Index Perturbations causing "Kinks"

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A DMD artifact identified by fiber manufacturers for input into the 802.3aq channel
modeling work is that actual DMDs will sometimes show a "jump" or "kink". This note
is intended to give some insight into what perturbations cause this artifact so that they can
be included in both restricted sets and Monte Carlo sets of profiles and mode delays
which represent the installed base.

The perturbation can be approximated a number of ways.

(1) One is as a local exponential "bump" in the profile, summarized by the Matlab
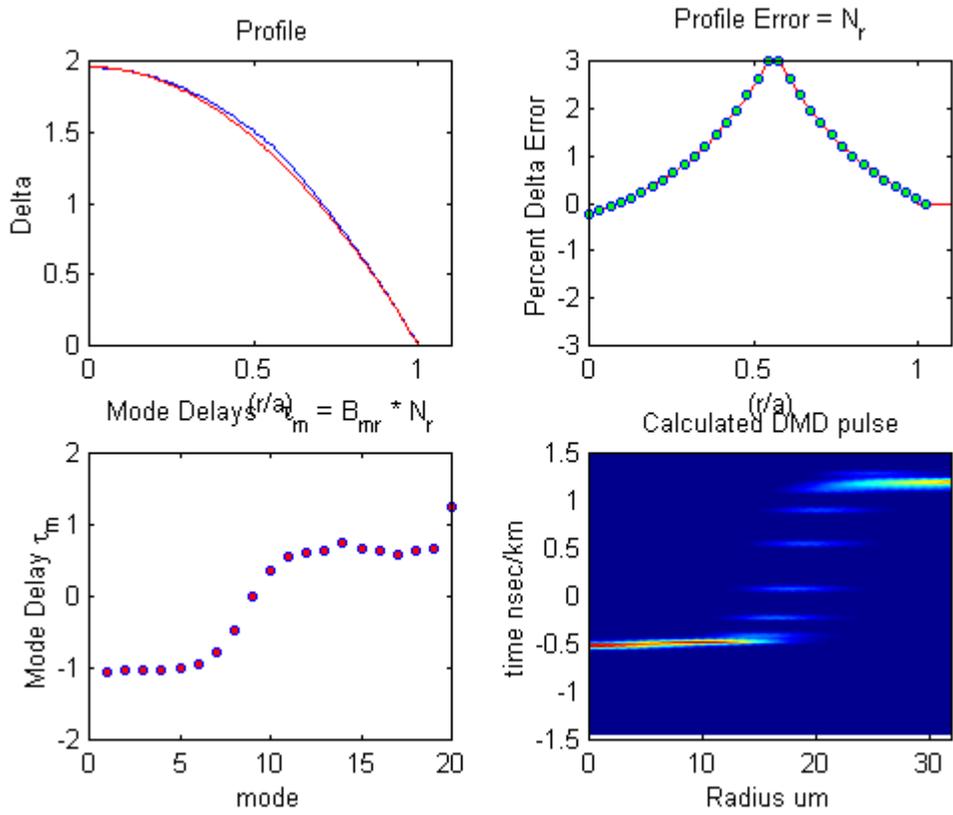snippet below.

```
a_k = .08 ;
b_k = 20*5/31.25;
D_N = 0.*x1;
r_k = .56;
for i_rad = 1:length(x1)
    D_N(i_rad) = a_k*(exp(-b_k*abs((x1(i_rad)-r_k)))-exp(-b_k*abs((x1(10)-r_k))));
end
D_N(101:111,1)=0.;
```

Here x1(i_rad) is the r/a position and the exponential bump has an amplitude a_k, an
steepness b_k, and a relative location r_k. There is a second term to force the
perturbation to zero.

Example calculations corresponding to this perturbation are shown on the next page.

(2) Another way to look at this perturbation is that it represents a misfit between two
perfect alpha profiles. Profile 1 has a slightly HIGHER DELTA and SMALLER CORE
RADIUS and Profile 2 has a slightly LOWER DELTA and LARGER CORE RADIUS.
The two profiles agree at a single radius r_k. Then the perturbed profile is the lower
delta profile on the inside and the higher delta profile on the outside. The perturbation
will qualitatively look like example (1) above.

Example 1 – an example with a "pretty clean" jump.

Example(2) -- not as clean a jump

Profile

Profile Error = N_r

Mode Delays $\tau_m = B_{mr} * N_r$

Calculated DMD pulse