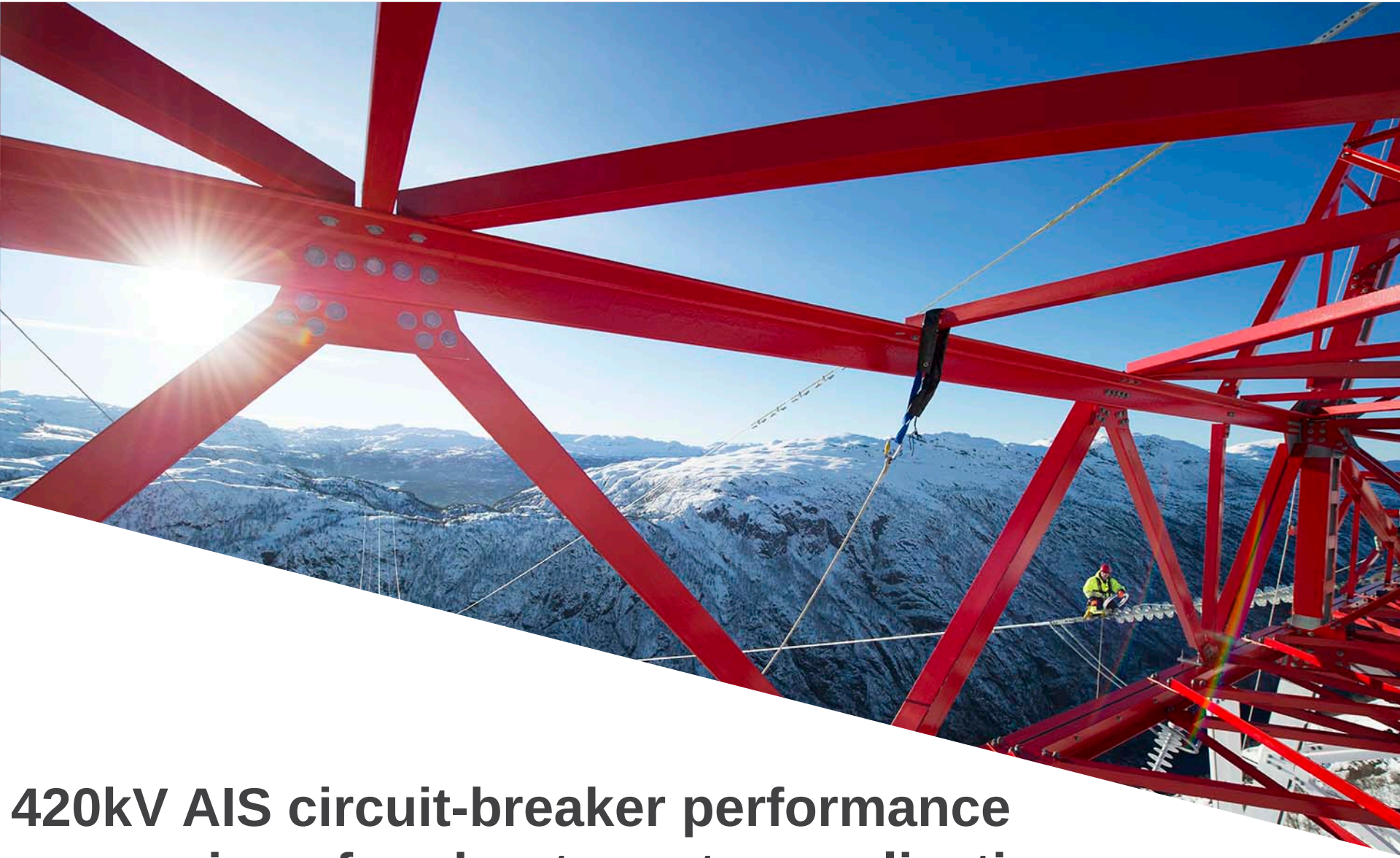

420kV AIS circuit-breaker performance comparison for shunt reactor application

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Statnett

Montreal, 10.052016

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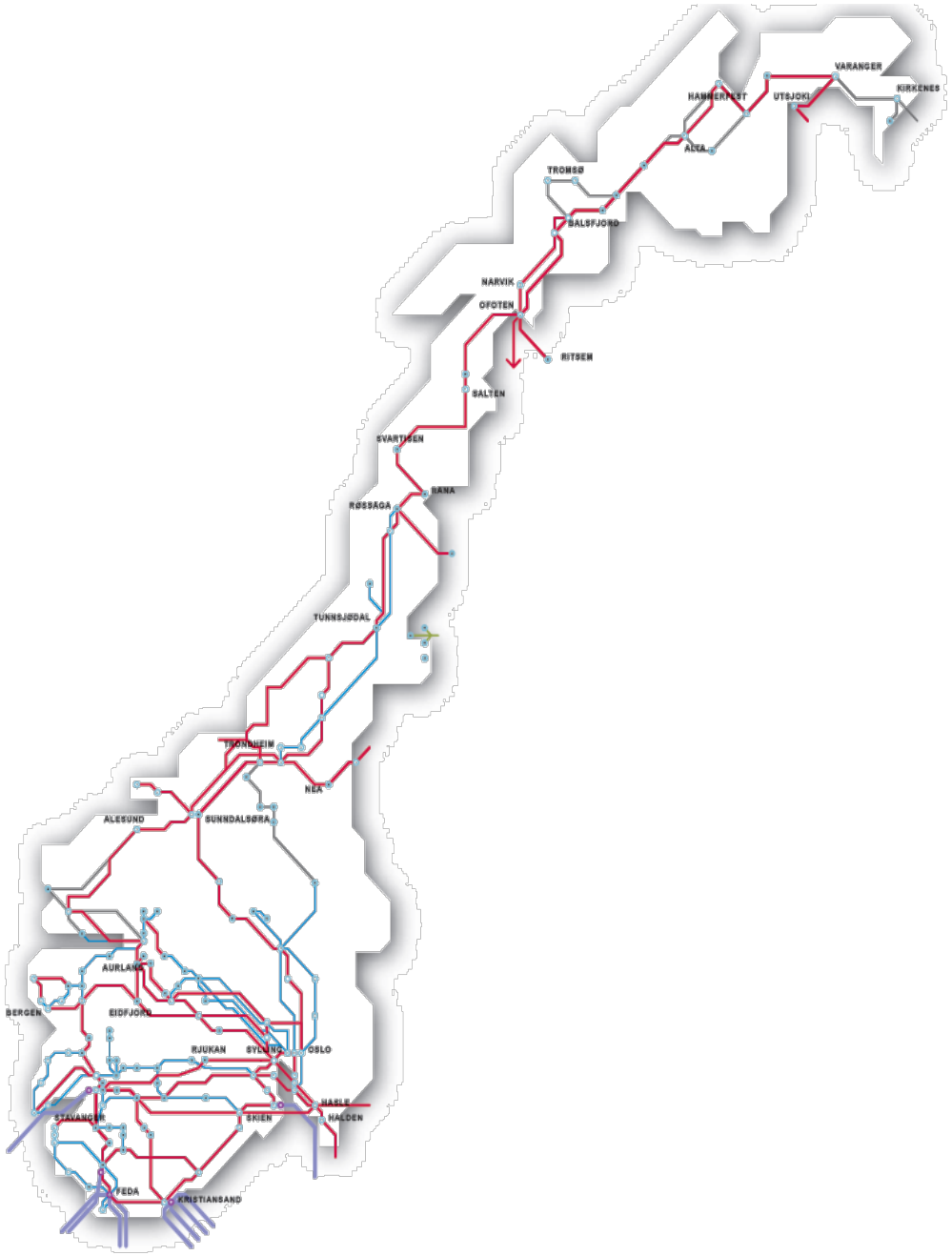
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KIRKENES
HAMMERFEST
UTSJOKI
ALTA
TROMSØ
BALSFJORD
NARVIK
OFOTEN
RITSEM
SALTEN
SVARTISEN
RANA
RØSSÅGA
TUNNSJØDAL
TRONDHEIM
NEA
ALESUND
SUNNDALSØRA
AURLAND
BERGEN
EIDFJORD
RJUKAN
SYLLING
OSLO
HASLE
STAVANGER
SKIEN
HALDEN
FEDA
KRISTIANSAND

Perforation of the composite insulator.

Fragmentation of 420 kV porcelain insulated circuit-breaker.

IEC 62271-110: Inductive load switching and site test.

The type test outcome can be grouped as follows:

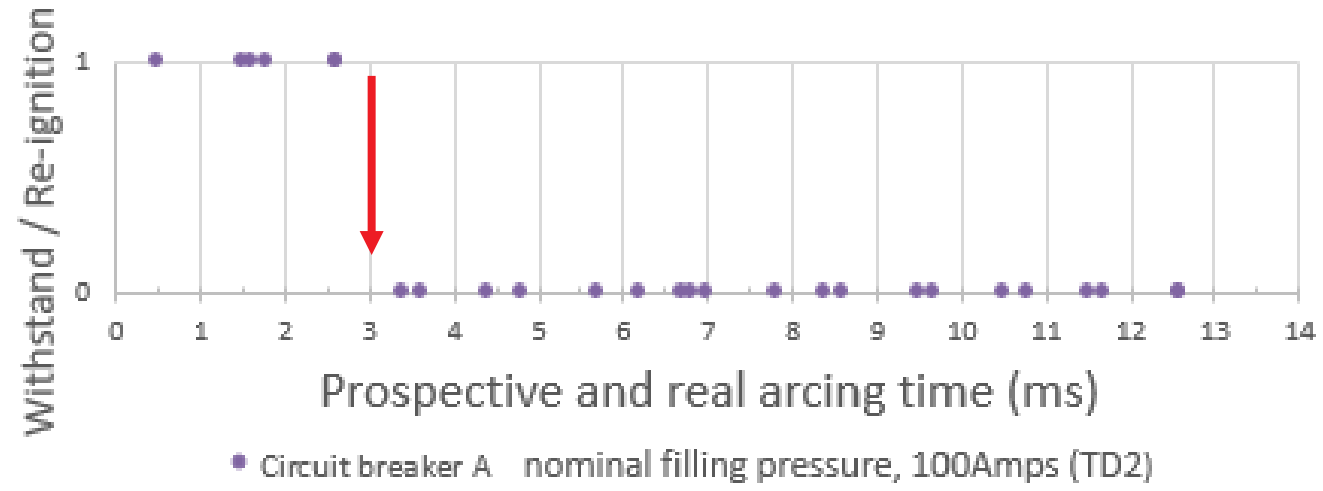
A/ Proving the interrupting capability of the breaker:

- ✓ To prove the ability of the breaker to interrupt the reactor current
- ✓ To prove that re-ignitions are not harmful to the breaker.

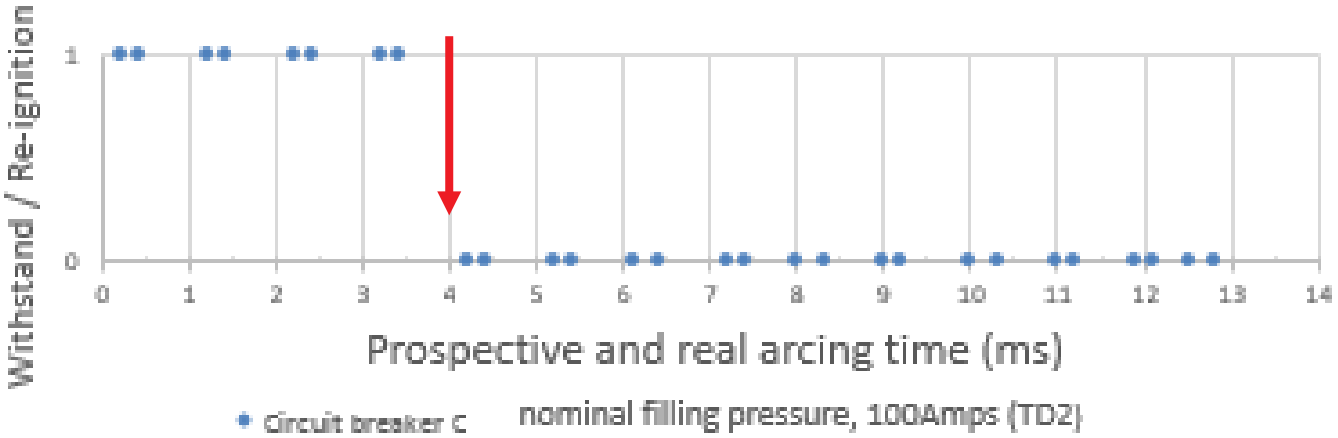
B/ Investigation of the breaker`s behavior mainly with regard to overvoltage generation:

- ✓ Re-ignition free arcing window
- ✓ Current chopping
- ✓ Rate of rise of dielectric strength

1- Re-ignition free arcing window



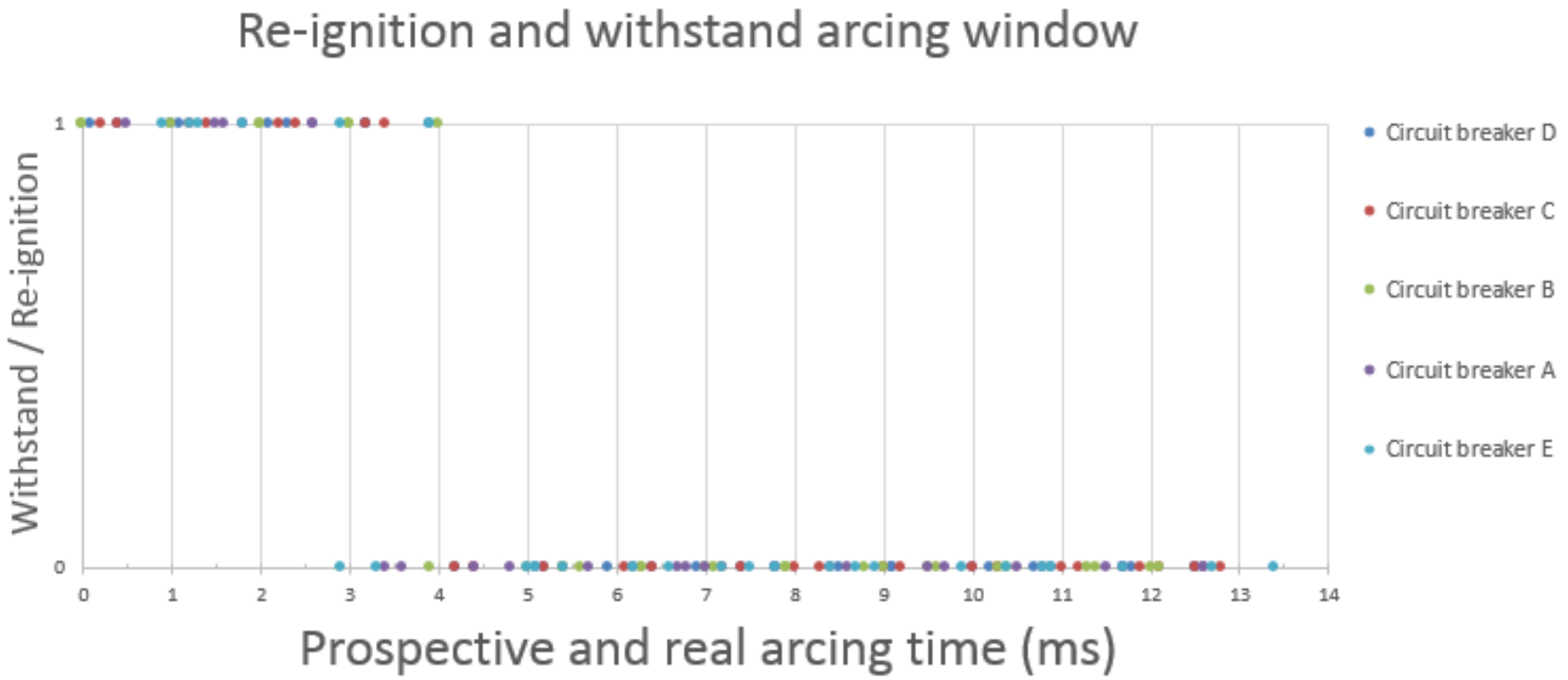
68% Withstand
32% Re-ignition



58% Withstand
42% Re-ignition

50Hz application

1- Re-ignition free arcing window (cont')



2- Current chopping/Chopping number (λ).

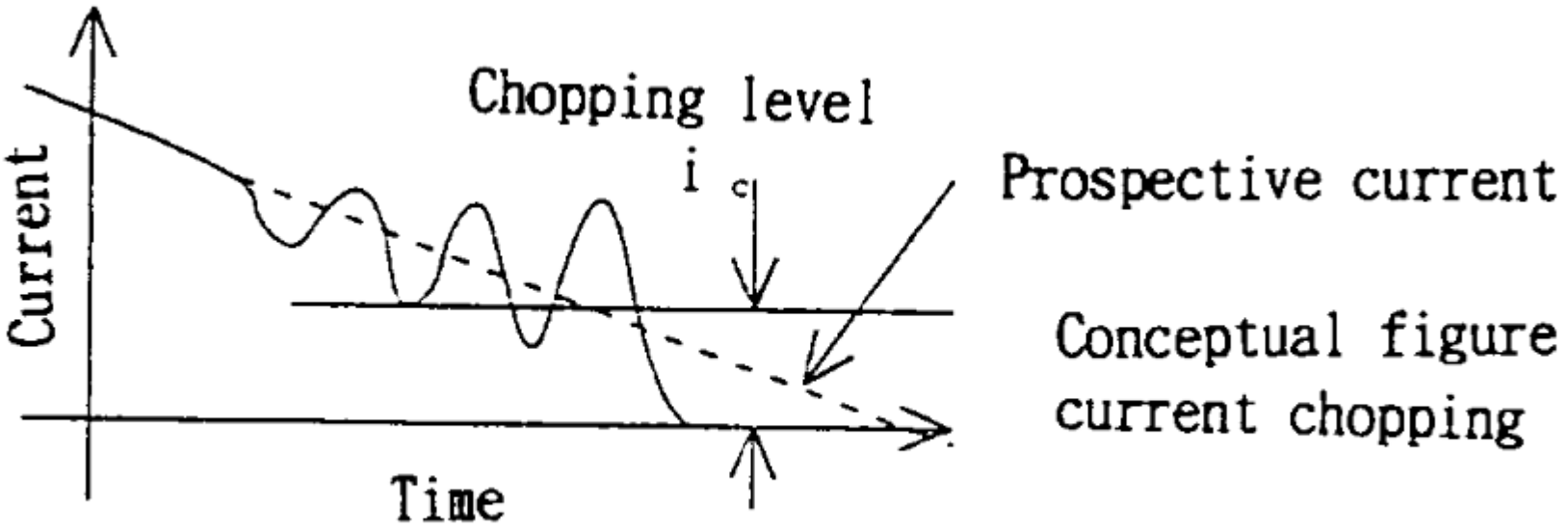
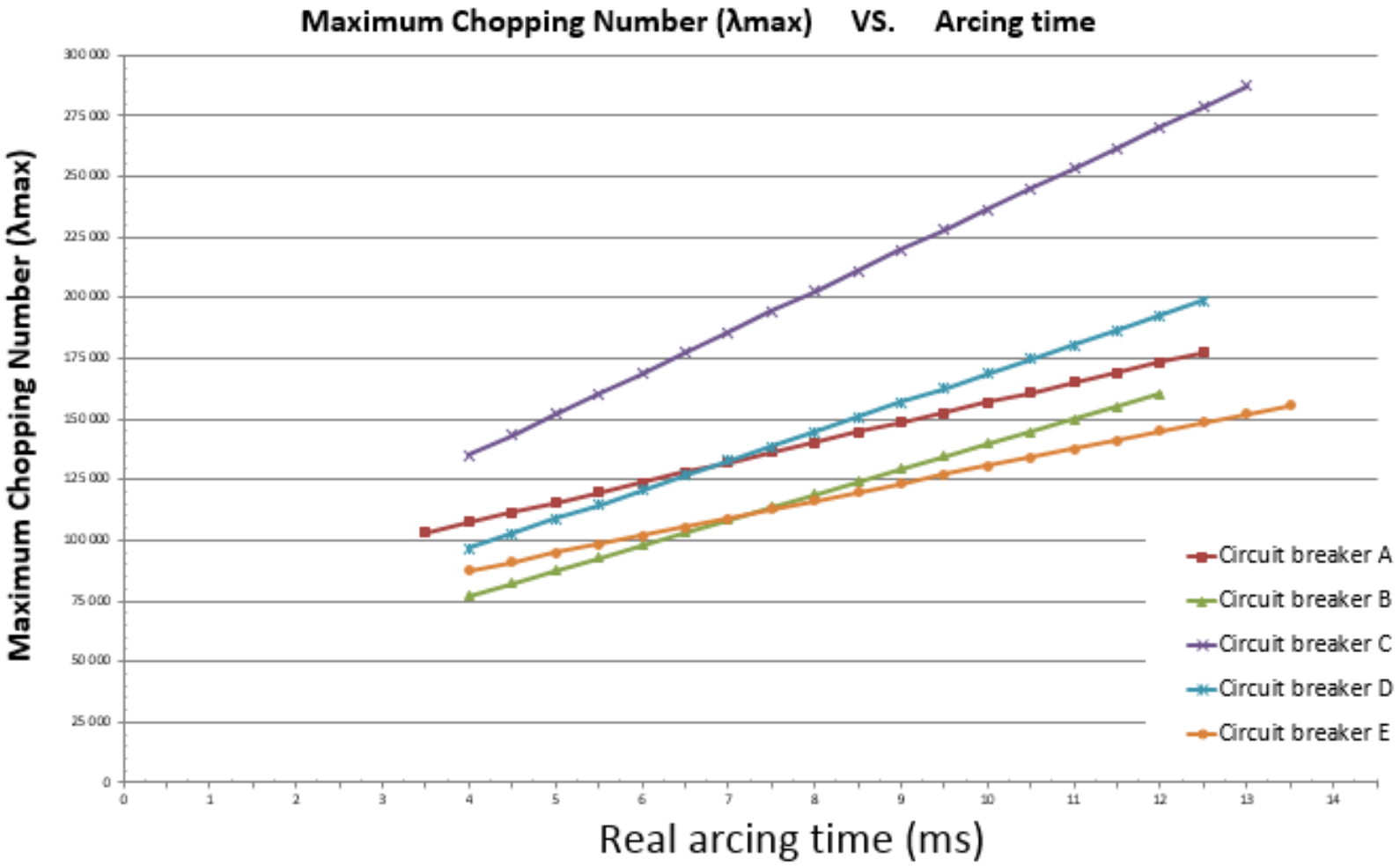


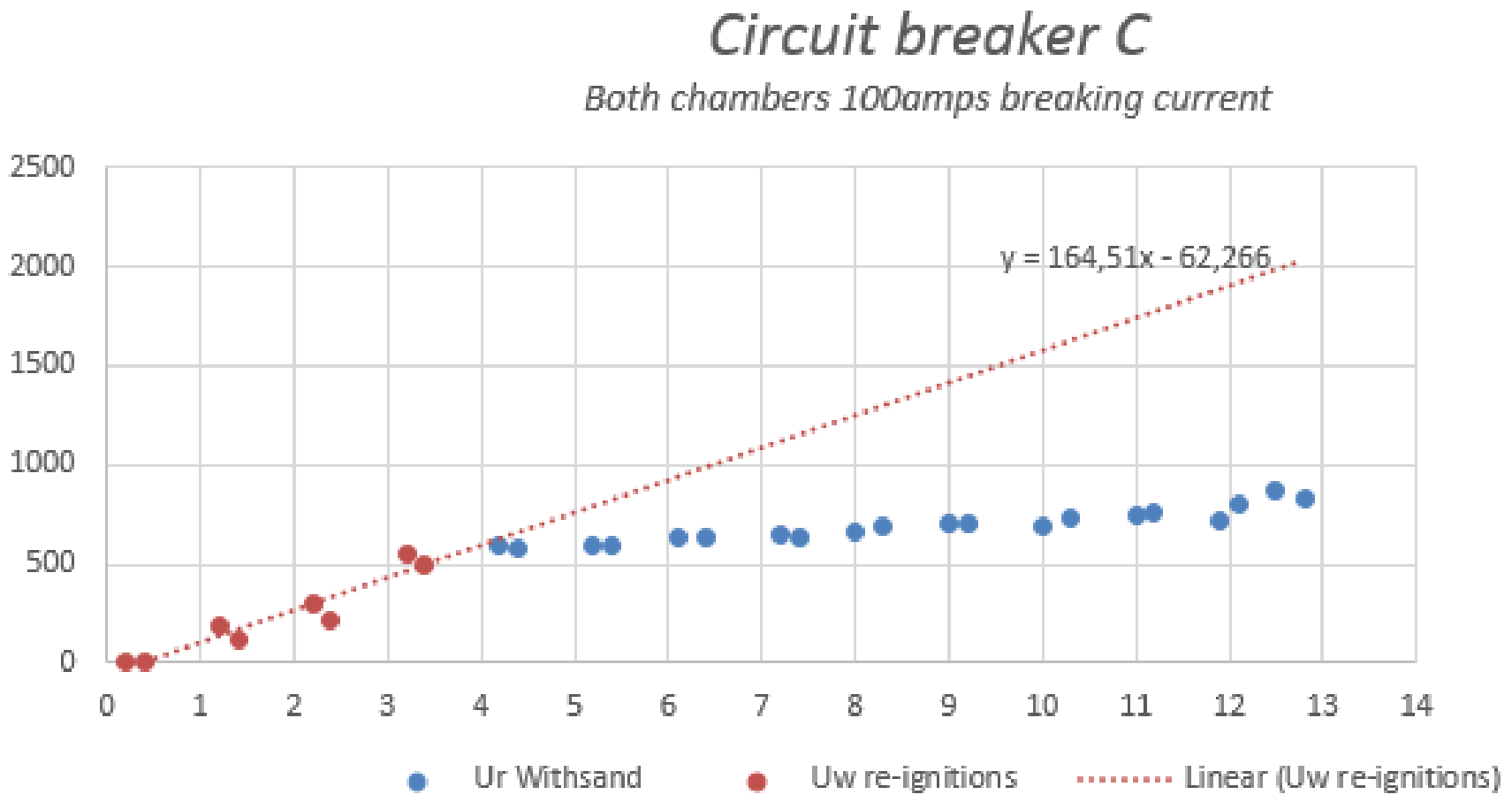
Fig. 4.2 Current chopping before the prospective current zero

2- Current chopping/Chopping number (cont')

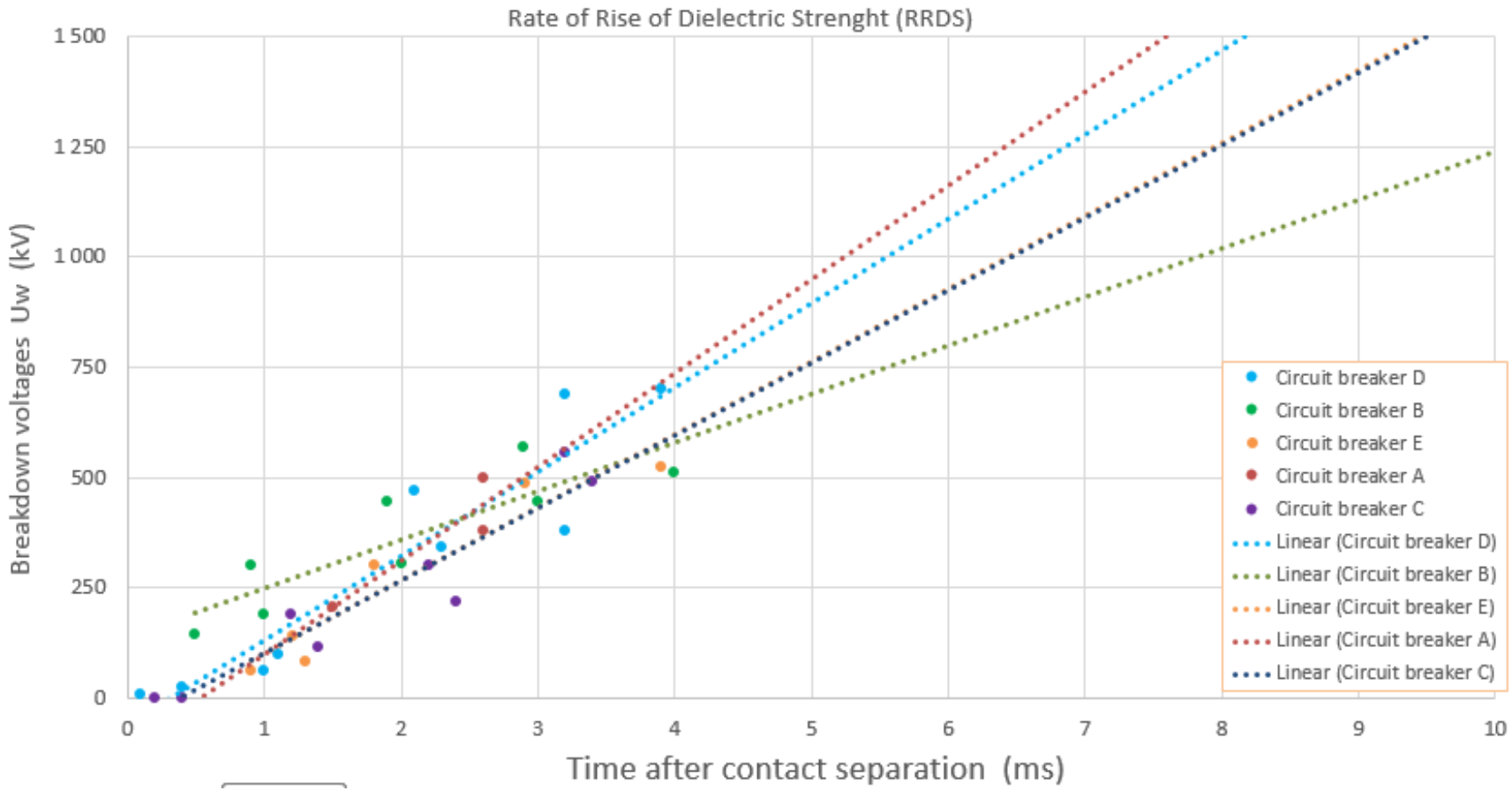


- 50 kA self blast (circuit-breakers B and E)
- 63 kA self blast (circuit-breakers A and D)
- 63 kA puffer (circuit-breaker C)

3- Rate of rise of dielectric strength



3- Rate of rise of dielectric strength (Cont')



- self-blast 63 kA circuit breakers (A and D) have the highest RRDS, approximately 190 and 210 kV/ms.
- the self blast 50 kA and the puffer 63 kA (C and E) have the same RRDS behaviour, with an RRDS of approximately 160 kV/ms.
- circuit-breaker B, self blast 50 kA model, has the lowest RRDS, approximately 110 kV/ms.

Conclusions

- The 63 kA puffer breaker technology is less suited than the others for interrupting small inductive currents, due to very high chopping number and medium range RRDS.

- The 63 kA self blast breakers considered also have a high chopping number which leads to high suppression peak or chopping overvoltages. However, the RRDS is better than for the 63 kA puffer and the 50 kA self blast breakers.

- The 50 kA self blast circuit-breakers have a low chopping current compared to the others. The RRDS is somewhat lower than the 63 kA self blast breakers, and therefore causes a higher risk for reignitions and corresponding overvoltages.

- ✓ From an economical perspective, 50 kA self blast circuit-breakers come out favourable compared to the others.

- ✓ Considering economical, HSE and technical aspects, it is concluded that 50 kA self blast circuit-breaker technology with composite insulator housings should be selected for shunt reactor switching applications.

Thanks for your attention !

Questions ?

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