**5G mmWave Channel Model Alliance**

**Measurement Parameter List**

Why we need to define Measurement Parameters?

* “Measurement Parameters” describe the key technical parameters and the calibration procedures of the sounder equipment as it was used to collect a certain data set. So, **every set of measured channel parameters should come with a version of this list**.
* These parameters support the trustworthiness and usability of the measured propagation and channel parameter data set. They indicate the potential strengths and limitations of both the data and the setup used.
* Procedures applied to calculate “Propagation-Channel-Related Metrics” and “Scenario Metrics” will be described elsewhere and shall not be included in this list
* The entries to this list should be short, concise, and self-explanatory. Please use references if you need to provide more detailed explanations.
* Note that the entries to this list may be slightly different from the “Channel Sounder Feature Worksheet” which we have already collected as we are asking here for the specific parameters used for a given set of measured data and, e.g., not for a possible parameter range.
* As we all know, there is perhaps no equipment available that can meet all parameters on the highest level at the same time. So please don’t hesitate to indicate if a certain parameter is not considered with your equipment, for example, if a sounder is not designed for real-time operation or for directional resolution.

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| --- | --- |
| Parameter | Parameter description |
| **Basic channel sounder architecture** |  |
| Transmit signal | Sinusoid/VNA, binary pseudo random signal, chirp, FMCW, OFDM |
| Binary pseudo random signal |
| Signal recording | Real-time sampling, periodic subsampling, sliding correlation (bandwidth compression), frequency sweep |
| Real-time sampling |
| Tx Antenna architecture | omni vs directive, single vs array |
| Omni, Single |
| Rx Antenna architecture | Omni vs directive, single vs array |
| Directive, Array |
| Antenna array architecture | One sided vs. two sided, parallel vs. switched antenna access vs. synthetic aperture. Same for TX and RX? |
| Octagonal, Switched antenna access – Rx  TX – Single dipole antenna with omni pattern in azimuth and 30deg beamwidth in elevation.  RX – Circular arrays of 16 horn antennas each with 45deg AZ and EL. Resulting array provides 360deg AZ field of view. |
| Tx/Rx synchronization | Cable or fiber synchronization, atomic/GPS clock remote synchronization |
| Atomic clock remote synchronization |
| Dual Polarization capability | Number of parallel Tx/Rx channels (1x1, 2x1, 1x2, 2x2), true parallel or switched? HP/VP or LHCP/RHCP) |
| Switched Rx channels (1x16). VP |
| Auxiliary remarks |  |
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| **Key technical parameters** |  |
| Center Frequency | 28.5 GHz |
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| Bandwidth and spectrum envelope shape/filter | rectangular, sinc^2, etc. |
| 2 GHz null-to-null bandwidth, sinc^2. |
| CIR period | Alternative: difference between frequency samples(=1/CIR period) |
| 32767 ns |
| Tx power | Power at input port of antenna? Radiated power? If radiated power, provide antenna gain. Provide methodology. |
| 30dBm at the input port of the antenna (recorded in header file TxData.TxPower). TX has 2dBi boresight gain. |
| Maximum instantaneous dynamic range | dB difference in the peak of the power delay profile or received CW signal in the passband for LOS only (just below saturation) and peak noise level, without temporal averaging. Noise level must be defined (e.g., thermal, quantization, correlation noise, etc.) |
| 55 dB |
| Measurable channel attenuation range | dB difference between lowest and highest channel attenuation that can be measured with an SNR of xx dB. The AGC range over which the defined instantaneous dynamic range can be maintained. |
| 170 dB |
| CIR repetition rate fCIR (Hz) | The inverse of the time between received CIRs. Determines maximum Doppler bandwidth, where BW=1/2 fCIR |
| 952 Hz |
| Averaging | No. of averages in complex and/or power domain. Time alignment method? |
| No averaging of received signal performed |
| Auxiliary remarks |  |
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| **Calibration procedures** |  |
| Frequency response | Back to back? Including antennas? Bandwidth, number of frequency points, number of power levels. Including AGC? |
| Back to back. No antennas. 2 GHz bandwidth,  81880 frequency points, 13 power levels. No AGC. |
| Received power/path loss | Wideband? Narrowband? Number of power levels checked? Antennas included? If so, how is antenna gain determined? |
| Wideband. 13 power levels. No antennas. |
| Antennas and antenna arrays | Complex radiation patterns? Including polarization? Including azimuth and elevation (full solid angle)? Including antenna switch and feeds? |
| No, we will do near field scan. |
| Tx/Rx LO frequency synchronization  (in case of remote operation) | Training of atomic clocks |
| PPS synchronization |
| Auxiliary remarks |  |
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