

- **Source:** Nokia
- **Title:** Analysis of LTE UE SEM proposal
- **Agenda Item:** 8.3.2
- **Document for:** Discussion
  
- **Introduction**
  - This document analyses the proposal in [1] and focuses on MPR needed to comply with FCC parts 24 and 27 and PHS protection in Japan.
  
  - The conclusions for FCC part 24 and 27 can be found from slide #2
  - The conclusions for PHS protection at 20MHz offset can be found from slide #16
  
- **References**

[1] R4-071235 E-UTRA UE RF Spectrum emissions , Motorola

## FCC PART 24 and PART 27 - Conclusions

- PART 24
  - All band width options OK
    - 1dB MPR is necessary when number of RBs is high
- PART 27
  - 5MHz and narrower Band Width options OK
  - 10MHz OK with 4dB MPR
  - 15MHz OK with 5dB MPR
  - 20MHz OK with 4dB MPR

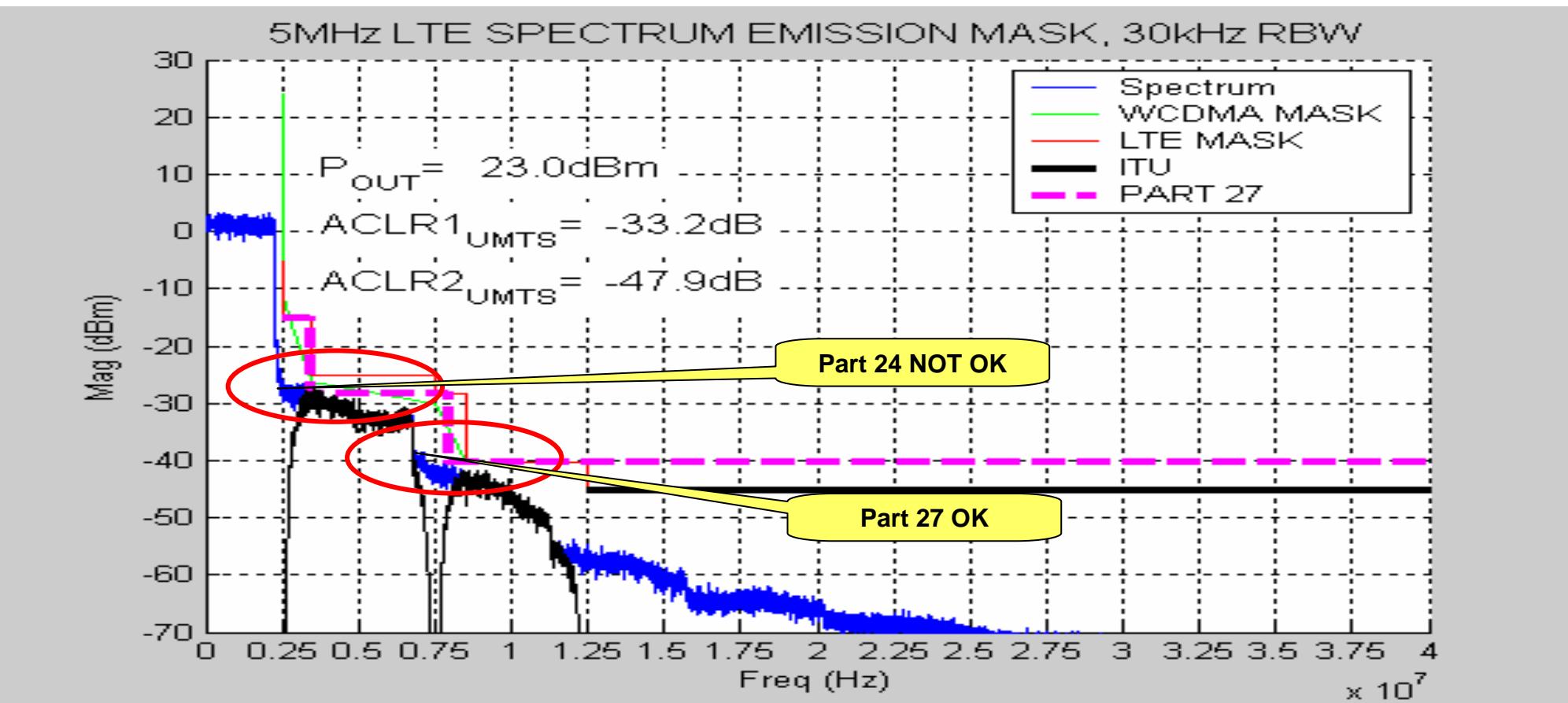
# FCC PART 24 and 27

## 5MHz LTE

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK and OK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



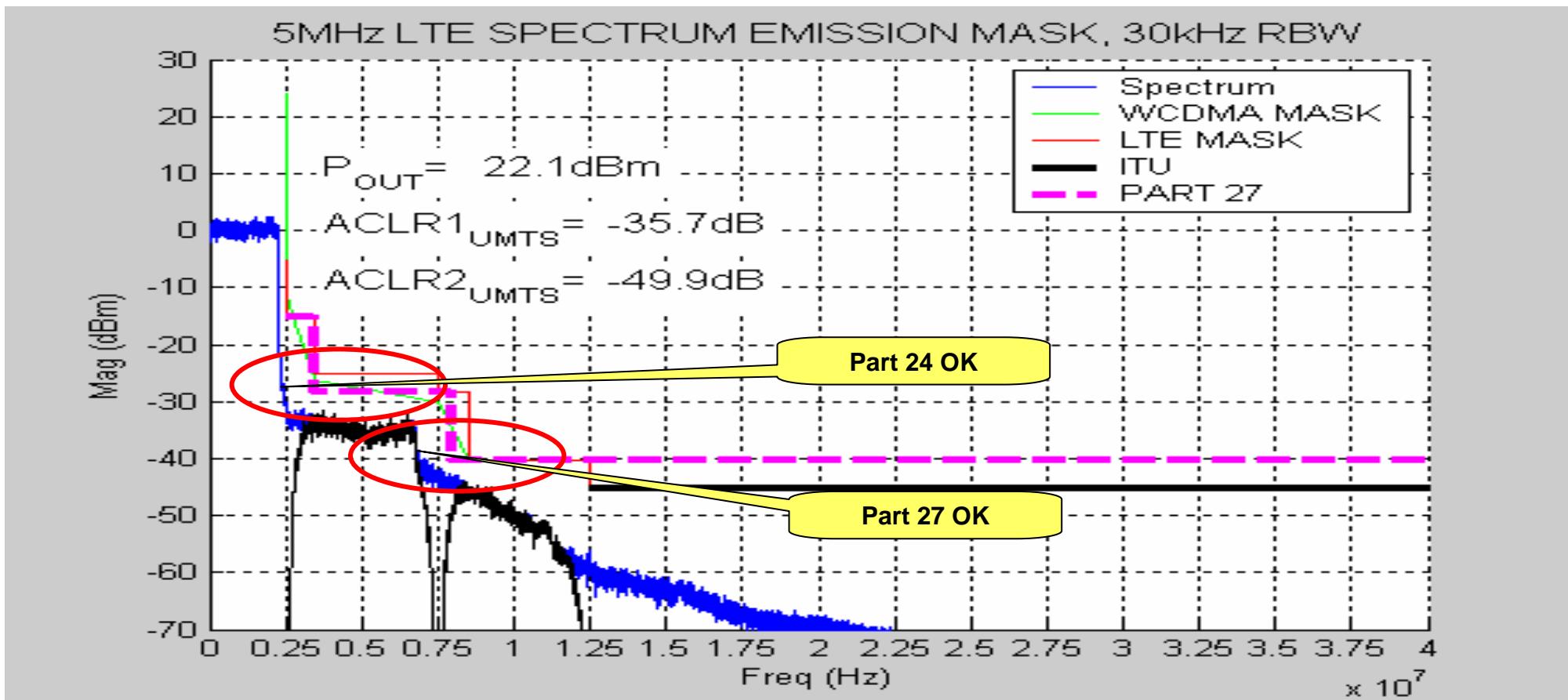
# FCC PART 24 and 27

## 5MHz LTE – 1dB MPR, 25 RBs

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **OK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



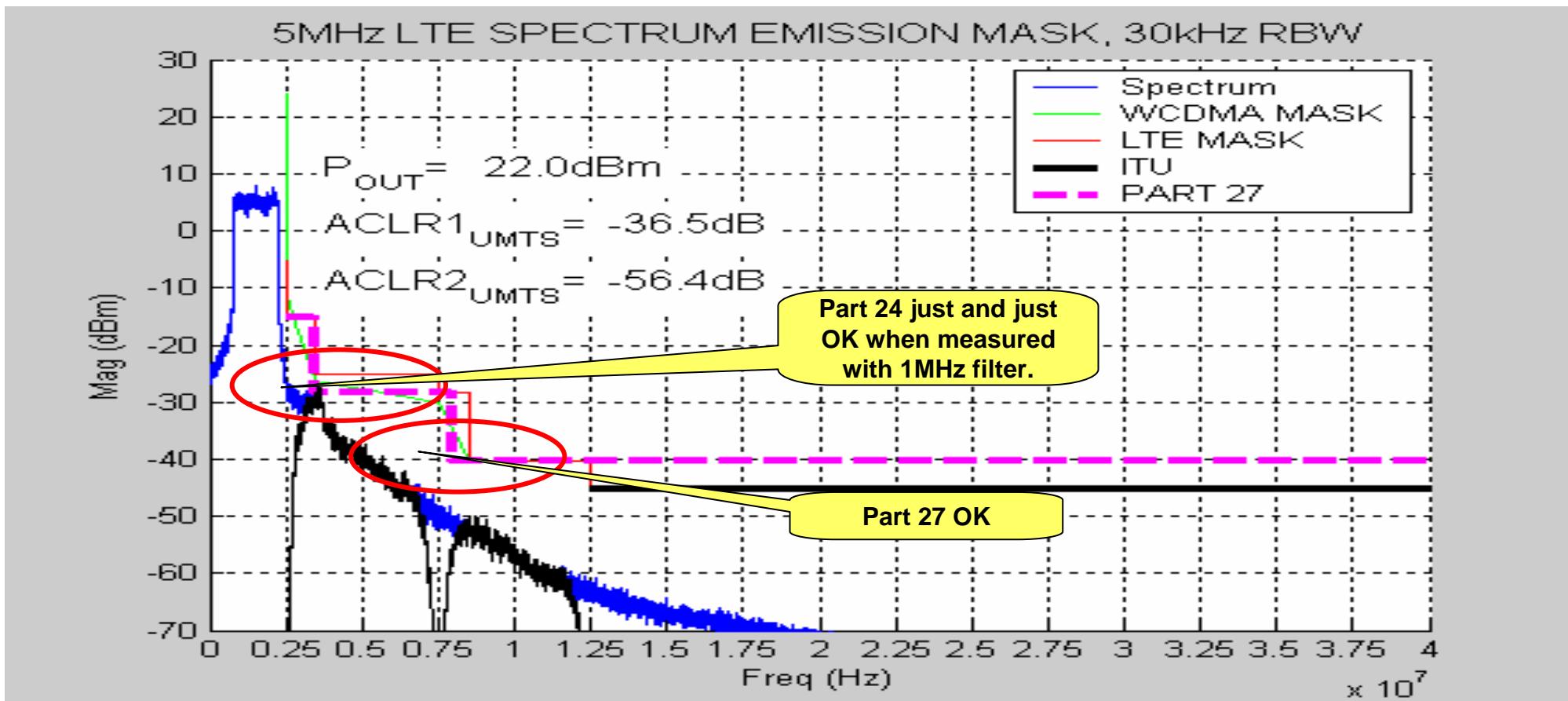
# FCC PART 24 and 27

## 5MHz LTE – 1dB MPR, 8 RBs

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **OK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



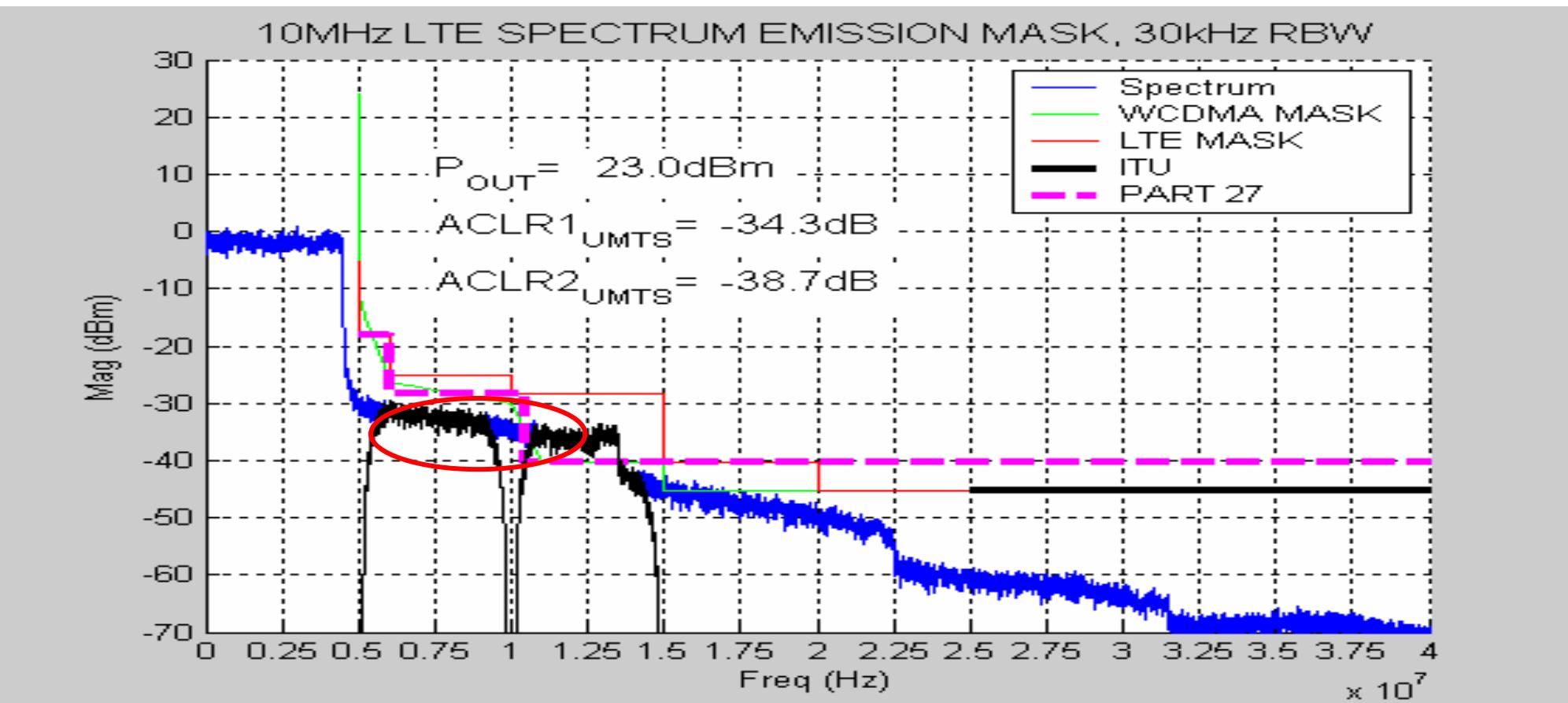
# FCC PART 24 and 27

## 10MHz LTE

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



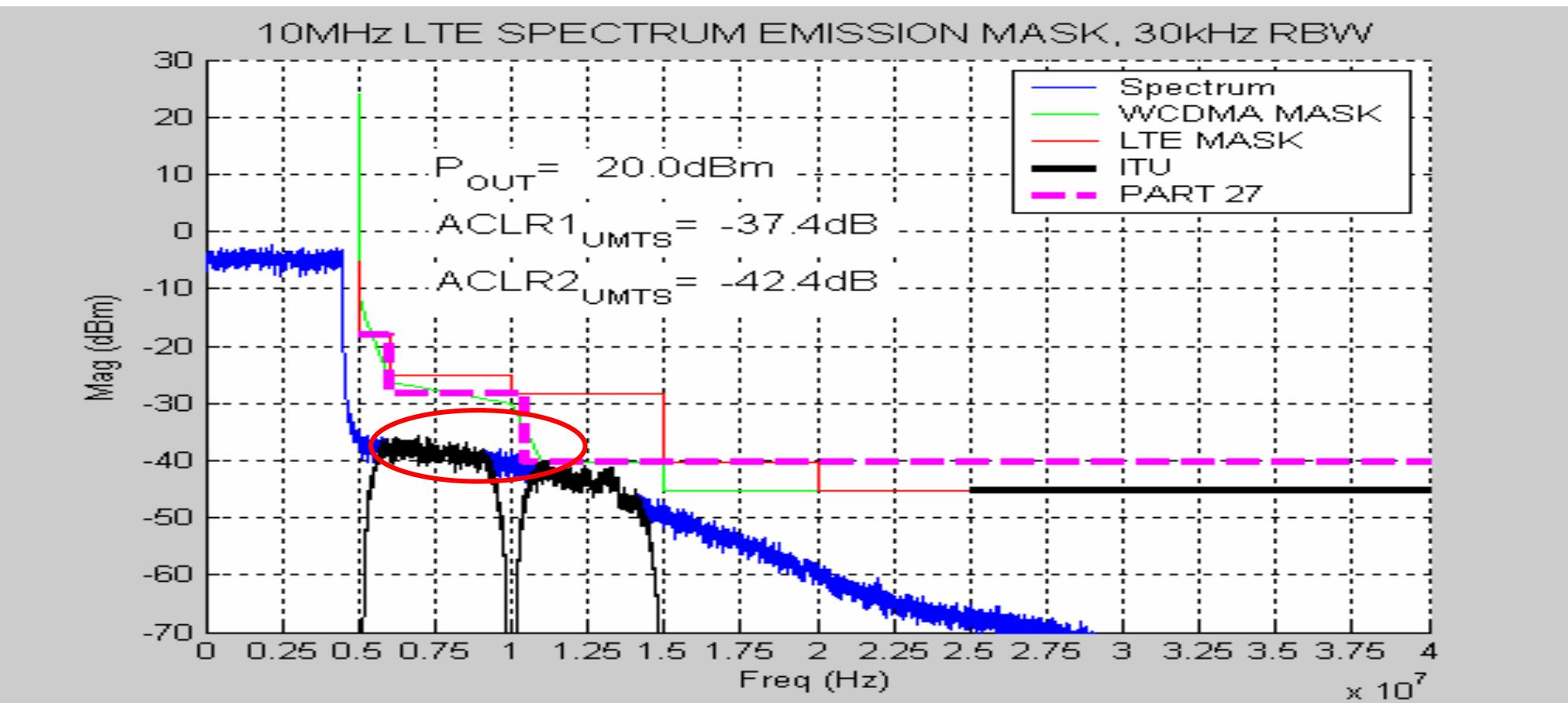
# FCC PART 24 and 27

## 10MHz LTE – 3dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



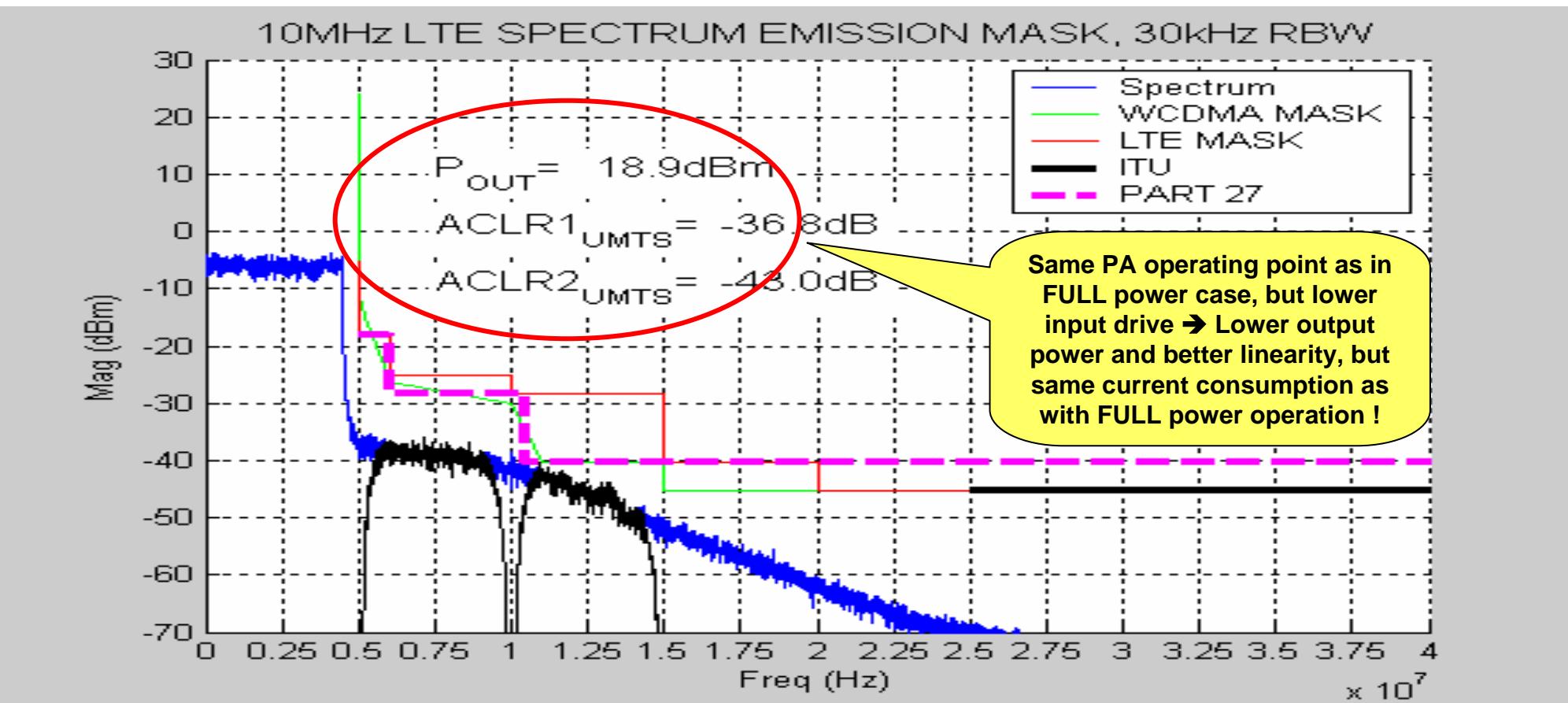
# FCC PART 24 and 27

## 10MHz LTE – 4dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **OK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



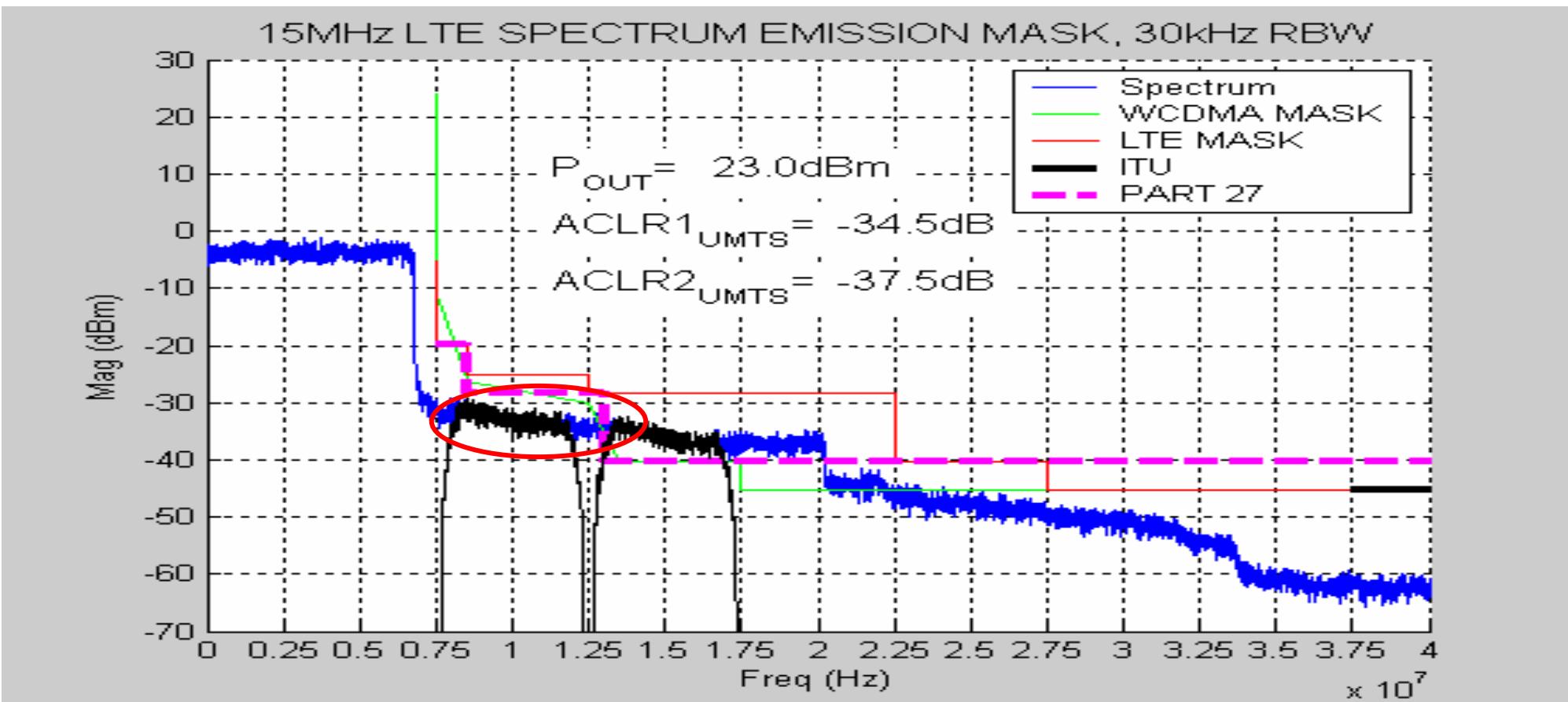
# FCC PART 24 and 27

## 15MHz LTE

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



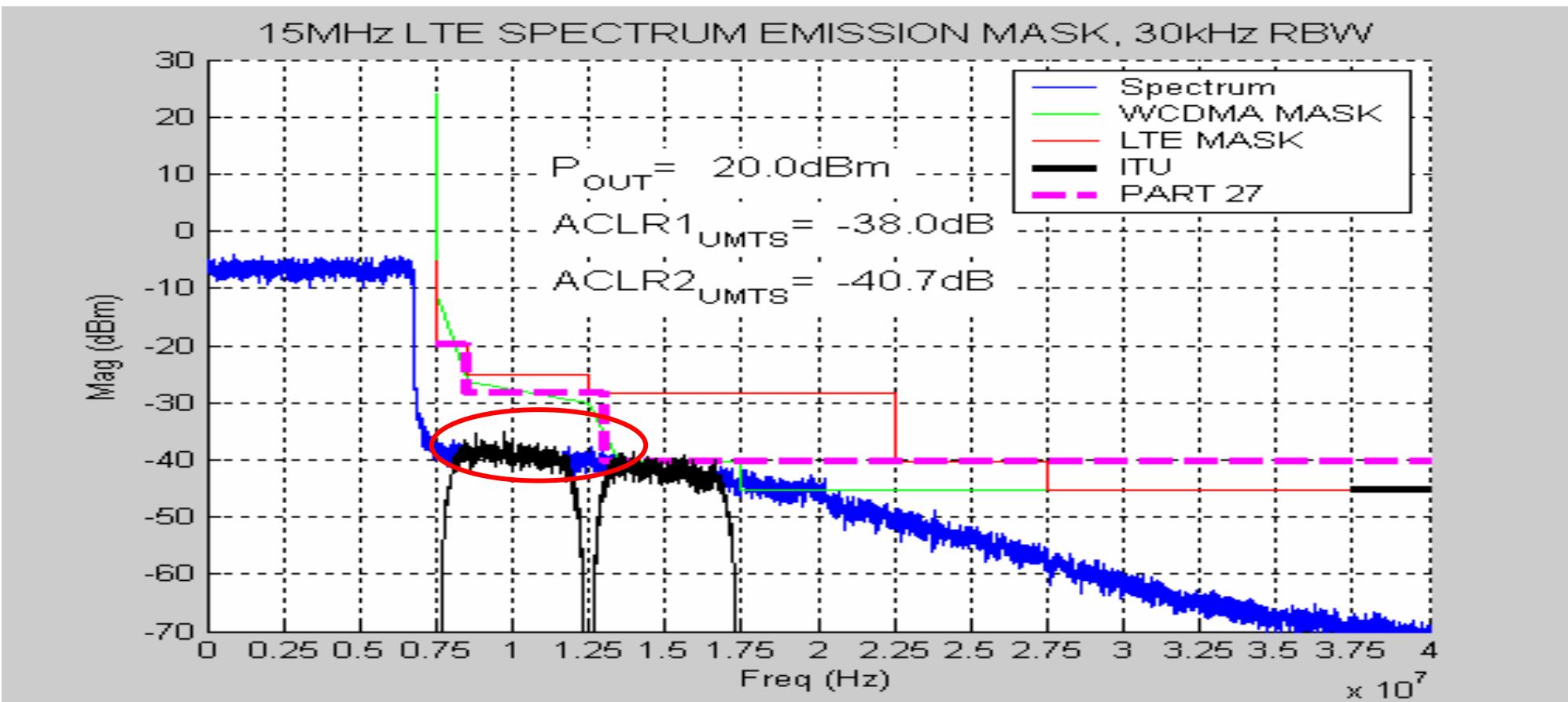
# FCC PART 24 and 27

## 15MHz LTE – 3dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



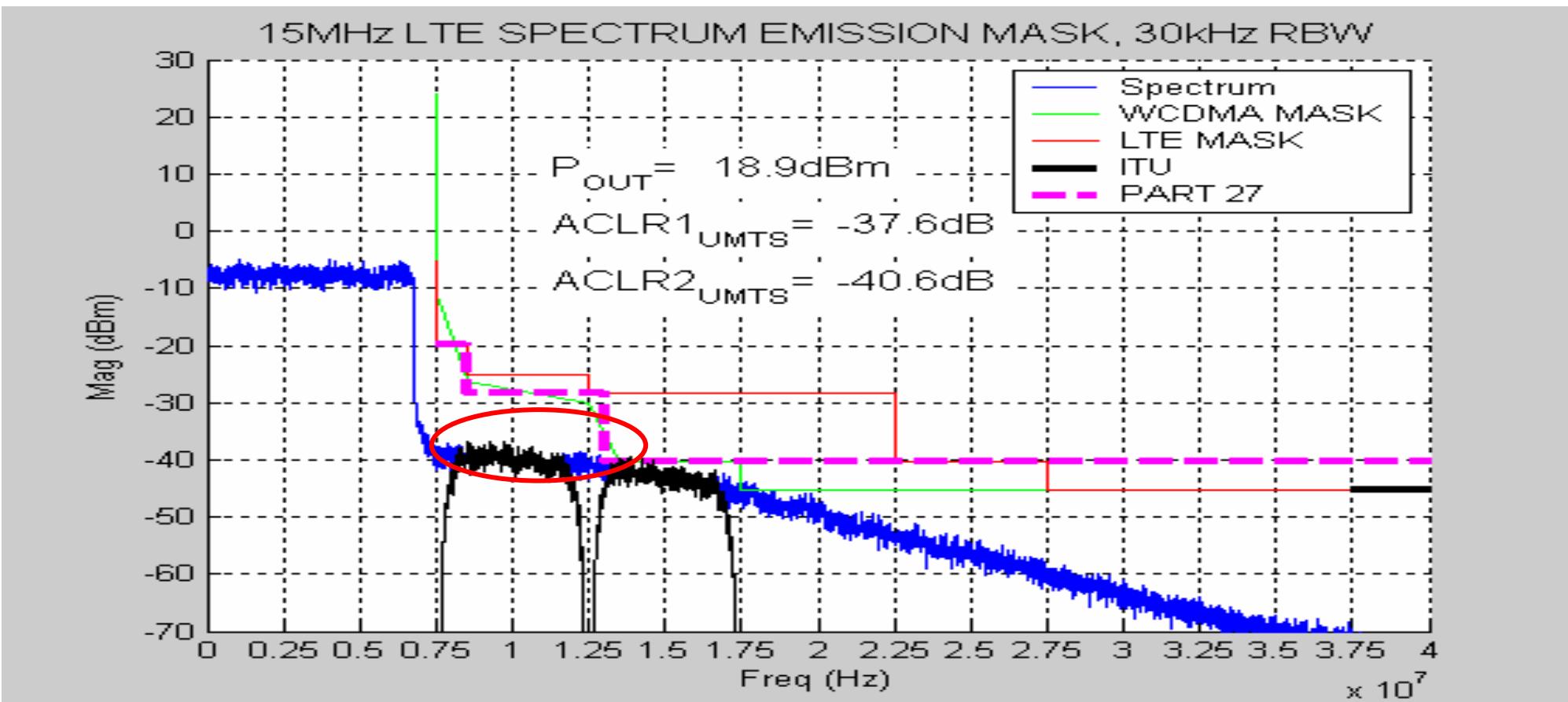
# FCC PART 24 and 27

## 15MHz LTE – 4dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



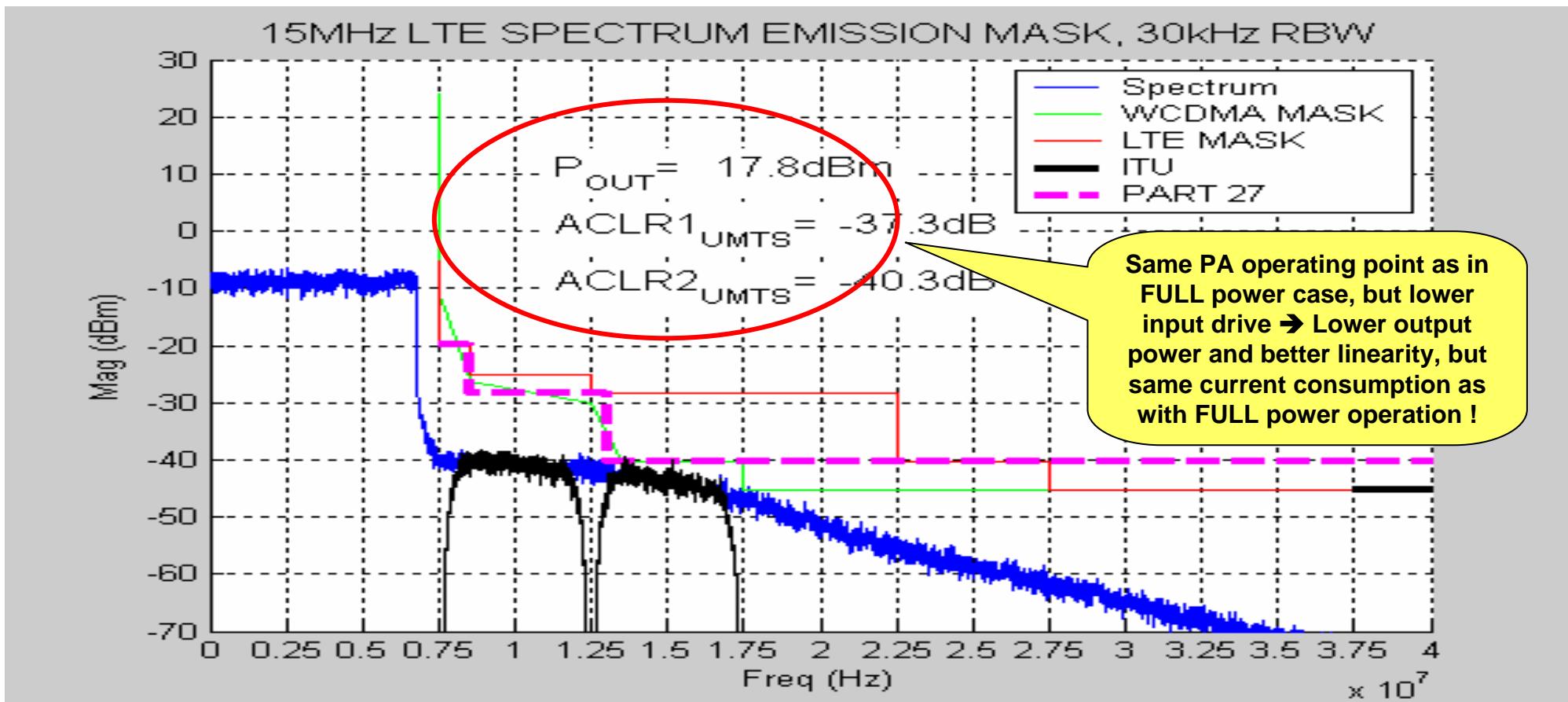
# FCC PART 24 and 27

## 15MHz LTE – 5dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **OK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



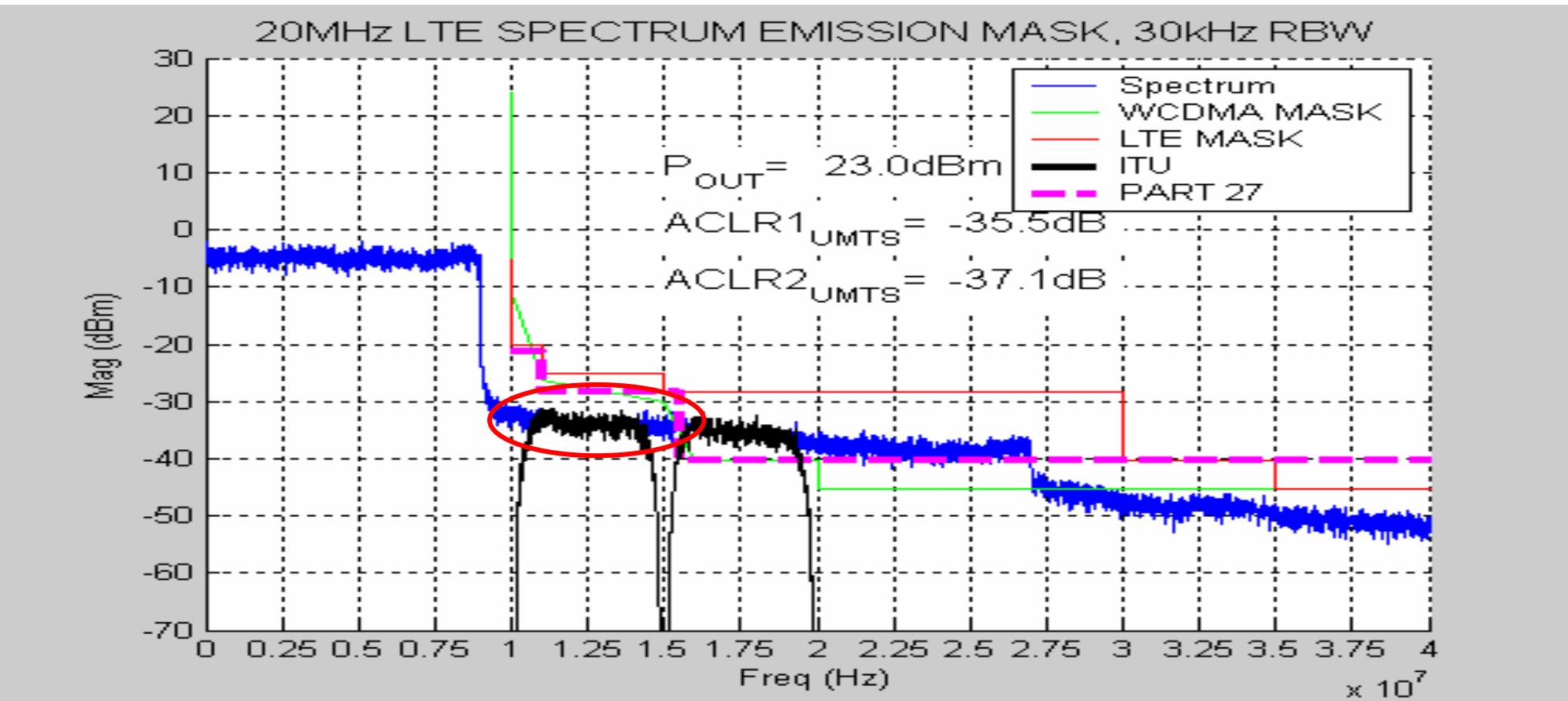
# FCC PART 24 and 27

## 20MHz LTE

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



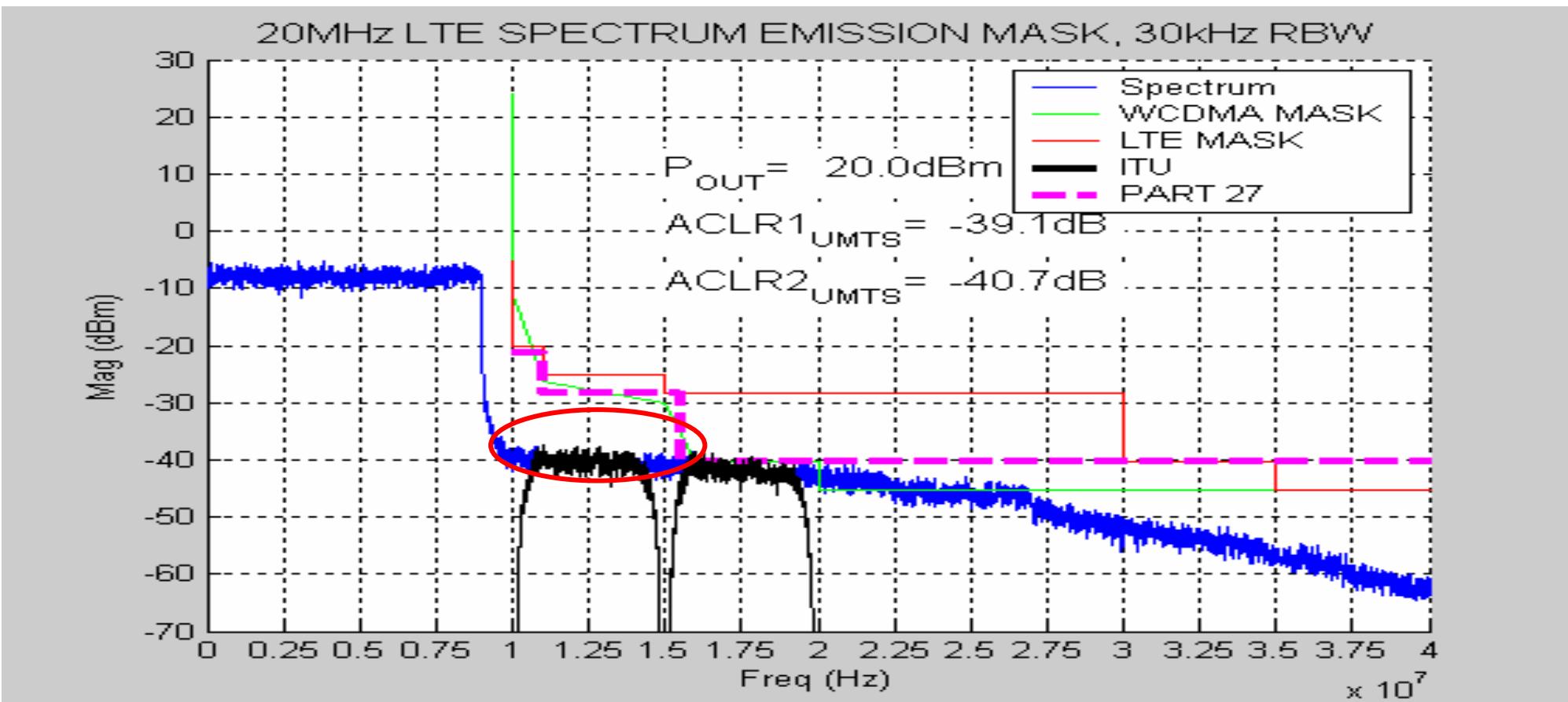
# FCC PART 24 and 27

## 20MHz LTE – 3dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **NOK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



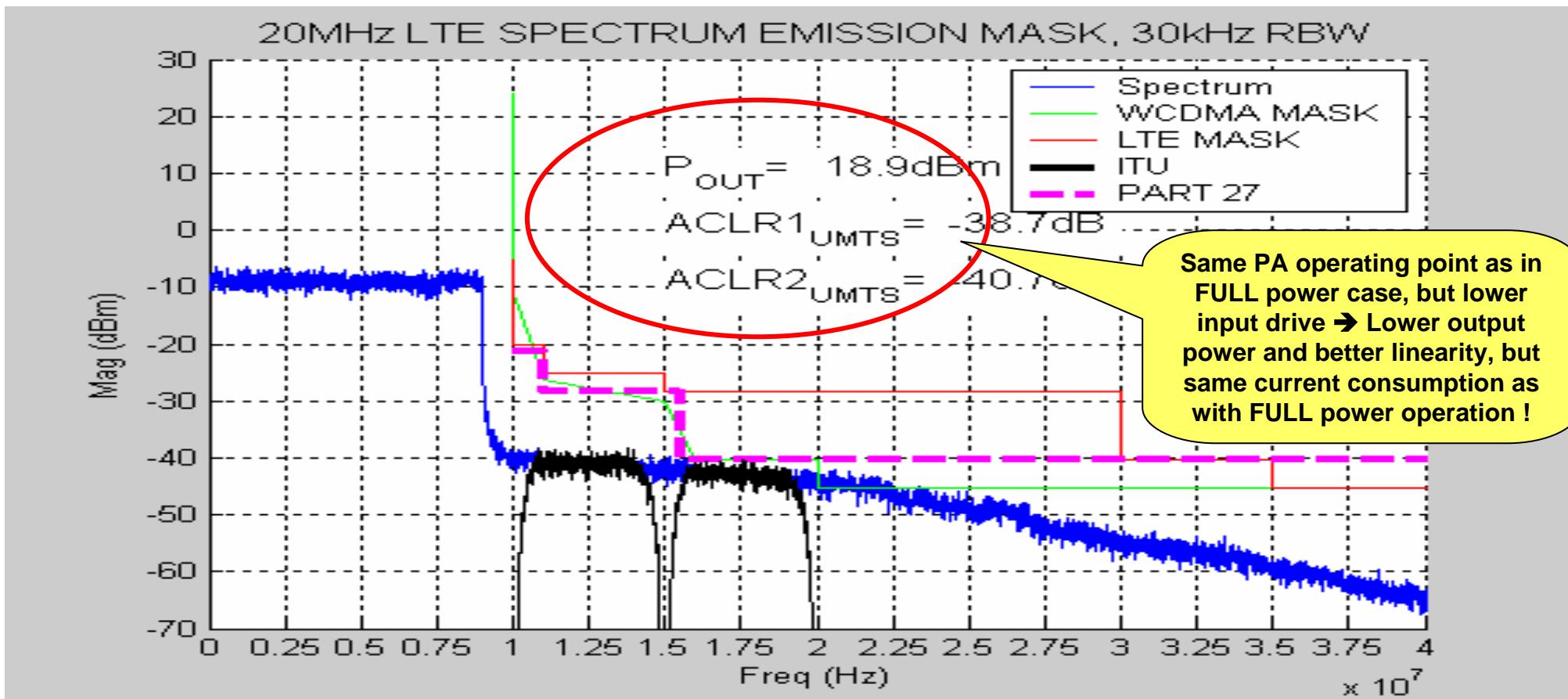
# FCC PART 24 and 27

## 20MHz LTE – 4dB MPR

- 1 to 5.5MHz:  $-13\text{dBm}/1\text{MHz} = -28\text{dBm}/30\text{kHz}$ , 5.5MHz onwards:  $-25\text{dBm}/1\text{MHz} = -40\text{dBm}/30\text{kHz}$
- **OK**

$$43 + 10 \cdot \log_{10}(P)$$

$$55 + 10 \cdot \log_{10}(P)$$



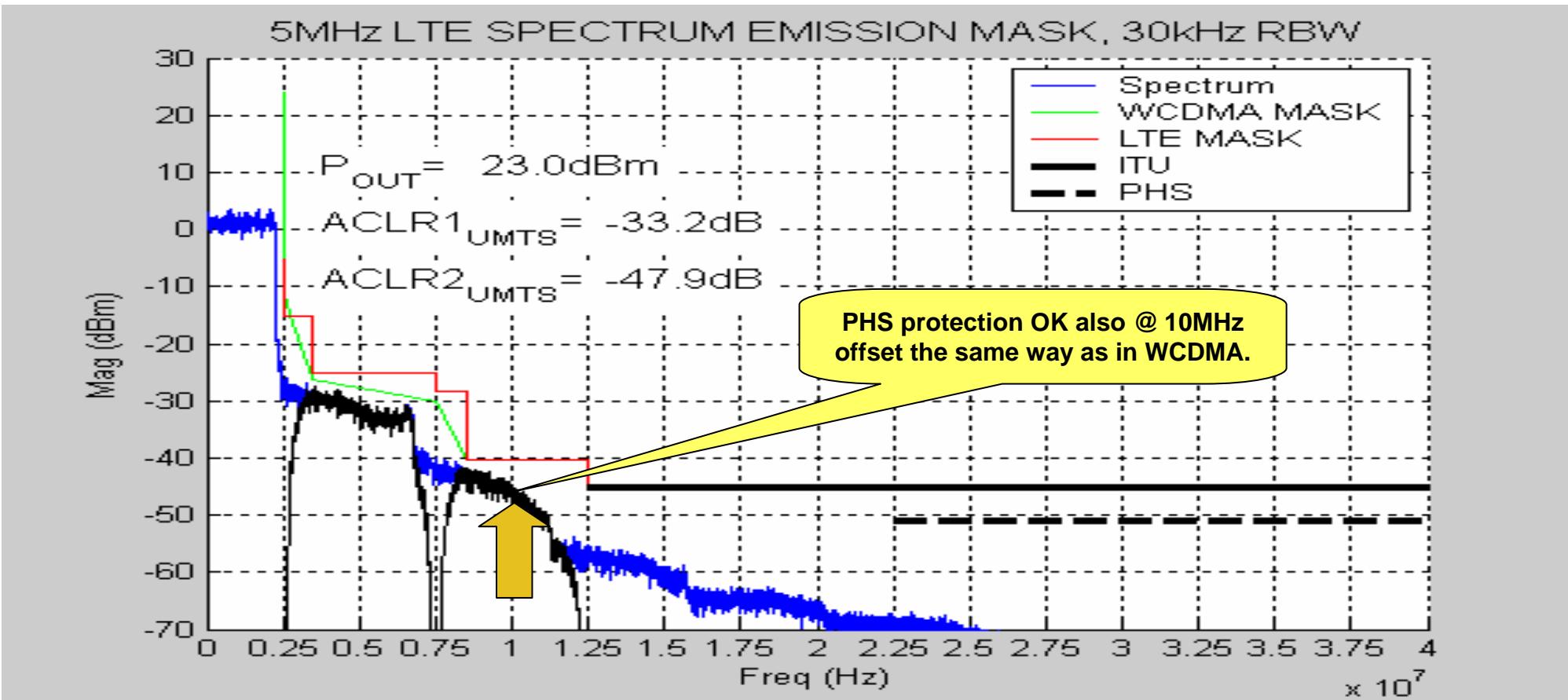
## **PHS @ 20MHz offset - Conclusions**

- 5MHz and narrower Band Width options OK
  - Similar to WCDMA
- 10MHz OK
- 15MHz OK with 2dB MPR
- 20MHz OK with 4dB MPR

# PHS @ 20MHz offset

## 5MHz LTE

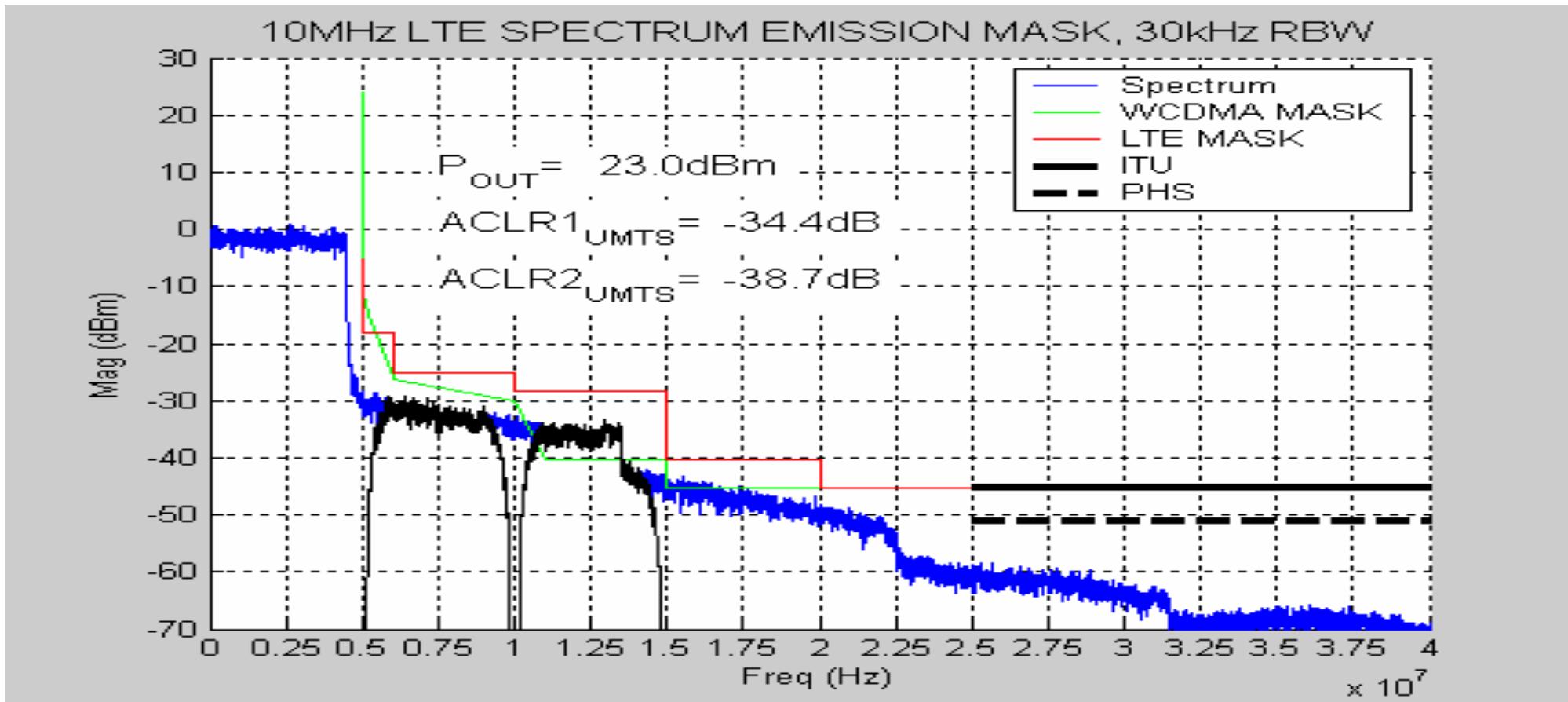
- 41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- OK



# PHS @ 20MHz offset

## 10MHz LTE

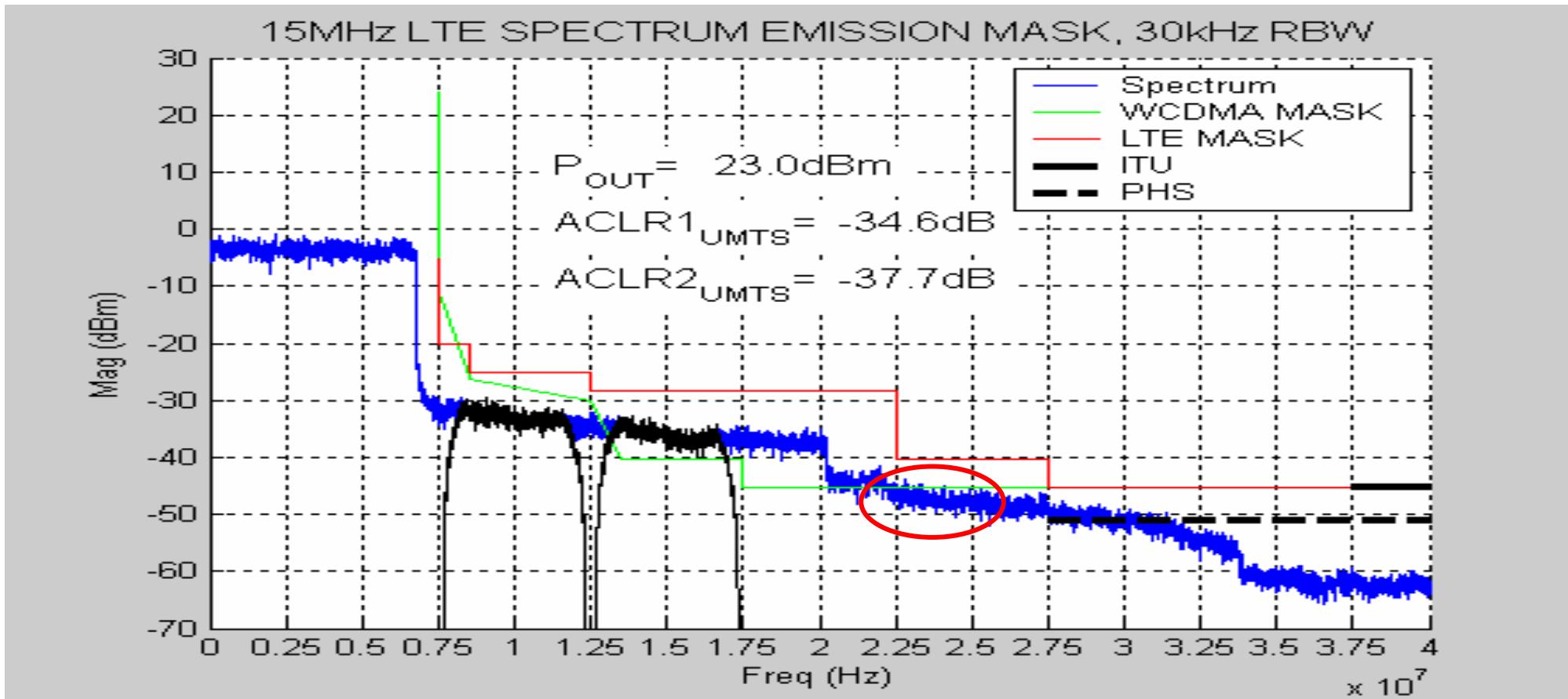
- -41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- **OK**



# PHS @ 20MHz offset

## 15MHz LTE

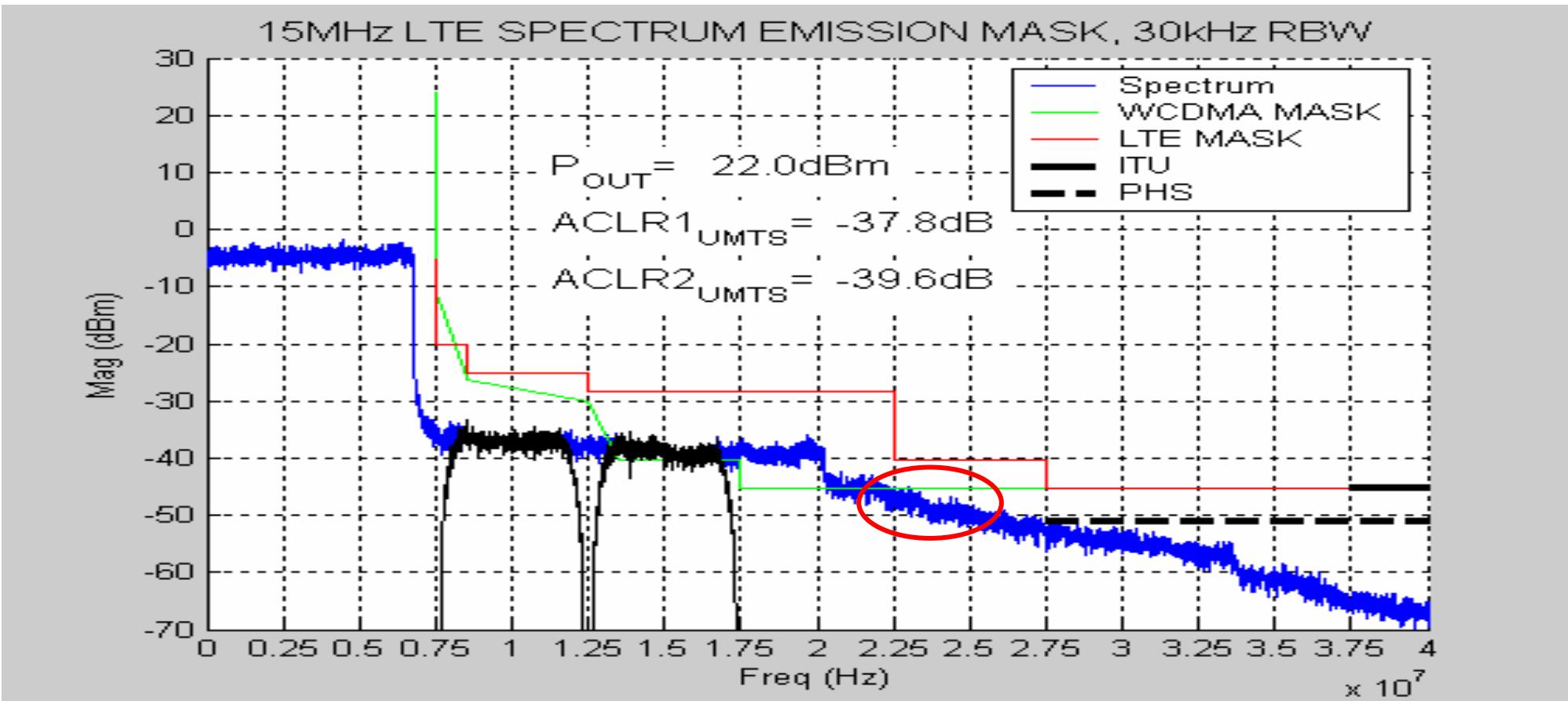
- 41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- NOK**



# PHS @ 20MHz offset

15MHz LTE – 1dB MPR

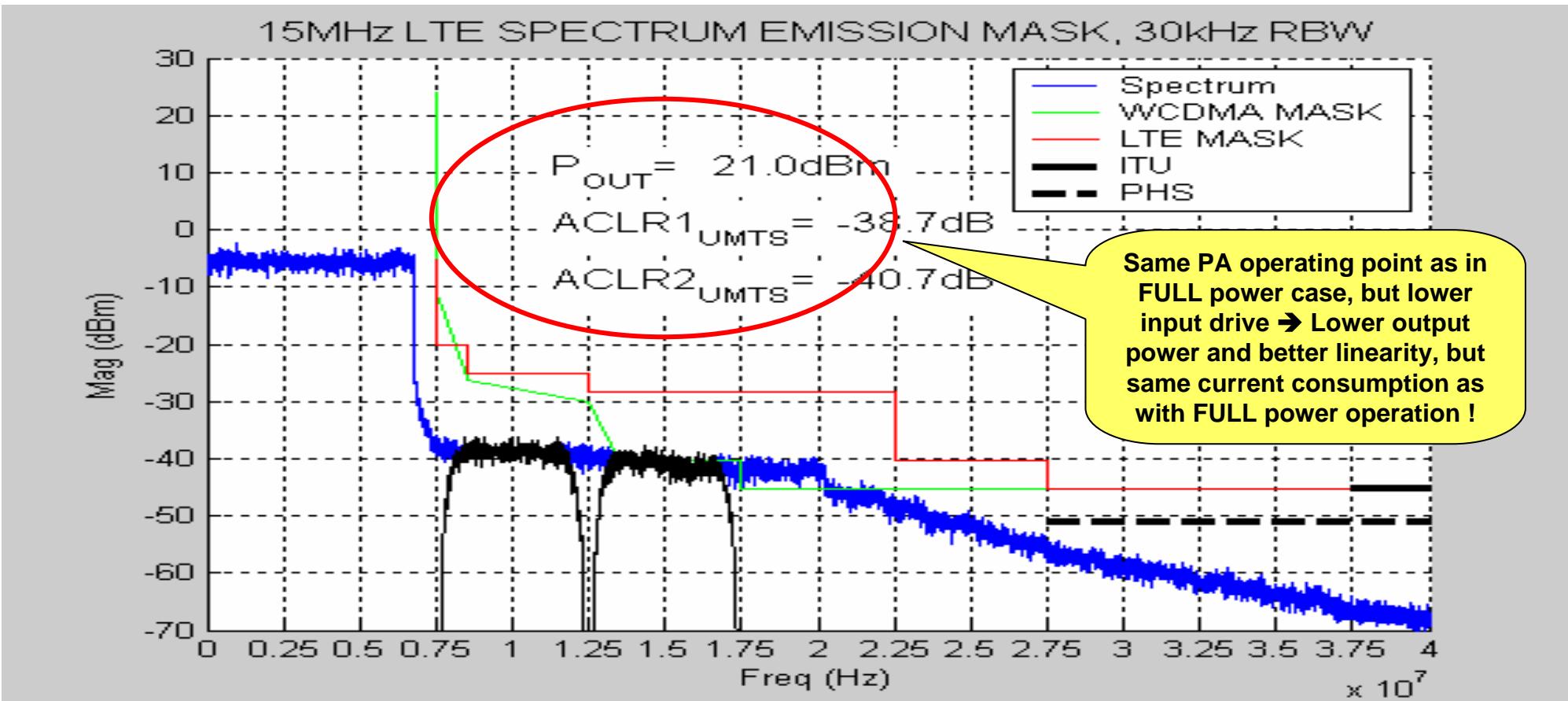
- -41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- **NOK**



# PHS @ 20MHz offset

## 15MHz LTE – 2dB MPR

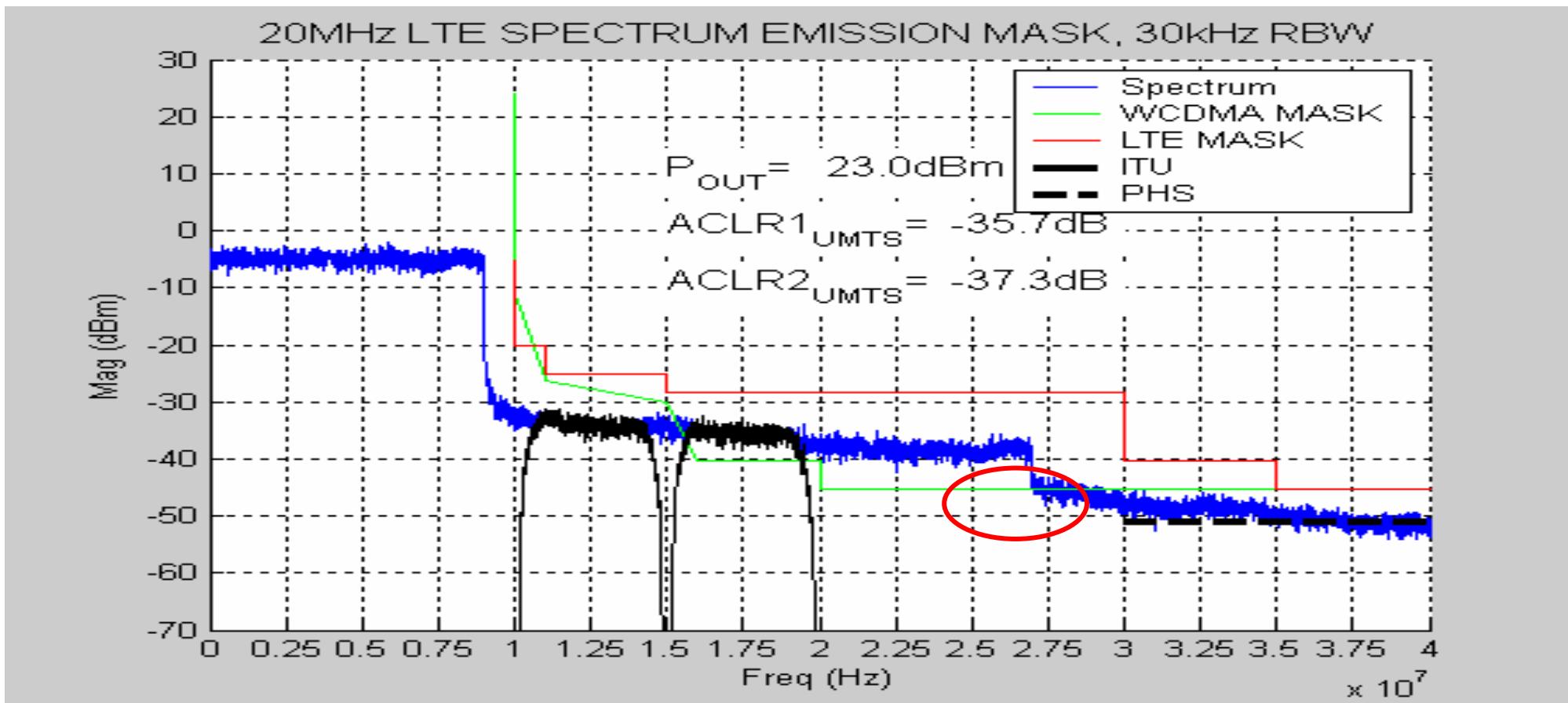
- 41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- OK



# PHS @ 20MHz offset

## 20MHz LTE

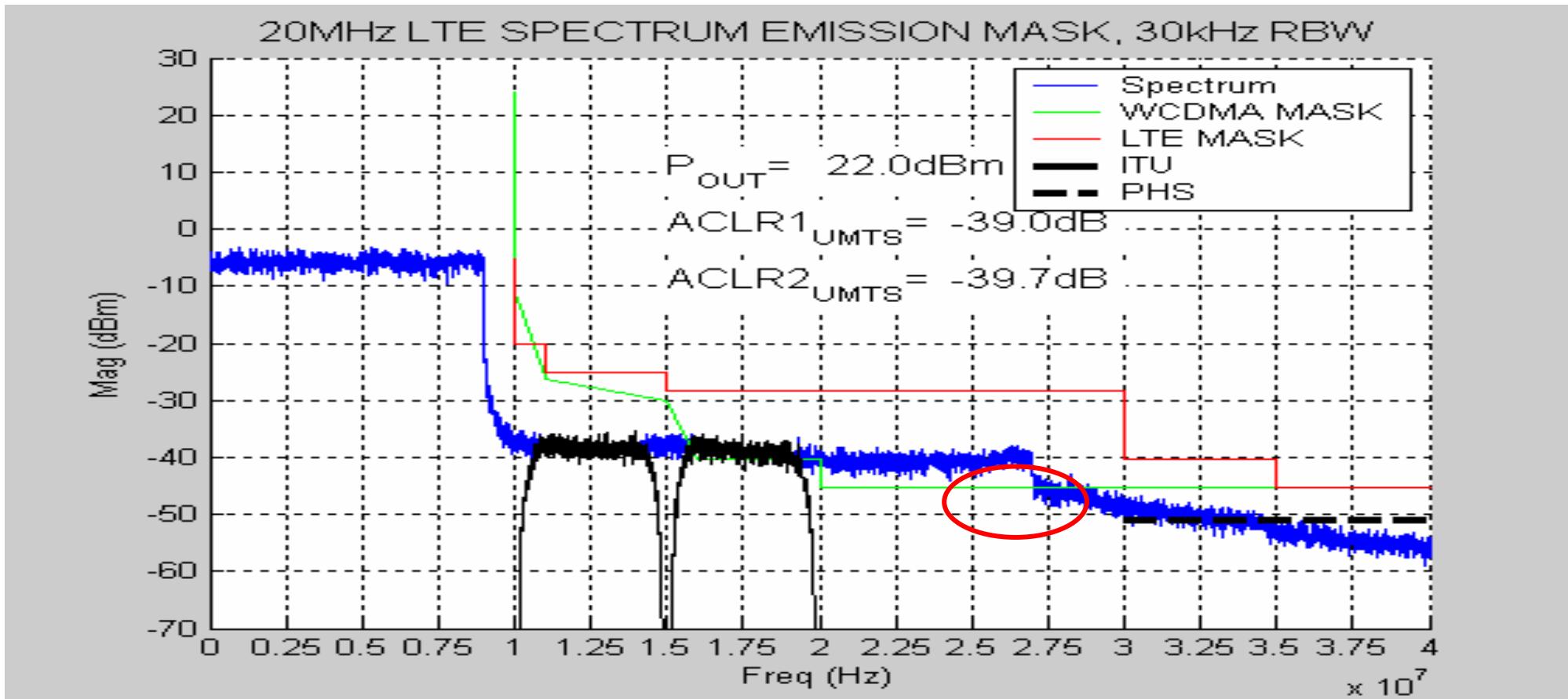
- 41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- NOK**



# PHS @ 20MHz offset

## 20MHz LTE – 1dB MPR

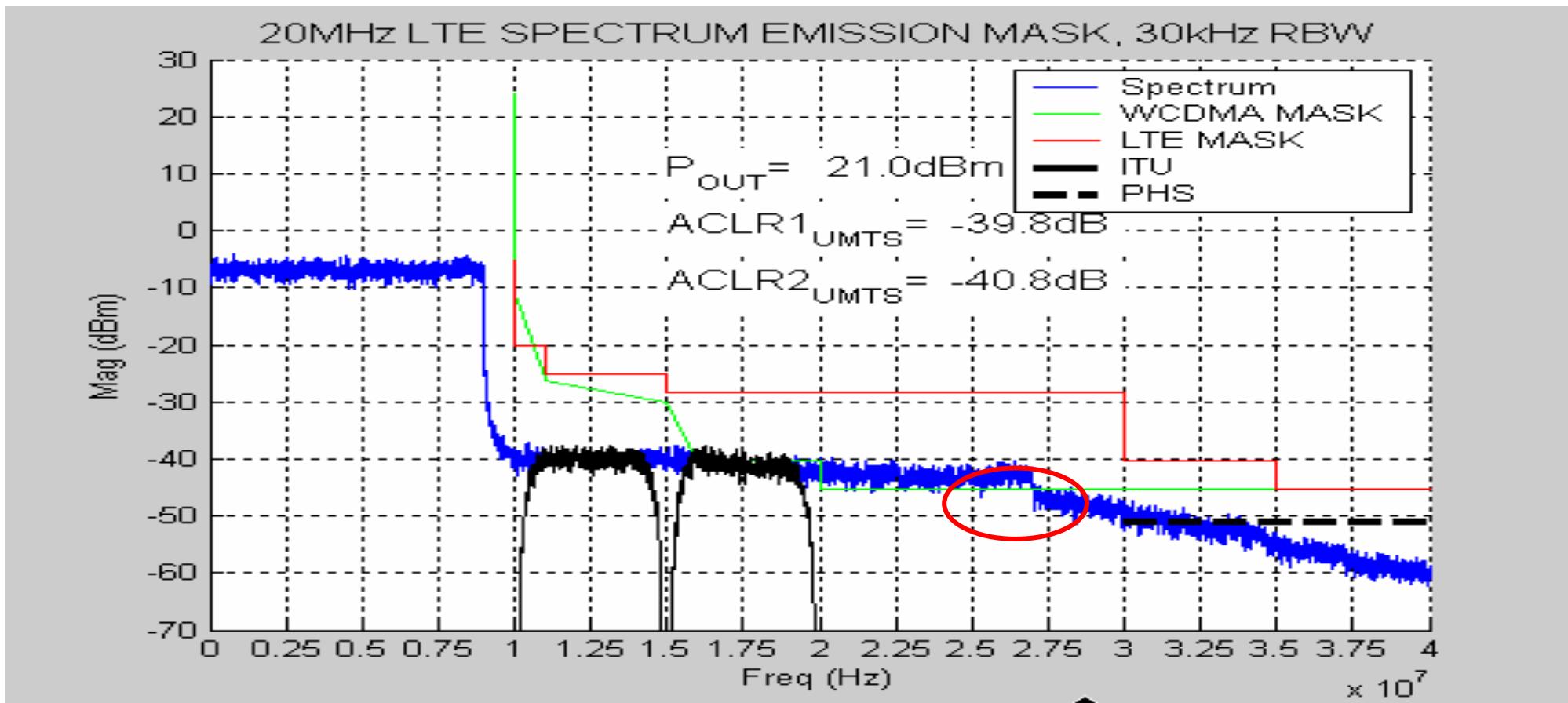
- -41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- **NOK**



# PHS @ 20MHz offset

20MHz LTE – 2dB MPR

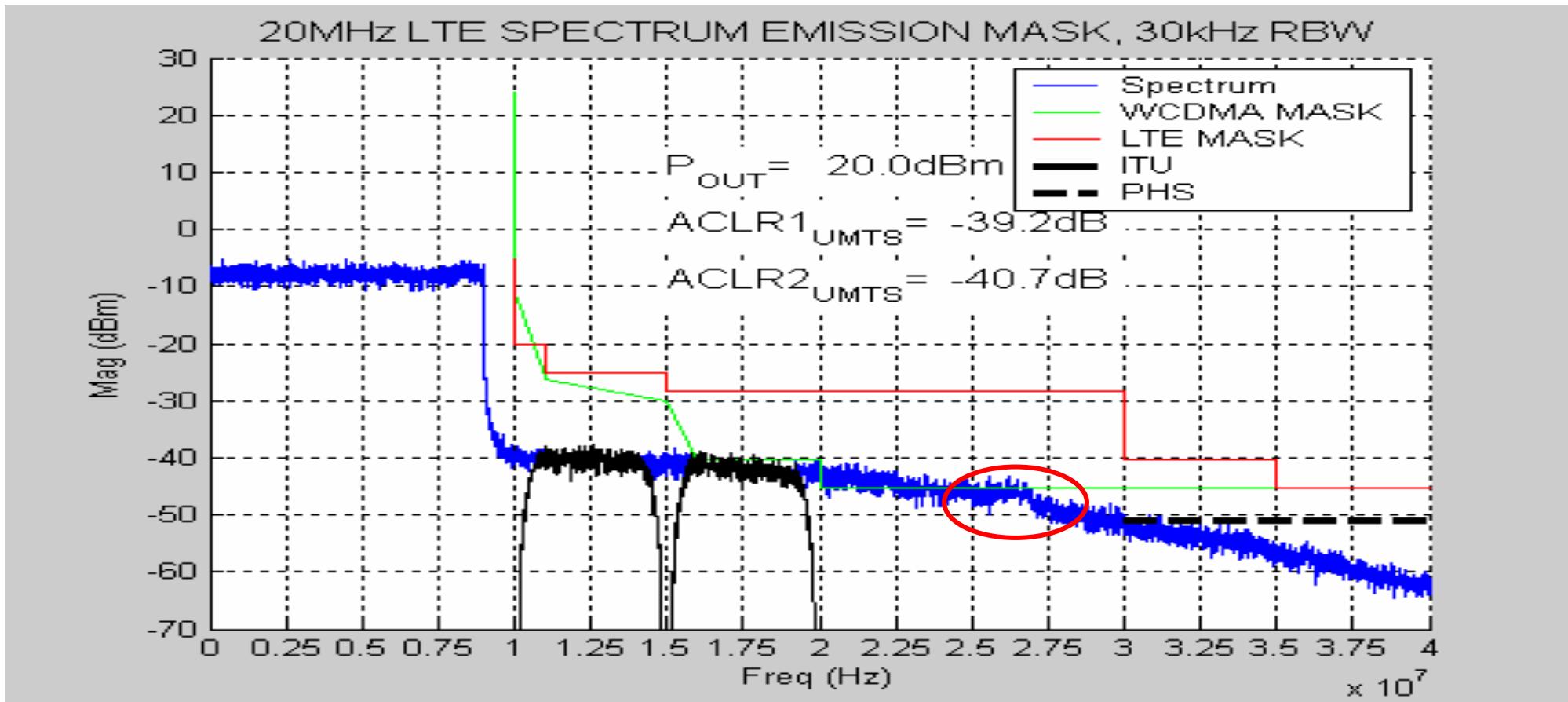
- -41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- **NOK**



# PHS @ 20MHz offset

20MHz LTE – 3dB MPR

- -41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- **NOK**



# PHS @ 20MHz offset

20MHz LTE – 4dB MPR

- -41dBm/300kHz @ 20MHz offset ~ -51dBm/30kHz
- OK

