

# **Caratterizzazione del bitume a bassa temperatura di servizio con DSR**

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## Sommario

- Scopo della caratterizzazione
- Metodo e analisi di campioni di bitume stradale
- Risultati, ripetibilità e confronto tra DSR (PP04) , DSR (SRF) e BBR

## Scopo della caratterizzazione

↓ Temperatura; ↑ Carichi



## Crack

- Rigidità del legante
- Aumento della componente elastica
- Diminuzione della componente viscosa



- BBR ( Esempio AASHTO T 313)
- DSR con PP04

## Metodo e analisi di campioni di bitume stradale



Table 1: Samples and conventional properties

Bitumen Type	30/45	50/70			70/100
Refinery	K	K	B	N	K
Needle Penetration 25 ° C [0.1 mm]	31	51	50	63	75
Softening point ring and ball [°C]	55.6	51.4	53.8	48.8	48.4
Breaking point after Fraaß [° C]	-4	-5	-7	-6	-7

## Metodo e analisi di campioni di bitume stradale



DSR con PP04 - AASHTO  
BBR- AASHTO

Metodo con SRF (22x3.8x8.8) in mm

- AS: strain 0.05%
- T [° C] (5,0,-5,-10,-16,-20 )
- 1° C/min & 15 min
- FS: 0.1 a 10Hz (21 punti)



Figure 1: clamped bituminous rod with open convection oven (CTD 180)

# Risultati, ripetibilità e confronto tra DSR (PP04 vs SRF)

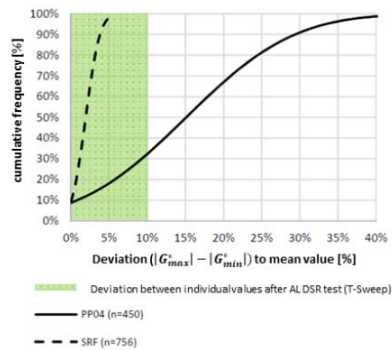


Figure 2: Deviation of the span of the complex Shear modulus ( $|G^*|$ ) of the SRF and PP04 - measuring system

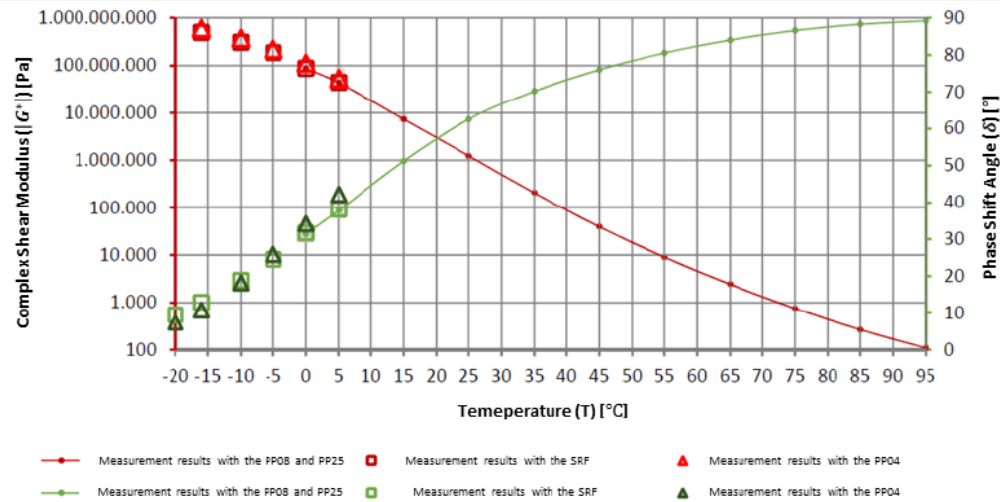
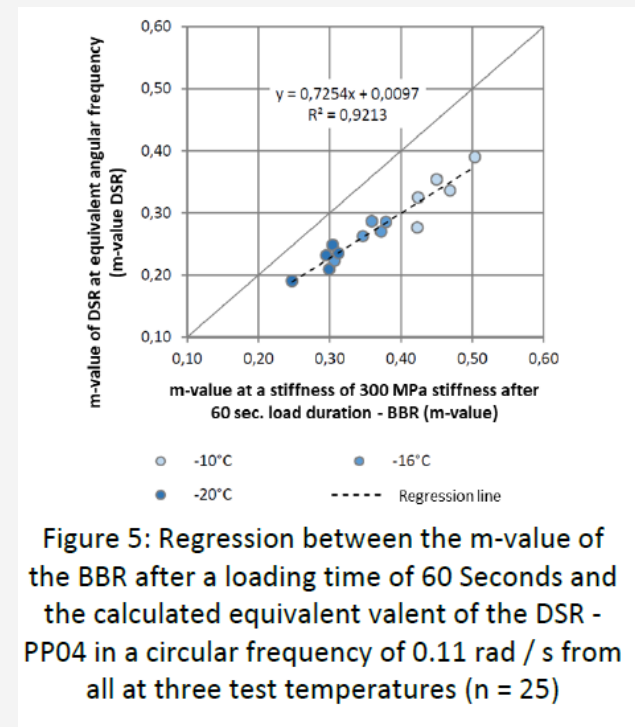
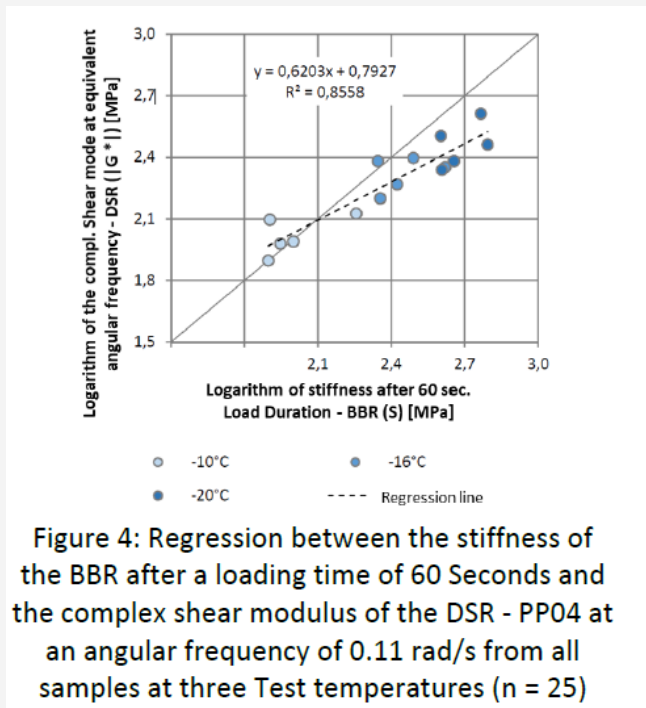


Figure 3: Isochrones of the road construction bitumen 50/70 N at 1.59 Hz measured with varying measuring systems

PP04: 33% diff. con 95% Probabilità  
 SRF: 4.5 diff. con 95% Probabilità

# Risultati, ripetibilità e confronto DSR (PP04) vs BBR DIN EN 147717



# Risultati, ripetibilità e confronto DSR (SRF) vs BBR



the regression.

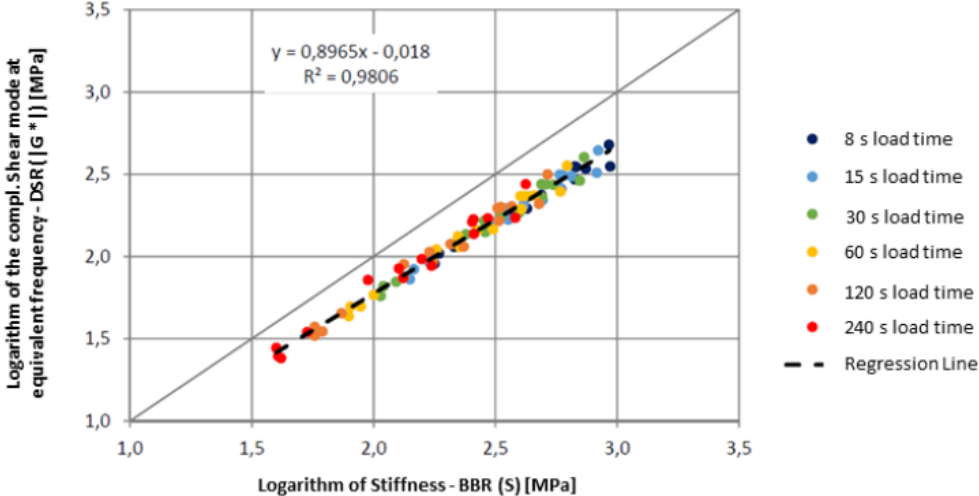


Figure 6: Regression between the rigidity of the BBR and the compl. Shear modulus of the DSR - SRF at an equivalent frequency of all samples, test temperatures and loading times (n = 90)



# Risultati, ripetibilità e confronto DSR (SRF) vs BBR

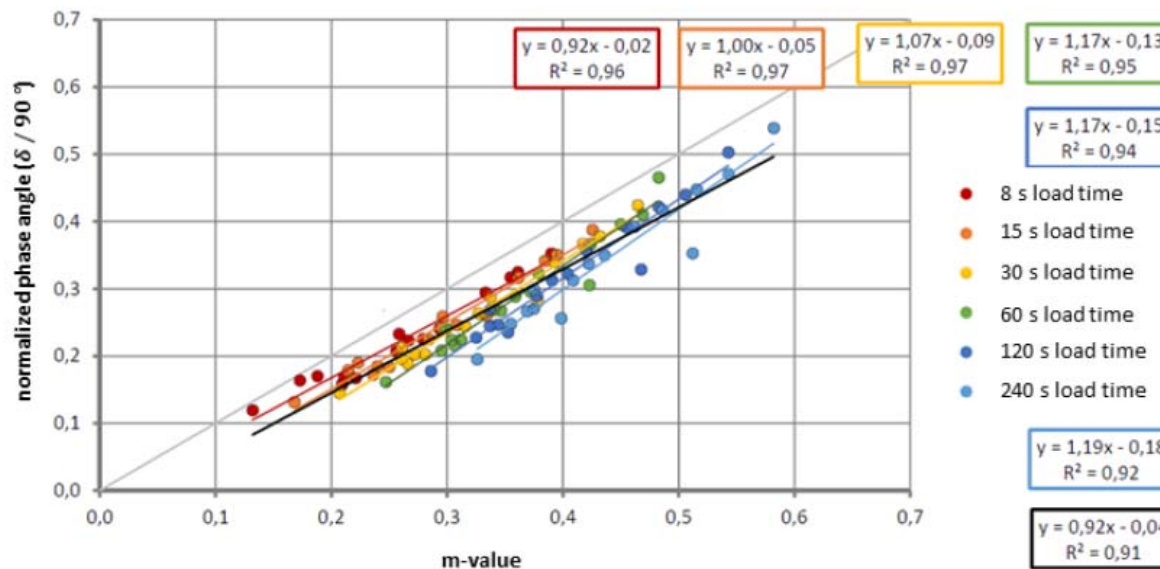
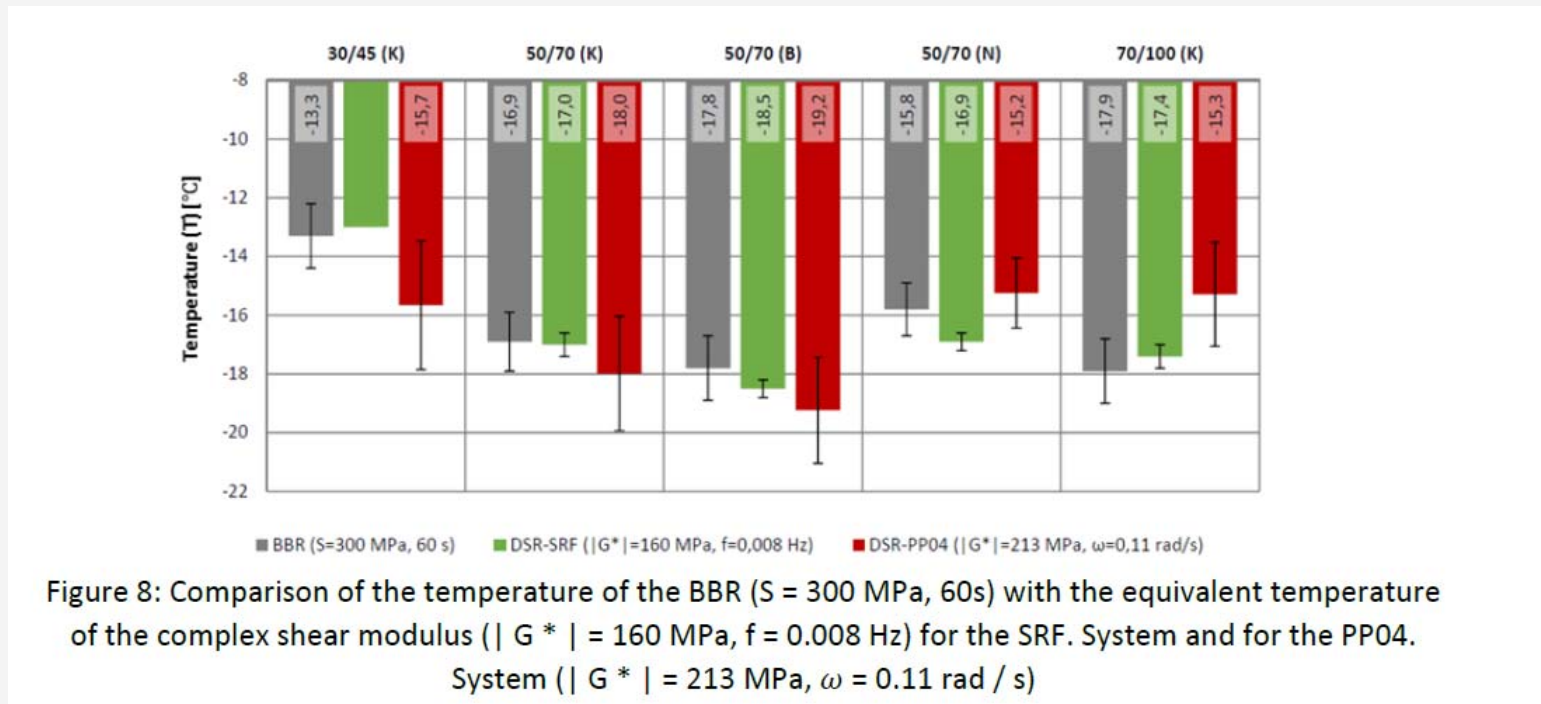


Figure 7: Comparison of the normalized phase angle and the m-value independent of the grade of the road pavement, the test temperature and the load duration over an equivalent mechanical power (n = 90)

# Risultati, ripetibilità e confronto BBR vs DSR (SRF) vs DSR (PP04)



# Risultati, ripetibilità e confronto BBR vs DSR (SRF) vs DSR (PP04)

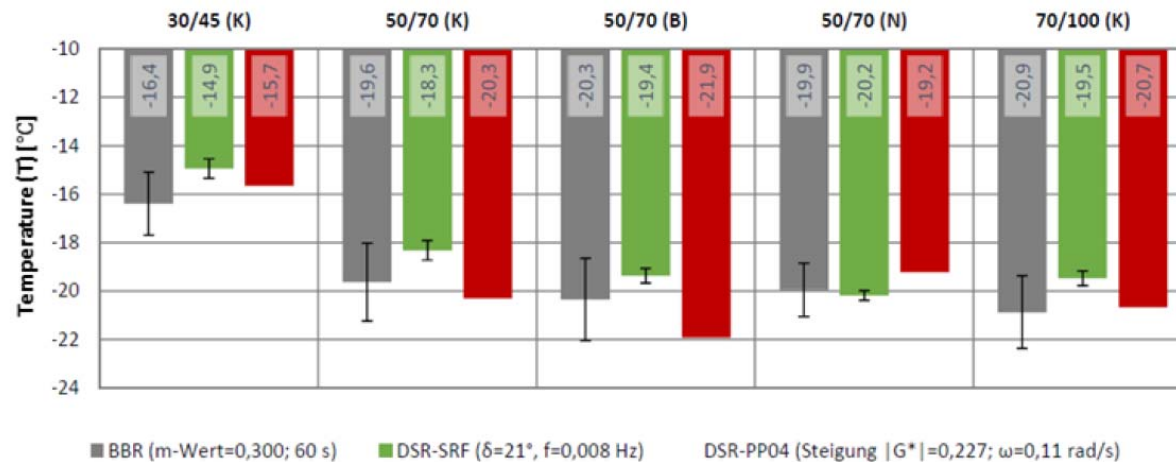


Figure 9: Comparison of the temperature of the BBR (m-value = 0.300; 60s; deviation  $\pm 1.4$  °C) with the equivalent temperature of the phase angle ( $\delta = 21^\circ$ ;  $f = 0.008$  Hz; deviation  $\pm 0.3$  °C) for the SRF. System and for the PP04. System (slope  $|G^*| = 0,227$ ,  $\omega = 0,11$  rad / s)

## Esempio di test di fatica



- Range di Temperatura  
Peltier            -20°C to 180°C  
Elettrico        -150°C to 450°C



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with your devices!

