	PS RECEIVER BANDWIDTH = 25 KHz (Ant Height = 92 m)				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	0.0001	0.0001	0.0001	0.0001	0.0001
200	0.0004	0.0003	0.0003	0.0004	0.0004
>1000	0.0036	0.0029	0.0029	0.0036	0.0036

	PS RECEIVER BANDWIDTH = 12.5 KHz (Ant Height = 92 m)				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	0.0001	0.0001	0.0001	0.0001	0.0001
200	0.0004	0.0003	0.0003	0.0004	0.0004
>1000	0.0036	0.0029	0.0029	0.0036	0.0036

TABLE 8. Rural Portable Sideband Impacts

Similarly, for Sideband emissions at the three distances from the cellular base station site (40 meters, 200 meters, and 1000 meters) for all migration paths, all noise floor rises were below 1 dB. The tables show a slight increase in interference from Sideband emissions between some scenarios deploying LTE with increased power and less cable loss (Case 4 and Case 5) than existing GSM and UMTS systems as represented by Case 1, 2 and 3. This rise in the interference floor is insignificant in practice and is still well under the 1 dB degradation in the noise floor of the Public Safety mobile receiver.

2.3 Overload Interference Impacts

	PS RECEIVER BANDWIDTH = 25 KHz				
DISTANCE TO MOBILE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	2500 W	2000 W	2000 W	2500 W	2000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES (-21.1)	YES (-22)	YES (-22)	YES (-21.1)	YES (-22)
200	YES (-22.2)	YES (-23.2)	YES (-23.2)	YES (-22.2)	YES (-23.2)
>1000	NO	NO	NO	NO	NO

	PS RECEIVER BANDWIDTH = 12.5 KHz				
DISTANCE TO MOBILE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	2500 W	2000 W	2000 W	2500 W	2000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-21.1)	YES(-22.0)	YES (-22)	YES(-21.1)	YES (-22)
200	YES(-22.2)	YES(-23.2)	YES (-23.2)	YES(-22.2)	YES (-23.2)
>1000	NO	NO	NO	NO	NO

TABLE 9. Non-Rural Mobile Overload Impacts

	PS RECEIVER BANDWIDTH = 25 KHz				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	2500 W	2000 W	2000 W	2500 W	2000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-24.1)	YES(-25)	YES (-25)	YES(-24.1)	YES(-25)
200	YES(-25.2)	YES(-26.2)	YES (-26.2)	YES(-25.2)	YES(-26.2)
>1000	NO	NO	NO	NO	NO

	PS RECEIVER BANDWIDTH = 12.5 KHz				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	2500 W	2000 W	2000 W	2500 W	2000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-24.1)	YES(-25)	YES (-25)	YES(-24.1)	YES(-25)
200	YES(-25.2)	YES(-26.2)	YES (-26.2)	YES(-25.2)	YES(-26.2)
>1000	NO	NO	NO	NO	NO

TABLE 10. Non-Rural Portable Overload Impacts

	PS RECEIVER BANDWIDTH = 25 KHz (Ant Height = 47 m)				
DISTANCE TO MOBILE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-26.8)	YES(-27.8)	YES(-27.8)	YES(-26.8)	NO
200	YES(-21.2)	YES(-22.2)	YES(-22.2)	YES(-21.2)	YES(-25.2)
>1000	YES(-25.8)	YES(-26.8)	YES(-26.8)	YES(-25.8)	YES(-29.8)

	PS RECEIVER BANDWIDTH = 12.5 KHz (Ant Height = 47 m)				
DISTANCE TO MOBILE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-26.8)	YES(-27.8)	YES(-27.8)	YES(-26.8)	NO
200	YES(-21.2)	YES(-22.2)	YES(-22.2)	YES(-21.2)	YES(-25.2)
>1000	YES(-25.8)	YES(-26.8)	YES(-26.8)	YES(-25.8)	YES(-29.8)

	PS RECEIVER BANDWIDTH = 25 KHz (Ant Height = 92 m)				
DISTANCE TO MOBILE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	NO	NO	NO	NO	NO
200	NO	NO	NO	NO	NO
>1000	YES(-23.8)	YES(-24.8)	YES(-24.8)	YES(-23.8)	YES(-27.8)

	PS RECEIVER BANDWIDTH = 12.5 KHz (Ant Height = 92 m)				
DISTANCE TO MOBILE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	NO	NO	NO	NO	NO
200	NO	NO	NO	NO	NO
>1000	YES(-26.8)	YES(-27.8)	YES(-27.8)	YES(-26.8)	NO

TABLE 11. Rural Mobile Overload Impacts

	PS RECEIVER BANDWIDTH = 25 KHz (Ant Height = 47 m)				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-29.8)	NO	NO	YES(-29.8)	NO
200	YES(-24.2)	YES(-25.2)	YES(-25.2)	YES(-24.2)	YES(-28.2)
>1000	YES(-28.8)	Yes(-29.8)	Yes(-29.8)	YES(-28.8)	NO

	PS RECEIVER BANDWIDTH = 12.5 KHz (Ant Height = 47 m)				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	YES(-29.8)	NO	NO	YES(-29.8)	NO
200	YES(-24.2)	YES(-25.2)	YES(-25.2)	YES(-24.2)	YES(-28.2)
>1000	YES(-28.8)	YES(-29.8)	YES(-29.8)	YES(-28.8)	NO

	PS RECEIVER BANDWIDTH = 25 KHz (Ant Height = 92 m)				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	NO	NO	NO	NO	NO
200	NO	NO	NO	NO	NO
>1000	YES(-26.8)	Yes(-27.8)	Yes(-27.8)	YES(-26.8)	NO

	PS RECEIVER BANDWIDTH = 12.5 KHz (Ant Height = 92 m)				
DISTANCE TO PORTABLE RECEIVER (METERS)	CASE 1 5 GSM CXRS (dB)	CASE 2 1 UMTS & 3 GSM CXRS (dB)	CASE 3 2 UMTS CXRS & 2 GSM CXRS (dB)	CASE 4 1 FIVE MHz LTE CXR, 1 UMTS CXR & 2 GSM CXRS (dB)	CASE 5 1 TEN MHz LTE CXR (dB)
Power/Sector	5000 W	4000 W	4000 W	5000 W	4000 W
Allowed Now	YES	YES	YES	NO	NO
40	NO	NO	NO	NO	NO
200	NO	NO	NO	NO	NO
>1000	YES(-26.8)	YES(-27.8)	YES(-27.8)	YES(-26.8)	NO

TABLE 12. Rural Portable Overload Impacts

For overload interference, the tables show that such interference is possible close to the cellular base station sites, but LTE deployments did not increase the number of possibilities of such

interference above that of existing deployments. The small difference in the overload levels for the near site calculations can be attributed to the path loss difference and the base station antenna discrimination. The tables also show that such cases of overload interference into Public Safety receivers could be reduced with the use of newer Public Safety receivers with overload limits around – 20 dBm (well within present design even at the current wider front end bandwidths) or the incorporation of front end filtering.

2.4 The PSD Limit

Reviewing the above tables lead to the conclusion that overload is the controlling interference mechanism. Based on this conclusion the highest PSD that can be implemented and still maintain the *status quo* in the interference environment can be determined. A PSD of 250 watts/MHz for non-rural areas and 500 watts/MHz for rural areas was determined to be the highest PSD limit that would not cause any additional interference into bands adjacent to the 850 MHz cellular band.

3. Conclusions

This study addressed the interference impacts on Public Safety receivers under five different cases that are representative of AT&T's past, present, and future network comprising GSM, UMTS and LTE systems in various configurations in the cellular band in a Missouri market. The study used the operating parameters of Public Safety portable and mobile units which were considered poor by present industry standards. The study results in Tables 1 through 12 suggest that the interference environment into Public Safety portable and mobile units from 2X2 MIMO LTE cellular deployments is not appreciably different than that from existing technologies in the cellular band.

Results of this "real world" study support AT&T's belief that a power limit based on a Power Spectral Density measure will not increase the possibility of harmful interference to adjacent bands and would maintain the "status quo" with respect to the potential impact on users of adjacent spectrum, such as the Public Safety Radio Service. The "real world" study results also supported a Power Spectral Density limit of 250 Watts/MHz in non-rural areas and 500 Watts/MHz in rural areas. As a result of this study, AT&T will file a petition at the FCC proposing to supplement the current per-emission ERP limits for cellular base stations with ones restated as power spectral density limits.