

# LWA ANTENNAS

## AROUND THE WORLD ~ 2020 UPDATE

Whitham D. Reeve  
Anchorage, Alaska USA



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LWA User Meeting  
Virtual  
30-31 July, 2020

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### LOCATIONS AROUND THE WORLD



- ❖ LWA antennas not used in genuine Long Wavelength Arrays
- ❖ Relatively small installations
- ❖ 1 to 10 antennas per location
- ❖ Sometimes more than 10
- ❖ I have been involved (as a supplier) in all but a couple of the installations shown here

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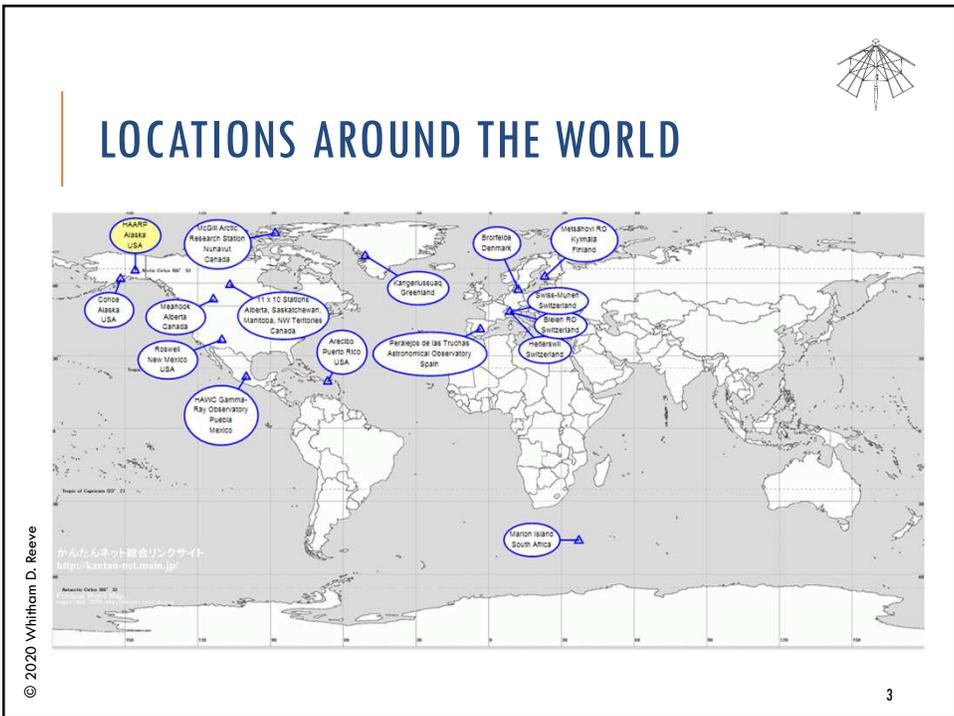
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## LOCATIONS AROUND THE WORLD

Country	Location	Organization	Program
Canada	Saskatchewan & others	University of Calgary	Sky Survey
Canada	Axel Heiberg Island, 77° N	McGill University	Sky Survey
Canada	Meanook Nat'l Wildlife Area	Keo Scientific	Riometer
Denmark	Brorfelde	Private	e-Callisto
Finland	Kirkkonummi, Kylmäla	Metsahovi Radio Observatory	e-Callisto
Greenland	Kangerlussuaq	Technical University of Denmark	e-Callisto
Mexico	Puebla	HAWC Gamma-Ray Observatory	Lightning
South Africa	Marion Island, 46° S	University of KwaZulu-Natal	Sky Survey
Spain	Peralejos de las Truchas	Peralejos de las Truchas Astron	e-Callisto
Switzerland	Bleien	Bleien Radio Observatory	e-Callisto
Switzerland	Muhen	Private	e-Callisto
Switzerland	Heiterswil	Swiss-Heiterswil	e-Callisto
USA	Arecibo, Puerto Rico	Arecibo Observatory	e-Callisto
USA	Cohoe, Alaska	Cohoe Radio Observatory, private	e-Callisto
USA	Roswell, New Mexico	Private	e-Callisto

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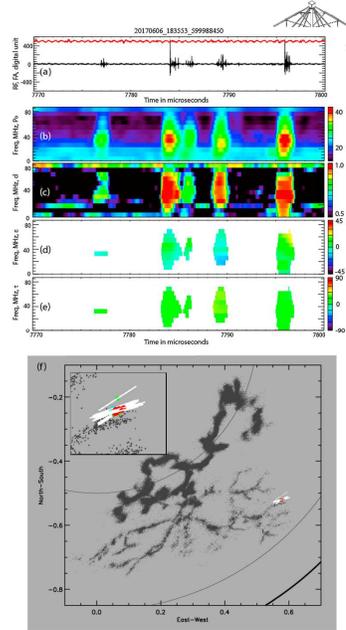


# PUEBLA MEXICO



## Lightning Research

Source: [Shao]



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# LANDSCHLACHT RADIO OBSERVATORY ~ SWITZERLAND



e-CALLISTO  
(previously at Bleien)



Source: [Monstein]

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# SWISS-MUHEN ~ SWITZERLAND

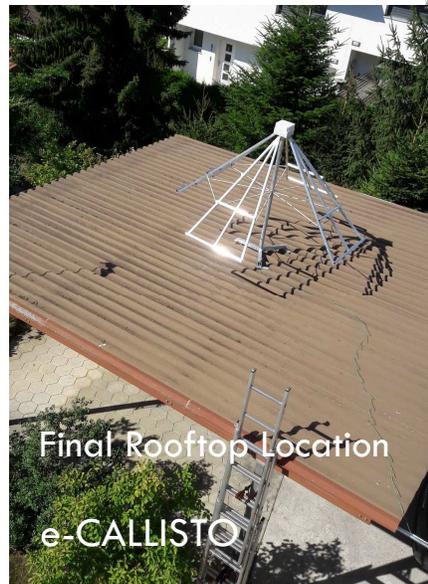


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Source: [Monstein]

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# SWISS-MUHEN ~ SWITZERLAND



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Source: [Monstein]

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HEITERSWIL  
~ SWITZERLAND

e-CALLISTO

Source: [Monstein]



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HEITERSWIL ~ 2018 DAMAGE



Source: [Bircher, 2018]

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## HEITERSWIL ~ 2019 DAMAGE



Source: [Bircher, 2019]

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## HEITERSWIL ~ 2020 DAMAGE



NONE! Antenna was removed for the winter ... but



Space Weather Cows

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## BRORFELDE ~ DENMARK



e-CALLISTO

Source: [Monstein]



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## METSÄHOVI RADIO OBSERVATORY ~ FINLAND



e-CALLISTO

Source: [Tornikoski]



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## KELLYVILLE ~ GREENLAND



e-CALLISTO



Source: [Leer]

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## PERALEJOS DE LAS TRUCHAS ASTRONOMICAL OBSERVATORY ~ SPAIN



e-CALLISTO

Source: [Russu]

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# UNIVERSITY OF CALGARY ~ ALBERTA CANADA



Location	Province
Pinawa	Manitoba
Gillam *	Manitoba
Meanook	Alberta
Meadow Lake *	Saskatchewan
Buffalo Narrows *	Saskatchewan
Russell	Manitoba
Flin Flon	Manitoba
Fort Smith *	Manitoba
Rabbit Lake *	Saskatchewan
Island Lake	Manitoba
Lucky Lake	Saskatchewan

- 10 LWA Antennas at each of 11 locations
- \* Operational or nearly so
- Sky Survey

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# UNIVERSITY OF CALGARY ~ ALBERTA CANADA



Buffalo Narrows, SK



Fort Smith, MB

Source: [Vollmerhaus]

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UNIVERSITY OF CALGARY  
~ ALBERTA CANADA



Meadow Lake, SK

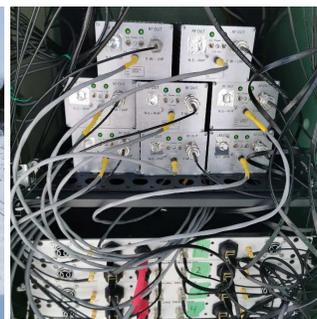
Source [Vollmerhaus]

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UNIVERSITY OF CALGARY  
~ ALBERTA CANADA



Equipment Enclosure



Source: [Vollmerhaus]

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# KEO SCIENTIFIC ~ MEANOOK, ALBERTA CANADA



Riometer



Source: [Unick]

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# COHOE RADIO OBSERVATORY ~ ALASKA USA



Solar Radio 5 ~ 85 MHz ~ e-CALLISTO

Source: [Reeve]



Rampaging Moose Problem

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# COHOE RADIO OBSERVATORY ~ ALASKA USA



Rampaging  
Moose  
Problem

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Source: (Reeve)

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# ALASKA OUTSIDE WORK HAZARDS



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STAN NELSON ~ NEW MEXICO USA



Source: [Nelson]

Meteor Trail Reflections & e-CALLISTO

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HILLSDALE COLLEGE LoFASM V  
~ MICHIGAN USA



Source: [Dolch]

Low-Frequency  
All-Sky Monitor –  
Station V  
(LoFASM)

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## ARECIBO ~ PUERTO RICO USA

e-CALLISTO

Source: [Monstein]



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## NATIONAL AUTONOMOUS UNIVERSITY OF MEXICO ~ UNAM MORELIA MEXICO



Source: [Kurtz]

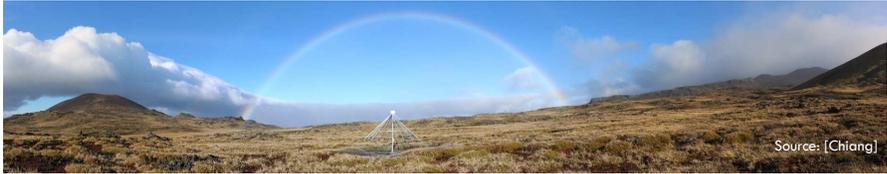
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MARION ISLAND  
~ SOUTH AFRICA

Radio sky 5 ~ 100 MHz

10 LWA antennas planned but delayed  
until at least 2021



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Source: [Chiang]

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MARION ISLAND  
~ SOUTH AFRICA

First autonomous installation

- Photovoltaic with Battery
- Readout electronics record baseband



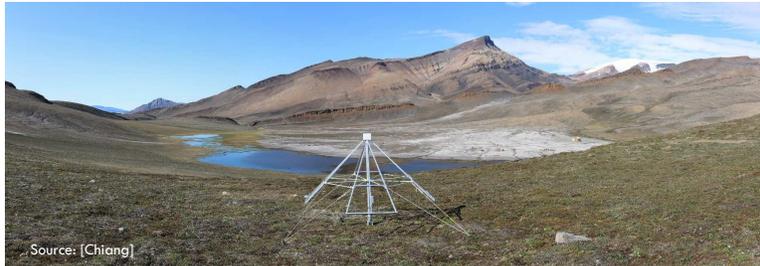
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Source: [Chiang]

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# AXEL HEIBERG ISLAND NUNAVUT ~ CANADA

Essentially an RFI survey



Source: [Chiang]

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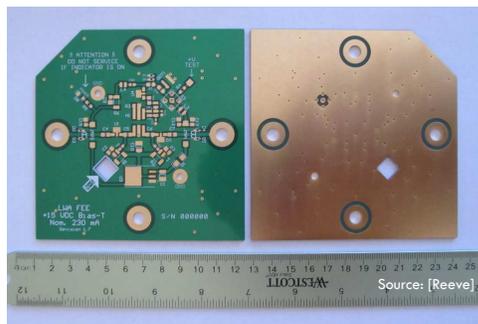
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# FRONT-END ELECTRONICS ~ FEE

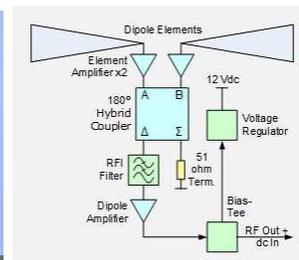
Popular in custom-designed antennas

Single and cross-polarized



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Source: [Reeve]



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## LWA POWER COUPLER ~ LWAPC (-Q)



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Source: [Reeve]

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## SUMMARY



The LWA antenna is versatile and can take it, anywhere in the world

“The antenna structure is made of aluminum frames and so does not need a heavy foundation. The lightweight structure is simply attached to wedges hammered into the ground, and this is enough to withstand the most severe local weather; the first winter season 2017–2018 allowed testing the system in cold temperatures (down to  $-25^{\circ}\text{C}$ ), high wind speeds, and heavy snowfall.” +

+ Kallunki J, Tornikoski M, Oinaskallio E, et al. Solar observing system for radio frequencies 5–120 MHz. *Astron. Nachr.* 2018;339:656–660. <https://doi.org/10.1002/asna.201913545>

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## PRESENTER



Whitham Reeve is (mostly) retired. He obtained B.S. and M.S. degrees in Electrical Engineering at University of Alaska Fairbanks, USA. He worked as a professional engineer and engineering firm owner/operator in the airline and telecommunications industries for more than 40 years and now manufactures electronic equipment used in radio astronomy. He has lived in Anchorage, Alaska his entire life.

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