

Understanding Marconi's 1901 Transatlantic Wireless Feat

Jeff Briggs – K1ZM/VY2ZM
(And A Dedicated Multinational
Team!)

Why I Became Interested In This

- Coastal New England was my birthplace
- Marconi's Site on Cape Cod 7 miles away
- WCC Chatham 4 Miles to my south
- I visited South Wellfleet for the first time in 1973 and was awestruck with the location
- Lowband communication and its difficulty fascinates me – especially 160m!

Marconi – The First Amateur? Canadian & US North American Feats – History Books Tell Us:

- 1901 St. Johns, NL – Copies “S” from UK
- 1902 N. Sydney, NS –Hears UK at 282kHz
- 1902 Glace Bay, NS – Xmits to Poldhu, UK
- 1903 S. Wellfleet, MA – Xmits Msg to UK
- Modern Radio is Born.....

Some Historical Perspective:

- 1901 QRG at approx 800kHz (or so)
- 1750z Reception in Broad Daylight in NL
- Marconi's Rx is rudimentary at best
- Jack Belrose, VE2CV (and others) suggest Marconi duped us all and heard nothing!

The Beacon Experiments 2006/7

- Joint Effort of PARC (UK) and MRC (NL)
- Joe Craig (VO1NA) plays key role in NA
- Keith Matthew (G0WYS) a key player in UK
- GB3SSS – 100w beacon established on 160m
- Tests commence late 2006 into early 2007
- Antenna is a 50ft T vertical with radials
- Xmit site near original Marconi location in UK

The GB3SSS Experiment Received Some Great Press

Islander joins radio history experiment

*Amateur radio enthusiast Jeff Briggs
says he heard blips transmitted
in attempt to settle Marconi claims*

BY NIGEL ARMSTRONG
THE GUARDIAN

An Island resident is playing a part in an international attempt to settle a piece of radio history involving questionable claims by the late Guglielmo Marconi.

Marconi claimed to have heard three blips representing the Morse code for the letter S, being a radio signal from a station in England, and heard by Marconi in Newfoundland on Dec. 12, 1901, at noon.



in daylight hours.

Now a group of amateur radio experts wants to test the possibility of Marconi's early claim.

They set up a transmitter in England at the same site claimed by Marconi, and a receiver in St. John's, Nfld.

The test began on Nov. 1 this year.

They cannot use the exact same style of transmitter because it would disrupt a broad range of modern radio communication but they used the best historical evidence to recreate Marconi's equipment.

Jeff Briggs knew of this experiment and last week used his amateur radio station in Monticello, P.E.I., to listen for the signal.

Last Friday and Saturday, he heard Marconi-like blips clearly, even close to noon-time, the only person in North America yet to do so.

"I'm not undecided anymore," said Briggs during an interview Wednesday with The Canadian Press.

"I'd be willing to bet some chips on Marconi."

Before his claim was confirmed



Paul Gallat
Kent Street
Guardian photo

He

About

It's a fine year, but it's the last tuber proving a the rains le "With these past going to a days before get back or Wood. of

The Highlights at VY2ZM

- Strong signals received at 0300z Oct 2006
- Weak signals heard at 1000z the next day
- Signals were copied at 1615z/1700z/1745z
- GB3SSS actually readable 22.5 hours a day
- 1230z – 1400z was only “blackout period”
- QED – More tests and measurement needed

Let's Define Some Terms

- Decibels are a logarithmic conversion of a power ratio
- dBm means decibels with respect to a milliwatt
- Zero dBm = 1 milliwatt
- -70dBm means 70dB below a milliwatt
- A signal 80dB stronger than -70dBm would be +10dBm or ten milliwatts or 0.01 watts
- -73dBm equates to S9 on a calibrated Rx S meter

November 2006 Tests on PEI

- Calibrated HP Signal Generator Employed
- Incoming signals matched to HP generator
- 1745z sigs varied from -86dBm to -91dBm
- 160m qso's made with GM3POI at 1300z
- GM3POI copied on PEI 559/569 at 1400z
- GM3POI two way made again at 1630z

Additional Tests at VY2ZM

- Next steps focused on Euro AM BC Stns
- EU BC stations centered at 9kHz intervals
- Target stations identified by WA1ION at 1521/1179/1089/855/745kHz
- BC carriers heard at 1600z & 1630z
- Very loud BC carriers at 1700z & 1715z
- Programming content enjoyable at 1730z

What Does It All Mean?

- A path exists EU to NA on 160m at 1750z
- A path exists EU to NA on 1089 at 1750z
- But.....Marconi's 1901 claim not validated
- The biggest hurdle remaining was his Rx
- Was it sensitive enough to hear these sigs?
- Papers by MacKean (1995) & Walker/Lyon (2001) estimate it to be -45dBm to -50dBm

How Close Are We Then?

- Sigs Peaked at -86dBm at VY2ZM
- Marconi's 20KW power gain provides 21dB versus the GB3SSS beacon 100w xmtr
- This puts us at -65dBm or 15dBm short
- Something else we don't understand is at work here
- More data and a breakthrough is needed

The Shortfall Issue Per K9LA

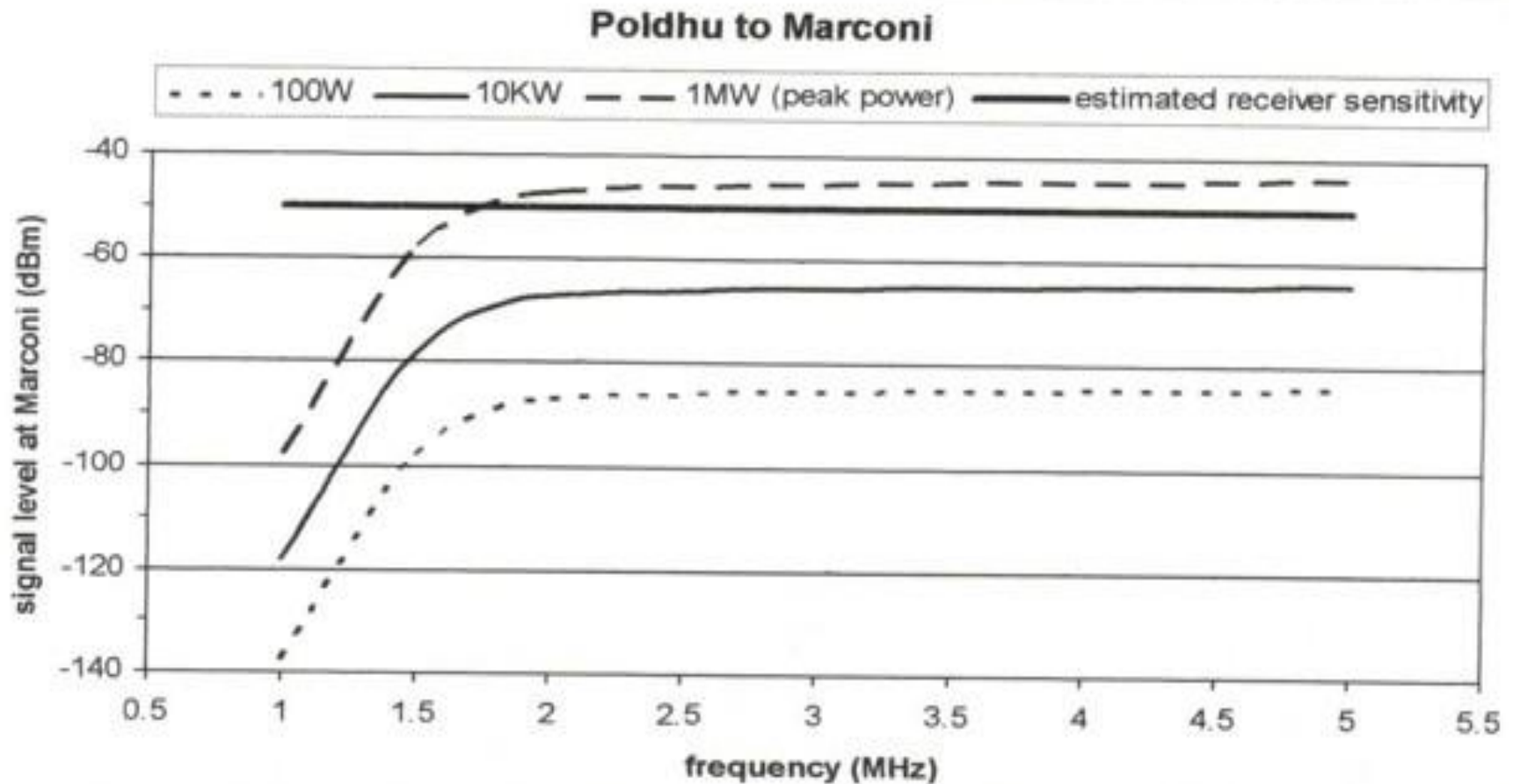


Figure 1 – Marconi results with the ‘improved’ lower ionosphere model

Some K1ZM “Conjecture” (It’s Time to Roll Up Your Pants)

- Marconi was distressed when his peers discounted his 1901 reception claims
- His subsequent actions speak *volumes*
- 1902 North Sydney NS
- 1902 Glace Bay, NS
- 1903 South Wellfleet Mass

Let's Discuss The Criticism

- The “confusion” theory
- The Marconi “heard distant thunder” theory
- The theory that Marconi duped us all
- (Marconi *was* a bit of a “*scalawag*”)
- The “You can’t do this in daylight theory”
- So how was it done then?

Part of the Answer was Luck and Timing!

- Location – Location – ***LOCATION!!!!!!***
- Salt Water is Magical on the lowbands
- 1901 was a solar minima year
- Dec 12, 1901 was at the Winter solstice
- There was no QRM – radio not invented
- There was probably little local noise
- Solar indices were likely near $A=0/K=0$

A View of Signal Hill, NL



Signal Hill and the Cabot Tower: A Closer Look



The Cabot Tower at Signal Hill



The Famous Pole Looking NE Towards Poldhu Across the Sea



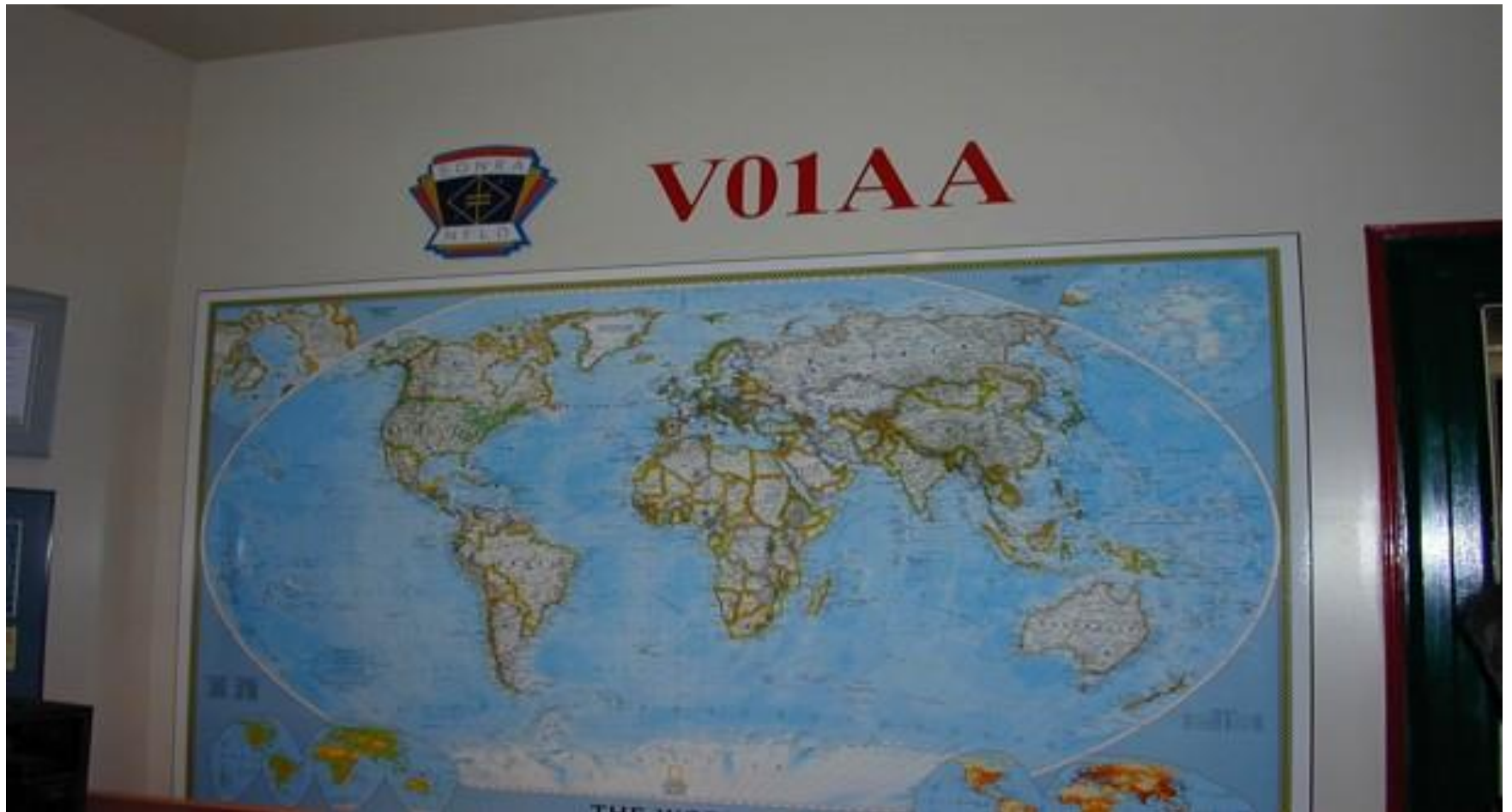
A Night View of St. Johns from the Cabot Tower



The Marconi Museum at the Cabot Tower



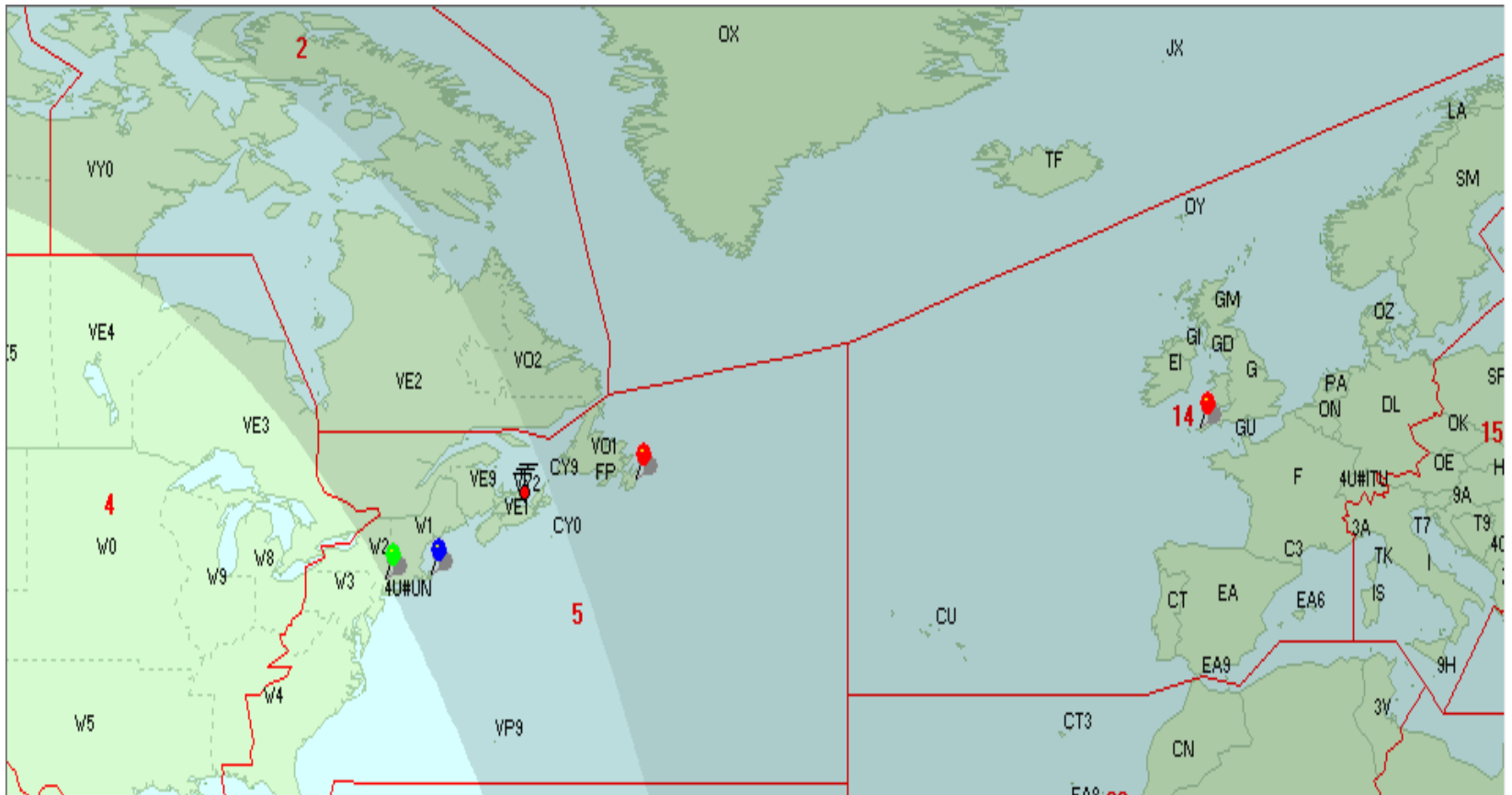
More Marconi Museum



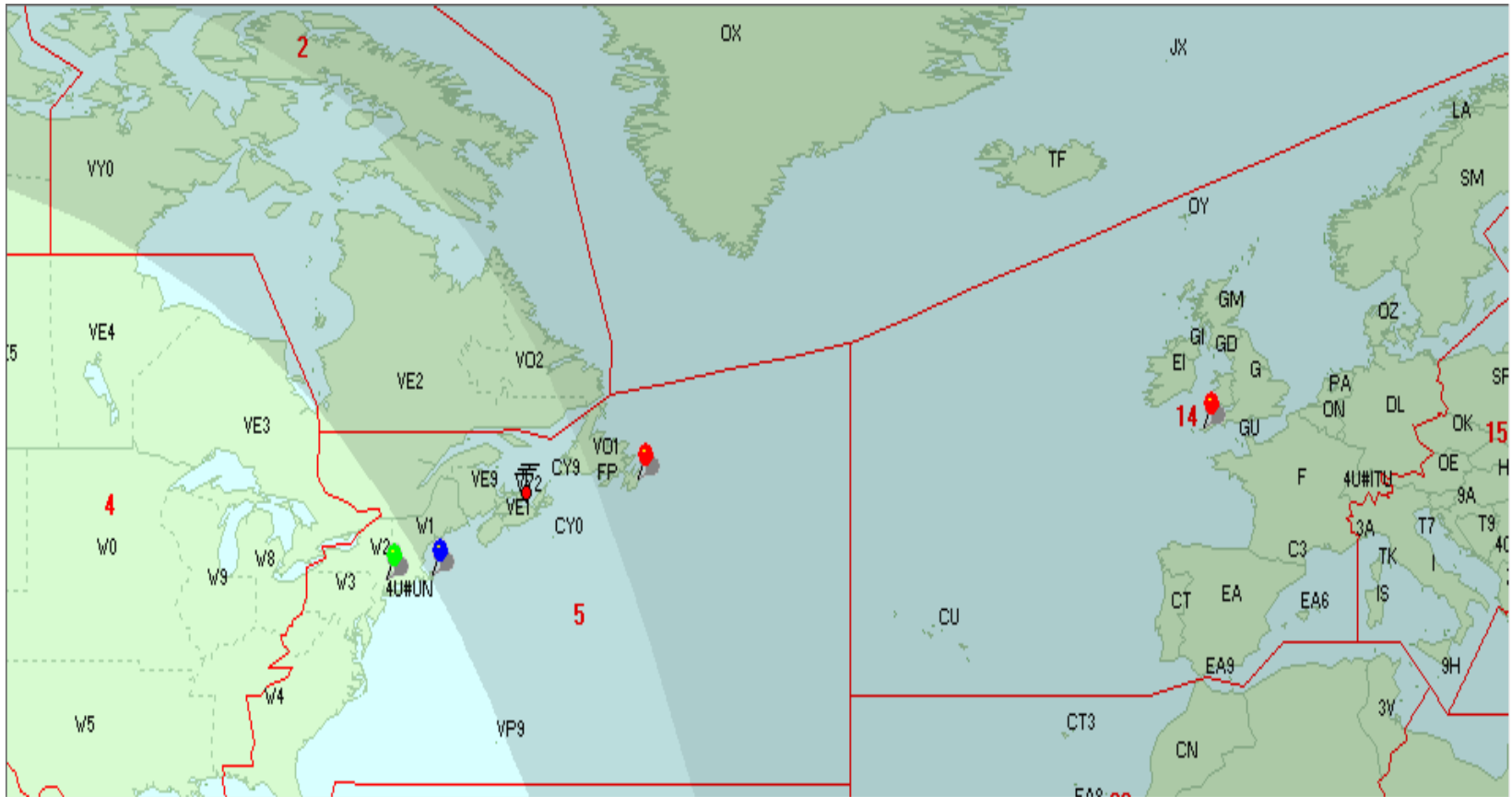
We're Still Short Some dB's; It's Time for More Theory

- Low band experience is helpful here
- Some comparisons of NY/Cape Cod/PEI and NL listening experiences instructive
- Acceptable path lengths, limited E layer absorption, proximity to approaching darkness are all a part of the answer
- Marconi was near the “hairy edge” but safely inside the zone of what is possible on this path
- DX Atlas illustrates why a path exists at 16z-17z

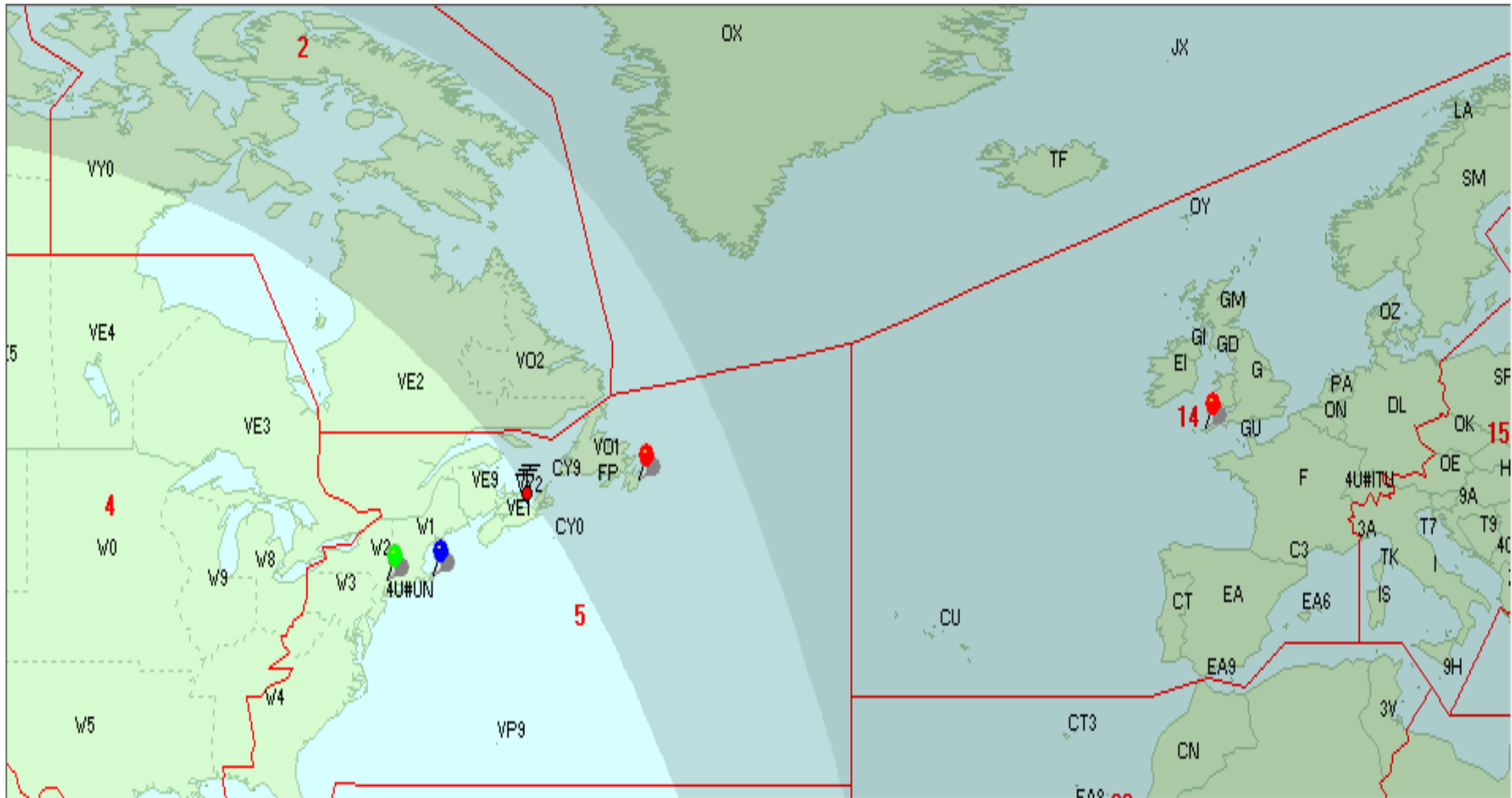
Sunset at K1ZM NY Occurs at 2125z on Dec 12th



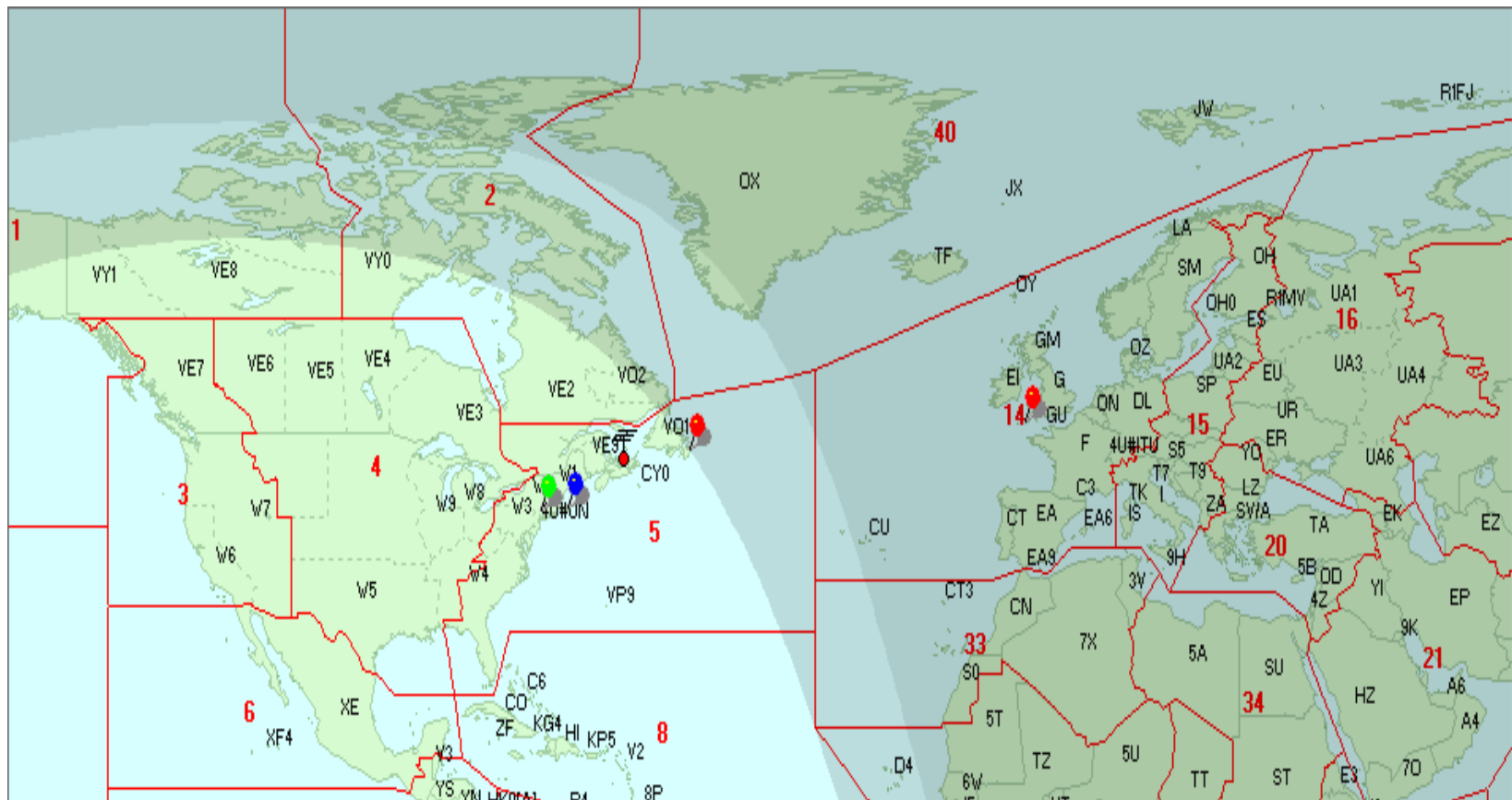
Cape Cod Sunset Occurs at 2110Z on Dec 12th



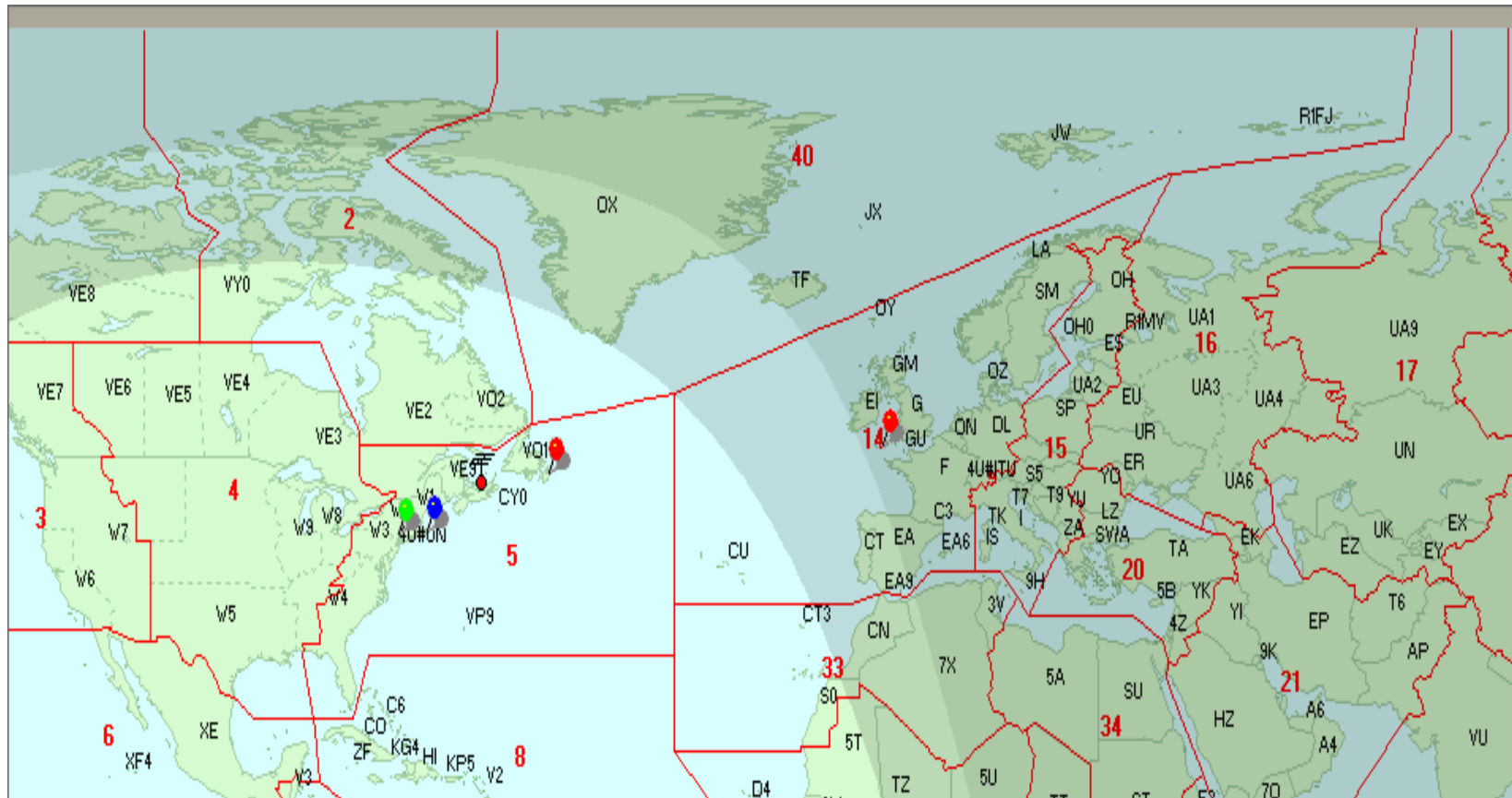
Sunset at VY2ZM on Dec 12th is
at 2020z



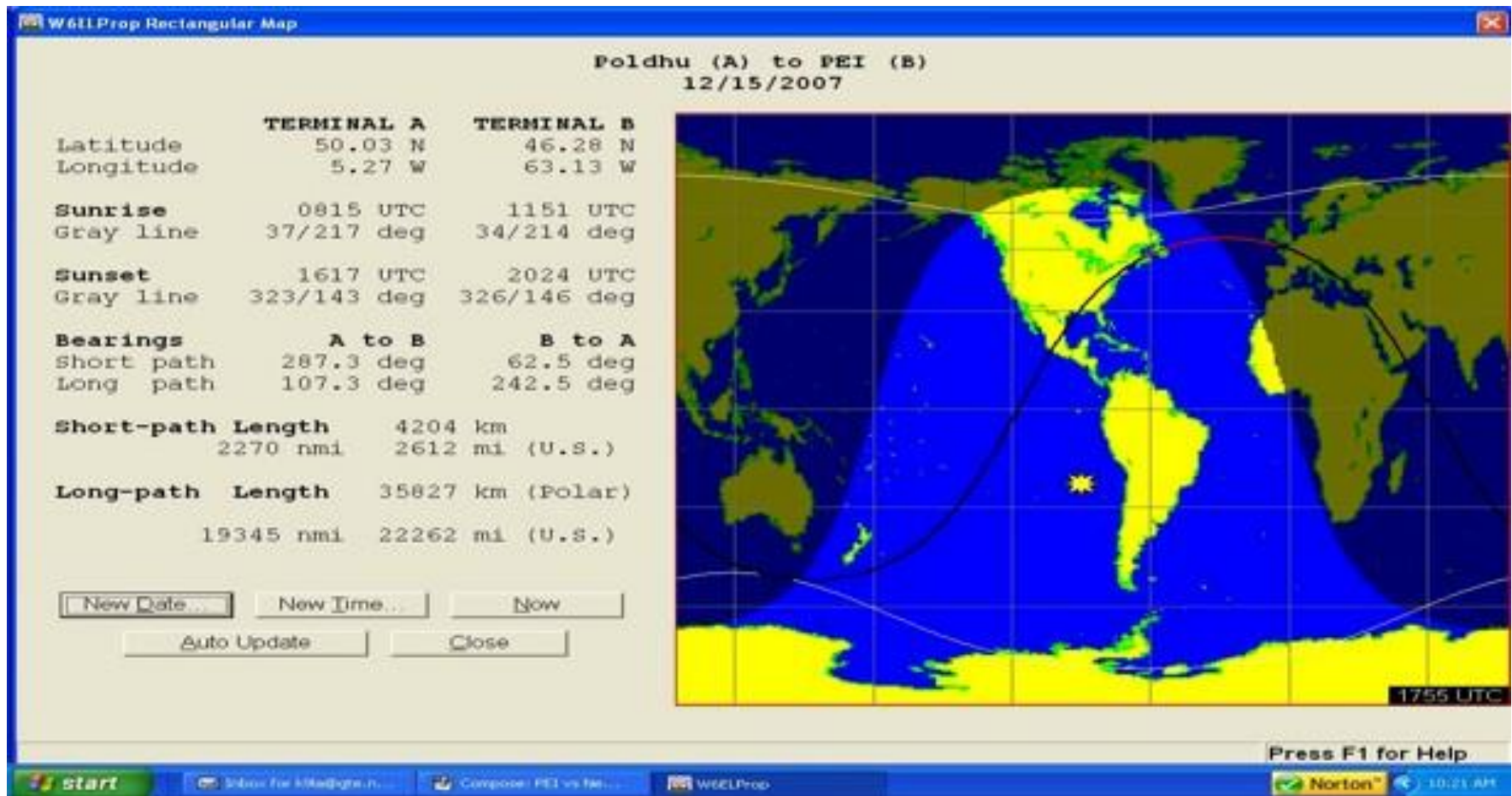
St Johns NL Sunset Occurs at 1940z on Dec 12th



The Path from Poldhu to St Johns as it Exists on Dec 12th at 1750z



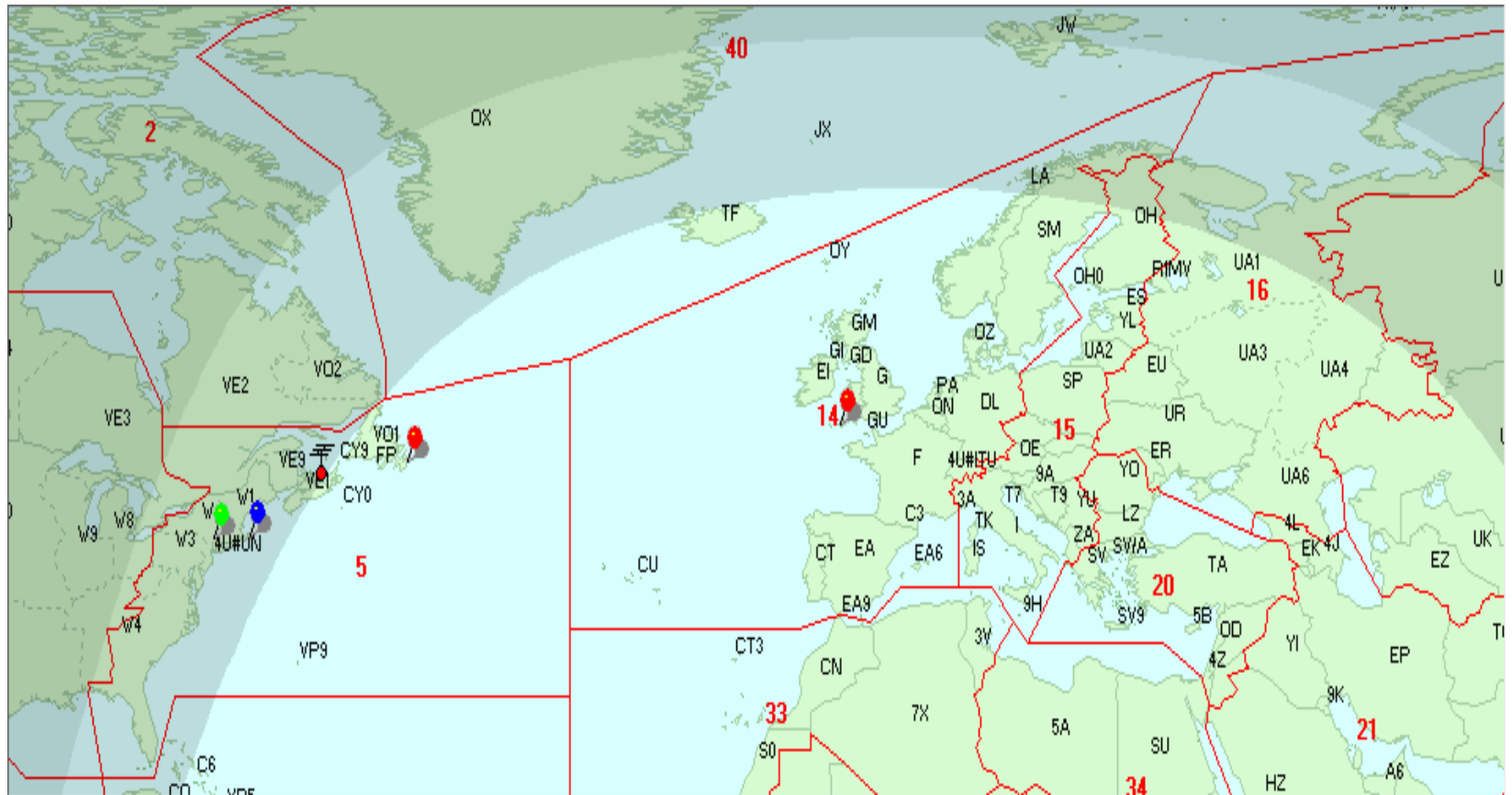
The Search for the Missing dB's Becomes the Next Step



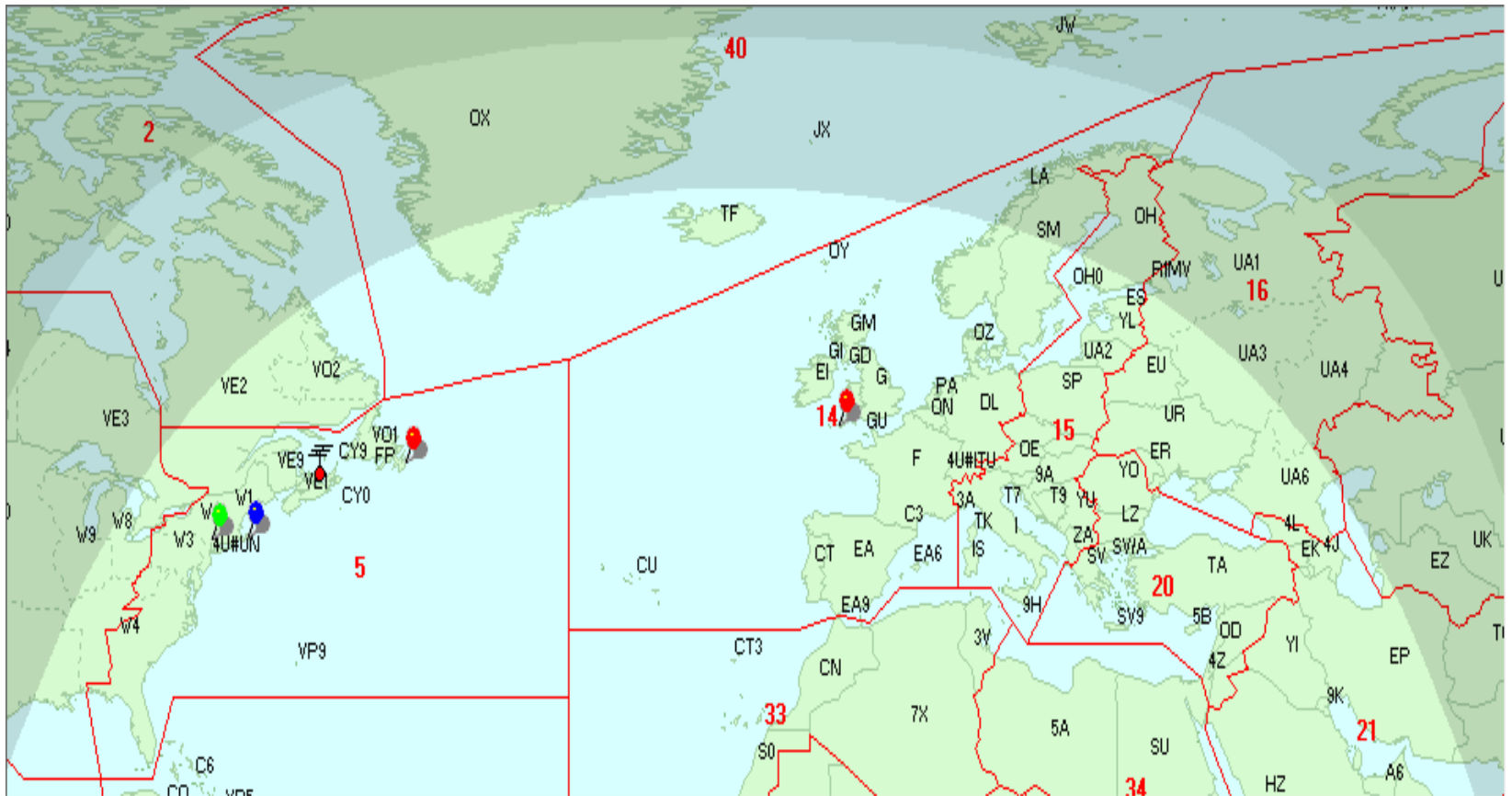
Proplab Pro Estimates a 4.4dB Edge At 1750z In Favor of NL vs. PEI

- December/1750z/1.96MHz
- Poldhu to PEI - 3 E Layer Hops/Total Distance 4223km/Absorption 15.0dB
- Poldhu to NL – 3 E Layer Hops/Total Distance 3433km/Absorption 10.6dB
- Experience suggests there should be more here – but where is it?
- **Proplab Pro (a product of Solar Terrestrial Dispatch) is a ray tracing program that takes into account the Earth's magnetic field and electron-neutral collisions**

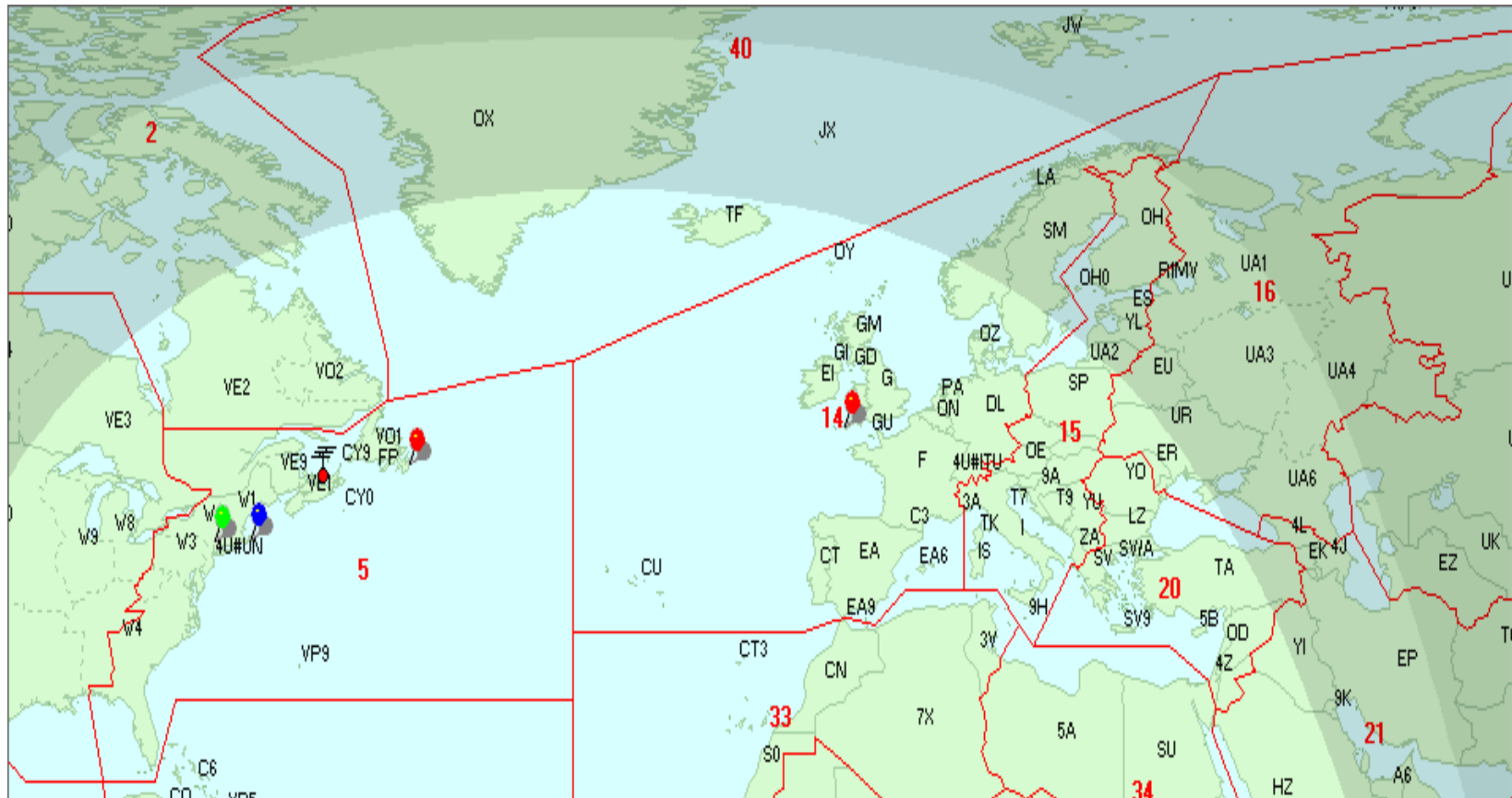
Poldhu to PEI Dec 12th 1141z



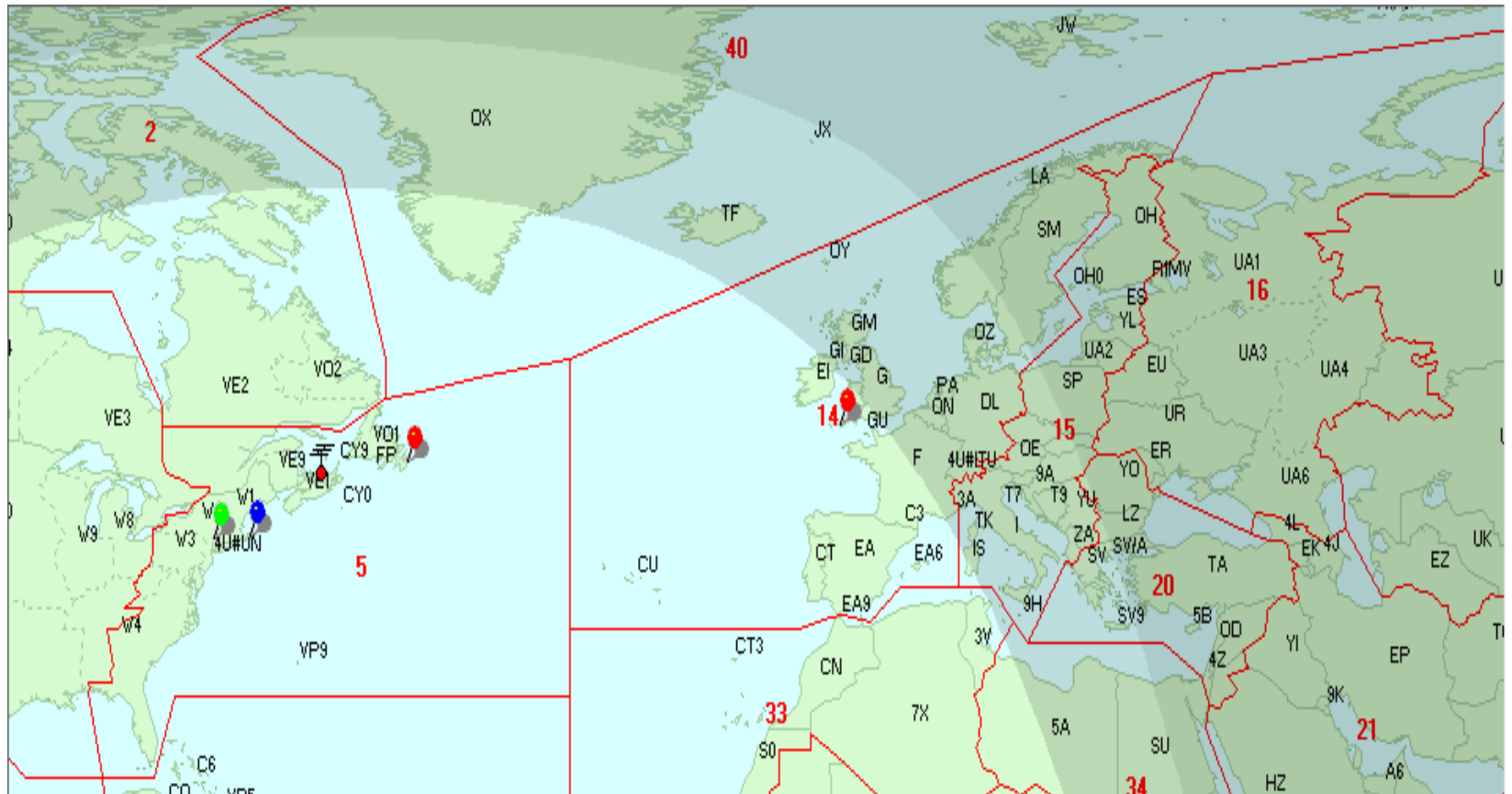
Poldhu to PEI Dec 12th 1300z



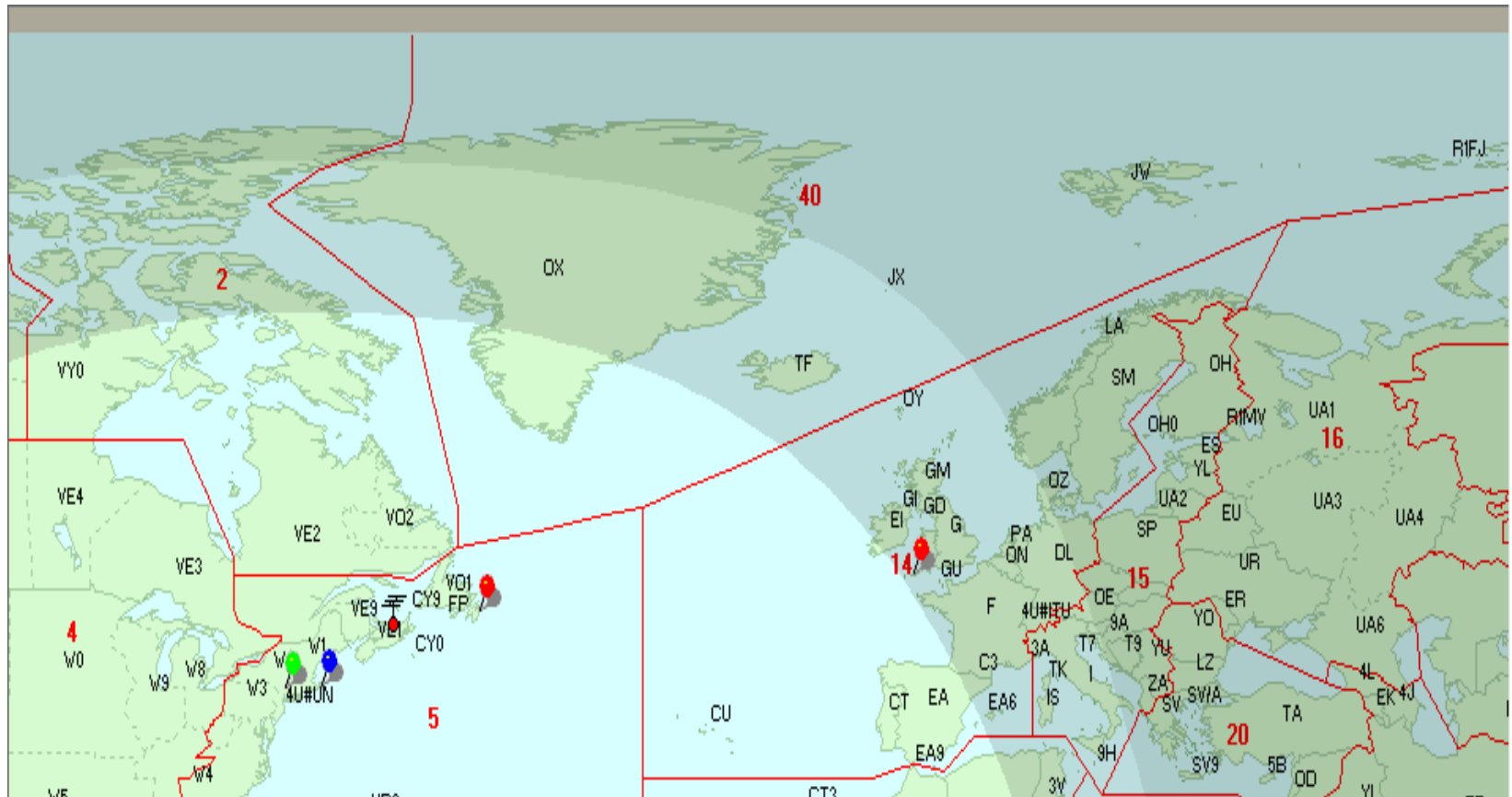
Poldhu to PEI Dec 12th 1400z



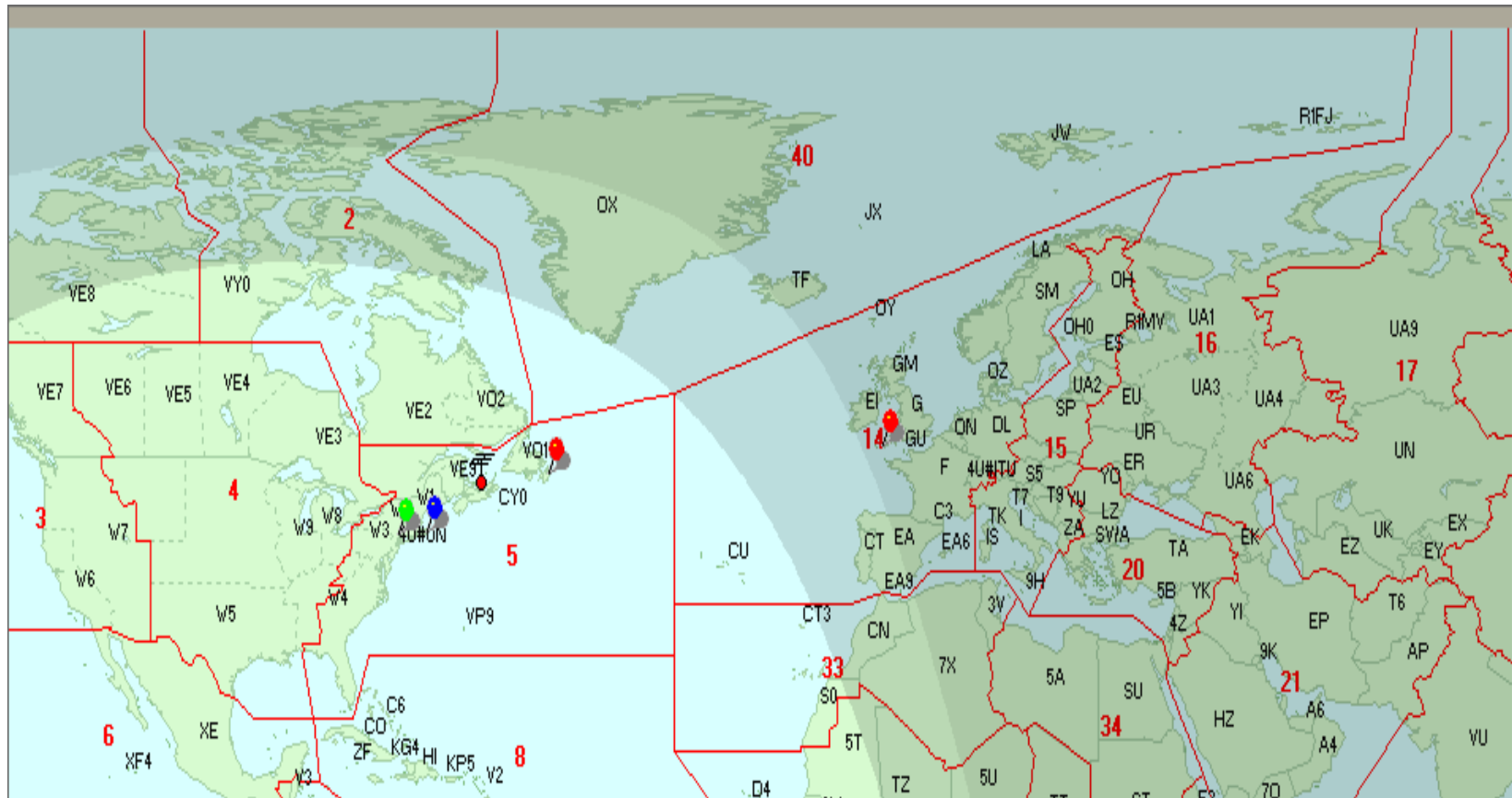
Poldhu to PEI Dec 12th 1600z



The Daylight Path GM3POI to VY2ZM at 1630z on Nov 28th



The Path from Poldhu to St Johns as it Exists on Dec 12th at 1750z



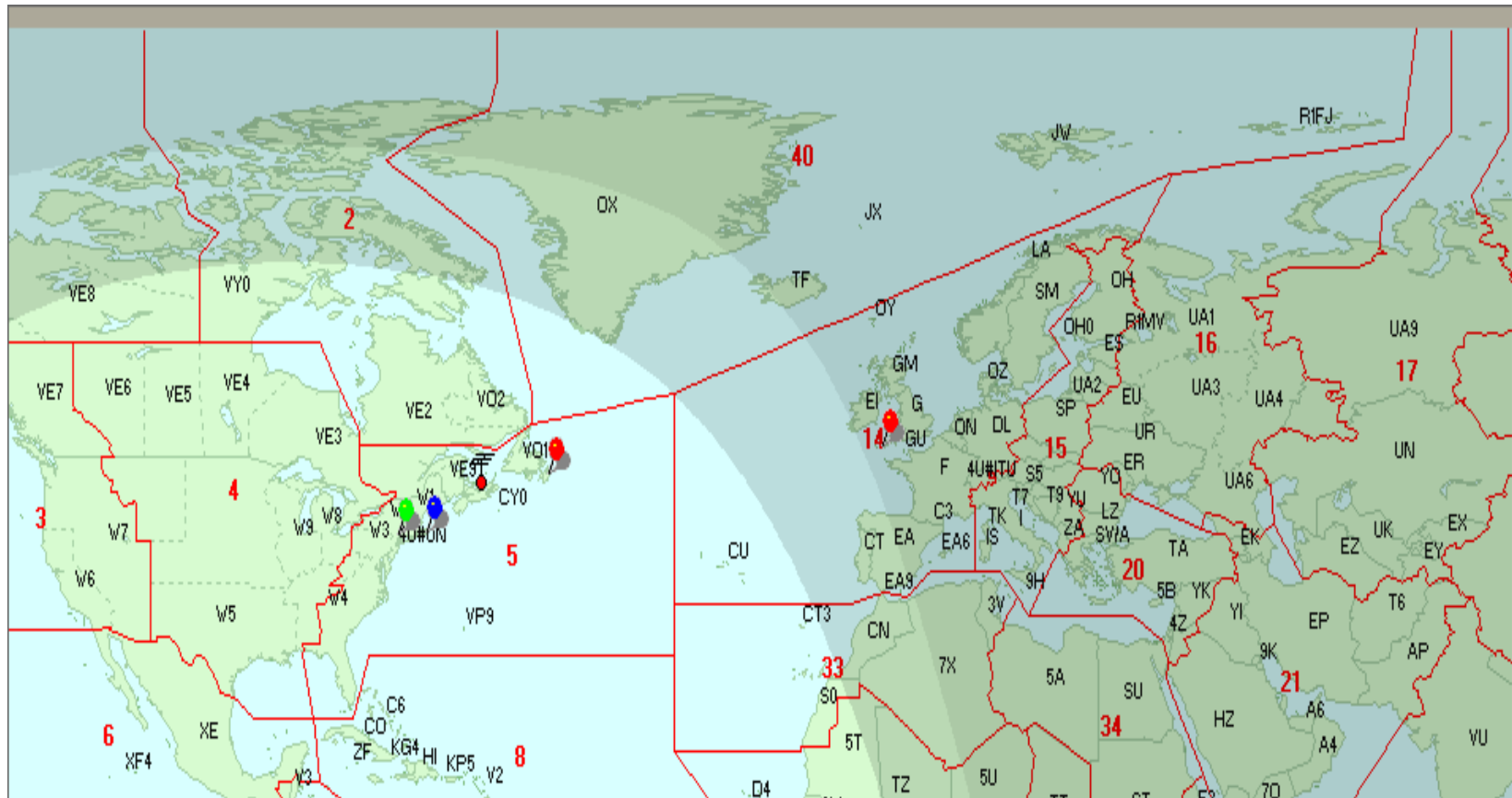
Poldhu and St Johns Were the Places to Be in NA and EU

- Path lengths were nearly as short as is possible over this circuit from EU to NA
- E layer absorption was reduced to acceptable levels due to advancing darkness
- At 1750z on Dec 12th, sunset at St Johns, NL was only 1 hour and 50 minutes away
- The key determinant to Marconi's success is that the path between Poldhu and NL opens as soon as the Eastern end of the circuit goes into darkness

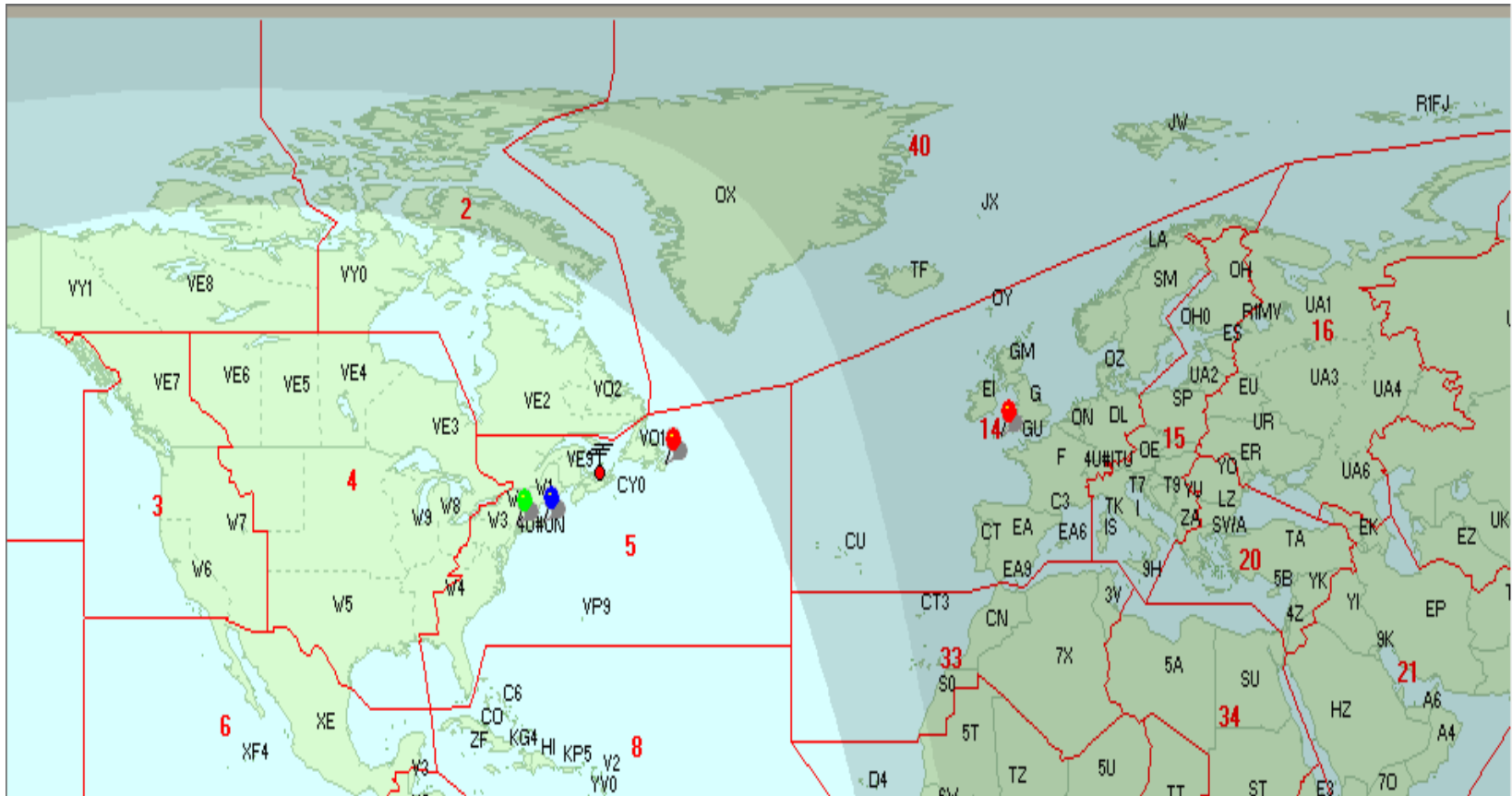
We Are Closer to Understanding Marconi's 1901 Success; Some Issues Remain, However

- Calibrated dBm measurements of GB3SSS signal levels in St John's were never made in 2006/7
- ProplabPro estimates of NL vs PEI path losses plus application of Marconi's xmit power gain to those signals measured at VY2ZM suggest an estimated -60dBm GB3SSS signal into NL or 10db short of what Marconi probably could hear
- $-86\text{dBm} + 26\text{dB} = -60\text{dBm}$ – Rx was @ -50dBm

The Path from Poldhu to St Johns as it Exists on Dec 12th at 1750z



Dx Atlas Showing Advancing Darkness on PEI Jan 26th 1937z Sunset = 2105z (In 1Hr 28 Min)



Possible Future Steps

- Further testing may be undertaken with different objectives than those of 2006/7
- Precise measurement of test signals received in NL is certainly one of them
- Experience suggests a greater difference between PEI and NL than 4.4dB @ 1750z
- Marconi's claim, while not proven, is looking more credible than ever before!

Thank you, Thank You, Thank You!

- As sort of a “tail-ender” to this whole experiment I would like to thank VO1NA, G0WYS, KV6LEE and others for allowing me to play a minor role
- I happened to be in the right place at the right time to alert the organizers of this venture to the incredible signal levels I was copying nearly around the clock on Prince Edward Island
- It was a pleasure to work with such dedicated amateurs