

Stray current within the instrument MARIA investigation of the equipotential bus bar

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MARIA is a magnetic reflectometer with high incident angle at MLZ in Garching

The power quality measurement system at MARIA register high PE current while the residual current is within the assumed range. The equipotential bus bar is connected to the PE wire within the power supply rack. All metallic parts of the instrument and the equipotential bus bar of the instruments hall are connected to the equipotential bus bar of the instrument. Therefore we attempt to classify each current introduced to the instruments bus bar in order to obtain a flow map of the stray current within MARIA.

Measurements

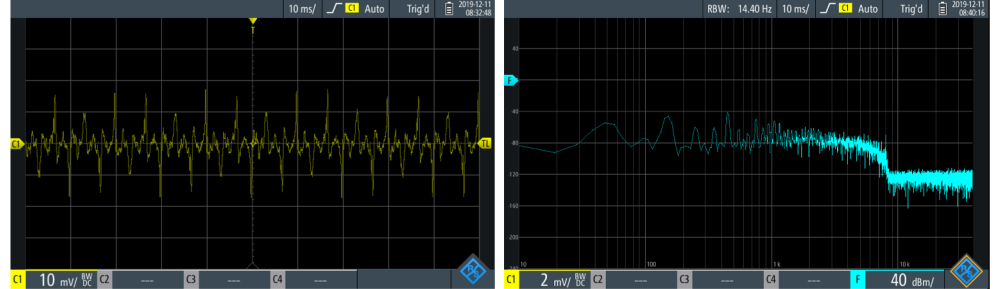
Cable between instruments bus bar and equipotential bus bar of the hall



Maria_PA_OSC_Halle_2019-12-11_082741_0

Maria_PA_FFT_Halle_2019-12-11_083822_0.png

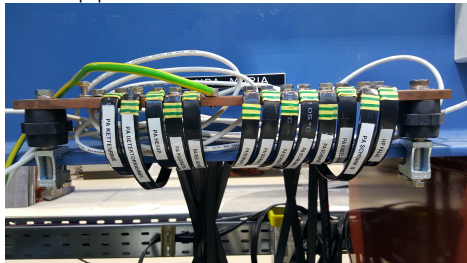
Cable between PE connection of the power supply rack and instruments equipotential bus bar



Maria_PA_OSC_Schrank2_2019-12-11_083248_0_IVS

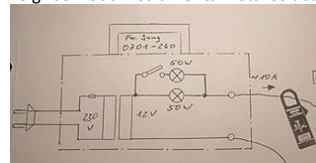
Maria_PA_FFT_Schrank2_2019-12-11_084017_0.png

Equipotential bus bar of the instruments Maria



Schematic of measurement

The transformer is used to introduce a current between bus bar and neighborhood instruments metal structur.



Source 5V Otto

to neighborhood instrument

to instruments equipotential bus bar

Item	Messung mit Messstab ohne Ferris / Polung 1 in mm	Messung mit Messstab mit Ferris / Polung 1 in mm	Messung mit Messstab mit Ferris / Polung 2 in mm	Phase	01000000 Messung mit Messstab ohne Ferris / Polung 1 in mm	01000000 Messung mit Messstab mit Ferris / Polung 1 in mm	Messung mit Messstab mit Ferris / Polung 2 in mm	Messung von PE mit Qualitätskabel mit Messstab ohne Ferris
Produkt	200 Ohm	6000	6000					
Wider	700	2700	1800	A	000	000		08:27:42
Schrank 10	0	0	0		0	0		08:28:07
Kollimator	407	124	104	7	132	Abgleichwert		08:28:16
Schrank 9	78	130	100	B	40	48		08:28:32
Schrank 8	94	93	137	B	52	53		08:28:46
Schrank 6	84	76	111	B	61	63		08:29:00
Schrank 5	84	85	101	B	70	73		08:29:22
Rel. Schrank	800	620	1020	B	1030	1030		08:29:30
Rel. Schrank	0	0	0		0	0		08:29:30
Polarisation	230	750	360	A	0	0		08:29:36
Hexapod	0	0	0		0	0		08:29:40
Collimator	0	0	0	B	90	90		08:29:40
Kollimator	0	0	0		0	0		08:29:45
Instrumentenbus Polarisator	165	100	260	A	000	100		08:29:56
Produkt	0	0	0		0	0		08:30:00
Produkt	0	0	0		0	0		08:30:00

Devices:
Transformer ,12V AC, 10A
Ammeter Hioki 3283
Oszilloscope RTH1004
500MHz Current Probe RT-CZ03 100KHz

First the current on all cables connected to bus bar is measured. With an external current introduced as described above the measurement was repeated. After shifting the external current to 180 degree phase again all currents were metered. The external current overlaps with the current on the cable. Measurement using the same current with different phase should permit a qualitative estimation of the direction of the superimposed current.

Conclusions

It is visible that the direction of the electric current can be estimated using the method described within this poster. As the probed current is not a sinus current and neither is it steady in time and value, only a rough qualitative estimation is possible. From the results of the measurements one can assume that stray currents are introduced to MARIA through equipotential bonding and/or electrical power system of FRM2. Further investigation, with an improved measurement system is needed!