

VIII International Conference on

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**To the memory of antenna science Atlantes
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TO HISTORY OF RADIO ENGINEERING'S TERM "ANTENNA"

Slyusar V. I.

Central Research Institute of Armaments and Military Equipment of Ukraine's Armed Forces, Kiev, Ukraine
e-mail: swadim@inbox.ru

Abstract

Results of the researches directed on finding-out of a true state of affairs in the history of origin of radio engineering's term of "antenna" are presented in the report. As a result of this report can be considered that the first document, we are aware of that uses the word *l'antenne* for an electromagnetic transmitter, is a paper by *Lucien Poincaré*, presented in 30 January 1898 at a *Revue générale des sciences pures et appliquées*. This paper by *Lucien Poincaré* contained information that Marconi was the author of radio engineering's term "antenna". It is shown that radio engineering's term "antenna" was introduced by Marconi, but a main role in expansion of this term to modern radio engineering has an publications of France's scientists *Lucien Poincaré*, *André Broca* and *A. E. Blondel*.

Keywords: radio engineering's term, antenna, Lucien Poincaré, Marconi

I. Introduction

The history of origin of the radiotechnical term "antenna" has no unequivocal interpretation till now.

In the literature of the Soviet period, the authorship of the application of this concept belongs to the French physicist A.E. Blondel (Blondel Andre Eugene, 1863-1938). S.E. Khaikin [1] claimed that Blondel was the first, who suggested to use the term "antenna" in his letter to A.S. Popov, in connection with the invention the latest mast device for emission and reception of radio waves. In foreign sources as radio's concept of "antenna" author Marconi was indicated, but the evidence for this is not quoted.

The report presents the results of the researches of the author, directed to find out the history of radio-technical interpretation the origin of concept of "antenna".

II. The main part

One of the main results of the researches conducted during the preparation of the report is to confirm the special role of the French scientific school of the end of 19th century in the history of development of the concept of "antenna" in scientific terminology of Radio Engineering. Representatives of French science were the most successive followers of using the word "antenna" in radiotechnical sense.

The original of the mentioned letter of Blondel to Popov, dated November, 20th, 1898 (in the old style) is stored in the Memorial museum-apartment of A.S. Popov in Saint Petersburg Electrotechnical University "LETI". In August 2009 the author managed to receive evidence of this due to the director of museum L.I. Zolotinkina and the employee of museum

E.V. Krasnikova, who had given him the possibility to familiarize with the indicated relic (exhibit MMP-186, F.2.1.3, № 289). In the text of the letter (fig. 1) the translation of which is shown in [2], Blondel didn't offer any terms, he is only interested, whether the apparatus of Popov contains the transmitting antenna (*l'antenne*) or only the receiving one, noting that "two antennas will be more effective" [2, with. 324].

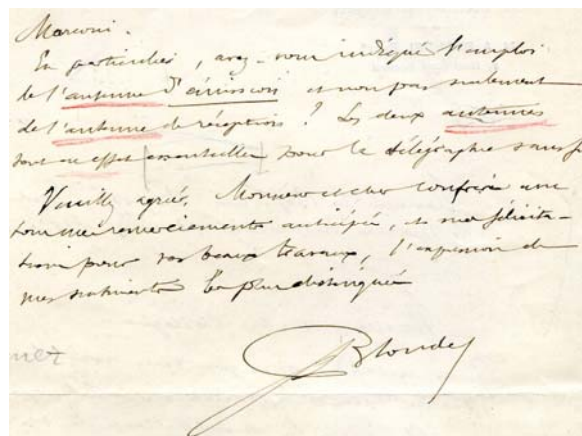


Fig. 1. The fragment of letter of A.E. Blondel to A.S. Popov.

A.S. Popov didn't answer to this letter, rather by the reason of difficulties in the correct translation of the term "*l'antenne*" used in it. In favor of this version his letter from Paris to his wife dated 13 (25) May 1899 [2, s.339] testifies, mentioning about the meeting with Blondel, whom Popov describes with the words, "the one who wrote me a letter with the

word "l'antenne" [2]. Notably, that nowhere in his Russian-language publications Popov never used a term "antenna", although after meeting with Blondel in Paris he was well-informed about its physical sense. In addition, in 1900 on the International Congress in Paris, Blondel also used the term in his report in the presence of Popov. However in a privilege for the patent № 6066 Popov applied only the term "receiving explorer", an analogical situation took place in his program of courses on a Telegraphy without Wires on April, 24, 1900 [2].

Apparently, this rejection of the new term has become as a consequence of the usual conservatism and adherence to his own terminology that is inherent to most scientists. Therefore, all instructions in the Soviet literature with the pictures executed handwritten by A.S. Popov, there is an inscription "antenna wire," that is only a consequence of an incorrect reading of illegible handwriting of A.S. Popov and aspiration to pass desirable for reality.

The way Blondel easily operated with the concept of "l'antenne" in the letter, on the contrary, proves that in his environment at that time this term had already settled down and became well established. In support of this more early letters of Blondel to Henri Poincaré (1854 - 1912), dated 25 and 31 August 1898 (old style) [3] can be found in the Internet, in which Blondel also used the term "antenna" without any comments.

Apart from Blondel the involvement in establishment of this term, at least, should be followed with respect to his friend Andre Broca (1863 - 1925). For example, at the congress in Nantes, on August 11, 1898, in reports made by Blondel [4] and Andre Broca [5] the titles contained the word "antenna" (available at the Library of the Russian Academy of Sciences, St. Petersburg). This fact has escaped from the attention of the authors [6], who succeeded to find the only book by Broca [7] published in 1899. In this book, A. Broca has identified the antenna as a "long wire, vertically elevated on a discharger pole, while the other pole is connected to the earth."

Unfortunately, neither Blondel nor Broca did not specify the source of origin of the concept "antenna" in the mentioned publications and more early works on this terminology were not succeeded to reveal. According to the statement of some modern publications about Marconi's authorship in this question demanded an objective documentary confirmation.

The author succeeded to find it, thanks to the French e-library GALLICA. It is about Lucien Poincaré's article [8] dated January, 30th, 1898 (in the old style) in the magazine "Revue générale des sciences pures et appliquées". Now it is the earliest of known scientific publications, where term "antenna" (l'antenne) is applied in modern radiotechnical interpretation. In more early editions of this magazine (article by L. Poincaré on May 30, 1897, the review of works by Marconi, dated July 30, 1897), the term "antenna" was not used.

Substantially, that E. Ducretet in [9] has gone by the way of the equivalent replacement of term "antenna" by a concept "vertical wire", attaches to the mast constructions (fig. 2).

Shenevu (Cheneveau), the author of the earlier note about the experiments of Marconi and Preece, published in [10], acted in 1897 similarly to E. Ducretet.

Unlike Ducretet and Shenevu in the work [8] for the first time L. Poincaré gave up the attempt of semantic interpretation of the Italian word "antenna" and adopted it to the French in the sense of the vertical wire used in composition of the receiver of Marconi. L. Poincaré (1862 - 1920) is a doctor of engineering sciences from Sorbonne, the cousin of mathematician Henri Poincaré, to whom A. Blondel wrote letters [3]. The fragment of the article of L. Poincaré [8] where it is directly said that Marconi names a "vertical wire" "the antenna" ("M. Marconi appelle ce fil une antenne"), it is presented on fig. 3 (the second paragraph in the left column).

Les distances franchies dans les premières expériences de M. Popoff ont été de 1.500 mètres, puis de 5 kilomètres en mer, le fil vertical isolé ayant 18 mètres de hauteur. M. Marconi a pu atteindre 5, 16 et 26 kilomètres, entre Bournemouth et l'île de Wight, avec des mâts de 25, 30 et 36 mètres de hauteur et des appareils peu différents des précédents comme puissance.

Fig. 2. The fragment of text [9].

The article by L. Poincaré dated January, 30, 1898 did not pass unnoticed among its contemporaries and became quoted enough. So, it is referenced by Andre Broca in his publication in 1899 [11], as well as Lui Olivier in the article [12]. However, L. Olivier unlike Andre Broca did not use the term "antenna" in the article, using the word "mast" (mâts) instead of it. This is the evidence of existence of two groups among the French scientists at the time: the first group, followed by L. Poincaré supported the idea of a borrowing of the word "antenna" in the interpretation of Marconi (Broca, Blondel, Rent [13], etc.), and the others tried to find an adequate translation to it into the French language (Ducretet, Shenevu, Olivier, etc.).

In the light of the article [8] the quote from Marconi's letter for 1895 to his friend Luigi Solari deserves the confidential relation cited in [6] with referring to [14], where the term "antenna" was mentioned for the first time is. However for complete credibility of the given fact is the absence of the publication of the original letter.

Notably, that Marconi had explicit language difficulties with a choice of the definite name for a conductor which performed the role of antenna. For example, he applied the term "antenna" in the report at a conference on May 7, 1903 [15]. In patents of the USA № 924168 (priority of 11/27/1905) and № 924560 (08/09/1906) he used the term of antenna, including the Latin transcription of "antennae". How-

ever, already in the patent of the USA № 896130 (priority 03/13/1907) Marconi introduced a new term "aerial", explaining that it "intended to capture any conductor in which fluctuations are caused by arrival of a wave of Hertz".

On a background of such inconsistency adherence of French scientific publications to the term "antenna" is interpreted as a decisive factor in the history of development of this concept in Radio Engineering.

III. Conclusion

Thus, as a result of researches of the documentary sources conducted by the author, it is necessary to displace the date of official origin of radiotechnical interpretation of term "antenna" on January, 30, 1898. It is the date of publication of the article [8], which confirms the priority of Marconi in the use of term "antenna" for the needs of wireless telegraphy. The statement [1] that the term "antenna" is offered by Blondel in his letter to Popov, is erroneous. To the wide introduction of this concept to the radio engineering foremost Lucien Poincaré is involved, who owns the first known scientific work today, using this concept [8], and only then - Broca and Blondel. For full clearness in the further it is necessary to trace the way the borrowing of the given term at Marconi into the French language was going. For this purpose it is necessary to examine the publication in the interval since the first experiments of Marconi and ending January 30, 1898 (the article of Lucien Poincaré [8]).

Nous ne voulons point décrire ici en détail le dispositif de Marconi; au reste, il suffira de jeter un coup d'oeil sur les deux figures qui représentent l'ensemble des appareils employés dans les dernières expériences faites à la Spezzia entre l'arsenal de San Bartolomeo et le cuirassé *San Martino*; quelques modifications ont été apportées par l'auteur depuis ses premiers essais effectués à Londres.

On remarquera particulièrement que les oscillations produites par l'oscillateur de Righi (fig. 1) sont transmises à un long fil vertical terminé par une plaque métallique; M. Marconi appelle ce fil une *antenne*. L'idée d'établir ce fil a été suggérée par un dispositif presque analogue, employé par M. Popoff pour étudier les orages. Le rôle de ce conducteur est considérable: c'est certainement grâce à lui que les ondulacions produites se transmettent sans trop s'affaiblir à de grandes distances; sans doute, il donne aux ondes une forme mieux définie, grossièrement cylindrique; le résultat, en tout cas, est incontestable.

Le récepteur (fig. 2) doit porter une antenne semblable; à une vingtaine de kilomètres, l'onde

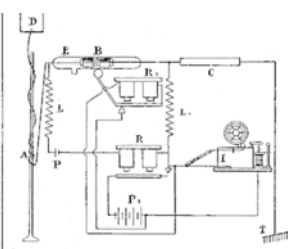


Fig. 2. - Récepteur des ondes. - A, antenne réceptrice; B, plaque conductrice terminant l'antenne; C, tube bobiné ou radio-condensateur; E, écran électrique, destiné à protéger le bobinage contre l'influence des étincelles de rupture des circuits en H.; G, capacité; P, communication avec le sol; R, pile; L, S, I, résistances; H, électroaimant destiné à déchiffrer le code; I, récepteur Morse; T, résis.

tubes de M. Branly, il serait encore à rechercher si d'autres récepteurs ne sauraient être utilisés; par

Fig. 3. The fragment of the article [8].

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