USING VEE PRO6 SOFTWARE TO CONTROL THE QUALITY OF ENERGY IN TO THE ELECTRICAL POWER NETWORKS

by
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Abstract. The simetry of voltages, among other parameters, in to real power networks, is essential for ensuring optimum performances of the electrical systems and a standard quality of the energy.
To control this, there are specific electric and electronic relays, which are hardware programmed to survey the symmetrical components of currents and voltages.
The paper describe a software method to control the direct, reverse and homopolar components of voltages and currents that are generated in to the real power networks, using the facilities of the VEE Pro 6 software and a data acquisition board, to interface the PC with the power network

1. Introduction

For electrical power networks there are specific standards that impose the quality of energy. For this reason, there are developed some instruments to analyze a multitude of parameters that characterize the quality of electrical energy in to the power networks.

Some quality parameters are determined by the symmetrical components of currents and voltages, known as direct, reverse and homopolar components, [1],[3].

To measure this components, in paper was described a method to develop a virtual instrument, using a data acquisition board, and a personal computer. The virtual simulator for direct, reverse and homopolar components, is presented as a first step in to this project.

2. Implementation of data acquisition system

2.1 Data acquisition system DT 304, Datatranslation

The DT 304 is a multifunctional data acquisition system (of DT 300 series), for connect at main line PCI of calculators (computers) which have some special characteristics as mentioned above:

- High speed from transfer bus-master of data, except intervention of central processor CPU, deliberating in this way the system resources for data processing;

- Flexible possibilities of triggering and of clock;
- Not require interruption systems, deliberating the system resources;

Extensive Windows software framework.

The data acquisition systems DT 304, contained 16 single-ended analogical input lines, or 8 differential, 23 digital input/output,(I/O), lines and a number of 4 timers.

The resolution of analogous-digital converter is achieved on 12 bytes, at a maximum 400 kHz frequency of samples. The DT 304 system disposes two analogous output channels.

2.2 Implementation of data acquisition system in to the measurement circuit of analyzer

The synthesized quality analyzer, gives the information in connection with voltages and current lines of the controlled electric network. Voltages are measured through the agency of three measurement transducers, TrU. The current information is obtained from at three transducers, TrdI (see figure 1).

Through the agency of terminal panel, TP, the information of voltages and currents, for the three network phases, are brought in computer, PC.

In this case is used for connections a special shielded cable, SC, figure 1.

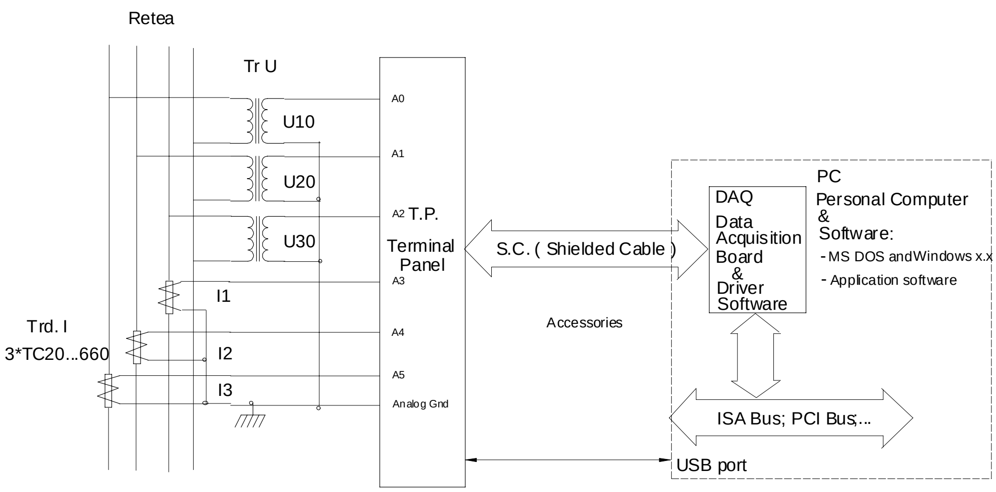

Figure 1. Basis scheme the of the quality analyzer

3. Programs synthesis of analysis the qualities of electric energy

3.1 Graphical programming environment HP VEE Pro & DT VP16.0

HP VEE is a graphical programming language optimized for building test and measurement applications and programs with operator interface; is recommended to be used to development of measurement programs of electronic instruments and from data acquisition systems.

With help HP VEE software can design graphical programs, through functional objects interconnect, which forms a block scheme [4], [5].

DT VPI is interface of data acquisition systems produced of Datatranslation, which unite with HP VEE constitutes the programming medium used in a framework project of research, which endorses elaboration of analysis instrument for the quality of the electric energy.

The multitudes of HP VEE functions do from this a universal instrument for development of control and measurement instruments [4]. [5].

3.2 HP VEE programs synthesis of analysis of quality of electric energy

Using the HP VEE Pro6 programming medium is developed a graphical program of simulation of symmetrical components which results from nonsymmetrical voltage and current components.

Through the symmetrical method components, a nonsymmetrical, three-phase system, can be decomposed and analyzed, in base of their symmetrical components. These three symmetrical systems in which are decomposed the three-phase system are called*: direct succession systems*, *reverse succession systems* and *homopolar succession systems.*

For simulate the voltage homopolar components is synthesized the program describes in figure 2.

This program uses three virtually voltage generators, *Function* $Generator_{1,2,3,}$ which simulate the nonsymmetrical voltages.

The amplitude and phase of three voltages is setting through the agency button $U_{1,2,3,}$ respective $FI_{1,2,3}$.

These voltages are algebraic summed with *Formula* instrument. Resultant voltage, unite with all causal voltages, is graphically represented through the agency instrument *U1, U2, U3, Uh.*

The represented homopolar voltages, Uh, results from equation: $3*U_h(t)=U_1(t)+U_2(t)+U_3(t)$.

The program described in figure 2 do possible generation of graphical interface also.

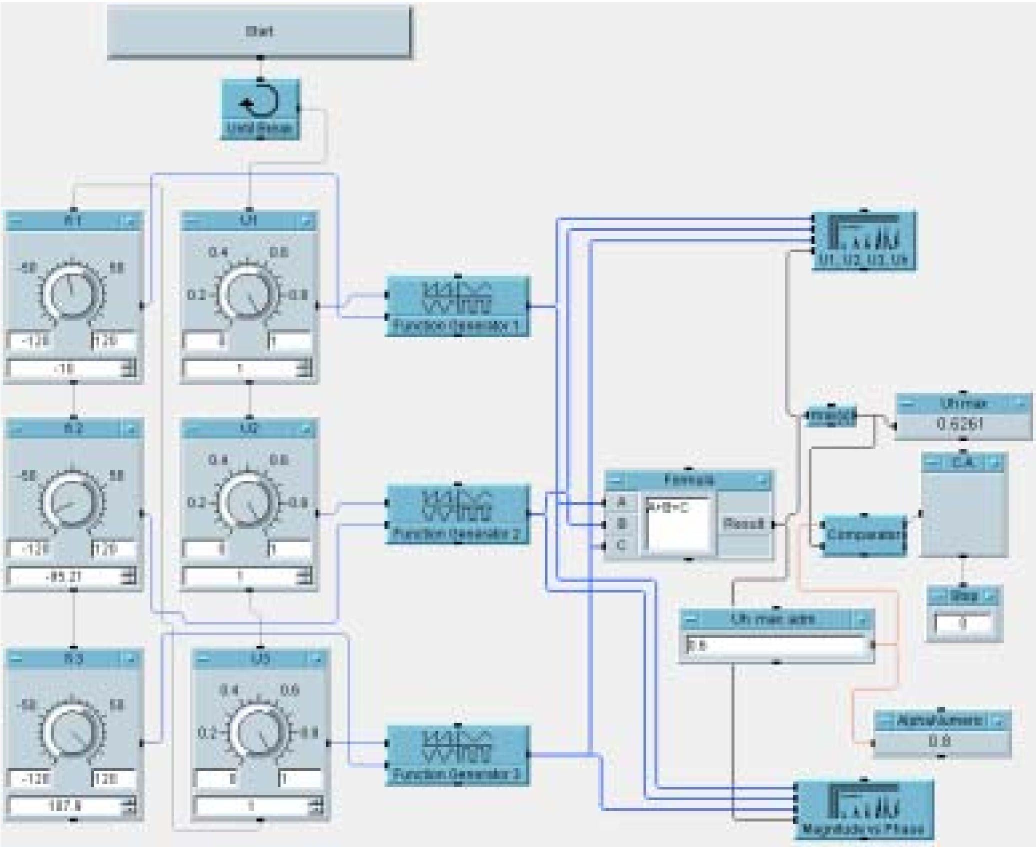

Figure 2. The simulator program for homopolar components

In figure 3 is presented the graphical interface of simulator, achieved in software basis VEE Pro6.

The graphical instruments (generators, buttons, displays, etc.) appeared and on graphical panel from figure 3. Additionally, are phassor visualized all the voltages, using *Magnitude vs Phase* instrument, which give a vector image of all four voltages.

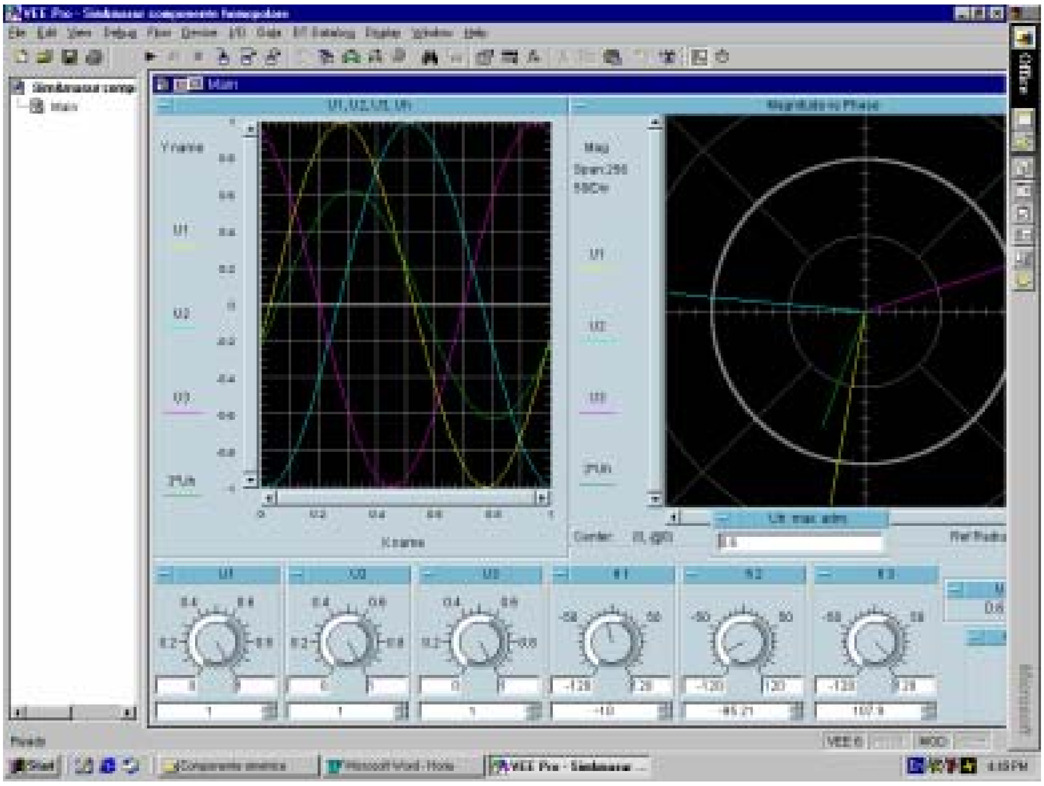

Figure 3. The simulator interface of homopolar components

For simulate of the direct components there are synthesized the graphic program which is presented in figure 4. This simulator use some graphical programming instruments used in the case of homopolar components.

For represent the resultant direct component of nonsymmetrical voltage component, this program achieves totalize algebraic of all three voltages, in keeping with equation: $\bar{U}d = \frac{1}{3}(\bar{U}1 + a^2 * \bar{U}2 + a * \bar{U}3)$, where: $a = -\frac{1}{2} + j\frac{\sqrt{3}}{2}$ and $a^2 = -\frac{1}{2} - j\frac{\sqrt{3}}{2}$.

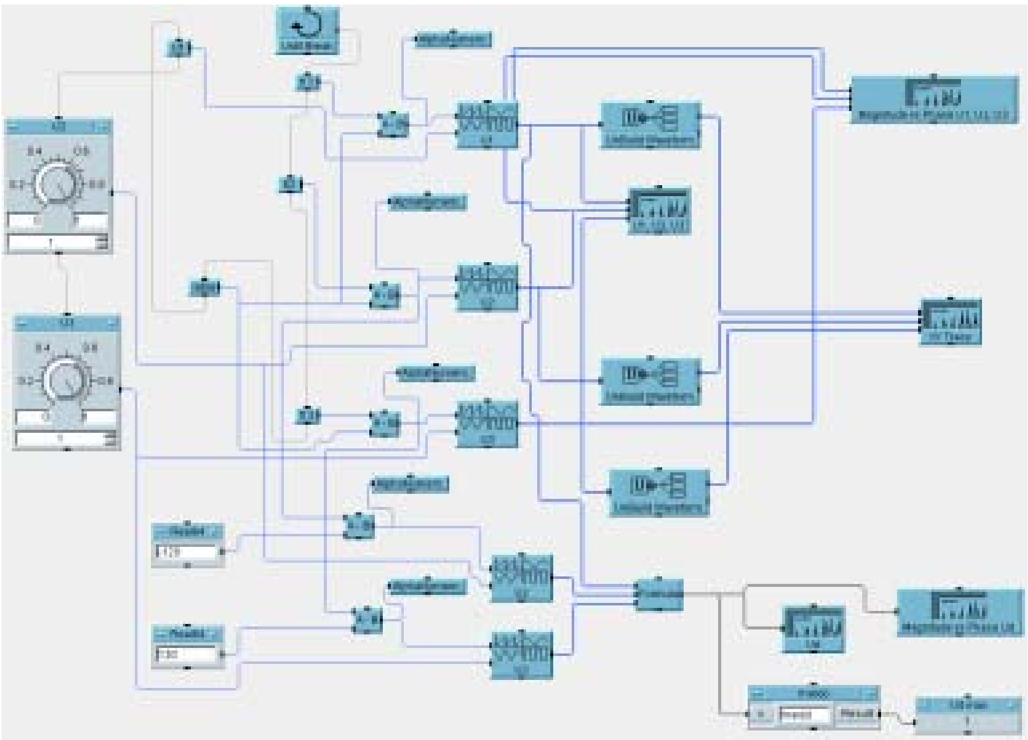

Figure 4. The simulator program for direct components

In figure 5 are presented the graphical interface of simulator for direct components, achieved in base of VEE Pro6 software.

The graphical instruments (generators, buttons, graphical displays, etc.) appear on graphical panel,also, in figure 5.

In plus are offered a phasor visualization instrument of voltages, *Magnitude vs Phase*, which give a vector image of all four voltages.

In separate manner, on panel shown in figure 6 appear explicit temporary and phasorial evolution of direct voltage resultant component from processing of all three nonsymmetrical voltages.

The virtual simulator of direct voltages can be setting for any voltages combination and phase of all three generators which constitutes primary nonsymmetrical voltages.

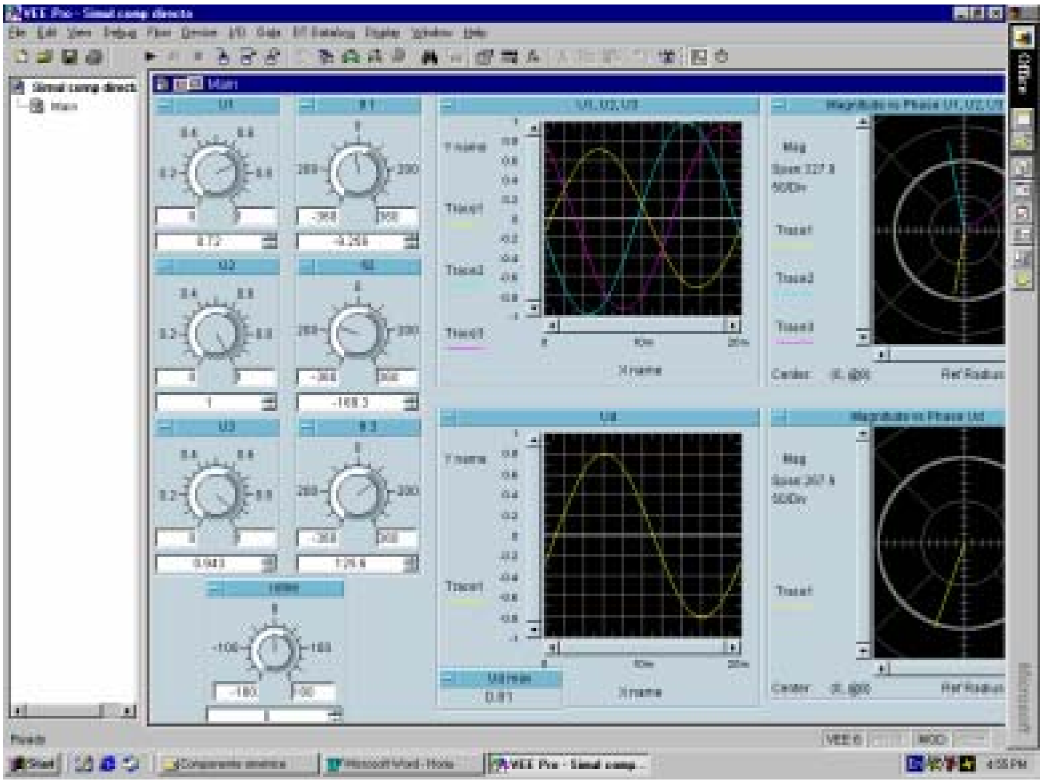

Figure 5. The simulator interface of direct components

For simulation of reverse components are presented the graphical program. To represent the reverse component, resulted from the nonsymmetrical voltages components, this program totalize algebraic of all voltages, on the base of equation: $\bar{U}_i = \frac{1}{3}(\bar{U}1 + a * \bar{U}2 + a^2 * \bar{U}3)$,where: $a = -\frac{1}{2} + j\frac{\sqrt{3}}{2}$ si $a^2 = -\frac{1}{2} - j\frac{\sqrt{3}}{2}$

In figure 6 are presented the graphical program simulation for symmetrical components, totally.

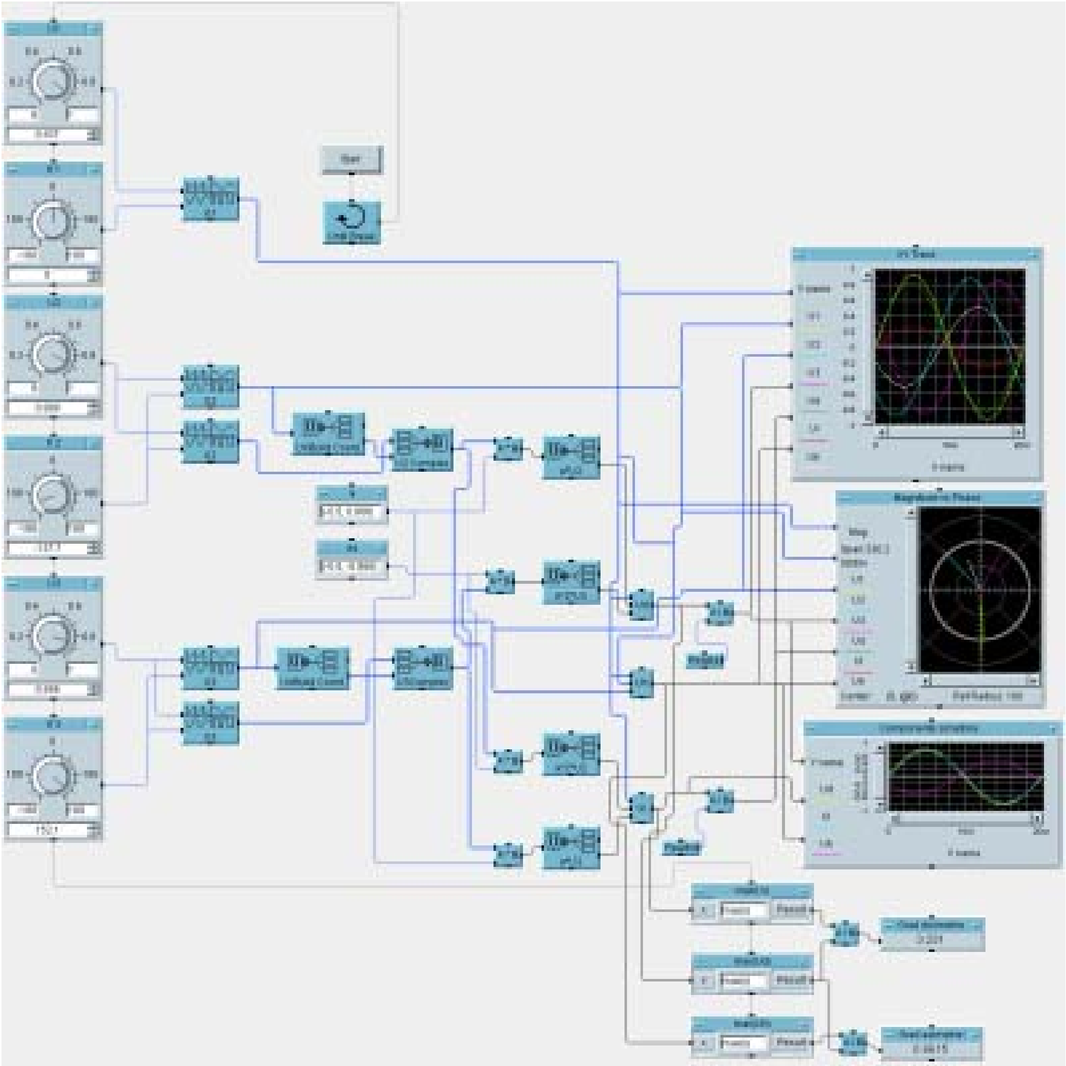

Fig.6. The graphical program for simulation symmetrical components

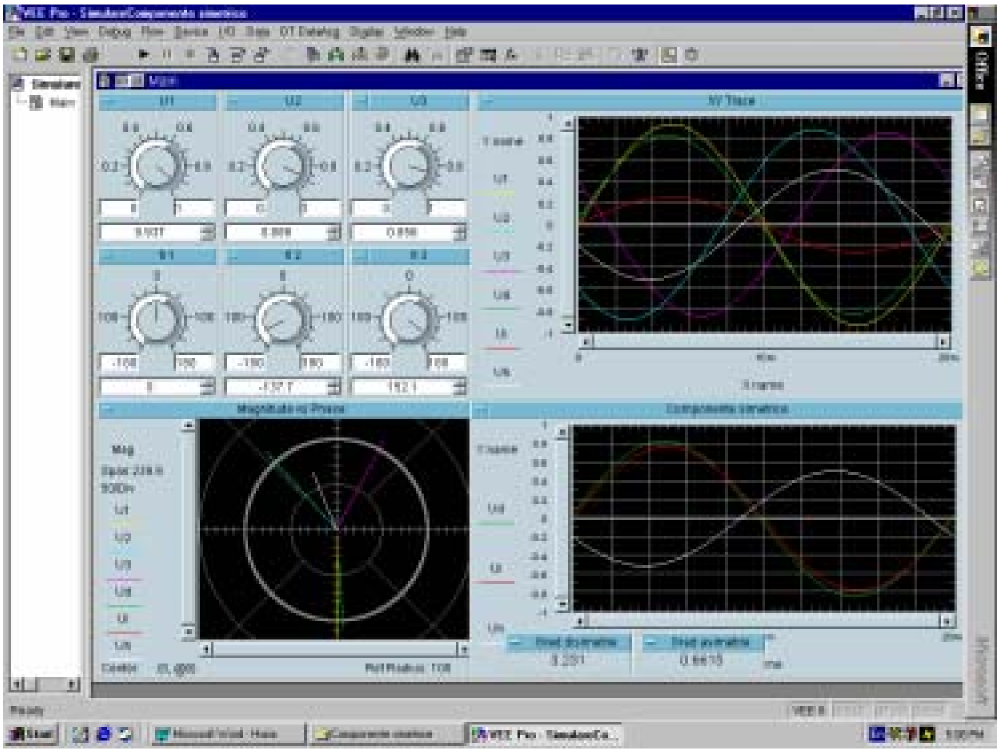

Fig 7. The simulator interface for direct components

Conclusions

The simetry of voltages, among other parameters, in to real power networks, is essential for ensuring optimum performances of the electrical systems and a standard quality of the energy.

To measure these components, in paper was described a method to develop a virtual instrument, using a data acquisition board, and a personal computer. The virtual simulator for direct, reverse and homopolar components, is presented as a first step in to this project, using VEE Pro 6.0. software.

References:

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[5] *** Data translation DT 300 User's Manual, Data Translation, Inc., 100 Locke Drive, Marlboro, MA 01752-1192 USA

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