

Analysis of GSM900 and GSM850 OTA measurements

Source: Telecom Italia, Vodafone, Orange

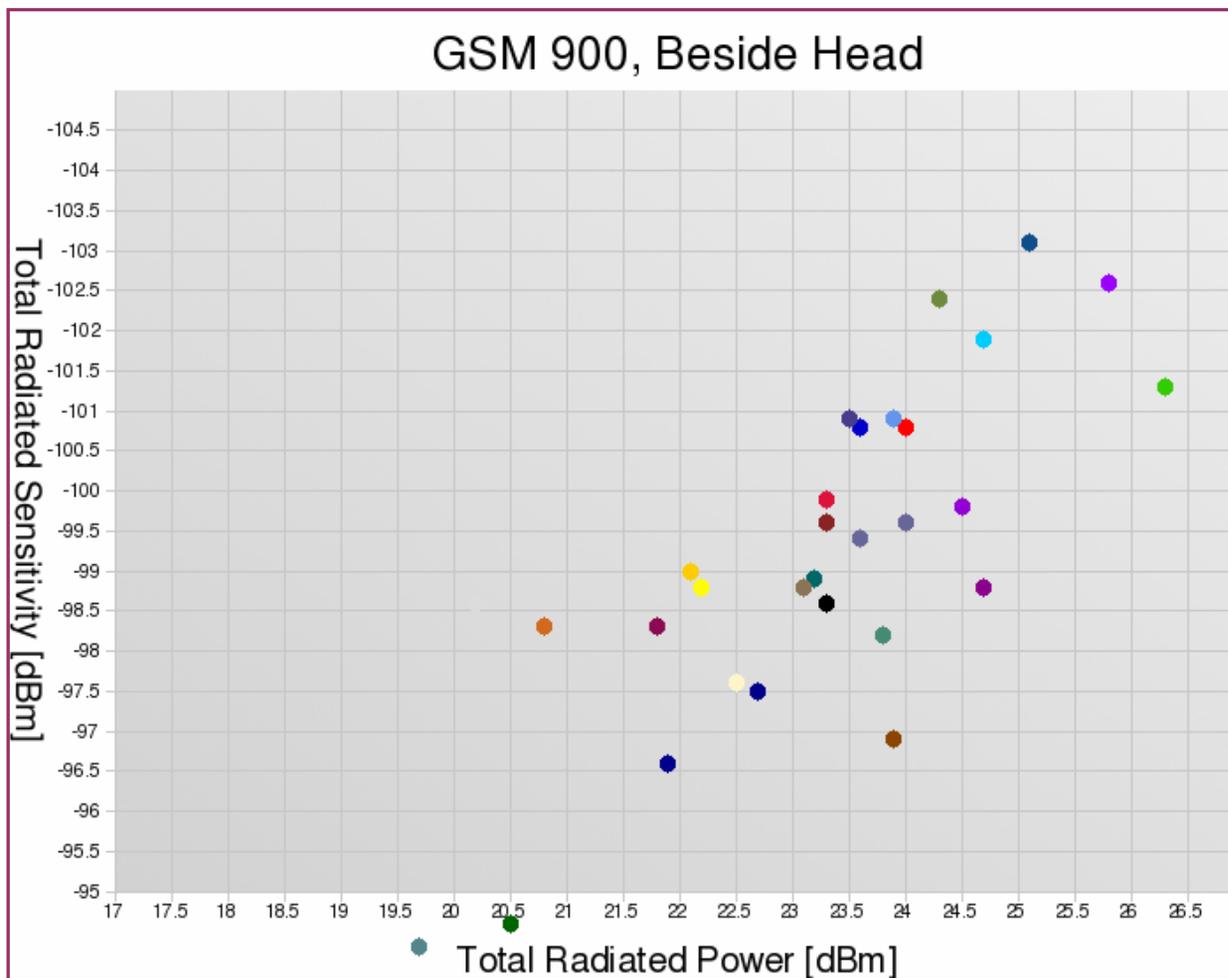
Summary

- Background on GSM OTA Requirements
- Tdoc# R4-082092 (Nokia)
- Statistical Analysis of measurements
- Conclusion

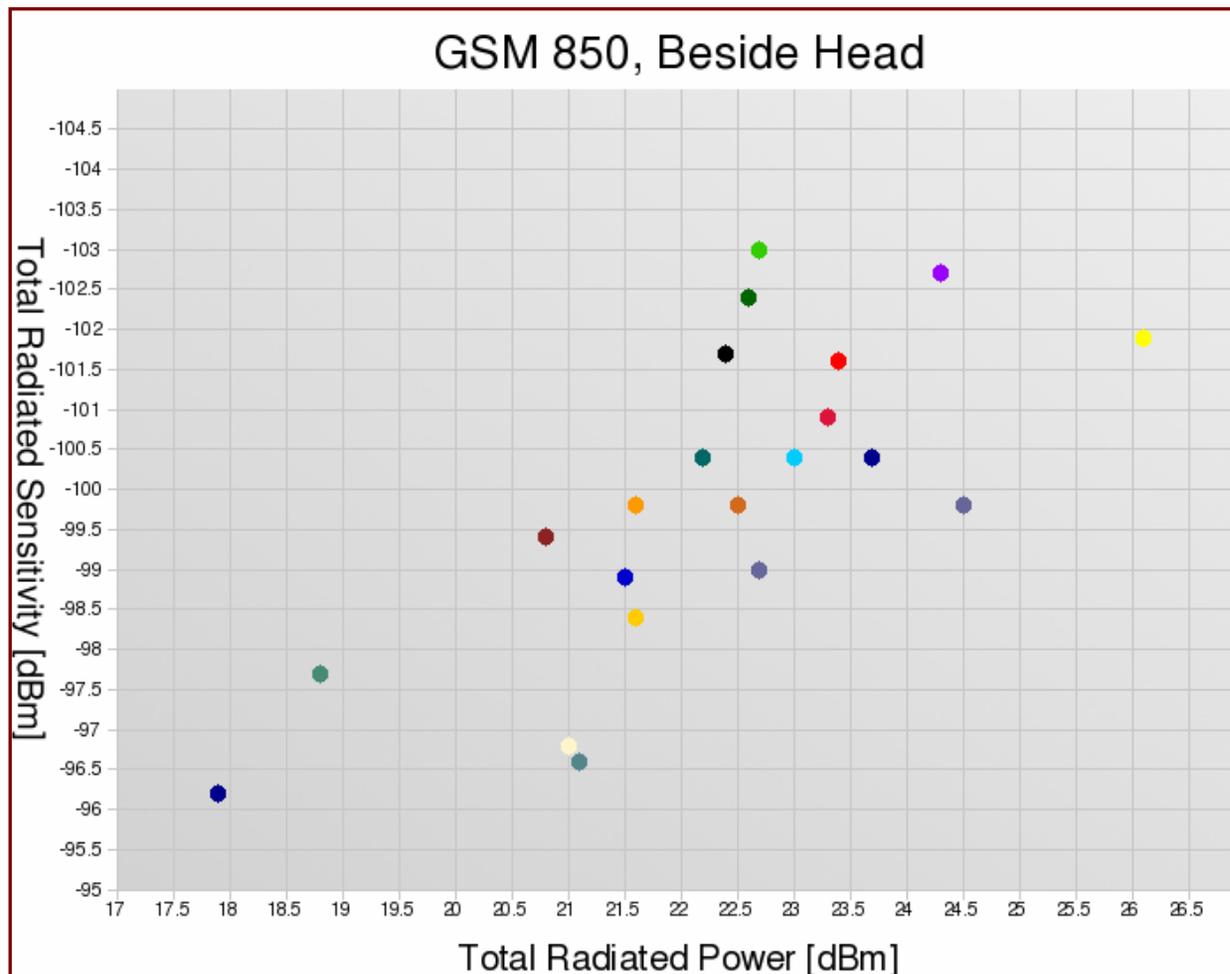
Background

- In RAN4#50 bis the CR R4-091472 triggered the discussion about 2G OTA requirements.
- Comments provided by some Operators during the main session, expressed some concerns especially about 900 MHz as GSM900 networks, are deployed and consolidated relying on the existing UE's population.
- The aim of this contribution, is to further analyze the available measurements recently presented in R4-082092, in order to carry out a statistical characterization.

GSM900 Measurements: extracted from R4-082092, Annex 1

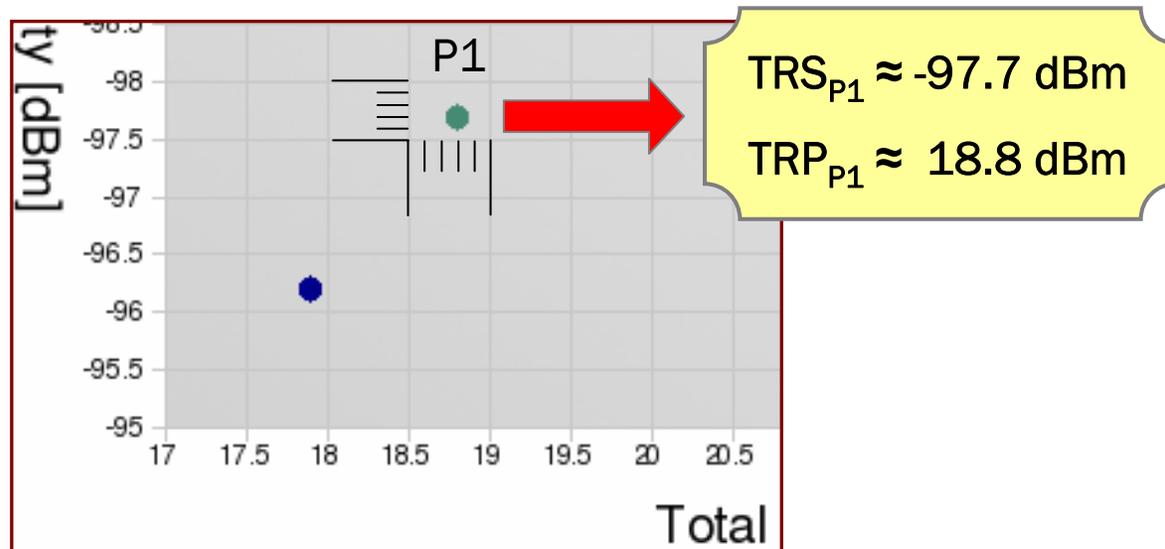


GSM850 Measurements: extracted from R4-082092, Annex 1



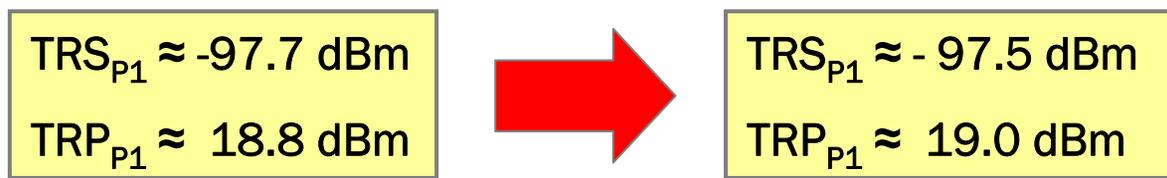
Method used to derive the numerical values (1/2)

- No source data are available, but every measured point is obtained by visual inspection of the reported pictures. Briefly:
 - A good “Zoom in” of the area around each point
 - Subdivision of the grid step (0.5 dBm) in 5 parts
 - Graphical step \rightarrow 0.1 dBm
 - Approximation of each point to the closest decimal



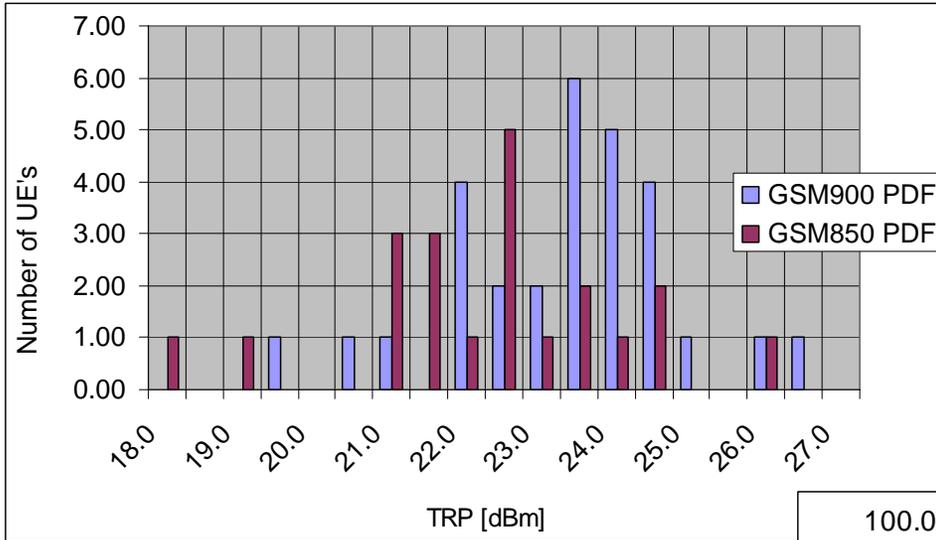
Method used to derive the numerical values (2/2)

- Taking into account 0.5 dB of granularity for last agreed OTA requirements (e.g. UMTS900) each point, previously graphically estimated, is rounded at the half dBm.



- This “graphical” method implies intrinsically, an approximation error of the order of some decimals of dB.
- The average process applied to the measured set in order to carry out the following statistics, smoothes the overall error, having low impact on the final results.
- The measured set is composed of respectively **29** GSM900 and **21** GSM850 measurements

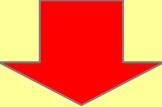
TRP: PDF and CDF of GSM900 and GSM850



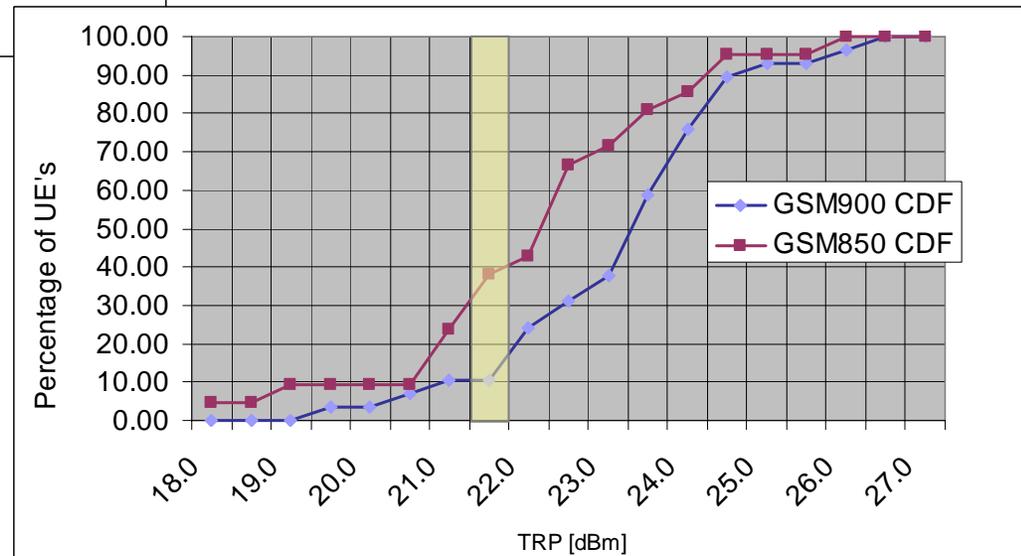
TRP	Averag. Meas.	Std Dev.
GSM900	23.3 dBm	1.5 dB
GSM850	22.3 dBm	1.85 dB

GSM900:

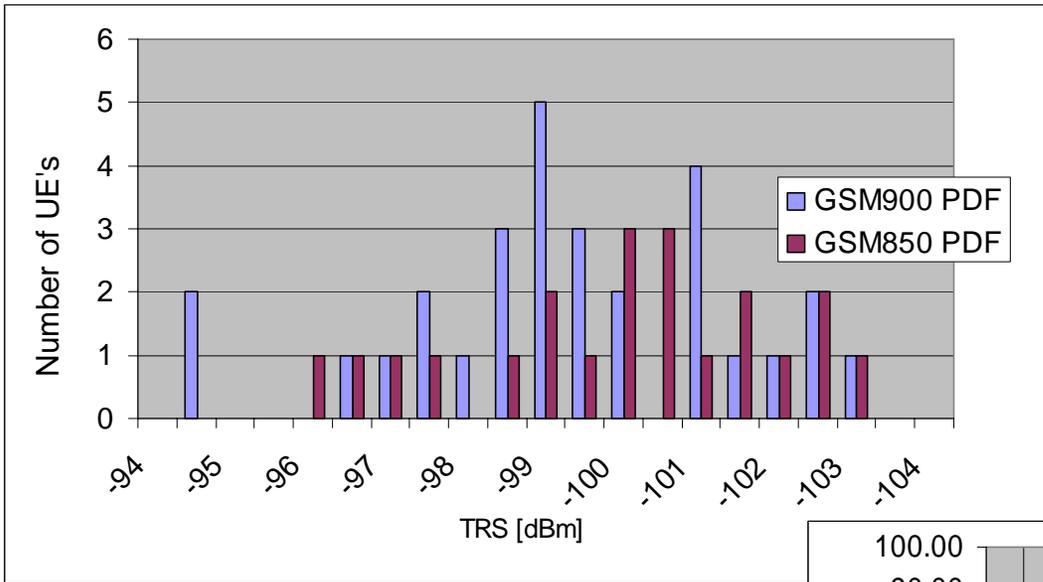
$TRP_{min_ave} = [21.5 \div 22.0] \text{ dBm}$



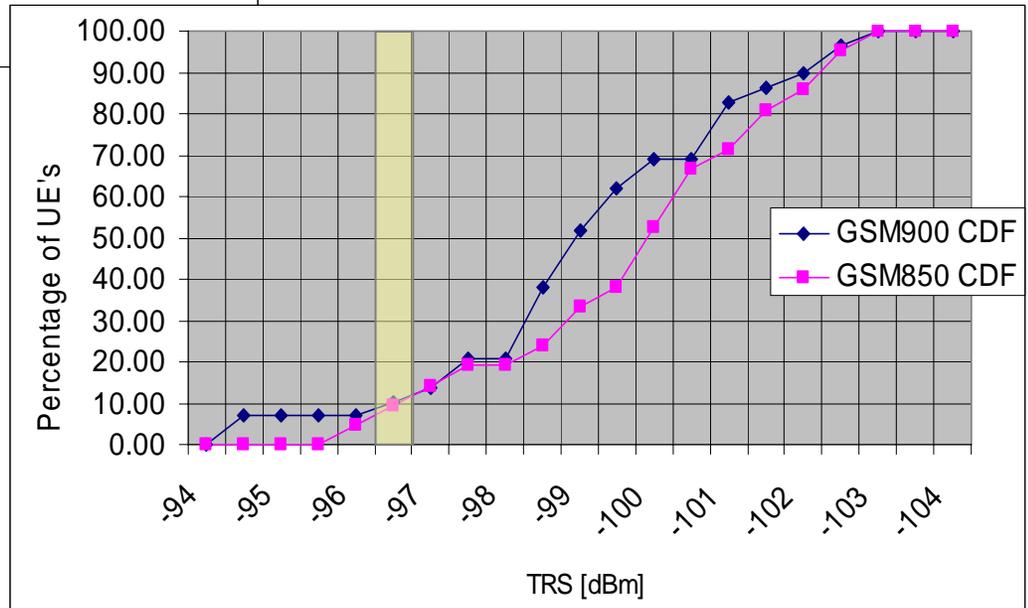
Only 2 ÷ 3 UE's out of 29 are not compliant



TRS: PDF and CDF of GSM900 and GSM850

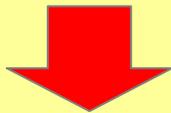


TRS	Averag. Meas.	Std Dev.
GSM900	-99.3 dBm	2.1 dB
GSM850	-99.9 dBm	2.0 dB



GSM900:

$$TRS_{\min_ave} = [-97.0 \div -96.5] \text{ dB}$$



Only 2 ÷ 3 UE's out of 29 are not compliant

Conclusion

- The experimental results provided in R4-082092 and analyzed in this paper show that OTA UE behavior is much better than the requirements proposed in the CR R4-091472 relative to GSM900.
- Similarly to what was specified for UMTS, also for GSM the requirements in 900 MHz band should be differentiated from the 850 MHz band, mainly due to TRP differences.
- Even if the aim of the above mentioned CR was to provide mainly a “minimum requirements” for 2G systems the proposed values for GSM900 seem to be very far from the real performance of the current commercial UE’s.
- Specifying relaxed minimum requirements relying on the worst case approach in order to make compliant also very low performing UE’s could have serious impact on network performances and end user experience especially for a many years consolidated network deployment.
- It is proposed to continue the discussion on the requirements taking into account the statistical distribution of real UE performance rather than a worst case approach