

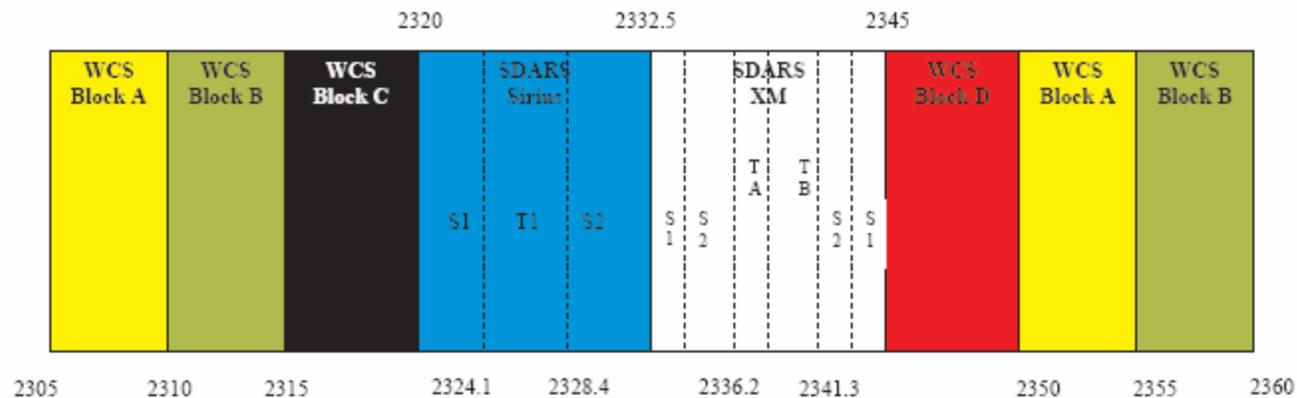


2.3 GHz WIRELESS COMMUNICATIONS SERVICE: Our experience with SDARS receiver vulnerability

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The Origins of WCS

- WCS and SDARS were created simultaneously in 1996-97 and both are primary services in their bands.



- WCS allocation
 - 2305-2310 MHz -- Fixed, Mobile (except aeronautical mobile) and Radiolocation
 - 2310-2320 and 2345-2360 MHz -- Fixed, Mobile, Radiolocation and Broadcasting-Satellite (sound)
- SDARS allocation
 - 2320-2345 MHz (Sirius: 2320-2332.5 MHz) (XM: 2332.5-2345 MHz)

The Origins of WCS

- Initial technical rules governing WCS
 - Tough OOB standards adopted at request of SDARS applicants.
 - For fixed operations: $80 + 10 \log(p)$ dB into all SDARS frequencies.
 - For mobile operations: $110 + 10 \log(p)$ into all SDARS frequencies.
 - FCC recognized that initial rules would effectively preclude mobile WCS, but recognized they were built on worst case assumptions and clearly stated intent to revisit rules in future as services developed.
 - Initial rules included no power limits on WCS whatsoever!
 - *SDARS community did not raise overload as a potential vulnerability*
 - FCC on reconsideration adopted power limits for WCS to address potential interference issues raised by MDS stemming from poor downconverter design:
 - Fixed, land and radiolocation land stations limited to 2,000 Watts peak EIRP.
 - WCS mobile and radiolocation mobile stations limited to 20 Watts EIRP.
 - Also required MDS to upgrade receivers going forward to minimize long term risks of interference.
 - No restrictions on outdoor antennas.
 - No duty cycle requirements.
 - No prior notice or special protection requirements.

Facilitating WCS mobility

- 2007
 - WCS proposes WCS rule changes to facilitate mobile use.
 - FCC issues NPRM in WT Docket No. 07-293.
- 2009
 - Joint testing of WCS/SDARS coexistence shows that WCS mobile OOB limit could be substantially reduced without resulting in OOB interference to SDARS
- May 2010
 - FCC R&O reduces mobile OOB limits into SDARS band:
 - $55 + 10 \log (P)$ dB between 2320-2324/2341-2345 MHz
 - $61 + 10 \log (P)$ dB between 2324-2328/2337-2341 MHz
 - $67 + 10 \log (P)$ dB between 2328-2337 MHz

OBE relief -- a Pyrrhic victory

- In May 2010 Order, FCC imposes significant restrictions on WCS to address vulnerability of inexpensive SDARS receivers to overload:
 - Mobility precluded in 2.5 MHz on either side of SDARS.
 - Mobile power limited to 50 mw/MHz PSD, effectively precluding LTE.
 - “Fixed CPE” power reduced from 2000 Watts to 20 Watts peak EIRP per 5 MHz.
 - Outdoor antennas banned for “fixed CPE” stations operating with 2 Watts per 5 MHz or less average EIRP.
 - Mobile/portable device duty cycles imposed that are biased against LTE and FDD.
 - WCS required to give advance notice of base station deployment or modification and “must select base station sites and frequencies, to the extent practicable, to minimize the possibility of harmful interference to operations in the SDARS 2320–2345 MHz band.”
- Practical effect of additional restrictions on WCS is inability to use 2.3 GHz LTE equipment being developed for worldwide use.

And it may get worse for WCS

- On reconsideration, Sirius XM has asked FCC to further protect its vulnerable inexpensive receivers from WCS operations:
 - Impose ground based field strength limit on WCS that would effectively preclude mobile services.
 - Delay deployment of new or modified WCS base stations until Sirius XM can conduct testing.
 - Preclude “fixed CPE” from 2317.5-2320 MHz and 2345-2347.5 MHz.
 - Further reduce maximum “fixed CPE” power to 4 Watts peak/MHz.
 - Tighten duty cycle requirements and restrict transmissions to every other frame.
 - Tighten new spectral masks.