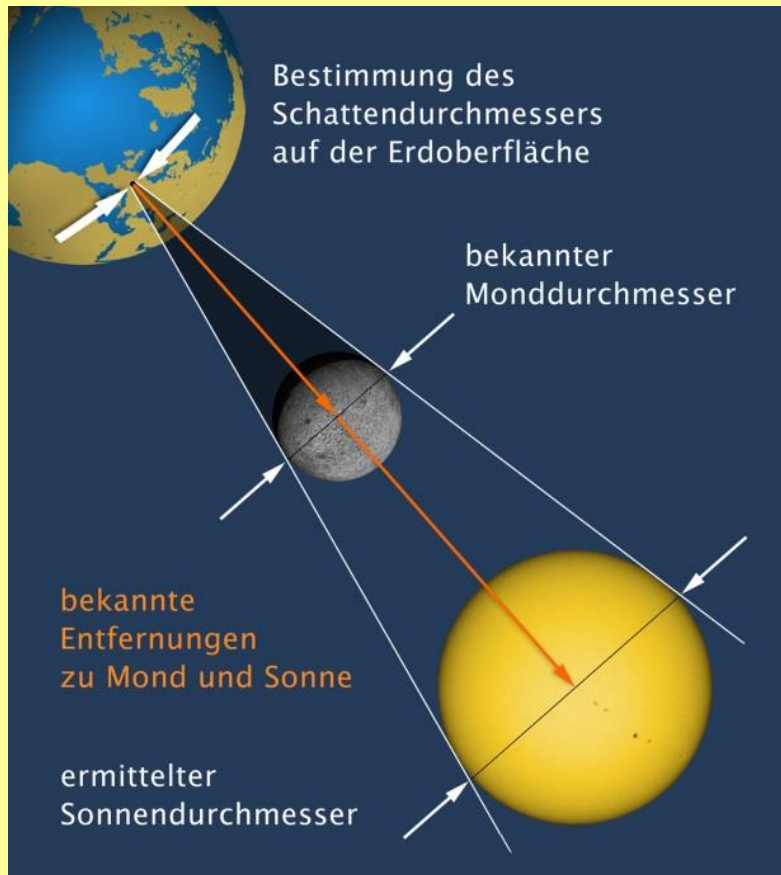


# Baily's Bead Observations during the Total Solar Eclipse 2017 August 21

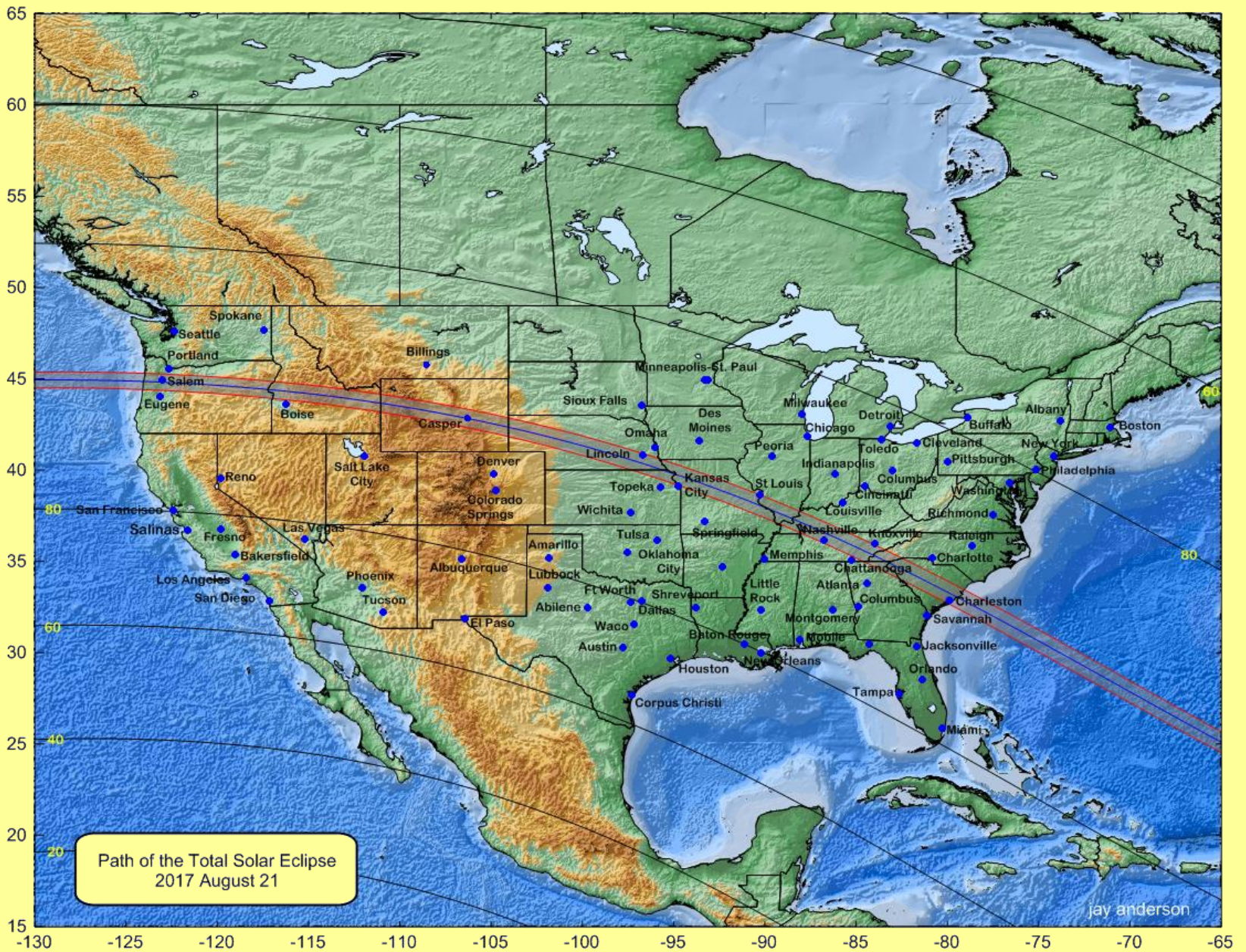
K. Guhl/IOTA-ES and A. Tegtmeier/IOTA-E

# Remember, prinzip and history:



- IOTA and IOTA/ES activity since many years
- Most accurate ground based methode
- 2012 (ESOP XXXI: Will „die“ in the next years due to spacecraft PICARD
- But, PICARD mission not so perfect like expected

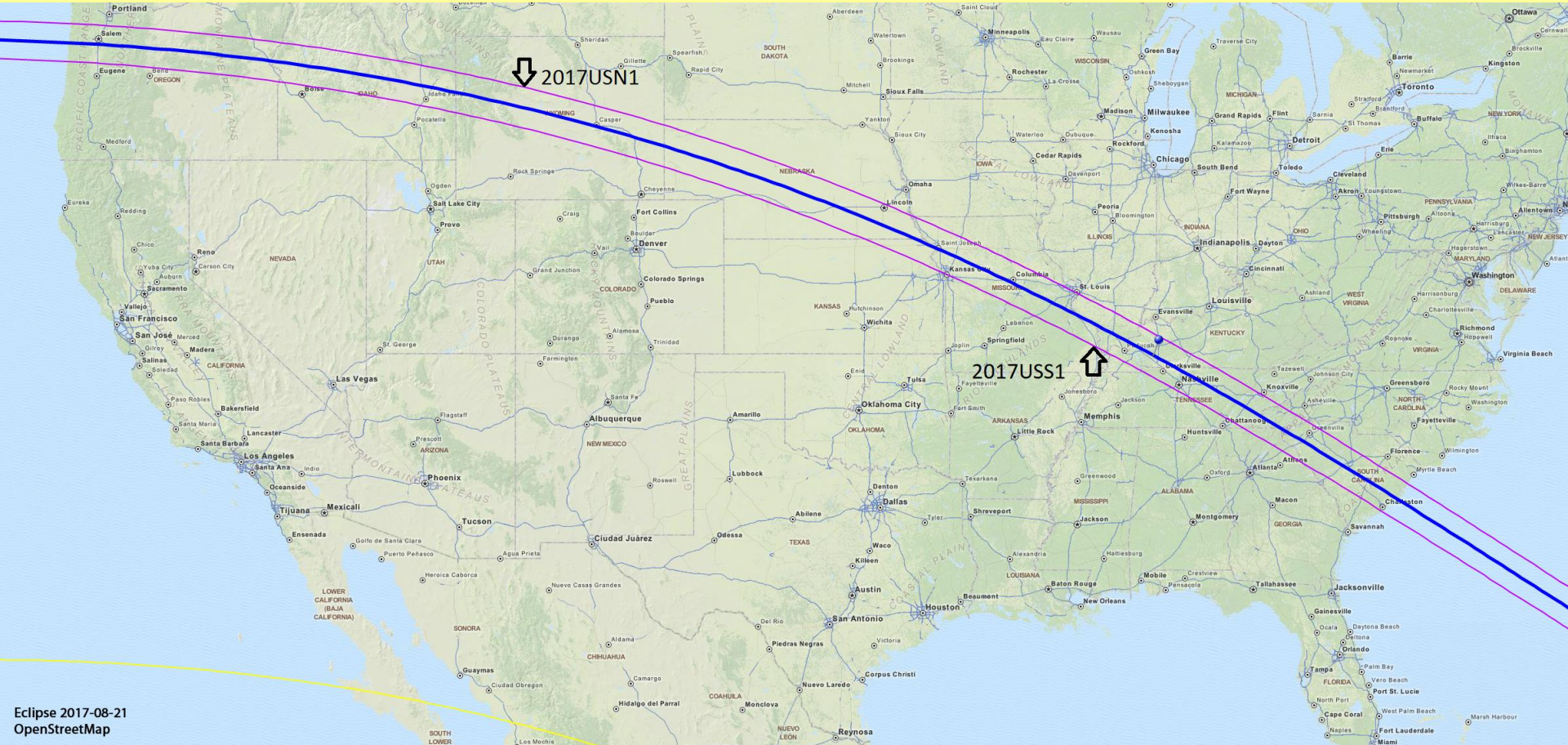




ESOP 2018



# IOTA/ES station





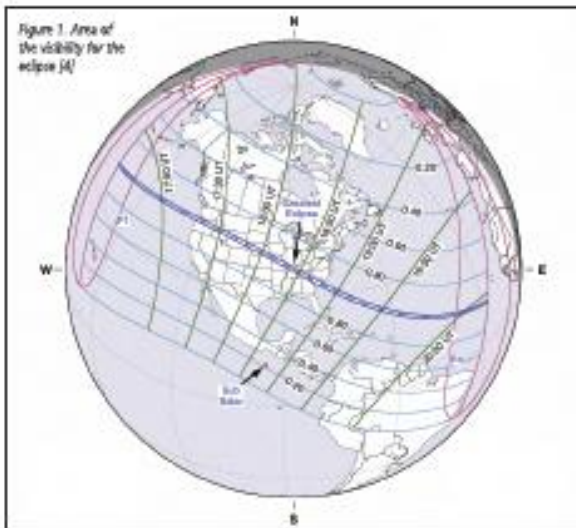
2017USS1



2017USN1

## Baily's Beads Observations during the Total Solar Eclipse 2017 August 21

Konrad Guhl (IOTA/ES, Archenhold-Sternwarte), Andreas Tegtmeler (IOTA/ES)



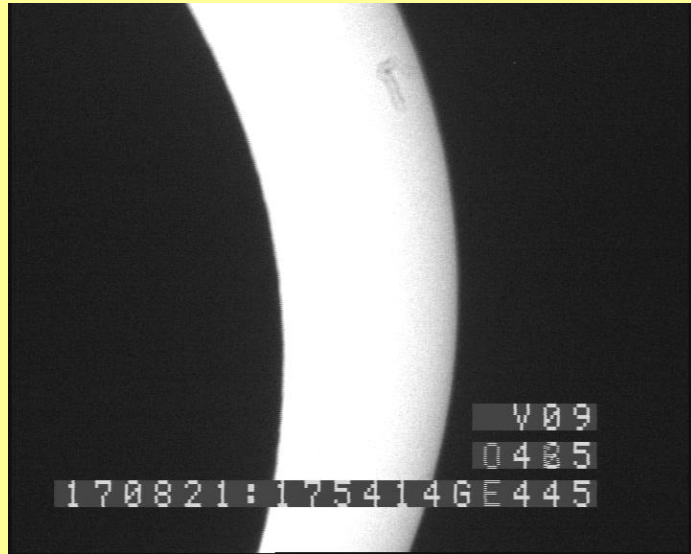
**ABSTRACT:** Measuring the angular solar diameter and calculating the real diameter, taking into account the Earth-Sun distance, has been a fundamental challenge for astronomers for more than two thousand years. After micrometer, heliometer or transit measurements, astronomers found one of the best ground-based methods for finding the solar diameter: The observation of the disappearance and reappearance of the remaining sunlight in the valleys on the lunar limb during total or annular solar eclipses. Due to the fact that Francis Baily (1774-1844) was one of the first who described the tiny points of light on the lunar edge during a total eclipse, the technique was named Baily's Beads observation. Such observations have been a focus of activity of IOTA and IOTA/ES for many years. The aim was a measurement of the solar diameter and detection of possible variations. Following the agreement at the ESOP XXXI (held 2012 in Pescara, Italy) the measurement program will end in 2017 due to the better precision of

spacecraft observations since 2012. This ensures some overlap in the data sequences from bead observation and spacecraft-borne observations, for 5 years after the start of the PICARD-spacecraft mission.

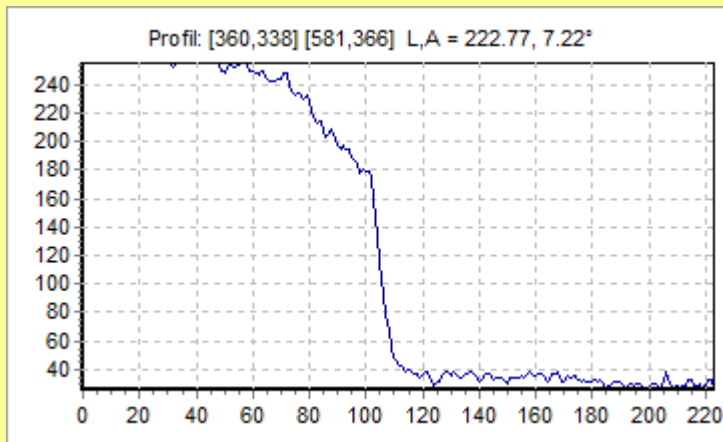
In 2017, IOTA/ES organized an expedition to the edges of a total solar eclipse (TSE) on August 21, where bead observation is possible. Additionally, some US observers (IOTA) observed this event; a separate report is expected.

Detailed report in  
JOA 3/2018

# Main problem: brightness of limb – controlled by gain of WATEC:



Picture during partial phase for exposition adjustment



Brightness vs. radius

## **Conclusion (see also JOA 3/2018)**

The average value for  $\Delta r_s$  on station 2017USN1 is 0.029”.

The average value for  $\Delta r_s$  on station 2017USS1 is 0.250”.

So using the measurement of station 2017USN1 only, the radius is found to  $959.63 + 0.03 = 959.66$ ”

Using the average of both stations, we have to add a value of 0.255 to the standard radius and find

$$959.63 + 0.25 = 959.88$$

In literature the average of measured solar radius from eclipse observation from 2010, 2012, 2013, and 2015 is given as  $959.99 \pm 0.06$ ”. KG+AT observed solar radius for September 2016 as 959.59.

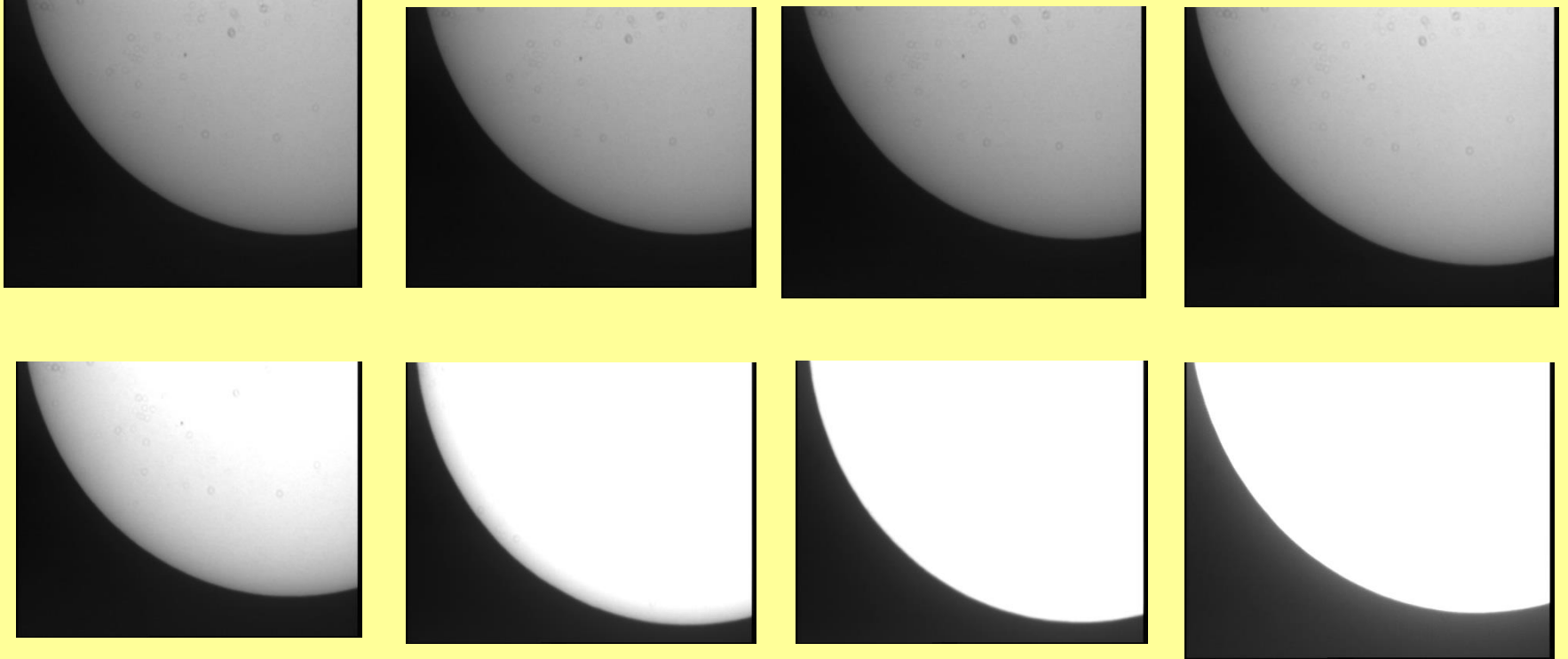
The official value, used for calculation is 959.63”.

So the value found by the expedition is close to the official value, the difference is within the field of tolerances.

The over exposed video on the southern station shows the limits of the method with the 8bit video signal. A signal resolution of 12 or 16bit would be a success towards accurate measurements.



Influence gain:



2018 Aug 16, 100/1000 + IOTA/ES Filt+pol.  
WATEC 120N with Gain from 0 to 4



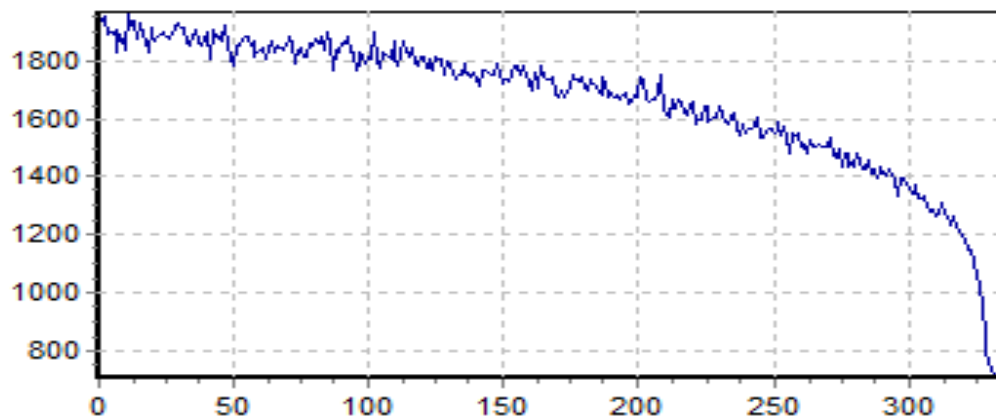
100/1000

IOTA/FIL+pol

IOC2 (Chameleon)

Exp 1 ms, gain 12 bright 15

Profil: [262,249] [492,6] L,A = 334.59, -46.57°



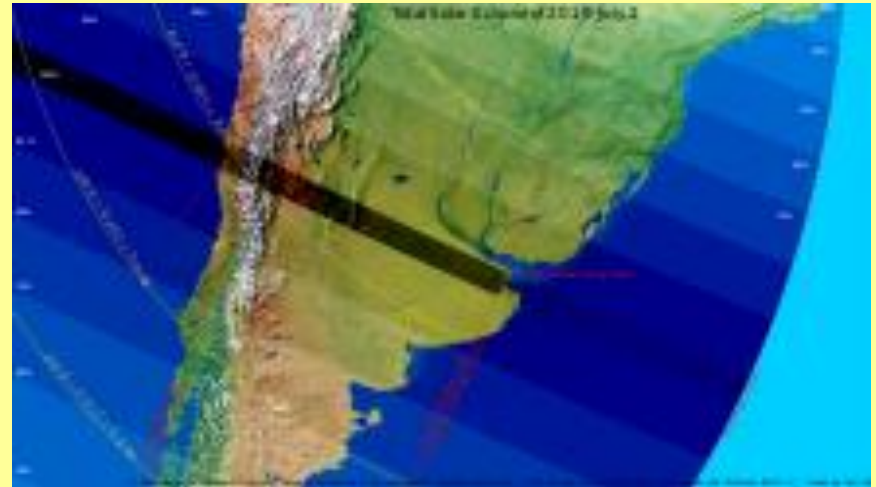
Signal vs. radius

- 12 bit camera give higher dynamic
- Exposition values are clear defined by using a „full“ digital camera
- Shorter exposition time give less noise



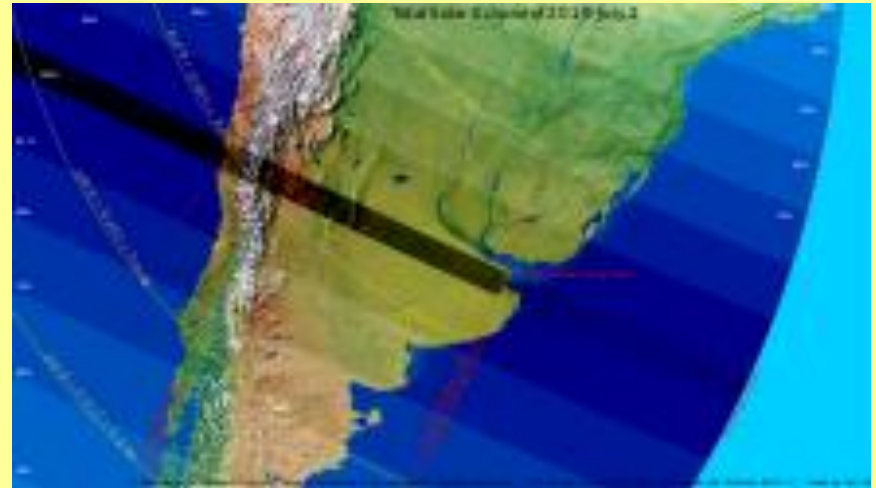
- 12 bit camera give higher dynamic
- Exposition values are clear defined by using a „full“ digital camera
- Shorter exposition time give less noise

July 2nd 2019, Chile:



- 12 bit camera give higher dynamic
- Exposition values are clear defined by using a „full“ digital camera
- Shorter exposition time give less noise

July 2nd 2019, Chile:



Thanks.....