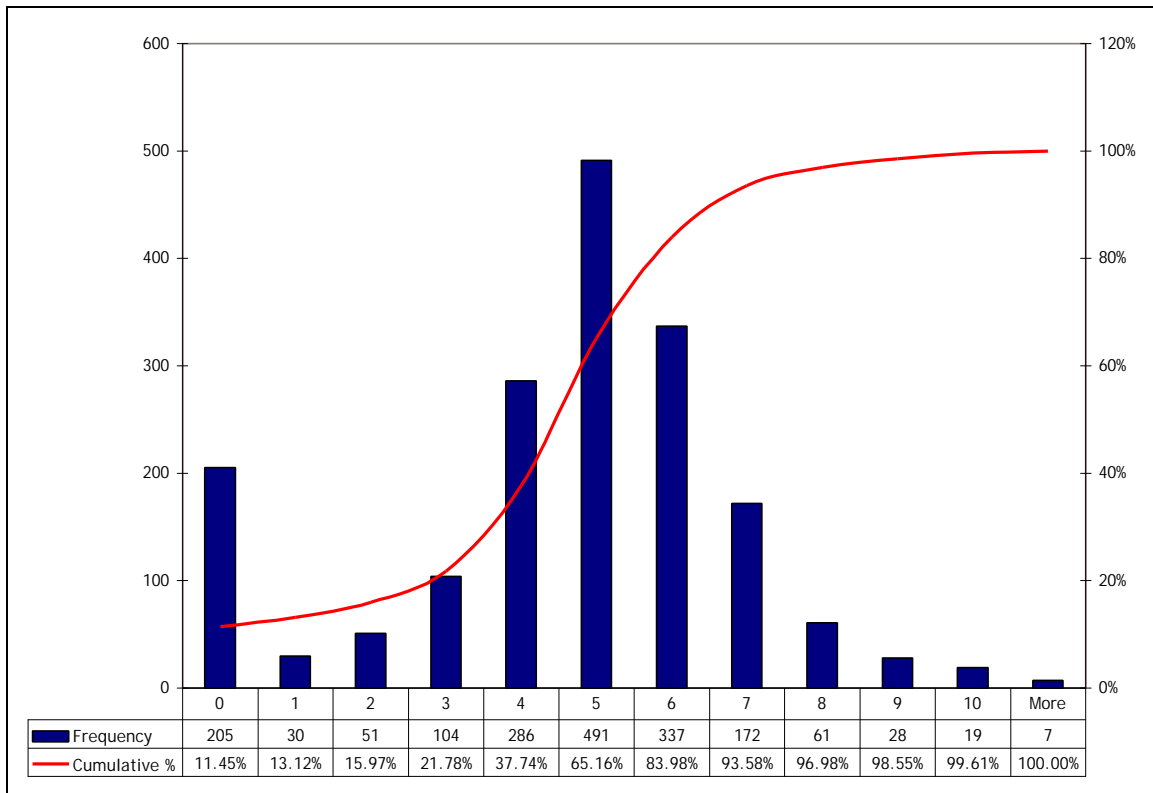
**Figure 9: Carrier 3 Forward FER (%)**



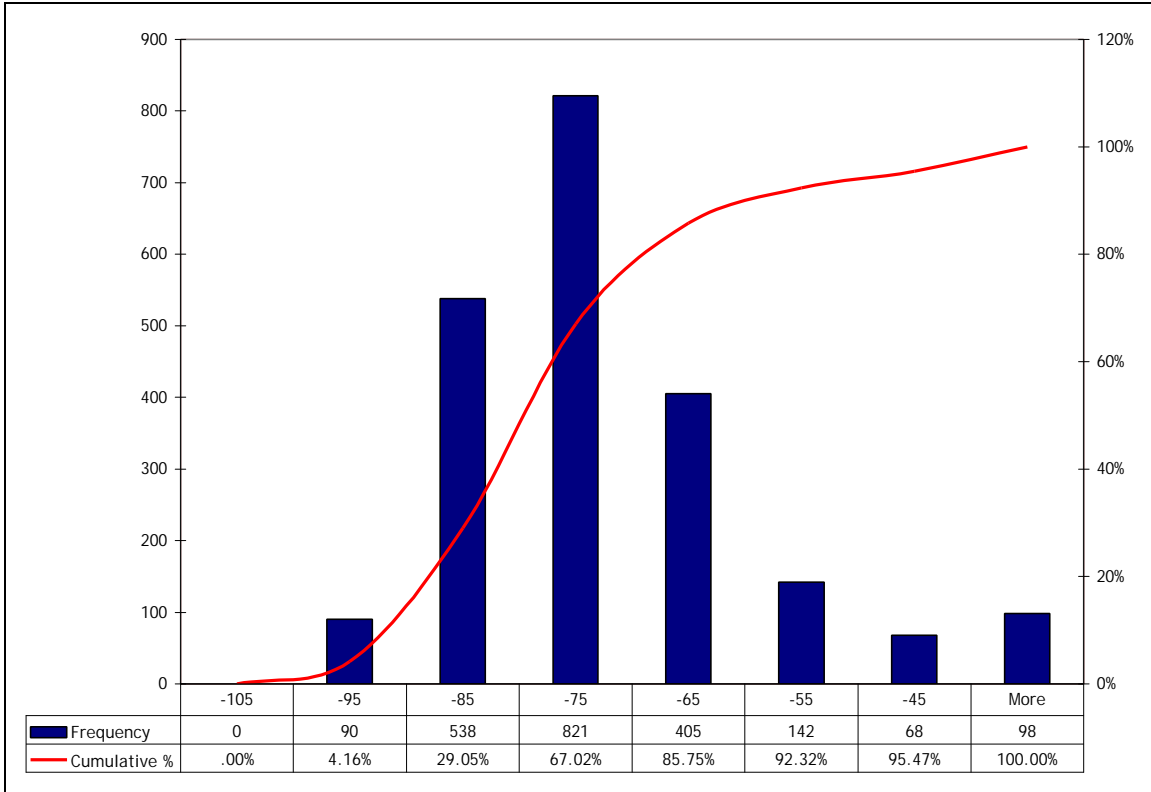
**Figure 10: Carrier 1 SCH FER (%)**



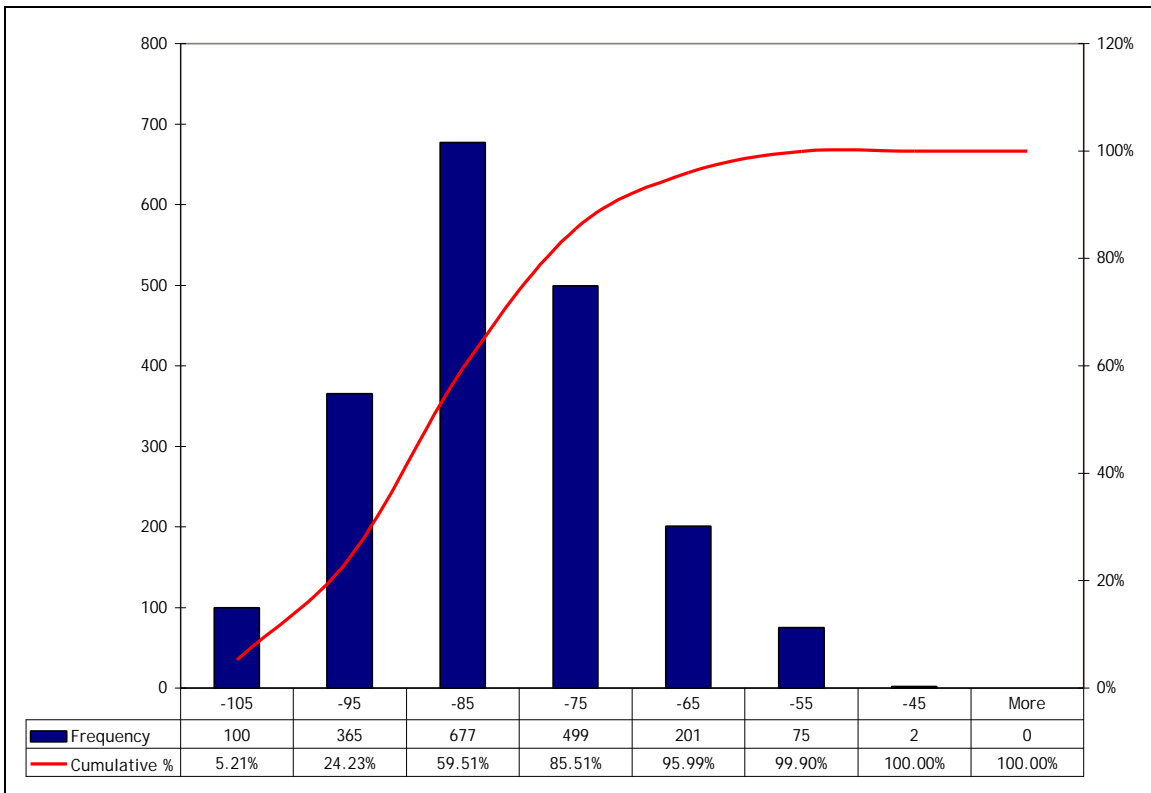
**Figure 11: Carrier 2 SCH FER (%)**



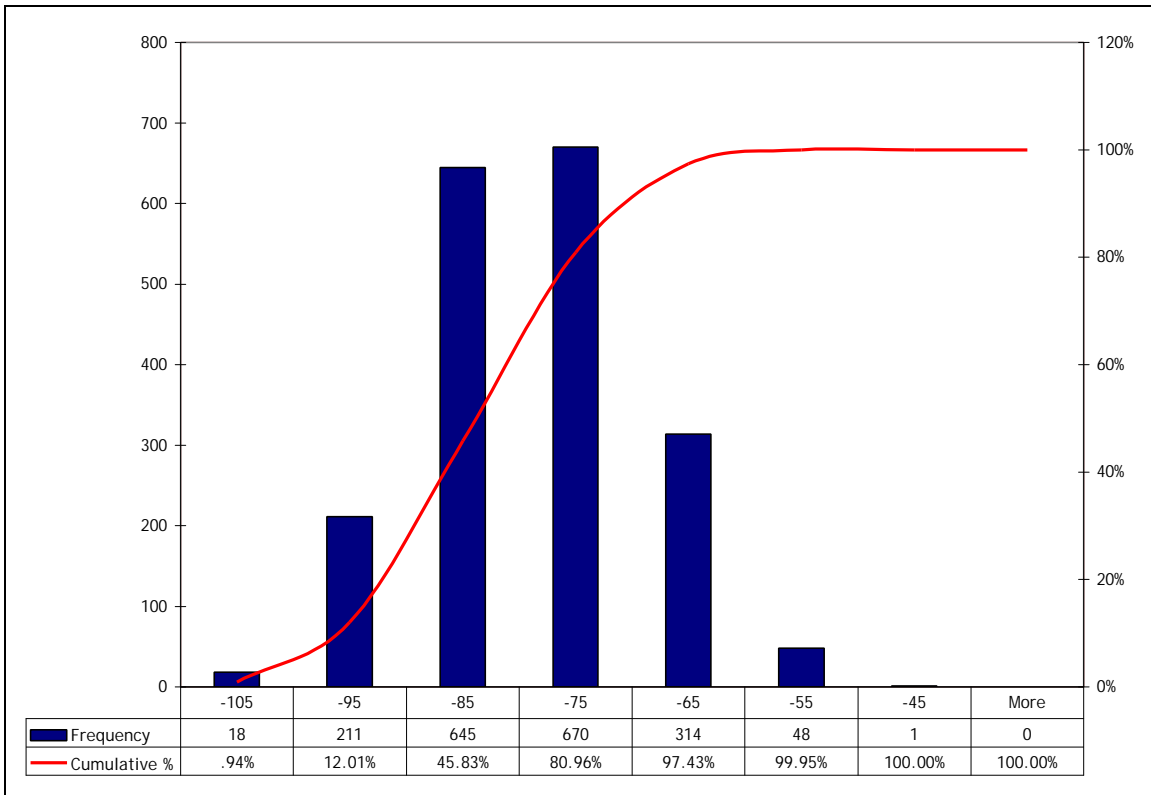
**Figure 12: Carrier 3 SCH FER (%)**



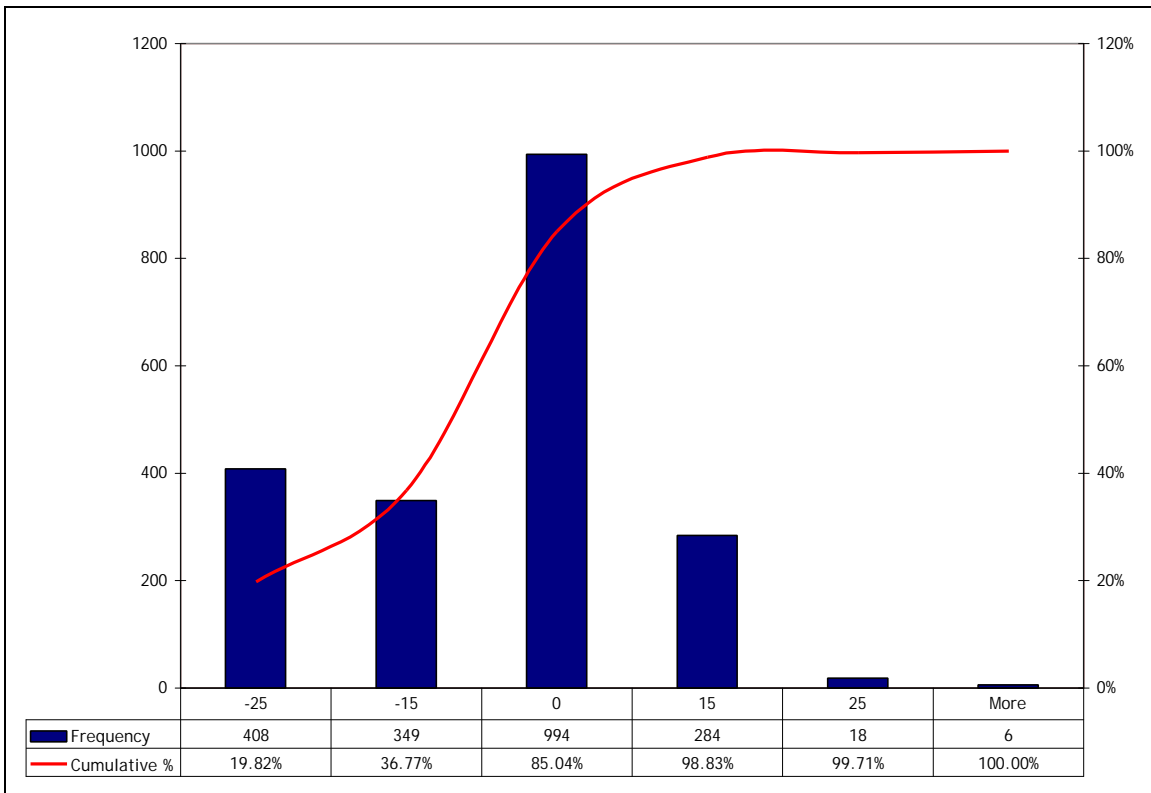
**Figure 13: Carrier 1 Mobile RX Power (dBm)**



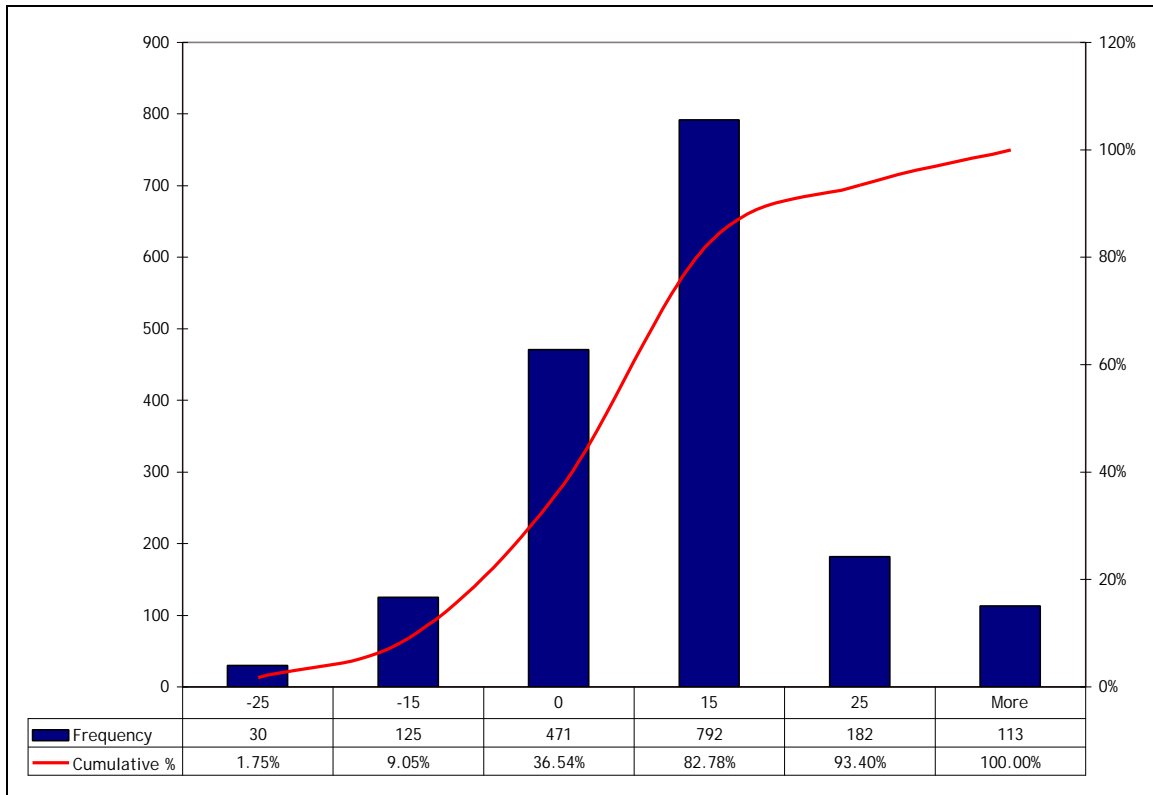
**Figure 14: Carrier 2 Mobile RX Power (dBm)**



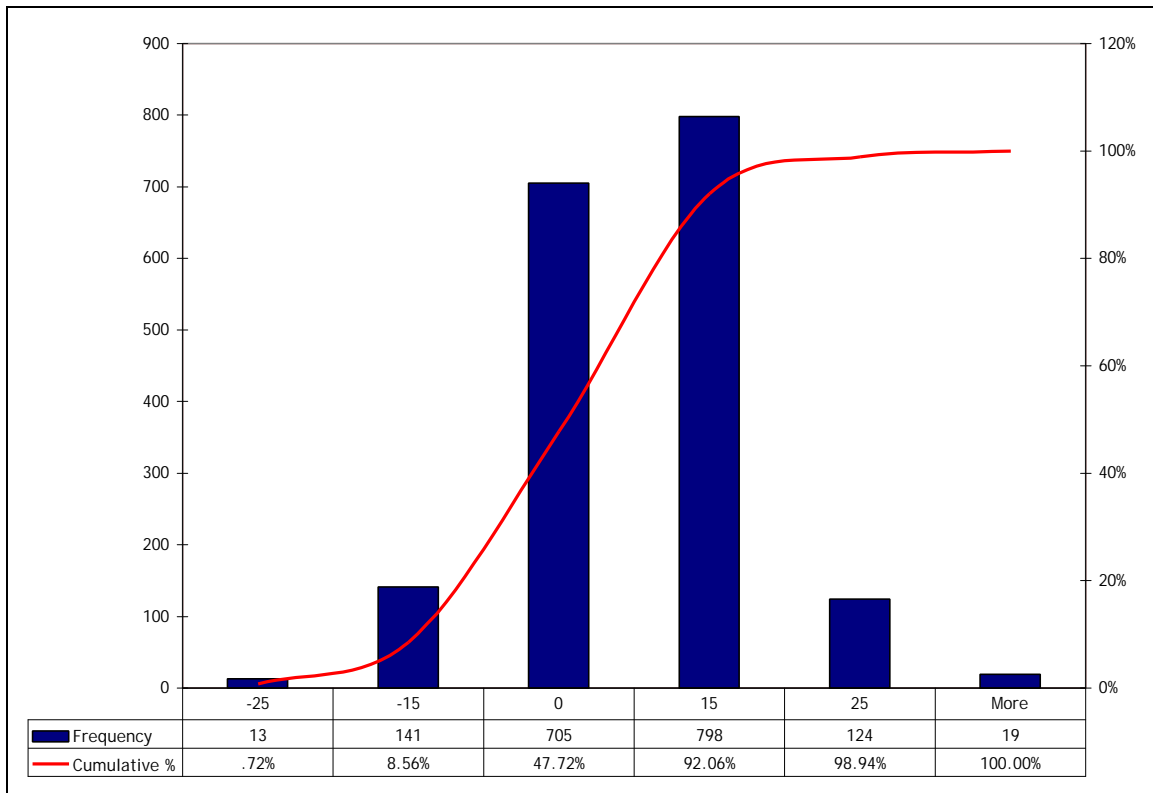
**Figure 15: Carrier 3 Mobile RX Power (dBm)**



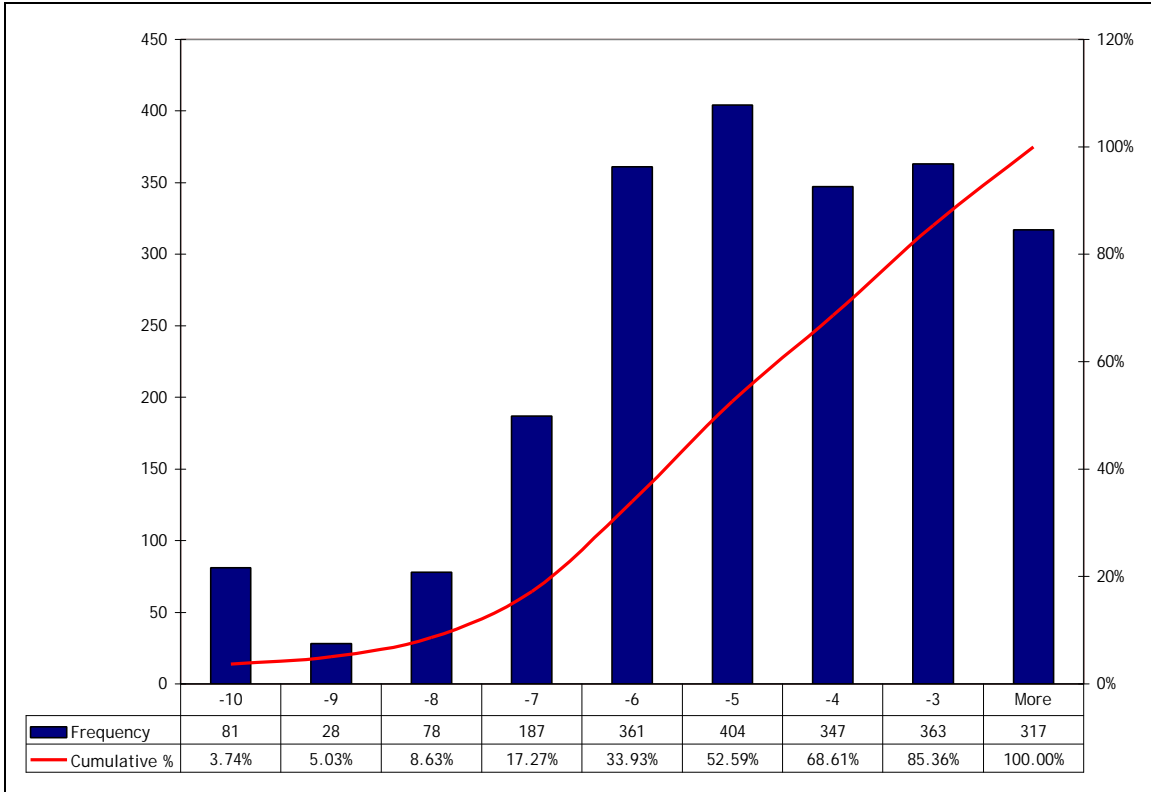
**Figure 16: Carrier 1 Mobile TX Power (dBm)**



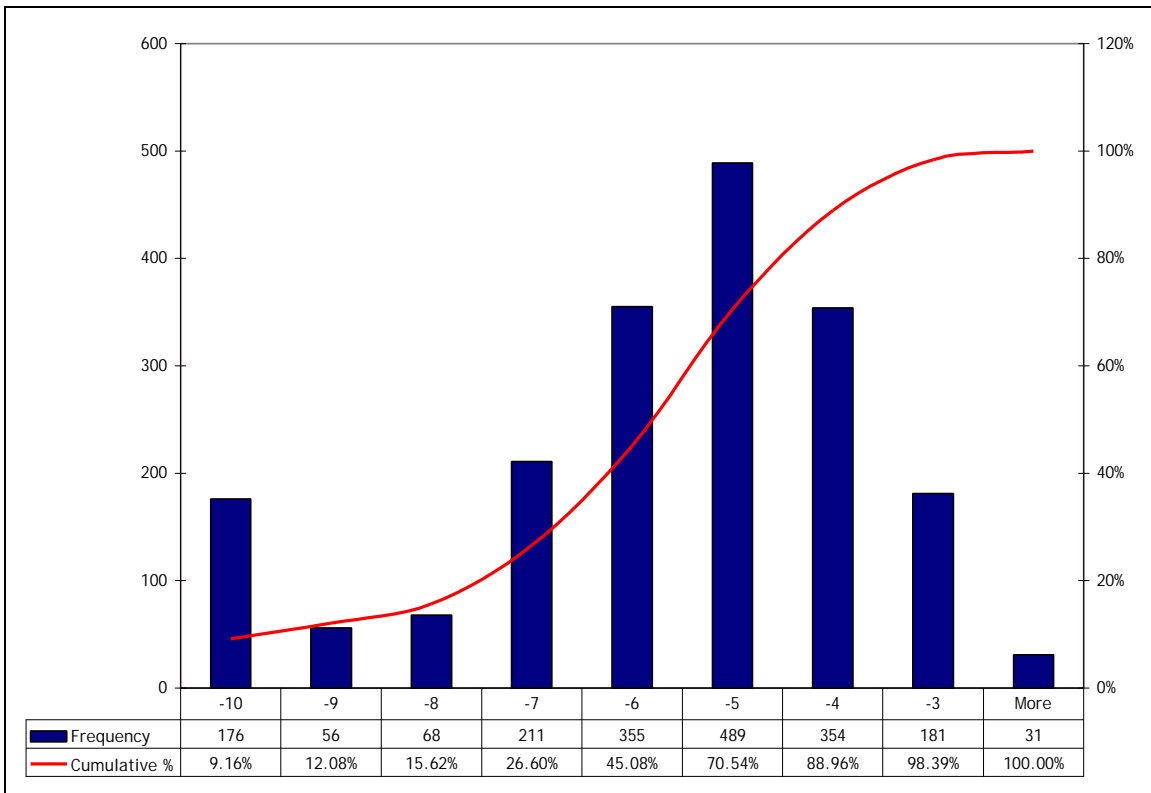
**Figure 17: Carrier 2 Mobile TX Power (dBm)**



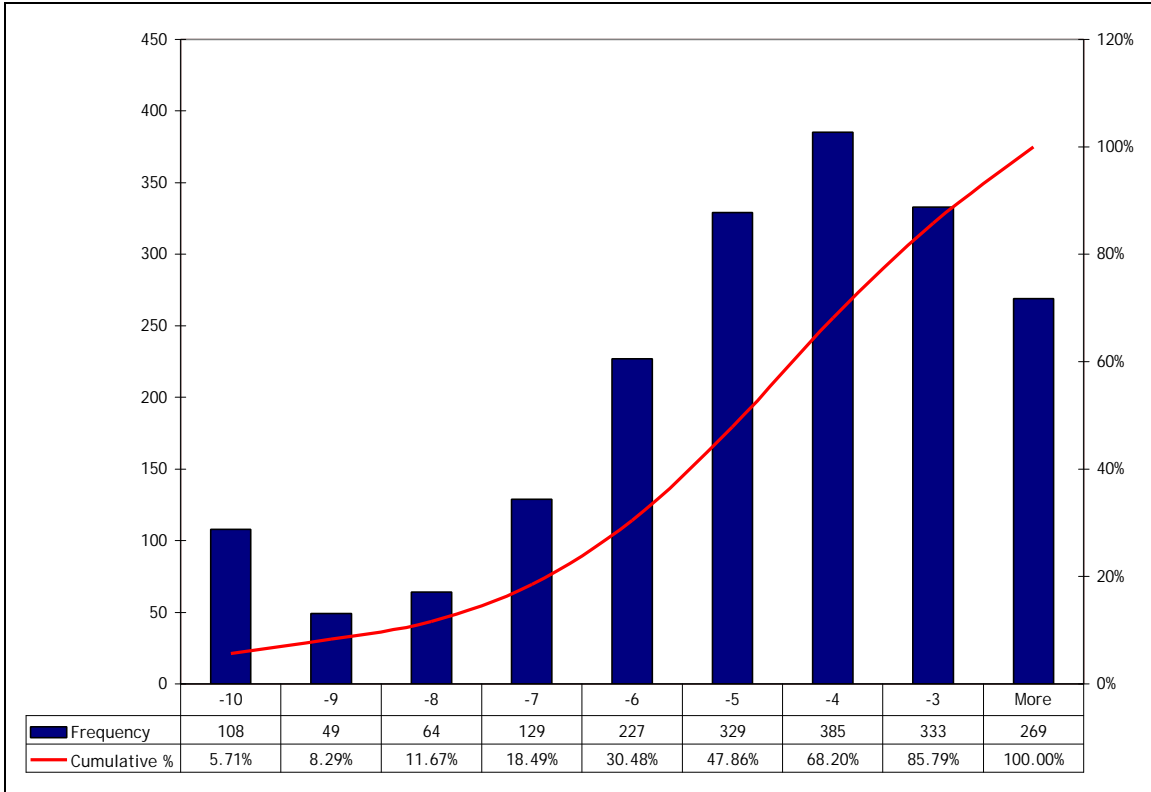
**Figure 18: Carrier 3 Mobile TX Power (dBm)**



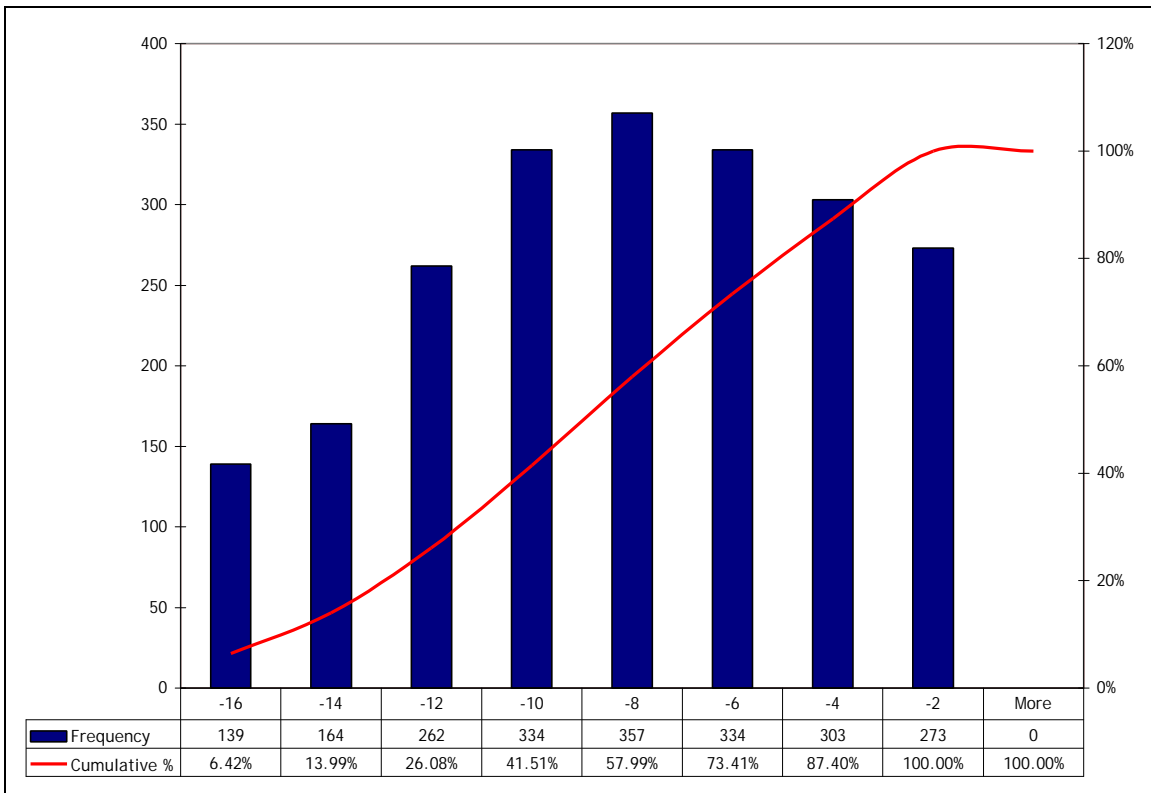
**Figure 19: Carrier 1 Aggregate Ec/Io (dB)**



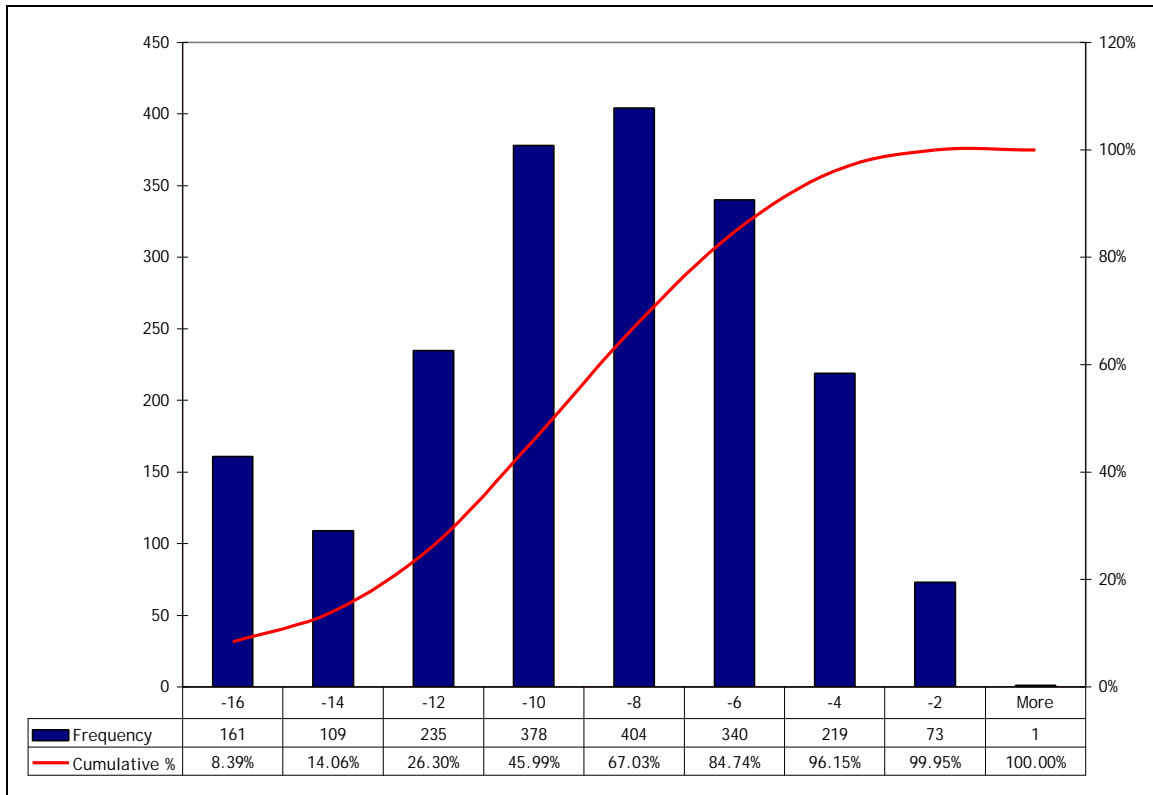
**Figure 20: Carrier 2 Aggregate Ec/Io (dB)**



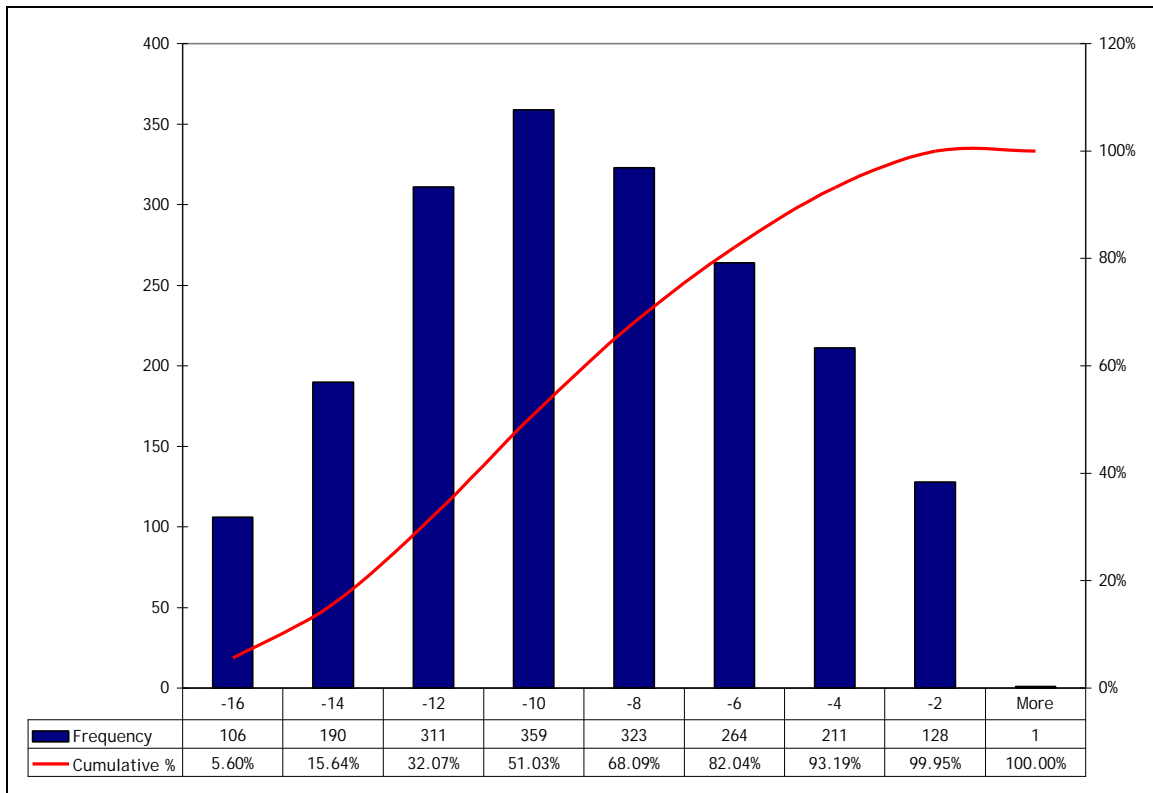
**Figure 21: Carrier 3 Aggregate Ec/Io (dB)**



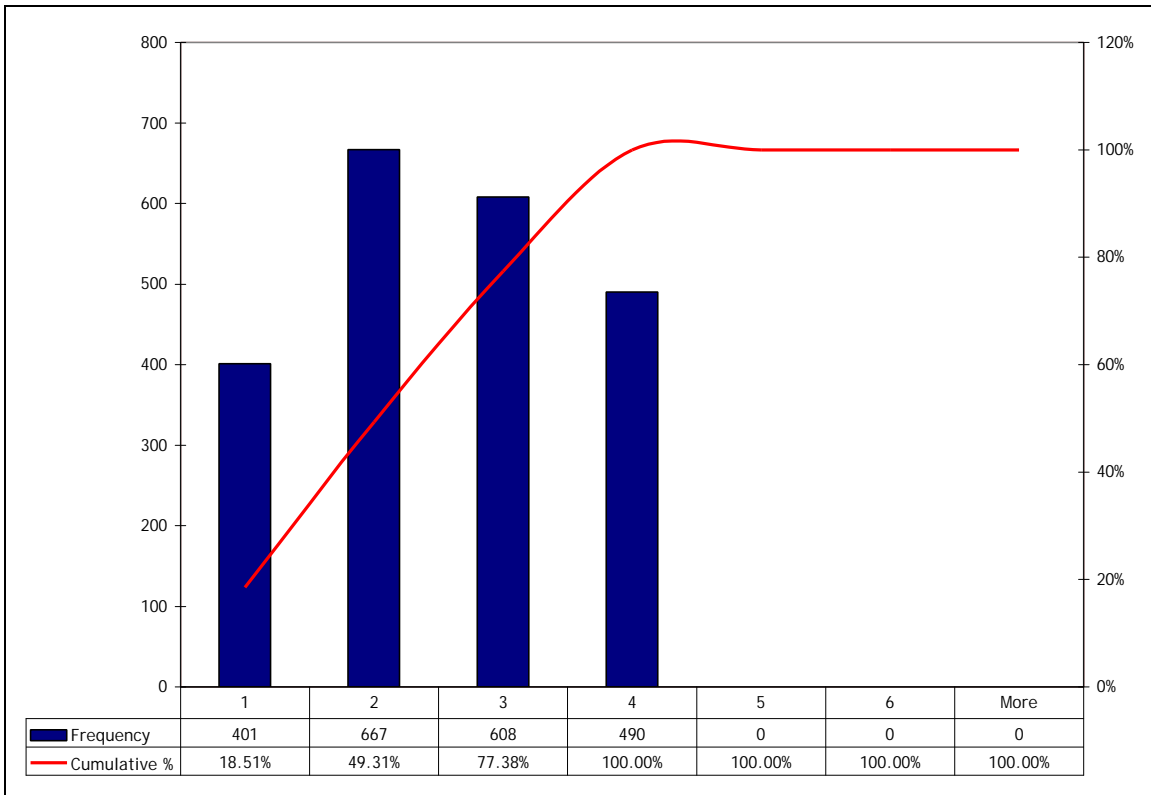
**Figure 22: Carrier 1 Best Ec/Io (dB)**



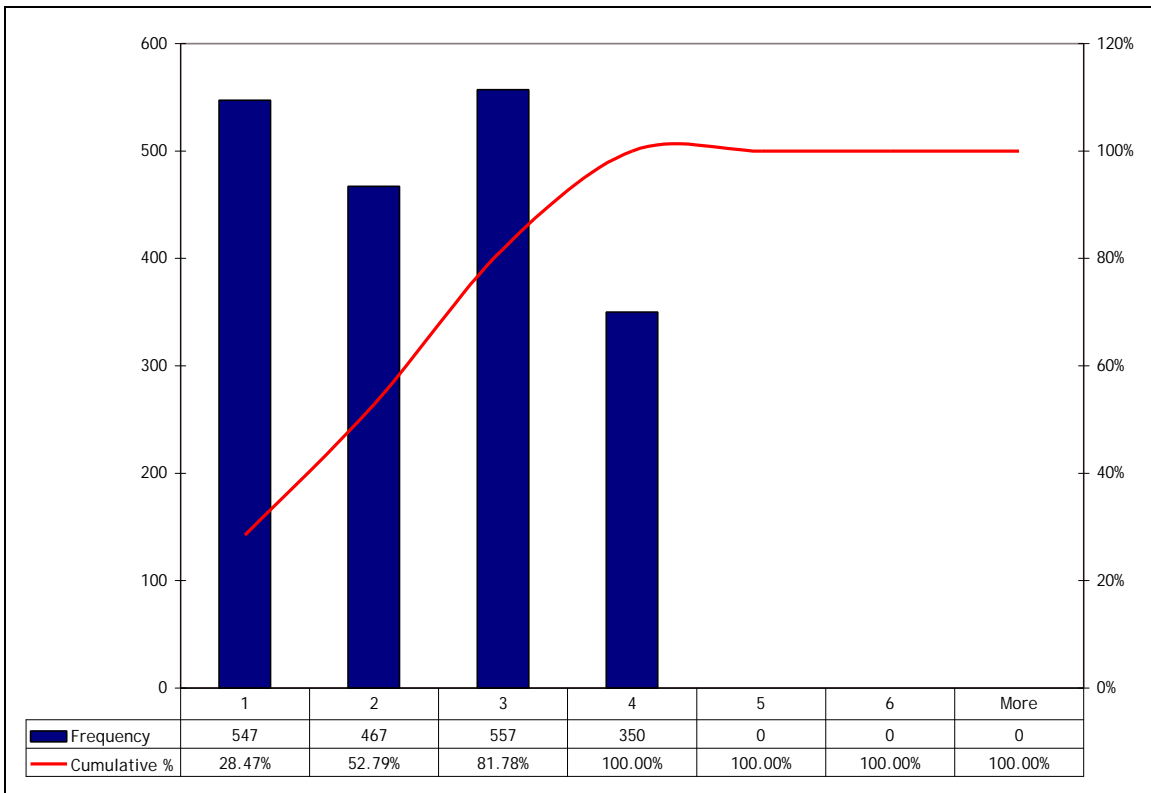
**Figure 23: Carrier 2 Best Ec/Io (dB)**



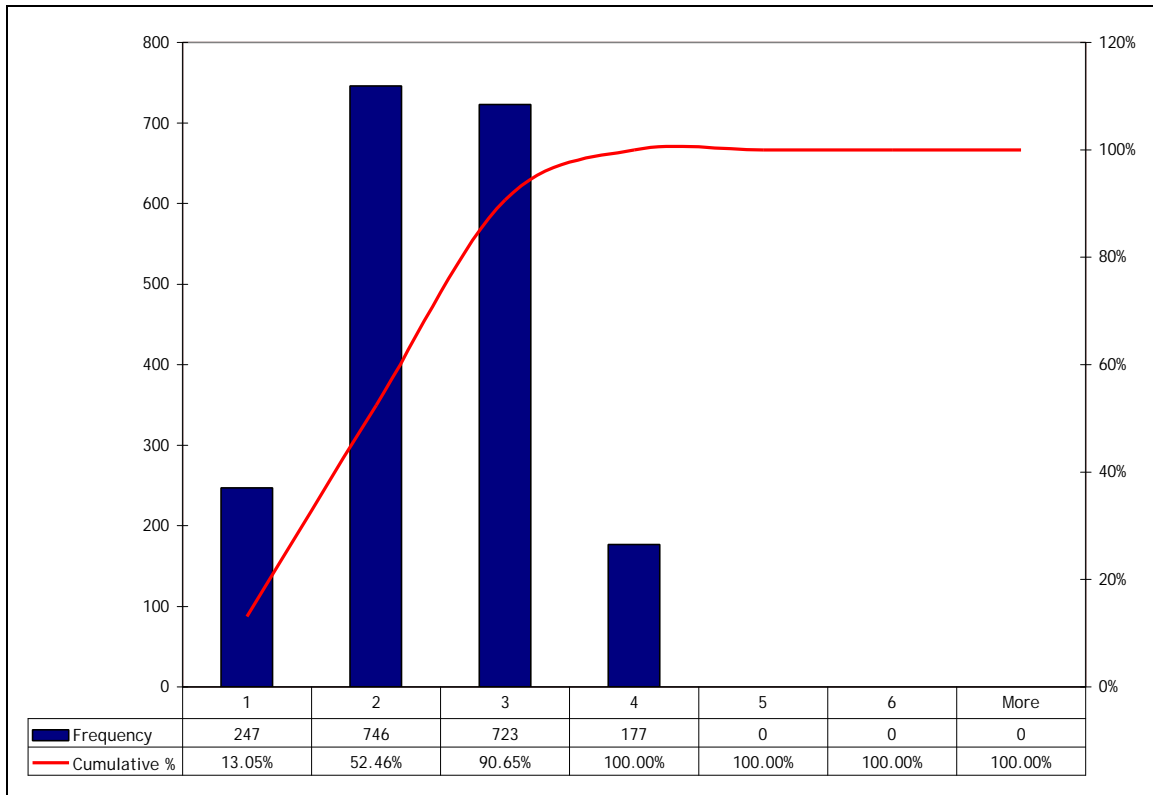
**Figure 24: Carrier 3 Best Ec/Io (dB)**



**Figure 25: Carrier 1 # of Active PNs**



**Figure 26: Carrier 2 # of Active PNs**



**Figure 27: Carrier 3 # of Active PNs**

#### 4. Geographic Plots

The following geographic plots are attached to this report.

Green Bay Overall	Green Bay Core
Carrier 1 - Fwd RLP Throughput (kbps)	Carrier 1 - Fwd RLP Throughput (kbps)
Carrier 2 - Fwd RLP Throughput (kbps)	Carrier 2 - Fwd RLP Throughput (kbps)
Carrier 3 - Fwd RLP Throughput (kbps)	Carrier 3 - Fwd RLP Throughput (kbps)
Carrier 1 - Rev RLP Throughput (kbps)	Carrier 1 - Rev RLP Throughput (kbps)
Carrier 2 - Rev RLP Throughput (kbps)	Carrier 2 - Rev RLP Throughput (kbps)
Carrier 3 - Rev RLP Throughput (kbps)	Carrier 3 - Rev RLP Throughput (kbps)
Carrier 1 - Aggregate Ec/Io (dB)	Carrier 1 - Aggregate Ec/Io (dB)
Carrier 2 - Aggregate Ec/Io (dB)	Carrier 2 - Aggregate Ec/Io (dB)
Carrier 3 - Aggregate Ec/Io (dB)	Carrier 3 - Aggregate Ec/Io (dB)
Carrier 1 - Best Ec/Io (dB)	Carrier 1 - Best Ec/Io (dB)
Carrier 2 - Best Ec/Io (dB)	Carrier 2 - Best Ec/Io (dB)
Carrier 3 - Best Ec/Io (dB)	Carrier 3 - Best Ec/Io (dB)
Carrier 1 - Mobile RX Power (dBm)	Carrier 1 - Mobile RX Power (dBm)
Carrier 2 - Mobile RX Power (dBm)	Carrier 2 - Mobile RX Power (dBm)
Carrier 3 - Mobile RX Power (dBm)	Carrier 3 - Mobile RX Power (dBm)
Carrier 1 - Mobile TX Power (dBm)	Carrier 1 - Mobile TX Power (dBm)
Carrier 2 - Mobile TX Power (dBm)	Carrier 2 - Mobile TX Power (dBm)
Carrier 3 - Mobile TX Power (dBm)	Carrier 3 - Mobile TX Power (dBm)
Carrier 1 - Forward FER (%)	Carrier 1 - Forward FER (%)
Carrier 2 - Forward FER (%)	Carrier 2 - Forward FER (%)
Carrier 3 - Forward FER (%)	Carrier 3 - Forward FER (%)
Carrier 1 - SCH FER (%)	Carrier 1 - SCH FER (%)
Carrier 2 - SCH FER (%)	Carrier 2 - SCH FER (%)
Carrier 3 - SCH FER (%)	Carrier 3 - SCH FER (%)
Carrier 1 - SCH Data Rate (1x, 2x, 4x, 8x or 16x)	Carrier 1 - SCH Data Rate (1x, 2x, 4x, 8x or 16x)
Carrier 2 - SCH Data Rate (1x, 2x, 4x, 8x or 16x)	Carrier 2 - SCH Data Rate (1x, 2x, 4x, 8x or 16x)
Carrier 3 - SCH Data Rate (1x, 2x, 4x, 8x or 16x)	Carrier 3 - SCH Data Rate (1x, 2x, 4x, 8x or 16x)
Carrier 1 - Number of Pilots in Active Set	Carrier 1 - Number of Pilots in Active Set
Carrier 2 - Number of Pilots in Active Set	Carrier 2 - Number of Pilots in Active Set
Carrier 3 - Number of Pilots in Active Set	Carrier 3 - Number of Pilots in Active Set
Carrier 1 - Number of Pilots > -14 dBm Ec/Io	Carrier 1 - Number of Pilots > -14 dBm Ec/Io