

INVENTION DISCLOSURE

1. Invention Title.

PAPR Reduction Using a Communal Band for Use By Multiple Cable Modems

2. Invention Summary.

Use vacant or noise corrupted bandwidth shared between more than one CM for PAPR reduction signals.

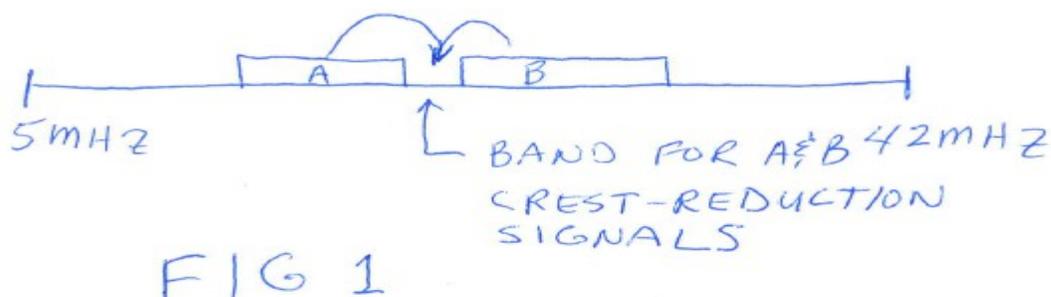
3. Invention Description.

a. Describe the invention in detail.

Peak to average power reduction is also known as crest factor reduction. This technique is particularly necessary when using OFDM or OFDMA modulation, which have high PAPRs. This is particularly valuable when transmitted power is limited by a transmitter power limit or battery life. One method of achieving PAPR reduction is to assign vacant bandwidth for use by the transmitter. At the instant an OFDM signal is having a positive crest, the out-of-band signal has a negative crest that reduces the peak amplitude of a transmitted signal.

On a cable upstream many CMs are active at the same time. If each of the CMs are assigned unique additional bandwidth in which to create a peak-canceling signal, the overall spectrum will be decreased. This idea is to use a shared bandwidth to be used for PAPR reduction by more than one CM at the same time.

Figure 1 illustrates this operation. Transmitter A and transmitter B both use the same band for their crest reduction signals. For A the vacant band is adjacent above (higher frequency) and for B the vacant band is adjacent below.



In a basic implementation, a number of subcarriers will be left vacant in between two spectral blocks that require PAPR reduction. PAPR reduction will be required when a CM's transmit power is near its maximum.

In a slightly more complex implementation, informed selection of the communal subcarriers can reduce the efficiency impact on the upstream spectrum. For example, subcarriers affected by external noise sources such that they are already unusable for data

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transmission, e.g. spectrum with ingress or narrowband interferers, can be used as the communal PAPR reduction bandwidth with no costs to upstream channel usable bandwidth. Furthermore, depending on the level of the noise source in this area, the additional power added by the CMs for PAPR reduction may have a smaller impact on the total power seen by laser than if vacant noise free subcarriers were selected.

The CMTS will assign communal vacant subcarriers for CMs with consideration for ones that need to use PAPR and can share PAPR reduction bandwidth.

If the shared PAPR bandwidth allows, some of the additional added energy can be notched-out before the laser by a notch filter, reducing the power load on the laser (or A-D converter).

**b. Why was the invention developed? What problem(s) does the invention solve?
How is it better?**

Reduces the lost bandwidth used for PAPR reduction and possibly reduces the added power seen by the laser for PAPR reduction. Problem is solved by sharing the lost bandwidth and/or using already unusable spectrum for PAPR reduction.

c. Briefly outline the potential commercial value and customers of the invention.

If implemented, large. Bandwidth, especially upstream bandwidth, is at a premium.