VieRDS: Informal Documentation

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Abstract

A informal documentation of VieRDS is presented. This documentation describes download and installation, how to run the software, and several examples with results are presented. The results are presented by fourfit plots obtain from DiFX correlation. All examples can be reproduced by using the corresponding input_val.yaml files which are shown next to the fourfit plots. More information of the algorithms are shown in the corresponding PASP article.

VLBI, raw telescope data, simulations

1 Download and Installation

Download or clone the repository to your directory (e.g. /home/jakob/software/BasebandSim). The folder contains a CODE/ folder, a DIFX/ folder, and an EXAMPLES/ folder. In the CODE/ folder the Matlab library of VieRDS is stored. In the DIFX/ folder auxiliary scripts are stored to run DiFX and fourfit. In the EXAMPLES/ folder examples of VieRDS simulations are stored.

The main function of VieRDS is vierds.m. This function needs to be executed to run VieRDS. The function vierds.m requires one argument: the input_val.yaml file. In the next section 2 an example of how to execute VieRDS is presented. In section 6 several examples are presented to realize simulations with VieRDS.

2 Run

2.1 With Matlab Installation from Linux Command Line

VieRDS is configured by one input text file. It is called input_val.yaml. Several examples of the input_val.yaml file can be found in section 6.

To run VieRDS under Linux execute

```
/usr/local/MATLAB/R2020a/bin/matlab -c ~/.matlab/R2020a_licenses/license_jgruber1_338656_
-r 'vierds_input_val.yaml; exit;'
```

Description of command:

```
/usr/local/MATLAB/R2020a/bin/matlab ... Matlab installation directory
-c ~/.matlab/R2020a_licenses/license_jgruber1_338656_R2020a.lic ... path to licen
-nodisplay -nosplash -nodesktop ...  run it without the GUI
-r 'vierds_input_val.yaml; exit;' ...
... run vierds.m script with argument input_val.yaml
```

2.2 Without Matlab Installation from Linux Command Line

3 Software Output

When you run vierds.m a output folder according to the processing time tag will be created. The output folder will stored in OUT/.

4 DiFX Correlation and Fourfit Fringe-Fitting

To process the simulated basebandata go to the output folder described in section 3 and execute:

```
DIFX/easy_corr.sh
```

Make sure to edit the lines in the machines file name according to your machine name.

5 Zero Baseline and Non-Zero Baseline Simulation

When simulating VLBI raw data, one can distinguish between two methods: zero baseline simulation and non-zero baseline simulation.

During VLBI observation, there is not only a signal shift (delay), but also a signal distortion. The latter is caused by the temporal change of the observation geometry (delay rate), e.g. due to the earth rotation with respect to the fixed radio source. The signal distortion is corrected in the correlation process by means of so-called fringe rotation. Since the fringe rotation is not completely error-free (the larger the bandwidth, the larger the error), the signals cannot be corrected error-free.

Therefore, zero baseline simulation is a suitable method for error-free investigation of systematic influences in raw data simulation. In this method, the stations involved are placed at the same point in space. Therefore, the same signal distortion or correction occurs in the correlation process. Since the same signal distortion occurs, the simulation of this influence is completely omitted. This saves an enormous computational effort. In summary, zero baseline simulation is a very good method to simulate raw data in a computationally efficient way and to investigate systematic influences without correction caused by fringe rotation, which is not error-free.

In the non-zero baseline simulation the actual signal distortion is simulated. Significantly more computational effort is involved and the correlation products include error due to fringe rotation.

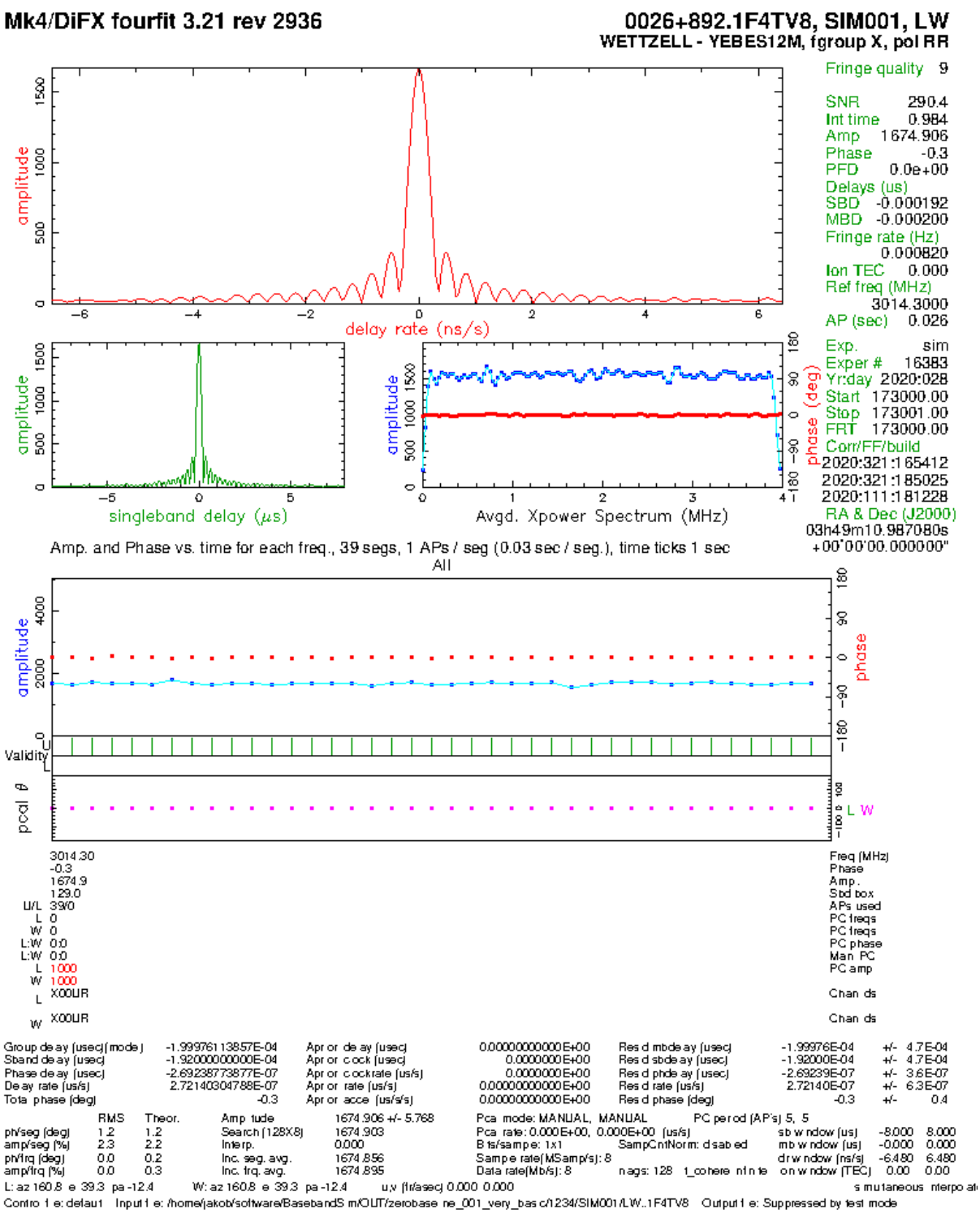
6 Simulation Examples

In this section, several examples for simulations with VieRDS are presented. The input_val.yaml file is shown and the corresponding fourfit fringe-plots are shown. To reproduce the results, copy the presented input_val.yaml file to the head of the VieRDS folder and execute the command shown in section 2.

6.1 Zero Baseline Simulation

6.1.1 Very Basic

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: WETTZELL
  station_name_trf_coord: Wz
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 10
  fluxdensity_system: 50
  f0: 3016.30
  number_of_bits: 1
  source_name: 0026+892
  bandpass_filter_name: default
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 10
  fluxdensity_system: 50
  f0: 3016.30
  number_of_bits: 1
  source_name: 0026+892
  bandpass_filter_name: default
```


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4TV8, SIM001, LW
WETTZELL - YEBES12M, fgroup X, pol RR
Fringe quality 9
SNR 290.4
Int time 0.984
Amp 1674.906
Phase -0.3
PFD 0.0e+00
Delays (us)
SBD -0.000192
MBD -0.000200
Fringe rate (Hz)
0.000820
Ion TEC 0.000
Ref freq (MHz)
3014.3000
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:165412
2020:321:185025
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
amplitude
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
phase (deg)
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
All
Validity
pcal θ
L W
3014.30 Freq (MHz)
-0.3 Phase
1674.9 Amp.
129.0 Sbd box
U/L 39/0 APs used
L 0 PC freqs
W 0 PC freqs
L:W 0:0 PC phase
L:W 0:0 Man PC
L 1000 PC amp
W 1000
L X00UR Chan ds
W X00UR Chan ds
Group delay (usec)(mode) -1.999761138 57E-04 Apriori delay (usec) 0.000000000000E+00 Resid mbdelay (usec) -1.99976E-04 +/- 4.7E-04
Sband delay (usec) -1.920000000000E-04 Apriori clock (usec) 0.000000000000E+00 Resid sbdelay (usec) -1.92000E-04 +/- 4.7E-04
Phase delay (usec) -2.692387738 77E-07 Apriori clockrate (us/s) 0.000000000000E+00 Resid phdelay (usec) -2.69239E-07 +/- 3.6E-07
Delay rate (us/s) 2.721403047 88E-07 Apriori rate (us/s) 0.000000000000E+00 Resid rate (us/s) 2.72140E-07 +/- 6.3E-07
Total phase (deg) -0.3 Apriori accel (us/s/s) 0.000000000000E+00 Resid phase (deg) -0.3 +/- 0.4
RMS Theor. Amplitude 1674.906 +/- 5.768 Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
ph/seg (deg) 1.2 1.2 Search (128X8) 1674.903 Pcal rate: 0.000E+00, 0.000E+00 (us/s) sbwindow (us) -8.000 8.000
amp/seg (%) 2.3 2.2 Interp. 0.000 Bits/sample: 1x1 SampCntNorm: disabled mbwindow (us) -0.000 0.000
ph/frq (deg) 0.0 0.2 Inc. seg. avg. 1674.856 Sample rate(MSamp/s): 8 drwindow (ns/s) -6.480 6.480
amp/frq (%) 0.0 0.3 Inc. frq. avg. 1674.895 Data rate(Mb/s): 8 nags: 128 t_cohere nfnte onwindow (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4 W: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000 simultaneous interpolat
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/zerobase_ne_001_very_basic/1234/SIM001/LW..1F4TV8 Output file: Suppressed by test mode

6.1.2 Arbitrary Magnitude Filter: Station Frequency Response

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 64
  scan_length: 1
  fluxdensity_targetsource: 50
  fluxdensity_system: 50
  f0: 3016.30
  number_of_bits: 2
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  bandpass_filter_name: default
  arb_mag_file_1: K2.txt
  arb_mag_filter_signal_type_1: super
  arb_mag_interpolation_res_1: 1e3
  arb_mag_filter_order: 300
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 64
  scan_length: 1
  fluxdensity_targetsource: 10
  fluxdensity_system: 50
  f0: 3016.30
  number_of_bits: 2
  source_name: 0026+892
  bandpass_filter_name: default
```

F (GHz)	Mag
3.000400	0.044193
3.000650	0.062204
3.000900	0.103179
3.001150	0.183057
3.001400	0.261378
3.001650	0.393336
3.001900	0.543534
3.002150	0.700005
3.002400	0.876209
3.002650	1.053162
3.002900	1.232959
3.003150	1.412478
3.003400	1.590275
3.003650	1.754650
3.003900	1.915873
3.004150	2.075617
3.004400	2.227008
3.004650	2.362459
3.004900	2.479694
3.005150	2.578114
3.005400	2.654331
3.005650	2.711728
3.005900	2.757487
3.006150	2.802019
3.006400	2.841063
3.006650	2.871627
3.006900	2.898534
3.007150	2.921241
3.007400	2.937567
3.007650	2.951368
3.007900	2.966399
3.008150	2.972899
3.008400	2.977383
3.008650	2.978795
3.008900	2.978899
3.009150	2.980630
3.009400	2.983068
3.009650	2.979730
3.009900	2.980404
3.010150	2.973435
3.010400	2.957100
3.010650	2.942613
3.010900	2.929595
3.011150	2.914425
3.011400	2.901956
3.011650	2.891284
3.011900	2.882199
3.012150	2.875131
3.012400	2.869162
3.012650	2.866354
3.012900	2.864326
3.013150	2.861510
3.013400	2.859163
3.013650	2.854946
3.013900	2.849708
3.014150	2.849802
3.014400	2.844400
3.014650	2.832448
3.014900	2.823164
3.015150	2.806697
3.015400	2.781994
3.015650	2.760481
3.015900	2.744270
3.016150	2.726962
3.016400	2.717698
3.016650	2.710862
3.016900	2.707471
3.017150	2.706091
3.017400	2.703437
3.017650	2.703482
3.017900	2.703735
3.018150	2.704476
3.018400	2.706426
3.018650	2.709184
3.018900	2.712081
3.019150	2.723395
3.019400	2.731020
3.019650	2.733028
3.019900	2.737126
3.020150	2.732720
3.020400	2.717076
3.020650	2.702468
3.020900	2.690739
3.021150	2.674824
3.021400	2.663886
3.021650	2.654963
3.021900	2.648248
3.022150	2.641970
3.022400	2.637719
3.022650	2.633201
3.022900	2.631797
3.023150	2.627386
3.023400	2.624240
3.023650	2.620748
3.023900	2.620170
3.024150	2.625760
3.024400	2.628006
3.024650	2.621404
3.024900	2.618467
3.025150	2.602479
3.025400	2.572535
3.025650	2.541222
3.025900	2.510501
3.026150	2.466307
3.026400	2.420613
3.026650	2.368399
3.026900	2.308377
3.027150	2.239787
3.027400	2.162666
3.027650	2.077228
3.027900	1.982237
3.028150	1.877392
3.028400	1.761273
3.028650	1.634952
3.028900	1.499963
3.029150	1.359951
3.029400	1.196208
3.029650	1.020491
3.029900	0.865441
3.030150	0.709193
3.030400	0.552803
3.030650	0.420985
3.030900	0.310697
3.031150	0.195493
3.031400	0.149515
3.031650	0.097383
3.031900	0.079180
3.032150	0.079675

Figure 1: Frequency-Magnitude table for the simulation of an arbitrary magnitude filter. Copy the values without the header to a text file called K2.txt as specified by the parameter "arb_mag_file_1" to run the simulation.

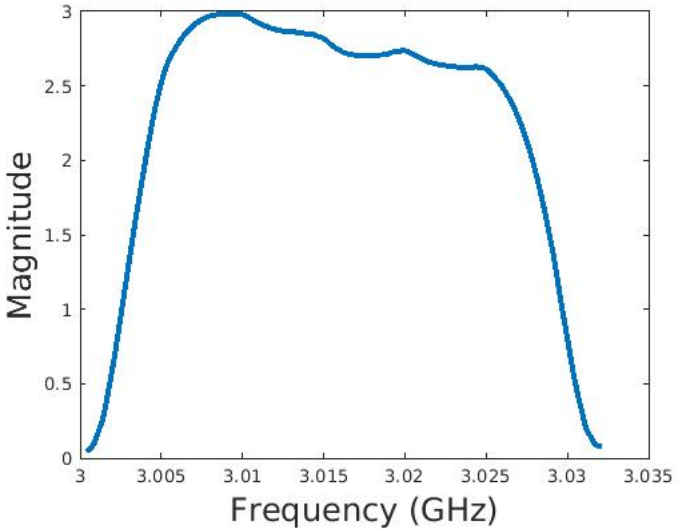
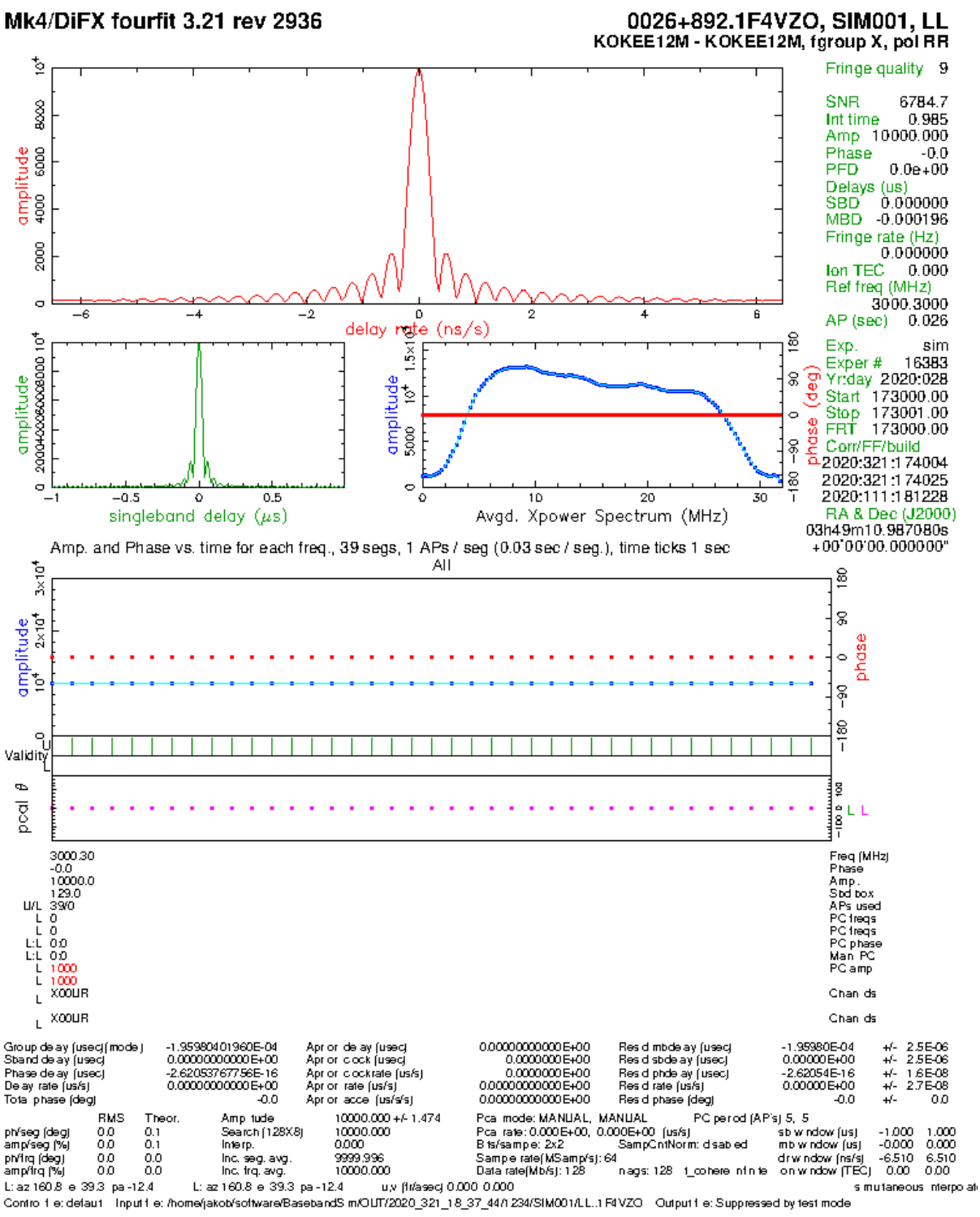
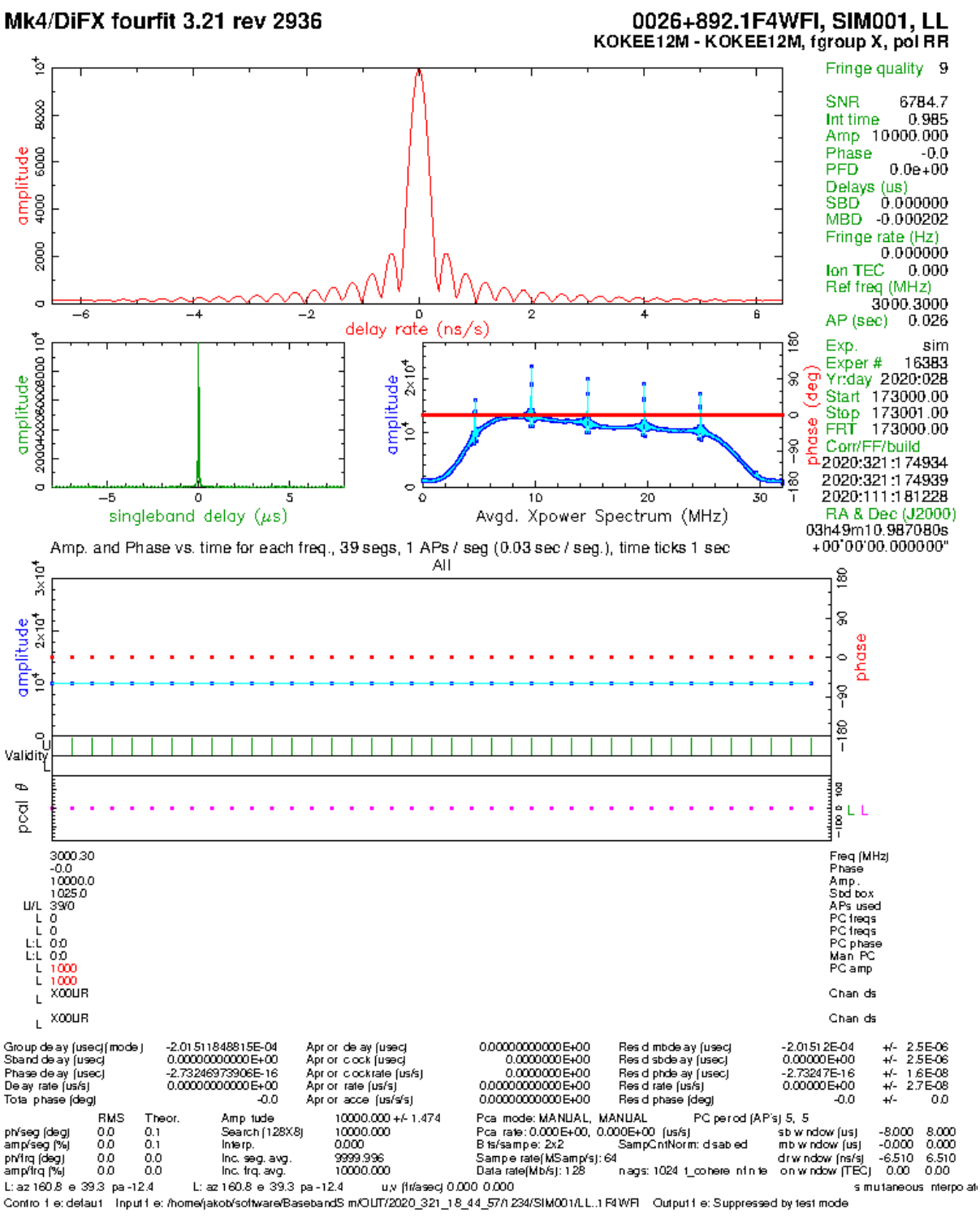


Figure 2: Plot of the values listed in the Figure 1


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4VZO, SIM001, LL
KOKEE12M - KOKEE12M, fgroup X, pol RR
Fringe quality 9
SNR 6784.7
Int time 0.985
Amp 10000.000
Phase -0.0
PFD 0.0e+00
Delays (us)
SBD 0.000000
MBD -0.000196
Fringe rate (Hz)
0.000000
Ion TEC 0.000
Ref freq (MHz)
3000.3000
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:174004
2020:321:174025
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
amplitude
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
phase (deg)
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
All
Validity
pcal θ
phase
Freq (MHz)
Phase
Amp.
Sbd box
APs used
PC freqs
PC freqs
PC phase
Man PC
PC amp
Chan ds
Chan ds
Group delay (usec)(mode) -1.959804019 60E-04
Sband delay (usec) 0.000000000 00E+00
Phase delay (usec) -2.620537677 56E-16
Delay rate (us/s) 0.000000000 00E+00
Total phase (deg) -0.0
Apriori delay (usec) 0.000000000 00E+00
Apriori clock (usec) 0.000000E+00
Apriori clockrate (us/s) 0.000000E+00
Apriori rate (us/s) 0.000000000 00E+00
Apriori accel (us/s/s) 0.000000000 00E+00
Resid mbdelay (usec) -1.95980E-04 +/- 2.5E-06
Resid sbdelay (usec) 0.00000E+00 +/- 2.5E-06
Resid phdelay (usec) -2.62054E-16 +/- 1.6E-08
Resid rate (us/s) 0.00000E+00 +/- 2.7E-08
Resid phase (deg) -0.0 +/- 0.0
RMS Theor.
ph/seg (deg) 0.0 0.1
amp/seg (%) 0.0 0.1
ph/frq (deg) 0.0 0.0
amp/frq (%) 0.0 0.0
Amplitude 10000.000 +/- 1.474
Search (128X8) 10000.000
Interp. 0.000
Inc. seg. avg. 9999.996
Inc. frq. avg. 10000.000
Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
Pcal rate: 0.000E+00, 0.000E+00 (us/s)
Bits/sample: 2x2 SampCntNorm: disabled
Sample rate(MSamp/s): 64
Data rate(Mb/s): 128 nags: 128 t_coherence
sbwindow (us) -1.000 1.000
mbwindow (us) -0.000 0.000
drwindow (ns/s) -6.510 6.510
onwindow (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4
L: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000
simultaneous interpolation
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_18_37_44/1234/SIM001/LL..1F4VZO Output file: Suppressed by test mode

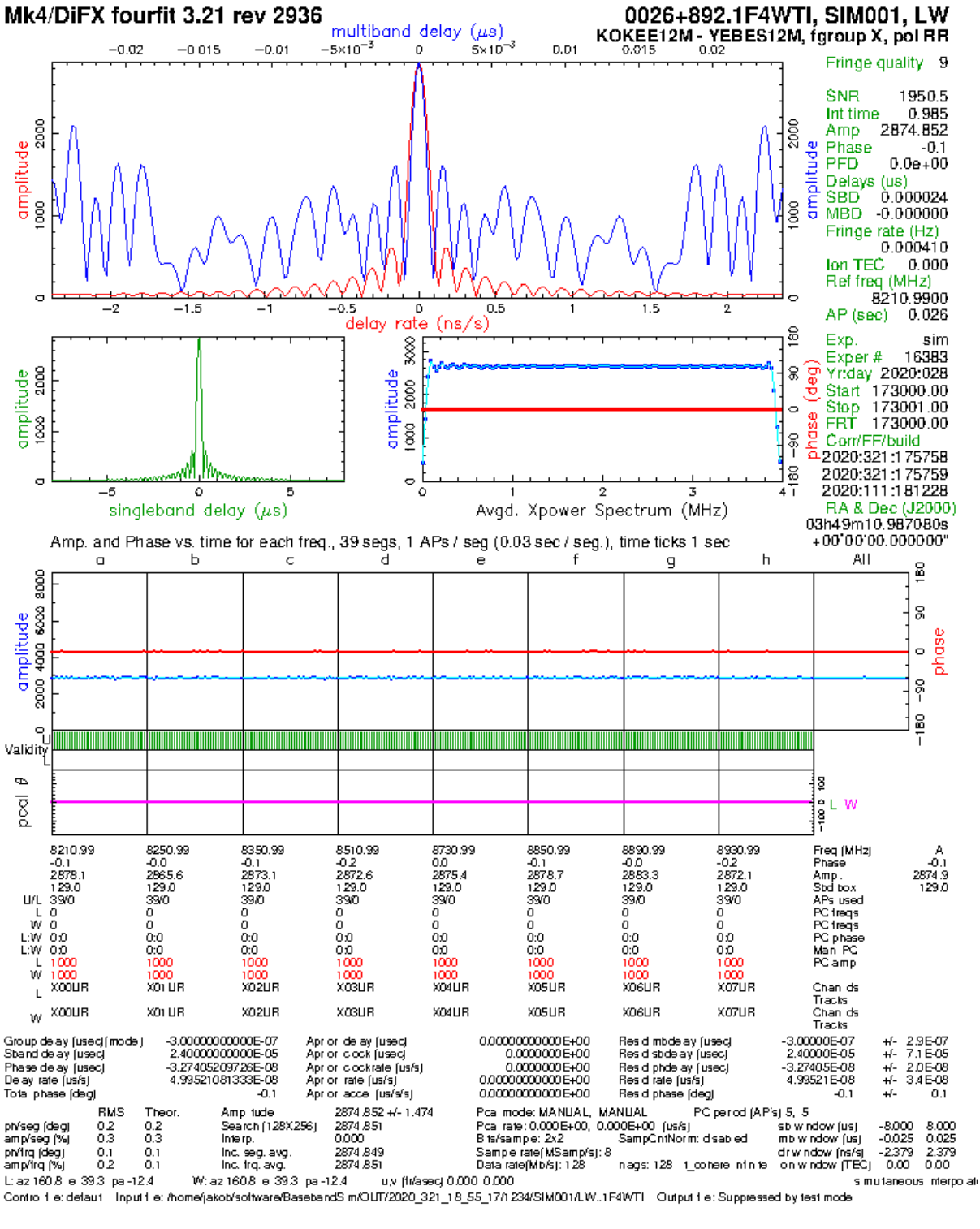
6.1.3 Phase Calibration Signal

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 64
  scan_length: 1
  fluxdensity_targetsource: 50
  fluxdensity_system: 50
  f0: 3016.30
  number_of_bits: 2
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  bandpass_filter_name: default
  arb_mag_file_1: K2.txt
  arb_mag_filter_signal_type_1: super
  arb_mag_interpolation_res_1: 1e3
  arb_mag_filter_order: 300
  phase_cal_tone_power_perc: 0.9
  phase_cal_repetition_rate: 5.0
  phase_cal_phase_offset: 0
  phase_cal_frequency_offset: -310000
  phase_cal_delay: 0.0
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 64
  scan_length: 1
  fluxdensity_targetsource: 10
  fluxdensity_system: 50
  f0: 3016.30
  number_of_bits: 2
  source_name: 0026+892
  bandpass_filter_name: default
```


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4WFI, SIM001, LL
KOKEE12M - KOKEE12M, fgroup X, pol RR
Fringe quality 9
SNR 6784.7
Int time 0.985
Amp 10000.000
Phase -0.0
PFD 0.0e+00
Delays (us)
SBD 0.000000
MBD -0.000202
Fringe rate (Hz)
0.000000
Ion TEC 0.000
Ref freq (MHz)
3000.3000
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:174934
2020:321:174939
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
amplitude
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
phase (deg)
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
All
Validity
pcal θ
Freq (MHz)
Phase
Amp.
Sbd box
APs used
PC freqs
PC freqs
PC phase
Man PC
PC amp
Chan ds
Chan ds
Group delay (usec)(mode) -2.015118488815E-04
Sband delay (usec) 0.000000000000E+00
Phase delay (usec) -2.732469739086E-16
Delay rate (us/s) 0.000000000000E+00
Total phase (deg) -0.0
Apriori delay (usec) 0.000000000000E+00
Apriori clock (usec) 0.000000E+00
Apriori clockrate (us/s) 0.000000000000E+00
Apriori rate (us/s) 0.000000000000E+00
Apriori accel (us/s/s) 0.000000000000E+00
Resid mbdelay (usec) -2.01512E-04 +/- 2.5E-06
Resid sbdelay (usec) 0.00000E+00 +/- 2.5E-06
Resid phdelay (usec) -2.73247E-16 +/- 1.6E-08
Resid rate (us/s) 0.00000E+00 +/- 2.7E-08
Resid phase (deg) -0.0 +/- 0.0
RMS Theor.
ph/seg (deg) 0.0 0.1
amp/seg (%) 0.0 0.1
ph/frq (deg) 0.0 0.0
amp/frq (%) 0.0 0.0
Amplitude 10000.000 +/- 1.474
Search (128X8) 10000.000
Interp. 0.000
Inc. seg. avg. 9999.996
Inc. frq. avg. 10000.000
Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
Pcal rate: 0.000E+00, 0.000E+00 (us/s)
Bits/sample: 2x2 SampCntNorm: disabled
Sample rate(MSamp/s): 64
Data rate(Mb/s): 128 nags: 1024 t_cohere nfnte
sb window (us) -8.000 8.000
mb window (us) -0.000 0.000
dr window (ns/s) -6.510 6.510
on window (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4
L: az 160.8 el 39.3 pa -12.4
u,v (fr/asec) 0.000 0.000
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_18_44_57/1234/SIM001/LL..1F4WFI Output file: Suppressed by test mode

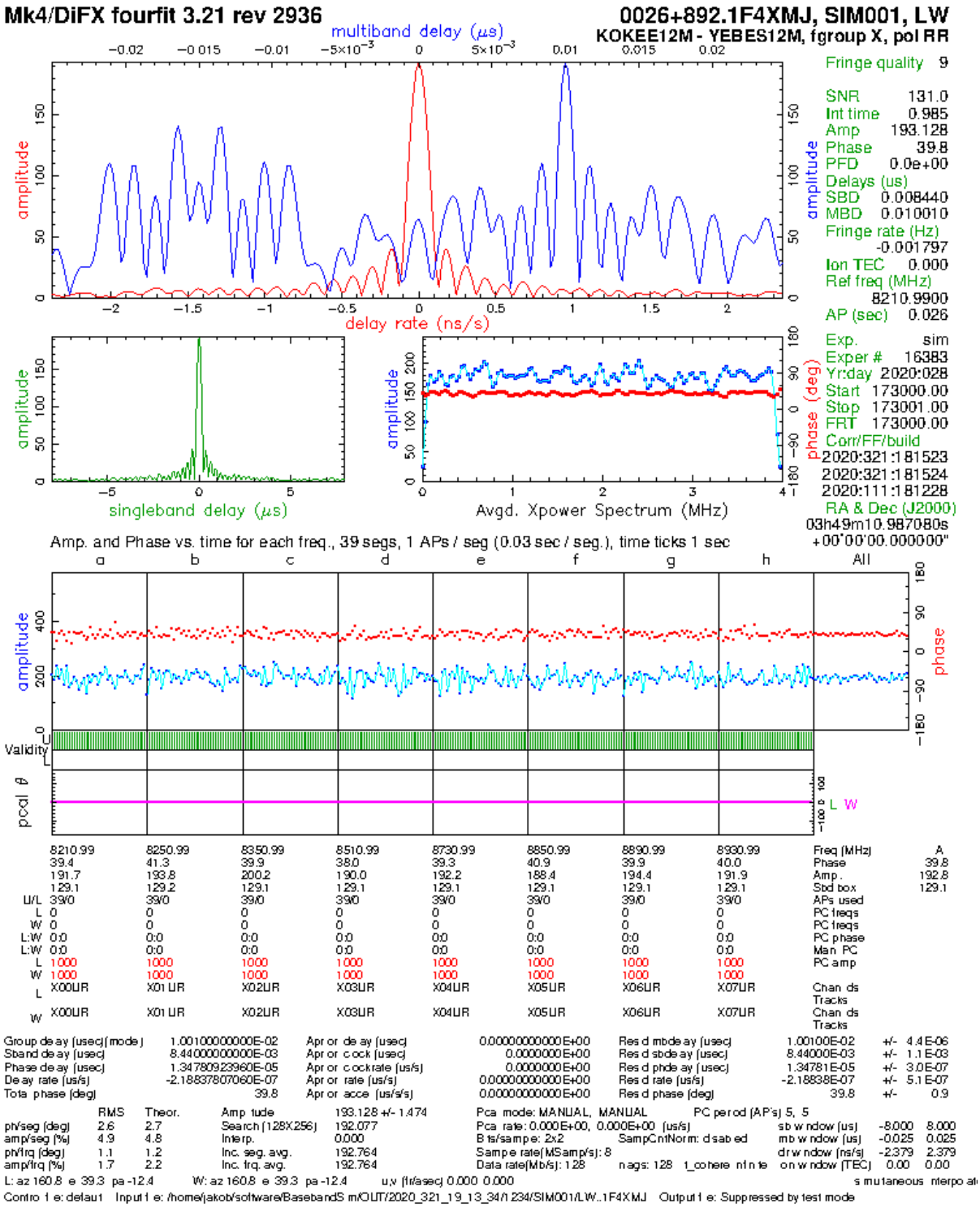
6.1.4 8 Channel X-band

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 50
  fluxdensity_system: 50
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  bandpass_filter_name: default
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 10
  fluxdensity_system: 50
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  source_name: 0026+892
  bandpass_filter_name: default
```


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4WTI, SIM001, LW
KOKEE12M - YEBES12M, fgroup X, pol RR
multiband delay (μs)
delay rate (ns/s)
amplitude
Fringe quality 9
SNR 1950.5
Int time 0.985
Amp 2874.852
Phase -0.1
PFD 0.0e+00
Delays (us)
SBD 0.000024
MBD -0.000000
Fringe rate (Hz)
0.000410
Ion TEC 0.000
Ref freq (MHz)
8210.9900
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:175758
2020:321:175759
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
phase (deg)
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
a b c d e f g h All
Validity
pcal θ
L W
8210.99 8250.99 8350.99 8510.99 8730.99 8850.99 8890.99 8930.99 Freq (MHz) A
-0.1 -0.0 -0.1 -0.2 0.0 -0.1 -0.0 -0.2 Phase -0.1
2878.1 2865.6 2873.1 2872.6 2875.4 2878.7 2883.3 2872.1 Amp. 2874.9
129.0 129.0 129.0 129.0 129.0 129.0 129.0 129.0 Sbd box 129.0
U/L 39/0 39/0 39/0 39/0 39/0 39/0 39/0 39/0 APs used
L 0 0 0 0 0 0 0 0 PC freqs
W 0 0 0 0 0 0 0 0 PC freqs
L:W 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 PC phase
L:W 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 Man PC
L 1000 1000 1000 1000 1000 1000 1000 1000 PC amp
W 1000 1000 1000 1000 1000 1000 1000 1000
L X00UR X01UR X02UR X03UR X04UR X05UR X06UR X07UR Chan ds
Tracks
W X00UR X01UR X02UR X03UR X04UR X05UR X06UR X07UR Chan ds
Tracks
Group delay (usec)(mode) -3.000000000000E-07 Apriori delay (usec) 0.000000000000E+00 Resid mbdelay (usec) -3.000000E-07 +/- 2.9E-07
Sband delay (usec) 2.400000000000E-05 Apriori clock (usec) 0.000000000000E+00 Resid sbdelay (usec) 2.400000E-05 +/- 7.1E-05
Phase delay (usec) -3.274052097268E-08 Apriori clockrate (us/s) 0.000000000000E+00 Resid phdelay (usec) -3.274052E-08 +/- 2.0E-08
Delay rate (us/s) 4.995210813338E-08 Apriori rate (us/s) 0.000000000000E+00 Resid rate (us/s) 4.995210E-08 +/- 3.4E-08
Total phase (deg) -0.1 Apriori accel (us/s/s) 0.000000000000E+00 Resid phase (deg) -0.1 +/- 0.1
RMS Theor. Amplitude 2874.852 +/- 1.474 Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
ph/seg (deg) 0.2 0.2 Search (128X256) 2874.851 Pcal rate: 0.000E+00, 0.000E+00 (us/s) sbwindow (us) -8.000 8.000
amp/seg (%) 0.3 0.3 Interp. 0.000 Bits/sample: 2x2 SampCntNorm: disabled mbwindow (us) -0.025 0.025
ph/frq (deg) 0.1 0.1 Inc. seg. avg. 2874.849 Sample rate(MSamp/s): 8 drwindow (ns/s) -2.379 2.379
amp/frq (%) 0.2 0.1 Inc. frq. avg. 2874.851 Data rate(Mb/s): 128 nags: 128 t_cohere nfnte onwindow (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4 W: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000 simultaneous interpolat
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_18_55_17/1234/SIM001/LW..1F4WTI Output file: Suppressed by test mode

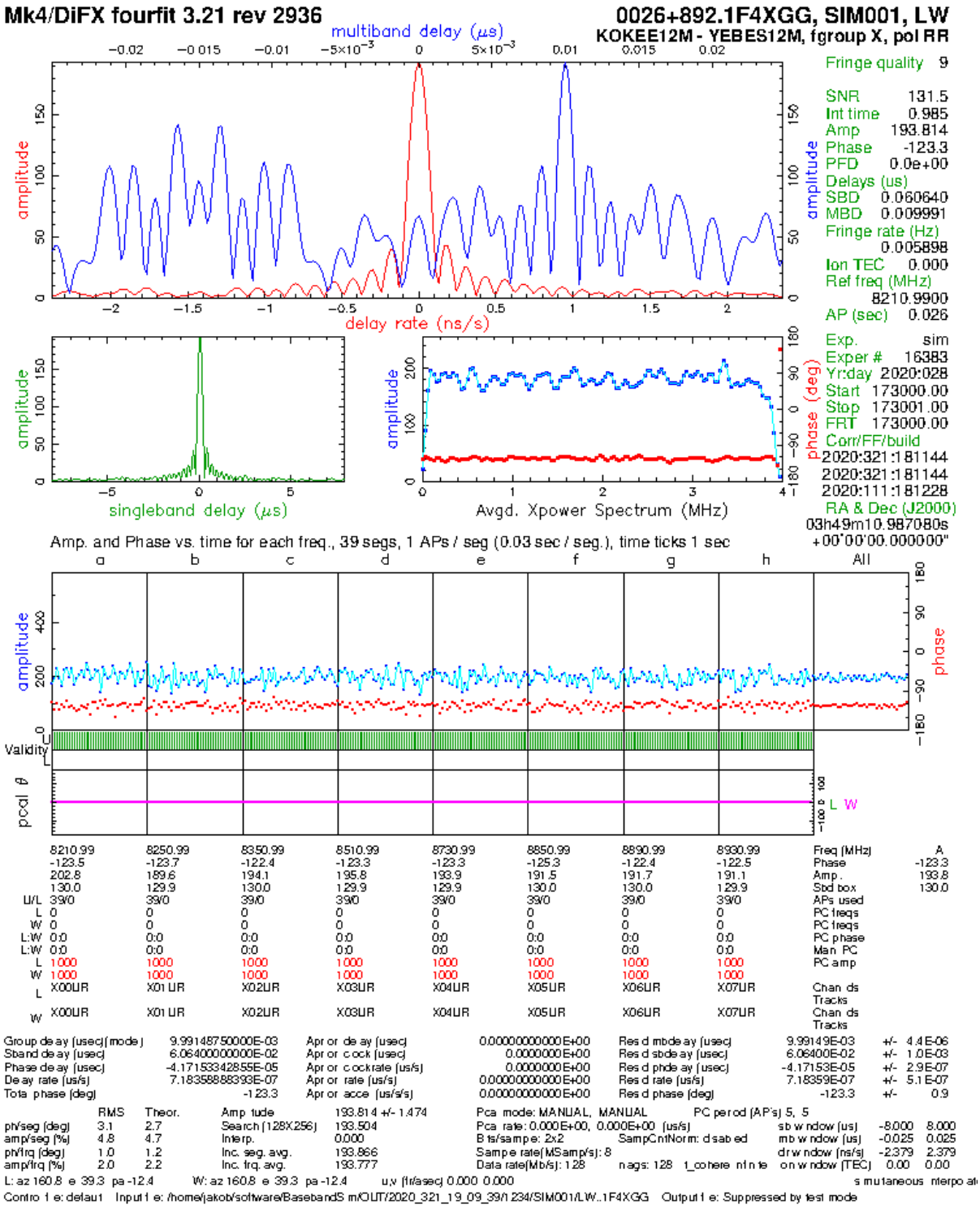
6.1.5 8 Channel X-band plus 10 ns Multiband Delay

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 1
  fluxdensity_system: 50
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  bandpass_filter_name: default
  delay_source: 10
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 1
  fluxdensity_system: 50
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  source_name: 0026+892
  bandpass_filter_name: default
```


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4XMJ, SIM001, LW
KOKEE12M - YEBES12M, fgroup X, pol RR
multiband delay (μs)
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
amplitude
phase (deg)
Fringe quality 9
SNR 131.0
Int time 0.985
Amp 193.128
Phase 39.8
PFD 0.0e+00
Delays (us)
SBD 0.008440
MBD 0.010010
Fringe rate (Hz)
-0.001797
Ion TEC 0.000
Ref freq (MHz)
8210.9900
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:181523
2020:321:181524
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
a b c d e f g h All
Validity
pcal θ
L W
8210.99 8250.99 8350.99 8510.99 8730.99 8850.99 8890.99 8930.99 Freq (MHz) A
39.4 41.3 39.9 38.0 39.3 40.9 39.9 40.0 Phase 39.8
191.7 193.8 200.2 190.0 192.2 188.4 194.4 191.9 Amp. 192.8
129.1 129.2 129.1 129.1 129.1 129.1 129.1 129.1 Sbd box 129.1
U/L 39/0 39/0 39/0 39/0 39/0 39/0 39/0 39/0 APs used
L 0 0 0 0 0 0 0 0 PC freqs
W 0 0 0 0 0 0 0 0 PC freqs
L:W 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 PC phase
L:W 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 Man PC
L 1000 1000 1000 1000 1000 1000 1000 1000 PC amp
W 1000 1000 1000 1000 1000 1000 1000 1000
L X00UR X01UR X02UR X03UR X04UR X05UR X06UR X07UR Chan ds
Tracks
W X00UR X01UR X02UR X03UR X04UR X05UR X06UR X07UR Chan ds
Tracks
Group delay (usec)(mode) 1.00100000000E-02 Apr or delay (usec) 0.00000000000E+00 Resid mbdelay (usec) 1.00100E-02 +/- 4.4E-06
Sband delay (usec) 8.44000000000E-03 Apr or clock (usec) 0.00000000E+00 Resid sbdelay (usec) 8.44000E-03 +/- 1.1E-03
Phase delay (usec) 1.34780923960E-05 Apr or clockrate (us/s) 0.00000000E+00 Resid phdelay (usec) 1.34781E-05 +/- 3.0E-07
Delay rate (us/s) -2.18837807060E-07 Apr or rate (us/s) 0.00000000000E+00 Resid rate (us/s) -2.18838E-07 +/- 5.1E-07
Total phase (deg) 39.8 Apr or accel (us/s/s) 0.00000000000E+00 Resid phase (deg) 39.8 +/- 0.9
RMS Theor. Amplitude 193.128 +/- 1.474 Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
ph/seg (deg) 2.6 2.7 Search (128X256) 192.077 Pcal rate: 0.000E+00, 0.000E+00 (us/s) sbwindow (us) -8.000 8.000
amp/seg (%) 4.9 4.8 Interp. 0.000 Bits/sample: 2x2 SampCntNorm: disabled mbwindow (us) -0.025 0.025
ph/frq (deg) 1.1 1.2 Inc. seg. avg. 192.764 Sample rate(MSamp/s): 8 drwindow (ns/s) -2.379 2.379
amp/frq (%) 1.7 2.2 Inc. frq. avg. 192.764 Data rate(Mb/s): 128 nags: 128 t_coherence onwindow (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4 W: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000 simultaneous interpolat
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_19_13_34/1234/SIM001/LW..1F4XMJ Output file: Suppressed by test mode

6.1.6 8 Channel X-band plus 60 ns Multiband Delay

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 1
  fluxdensity_system: 50
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  bandpass_filter_name: default
  delay_source: 60
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: 1
  fluxdensity_system: 50
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  source_name: 0026+892
  bandpass_filter_name: default
```



	8210.99	8250.99	8350.99	8510.99	8730.99	8850.99	8890.99	8930.99	Freq (MHz)	A
	-123.5	-123.7	-122.4	-123.3	-123.3	-125.3	-122.4	-122.5	Phase	-123.3
	202.8	189.6	194.1	195.8	193.9	191.5	191.7	191.1	Amp.	193.8
	130.0	129.9	130.0	129.9	129.9	130.0	130.0	129.9	Sbd box	130.0
U/L	39/0	39/0	39/0	39/0	39/0	39/0	39/0	39/0	APs used	
L	0	0	0	0	0	0	0	0	PC freqs	
W	0	0	0	0	0	0	0	0	PC freqs	
L:W	0:0	0:0	0:0	0:0	0:0	0:0	0:0	0:0	PC phase	
L:W	0:0	0:0	0:0	0:0	0:0	0:0	0:0	0:0	Man PC	
L	1000	1000	1000	1000	1000	1000	1000	1000	PC amp	
W	1000	1000	1000	1000	1000	1000	1000	1000		
L	X00UR	X01UR	X02UR	X03UR	X04UR	X05UR	X06UR	X07UR	Chan ds	
									Tracks	
W	X00UR	X01UR	X02UR	X03UR	X04UR	X05UR	X06UR	X07UR	Chan ds	
									Tracks	

Group delay (usec)(mode)	9.99148750000E-03	Apr or delay (usec)	0.00000000000E+00	Res d mbdelay (usec)	9.99149E-03	+/-	4.4E-06
Sband delay (usec)	6.06400000000E-02	Apr or clock (usec)	0.00000000E+00	Res d sbdelay (usec)	6.06400E-02	+/-	1.0E-03
Phase delay (usec)	-4.17153342855E-05	Apr or clockrate (us/s)	0.00000000E+00	Res d phdelay (usec)	-4.17153E-05	+/-	2.9E-07
Delay rate (us/s)	7.18358888393E-07	Apr or rate (us/s)	0.00000000000E+00	Res d rate (us/s)	7.18359E-07	+/-	5.1E-07
Total phase (deg)	-123.3	Apr or acce (us/s/s)	0.00000000000E+00	Res d phase (deg)	-123.3	+/-	0.9

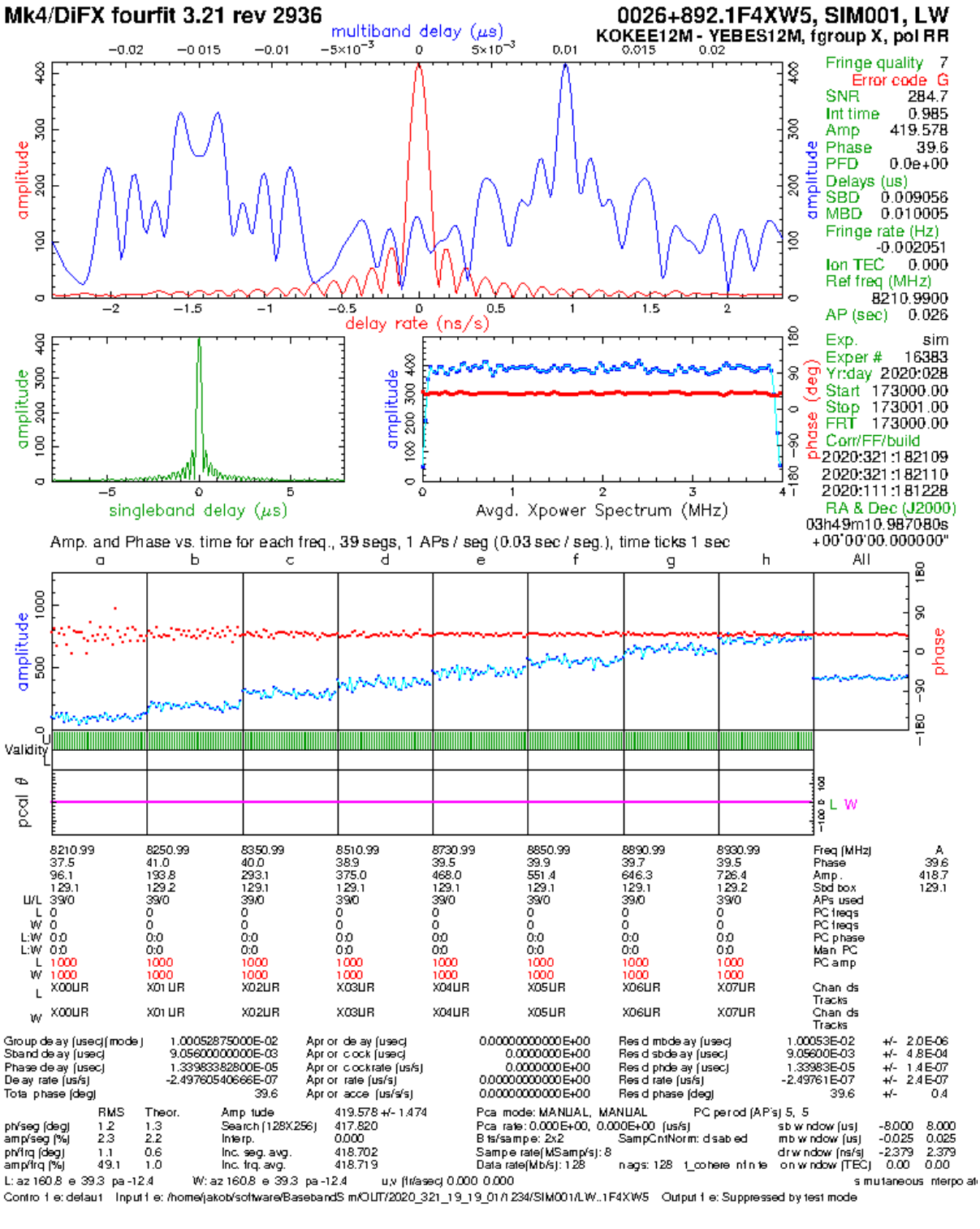
	RMS	Theor.					
			Amplitude	193.814 +/- 1.474	Pcal mode: MANUAL, MANUAL	PC period (AP's) 5, 5	
ph/seg (deg)	3.1	2.7	Search (128X256)	193.504	Pcal rate: 0.000E+00, 0.000E+00 (us/s)	sb window (us)	-8.000 8.000
amp/seg (%)	4.8	4.7	Interp.	0.000	Bits/sample: 2x2 SampCntNorm: disabled	mb window (us)	-0.025 0.025
ph/frq (deg)	1.0	1.2	Inc. seg. avg.	193.866	Sample rate(MSamp/s): 8	dr window (ns/s)	-2.379 2.379
amp/frq (%)	2.0	2.2	Inc. frq. avg.	193.777	Data rate(Mb/s): 128 nags: 128 t_cohere nfnte	on window (TEC)	0.00 0.00

L: az 160.8 el 39.3 pa -12.4 W: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000 simultaneous interpolation

Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_19_09_39/1234/SIM001/LW..1F4XGG Output file: Suppressed by test mode

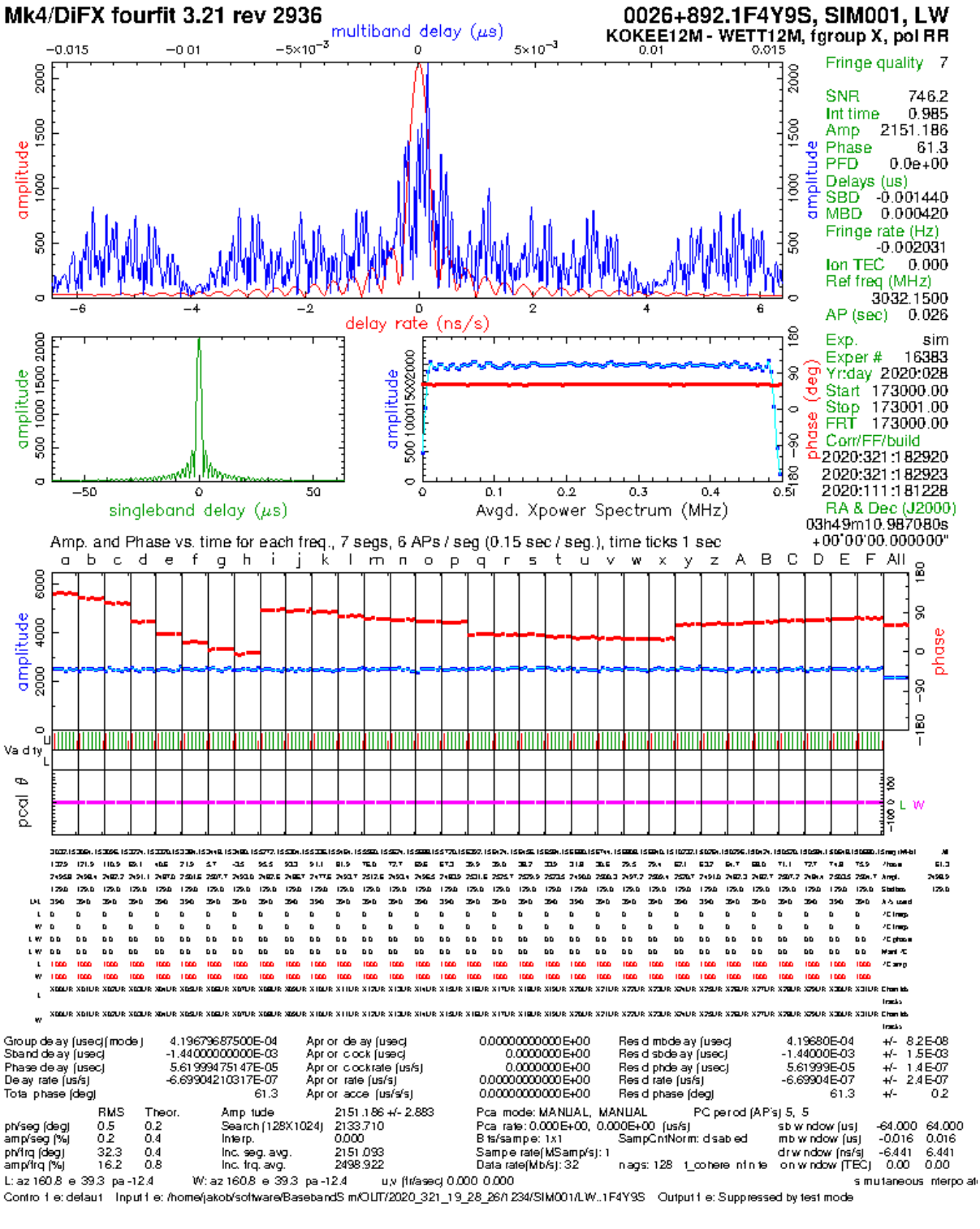
6.1.7 8 Channel X-band with Increasing Source Flux

```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: [1,2,3,4,5,6,7,8]
  fluxdensity_system: 100
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  bandpass_filter_name: default
  delay_source: 10
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: YEBES12M
  station_name_trf_coord: Ys
  sampling_frequency: 8
  scan_length: 1
  fluxdensity_targetsource: [1,2,3,4,5,6,7,8]
  fluxdensity_system: 100
  f0: [8212.99, 8252.99, 8352.99, 8512.99, 8732.99, 8852.99, 8892.99, 8932.99]
  number_of_bits: 2
  source_name: 0026+892
  bandpass_filter_name: default
```


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4XW5, SIM001, LW
KOKEE12M - YEBES12M, fgroup X, pol RR
multiband delay (μs)
amplitude
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
phase (deg)
Fringe quality 7
Error code G
SNR 284.7
Int time 0.985
Amp 419.578
Phase 39.6
PFD 0.0e+00
Delays (us)
SBD 0.009056
MBD 0.010005
Fringe rate (Hz)
-0.002051
Ion TEC 0.000
Ref freq (MHz)
8210.9900
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:182109
2020:321:182110
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
a b c d e f g h All
Validity
pcal θ
L W
8210.99 8250.99 8350.99 8510.99 8730.99 8850.99 8890.99 8930.99 Freq (MHz) A
37.5 41.0 40.0 38.9 39.5 39.9 39.7 39.5 Phase 39.6
96.1 193.8 293.1 375.0 468.0 551.4 646.3 726.4 Amp. 418.7
129.1 129.2 129.1 129.1 129.1 129.1 129.1 129.2 Sbd box 129.1
U/L 39/0 39/0 39/0 39/0 39/0 39/0 39/0 39/0 APs used
L 0 0 0 0 0 0 0 0 PC freqs
W 0 0 0 0 0 0 0 0 PC freqs
L:W 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 PC phase
L:W 0:0 0:0 0:0 0:0 0:0 0:0 0:0 0:0 Man PC
L 1000 1000 1000 1000 1000 1000 1000 1000 PC amp
W 1000 1000 1000 1000 1000 1000 1000 1000
L X00UR X01UR X02UR X03UR X04UR X05UR X06UR X07UR Chan ds
Tracks
W X00UR X01UR X02UR X03UR X04UR X05UR X06UR X07UR Chan ds
Tracks
Group delay (usec)(mode) 1.00052875000E-02 Apr or delay (usec) 0.00000000000E+00 Resid mbdelay (usec) 1.00053E-02 +/- 2.0E-06
Sband delay (usec) 9.05600000000E-03 Apr or clock (usec) 0.00000000E+00 Resid sbdelay (usec) 9.05600E-03 +/- 4.8E-04
Phase delay (usec) 1.33983382800E-05 Apr or clockrate (us/s) 0.00000000E+00 Resid phdelay (usec) 1.33983E-05 +/- 1.4E-07
Delay rate (us/s) -2.49760540666E-07 Apr or rate (us/s) 0.00000000000E+00 Resid rate (us/s) -2.49761E-07 +/- 2.4E-07
Total phase (deg) 39.6 Apr or accel (us/s/s) 0.00000000000E+00 Resid phase (deg) 39.6 +/- 0.4
RMS Theor. Amplitude 419.578 +/- 1.474 Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
ph/seg (deg) 1.2 1.3 Search (128X256) 417.820 Pcal rate: 0.000E+00, 0.000E+00 (us/s) sbwindow (us) -8.000 8.000
amp/seg (%) 2.3 2.2 Interp. 0.000 Bits/sample: 2x2 SampCntNorm: disabled mbwindow (us) -0.025 0.025
ph/frq (deg) 1.1 0.6 Inc. seg. avg. 418.702 Sample rate(MSamp/s): 8 drwindow (ns/s) -2.379 2.379
amp/frq (%) 49.1 1.0 Inc. frq. avg. 418.719 Data rate(Mb/s): 128 nags: 128 t_cohere nfinte onwindow (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4 W: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000 simultaneous interpolat
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_19_19_01/1234/SIM001/LW..1F4XW5 Output file: Suppressed by test mode

6.1.8 VGOS 32 Channel Setup with Dispersive Group Delay due Ionoshpere 8 TEC (sampling frequency 1 MHz, can be simulated on private machine)

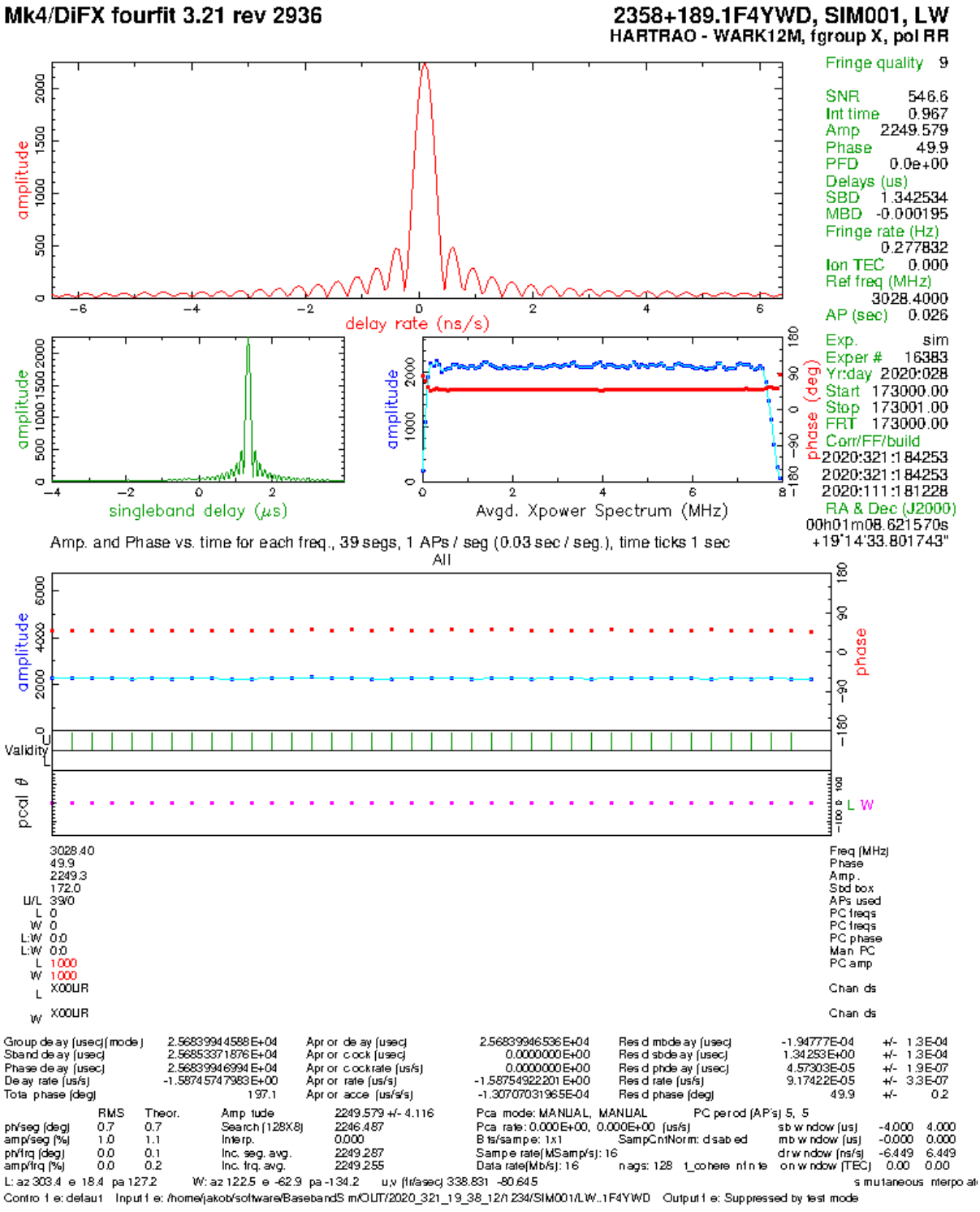
```
setup:
  zero_bl: 1
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: KOKEE12M
  station_name_trf_coord: K2
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 1
  scan_length: 1
  fluxdensity_targetsource: 20
  fluxdensity_system: 60
  f0:
[3032.40,3064.40,3096.40,3224.40,3320.40,3384.40,3448.40,3480.40,5272.40,5304.40
,5336.40,5464.40,5560.40,5624.40,5688.40,5720.40, 6392.40, 6424.40, 6456.40,
6584.40, 6680.40, 6744.40, 6808.40, 6840.40,10232.40, 10264.40, 10296.40,
10424.40, 10520.40, 10584.40, 10648.40, 10680.40]
  number_of_bits: 1
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
  delay_source: [-0.569826, -0.545521, -0.521966, -0.434654, -0.375689,
-0.339136, -0.304599, -0.288041, 0.213037, 0.217692, 0.222263, 0.239753,
0.252085, 0.259957, 0.267566, 0.271275, 0.336757, 0.339373, 0.341950, 0.351885,
0.358965, 0.363518, 0.367943, 0.370109, 0.497263, 0.497902, 0.498536, 0.501012,
0.502811, 0.503982, 0.505133, 0.505701]
  phaseoff_source: [-44.577691, -44.112163, -43.656258, -41.923135, -40.710988,
-39.941097, -39.199784, -38.839353, -25.638204, -25.483533, -25.330717,
-24.737351, -24.310255, -24.033624, -23.763218, -23.630285, -21.146122,
-21.040791, -20.936505, -20.529497, -20.234477, -20.042462, -19.854058,
-19.761178, -13.210386, -13.169201, -13.128273, -12.967071, -12.848745,
-12.771053, -12.694295, -12.656260]
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: WETT12M
  station_name_trf_coord: WS
  X_trf: [4.0755139837000000e+06,9.317353092000000e+05,4.801629401000000e+06]
  sampling_frequency: 1
  scan_length: 1
  fluxdensity_targetsource: 20
  fluxdensity_system: 60
  f0:
[3032.40,3064.40,3096.40,3224.40,3320.40,3384.40,3448.40,3480.40,5272.40,5304.40
,5336.40,5464.40,5560.40,5624.40,5688.40,5720.40, 6392.40, 6424.40, 6456.40,
6584.40, 6680.40, 6744.40, 6808.40, 6840.40,10232.40, 10264.40, 10296.40,
10424.40, 10520.40, 10584.40, 10648.40, 10680.40]
  number_of_bits: 1
  signal_type_target_source: gaussian-white-noise
  source_name: 0026+892
```


Mk4/DiFX fourfit 3.21 rev 2936
0026+892.1F4Y9S, SIM001, LW
KOKEE12M - WETT12M, fgroup X, pol RR
multiband delay (μs)
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
amplitude
phase (deg)
Fringe quality 7
SNR 746.2
Int time 0.985
Amp 2151.186
Phase 61.3
PFD 0.0e+00
Delays (us)
SBD -0.001440
MBD 0.000420
Fringe rate (Hz)
-0.002031
Ion TEC 0.000
Ref freq (MHz)
3032.1500
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:182920
2020:321:182923
2020:111:181228
RA & Dec (J2000)
03h49m10.987080s
+00°00'00.000000"
Amp. and Phase vs. time for each freq., 7 segs, 6 APs / seg (0.15 sec / seg.), time ticks 1 sec
a b c d e f g h i j k l m n o p q r s t u v w x y z A B C D E F All
Validity
pcal θ
Group delay (usec)(mode) 4.196796875000E-04
Sband delay (usec) -1.440000000000E-03
Phase delay (usec) 5.619994751 47E-05
Delay rate (us/s) -6.699042103 17E-07
Total phase (deg) 61.3
Apriori delay (usec) 0.000000000000E+00
Apriori clock (usec) 0.000000000E+00
Apriori clockrate (us/s) 0.000000000E+00
Apriori rate (us/s) 0.000000000000E+00
Apriori accel (us/s/s) 0.000000000000E+00
Resid mbdelay (usec) 4.19680E-04 +/- 8.2E-08
Resid sbdelay (usec) -1.44000E-03 +/- 1.5E-03
Resid phdelay (usec) 5.61999E-05 +/- 1.4E-07
Resid rate (us/s) -6.69904E-07 +/- 2.4E-07
Resid phase (deg) 61.3 +/- 0.2
RMS Theor.
ph/seg (deg) 0.5 0.2
amp/seg (%) 0.2 0.4
ph/frq (deg) 32.3 0.4
amp/frq (%) 16.2 0.8
Amplitude 2151.186 +/- 2.883
Search (128X1024) 2133.710
Interp. 0.000
Inc. seg. avg. 2151.093
Inc. frq. avg. 2498.922
Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
Pcal rate: 0.000E+00, 0.000E+00 (us/s)
Bits/sample: 1x1 SampCntNorm: disabled
Sample rate(MSamp/s): 1
Data rate(Mb/s): 32 nags: 128 t_coherence
sb window (us) -64.000 64.000
mb window (us) -0.016 0.016
dr window (ns/s) -6.441 6.441
on window (TEC) 0.00 0.00
L: az 160.8 el 39.3 pa -12.4 W: az 160.8 el 39.3 pa -12.4 u,v (fr/asec) 0.000 0.000
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_19_28_26/1234/SIM001/LW..1F4Y9S Output file: Suppressed by test mode

6.2 Non-Zero Baseline Simulation

6.2.1 Very High delay rate, single channel

```
setup:
  zero_bl: 0
s1:
  date_vec: [2020,1,28,17,30,00]
  station_name: S1
  station_name_8character: HARTRAO
  station_name_trf_coord: Hh
  sampling_frequency: 16
  scan_length: 1
  fluxdensity_targetsource: 20
  fluxdensity_system: 60
  f0: [3032.40]
  number_of_bits: 1
  signal_type_target_source: gaussian-white-noise
  source_name: 2358+189
s2:
  date_vec: [2020,1,28,17,30,00]
  station_name: S2
  station_name_8character: WARK12M
  station_name_trf_coord: Ww
  sampling_frequency: 16
  scan_length: 1
  fluxdensity_targetsource: 20
  fluxdensity_system: 60
  f0: [3032.40]
  number_of_bits: 1
  signal_type_target_source: gaussian-white-noise
  source_name: 2358+189
```


Mk4/DiFX fourfit 3.21 rev 2936
2358+189.1F4YWD, SIM001, LW
HARTRAO - WARK12M, fgroup X, pol RR
Fringe quality 9
SNR 546.6
Int time 0.967
Amp 2249.579
Phase 49.9
PFD 0.0e+00
Delays (us)
SBD 1.342534
MBD -0.000195
Fringe rate (Hz)
0.277832
Ion TEC 0.000
Ref freq (MHz)
3028.4000
AP (sec) 0.026
Exp. sim
Exper # 16383
Yr:day 2020:028
Start 173000.00
Stop 173001.00
FRT 173000.00
Corr/FF/build
2020:321:184253
2020:321:184253
2020:111:181228
RA & Dec (J2000)
00h01m08.621570s
+19°14'33.801743"
amplitude
delay rate (ns/s)
singleband delay (μs)
Avgd. Xpower Spectrum (MHz)
phase (deg)
Amp. and Phase vs. time for each freq., 39 segs, 1 APs / seg (0.03 sec / seg.), time ticks 1 sec
All
Validity
pcal θ
L W
3028.40 Freq (MHz)
49.9 Phase
2249.3 Amp.
172.0 Sbd box
U/L 39/0 APs used
L 0 PC freqs
W 0 PC freqs
L:W 0:0 PC phase
L:W 0:0 Man PC
L 1000 PC amp
W 1000
L X00UR Chan ds
W X00UR Chan ds
Group delay (usec)(mode) 2.568399445 88E-04 Apriori delay (usec) 2.568399465 36E-04 Resid mbdelay (usec) -1.947 77E-04 +/- 1.3E-04
Sband delay (usec) 2.568533718 76E-04 Apriori clock (usec) 0.000000000E+00 Resid sbdelay (usec) 1.342 53E-04 +/- 1.3E-04
Phase delay (usec) 2.568399469 94E-04 Apriori clockrate (us/s) 0.000000000E+00 Resid phdelay (usec) 4.573 03E-05 +/- 1.9E-07
Delay rate (us/s) -1.587 45747983E+00 Apriori rate (us/s) -1.587 54922201E+00 Resid rate (us/s) 9.174 22E-05 +/- 3.3E-07
Total phase (deg) 197.1 Apriori accel (us/s/s) -1.307 070319 65E-04 Resid phase (deg) 49.9 +/- 0.2
RMS Theor. Amplitude 2249.579 +/- 4.116 Pcal mode: MANUAL, MANUAL PC period (AP's) 5, 5
ph/seg (deg) 0.7 0.7 Search (128X8) 2246.487 Pcal rate: 0.000E+00, 0.000E+00 (us/s) sbwindow (us) -4.000 4.000
amp/seg (%) 1.0 1.1 Interp. 0.000 Bits/sample: 1x1 SampCntNorm: disabled mbwindow (us) -0.000 0.000
ph/frq (deg) 0.0 0.1 Inc. seg. avg. 2249.287 Sample rate(MSamp/s): 16 drwindow (ns/s) -6.449 6.449
amp/frq (%) 0.0 0.2 Inc. frq. avg. 2249.255 Data rate(Mb/s): 16 nags: 128 t_cohere nInte onwindow (TEC) 0.00 0.00
L: az 303.4 el 18.4 pa 127.2 W: az 122.5 el -62.9 pa -134.2 u,v (fr/asec) 338.831 -80.645 simultaneous interpolat
Control file: default Input file: /home/jakob/software/BasebandSim/OUT/2020_321_19_38_12/1234/SIM001/LW..1F4YWD Output file: Suppressed by test mode