

SAQ in Grimeton, the only remaining pre-electronic transmitter for transatlantic work, on the Unesco World Heritage List

Carl Henrik Walde, SM5BF

On July 2nd, 2004, Unesco decided to put SAQ, Varberg Radio in Grimeton, on the World Heritage List. The World Heritage Committee declared that

The Varberg Radio Station at Grimeton in southern Sweden (built in 1922-24) is an exceptionally well preserved monument to early wireless transatlantic communication. It consists of the transmitter equipment, including the aerial system of six 127-m high steel towers. Though no longer in regular use, the equipment has been maintained in operating condition. The 109.9-ha site comprises buildings housing the original Alexanderson transmitter, including the towers with their antennae, short-wave transmitters with their antennae, and a residential area with staff housing. The architect Carl Åkerblad designed the main buildings in the neoclassical style and the structural engineer Henrik Kreüger was responsible for the antenna towers, the tallest built structures in Sweden at that time. The site is an outstanding example of the development of telecommunications and is the only surviving example of a major transmitting station based on pre-electronic technology.

From late 1924, the Alexanderson alternator and his multiple tuned antenna system were used for communication to the "Radio Central" of RCA at Rocky Point, Long Island, USA. During the Second World War and for some years after that, the Royal Swedish Navy used it for traffic to submerged submarines, in retrospect crucial for the survival of the station, still in perfect working order.

It started a hundred years ago

In the 1860's James Clerk Maxwell published his theory on electromagnetic waves which was confirmed experimentally by Heinrich Hertz 20 years later. Nikola Tesla's work on AC for power and light applications included high frequency alternators and already in the early 1890's he foresaw transatlantic wireless telegraphy employing continuous waves (CW). Spring 1895, Alexander Popov demonstrated a receiver to predict arriving thunderstorms. It is rumoured and may well be true that he also had sent wireless signals to ships, a fact concealed by the Russian Imperial Navy. Autumn 1895, Guglielmo Marconi, made his first experiments. Being an entrepreneur, he was the first person to understand that these waves could be used commercially for wireless communication – everybody including Popov regarded Marconi as the father of radio. In the beginning, signals were generated by electric sparks. At the turn of the century, CW became possible with the Poulsen electric arc converter and the Goldschmidt, Arco-Slaby, Béthenod-Latour and Alexanderson types of rotary machinery. In the 1920's, electronic transmitting tubes had arrived and the famous Rugby station used these from its start in 1925.

Ernst Fredrik Werner Alexanderson (1878-1975) was born in Sweden, graduated at the Royal Technical Institute (KTH) in Stockholm and emigrated to the United States in 1901. Employed by General Electric, Schenectady, New York, he remained there for the rest of his long and creative life. Alexanderson laid the foundation for communications between Sweden and America, increasingly

needed after the First World War 1914-1918. He was awarded decorations, medals, honorary doctorates and, at the age of 94, his 344th patent. He was inducted posthumously into the US National Inventors Hall of Fame in 1983.

Just after the turn of the century, Alexanderson began to design HF alternators based on the idea of Reginald A Fessenden who used one for his first broadcasting experiments at Christmas 1906 when voice, singing and music bewildered the radio officers of ships along the US east coast. The design of the 200 kW alternators for VLF were ready in 1918. Including the very impressive multiple tuned antenna, they were manufactured by General Electric and sold by the Radio Corporation of America around the world. Six 127 metre high towers with 46 metre long booms carried twelve 2,200 metre long wires that fed six vertical antenna elements from the top of each tower. The network included 18 transmitters in continental USA, Hawaii, Wales, Poland and Sweden.

The first message from Grimeton Radio (SAQ) on the Swedish west coast was sent to Radio Central at Rocky Point, Long Island, in October 1924. The wavelength was about 18,000 metres, later changed to a frequency of 17.2 kHz. Two alternators with an output power of 200 kW could be used one at a time or in parallel. The rotating disc of the motor-generator was 1.6 metre in diameter and the air gap 1 mm. At 2,100 revolutions per minute, the rotor peripheral velocity was 180 m/s illustrating the seriousness of the mechanical problems. Six 127 metre high towers with 46 metre long booms carried twelve 2,200 metre long wires that fed six vertical antenna elements from the top of each tower.

On July 2nd, 1925, the station was inaugurated by King Gustaf V sending a telegram to US president Calvin Coolidge praising the new link to America. He also praised the democratic umbrella under which millions of Swedes had found new homes.

Grimeton in danger, but saved

SAQ was in service slightly beyond the Second World War 1939-1945. After that period, the alternator and its antenna system stood a small chance of surviving because intercontinental communications had been taken over by HF radio. However, the Royal Swedish Navy needed SAQ for VLF traffic to submerged submarines and, without knowing our cultural foresight, we remunerated the maintenance costs, predominantly for the painting of the antenna towers.

The naval interest decreased and in 1995 the Radio Services of Swedish Telecom decided to close SAQ, still in perfect working order. As people prepared themselves to listen to the last transmission, other people started a resistance movement. As a first victory, we succeeded in getting a few months of postponement. Thus, the "last SAQ transmission" by the one and only remaining Alexanderson alternator could be heard in September 1995 at the IEE London conference "A Hundred Years of Radio" as well as in the United States. Many radio amateurs and professionals were present at the conference and, signals being heard in auditorium, they sadly took down the message received by courtesy of BBC.

Luckily, interest to preserve the station and to maintain it in working order was increasing and after a very short time the situation was totally reversed. The Swedish National Heritage Board, the County of Halland, Varberg town and Swedish Telecom gave generous support, backed by very hard pressure from radio enthusiasts, radio engineers, radio officers and radio amateurs.

Grimeton Radio was listed as a national industrial monument, protected by Swedish law, in October 1996, ensuring that the station buildings, the alternator and the multiple tuned antenna of Grimeton Radio will for ever be kept in working order and on that occasion some of us got world heritage in mind. SAQ was honoured as the foremost Swedish industrial monument of 1997 and is on the current list of the most important sites in Sweden.

Royal support

On the first day of the new millennium, Grimeton Radio sent a message from the King of Sweden, H. M. Carl XVI Gustaf, keyed by Lars SM6NM who is a professional operator.

Seventyfive years ago the first wireless messages were sent from the radio station at Grimeton in Sweden to the United States of America. The new link was supplied with the ultimate in modern radio technology at that time, invented by the Swedish-American Ernst F. W. Alexanderson, USA.

In that first message from Grimeton seventyfive years ago, my great grandfather King Gustaf V expressed the hope that better communications would strengthen the relations between peoples and nations. To-day the only existing Alexanderson transmitter is again sending a message around the world.

To-day the unique radio transmitter at Grimeton meets a new millennium. My message to-day is, however, the same as that sent by King Gustaf V seventyfive years ago. With modern technology and means of communication, the possibilities of deepened understanding, peace, democracy and free exchange of opinions between the peoples of the world will increase.

Finally, I wish A Happy New Year to all of you around the world, who are listening to this transmission!

The message was reported received by about a hundred listeners in Europe and in the United States, Minnesota being most distant.

On September 5, 2001, King Carl XVI Gustaf and Queen Silvia visited Grimeton and sent a short radiogram from SAQ to the People of the world, keyed by SM5BF, the author of this article who is not a professional operator. To be sitting there, the royal couple standing, was great.

on july 2 1925 my great grandfather inaugurated grimeton radio and on jan 1 2000 saq transmitted my millennium message stop today on our royal tour we send our best wishes from saq = carl gustaf rex silvia regina

The world heritage

After eight years of work, our ultimate goal of getting the unique SAQ on the Unesco World Heritage List was reached on July 2nd, 2004, exactly 79 years since the station inauguration. Thanks are due for intense efforts by numerous people in all Sweden including the Swedish Government, the Swedish National Heritage Board, the county of Halland, the town of Varberg and Swedish Telecom Radio Services. The world heritage declaration is a major achievement for radio people and a manifestation for a nation like Sweden which is among the foremost countries in IT and radio communications.

The celebrations started only a few hours after the Unesco decision by the Halland County Governor, Mrs Karin Starrin, speaking to the crowd from a balcony at the main square in Varberg. Two days later, on the 2004 Alexander Day, 1600 people visited the station to see and hear SAQ going on the air to tell the news.

Swedish Telecom has generously donated SAQ to the newly formed World Heritage Foundation of Grimeton including a very substantial amount of money for operation and maintenance. Thanks are due also for their earlier support and for that of the Royal Swedish Navy. The station is in almost mint condition and the antenna towers have been completely repainted a few years ago (1 M\$ each).

Point-of-contact is the SAQ website with photos, opening hours and transmission schedules. Visitors will be guided by the station crew or members of the supporting non-profit society of Alexander. In a year (Summer 2005) a visitors' centre close to the station building will be ready to welcome you. Apart from being the SAQ reception area, it will contain activities to stimulate young people to show interest in natural science and technology.

SAQ will go on air once a year on Alexander Day in late June or early July. The cooling water fountains, the clicking relays, the liquid variable resistors, the whining alternator will recall the atmosphere of the 1920's – please pay tribute to Ernst Alexanderson, the complete chief engineer.

ACKNOWLEDGEMENTS

I am indebted to the references below and to my friends everywhere for support in writing this article and earlier conference papers on SAQ. Special thanks go to my paper co-author Hans Bergfast of the County Administration of Halland and to Karl-Gustav Strid SM6FJB for their expertise in preparing the world heritage application. I also like to mention the support from Gunnar Brodin whom I first met at KTH in the late 1950's. He became a professor at KTH and got interested in Alexanderson and his work. He ended his career as Earl Marshal of Sweden. Coming out of the wings at the royal visit in 2002, he amazed his nearest bosses, i. e. our royal couple who had not been told in advance. As our foremost Alexanderson expert he had been asked to deliver the first speech.

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Websites: whc.unesco.org (Unesco World Heritage Centre); www.raa.se (Swedish National Heritage Board), www.alexander.n.se (SAQ and Alexander Society).

ARTICLE ABSTRACT

Ernst Fredrik Werner Alexanderson designed electromechanical HF alternators, one of which was used for early broadcast experiments. His 200 kW alternators for VLF and his multiple aerial were used for communication from Grimeton Radio (SAQ) to the Radio Central of RCA at Rocky Point, Long Island, USA. SAQ survived as the Royal Swedish Navy used it for traffic to submerged submarines. It is in perfect working order and on July 2nd, 2004, this unique radio station of the 1920's was added to the Unesco World Heritage List.

SHORT ARTICLE (arrows indicate shorter version)

SAQ at Grimeton, Sweden, on the Unesco World Heritage List.

Varberg Radio SAQ at Grimeton has been added to the Unesco World Heritage List. It is the only remaining pre-electronic transmitter for transatlantic work and is kept in perfect working order. On July 4th, "2004 Alexander Day", the 80 year old 200 kW Alexanderson alternator with its multiple tuned antenna transmitted a celebration message on 17.2 kHz which was heard in Europe and on the US east coast. The return channels were amateur radio to SA6Q and email. Welcome to the SAQ website www.alexander.n.se.

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According to Unesco, the Varberg Radio Station at Grimeton in southern Sweden (built in 1922-24) is an exceptionally well preserved monument to early wireless transatlantic communication. It consists of the transmitter equipment, including the aerial system of six 127-m high steel towers. Though no longer in regular use, the equipment has been maintained in operating condition. The 109.9-ha site comprises buildings housing the original Alexanderson transmitter, including the towers with their antennae, short-wave transmitters with their antennae, and a residential area with staff housing. The architect Carl Åkerblad designed the main buildings in the neoclassical style and the structural engineer Henrik Kreüger was responsible for the antenna towers, the tallest built structures in Sweden at that time. The site is an outstanding example of the development of telecommunications and is the only surviving example of a major transmitting station based on pre-electronic technology.

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The first message from SAQ was sent to "Radio Central" at Rocky Point, Long Island, in October 1924. It was in commercial service slightly beyond the Second World War 1939-1945. After that period, the alternator stood a small chance of surviving because intercontinental communications had

been taken over by HF radio. However, the Royal Swedish Navy needed SAQ for VLF traffic to submarines and remunerated the maintenance costs. Later, the naval interest decreased and in 1995 the Radio Services of Swedish Telecom decided to close SAQ, still in perfect working order.

As people prepared themselves to listen to the last transmission, other people started a resistance movement that succeeded in preserving the station. A year later it was listed as a national industrial monument. Our ultimate goal of getting the unique SAQ on the Unesco World Heritage List was reached on July 2nd, 2004, thanks to efforts by numerous people in all Sweden.

SAQ will go on air once a year on "Alexander Day". Visitors to the station will be guided by the station crew or members of the supporting non-profit society of Alexander. The cooling water fountains, the clicking relays, the liquid variable resistors, the whining alternator will recall the atmosphere of the 1920's – a tribute to Ernst Alexanderson, the complete chief engineer, inducted posthumously into the US National Inventors Hall of Fame in 1983.

ABOUT THE AUTHOR

Carl Henrik Walde graduated in Engineering Physics at the Royal Institute of Technology (KTH) in Stockholm. He spent over 40 years in the Swedish Defence Materiel Administration (FMV). As chief engineer he was head of the naval telecom division and of the defence radio division. He is secretary of the Swedish National Committee of Radio Science (SNRV), an expert body to the Swedish Royal Academy of Sciences (KVA), and of its supporting foundation the Nordic Radio Society (NRS). As SM5BF he has been a member for 50 years of the American Radio Relay League (ARRL) and of the Swedish League of Radio Amateurs (SSA). When stepping down as SSA vice president he was elected honorary member. He chairs REFUG, a "Radio Engineering and Frequency User Group", which is sort of a consumer organisation for frequency management matters.

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ILLUSTRATIONS

Four free hi-resolution photographs are available from the Swedish National Heritage Board, photographer Bengt A Lundberg (www.raa.se/press/040702.asp), low-resolution pictures enclosed.

Further down, there are three free illustrations, viz. a map showing the whereabouts of SAQ (from the world heritage application), the "SAQ circuit diagram" (from the Swedish telecom history book) and a royal visit photograph, SM5BF at the key (from Swedish Telecom, photographer Hans G Larsson).



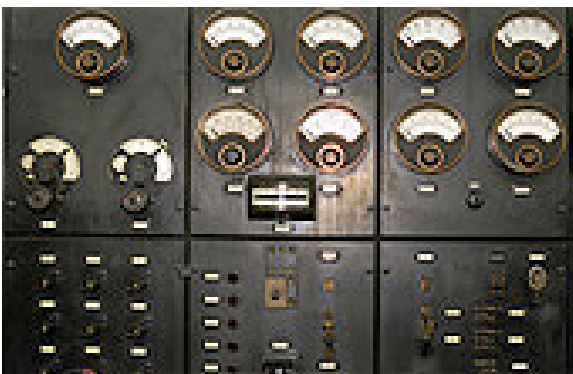
The multiple tuned antenna



The SAQ station building



The Alexanderson generator



Part of the control panel

(karta)

(kopplingschema)

(kungabesöket)

----- + (end)