TinyRad-021200040171 Calibration Report

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1 Calibration of the MIMO Frontend

In this report the calibration of the 24-GHz TinyRad system, as shown in Fig. 1, is summarized. For generating the calibration data a corner cube was placed in front of the radar. The standard

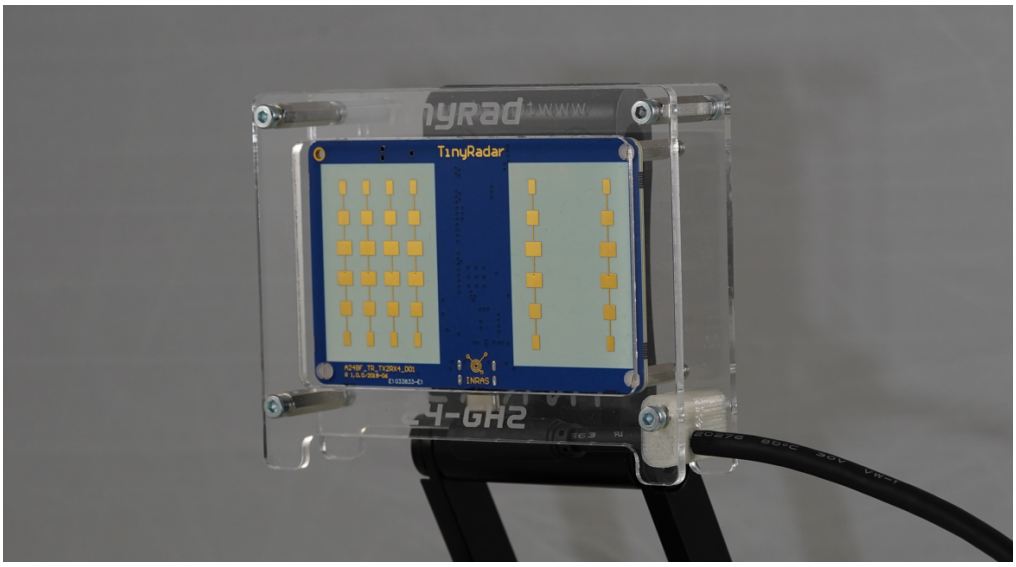

Figure 1: 24-GHz TinyRad system.

calibration data is derived from the range profiles for a single angle of incidence and the coupling between the elements is neglected. A picture of the measurement setup with the corner cube is shown in Fig. 2. The configuration of the radar including the FMCW parameters is summarized in the table below.

Parameter	Description	Value	Unit
f_{Strt}	Start frequency	24000	MHz
f_{Stop}	Stop frequency	24250	MHz
T_{RampUp}	Ramp duration	256	us
TxSeq	Tx activation sequence	[1 2]	
f_s	Sampling rate	1	MHz
N	Number of samples	256	
$\mathrm{G_{ADC}}$	Gain ADAR	21	dB
$\mathrm{a_{Cube}}$	Length of corner cube	78	mm
$\mathrm{RCS_{Cube}}$	Radar-cross section	0	dBsm

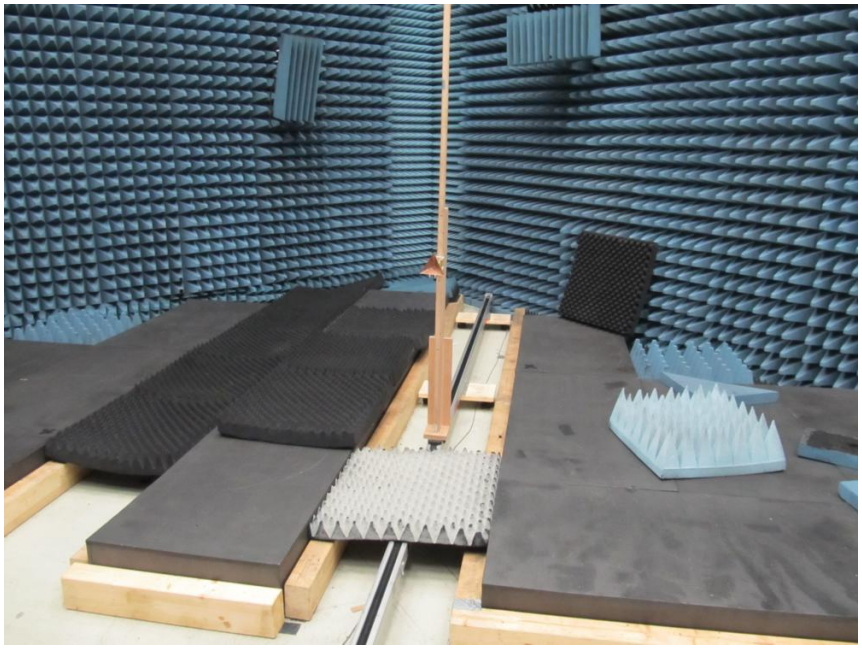

Figure 2: Corner cube for calibrating the MIMO system.

2 Measurement Results:

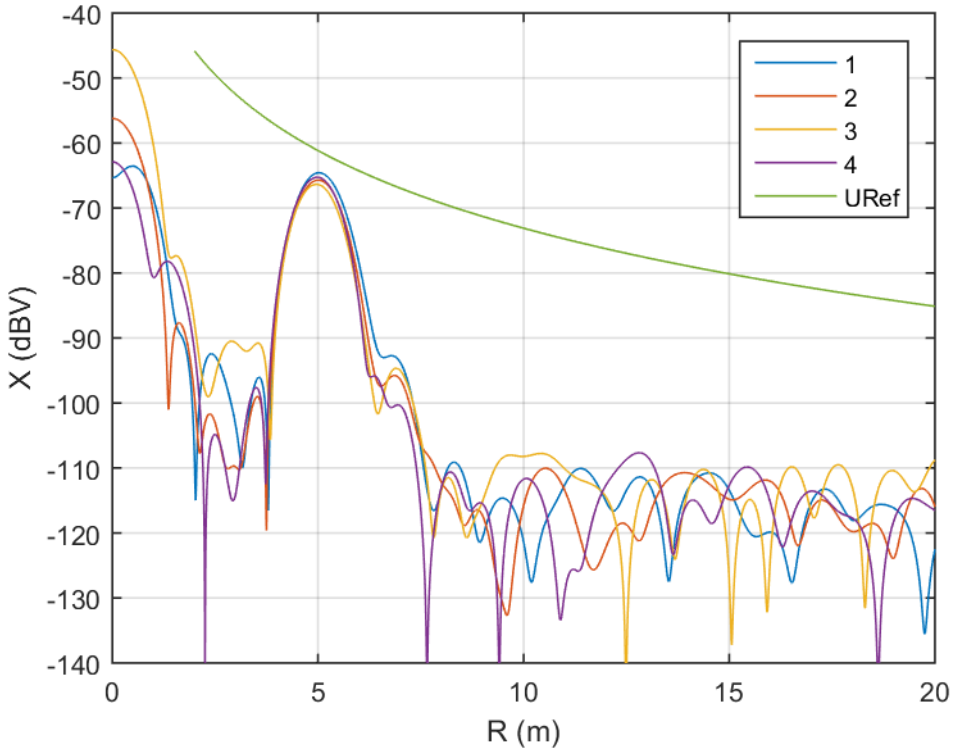

Figure 3: Range profile of receive channels 1-4 and Tx1.

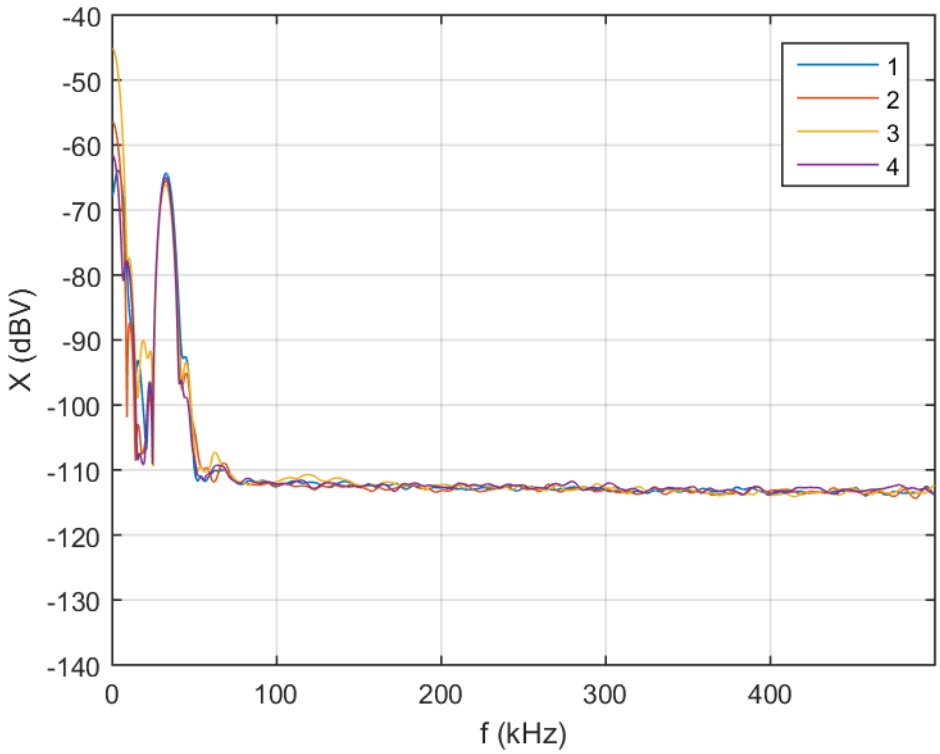

Figure 4: PSD of receive channels 1-4 and Tx1.

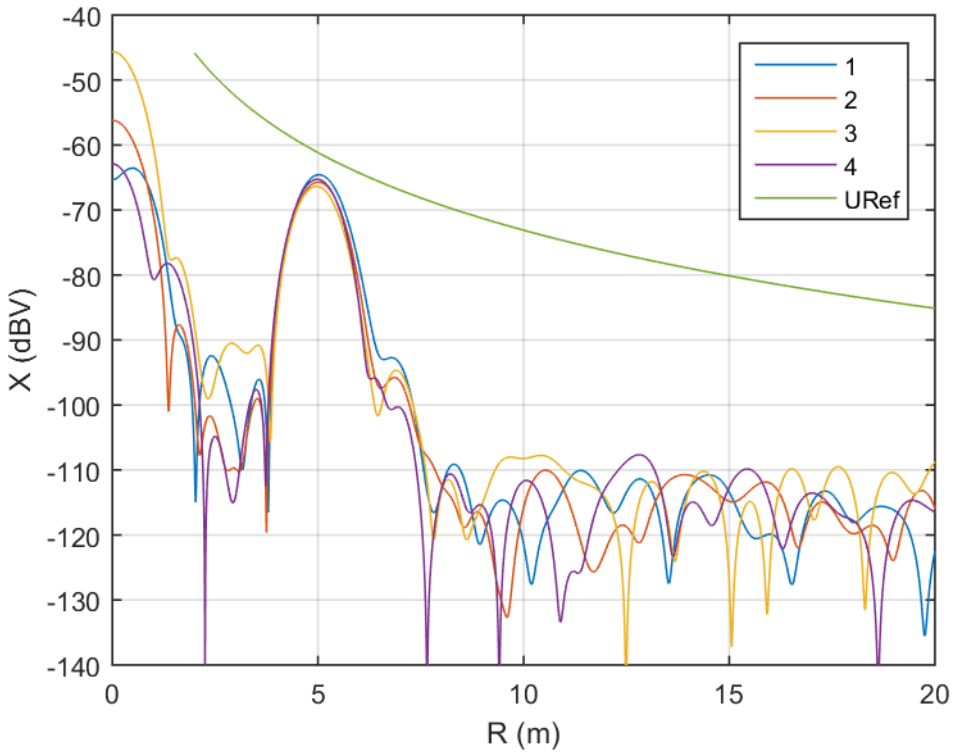

Figure 5: Range profile of receive channels 1-4 and Tx2.

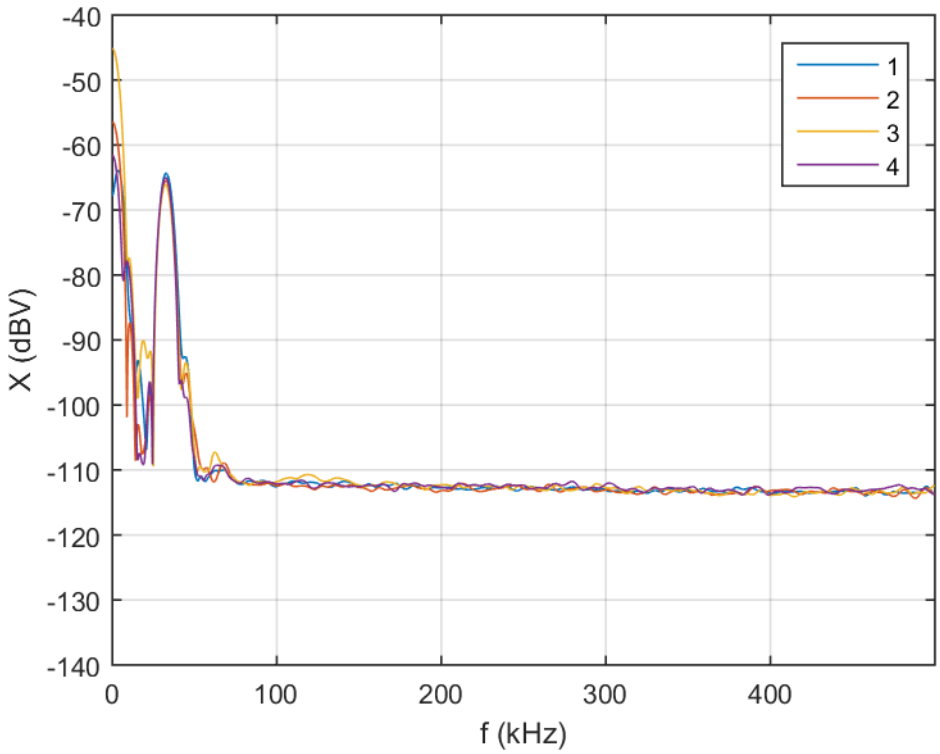

Figure 6: PSD of receive channels 1-4 and Tx2.

3 Calibration Results:

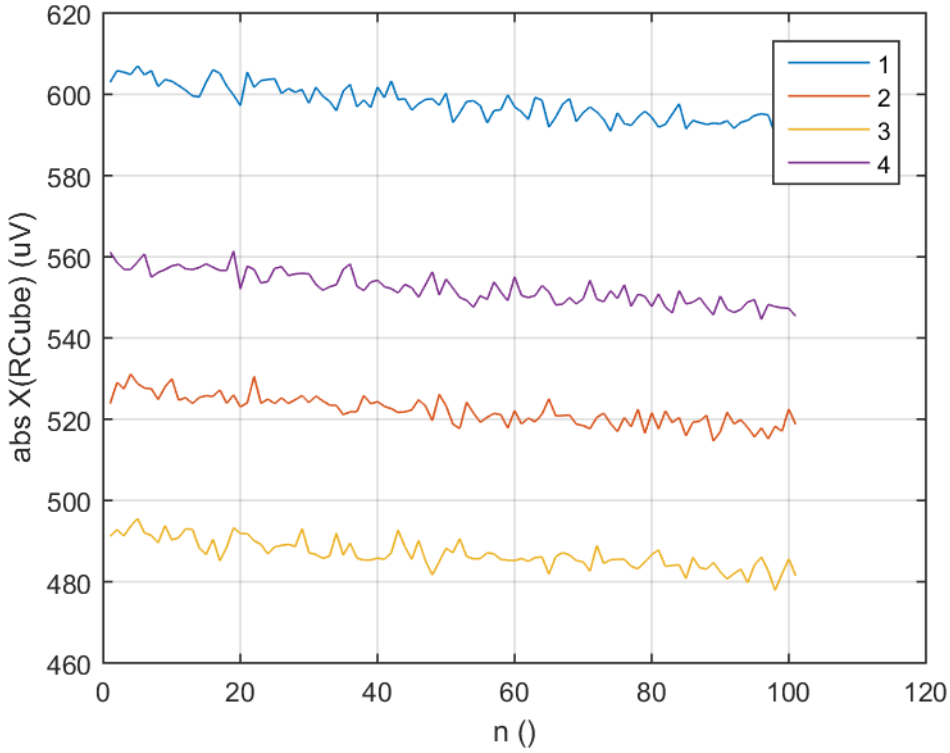

Figure 7: Magnitude of calibration coefficients Tx1.

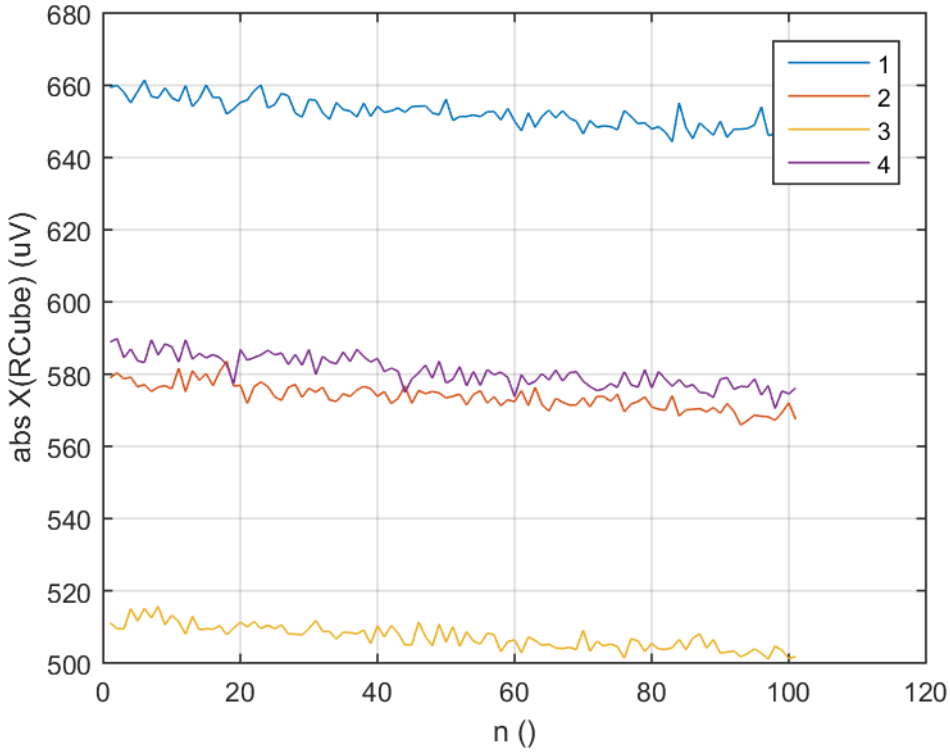

Figure 8: Magnitude of calibration coefficients Tx2.

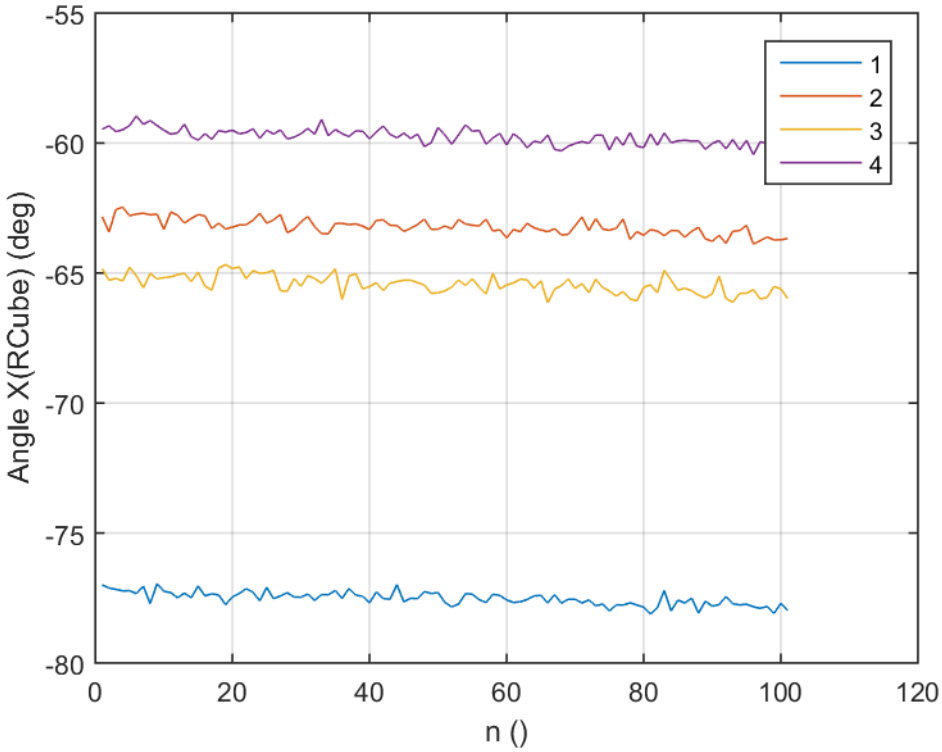

Figure 9: Phase of calibration coefficients Tx1.

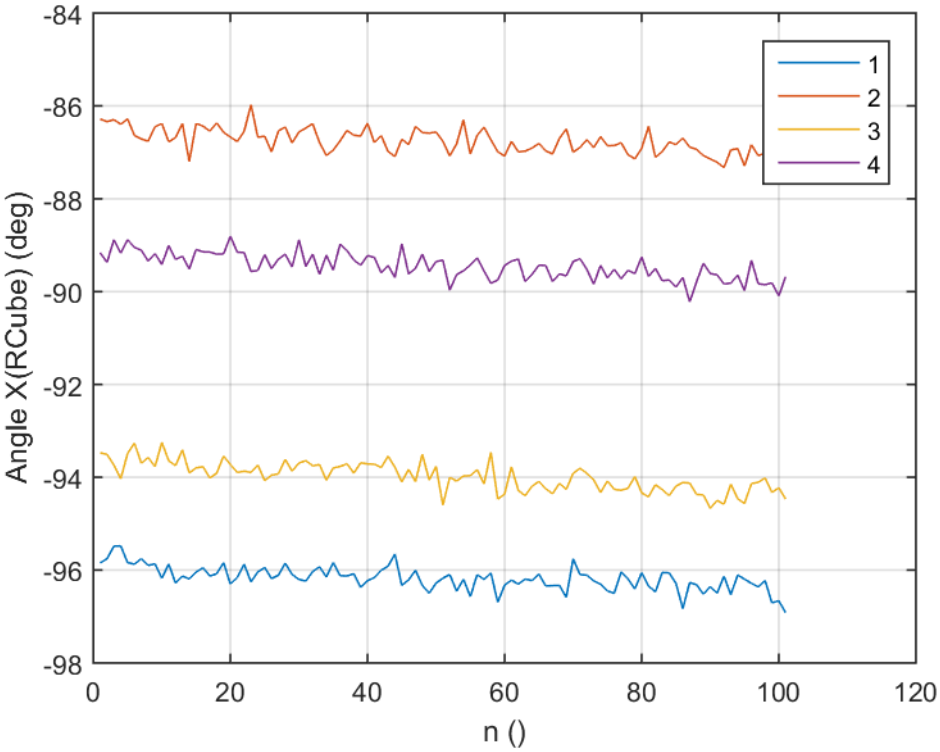

Figure 10: Phase of calibration coefficients Tx2.

4 Calibration Table:

In the subsequent table the calibration data is listed.

Tx-Rx	Abs	Real	Image
(Tx1 Rx1)	0.92417692	0.88014001	0.28188038
(Tx1 Rx2)	1.0579507	1.0560148	0.063972076
(Tx1 Rx3)	1.1348339	1.1293081	0.11185331
(Tx1 Rx4)	1	1	0
(Tx2 Rx1)	0.84677716	0.68137032	0.50275843
(Tx2 Rx2)	0.96251534	0.85769729	0.43679644
(Tx2 Rx3)	1.0892361	0.90063365	0.6126126
(Tx2 Rx4)	0.95117092	0.82629028	0.47113744