



Automotive 24 GHz UWB Short-Range Radars

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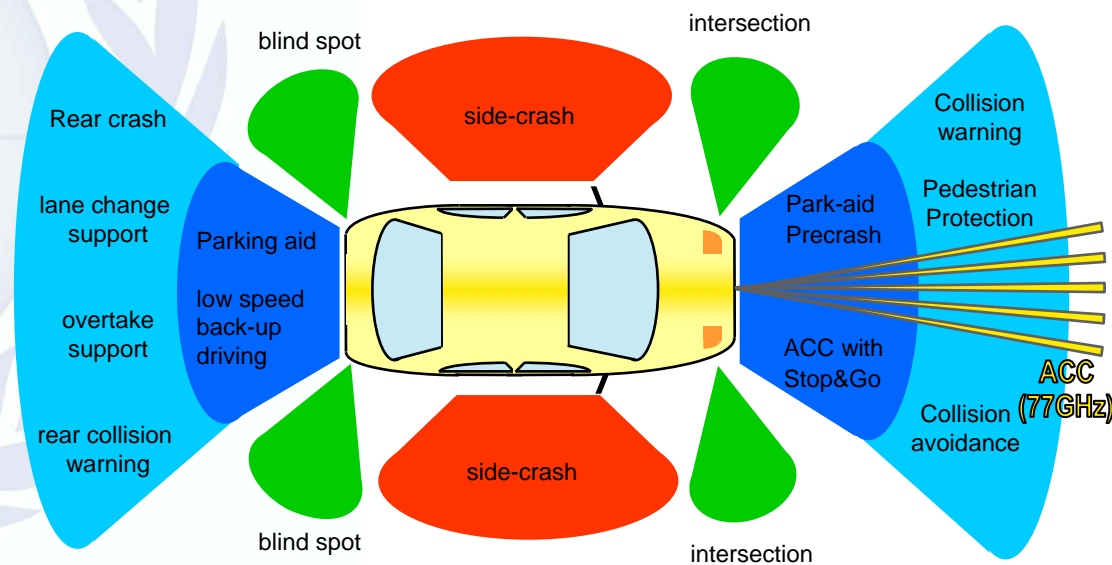
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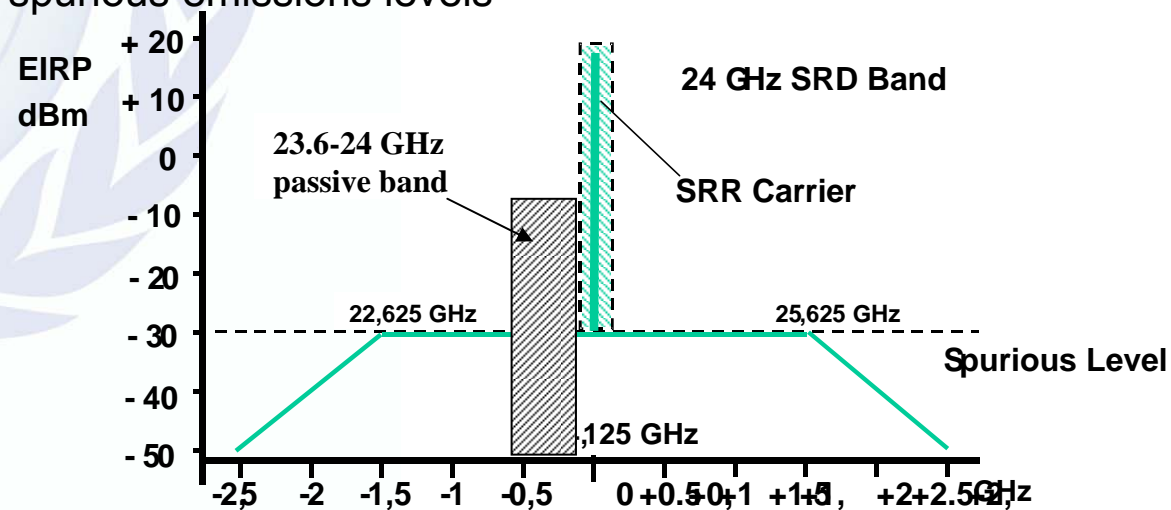
What are Automotive SRR ?

- Short-Range Radars (SRR) are expected to be implemented on cars (up to 10 radars) to ensure a survey of the close environment of the cars for safety purposes:



The 24 GHz SRR

- The 24 GHz SRR issue started 2000/2001 during the US Administration authorization process on UWB devices
- Arguments of the Automotive industry was that :
 - 24 GHz technology was available
 - the center frequency (higher power) would be limited in the SRD band 24.05-24.25 GHz
 - the power in the Ultra-Large Bandwidth (5 GHz) would be very low, below the spurious emissions levels



The 23.6-24 GHz passive band

- One of the major passive band
- Related to Water vapour and cloud liquid water measurements
- Covered by Radio Regulations Footnote 5.340 that states that “all emissions are prohibited”
- Interference protection criteria given by ITU-R Recommendation SA.1029-2 (-166 dBW/200 MHz), assumed to cover “unwanted” emissions only
- Spaceborne passive sensing performed by a number of current and future instruments (AMSU-A, ATMS, CMIS,...)
- At a certain level, measurements interfered over a given area render the total measurements unusable

The interference scenario

- One single SRR is not able to produce interference to passive sensors in the 23.4-24 GHz band
- On the other hand, due to the number of cars and the expected number of devices per car, the aggregation of interference from all SRR in the EESS footprint cannot be neglected
- Average of 4 SRR per cars
- Highway, suburban or urban areas cases studied with, respectively, 123, 330 and 453 cars/km²
- Direct path and scattered/reflected emissions need to be considered

Initial studies and regulation in the US

- The US Administration established its domestic rules in 2002 allowing SRR to operate in the 23.6 to 24.0 GHz with a maximum EIRP of -41.3 dBm/MHz
- These rules were based on technical analysis for which :
 - Scattering or reflection of SRR signals were not used
 - 6 dB higher interference criteria, based on the former version of ITU-R Recommendation SA.1029-1
 - 100% of the interference allocation was given to SRR, neglecting impacts from other interference sources, mainly unwanted emissions

The situation in Europe

- The similar issue started in 2002 in Europe and rapidly became highly political
- New technical analysis showed that a large deployment of SRR is not compatible with passive sensors operation (more than 10 dB negative margin using full interference criteria from Rec SA.1029-2)
- Facing the powerful European automotive lobby, the scientific and meteorological communities had to strongly argue on both technical (non compatibility) and regulatory (Footnote 5.340) fields to convince European Administrations to ensure protection of this crucial passive bands
- After 3 years discussions, the final European Regulation resulted in a compromise solution :
 - Temporary authorisation up to 1st July 2013
 - Transfer in the 79 GHz band after the deadline date
 - Maximum 7% penetration in each European countries
 - Automatic geographical deactivation to protect Radio Astronomy sites

Developments in ITU-R

- TG 1/8 continued the study initially undertaken in the US and in Europe and confirmed and even tightened the negative conclusions reached in Europe
- More detailed technical studies based on up-to-date assumptions (in particular apportionment concept) shows that negative margins up to 35 dB can be expected from SRR 24 GHz to passive sensors
- It means that if more than about **0.03%** of cars are equipped with such devices (operating at -41.3 dBm/MHz), passive sensing will be put at risk

Current situation and future actions

- the powerful automotive lobby has been trying to convince Administrations having not adopted their own domestic rules to authorise SRR in the 24 GHz band
- In Europe, in 2008, some car manufacturers argued about the non-feasibility of transferring into the 79 GHz by the 1st July 2013
- they proposed to shift the SRR to the 26 GHz band (24.25-29 GHz) to avoid the passive band (solution possible due to development allowing to avoid the high power emissions at centre frequency)
- This solution is now facing opposition from the Fixed Service community
- Other manufacturers have either develop 79 GHz technology or alternative 24 GHz avoiding both the passive band and the FS band (arguing that UWB technology for SRR has nothing to do with safety : it is only necessary for parking aids !!)

Current situation and future actions

- the Earth Observation community certainly welcome this 26 GHz solution but still raises concerns :
 - If opposition from FS community remains, there is a high risk that the alternative solution be to keep SRR at 24 GHz but to postpone the cut-off date
 - Although not operating any more in the 24 GHz, SRR 26 GHz would still have to be protect the 23.6-24 GHz passive sensors from their unwanted emissions
- One can note that such 26 GHz SRR are compatible with current regulations in US or Japan that cover the whole 22-29 GHz band.
- The discussions are on-going and one can expect a Decision in the next months
- Anyway, either for 24 GHz or 26 GHz SRR, the whole meteorological community still needs to be involved on this issue and undertake all possible actions to convince national radiocommunication authorities not to authorise (at least on the long-term) SRR in the 24 GHz band and ensure protection of essential 23.6-24 GHz band



Thank you for your attention