RF Tuning Procedure for Transmitters Using Exact V2 Exciter

1. Overview Panel

The Comark Exact exciter has a very capable / powerful non-linear digital pre-corrector contained in it. Knowing how to set up and properly adjust this corrector is key to the best performance and safe operation of a transmitter. Described below is a basic guide to allow a user to accomplish the proper tuning adjustment of this corrector.

2. Basic Setup

First insure that the transmitter is properly connected to the output mask filter and load. Ensure that you have RF output couplers in the path before and after the mask filter for transmitter feedback to the Exact exciter. Log into the Exact Exciter's webpage and configure the correct output modulation type, bandwidth, and frequency in the RF Output Parameters tab.

3. Connecting Feedback Signals

On the rear panel there are 2 SMA connectors labeled FBA (Feed Back Amplifier), and FBF (Feed Back Filter).

The FBA signal should come from the transmitter output sample before the mask filter. This is used for non-linear (shoulder) correction.

The FBF signal should come from the transmitter output sample after the mask filter. This is used for linear (SNR) correction.

These signal levels should be in the range of -15 to -5 dBm.

Fig. 1   Rear panel

4. Checking the Feedback Signals Levels

Once the feedback signals are connected, the user can check, in the Exact Precorrections Menu, that they are properly wired, synchronized, and that their power levels are in accordance with the specifications.
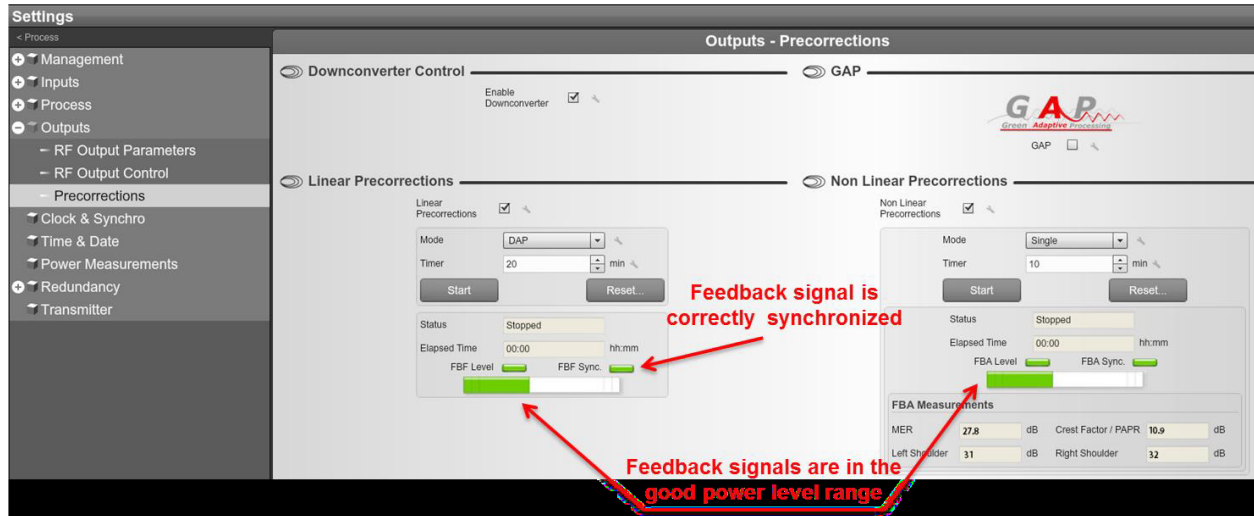

Fig. 2   Exact Precorrections screen

5. Connecting Feedback Signals

The only parameters that need to be set before launching the DAP are Crest Factor, Protection Clipping, and Timer (Correction Time).

6. Crest Factor Setting

Since the Exact is performing a clever PAPR reduction, less destructive for the signal compared to the amplifier, the Crest Factor has to be reduced as much as possible by Exact instead of the amplifier. As a tool, the Crest Factor value monitored from the amplifier feedback signal can be used as a guide / starting point. Once the transmitter is at full power and before correction is run for the first time, the crest factor / PAPR can be read in the FBA Measurements section of the Corrections page. This is the Crest Factor / PAPR that the Exact is measuring on the transmitter output without correction. The recommended starting point is to set the Crest Factor setting only about 1dB higher than the value which is monitored in the FBA Measurements section. This should not be set to what you believe the Crest Factor / PAPR should be when you are finished correcting or as referenced by any other measurement means.

7. Protection Clipping Setting

Protection Clipping is just what the name implies. It is the maximum level of PAPR allowed out of the exciter when correction is run. Because the DAP corrector simply tries to make the feedback signal as close to perfect as possible it essentially knows no limits of how far it can stretch peaks unless told otherwise. If this is not kept to a "reasonable" level it could result in amplifier damage. A good guideline is to keep this only about 3dB above the crest factor setting. Once

7.   Protection Clipping Setting cont.

correction has run, it should be adjusted down by 1dB from where it is set to see if there is a performance impact. If not, then leave it alone. It should only be carefully increased in small increments to see if increasing has any positive effect on signal performance. Essentially, it should be adjusted only as high as necessary to achieve acceptable performance.
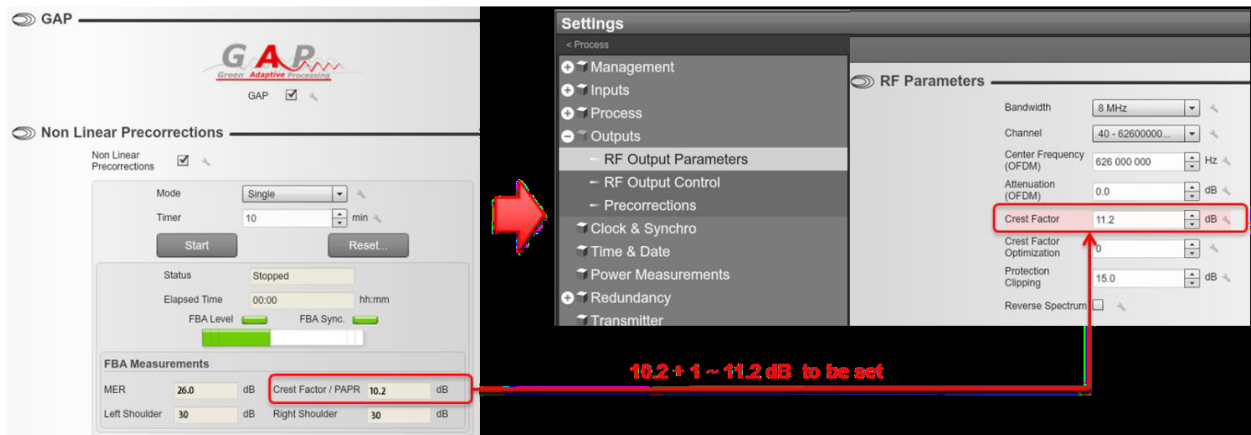

Fig. 3   Non Linear Precorrections screen followed by the RF Output Parameters screen

Once the Crest Factor and Protection Clipping have been set, the DAP can be launched in the Precorrection Menu, using one of the following modes:

"Single" mode (recommended), where the DAP will be automatically stopped after a user configurable "Timer" value.

"Continuous" mode, where the DAP works continuously until the user exit the continuous mode

8.   Timer Setting

In the Precorrections menu if "Single" mode is selected the amount of time the corrector will run can be adjusted. In most cases 3 to 5 Minutes is sufficient for good performance of the non-linear corrector. By not setting the value too low or short, the shoulder performance may not reach its best performance level as the corrector has not run enough iterations of correction to linearize the transmitter optimally. By setting it excessively high or long, the transmitter performance will have already reached the optimum performance before the corrector has stopped. Setting it too long can potentially have ill effects in that the shoulders could become "over corrected" and not be at optimum performance.

9.   Crest Factor Parameter Setting Fine Tuning

After a first run of DAP (in "single" mode with a timer value set), it is usually possible to fine tune the Crest Factor setting in order to improve the achieved shoulders performance.

This change should be made in small increments (0.1 to 0.3dB) either up or down from the original set value while observing the shoulder performance. If the performance gets better, try going a little more in that direction until the performance starts to degrade then back up a bit to the best performance. Once this is done, reset the correction, and re-run the DAP. This should yield equal or perhaps slightly better performance. The corrector is now optimally adjusted.

10. Crest Factor Optimization Parameter Setting

For a given "Crest Factor", the "Crest Factor Optimization" enhances the signal shoulders. Finding the best value for this parameter allows the user to gain performance on the shoulders of the signal, thus optimizing the amplifier power.

This shoulder optimization involves a MER / SNR performance reduction. The user must find the best trade-off for shoulder performance vs. MER/SNR performance.

This parameter can vary in a range from 0 (Off or None) to 255 (Max).

When the Crest Factor Optimization parameter is increased, the shoulder level becomes better. At the same time, the MER performance decreases. As explained earlier, a trade-off between the two is necessary to obtain the best overall optimization and desired signal performance.

There is a "usable" range for the Crest Factor Optimization parameter between about 50 and 150. Below 50 on this setting not too much effect is noticed. Above 150 on this setting the MER / SNR performance will likely be too far degraded.