EXPERIMENTAL OPTIMIZATION OF DSP-AGGREGATED FRONT-HAULING TRANSMISSION FOR UP TO 4X96 LTE RADIO WAVEFORMS

M. BEFEKADU[1], S. STRAULLU[2], S. ABRATE[2] AND ROBERTO GAUDINO[1]

[1] Politecnico di Torino
C. so Duca degli Abruzzi 24,
10129 Torino – Italy,
roberto.gaudino@polito.it

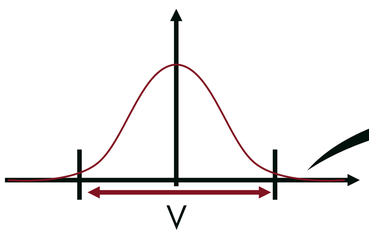
[2] Istituto Superiore Mario Boella
Via P. C. Boggio 61,
10138 Torino – Italy
straullu@ismb.it

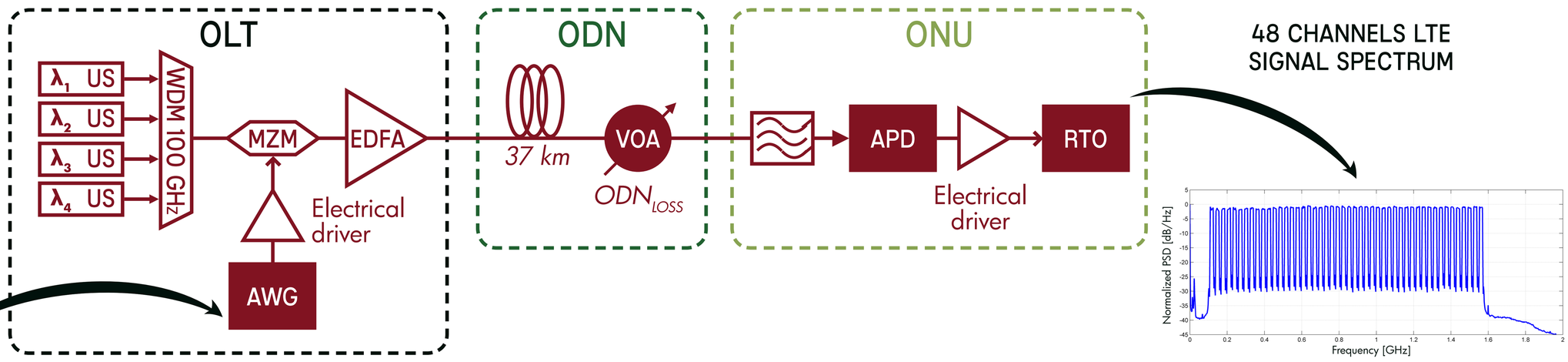
POLITECNICO DI TORINO

ISMB Istituto Superiore Mario Boella

AGGREGATED SIGNAL PROBABILITY DENSITY FUNCTION

$$Clip_{ratio} = \frac{V_{pp}}{\sigma_s}$$





LTE-A INTERNATIONAL STANDARD ETSI TECHNICAL SPECIFICATION 136 104 V12.6.0

MODULATION FORMAT	MAX EVM_{RMS}
256-QAM	3,5%
64-QAM	8%
16-QAM	12,5%
QPSK	17,5%

We believe the "EVM budget" cannot completely attributed to the optical part

Actually, most of the EVM budget should remain for the wireless part

The optical fronthauling segment should be as "transparent" as possible to the wireless segment

$$SNR_{TOT} = \frac{1}{SNR_F^{-1} + SNR_w^{-1}}$$

$$EVM_{TOT} = \sqrt{EVM_F^2 + EVM_w^2}$$

$$SNR = \frac{E_s}{N_0} = \frac{1}{EVM_{RMS}^2}$$

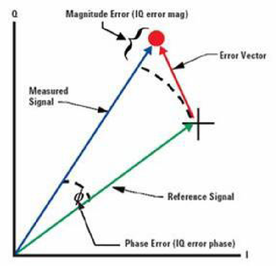
$$SNR_{W,dB} = SNR_{T,dB} - K_{pen,dB}$$

$$EVM_F = EVM_T \times \sqrt{\frac{K_{pen,linear}^{-1}}{K_{pen,linear}}}$$

Target EVM on the fiber link

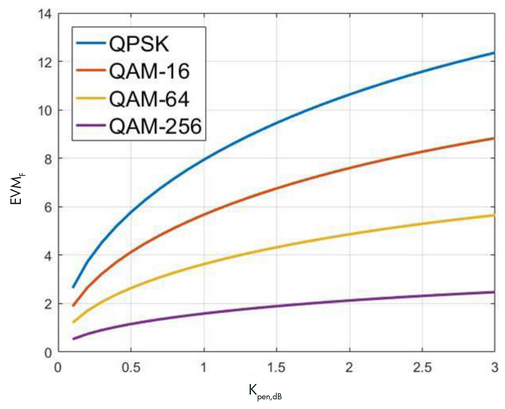
Target EVM on the full link (optical+wireless)

Acceptable penalty on the wireless part

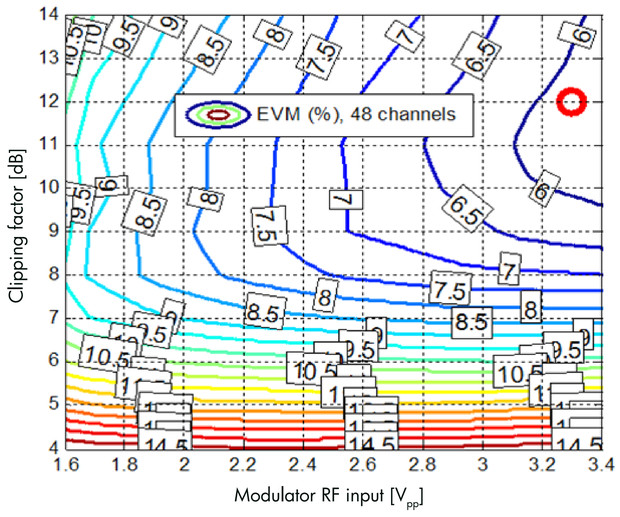


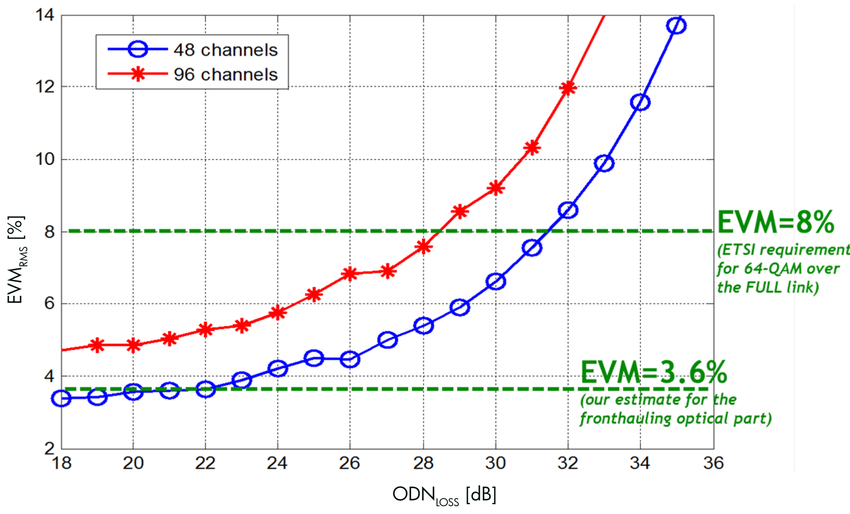
$$EVM = \sqrt{\frac{\sum_{K=1}^{M} |Z(k)-R(k)|^2}{\sum_{K=1}^{M} |R(k)|^2}}$$

MODULATION FORMAT	MAX EVM_F
256-QAM	1,58%
64-QAM	3,62%
16-QAM	5,66%
QPSK	7,93%

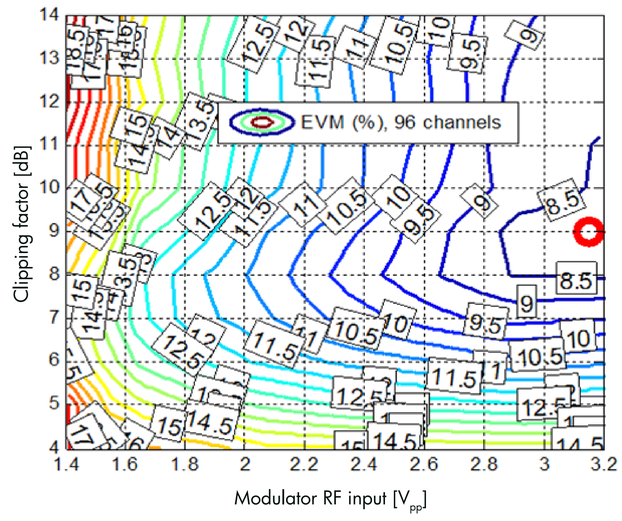


48 CHANNELS

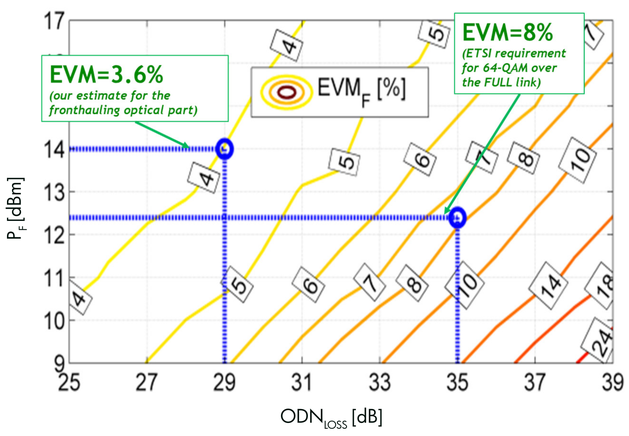




96 CHANNELS



48 CHANNELS



- After a careful optimization of system parameters we manage to obtain

  EVM<4% for 48 LTE channels

  using manageable transmitted optical power (Pfiber≈14 dBm, CATV video-overly systems launches up to 17 dBm)

- We are currently finding solutions that allows 96 channel transmission by working on some (simple) nonlinearity compensation at the receiver

96 CHANNELS