5G Clever Dumb Antenna

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About

- Founded in 1996
- Manufacturer of state-of-the-art Telecommunications and Defense systems, subsystems and components
- Specialize in custom built solutions for:
  - Telecommunications
  - Military & Defense
  - Aerospace
- ISO 9001 Manufacturing Facility in Boonton, NJ

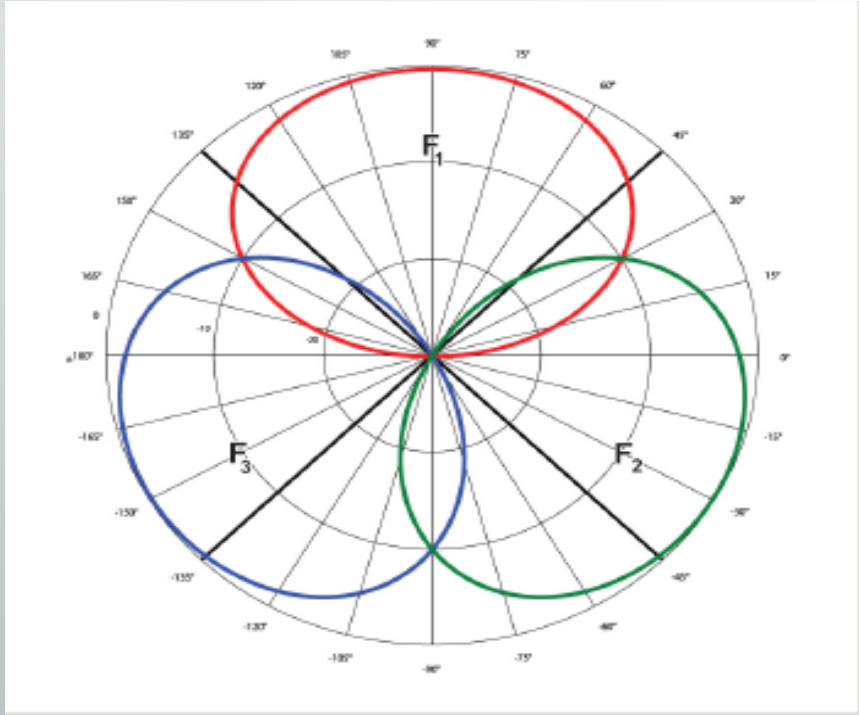
Introduction

- Multi-beam antennas can provide increased wireless capacity with enhanced spectral efficiency
- Enhanced spectral efficiency by use of space division multiple access (SDMA) techniques
- SDMA methods provide higher user capacity in a limited frequency spectrum
- Traditionally, wireless providers use three sectors in a 360° coverage area
- With the 5G Clever Dumb Antenna spectrum and capacity can be multiplied as many as 32 times within 360° coverage, providing 96 dual polarized beams

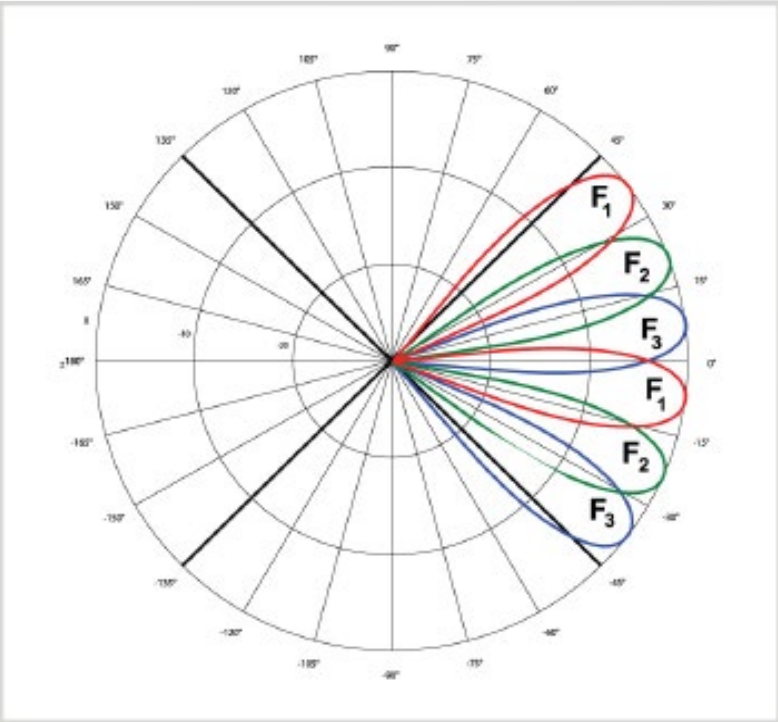
Why 5G Clever Dumb Antenna?

- The antenna system is **dumb** because it does not require electricity or software to operate
- **Clever** as it introduces multiple beams and frequency re-use without software or active components. Thus, multiplying existing spectra without purchasing expensive additional frequency bands

Typical vs 6-Beam Antenna



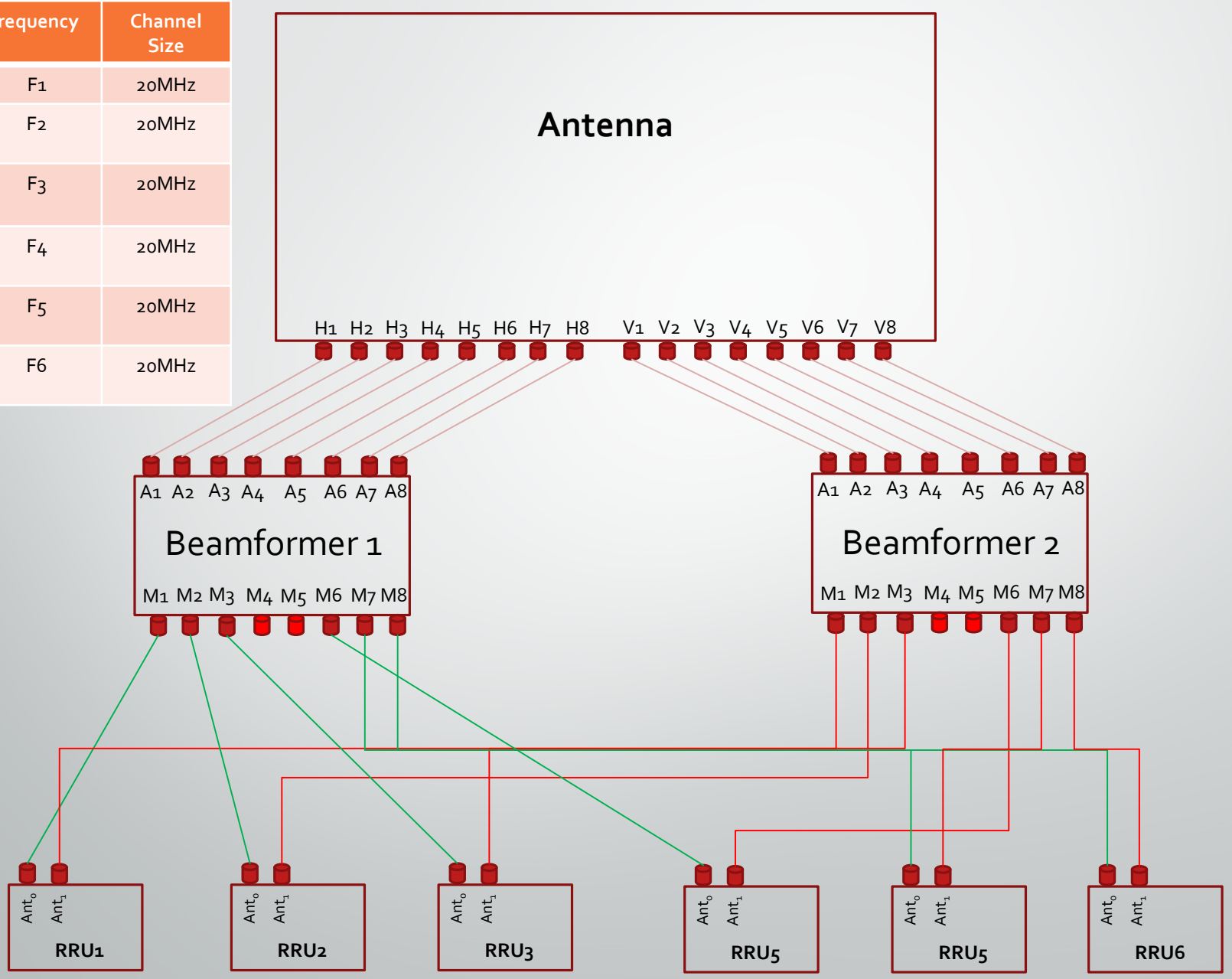
Typical Cell Site using three separate frequency channels, F1, F2, F3

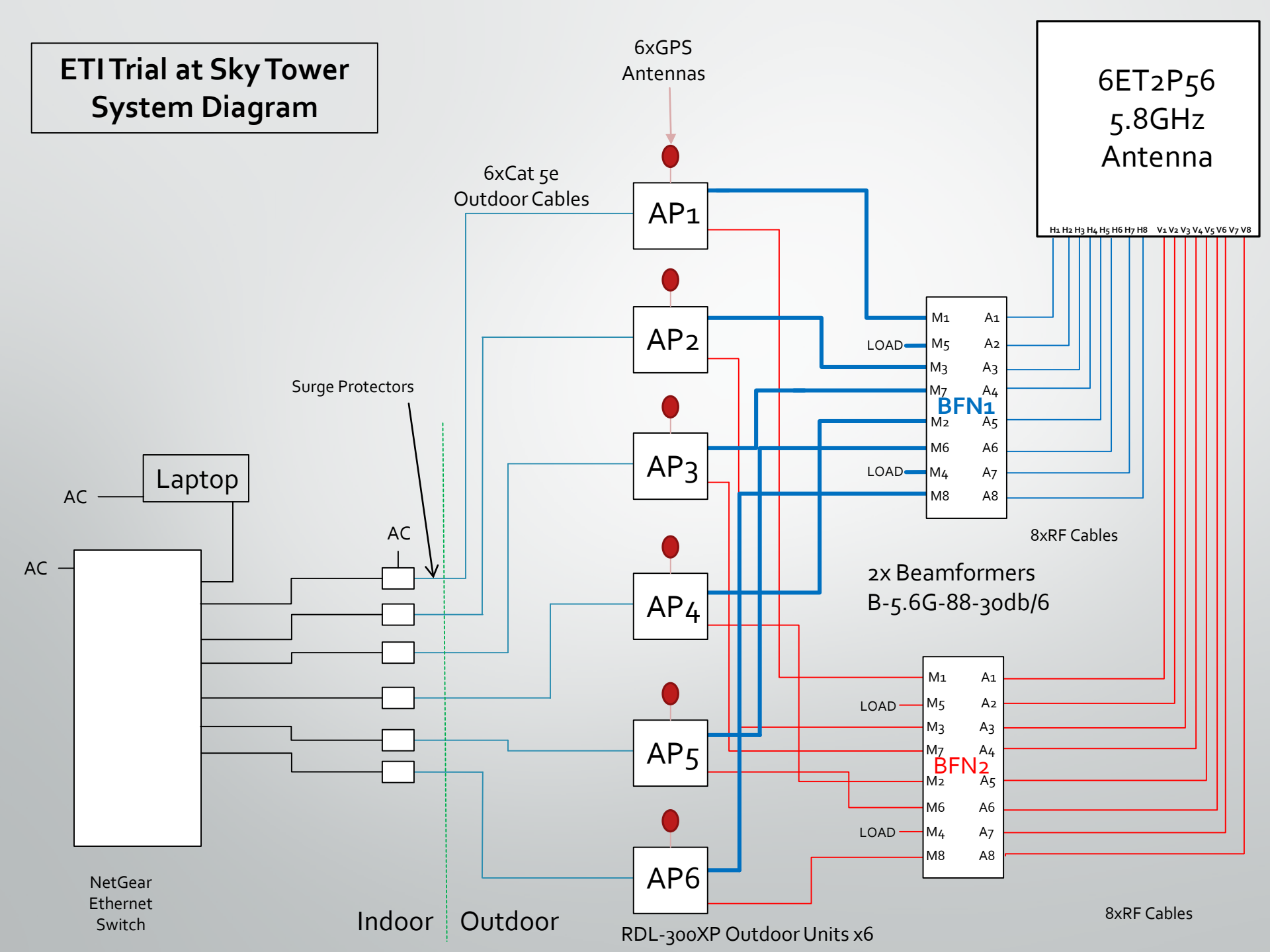


Beam Array diagram of four of E.T. Industries' 6-beam antennas using three frequency channels, F1, F2, F3. Frequency reuse ratio of 8:1.

5G Clever Dumb Antenna Connection Diagram Example

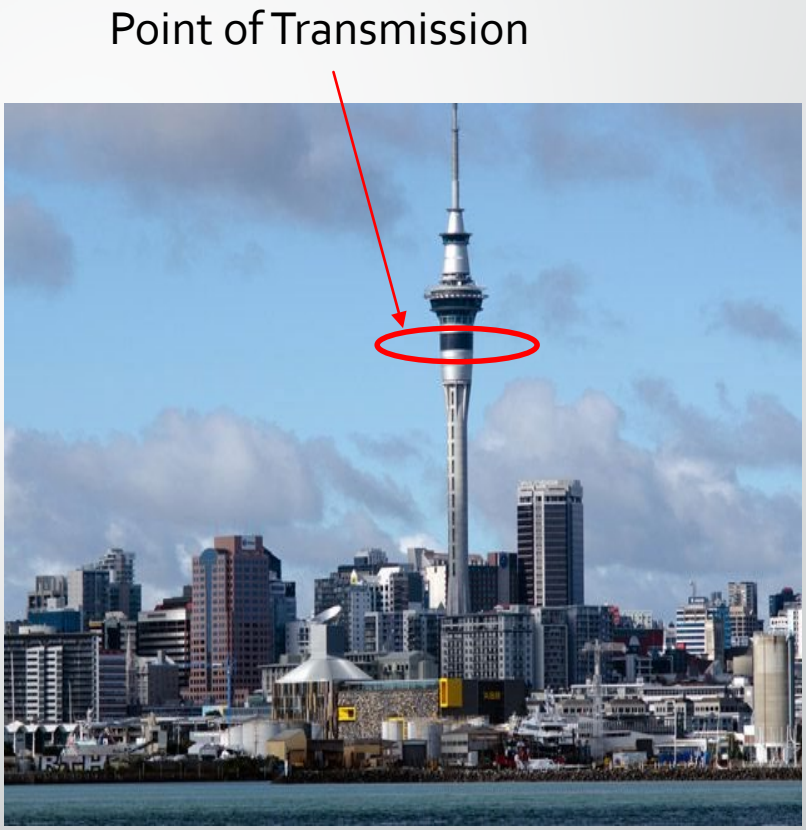
Mode	Frequency	Channel Size
1	F1	20MHz
2	F2	20MHz
3	F3	20MHz
6	F4	20MHz
7	F5	20MHz
8	F6	20MHz



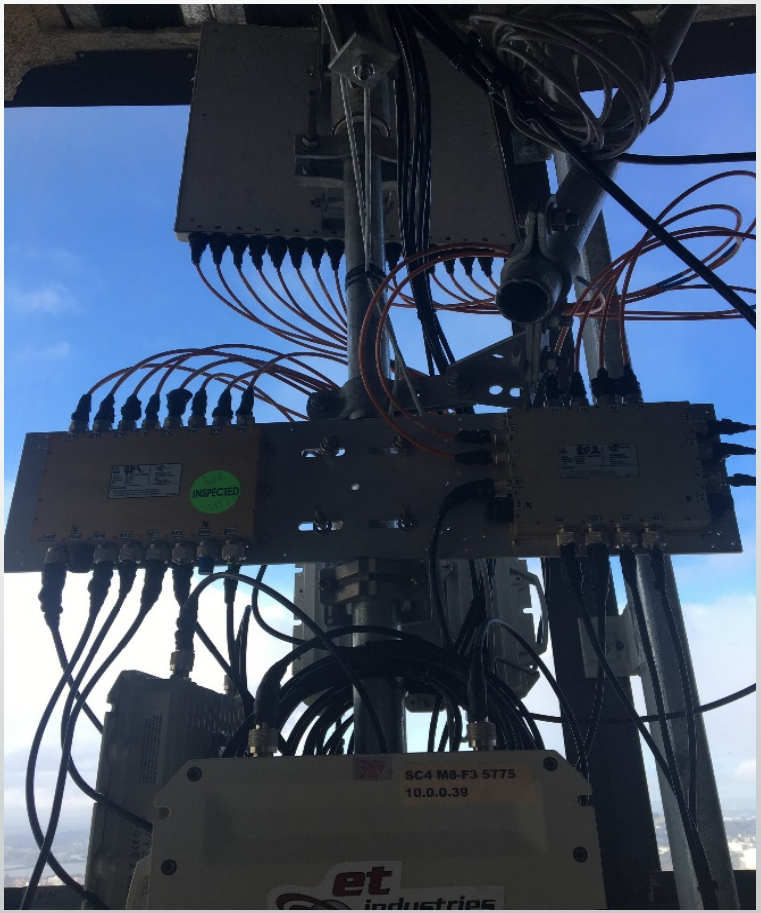

ETI Trial at Sky Tower
System Diagram
6xGPS
Antennas
6ET2P56
5.8GHz
Antenna
H1 H2 H3 H4 H5 H6 H7 H8 V1 V2 V3 V4 V5 V6 V7 V8
6xCat 5e
Outdoor Cables
AP1
AP2
AP3
AP4
AP5
AP6
Surge Protectors
AC
Laptop
AC
AC
NetGear
Ethernet
Switch
Indoor
Outdoor
M1 A1
LOAD M5 A2
M3 A3
M7 A4
BFN1
M2 A5
M6 A6
LOAD M4 A7
M8 A8
8xRF Cables
2x Beamformers
B-5.6G-88-30db/6
M1 A1
LOAD M5 A2
M3 A3
M7 A4
BFN2
M2 A5
M6 A6
LOAD M4 A7
M8 A8
8xRF Cables
RDL-300XP Outdoor Units x6

Sky Tower

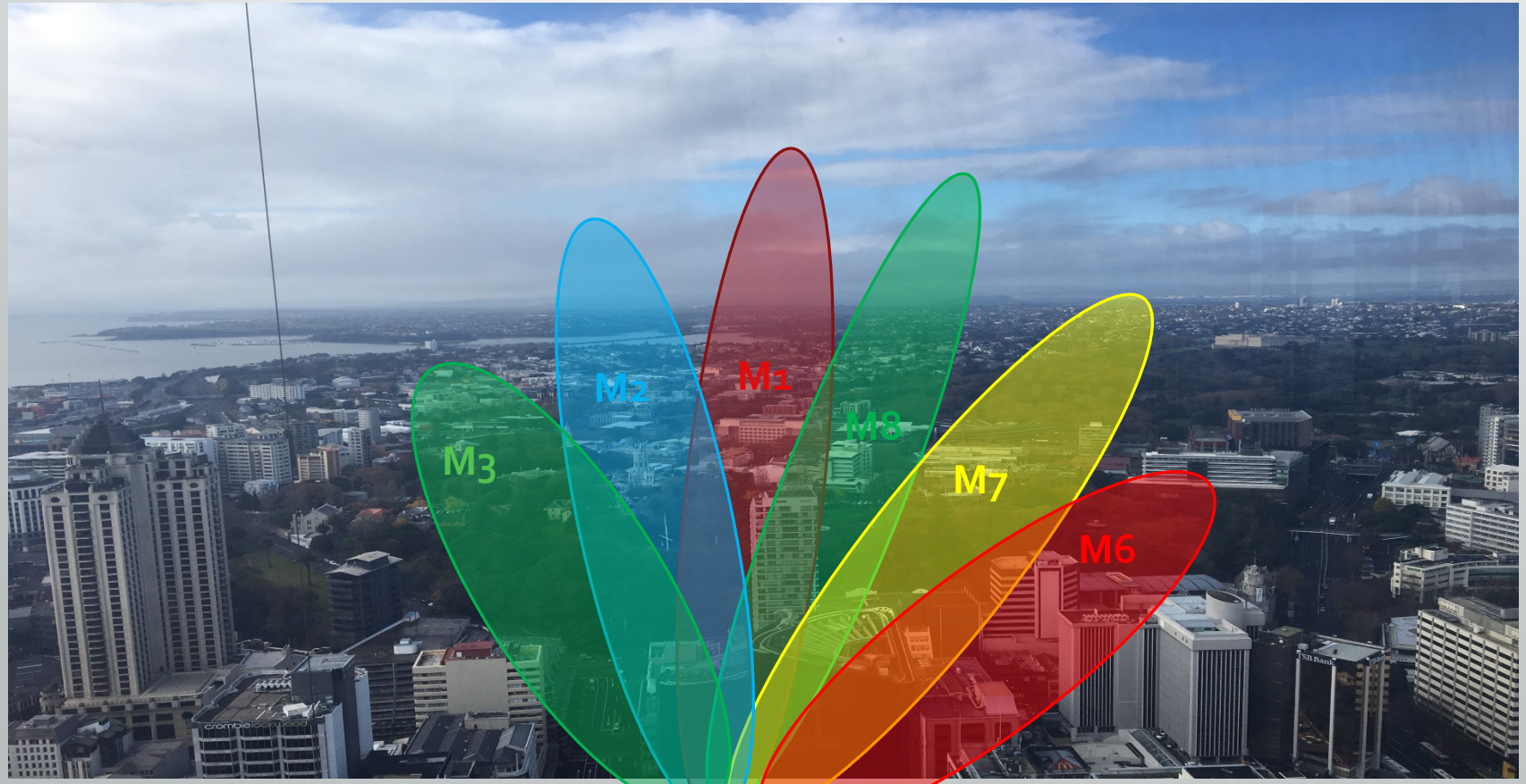
- 328 metres (1,076 ft) tall, as measured from ground level to the top of the mast
- 170 meter height point of transmission
- Latitude: 36° 50′ 54.46″ S
- Longitude: 174° 45′ 43.86″ E



ETI Antenna System Installation



View from Behind the Antenna System



Results: Mode 1 (5735 MHz)

Location	RSSI (dBm)				SINADR (dB)				Data Rate (Mb/s)		MIMO		Distance (km)
	RF 1 DL	RF 2 DL	RF 1 UL	RF 2 UL	RF 1 DL	RF 2 DL	RF 1 UL	RF 2 UL	DL	UL	DL	UL	
Birdwood Crescent	-61	-58	-61	-57	21	24	20	21	108	96	B	B	2.0
Burwood Crescent	-74	-70	-69	-65	20	23	19	21	96	96	B	B	3.52
Victoria Ave School	-72	-68	-72	-65	19	22	12	12	96	18	B	A	3.76
Walton St.	-75	-72	-75	-71	17	19	15	17	72	72	B	B	4.1
82 Upland Rd.	-76	-75	-79	-73	18	18	16	17	72	36	B	A	5.1
53 Upland Rd.	-79	-74	-78	-71	18	18	19	19	48	48	A	A	5.32
20 Waiatarua Rd.	-80	-83	-80	-79	16	16	14	14	48	36	B	A	6.25
Mt. Wellington	-84	-80	-83	-78	12	12	13	14	24	36	A	A	9.04

Birdwood Crescent

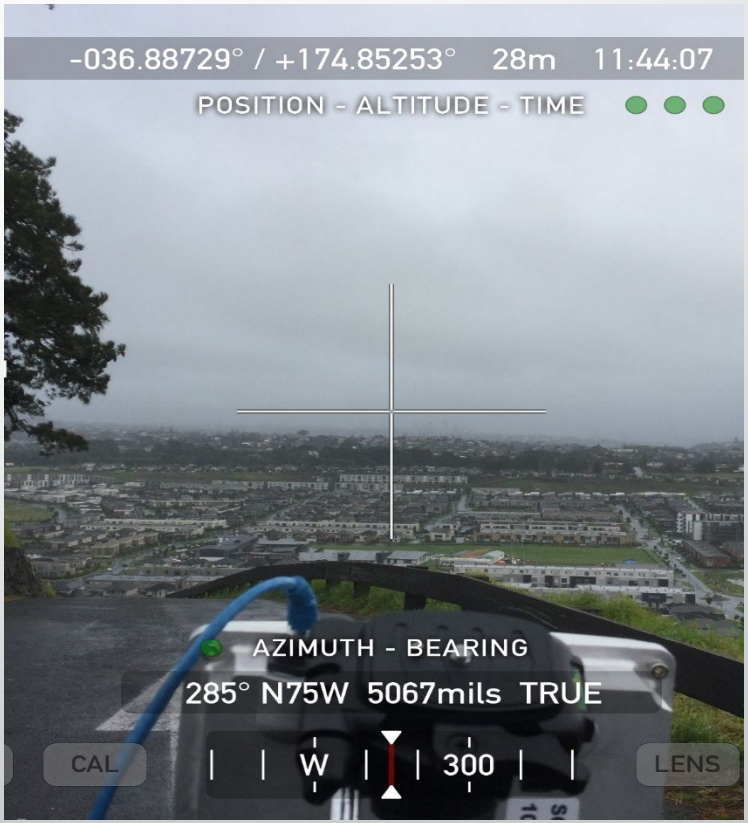
Burwood Crescent

Walton St.


SC3 M1 5735
10.0.0.33


-036.87107° / +174.79925° 59m 09:44:45
POSITION - ALTITUDE - TIME
AZIMUTH - BEARING
289° N71W 5138mils TRUE
CAL
W
300
LENS

Mount Wellington



Frequency Reuse M3 and M8

Frequency Reuse

- Repeated Channel 5815MHz on M3 and M8
- Simultaneous Connections on same channel 5815 MHz
- Results of repeated channels:

Location	RSSI (dBm)				SINADR (dB)				Data Rate (Mb/s)		MIMO		Distance (km)
	RF 1 DL	RF 2 DL	RF 1 UL	RF 2 UL	RF 1 DL	RF 2 DL	RF 1 UL	RF 2 UL	DL	UL	DL	UL	
Gladstone Park (M3, 5815MHz)	-65	-62	-64	-62	18	18	21	21	72	108	B	B	2.1
Domain Museum (M8, 5815MHz)	-66	-65	-63	-61	17	17	21	19	72	96	B	B	2.1

Conclusions:

- Spectrum and capacity can be multiplied as many as 32 times within 360° coverage, providing 96 dual polarized beams
- Higher data throughput, higher customer capacity and increased spectral efficiency
- The beam crossing can be designed to cross between 3 to 10 dB with side lobe levels of 25dB
- The 5G Clever Dumb Antenna is clearly the solution to the ever growing demand of data usage and network capacity for the finite amount of spectrum
- Frequency re-use permitted

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Questions