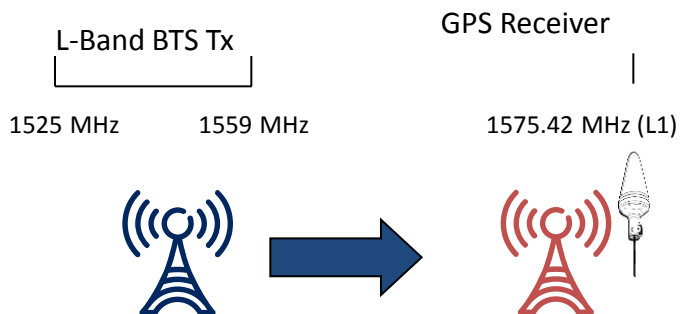




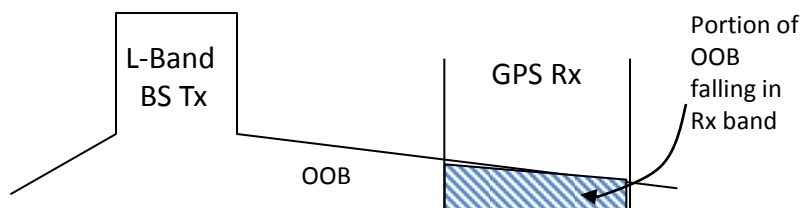
LTE B24 BS Design

Andy McGregor

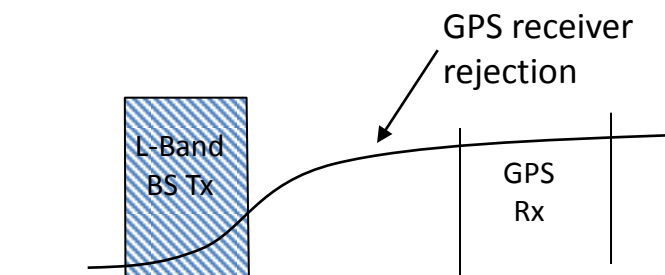
BS -> GPS Interference Modes



BS OOB Falling in Rx Band



BS Tx Signal Causing Rx Blocking



- Tx OOB
 - Feasible to use BS filtering to reduce OOB into GPS RX
 - A guard band (3-5 MHz ?) between highest LTE channel and lowest GPS edge is essential for FCC -110 dBW/MHz
- Rx Blocking
 - Cannot be resolved by BS filtering
 - Helped by lower BS Tx power
 - Helped by larger guard band
 - Helped by improved GPS Rx filter

Commercial Base Station Specification



- 3GPP TS 36.104 defines Band 24 as
 - UE transmit 1626.5 – 1660.5 MHz (uplink)
BS transmit 1525 – 1559 MHz (downlink)
 - For wide-area use, no specific BS transmit power indicated
 - Unwanted emissions - generic
 - Adjacent Channel Leakage power Ratio (ACLR) generic requirement is less stringent of:
 - -13dBm/MHz (Category A) (= - 43 dBW/MHz)
 - 45dBc (mean power on assigned channel vs mean power on adjacent channel)
 - Spurious emissions (> 10MHz away) generic -13dBm/MHz Category A
 - Specific GPS limit applies to 1559-1610 MHz shall not exceed the maximum emission levels PE_1MHz and PE_1kHz declared by the manufacturer (but no 3GPP value)
- Generic LTE Implementation
 - Good commercial BS Tx design (from tx modulator and digital filter) can provide ~60dBc rejection at > 5MHz
 - Good commercial analog filter design can provide additional ~80dB rejection at > 5MHz
 - Actual implementation can use extra techniques to improve OOB
- Commercial BS design MUST be compliant to BOTH 3GPP TS and FCC Rules

FCC Rules

- ATC 25.253
 - (b) OOB -57.9 dBW/MHz at edge of block
 - (d)(9) OOB -70 dBW/MHz in 1559-1605 MHz in 2ms active tx interval
 - (d)(1, 2) EIRP 1525-1541.5, 1547.5-1559 MHz
31.9 dBW/200kHz and 26.9 dBW/200k towards horizon (38.9 dBW/MHz)
reduced by 3 dB if 2*2 MIMO
 - (d)(3, 4) EIRP 1541.5-1547.5 MHz
23.9 dBW/200kHz and 18.9 dBW/200kHz towards horizon (30.9 dBW/MHz)
reduced by 3 dB if 2*2 MIMO
 - (d)(8) peak antenna gain 16dBi
- DA 10-534 Order & Authorization
 - §10 §31 Tx power 32 dBW/MHz in any 1ms interval
 - §11 §31 OOB -32.4 dBW/MHz @ 1MHz from band edge
OOB -39.4 dBW/MHz @ 2MHz from band edge
 - §45 OOB -100 dBW/MHz in 1559-1605 MHz

BS GPS Rx



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- GSM, WCDMA, 1xRTT, LTE BS often uses GPS Rx for timing
 - Thus BS (in any band... PCS, AWS, L-band etc) will be potential victim of “GPS Interference”
 - Co-located BS may share the GPS signal
- Feasible to add Rx filtering on BS GPS Rx (e.g. PCTEL GPS-TMG-HR-26N)
 - Interfering BS location is known
 - Higher BS cost & may need relocation of GPS antenna to improve clear-sky view
- BS could also use emerging standards for network timing (e.g. IEEE 1588 V2) for in-building equipment in future



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