THE LENS EFFECT IN THE SECONDARY EMISSION BASED SYSTEMS OF JOINT SEARCHING IN EBW

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The results of the developed scan lines generator for the magnetic correctors system are presented. Get the dependency between various types of scan lines and distribution of the allocated energy in the electron beam welding facility. The lens effect in the secondary emission based system of joint searching, using 3-fragment linear scan line is received. The accuracy of the joint searching system (the error of the positioning system) is 0.05 mm, the lens effect can decrease this value several times. The requirements for the creation full calibrated system of joint searching are listed.



Electron beam technologies based on using beam source (electron gun) with accelerating voltage about some decades kilovolts and power from several watts to several decades kilowatts. The joint search system is very important part of the electron beam welding facility, it allows scan the surface of the target and sees the map of scanning area with asperities of the surface, in particular, the system allows see the joint.



Figure 1. Facility of electron beam welding located in BINP, with typical product

The principle of functioning the joint search system is reflection and reemission the part of electrons, which interact with the target The back current is surface. measured by the isolated electrode. Different areas of the surface have different reflection coefficient, so we can see the different current values depending on the surface traits. In practice, we need the beam reflecting system with a reading of values from sensors.

Figure 2. Block scheme of the joint searching system of the EBW facility.

The experimental setup has the The beam intersects the joint each vacuum chamber, the electron gun (up period of scanning, and the target to 60 kV) with current ability up to 750 movement system moves the detail mA, two-coordinate reflection system based on cos(theta) coils, amplifiers see the position error for all length of for magnetic system, electrode, the joint. The dual scan uses when amplifier, and processing block of the we need to get the frame of the joint search system.

along the joint. As a result, we can scanning area. The experimental setup allows creating this type of scan.







Figure 3. Example of joint, the Figure 4. Signal of the joint in the scanning area selected. joint searching system.

The quality of the plotted map depends on the noises level in reflected beam current, the geometry of the collector electrode, and the amplification factor. Besides, we can use programming methods to increase the quality of the image. One of them is filtering methods applying to the big set of data measured by special function in automatic mode. The user interface allows seeing the map in real time, with noises. It is very useful for a primary setting of the target position.



We develop the special signal for searching joint Two system. parameters set the form of signal, and the program generates it automatically. The shape could be transformed in various waves. When the beam moved with small velocity on the central part of the scan line and has high velocity at the edges of

Figure 7. Map of the surface with joint, with small lens effect

Figure 8. Map of the surface with joint, with great lens effect





Figure 6. By setting the parameters of generation system different signals could be generated.

Figure 9. Maps of the surface with joint. Different parameters of joint searching system make different lens effect.

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