### Male and female calibration of NanoVNA-H

The NanoVNA-H in the giftbox purchased from Alibama.com contained the new low loss SMA female female adaptor which show extreme low loss. This new SMA female female will be delivered to all NanoVNA-H deliveries from end of October 2019.

These data here given for calibration is derived from this new calibration kit, where the SMA male open, male short and male load adaptors are identical to what has been delivered previously, only the SMA female female adaptor differs.

The load resistances marked with red color are mine values but just use 50 ohm for your kit if you have no means for accurate 4 point measurements of your load.

Please be observant of the sign for delays whether it is positive or negative

### **NOTE: The entered delay data in the NanoVNA-Saver is always one way offset delay.** The Two way reflection delay are for other type of software not using one way offset delay.

During thru calibration where the test cable from Ch1 is connected to Ch0 directly no Thru delay used thus set to 0 ps.

Male calibration at CH0	Calibration adaptors	50KHz to 500MHz	50KHz to 900/1500MHz
		Calibration	Calibration
	No open adaptor used	One way offset delay	One way Offset delay
Open		+0.98ps	+.0.98ps
		Two way reflection delay	Two way reflection delay
Short		-1.86ps	-1.86ps
Lord	Male Open adaptor	One way offset delay	One way offset delay
Load		+2.15ps	+1.62ps
		Two way reflection delay	Two way reflection delay
- 74		-4.3ps	-3.24ps
	Male Short adaptor	One way offset delay	One way offset delay
		+0.176ps	+0.035ps
		Two way reflection delay	Two way reflection delay
15 E		-0.352ps	-0.07ps
÷	Male Load adaptor	R=49.846 ohm	R=49.846 ohm
S21	No Shunt Capacitor	One way offset delay	One way offset delay
		- 6.43ps	+4.514ps
		Two way reflection delay	Two way reflection delay
		+12.86ps	-9.027ps
		L= -267pH	L= -297.5pH
	Male Load adaptor	R=49.846 ohm	R=49.846 ohm
	No Series Inductor	One way offset delay	One way offset delay
		- 9.133ps	+1.534ps
		Two way reflection delay	Two way reflection delay
		+18.226ps	-3.068ps
		C= 107.5fF	C= 119.37fF
	Thru delay	0 ps	0 ps

SPECIAL NOTICE: The NanoVNA-saver requires some special setting which is shown in the screen copies added. The reason is that then open setting cannot accept a delay without a CO value and the Load only accept L values NanoVNA-saver allows delay for the female female adaptor to be subtracted, such that the correct calibration planes for the two SMA male adaptors of the two test cables are correctly established.

On the next page is the data given for calibration using the SMA female female adaptor terminated with the SMA male calibration adaptor. It is essential to use this method when Ch0 and Ch1 fitted with the SMA male male test cables. If the delay of the thru adaptor 50.7ps cannot be subtracted use ELECTRICAL DELAY

Please note: These data will only provide correct calibration when using the new low loss SMA female female adaptor. The thru delay for the previously delivered SMA female female adaptor is 65ps as earlier measured However if used anyway reflection loss and transmission loss will have small errors. For transmission loss about 0.4dB at 900MHz whereas the new SMA female female adaptor has 0.02dB loss at 900MHz

Female Calib	ration at SMA	Calibration adaptors	50KHz to 500MHz	50KHz to 900/1500MHz			
male adaptor	-		Calibration	Calibration			
		No male open adaptor	One way offset delay	One way offset delay			
	M-Load	used	50.3ps	50.51ps			
			Two way reflection delay	Two way reflection delay			
	M-Short		-100.6ps	-101.02ps			
	M-Load M-Short M-Open F-F	Female Open adaptor	One way offset delay	One way offset delay			
	IVI-Open		50.86ps	51.13ps			
in the			Two way reflection delay	Two way reflection delay			
	F-F		-101.72ps	-102.23ps			
		Female Short adaptor	One way offset delay	One way offset delay			
			51.28ps	51.16ps			
			Two way reflection delay	Two way reflection delay			
	anna anna		-102.55ps	-102.32ps			
		Female Load adaptor	R=49.854 ohm	R=49.854 ohm			
		No Shunt Capacitor	One way offset delay	One way offset delay			
			+3.945ps	+61.59ps			
			Two way reflection delay	Two way reflection delay			
			-7.89ps	-123.18ps			
			L=-171pH	L=-205pH			
	/	Female Load adaptor	R=49.854 ohm	R=49.854 ohm			
		No Series Inductor	One way offset delay	One way offset delay			
/			+37.244ps	+59.54ps			
			Two way reflection delay	Two way reflection delay			
/			-75.488ps	-119.08ps			
			C=68.5fF	C=82.27ps			
E	Ch0	SMA male male test	cable or SMA male male adap	otor connected to Ch0			
снт 🔁 🔳	в Сно	Thru delay	50.7ps	50.7ps			

The next pages are how the NanoVNA-saver calibration settings for male and female calibrations are configured with an without the use of the male open calibration standard

## Male calibration 50K to 500M

no male open used

#### Male Calibration 50K to 900M no male open used

		—		×				_		
libration standards					-0	Calibration standards				
Use ideal values					[	Use ideal values				
Short						Short				
L0 (H(e-12))	0					L0 (H(e-12))	0			
L1 (H(e-24))	0					L1 (H(e-24))	0			
L2 (H(e-33))	0					L2 (H(e-33))	0			
L3 (H(e-42))	0					L3 (H(e-42))	0			
Offset Delay (ps)	0.176					Offset Delay (ps)	0.035			
Open						Open				
C0 (F(e-15))	19.6					C0 (F(e-15))	19.6			
C1 (F(e-27))	0					C1 (F(e-27))	0			
C2 (F(e-36))	0					C2 (F(e-36))	0			
C3 (F(e-45))	0					C3 (F(e-45))	0			
Offset Delay (ps)	0					Offset Delay (ps)	0			
Load						Load				
Resistance (Ω)	49.846					Resistance (Ω)	49.846			
Inductance (H(e-1	2)) -267					Inductance (H(e-12	.)) -297.5			
Offset Delay (ps)	-6.43					Offset Delay (ps)	4.514			
Through						Through				
Offset Delay (ps)	0					Offset Delay (ps)	0			
Saved settings						Saved settings				
Male NanoVNA-	H 50K to 500M			$\sim$		Male NanoVNA-H	1 50K to 900M			~
Load	Save		Delete			Load	Save		Delete	

#### Female calibration 50K to 500M no male open used

#### Female Calibration 50K to 900M no male open used

		_		×				—		
libration standards					c	alibration standards				
Use ideal values						Use ideal values				
Short						Short				
L0 (H(e-12))	0					L0 (H(e-12))	0			
L1 (H(e-24))	0					L1 (H(e-24))	0			
L2 (H(e-33))	0					L2 (H(e-33))	0			
L3 (H(e-42))	0					L3 (H(e-42))	0			
Offset Delay (ps)	51.28			=		Offset Delay (ps)	51.16			
0	L					Open				
Open						C0 (F(e-15))	10.0			
C0 (F(e-15))	19.6						19.6			_
C1 (F(e-27))	0					C1 (F(e-27))	0			
C2 (F(e-36))	0					C2 (F(e-36))	0			
C3 (F(e-45))	0					C3 (F(e-45))	0			
Offset Delay (ps)	49.32			=		Offset Delay (ps)	49.53			
Load						Load				
Resistance (Ω)	49.854					Resistance (Ω)	49.854			
Inductance (H(e-1				=		Inductance (H(e-12	)) -205			
Offset Delay (ps)	3.945					Offset Delay (ps)	61.59			
Through						Through				
Offset Delay (ps)	50.7					Offset Delay (ps)	50.7			
Saved settings						Saved settings				
Female NanoVN	A-H 50K to 50	DM		$\sim$		Female NanoVNA	A-H 50K to 90	OM		$\sim$
Load	Save		Delete			Load	Save		Delete	

# Male calibration 50K to 500M

# Male Calibration 50K to 900M

Male open used

Male open used 

Female calibration 50K to 500M

#### Male open used

#### Female Calibration 50K to 900M Male open used

		—		×	] _			_		
libration standards					G	alibration standards				
Use ideal values						Use ideal values				
Short					ſ	Short				
L0 (H(e-12))	0					L0 (H(e-12))	0			
L1 (H(e-24))	0					L1 (H(e-24))	0			
L2 (H(e-33))	0					L2 (H(e-33))	0			
L3 (H(e-42))	0					L3 (H(e-42))	0			
Offset Delay (ps)	51.28					Offset Delay (ps)	51.16			
Open						Open				
C0 (F(e-15))	43						22.4			
				-		C0 (F(e-15))	32.4			
C1 (F(e-27))	0					C1 (F(e-27))	0			
C2 (F(e-36))	0					C2 (F(e-36))	0			
C3 (F(e-45))	0					C3 (F(e-45))	0			
Offset Delay (ps)	48.71					Offset Delay (ps)	49.51			
Load						Load				
Resistance (Ω)	49.854					Resistance (Ω)	49.854			
Inductance (H(e-12	2)) -171					Inductance (H(e-12	.)) -205			
Offset Delay (ps)	3.945					Offset Delay (ps)	61.59			
Through						Through				
Offset Delay (ps)	50.7					Offset Delay (ps)	50.7			
Saved settings						Saved settings				
Female wMO Na	noVNA-H 50k	( to 500M	И	$\sim$		Female wMO Na	noVNA-H 50H	( to 900M		$\sim$
Load	Save		Delete			Load	Save		Delete	

26-11-2019 Kurt Poulsen