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***Transparency of the atmosphere according to WVR data in  
Svetloe observatory and quality of LRS "Sazhen-TM"  
observations***



WVR Svetloe Observatory 2012-08-08 16:16:10



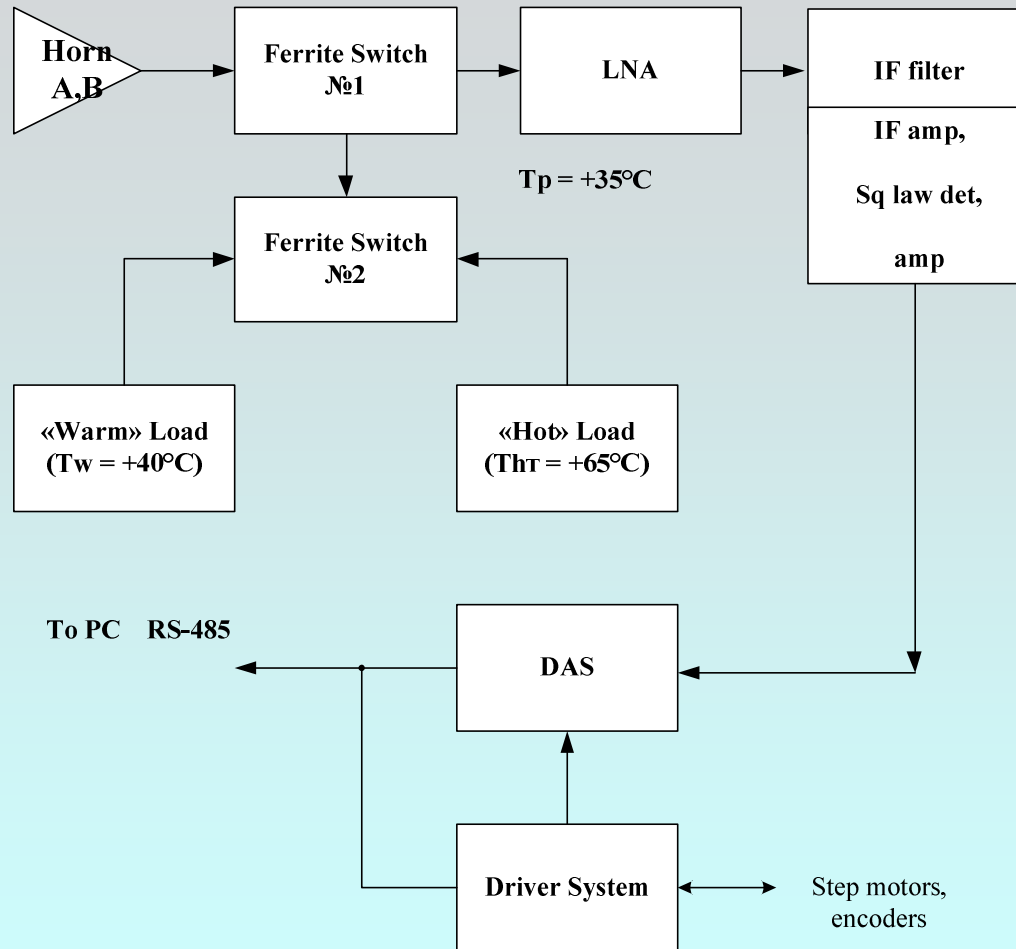
***Prototype of WVR is mounted in Svetloe observatory in 2011***

WVR +VLBI

$$T_a = T_{bg} \cdot e^{-\tau} + T_m \cdot (1 - e^{-\tau})$$



Elgered, G. (1993). Atmospheric Remote Sensing by Microwave Radiometry, Ed. M. A. Janssen, John Wiley & Sons, Inc., pp. 215-258.



**Operation mode:**  
Total power measurements of the LNA input signal

**WVR Micro wave block** (Hach, J.P. A very Sensitive Airborne Microwave Radiometer Using Two Reference Temperatures. IEEE Trans. On MTT, 1968, 16, 629-636.



Parameters	Value
Frequency bandwidth, - 3 dB, GHz	20,75±0,25
Block A	32,05±0,25
Block B	
Noise temperature, at the input , K,	
Block A	132
Block B	288
Gain, up to Sq. law detector, dB	
Block A	65
Block B	65
Real sensitivity, mK, t = 1s (dry weather)	
Block A	50/12
Block B	60/18
Relative gain instability 1h/24 h, , $\Delta T_{amb} = \pm 0.5^{\circ}C$ , % , less than	0,03 0,06
HPBW, degree	6
Angular resolution Az, El, arc minutes	5

Table 1.

*WVR MW Block Parameters*



WVR - new instrument for Quasar observatory

WVR – highly sensitive to  $T_a(t)$  variations,

WVR channel 21GHz – more sensitive for water vapor

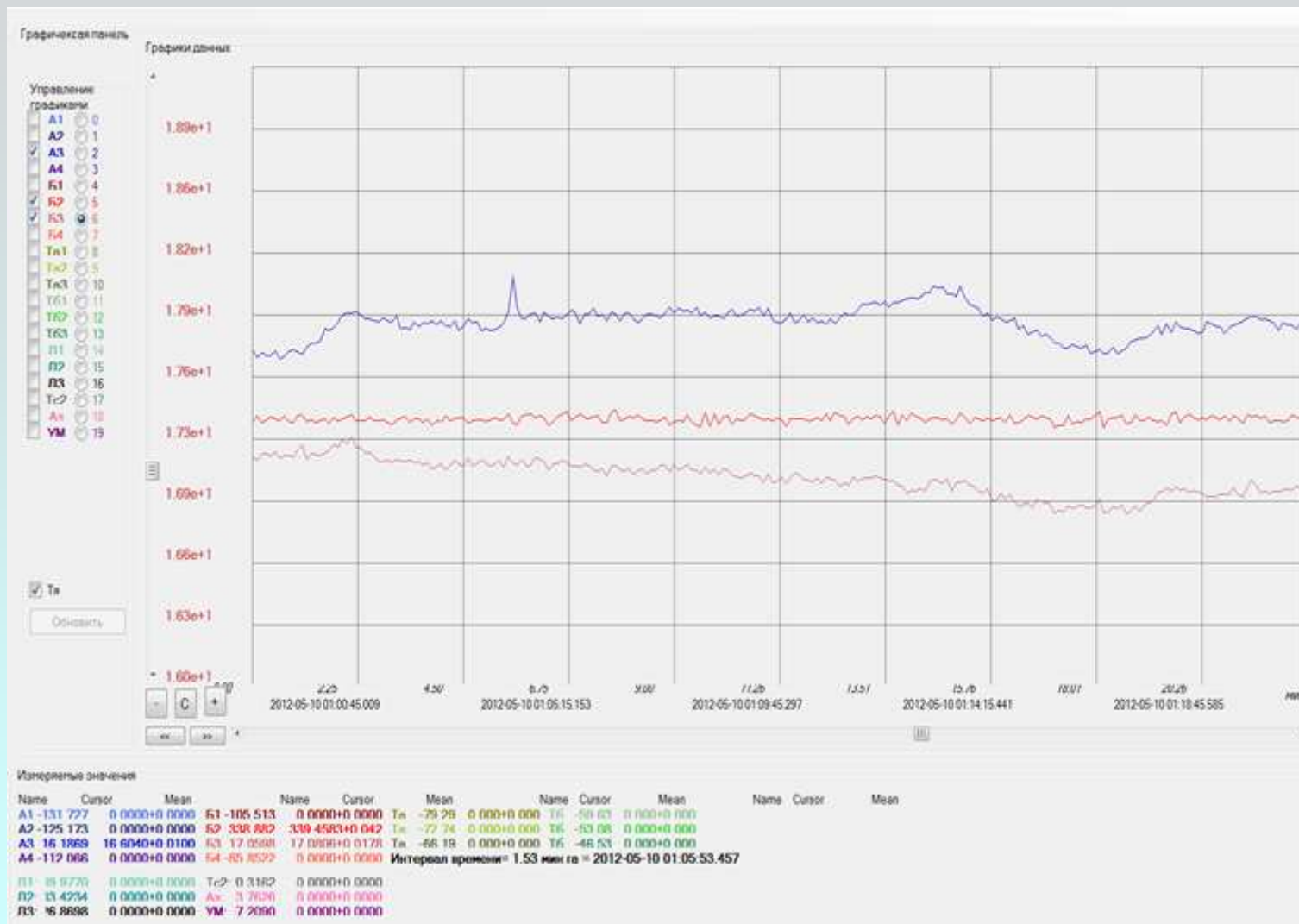
WVR channel 32GHz – more sensitive for condensed water

Can WVR register small troposphere turbulence  
(small variation in  $T_a$ ) ?



Date	Time	Time	Satellite	Dist., km	Quantity, N(LRS)	$\Delta T$ , minutes
<b>2012-05-02</b>	0:00	0:24	Лареос 1	5850	3459	24
2012-05-03	9:40	9:49	Лареос 2	5625	194	9
2012-05-04	1:20	1:22	Лареос 1		191	2
2012-05-06	1:53	1:59	Лареос 1		361	6
	2:07	2:11	Лареос 1		236	4
2012-05-09	1:13	1:19	Лареос 1		136	6
	23:39	23:56	Лареос 1		428	17
2012-05-10	0:01	0:19	Лареос 1		5136	18
2012-05-14	1:27	1:37	Лареос 1		347	10
	9:53	9:55	Лареос 1		444	2
2012-05-15	0:02	0:06	Лареос 1		651	4
	0:21	0:24	Лареос 1		596	3
2012-05-18	22:24	22:37	Лареос 1		33	13
2012-05-19	1:52	2:00	Лареос 1		546	8
	3:33	4:02	Лареос 2		100	9
	7:35	7:41	Лареос 2		301	6
	17:03	17:14	Лареос 1		2325	11
2012-05-20	0:16	0:44	Лареос 1		1280	28
	23:02	23:17	Лареос 1		593	15
2012-05-21	3:45	4:09	Лареос 2		566	24
	7:43	7:48	Лареос 2		213	5
2012-05-23	18:38	18:51	Лареос 1		2590	13
2012-05-25	8:01	8:11	Лареос 2		855	10
2012-05-26	21:42	22:02	Лареос 1		2532	20
<b>2012-05-27</b>	<b>1:33</b>	<b>1:44</b>	<b>Лареос 1</b>		<b>278</b>	<b>11</b>

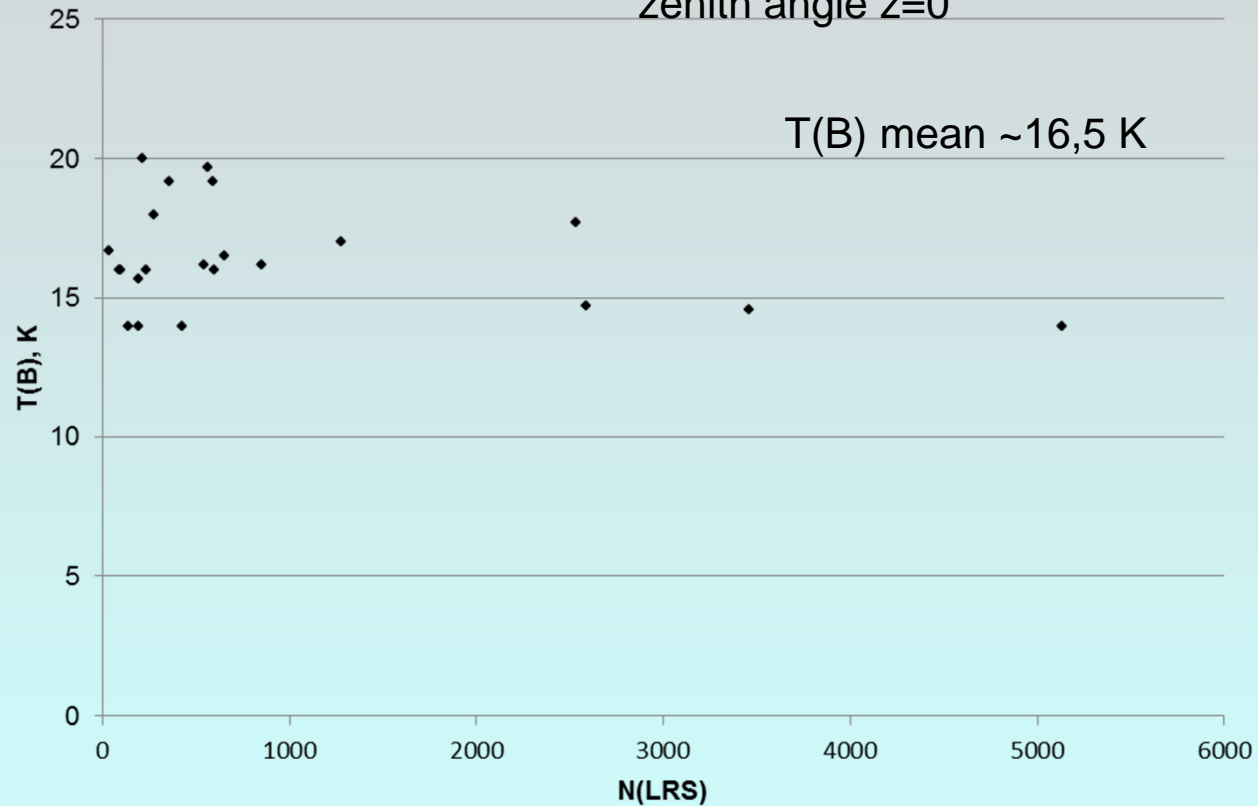
$\Delta T_{\text{mean}} \approx 10\text{m}$



2012:05:10



T(B) – antenna temperature in Kelvin in channel B of WVR (32GHz),  
zenith angle z=0

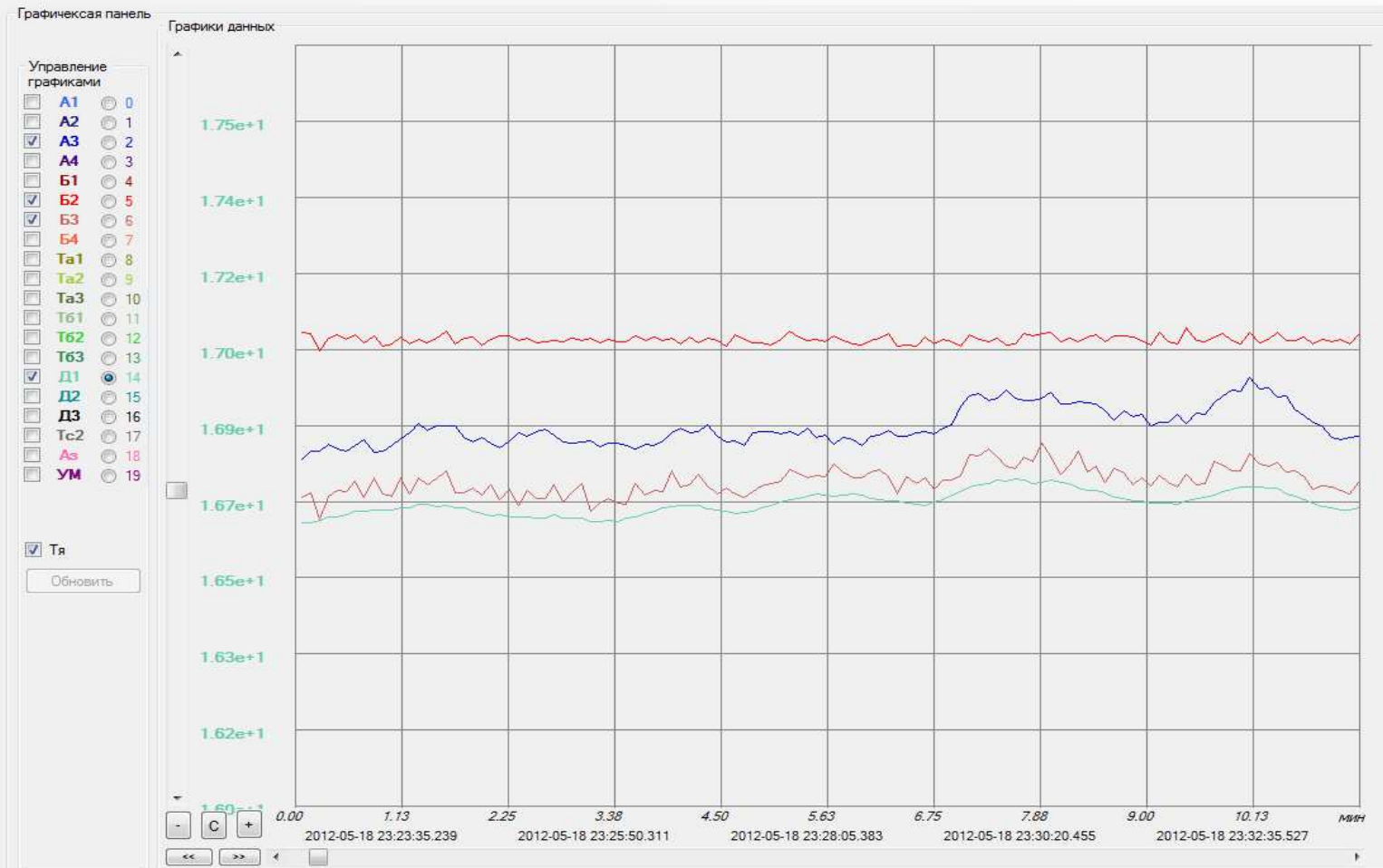


T(B) mean ~16,5 K

T(A) mean ~15,2 K     $\tau(z = 0) \sim 0.05$

$$T(B, z), \tau \sim \frac{1}{\cos(z)}$$

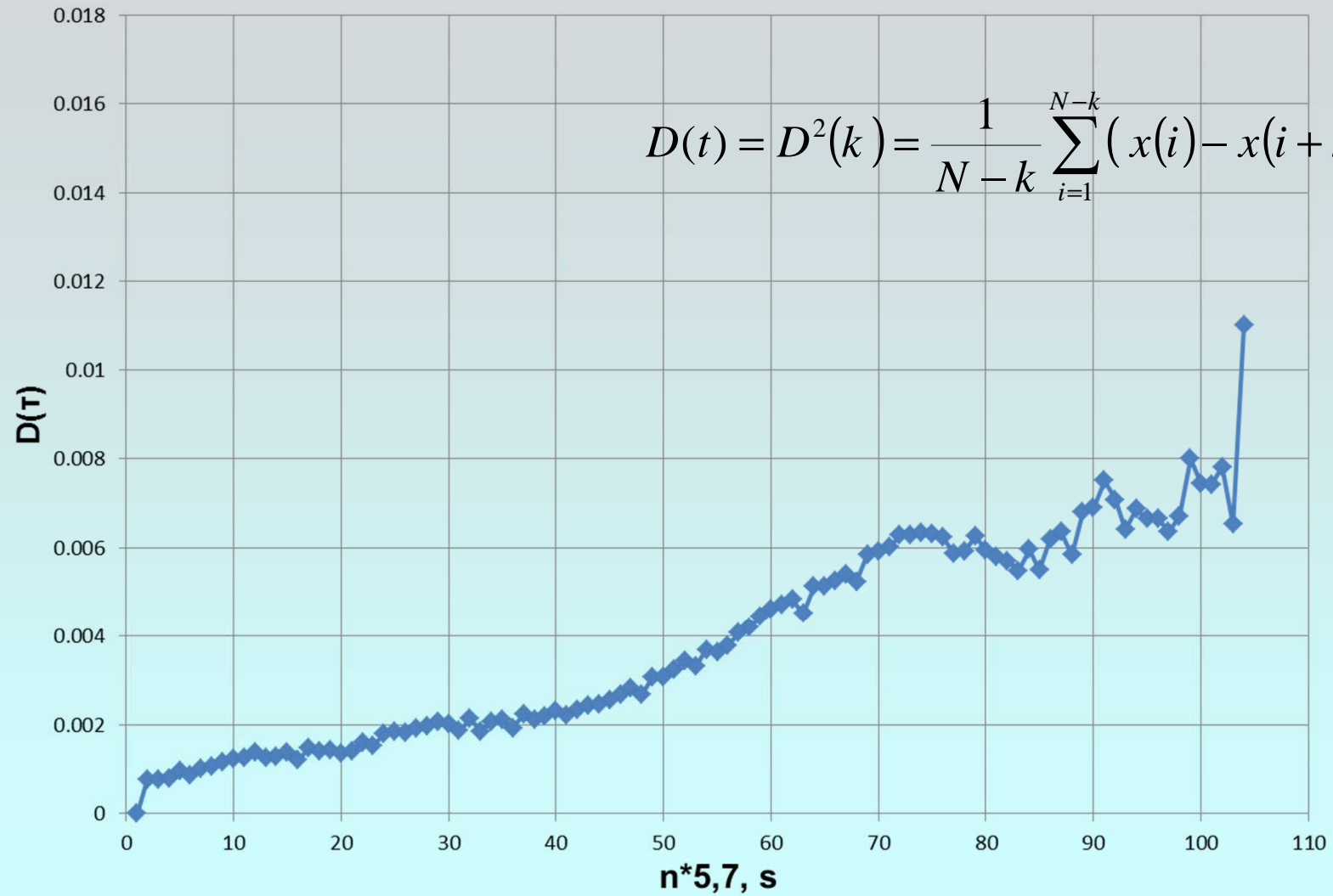




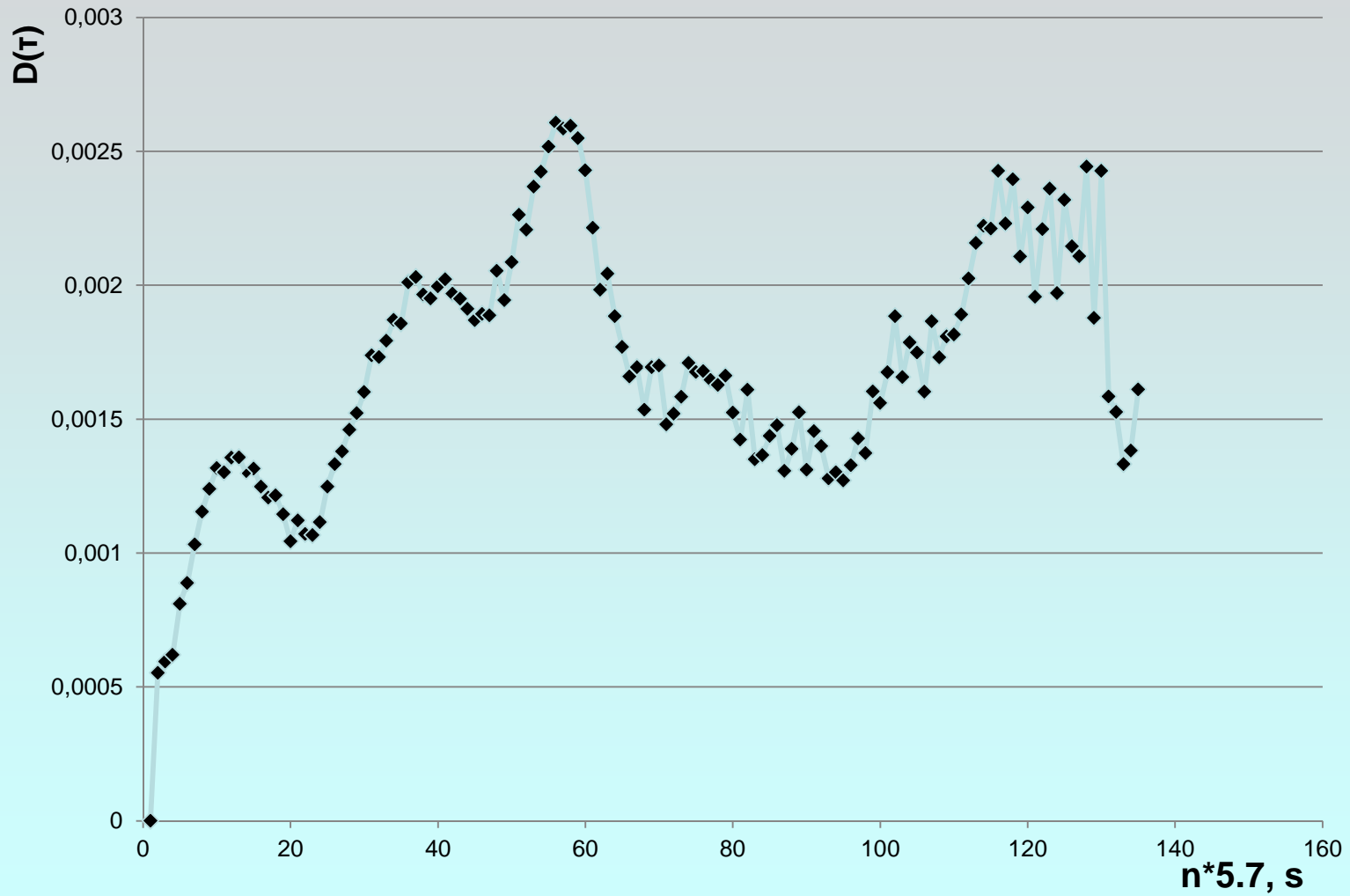
Измеряемые значения

Name	Cursor	Mean	Name	Cursor	Mean	Name	Cursor	Mean
A1:	20.9715	0.0000±0.0000	B1:	47.1859	0.0000±0.0000	Ta1	73.400	0.000±0.000
A2:	27.5251	0.0000±0.0000	B2:	338.8928	338.3090±0.0279	Ta2	79.954	0.000±0.000
A3:	15.2397	14.8762±0.0145	B3:	17.1418	16.6667±0.0236	Ta3	86.508	0.000±0.000
A4:	40.6323	0.0000±0.0000	B4:	66.8467	0.0000±0.0000			
Д1:	17.1904	16.6668±0.0171	Тс2:	0.0002	0.0000±0.0000			
Д2:	119.2755	0.0000±0.0000	Ас:	138.9363	0.0000±0.0000			
Д3:	125.8291	0.0000±0.0000	УМ:	145.4899	0.0000±0.0000			

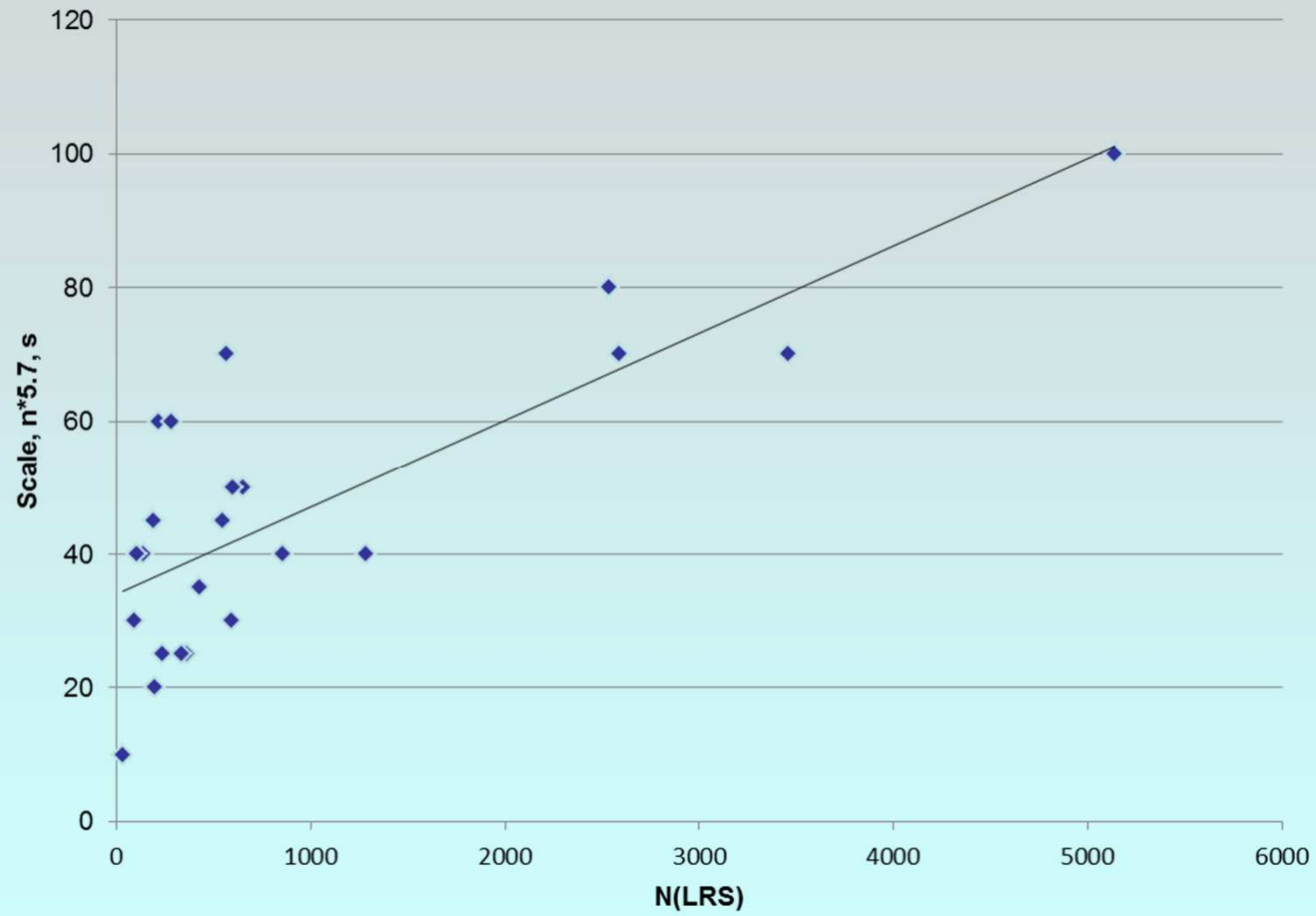
Интервал времени= 2.58 мин    Дата = 2012-05-18 23:24:58.051



2012:05:19, N=546, Scl~40



2012:05:18, N=33, Scl ~ 10





**Thank you**



# Institute of Applied Astronomy

