

Agenda Item: Ad Hoc #3 (RACH)
Source: Siemens¹
Title: Terminology for RACH Preamble power ramping
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1 Introduction

The 3GPP discussion on RACH preamble power ramping is sometimes confused by a lack of agreed terminology and the fact that there are a number of concepts which have been introduced at various times and not summarised.

In this paper an idealised RACH ramp is shown with various parameters which might be relevant to a final specification.

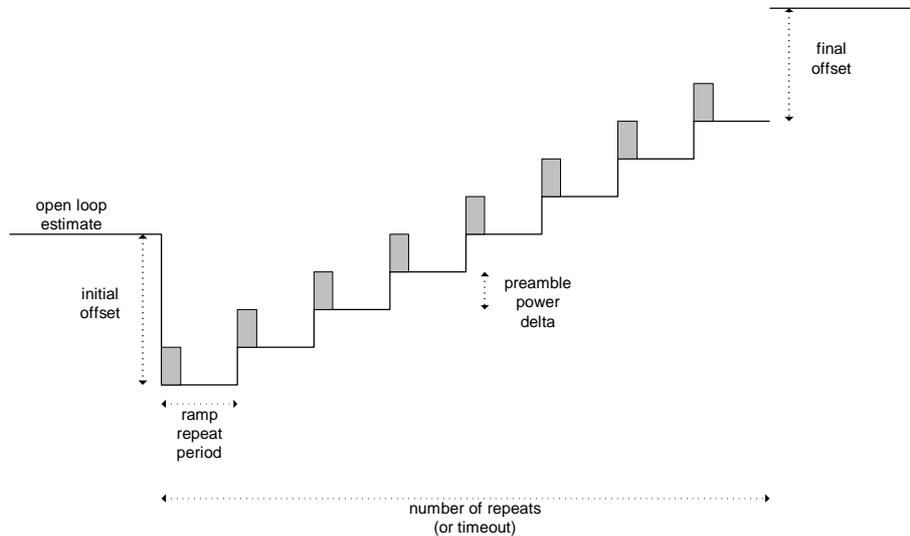


Figure 1 – RACH preamble ramping

In the figure above the power setting starts with the open loop estimate derived from the long term averaging procedure which was defined as a physical layer procedure before ramping was introduced.

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When ramping starts the power of the first access attempt preamble may, in general, be at a power offset from the open loop estimate. This would be set by heuristic methods based on a trade off between initial interference levels and the number of re-tries necessary for access on average. No doubt the most flexible implementation would be achieved, if this be broadcast on the BCH. Unfortunately this approach would consume additional capacity on the BCH, so it may not be justified.

When ramping proper starts the “power delta”, the “repeat period” and the “(maximum) number of repeats” define the ramp itself. Equivalently the “power delta” and “timeout” define the same thing given the RACH timing raster. Note that in the case of pseudo-random timing of retries the repeat period would then be a variable. Applying dynamic persistence is equivalent to variable repeat periods. Possibly the maximum repeat period could be specified to obtain an upper bound on the time for the RACH procedure to enable timeouts at higher layers to be selected accordingly.

In addition the accuracy to which the power is to be set will have to be specified.

Finally the power of the message part may differ from the successful preamble by some amount. There is an open issue of how much this should be. Some proponents favour setting a high power for successful preamble ACK in order to enable channel estimation on the preamble whilst others only propose using just enough preamble energy for matched filter detection.

Some suggested symbology for these terms is:

P_{O_i} initial offset (relative power in dB)

P_{O_f} final offset (relative power in dB)

Δ_{RACH} RACH preamble power delta (relative power in dB)

T_{ORP} timeout RACH preamble

T_{TRP} (maximum) repeat time for RACH preamble attempt

N_{RACH} (maximum) number of RACH preamble ramp attempts

It should be noted that this Tdoc is intended to clarify discussion in WG1 and that actual specification will involve also WG2 for interfacing and requirements and WG4 for power and accuracy parameters.