Application Note: RSSI Trimming

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Input Values

Important output values

Using register RSSIRX for calibration process

Trim Target Slope (=SLOPER):	2,5	digit/dB	
Trim Target Offset @ -65dBm input level (=RSSIR2):	182,5	digit	use formula P_in <-> RSSIRX below for slightly different P_in (RSSIR2 = RSSIRX = (P_in+138)*2.5; eg.:(-65+138)*2.5=182.5)

Trimming Procedure:

- Download configuration file (Run Mode Slave; RSSISLOPE, RSSIOFFS set to default, i.e. RSSISLOPE=1, RSSIOFFS=0)
- Depending on AGC usage in final application, one of the following 2 points needs to be chosen:
  - In case AGC is deactivated in final application (AGC gain is fixed): Set AGCSTART=01 (Direct ON) and set gain to AGCGAIN=00 (0dB)
  - In case AGC is activated in final application: Set AGCSTART=01 (Direct ON) and set gain to AGCGAIN=11 (Automatic). ATTENTION: AGC thresholds are depending on selected BPF bandwidth !!
- Apply P_{IN1} = -85 dBm RF input signal (use unmodulated carrier) at the receiver's reference plane
- Read RSSIRX eleven times (minimum 10 ms in-between readings), use average of last ten readings (always), store as RSSIM1
- Apply P_{IN2} = -65 dBm RF input signal (use unmodulated carrier) at the receiver's reference plane
- Read RSSIRX eleven times (minimum 10 ms in-between readings), use average of last ten readings (always), store as RSSIM2
- Calculate measured RSSI slope SLOPEM=(RSSIM2-RSSIM1)/(P_{IN2}-P_{IN1})
- Adjust RSSISLOPE for required RSSI slope SLOPER as follows:
  RSSISLOPE = Round((SLOPER/SLOPEM)*2^7) * 2^-7 — Info: Round is applied due to discrete register values
- Adjust RSSIOFFS for required value RSSIR2 at P_{IN2} as follows:
  RSSIM2_corr = (RSSIM2*4 - 512)*RSSISLOPE + 512
  RSSIOFFS = RSSIR2 * 4 - RSSIM2_corr — Info: Factor 4 is applied due to 8bit / 10bit values
- The new values for RSSISLOPE and RSSIOFFS have to be added to the configuration!

RSSIRX	P_{IN}
182,5	-65

P_{IN}	RSSIRX
-85	132,5

After trimming with above target values, RSSI slope formula can be converted to:

$$P_{in} = \frac{RSSIRX}{2,5} - 138$$

Note: RSSI shows a slight temperature dependency in the range of 8 to 10 digits from -40°C to +105°C
In the real application this temperature dependency can be compensated additionally from time to time (e.g. every minute)

When using AGC:
* So now the RSSI offset is trimmed via register RSSIOFFS
* Table "AGC Settings 2" from the datasheet in the AGC section can be applied, but RSSIOFFS needs to be used from this trimming procedure