New Surface Measurement System

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Atacama Large Millimeter/submillimeter Array
Karl G. Jansky Very Large Array
Robert C. Byrd Green Bank Telescope
Very Long Baseline Array

Surface Measurement System

- Current OOF measurement takes ~ 30 – 40 minutes
- Needs for Q-band (~ 40 GHz) and above
- High overhead (night-time)
- Not practical (day-time)

- Need a faster alternative!

- "Metrologies at Radio Astronomy Antennas"
  - ERATec 2014, Gothenburg, Sweden

- "Aiming at self-calibration of terrestrial laser scanners using only one single object and one single scan"
  - C Holst, H Kuhlmann - Journal of Applied Geodesy, 2014
  - "Object" was the Effelsberg radio telescope

Leica ScanStation P40

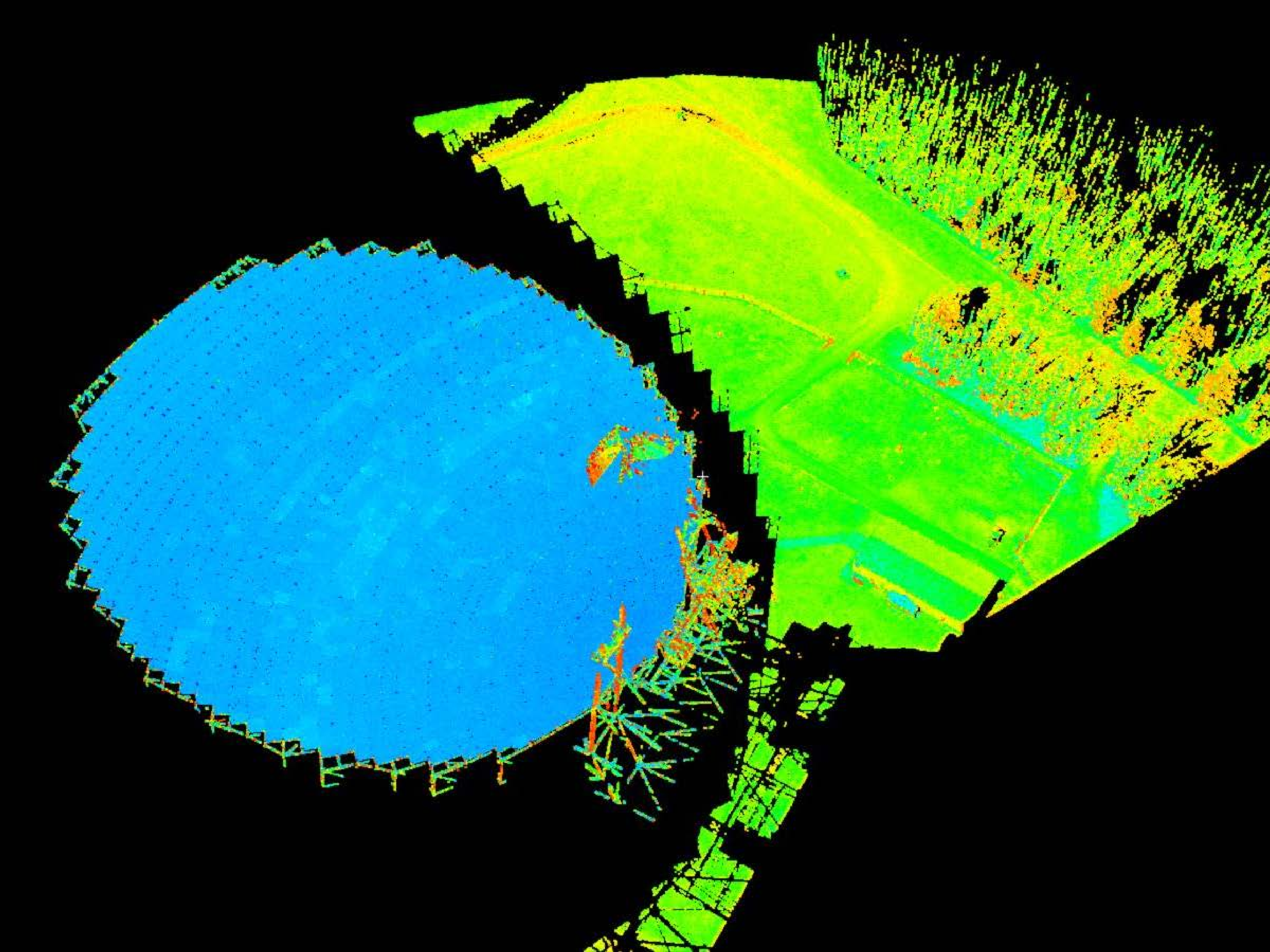
delete

System Accuracy	
Accuracy of single measurement *	
Range accuracy	1.2 mm + 10 ppm over full range
Angular accuracy	8" horizontal; 8" vertical
3D position accuracy	3 mm at 50 m; 6 mm at 100 m
Target acquisition **	2 mm standard deviation at 50 m
Dual-axis compensator	Liquid sensor with real-time onboard compensation, selectable on/off, resolution 1", dynamic range ±5', accuracy 1.5"

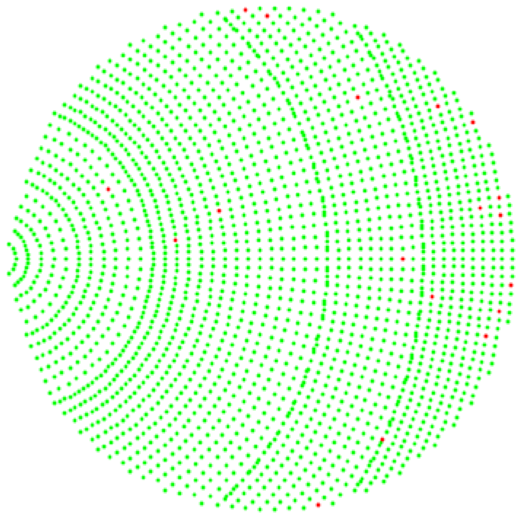
Distance Measurement System				
Type	Ultra-high speed time-of-flight enhanced by Waveform Digitising (WFD) technology			
Wavelength	1550 nm (invisible) / 658 nm (visible)			
Laser class	1 (in accordance with IEC 60825:2014)			
Beam divergence	< 0.23 mrad (FWHM, full angle)			
Beam diameter at front window	≤ 3.5 mm (FWHM)			
Range and reflectivity	Minimum range 0.4 m			
		Maximum range at reflectivity		
		120 m	180 m	270 m
	P30	18 %	–	–
	P40	8 %	18 %	34 %
Scan rate	Up to 1'000'000 points per second			
Range noise *	0.4 mm rms at 10 m 0.5 mm rms at 50 m			
Field-of-View				
Horizontal	360°			
Vertical	270°			
Data storage capacity	256 GB internal solid-state drive (SSD) or external USB device			
Communications/ Data transfer	Gigabit Ethernet, integrated Wireless LAN or USB 2.0 device			
Onboard display	Touchscreen control with stylus, full colour VGA graphic display (640 x 480 pixels)			
Laser plummet	Laser class 1 (IEC 60825:2014) Centring accuracy: 1.5 mm at 1.5 m Laser dot diameter: 2.5 mm at 1.5 m Selectable ON/OFF			

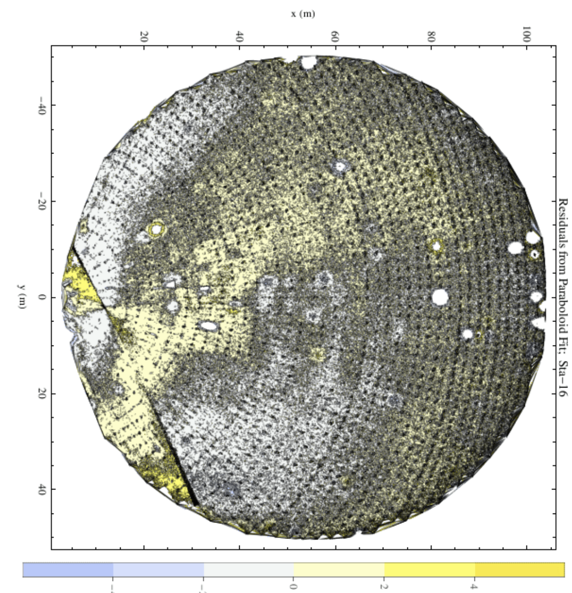
3D accuracy: 6mm @ 100m

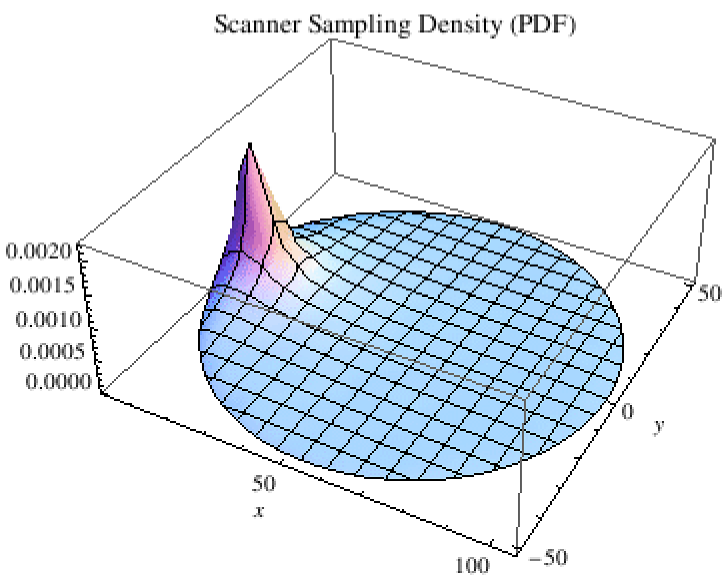
Range noise: 0.5mm @ 50m

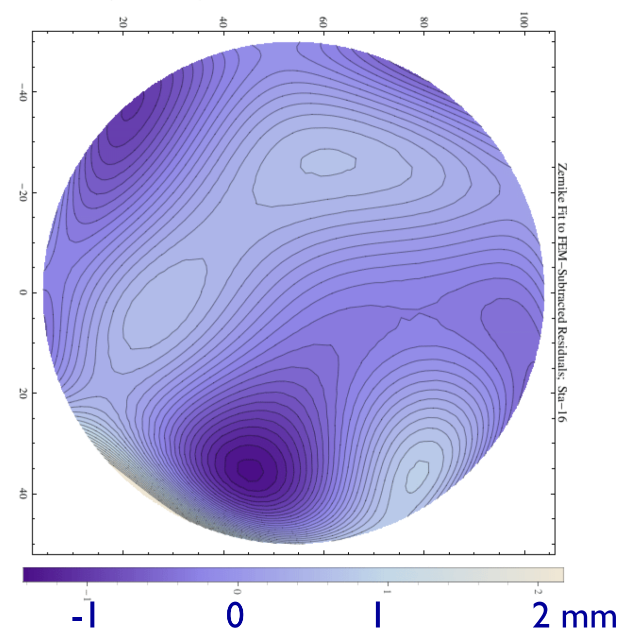


Data Processing (Fred Schwab)









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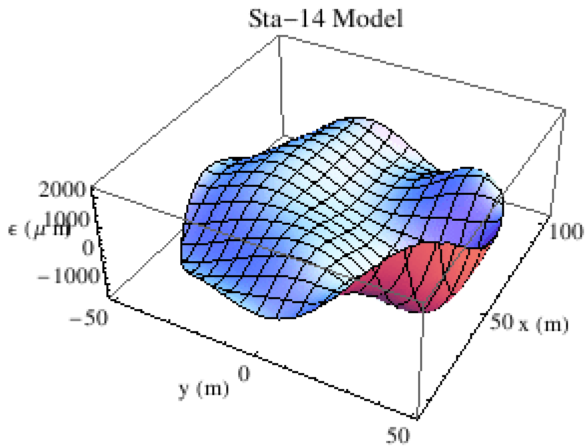

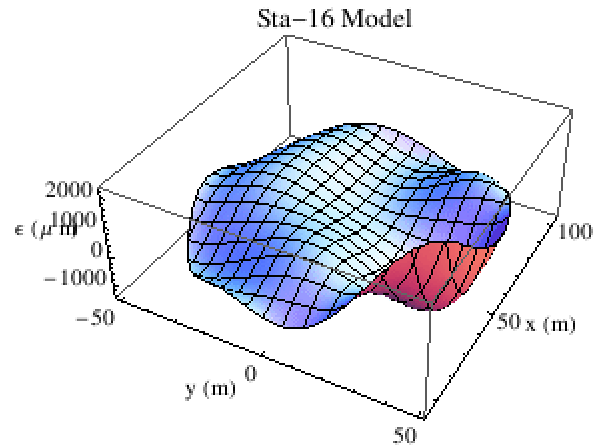

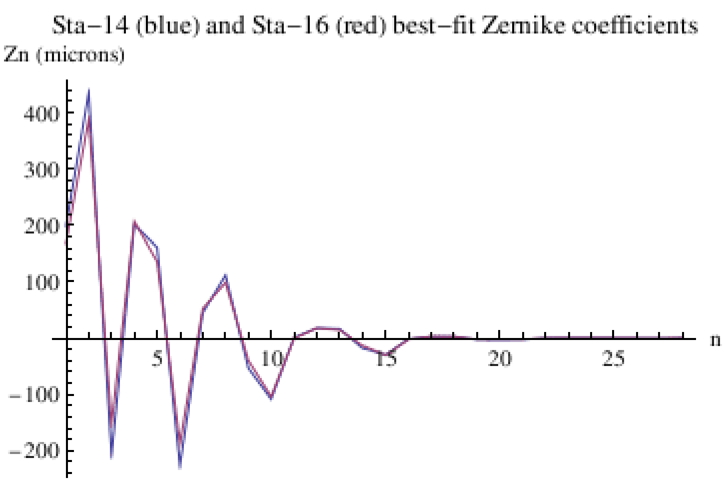

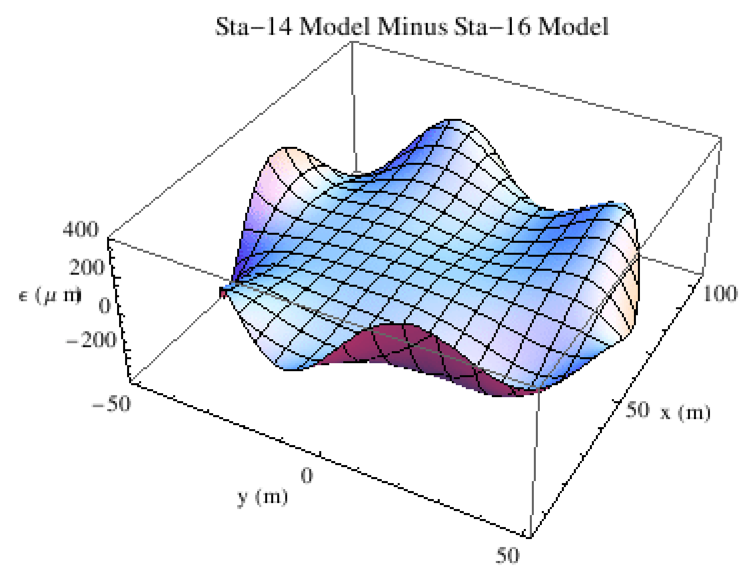

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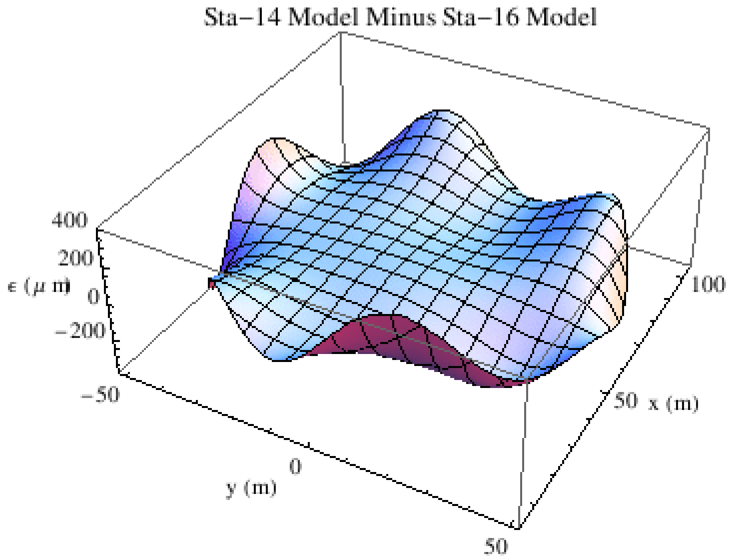
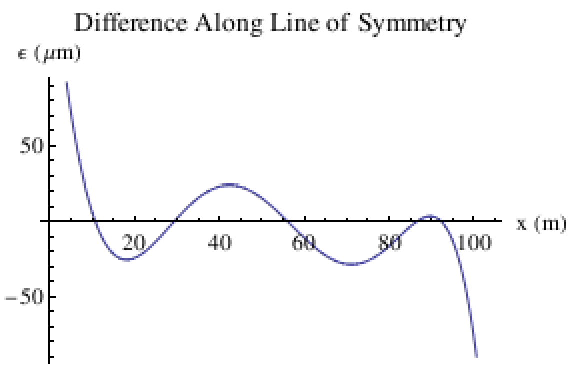
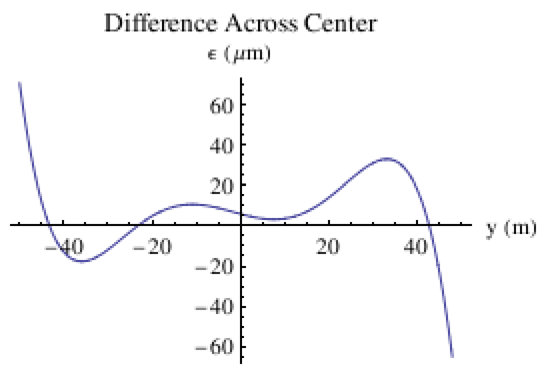


Difference of two successive runs (best case!)





RMS Differences:

- $|r| < 50m = 68\mu m$
- $|r| < 45m = 48\mu m$
- $|r| < 40m = 38\mu m$

RMS of single a measurement: ~ 35μm

RMS of two subsets of the same run ~ 18μm

best case OOF holography: ~ 40μm

Estimated error budget

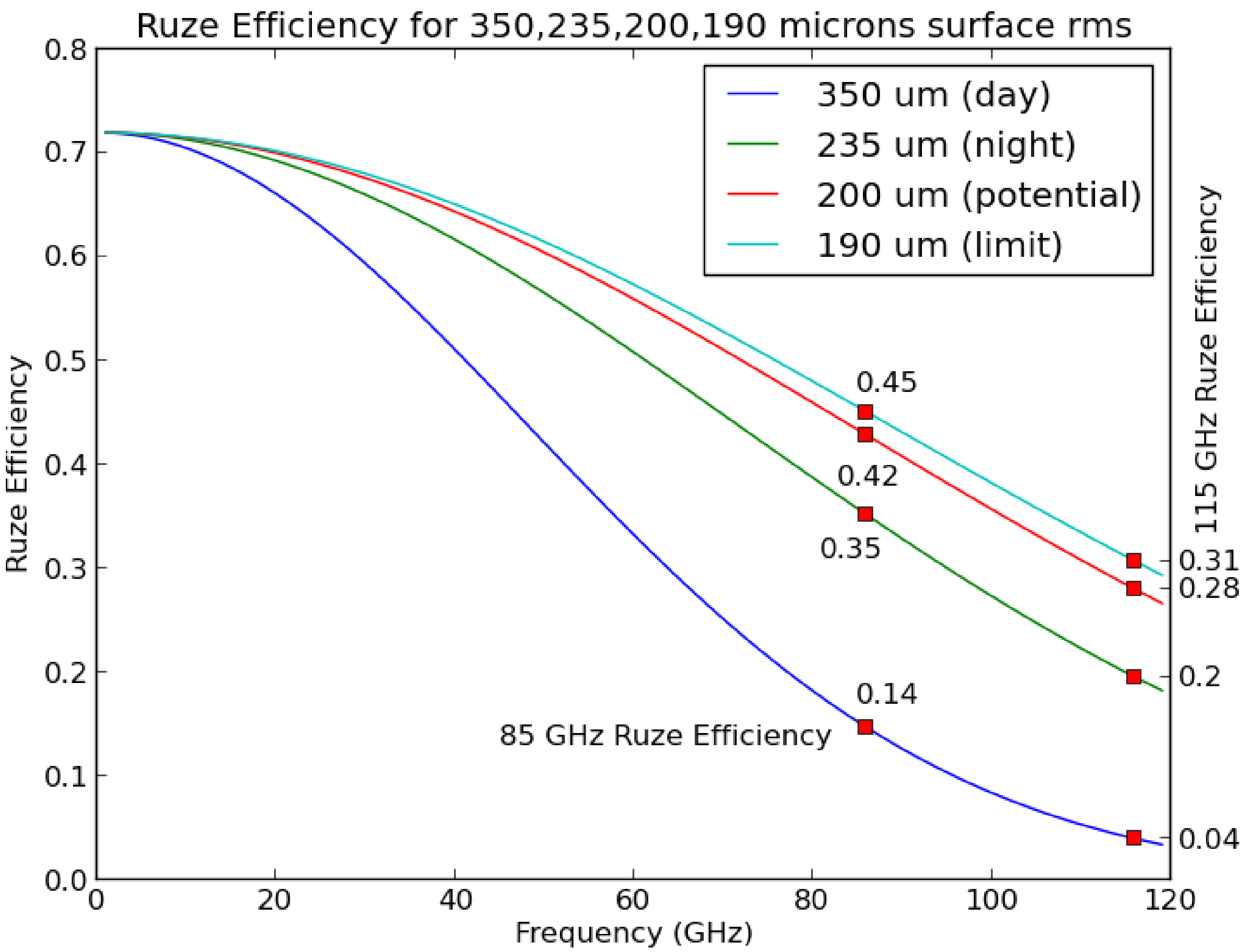
- Small-scale errors:
  - panel manufacturing plus gravity error: 127 μm
  - residual actuator error: ~~80 μm~~ 50 μm
  - panel corner setting error: 80 μm
  - panel-scale thermal errors: 100 μm
  - subreflector: 75 μm
  - total small-scale error: 80+80+127+100+75 = 211 μm
- Large-scale thermal error: ~~100 μm~~ 30 μm
- Total error: ~~211+100~~ = ~~235 μm~~ **~ 200 μm!**

201 μm

- Current OOF overhead ~ 30 m in 2 hr ~ 25%
- Potential Scan overhead ~ 5 m in 2 hr ~ 4%
- Independent of atmospheric opacity
- Daytime observing becomes possible!

NRAO

Ruze Efficiency



Google leica p40 Richard

Leica ScanStation P40 3D Laser Scanner

My Shortlist (0)

$123,915 online

Save to Shortlist

The Leica Scan - Station P40 offers the highest versatility including long range (up to 885 ft/270m at 34% reflectivity), speed (up to 1 million points per second), and accuracy (3D positional accuracy of 3mm at 50m; 6mm at 100m). Delivering outstanding range, speed and data ... more »

$86,740 with academic discount !

Online stores Reviews Details

Online stores shipping to Green Bank, WV

Free shipping Refurbished / used

Sponsored

Sellers	Seller Rating	Details	Base Price	Total Price	
FLT Geosystems	No rating	No tax	$123,915.00 +$26.48 shipping	$123,941.48	Shop

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Anyone interested to collaborate?

Thank you!