

GLONASS-VLBI:

Onsala-Wettzell test observations

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Outline

- Motivation
- Observations
- Modelling and correlation
- Preliminary analysis
- Conclusions and outlook

Motivation

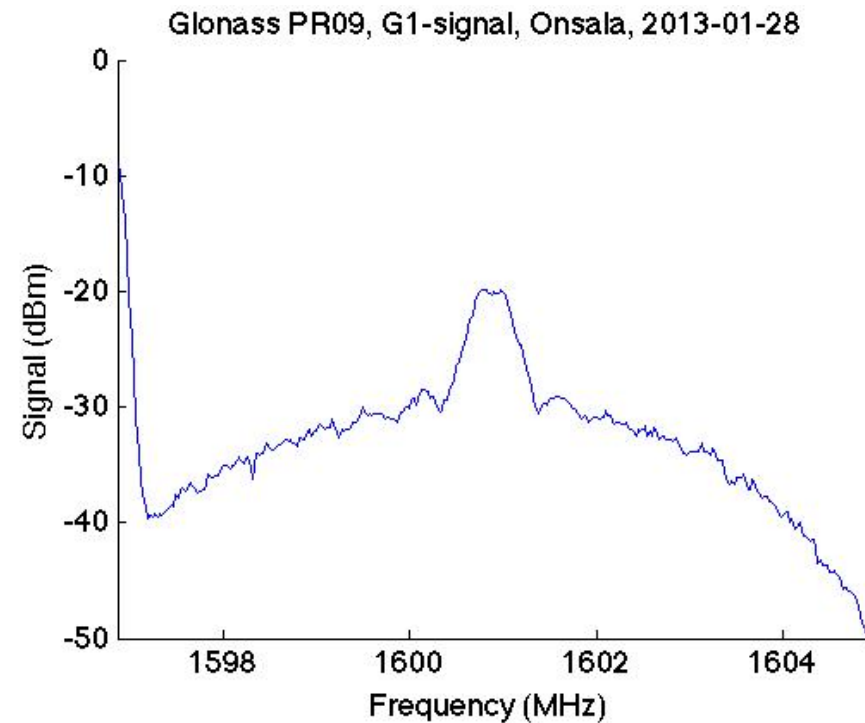
- Question: Can co-location in space improve the ITRF?
 - Dedicated co-location satellites have been proposed, e.g. GRASP
 - It is to be expected that such satellites will be realised soon
 - Can also VLBI observations to GNSS-satellites be used?
- Several previous tests during the last years, mainly Onsala-Medicina and Onsala Wettzell
- Using L-band systems at EVN-stations
- Special: L/S/X-band system at Wettzell 20 m
- Why GLONASS? Retro-reflectors allow also for SLR measurements

Observations in 2013 and 2014

- Onsala 25 m telescope, L-band system
- Wettzell 20 m L-band system via S-band horn
- 15 s stop-and-go GLONASS observations

- G130128
 - PR09 for 45 min (9 scans à 4 min)
- G140116a
 - PR08, PR11, PR01 for 15 min each
- G140116b
 - PR01, PR12, PR02 for 15 min each
- G140121a
 - PR08, PR23, PR24 alternating 5 min each
- G140121b
 - PR24, PR17, PR11 for 15 min each

Observations

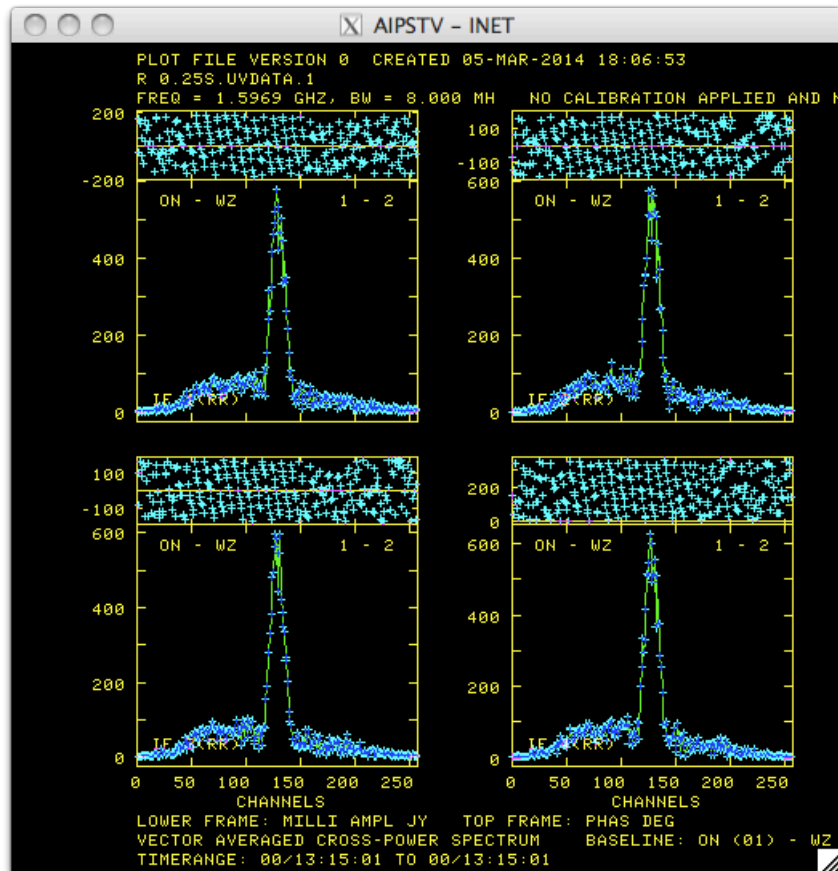


Strong satellite signal:
=> additional RF-attenuation 30 dB necessary

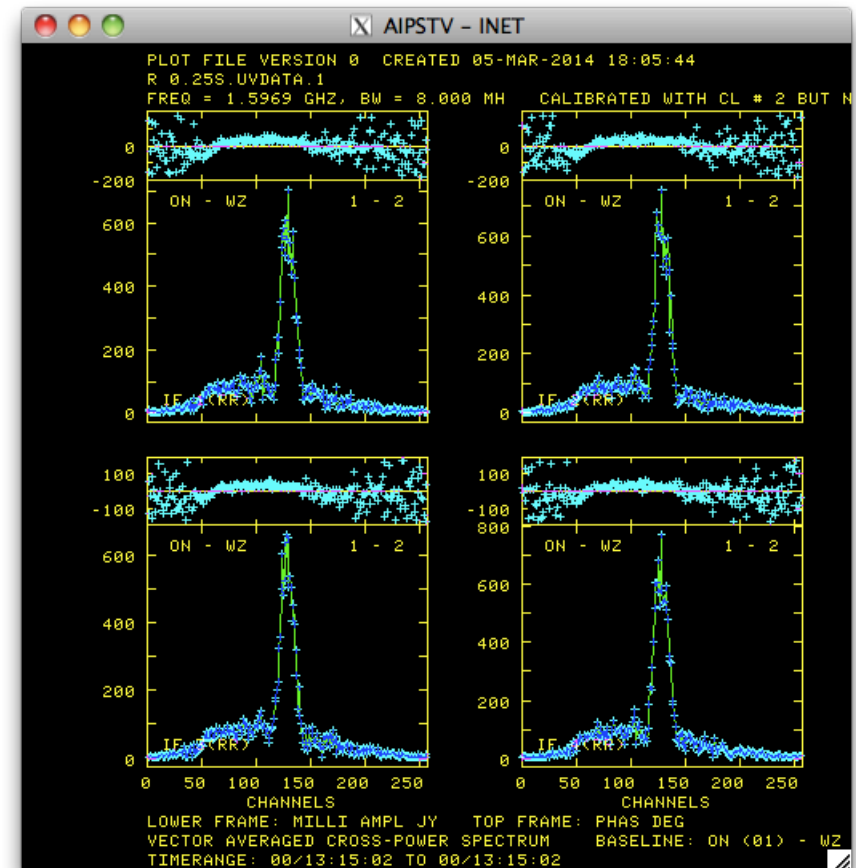
Modelling and correlation

- Near-field delay modelling using GLONASS final orbits by CODE and light time equation
- Implementation into control files for DiFX
- Correlation with DiFX at Onsala
- Post-processing with
 - G130128: AIPS
 - G1401xx: Fourfit

G130128 AIPS processing

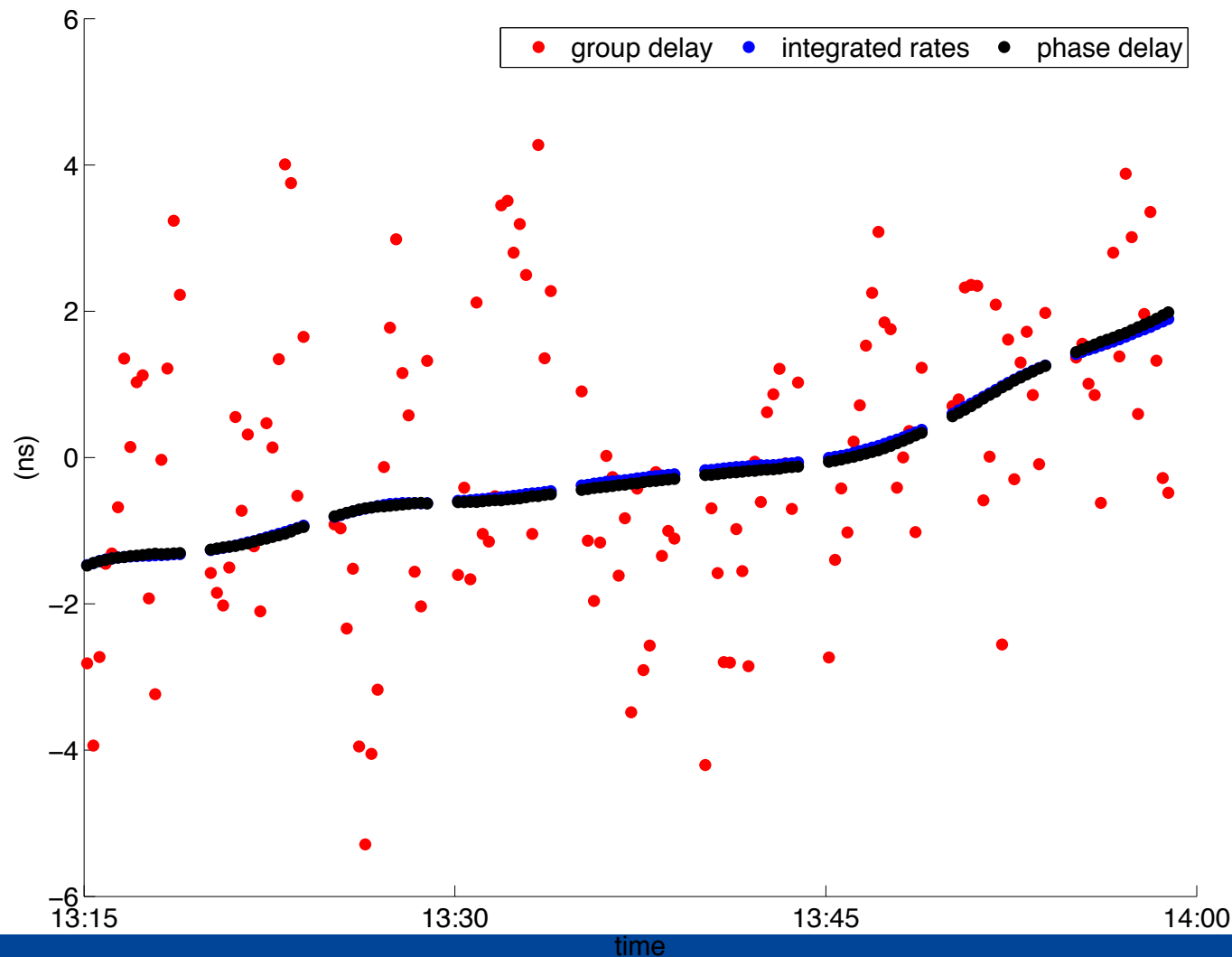


DiFX data before fringing.



DiFX data after fringing.

Group delay, integrated delay rate, phase delay



DiFX with
D-model
aprioris

G140116 and G140121

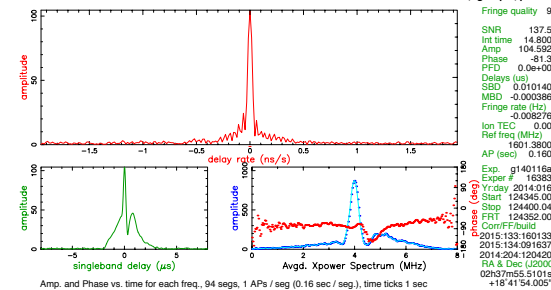
G140116 och G140121

Datum	Tid	GLONASS satellit	NORAD Nr.	PR nr.	MJD start	MJD stop	FRINGES
2014-01-16 (GPS 1775-4) (MJD 56673)	12:30-12:45	GLONASS-743	NORAD 37869	PR08	56673.52083333	56673.53125000	YES :-)
	12:50-13:05	GLONASS-723	NORAD 32395	PR11	56673.53472222	56673.54513889	YES :-)
	13:10-13:25	GLONASS-730	NORAD 36111	PR01	56673.54861111	56673.55902778	YES :-)
	14:00-14:15	GLONASS-730	NORAD 36111	PR01	56673.58333333	56673.59375000	YES :-)
	14:20-14:35	GLONASS-737	NORAD 37138	PR12	56673.59722222	56673.60763889	YES :-)
	14:40-15:00	GLONASS-747	NORAD 39155	PR02	56673.61111111	56673.62500000	YES :-)
2014-01-21 (GPS 1776-2) (MJD 56678)	13:30-13:35	GLONASS-743	NORAD 37869	PR08	56678.56250000	56678.56597222	YES :-)
	13:37-13:42	GLONASS-732	NORAD 36402	PR23	56678.56736111	56678.57083333	YES :-)
	13:44-13:49	GLONASS-743	NORAD 37869	PR08	56678.57222222	56678.57569444	YES :-)
	13:51-13:56	GLONASS-732	NORAD 36402	PR23	56678.57708333	56678.58055556	YES :-)
	13:59-14:04	GLONASS-743	NORAD 37869	PR08	56678.58263889	56678.58611111	YES :-)
	14:08-14:13	GLONASS-735	NORAD 36401	PR24	56678.58888889	56678.59236111	YES :-)
	14:14-14:19	"	"	"	56678.59305556	56678.59652778	"
	14:25-14:30	GLONASS-732	NORAD 36402	PR23	56678.60069444	56678.60416667	NO (!) =>???
	15:00-15:04	GLONASS-735	NORAD 36401	PR24	56678.62500000	56678.62777778	YES :-)
	15:05-15:09	"	"	"	56678.62847222	56678.63125000	"
	15:10-15:14	"	"	"	56678.63194444	56678.63472222	"
	15:20-15:24	GLONASS-746	NORAD 37938	PR17	56678.63888889	56678.64166667	YES :-)
	15:25-15:29	"	"	"	56678.64236111	56678.64513889	"
	15:30-15:34	"	"	"	56678.64583333	56678.64861111	"
	15:45-15:49	GLONASS-723	NORAD 32395	PR11	56678.65625000	56678.65902778	YES :-)
	15:50-15:54	"	"	"	56678.65972222	56678.66250000	"
	15:55-16:00	"	"	"	56678.66319444	56678.66666667	"

G140116a Fourfit processing

Mk4/DIFX fourfit 3.9 rev 6188

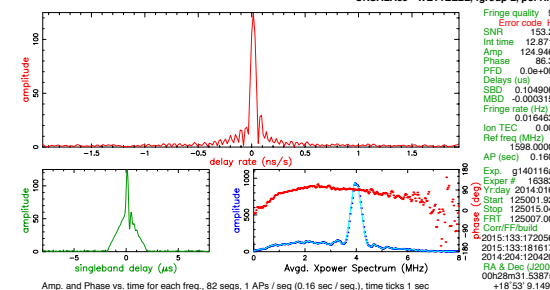
124345.ydupme, No. 0056, LV
ONSLA85 - WETZELL, Igroup L, pol RR



PR08

Mk4/DIFX fourfit 3.9 rev 6188

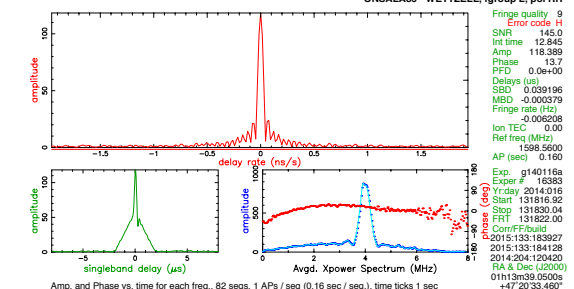
125000.ydushh, No. 0061, LV
ONSLA85 - WETZELL, Igroup L, pol RR



PR11

Mk4/DIFX fourfit 3.9 rev 6188

131815.yduswu, No. 0154, LV
ONSLA85 - WETZELL, Igroup L, pol RR

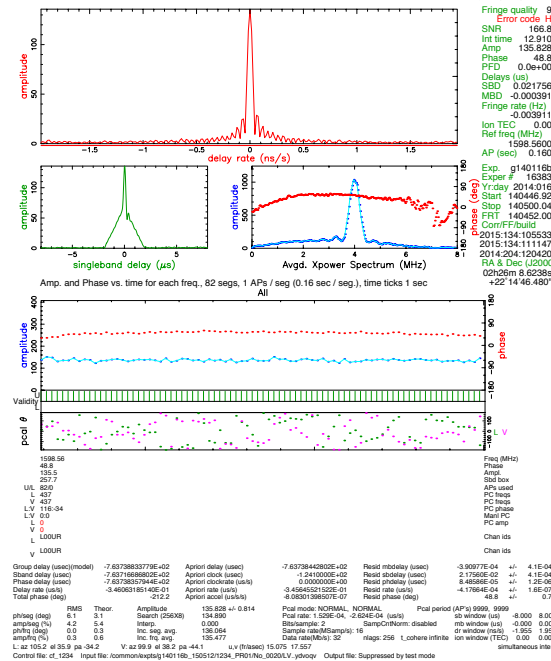


PR01

G140116b Fourfit processing

Mk4/DIFX fourfit 3.9 rev 6188

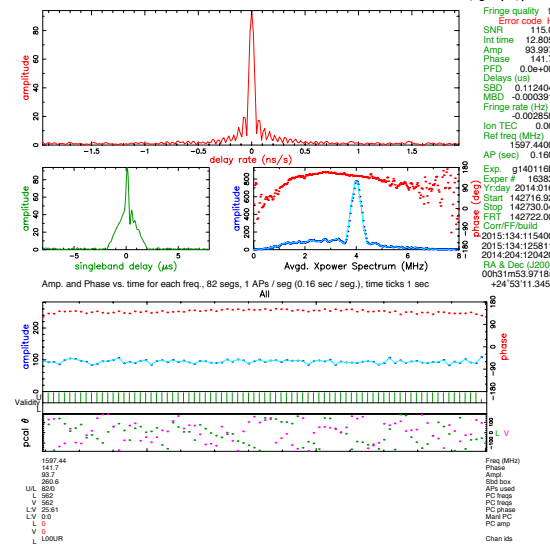
140445.ydvovv, No. 0020, LV
ONSLA85 - WETZELL, Igroup L, pol RR



PR01

Mk4/DIFX fourfit 3.9 rev 6188

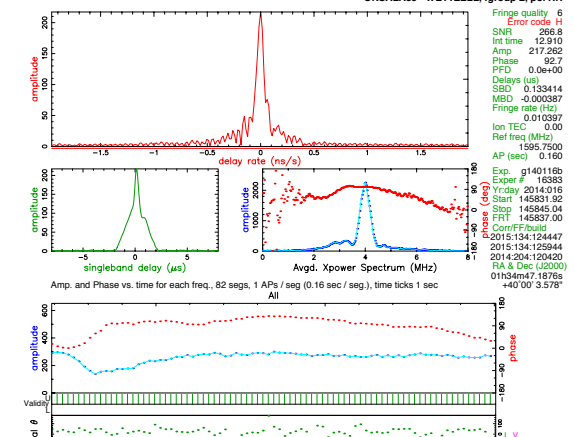
142715.ydvqks, No. 0090, LV
ONSLA85 - WETZELL, Igroup L, pol RR



PR12

Mk4/DIFX fourfit 3.9 rev 6188

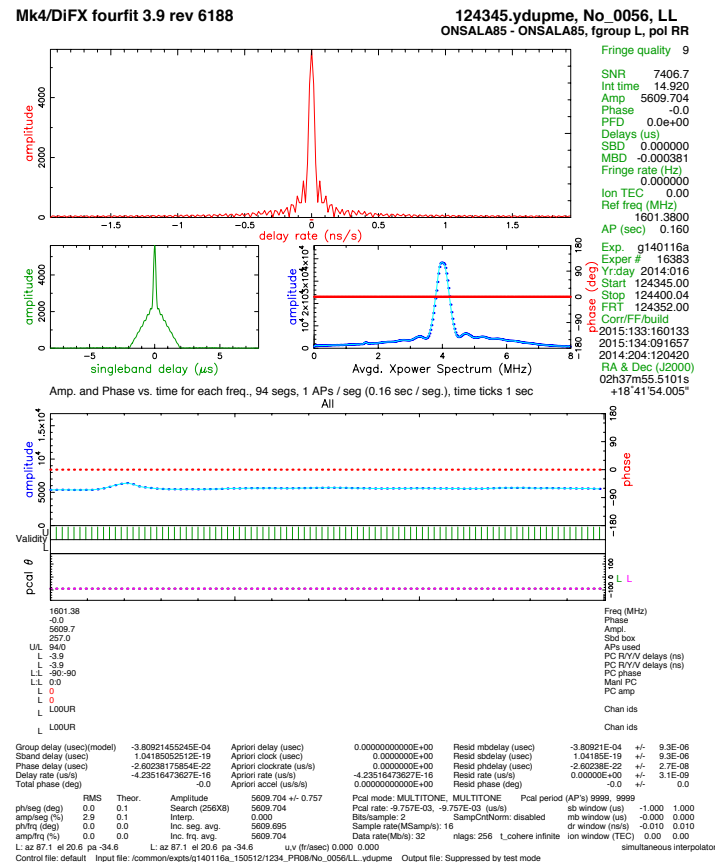
145830.ydvqzf, No. 0195, LV
ONSLA85 - WETZELL, Igroup L, pol RR



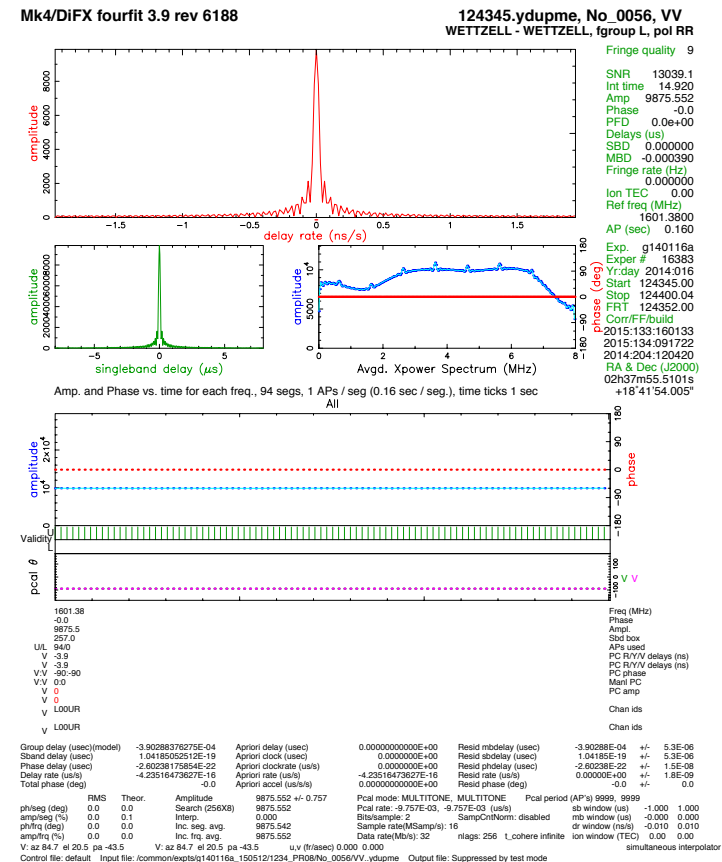
PR02

G140116 autocorrelations

Onsala



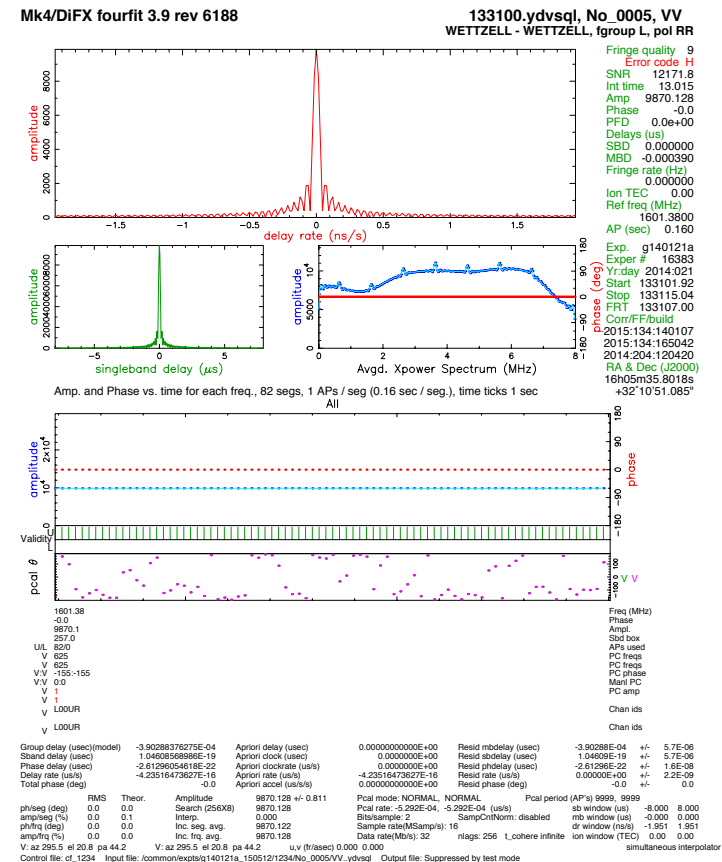
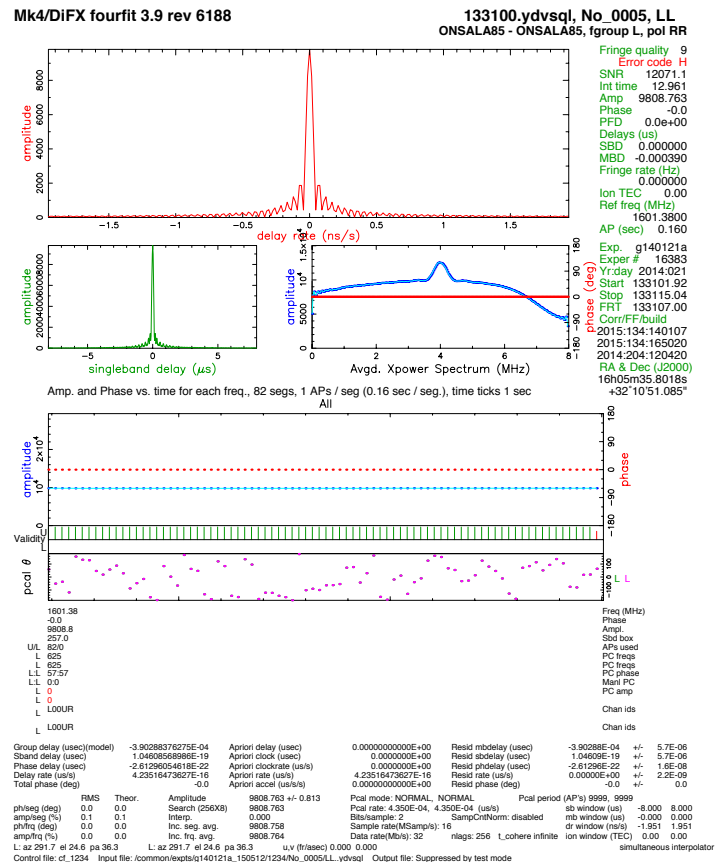
Wettzell



G140121 autocorrelations

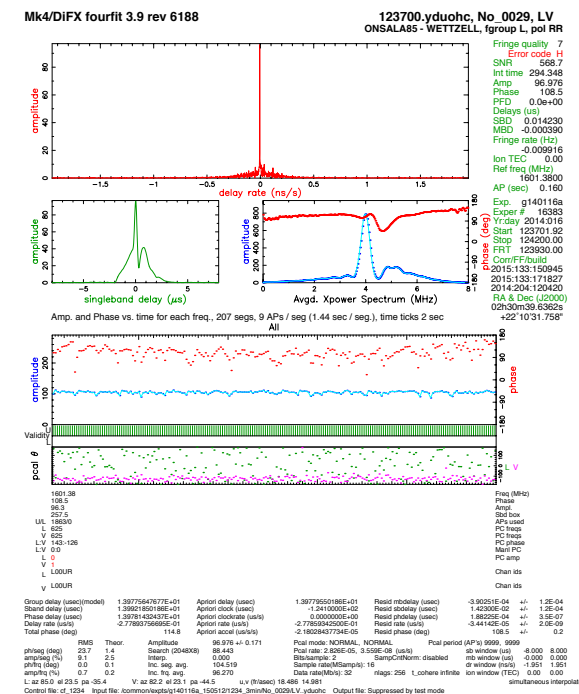
Onsala

Wettzell



Effect of integration length

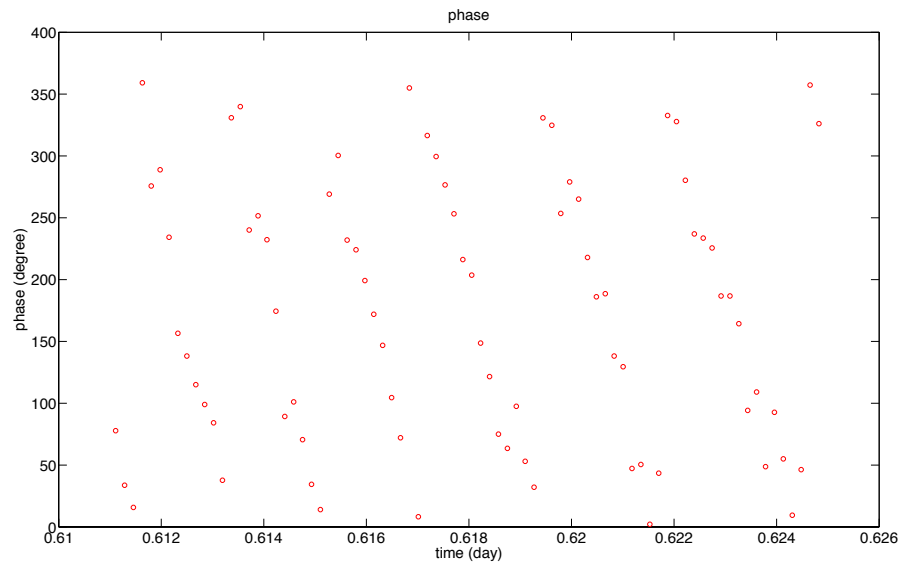
300 s



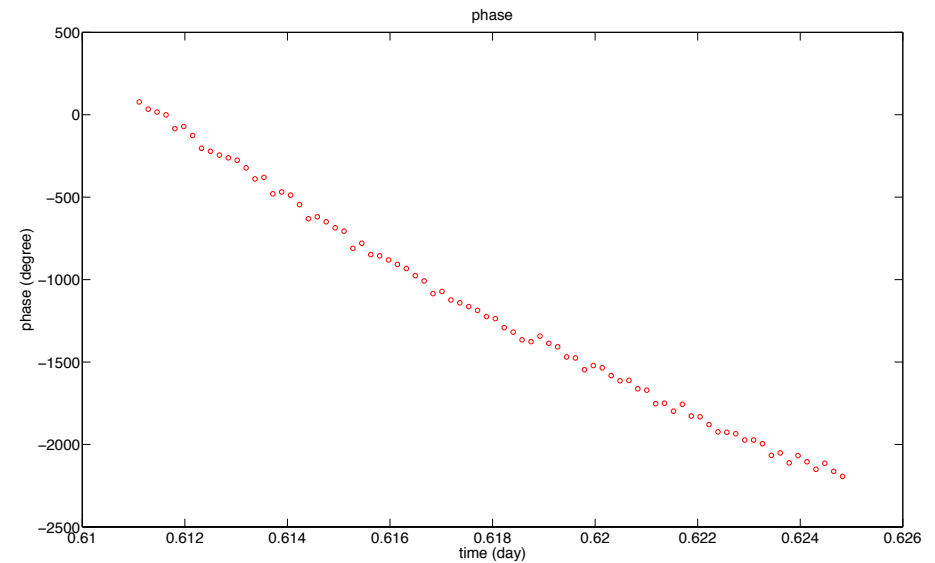
SNR 568

Phase unwrapping

Residual phases only



original



unwrapped

Phases hopefully can be unwrapped, thus phase-delays might be determined

Conclusions and outlook

- Successful correlation of several On-Wz GLONASS-VLBI experiments using DiFX
- Post-correlation analysis with Fourfit successful
- Phase delays hopefully can be determined
- Apriori delay model needs to be improved
- Further work is necessary to characterize the accuracy level that can be reached
- Import to geodetic post-processing software
- Further test experiments, potentially with more stations, would be nice